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A COMPARATIVE ANALYSIS OF MFEP AND SAW METHODS IN DECISION SUPPORT SYSTEMS FOR MAJOR SELECTION

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Abstract: The selection of majors at SMAS YPK Kedaisianam previously still used a manual system that was less effective in determining the right major for students. To overcome this, a new system that is easier and more accurate is needed. This system is expected to assist counseling guidance teachers in providing solutions for choosing majors to students. This study compares two methods, namely Multi Factor Evaluation Process (MFEP) and Simple Additive Weighting (SAW), which have similarities in weighting criteria to produce more effective rankings. The research methodology used is a quantitative approach with numerical data analysis. This study aims to describe the comparison of the two methods in the decision support system for choosing majors at SMKS DAAR Muhsinin. The results of the study show that the use of more effective methods in the application system can make decision-making easier. The conclusion of this study is that the application of MFEP methods can improve accuracy and efficiency in the course selection process.

Keywords: decision support system; mfep and saw methods; major selection.

Abstrak: Pemilihan jurusan di SMAS YPK Kedaisianam sebelumnya masih menggunakan sistem manual yang kurang efektif dalam menentukan jurusan yang tepat bagi siswa. Untuk mengatasi hal tersebut, diperlukan sistem baru yang lebih mudah dan akurat. Sistem ini diharapkan membantu guru bimbingan konseling dalam memberikan solusi pemilihan jurusan kepada siswa. Penelitian ini membandingkan dua metode, yaitu Multi Factor Evaluation Process (MFEP) dan Simple Additive Weighting (SAW), yang memiliki kesamaan dalam pembobotan kriteria untuk menghasilkan peringkat yang lebih efektif. Metodologi penelitian yang digunakan adalah pendekatan kuantitatif dengan analisis data berbasis angka. Penelitian ini bertujuan untuk mendeskripsikan perbandingan kedua metode tersebut dalam sistem pendukung keputusan pemilihan jurusan di SMKS DAAR Muhsinin. Hasil penelitian menunjukkan bahwa penggunaan metode yang lebih efektif dalam sistem aplikasi dapat mempermudah pengambilan keputusan. Simpulan dari penelitian ini adalah penerapan metode MFEP dapat meningkatkan akurasi dan efisiensi dalam proses pemilihan jurusan.

Kata Kunci: metode mfep dan saw; pemilihan jurusan; sistem pendukung keputusan.

INTRODUCTION

Choosing a major in high school is one of the important decisions that affect a student's future. However, at SMAS YPK Kedaisianam, the process of selecting a major is still carried out manually, which is often less accurate and does not take into account the individual potential of students.

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Students tend to choose majors based on peer preferences, not personal abilities or interests. This causes a number of students to experience academic difficulties because the chosen major does not match their talents and interests. The manual major selection system not only results in inappropriate decisions, but also affects students' academic performance. Students who are uncomfortable with their chosen major are less likely to be motivated to study, which ultimately leads to a decline in academic outcomes. Therefore, a more sophisticated system is needed to facilitate the selection of the right major, so that students' potential can be optimized. This study aims to compare two decision-making methods, namely MFEP and SAW, in order to determine which method is more effective in choosing majors in schools. This system will be implemented in the form of an application that can be used by counseling guidance teachers to help students choose majors that suit their abilities and interests.This research uses a quantitative approach, where data is processed and analyzed using certain formulas to produce rankings from various alternative majors. The MFEP method will be compared to the SAW method in terms of the effectiveness and efficiency of the decision-making process. Both methods have their own advantages, where MFEP is more intuitive and SAW is more number-based. The data used came from students of SMAS YPK Kedaisianam and SMKS DAAR Muhsinin, which will be analyzed using the decision support system application developed. The uniqueness of this study lies in the combination of two decision-making methods that are rarely compared directly in the context of major selection. The integration of the MFEP and SAW methods into an application is an innovation that is expected to be able to increase the accuracy and efficiency of major selection in schools. The research also offers practical solutions that can be applied in various other schools with similar problems. Previous research has focused more on the use of one of the methods, both MFEP and SAW, in other contexts such as risk management or project selection.However, there has been no research that specifically compares these two methods in the context of choosing a major in school. This makes this research have a new contribution in the field of decision support system development in the world of education. By comparing the MFEP and SAW methods, this study shows that both methods have their own advantages in the context of major selection. However, the integration of the two in the form of an application provides a more practical and effective solution in helping students choose a major that suits their interests and abilities.

METHODS

Data Collection Techniques

The data collection techniques carried out by the author are: Interviews, Observation is a data collection technique by making observations or coming directly to the research site.

Decision Support System

Constitutes a segment of computer-based information systems, encompassing knowledge-based or knowledge management systems, designed to facilitate decision-making

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within an organization or enterprise [1]. It is characterized as "a system intended to assist decision-makers in scenarios where decisions are either unstructured or semi-structured" [2].

Multi-Factor Evaluation Process (MFEP) Method

In MFEP, all criteria considered pivotal for evaluation are initially assigned appropriate weights [4][5][6], based on subjective and intuitive assessments of the indicators or causal factors deemed significant [7]. The MFEP methodology posits that the alternative with the highest score represents the most optimal solution according to the established criteria [8].

The implementation of the MFEP method is realized through the following formulas [9][10][11].
The calculation of factor evaluation weights is expressed by the formula below:

$$EF = \frac{\sum x}{\sum x \, max} \quad (1)$$

Description:
EF : Evaluation factor
x : Sub-criterion value
x_{max} : Maximum value of *x*

The calculation of evaluation weight is expressed by the formula beside:

$$WE = FW \times E \quad (2)$$

Description:
WE : Evaluation weight
FW : Factor weight
E : Evaluation factor value

The calculation of the total evaluation value is represented by the formula:

$$\sum_{i=1}^{n} WE_i = WE_1 + WE_2 + WE_n \quad (3)$$

The calculation of the total evaluation weight of the *i*-th evaluation criterion:

$$\sum_{i=1}^{n} WE_i \quad (4)$$

Description:
i=1 : total evaluation weight value
WE_i : i-th evaluation weight value

Simple Additive Weighting (SAW) Method

The simple additive weighting (SAW) method represents one of the most elementary and extensively employed techniques in fuzzy multi-attribute decision-making (MADM).
For benefit attributes, the normalization formula is as follows:

$$r^{ij} = \left\{ \frac{x^{ij}}{Max \; x^{ij}} \right\} \quad (5)$$

For cost attributes, the normalization formula is as follows:

$$r^{ij} = \left\{ \frac{Min \; x^{ij}}{x^{ij}} \right\} \quad (6)$$

Description:
r^{ij} : normalized performance rating
Max x^{ij}: maximum value of each row and column
Min x^{ij}: minimum value of each row and column
X^{ij} : value within the matrix cell corresponding to the row and column

Here, r^{ij} denotes the normalized performance rating of alternative A^i for attribute C^j, where $i = 1, 2, \ldots, m$ and $j = 1, 2, \ldots, n$.

The preference value for each alternative (V^i) is computed as follows:

$$V^i = \sum_{j}^{n} =1 \; w^j r^{ij} \quad (7)$$

Description:
Vi : Final score of the alternative

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Wj : Assigned weight
rij : Normalized matrix value

A higher *Vi* indicates a more preferred alternative *Ai*.

RESULTS AND DISCUSSION

Implementation

These data are quantified and utilized as variables to be processed and analyzed using the multi-factor evaluation process (MFEP) and simple additive weighting (SAW) methods.

Table 1. Criteria Data

No.	Criteria	Code
1	The National Examination Score for Science	C1
2	Psychometric Test Score	C2
3	Interest Score	C3

Multi-Factor Evaluation Process (MFEP) Method In analyzing the application of the multi-factor evaluation process (MFEP) method, it is imperative to consider the criterion values and their corresponding weights, alongside the alternative values, for selecting a major at SMAS YPK Kedaisianam.

Table 2. Criteria and Weights

Criteria	Weight (percentage)	Weight (decimal)
C1	50%	0.5
C2	30%	0.3
C3	20%	0.2
Total		1

Table 3. Calculation for Student 1

criteria	criterion weight		factor evaluation	evaluatio weight
C1	0.5	X	82	41
C2	0.3	X	82	24.6
C3	0.2	X	81	16.2
Total	1			81.8

Table 4. Evaluation Outcomes

Alt	C1	C2	C3
A1	41	24.6	16.2
A2	39.5	24.9	16
A3	40.5	25.2	16.6
A4	41	24.6	16.8
A5	40.5	25.2	16.4
A6	41.5	24.3	16.6
A7	41.5	25.5	16.8
A8	41	25.5	16.8
A9	41.5	25.5	16.6
A10	40.5	25.2	16.6
A11	40	24.3	16.2
A12	40.5	24	16
A13	40	24.3	16.4
A14	41	24.6	16.2
A15	39.5	24.9	16.6

The next step, determine the total weighted evaluation for each alternative.
Alternative 1
= 41 + 24.6 + 16.2
= 81.8

Table 5. Decision Outcomes

No	Alt	Total Weighted Evaluation	Status
1	A1	81.8	Science
2	A2	80.4	Social
3	A3	82.3	Science
4	A4	82.4	Science
…	….	……..	……
13	A13	80.7	Social
14	A14	81.8	Science
15	A15	81	Social

If the evaluation score exceeds 81, the student is allocated to the Science major; if the score is below 81, the student is allocated to the Social Studies major.

From the MFEP method, it can be concluded that 10 alternatives are

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classified under the Science major, including A1, A3, A4, A5, A6, A7, A8, A9, A10, and A14. Conversely, 5 alternatives are assigned to the Social Studies major, comprising A2, A11, A12, A13, and A15. The MFEP method is deemed advantageous due to its streamlined calculation process with fewer procedural steps.

Simple Additive Weighting Method

It is imperative to assign weight values to each criterion for every alternative. The subsequent step involves calculating the total evaluation score for each alternative based on these weights.

Table 6. Criteria and Weights

Criteria	Weight (percentage)	Weight (decimal)
The National Examination Score for Science	12.5%	0.125
The National Examination Score for the Indonesian Language	12.5%	0.125
The National Examination Score for English	12.5%	0.125
The National Examination Score for Mathematics	12.5%	0.125
Psychometric Score	30%	0.3
Interest Score	20%	0.2
Total		1

The subsequent phase involves ascertaining the congruence rating of each alternative against the defined criteria. This evaluation measures the degree of alignment between each alternative and the respective criterion.

Table 7. Rating and Weights

Rating	Weights
> 90	5
≥ 84	4
> 80	3
> 75	2
≤ 75	1

Table 8. Suitability Ratings for Alternatives

No	Alt	C1	C2	C3	C4	C5	C6
1	Alt 1	3	3	3	3	3	3
2	Alt 2	3	2	2	2	3	2
3	Alt 3	3	3	3	3	3	3
4	Alt 4	3	3	3	3	3	3
….	….	…	…	…	…	…	…
13	Alt 13	3	3	2	2	3	3
14	Alt 14	2	3	2	3	3	3
15	Alt 15	3	3	2	2	3	3

The next phase involves normalizing the decision matrix x by computing the normalized performance ratings R_{ij} for each alternative A_i across criteria C_j. The following examples illustrate the calculation for R_{11}, R_{21}

Table 9. Normalization Results

1	**0.75**	**0.75**	**1**	**0.75**	**1**
1	0.5	0.5	0.67	0.75	0.67
1	0.75	0.75	1	0.75	1
1	0.75	0.75	1	0.75	1
1	0.75	0.75	1	0.75	1
0.67	0.75	0.75	1	0.5	0.67
…	….	….	…...	….	….
1	0.75	0.5	0.67	0.75	1
0.67	0.75	0.5	1	0.75	1
1	0.75	0.5	0.67	0.75	1

The weight vector W is (0.125|0.125|0.125|0.125|0.3|0.2), which is then multiplied by matrix R. The

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following example illustrates the computation of V_1:

$$V = (C1 * R1) + (C2 * R2) + (C3 * R3) + (C4 * R4) + (C5 * R5) + (C6 * R6)$$

Table 10. Computed Values of V

No	Alt	Total Value
1	A1	0.86
2	A2	0.69
3	A3	0.86
4	A4	0.86
…	…..	….
13	A13	0.79
14	A14	0.79
15	A15	0.79

Following the calculation of V_i, the final decision regarding student majors is made. Students with a total value exceeding 0.81 are classified under the Science major, while those with a total value below 0.81 are categorized under the Social Studies major.

Table 11. Final Decision

No.	Alternative	Total Value
1	A1	Science
2	A2	Social
3	A3	Science
4	A4	Science
….	…..	….
13	A13	Social
14	A14	Social
15	A15	Social

Based on the simple additive weighting (SAW) analysis, it can be deduced that 9 alternatives are categorized under the Science major, specifically A1, A3, A4, A5, A6, A7, A8, A9, and A10. Conversely, 6 alternatives are assigned to the Social Studies major, namely A2, A11, A12, A13, A14, and A15.

A discrepancy of one student is evident between the two methodologies: the multi-factor evaluation process (MFEP) analysis allocates 10 students to the Science major, whereas the SAW method designates 9 students to this major. This indicates a marginal superiority of the MFEP method over SAW. Additionally, the MFEP approach is characterized by its simplicity in calculation, and its accuracy is commendable—9 out of 10 students designated to the Science major were correctly classified as such. In contrast, the SAW method accurately identified 7 out of 9 students as belonging to the Science major.

Discussion

Implementation represents the culmination of the system design process, marking the pivotal phase of program validation. During this phase, each design element is meticulously evaluated, beginning with the execution of forms and data entry procedures.

Image 1. Data Criteria Menu Form

Implementation of Calculation Form

This form is integrally linked to the alternative data form; upon entering alternative data, the form automatically

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generates and displays the MFEP method's calculation outcomes.

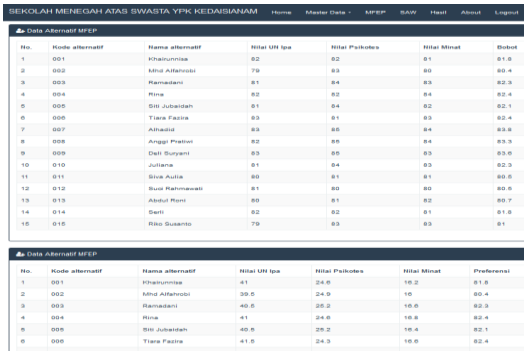

Image 2. MFEP Calculation

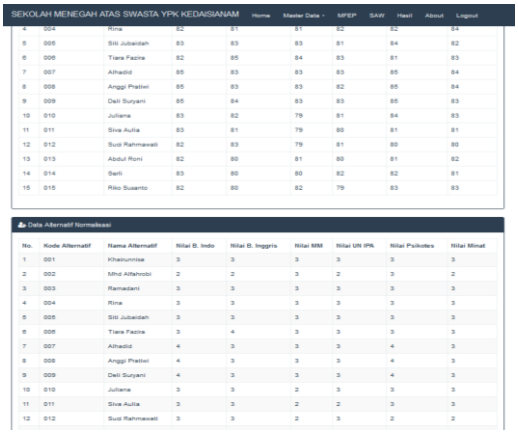

Image 3. SAW Calculation

The Comparative Analysis Form for MFEP and SAW Methods

This form delineates the ranking outcomes derived from both methods, thereby elucidating the distinctions between the MFEP and SAW approaches.

Image 4. Comparative Results of SAW and MFEP

Results of comparison MFEP & SAW

The comparison of results represents the culminating phase in the calculation process of decision support system methodologies. In this phase, the outcomes from the multi-factor evaluation process (MFEP) are juxtaposed with those from the simple additive weighting (SAW) method. The analysis reveals that while the discrepancies between the two methodologies are relatively minor, the results predominantly favor the MFEP method. Based on the calculations from both MFEP and SAW, it can be inferred that the MFEP method demonstrates superior accuracy in selecting majors at SMAS YPK Kedaisianam, with an accuracy rate of 60%, as opposed to the 46% accuracy rate observed with the SAW method.

CONCLUSION

The major selection application markedly aids the relevant stakeholders in the selection process. This system leverages computerized techniques, utilizing PHP for programming and MySQL for database management. The ultimate result comprises calculations that ascertain each student's academic major. By employing both MFEP and SAW methods, a comparative evaluation of the outcomes has been conducted. The analysis indicates that the MFEP method exhibits superior precision, with an accuracy rate of 60%, compared to the 46% accuracy rate of the SAW method.

BIBLIOGRAPHY

[1] R. Br Marpaung, "Prosiding SNASTIKOM: Seminar Nasional

Teknologi Informasi & Komunikasi Paper Perbandingan Metode MFEP dan SAW Dalam Menentukan Wisata Kuliner Terbaik Di Kota Medan".

[2] S. Jonatan, W. Riansah, and A. Calam, "Sistem Pendukung Keputusan Menentukan Posisi Karyawan Menggunakan Metode (Mfep)," *J. CyberTech*, vol. 3, no. 3, pp. 489–502, 2020.

[3] A. Komarudin, R. P. Sari, and A. Hafiz, "Perbandingan Kinerja Multifactor Evaluation Process (MFEP) dengan Analytic Hierarchy Process (AHP) dalam menentukan mutasi karyawan (Studi Kasus pada PT Sumber Alfaria Trijaya, Tbk Departement Information Technology)," *Electrician*, vol. 15, no. 2, pp. 89–95, 2021, doi: 10.23960/elc.v15n2.2171.

[4] D. Erwandi, M. Darul, H. Santoso, I. Jamaludin, and W. Mardiyanti, "Analisis Perbandingan Penentuan Konsentrasi Jurusan Pendidikan Masyarakat dengan Metode Simple Additive Weighting dan Metode Multi Factor Evaluation Process," pp. 305–311, 2022.

[5] R. R. Hidayatullah, S. Sumijan, and Y. Yunus, "Accuracy in Identifying Talent for Advanced Students Using the Multifactor Evaluation Process (MFEP) Method," *J. Inf. dan Teknol.*, vol. 2, pp. 151–155, 2020, doi: 10.37034/jidt.v2i4.112.

[6] L. Ersa, I. S. F. Al Afif, and S. Hidayatulloh, "Sistem Pendukung Keputusan Penentuan Produk Otomasi Paling Diminati Dengan Metode Multi Factor Evaluation Process," *Paradig. - J. Komput. dan Inform.*, vol. 24, no. 1, pp. 37–46, 2022, doi: 10.31294/paradigma.v24i1.971.

[7] J. Hutahaean, S. Suriani, S. anto, H. yani, M. Amin, and Z. Azhar, "Implementation of Simple Additive Weighting Method in Evaluating Employee Performance for Job Promotion Recommendations," *Webology*, vol. 19, no. 1, pp. 123–132, 2021, doi: 10.14704/web/v19i1/web19009.

[8] M. R. Al Fatih and Rini Agustina, "Sistem Pendukung Keputusan Pemilihan Jurusan Menggunakan Metode Multifactor Evaluation Process Di Smk Muhammadiyah 7 Gondanglegi Kabupaten Malang," *RAINSTEK J. Terap. Sains Teknol.*, vol. 2, no. 3, pp. 174–181, 2020, doi: 10.21067/jtst.v2i3.4169.

[9] J. Hutahaean, N. Mulyani, Z. Azhar, and A. K. Nasution, "Sistem Pendukung Keputusan Pemilihan Supervisor Karyawan Dengan Menggunakan Metode ROC-SAW," *JURIKOM (Jurnal Ris. Komputer)*, vol. 9, no. 3, p. 550, 2022, doi: 10.30865/jurikom.v9i3.4137.

[10] N. Mulyani, J. Hutahaean, Z. Azhar, and A. Kartika, "Sistem Pendukung Keputusan Dalam Pemilihan Peserta Beasiswa Magister Menggunakan Metode SAW," *J. Media Inform. Budidarma*, vol. 6, no. 3, p. 1313, 2022, doi: 10.30865/mib.v6i3.4149.

[11] Y. M. Aritonang, Z. Azhar, and ..., "Implementation of the Simple Additive Weighting (Saw) Method in the Selection of the Best Employeesat Pt. Sawita Inter Perkasa," *J. Tek. Inform. ...*, vol. 3, no. 4, 2022, [Online]. Available: http://jutif.if.unsoed.ac.id/index.php/jurnal/article/view/251%0Ahttp://jutif.if.unsoed.ac.id/index.php/jurnal/article/download/251/165

[12] H. Harmayani and R. A. Harahap, "Perbandingan Metode WP dan SAW dalam Sistem Pendukung Keputusan untuk Menentukan Tingkat Keberhasilan Guru Mengajar di Tingkat SMK," *J. Media Inform. Budidarma*, vol. 6, no. 2, p. 923, 2022, doi: 10.30865/mib.v6i2.3571.