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DECISION SUPPORT SYSTEM FOR OUTSTANDING STUDENTS' SELECTION USING TOPSIS

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Abstract

In the school environment, determining outstanding students has a significant meaning. High academic achievement among students and low failure rates reflect the overall quality of education. Based on interviews, it is known that the assessment process for outstanding students in schools still needs to be revised, and the current decision-making system needs to consider other factors, resulting in a less-than-optimal selection process, which is due to the existence of conflicts of interest in the assessment and inconsistent formulation of the evaluation. To address this issue, it is necessary to implement a Decision Support System (DSS) to assist schools in selecting top-performing students. DSS is an interactive system that provides access to data and modelling information, designed to support decision-making in structured and unstructured situations. The research predominantly employs quantitative methods, gathering primary data and conducting interviews. The DSS technique will be developed using the Order of Preference Technique based on Similarity to the Ideal Solution (TOPSIS) as an alternative ranking method. The final results show that using the TOPSIS method in this decision support system can increase efficiency and accuracy in selecting outstanding students in the school environment. Implementation has been carried out at the school, with results in line with expectations.

Keywords: quantitative; decision support system; TOPSIS; achievement

Abstrak

Dalam lingkungan sekolah, penentuan siswa berprestasi mempunyai arti yang sangat penting. Prestasi akademik yang tinggi di kalangan siswa dan tingkat kegagalan yang rendah mencerminkan kualitas pendidikan secara keseluruhan. Berdasarkan wawancara diketahui bahwa proses penilaian siswa berprestasi di sekolah masih perlu direvisi, dan sistem pengambilan keputusan yang ada saat ini perlu mempertimbangkan faktor-faktor lain sehingga mengakibatkan kurang optimalnya proses seleksi, hal ini disebabkan oleh adanya konflik kepentingan dalam penilaian dan formulasi penilaian yang tidak konsisten. Untuk mengatasi permasalahan tersebut, perlu diterapkan Sistem Pendukung Keputusan (DSS) untuk membantu sekolah dalam menyeleksi siswa yang berprestasi. DSS adalah sistem interaktif yang menyediakan akses ke data dan informasi pemodelan, yang dirancang untuk mendukung pengambilan keputusan baik dalam situasi terstruktur maupun tidak terstruktur. Penelitian ini sebagian besar menggunakan metode kuantitatif, mengumpulkan data primer dan melakukan wawancara. Teknik DSS akan dirancang menggunakan Teknik Order of Preference based on Kemiripan dengan Solusi Ideal (TOPSIS) sebagai metode perangkingan alternatif. Hasil akhir menunjukkan bahwa penggunaan metode TOPSIS pada sistem pendukung keputusan ini dapat meningkatkan efisiensi dan akurasi dalam menyeleksi siswa berprestasi di lingkungan sekolah. Implementasi telah dilakukan di sekolah, dengan hasil yang sesuai dengan harapan.

Kata kunci: Kuantitatif; sistem pendukung keputusan; TOPSIS; prestasi

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INTRODUCTION

Education is now required to be highly competitive and utilize resources optimally. High student achievement indices and low failure rates reflect the overall quality of education (Frieyadie, 2017; Sibuea & Safta, 2017). The school principal is responsible for conducting objective assessments to determine students deserving of an outstanding status based on neutral perspectives. They also implement these decisions based on school regulations (Dahriansah, Nata, & Harahap, 2020).

A decision support system (DSS) is a platform that can assist institutions or companies in the decision-making process to address various issues, whether they have a semi-structured or fully structured level of complexity (Andriyani & Hafiz, 2018; Dahriansah, Andri Nata, 2020; Mutiara, 2020; Sani et al., 2022; Syah et al., 2021).

Yapermas Vocational High School (SMK) is an institution of vocational secondary education that has been active in the education sector since 1989. The school provides various facilities and infrastructure to support and enhance student achievements. This includes guidance services, organizational activities, extracurricular clubs, and competition participation. Additionally, the school implements a reward system for students who achieve specific accomplishments. The selection of outstanding students is conducted periodically each semester.

Based on the interviews conducted by the author with several homeroom teachers at school, it is known that the evaluation of outstanding students is still carried out manually, involving complexity and being influenced by subjective considerations. Decisions tend to focus more on academic achievements, leading to a suboptimal selection of outstanding students.

Based on these issues, a system is necessary to support the school in making accurate and structured decisions to determine the best student selection. A Decision Support System (DSS) is an interactive system that provides access to data, data modelling, and the ability to process information. DSS is designed to assist in the decision-making process, both in situations with limited structural levels and highly unstructured situations where optimal decisions are not always clear (Alawiah & Sefrika, 2020; Kannia & Frieyadie, 2022; Sinaga & Zebua, 2017; Siregar, Arifian, & Azis, 2022; Sucahyo, Fitriansyah, & Suhanda, 2022).

This decision support system will be implemented by adopting the Technique for Order Preferences by Similarity to an Ideal Solution (TOPSIS) as the ranking method for alternatives. TOPSIS is a practical approach for optimal decision-making. Its advantages lie in simplicity, computational efficiency, and the ability to measure the relative performance of other options with precise mathematical formulations. As a valuable tool, TOPSIS supports decision-makers in achieving effective and efficient solutions in various situations (Trise Putra, Santi, Swara, & Yulianti, 2020).

TOPSIS is based on the rule that the best choice should have the closest distance to the positive ideal solution and farthest from the negative ideal solution geometrically. Utilizing the Euclidean distance, TOPSIS measures how close alternatives are to the best solution. The positive perfect solution refers to the total best values for each attribute, while the negative ideal solution consists of the total worst values. Thus, TOPSIS assists in determining the relative ranking of alternatives by considering their proximity to the perfect solution. This approach is helpful in various contexts, such as product selection, investment, or project performance evaluation (Mutmainah & Yunita, 2021; Nurelasari & Purwaningsih, 2020; Trise Putra et al., 2020; Tuslaela, 2020).

In this research, a decision support system will be developed to determine outstanding students. The main goal of this system is to simplify and expedite the ranking process of exceptional students with an objective approach without requiring excessive effort. The ranking results produced by this system are expected to provide valuable support for the school in selecting outstanding students more efficiently.

RESEARCH METHODS

Stages of Research

This research is designed through several stages. Figure 1 is a flowchart of the design stages.

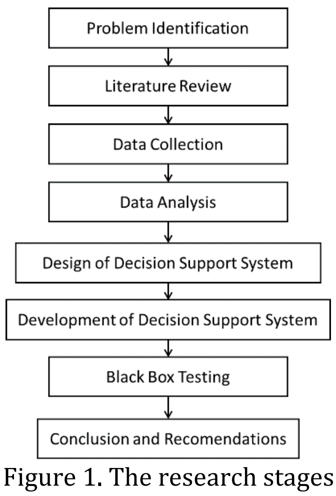

Figure 1. The research stages

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Figure 1 above explains the stages of research design, starting with the problem identification stage to recognize the needs and challenges that must be addressed. The next step involves conducting a literature review to understand the context and conceptual framework. Data is collected to obtain the necessary information, followed by data analysis to gain deeper insights.

Next, the design of the decision support system is carried out to plan its architecture and features. The subsequent development of the decision support system is based on the previously established design. Blackbox testing is conducted to ensure the alignment between the system's functionality and the specified requirements. Conclusions are drawn from the research findings, providing insights into achieving the research objectives and laying the groundwork for further recommendations.

Types of Research

This research adopts a quantitative approach, where data is obtained through interviews to determine assessment criteria and the needs of the decision support system. Additionally, document analysis is used to collect data relevant to the predetermined criteria. According to Ali et al. (2022), quantitative research is an exploratory type focused on social aspects by testing a theory that includes variables measured using numerical data. Statistical methods are employed to analyze this data, allowing conclusions to be drawn regarding whether the generalizations contained in the theory can be considered valid.

Time and Place of Research

The research will be conducted within the period specified by the school through the headmaster of SMK Yapermas Jakarta Pusat, commencing on September 18, 2023, and concluding on November 1, 2023. This timing plan has been adjusted with thorough coordination and approval from the school, ensuring the smoothness and optimal quality of the research.

This research will be conducted at SMK Yapermas Jakarta Pusat, located at Jalan Anyer No. 7, in the Menteng area, Menteng District, Central Jakarta, 10310, DKI Jakarta. SMK Yapermas is a formal educational institution in the Special Capital Region of Jakarta. The study will focus on the academic environment at SMK Yapermas Jakarta Pusat, where the interventions and research will be applied to enhance the selection of outstanding students.

Research Target / Subject

This research aims to identify the criteria used to assess outstanding students. Therefore, the author selected homeroom teachers as interview subjects to gain their perspectives and insights into decision-making. Homeroom teachers were chosen as the primary informants in this study to understand better the assessment aspects used to measure the achievement of outstanding students. They have direct experience observing students' development in the classroom and applying assessment criteria, making their views valuable to our understanding of how students are recognized as high achievers in the educational context.

Data, Instruments, and Data Collection Techniques

The type of data used in this research is primary data obtained directly from the research subjects. The data collection methods involve observation, interviews with class teachers, analysis of student grades, and literature review. According to the research needs, the instruments used to support the data collection techniques include smartphones to capture relevant data through photographs. Google Forms, a sophisticated and efficient tool, is employed to conduct interviews with class teachers to assess high-achieving students. Additionally, the literature review used in preparing this research report draws from various scholarly journal references to ensure the accuracy and credibility of the information.

Data analysis technique

This study analyzed the data using the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method. The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is a decision-making method that considers how close alternatives are to the positive ideal solution and how far they are from the negative ideal solution. Although the alternative closest to the positive ideal solution is considered better, other options may exist. The farthest valuation is done by simultaneously considering both criteria, creating the best balance between proximity to the positive ideal solution and distance from the negative ideal solution. As a decision-making method, TOPSIS provides a comprehensive approach based on various relevant criteria (Harits & Majid, 2023; Oprasto, 2023; Pahlevi, Testiana, & Putra, 2023; Singgalen, 2023).

According to Wahyusni (2017), the TOPSIS procedure involves a series of steps as follows:

1. Conducting performance assessment for each alternative A_i on each normalized criterion C_j.

Equation (1) $r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^{m} X_{ij}\,2}}$ ....(1)

With i = 1, 2, ..., m; and j = 1, 2, ..., n.

2. Determining the positive ideal solution A^+ and the negative ideal solution A^- based on the ratings of normalized weights (y_{ij}). Equation (2), (3), dan (4)

$y_{ij} = W_j\, r_{ij}$; ....(2)
$A^+ = (y_1^+, y_2^+, \dots, y_n^+)$; ....(3)
$A^- = (y_1^-, y_2^-, \dots, y_n^-)$; ....(4)

With i = 1, 2, ..., m; and j = 1, 2, ..., n.
Equations (5) and (6)

$y_j^+ = \begin{pmatrix} max_i\ y_{ij}; if\ j\ is\ a\ benefit\ atribut \\ min_i\ y_{ij}; if\ j\ is\ a\ cost\ atribut \end{pmatrix}$ .... (5)

$y_j^- = \begin{pmatrix} min_i\ y_{ij}; if\ j\ is\ a\ benefit\ atribut \\ max_i\ y_{ij}; if\ j\ is\ a\ cost\ atribut \end{pmatrix}$ .... (6)

3. Determining the distance between alternative A_i And the positive ideal solution. Equation (7)

$D_i^+ = \sqrt{\sum_{j=1}^{n} (y_i^+ - y_{ij})2}$; = 1, 2, …., m .... (7)

Determining the distance between alternative A_i And the negative ideal solution.Equation (8)

$D_i^- = \sqrt{\sum_{j=1}^{n} (y_{ij} - y_i^-)2}$; = 1, 2, …., m .... (8)

4. Determining the preference value for each alternative (V_i). Equation (9).

$V_i = \frac{D_i^-}{D_i^- + D_i^+}$ I = 1, 2, ….., m .... (9)

A larger value of V_i indicates that alternative A_i It is preferred.

Design of Decision Support System

Here is the visual representation of the use case diagram in the proposed decision support system plan for selecting outstanding students.

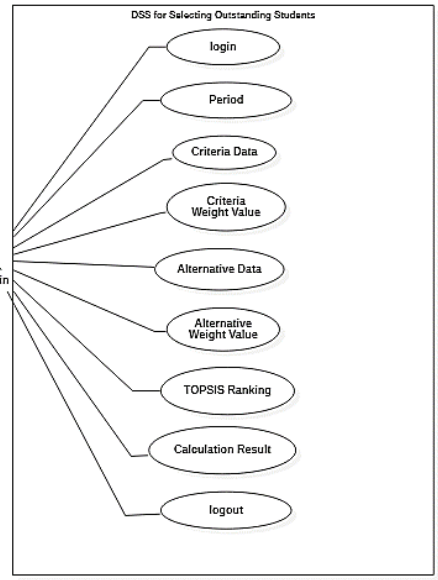

Figure 2. Use case diagram for DSS

Here is an explanation of Figure 2. Use the case diagram above:

1. Admin: An authorized actor responsible for managing and overseeing the entire system or platform.
2. Login: The admin uses the login process to access the system by entering credentials such as a username and password to gain full access.
3. Period: The admin can determine and set a specific time range or period likely used for analysis, reporting, or data management within a contextual timeframe.
4. Criteria data: The admin can define criteria or evaluation standards for decision-making processes or data analysis.
5. Criteria Weight Values: Admin can directly modify the criteria weight table, compare the intensity of importance among criteria, and adjust the weight values.
6. Alternatives data: Admin can add, delete, or manage options or alternatives related to specific decisions or actions within the system.
7. Alternative Weight Values: The admin can directly modify the alternative weight table and assign values to each alternative according to criteria such as report grades, internships, extracurricular activities, and skills.
8. TOPSIS Ranking: Admin utilizes the TOPSIS ranking calculation method as one of the decision analysis tools, considering specific criteria against a series of alternatives.
9. Ranking Results: Admin can access and review the ranking results obtained from the TOPSIS calculation process through the system.

10. Logout: As a security measure, the admin can log out to exit the system, end the session, and protect information and privacy access.

RESULTS AND DISCUSSION

After discussing the background and research methodology to understand the issues and their solutions, the next step is to move on to the discussion section. The research findings will be introduced and further elaborated in this discussion.

Data

The author utilizes ten alternative datasets in this research that provide detailed information about each student. The applied alternative function aims to evaluate and compare the performance or values of each alternative considered in the decision-making process. Using alternatives is crucial as it helps link input attributes or variables with output values, which are subsequently employed in ranking or selecting the best alternative. As a case example, the author employs ten student data to enrich the analysis and calculations in this research. Here are the ten-student data used as alternatives in this study:

Table 1. Alternative Data

Alternative number	Student name
A1	Adelia Rahmawati
A2	Adrian Syawal Sofyan
A3	Amelia Putri
A4	Annisa Yaumil Akhir
A5	Arasyd Rinyadi
A6	Arya Putra Hadi Pratama
A7	Aryo Haikal Bisri
A8	Asyira Audriani Qintary
A9	Cindy Fitriani Sanudi
A10	Dewi Angelina Br. Panggabean

Table 1 above contains ten examples of student data used as alternatives in this study. Information about the alternative data was obtained by analyzing student grade documents. The homeroom teachers also provided these grade documents as the research subjects.

After identifying the available options, the next step is recognizing the criteria. In the context of this research, the author obtained these criteria through interviews with homeroom teachers as the research subjects. Four criteria serve as this study's central focus of analysis and consideration. The following are the four evaluation criteria for high-achieving students at school.

Table 2. Criterion Weights

Code	Criteria	Type	Weight
C1	Report card grades	Benefit	0,558
C2	work practice grades	Benefit	0,263
C3	Extracurricular grades	Benefit	0,122
C4	Skill assessment grade	benefit	0,057

Table 2 above displays four evaluation criteria: report grades, internship grades, extracurricular grades, and skill grades. The criteria weights are determined by applying the TOPSIS method, where the importance level of each criterion becomes the primary consideration. In this case, report grades have the highest weight as they are considered the most essential criterion in the evaluation, followed by internship grades, extracurricular grades, and skill grades.

After understanding the criteria weights, the next step is to delve into further discussions regarding the implementation and application of alternatives and criteria in the context of this research, particularly in the ranking process using the TOPSIS method. This will provide a comprehensive understanding of how each alternative is evaluated and ranked based on the predetermined criteria weights.

Discussion

The following table illustrates the assessment data of alternatives according to the established criteria, and this information was obtained from the research subjects.

Table 3. Assessment Data

Alternative	C1	C2	C3	C4
A1	70	100	78	90
A2	78	50	80	90
A3	80	75	79	90
A4	79	100	82	90
A5	82	75	77	96
A6	77	50	76	90
A7	76	100	75	92
A8	75	100	79	90
A9	79	75	78	91
A10	78	50	78	95

Table 3 above shows the values of 10 alternative data according to the evaluation criteria. Based on the table, it is known that alternative 1 has a reported value of 70, an internship value of 100, an extracurricular value of 78, and a skill value of 90. This value information was obtained from the homeroom teacher as the research subject.

After understanding the assessment data of alternatives according to the established criteria, the initial step in the TOPSIS method involves normalizing the decision matrix using the formula in Equation 1. This process is crucial for addressing the scale inequality among criteria. Normalization is performed by transforming the values of each cell in the decision matrix to ensure they fall within a uniform range, typically between 0 and 1. Here are the results of the normalization from the table 4:

Table 4. Decision Normalization Matrix

A	C1	C2	C3	C4
A1	0,28576	0,39413	0,31533	0,3113
A2	0,31842	0,19707	0,32341	0,3113
A3	0,32659	0,2956	0,31937	0,3113
A4	0,32251	0,39413	0,3315	0,3113
A5	0,33475	0,2956	0,31128	0,33205
A6	0,31434	0,19707	0,30724	0,3113
A7	0,31026	0,39413	0,3032	0,31822
A8	0,30618	0,39413	0,31937	0,3113
A9	0,32251	0,2956	0,31533	0,31476
A10	0,31842	0,19707	0,31533	0,32859

Based on Table 4 above, each value in the decision matrix for each alternative (A1 to A10) and criteria (C1 to C4) is normalized using a normalization formula. This process is repeated for each cell in the decision matrix, resulting in normalized values for the entire matrix. For example, from the results of Table 4, it is known that alternative 1 obtained a normalized decision value of 0.28576 for the criterion of report grades, 0.39413 for internship grades, 0.31533 for extracurricular activities, and 0.3113 for skills.

After normalizing the decision matrix, the next step in the TOPSIS method is to determine the positive ideal solution (A^{+}) and negative ideal solution (A^{-}) based on the normalized weight ratings (y_{ij}). Before determining the positive and negative ideal solutions, normalized weights are assigned to each criterion using the formula in Equation 2. Table 5 presents the results of the normalized weight matrix

Table 5. Normalized Weight Matrix

Al	C1	C2	C3	C4
A1	0,15946	0,10366	0,03847	0,01774
A2	0,17768	0,05183	0,03946	0,01774
A3	0,18224	0,07774	0,03896	0,01774
A4	0,17996	0,10366	0,04044	0,01774
A5	0,18679	0,07774	0,03798	0,01893
A6	0,1754	0,05183	0,03748	0,01774
A7	0,17312	0,10366	0,03699	0,01814
A8	0,17085	0,10366	0,03896	0,01774
A9	0,17996	0,07774	0,03847	0,01794
A10	0,17768	0,05183	0,03847	0,01873

Table 5 above shows the results of the normalized weight matrix for ten alternatives on four criteria (C1, C2, C3, and C4) using the TOPSIS method. This matrix reflects the relative contribution of each alternative to each criterion after considering the predetermined criterion weights. For example, Alternative A1 has a relative value of about 0.16003 on C1, 0.10247 on C2, 0.03784 on C3, and 0.01868 on C4. A similar process is carried out for each alternative.

The data from the matrix above is utilized in the next step of the TOPSIS method to determine the priority order of alternatives based on their proximity to the positive and negative ideal solutions using equations 3. The following table illustrates the results of the positive and negative ideal solutions generated from the normalized weight matrix :

Table 6. Positive ideal solution

C1	C2	C3	C4
0,18679	0,10366	0,04044	0,01893

Table 6 above shows the positive ideal solution for the four criteria (C1-C4) in the TOPSIS method. These values represent the maximum that can be achieved by an alternative for each criterion, taken from the normalized weight matrix.

Table 7. Negative ideal solution

C1	C2	C3	C4
0,15946	0,05183	0,03699	0,01774

Table 7 above shows the negative ideal solution for the four criteria (C1, C2, C3, and C4) in the TOPSIS method. The values in this table are obtained by selecting the minimum values from the normalized weight matrix.

After the normalization process of the matrix and obtaining the positive and negative ideal solutions, the next step is to calculate the distance between each alternative. A_i and the positive ideal solution D_i^{+} as well as the negative ideal solution D_i^{-} Using equations 4 and 5. This step evaluates how far each alternative approaches or deviates from the maximum value (positive ideal solution) and the minimum value (negative ideal solution) at the criterion level. The following is a table 8 of distances to the positive ideal solution from the existing alternatives:

Table 8. Distance to the positive ideal solution

Alternative	Distance
D1+	0,02743
D2+	0,05265
D3+	0,02638
D4+	0,00694
D5+	0,02603
D6+	0,05316
D7+	0,01412
D8+	0,01606
D9+	0,02689
D10+	0,05266

Table 8 above illustrates the results of calculating the distance between each alternative. D_i^{+}And the positive ideal solution in the TOPSIS

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method. This distance is measured using the Euclidean Distance formula and reflects how close each alternative is to the desired maximum value for each criterion. Smaller distance values indicate that an alternative is closer to the positive ideal solution. For instance, D4+ has a minimal distance, approximately 0.00694, indicating that Alternative D4 is close to the desired maximum value at the criterion level.

After calculating the distance to the positive ideal solution, the next step is determining the distance to the negative ideal solution. The following table 9 presents the results of the distance to the negative perfect solution:

Table 9. Distance to the negative ideal solution

Alternative	Distance
D1-	0,05185
D2-	0,01839
D3-	0,03456
D4-	0,05584
D5-	0,0377
D6-	0,01595
D7-	0,0536
D8-	0,0531
D9-	0,03308
D10-	0,01831

Table 9 shows the results of calculating the distance between each alternative and the negative ideal solution in the TOPSIS method. This distance is measured using the Euclidean Distance formula and reflects how far each alternative deviates from the undesired minimum value for each criterion. Smaller distance values indicate that an alternative is far from the negative ideal solution. For example, D6 has a small distance of approximately 0.01601, indicating that Alternative D6 has a significant distance from the undesired minimum value at the criterion level. The next step after determining the distance between each alternative and the positive and negative ideal solutions in the TOPSIS method is calculating the preference value. V_i For each alternative, use equation 6. The following table 10 displays the results of the preference values V_i :

Table 10 Table 10. Preference value results

Alternative	Preference Value		Rank
A1	V1	0,654	4
A2	V2	0,259	8
A3	V3	0,567	6
A4	V4	0,890	1
A5	V5	0,592	5
A6	V6	0,231	10
A7	V7	0,792	2
A8	V8	0,768	3
A9	V9	0,552	7
A10	V10	0,258	9

Table 10 above presents the results of preference values and rankings for each alternative in the TOPSIS method. These preference values reflect how well each alternative satisfies the established criteria, with higher values indicating more excellent proximity to the positive ideal solution.

Based on Table 10, Alternative A4 has the highest preference value, 0.890, and thus receives the first rank. It is followed by Alternatives A7 and A8, each having preference values of 0.792 and 0.768, securing the second and third ranks, respectively.

Compared with previous research, which may use other decision analysis methods such as the Analytical Hierarchy Process (AHP), Fuzzy AHP, or other criteria-based assessment methods, TOPSIS offers efficiency and ease in dealing with complex and conflicting assessment situations. TOPSIS allows objective assessment by measuring the relative distance of each alternative from positive and negative ideal solutions. The effectiveness of TOPSIS compared to other methods in previous research can be measured in accuracy and objectivity in selection. TOPSIS, with its mathematical approach, reduces the subjective biases and conflicts of interest that often influence the assessment process, thereby increasing the accuracy and objectivity of selection. This research adds to the literature by applying TOPSIS in a new context, namely the selection of outstanding students in a school environment, which previously may have focused more on industrial or organizational applications. The use of TOPSIS-based DSS in educational contexts shows innovation in addressing complex and subjective assessment problems.

Development of Decision Support System

After analysis using the TOPSIS method, a ranking of each alternative was produced through calculations using Microsoft Excel. The display below is the software design result of using the TOPSIS method to determine outstanding students at school.

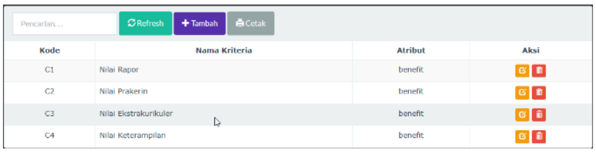

Figure 3. The Criteria Page

Figure 3 above is the criteria page displaying the criteria table. This page presents the criteria data that has been inputted previously for the 2022-2023 period. Users can add, edit, print, and delete the available criteria information on this page.

Kode	C1	C2	C3	C4
C1	1	3	5	7
C2	0.333	1	3	5
C3	0.2	0.333	1	3
C4	0.143	0.2	0.333	1

Figure 4 The display of the criteria weight page

Figure 4 above displays the criteria weight page that users can customize. Users can adjust the importance value of each criterion through the dropdown menu, which presents the level of importance and intensity of a criterion compared to others.

Pencarian | Refresh

Kode	Nama Siswa	C1	C2	C3	C4	Aksi
A1	Adelia Rahmawati	70	100	78	90	Ubah
A2	Andrian Syawan Sofian	78	50	80	90	Ubah
A3	Amelia Putri	80	75	79	90	Ubah
A4	Annisa Yaumil Akhir	79	100	82	90	Ubah
A5	Arasyd Riyadi	82	75	77	96	Ubah
A6	Arya Putra Hadi Pratama	77	50	76	90	Ubah
A7	Aryo Haikal Bisri	76	100	75	92	Ubah
A8	Asyra Audriani Qintary	75	100	79	90	Ubah

Figure 5. The alternative page and the weight of alternative values

Figure 5 above shows the alternative page displaying a table of alternatives and alternative weight values according to the predetermined evaluation criteria. Users can adjust the values for each alternative according to the existing criteria.

Normalisasi

	C1	C2	C3	C4
A1	0.28576	0.39413	0.31533	0.3113
A2	0.31842	0.19707	0.31533	0.32859
A3	0.31842	0.19707	0.32341	0.3113
A4	0.32659	0.2956	0.31937	0.3113
A5	0.32251	0.39413	0.3315	0.3113
A6	0.33475	0.2956	0.31128	0.33205
A7	0.31434	0.19707	0.30724	0.3113
A8	0.31026	0.39413	0.3032	0.31822
A9	0.30618	0.39413	0.31937	0.3113
A10	0.32251	0.2956	0.31533	0.31476

Figure 6. The normalized matrix results

Figure 6 above displays the normalization matrix results of the previously set alternative weight values. This provides a standardized representation of the alternative weight values, allowing users to understand better the relative comparison between alternatives based on the predetermined criteria.

Normalisasi Terbobot

	C1	C2	C3	C4
A1	0.15943	0.10379	0.03843	0.01771
A2	0.17765	0.0519	0.03942	0.01771
A3	0.1822	0.07784	0.03892	0.01771
A4	0.17992	0.10379	0.0404	0.01771
A5	0.18676	0.07784	0.03794	0.01889
A6	0.17537	0.0519	0.03744	0.01771
A7	0.17309	0.10379	0.03695	0.0181
A8	0.17081	0.10379	0.03892	0.01771
A9	0.17992	0.07784	0.03843	0.01791
A10	0.17765	0.0519	0.03843	0.01869

Figure 7. The weighted normalization results

Figure 7 above shows the weighted normalized matrix calculation results in the calculation menu. This is an advanced stage in the analysis process, where the previously calculated normalization values are then weighted according to the predetermined criteria weights.

Matriks Solusi Ideal

	C1	C2	C3	C4
positif	0.18676	0.10379	0.0404	0.01889
negatif	0.15943	0.0519	0.03695	0.01771

Figure 8. The ideal solution matrix results

Figure 8 above shows the results of calculating positive and negative ideal solutions in the calculation menu. This matrix includes comparisons between each alternative and the positive ideal solution (best) and the negative ideal (worst) based on the predetermined criteria.

Jarak Solusi & Nilai Preferensi

	Positif	Negatif	Preferensi
A1	0.02743	0.05192	0.65433
A2	0.05271	0.01839	0.2586
A3	0.02641	0.03458	0.56696
A4	0.00693	0.0559	0.88966
A5	0.02606	0.03772	0.59135
A6	0.05323	0.01595	0.23057
A7	0.01412	0.05367	0.79175
A8	0.01605	0.05317	0.76807
A9	0.02692	0.0331	0.55146
A10	0.05273	0.01831	0.25772

Figure 9. Solution distance & preference

Figure 9 above displays the results of the distance calculation of solutions and preference values in the calculation menu. In this context, the solution distance measures how close or far each alternative is from the positive or negative ideal solution. Meanwhile, the preference value reflects each alternative's relative ranking based on comparing these solution distances.

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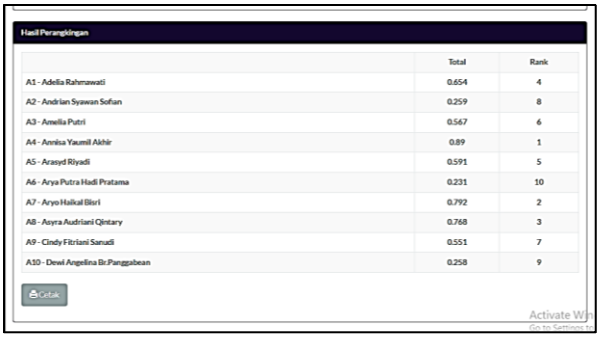
Accredited rank 4 (SINTA 4), excerpts from the decision of the DITJEN DIKTIRISTEK No. 230/E/KPT/2023


Hasil Perangkingan

	Total	Rank
A1 - Adelia Rahmawati	0.654	4
A2 - Andrian Syawan Sofian	0.259	8
A3 - Amelia Putri	0.567	6
A4 - Annisa Yaumil Akhir	0.89	1
A5 - Arasyd Riyadi	0.591	5
A6 - Arya Putra Hadi Pratama	0.231	10
A7 - Aryo Haikal Bisri	0.792	2
A8 - Asyra Audriani Qintary	0.768	3
A9 - Cindy Fitriani Sanudi	0.551	7
A10 - Dewi Angelina Br.Panggabean	0.258	9

Cetak

Figure 10. Alternative ranking results

Figure 10 above shows the ranking results in the calculation menu. This ranking is based on the preference values calculated from the solution distances and provides a direct view of the priority order of alternatives based on the established criteria.

CONCLUSIONS AND SUGGESTIONS

Conclusion

After conducting research, which includes designing a decision support system for selecting outstanding students at the school by applying the TOPSIS method, the authors conclude that the developed system successfully achieved its goal of creating an efficient platform to assist in decision-making related to selecting outstanding students in the school environment. The research uses the TOPSIS method, which provides preference values for each alternative, with alternative A4 obtaining the highest rank. This demonstrates the success of the TOPSIS method in determining the best alternative according to the established criteria. Therefore, using the TOPSIS method in this decision support system can enhance efficiency and accuracy in selecting outstanding students in the school environment. This system is expected to positively contribute to improving the quality of decision-making at the educational level.

Suggestion

Although this study covers four assessment criteria (report grades, internship performance, extracurricular activities, and skills), it is recommended to consider adding relevant assessment criteria for further development. By adding more assessment criteria, student evaluation becomes more comprehensive, encompassing various aspects of achievement and student development, thus strengthening broader and more holistic decision-making aspects.

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