

Decision Support System for the Presidential Election of the Student Executive Board Using the Multi-Factor Evaluation Process Method

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ABSTRACT

Student Executive Board is a student organization or executive institution found in every tertiary institution and can represent the existence of a tertiary institution. The student Executive Board is headed by the Student Executive Board President, who is assisted by the Secretary-General, three Coordinating Ministers, and several ministries that represent student needs. In carrying out its function as a forum for student aspirations to make changes (agents of change) in paradigm, emotional, intellectual, and religious values, the Student Executive Board requires student candidates who are in synergy with their vision and mission. The Student Executive Board Presidential Election is usually held every year. A decision support system (DSS) was built by implementing the Multi-Factor Evaluation Process (MFEI) method to easily and efficiently elect the Student Executive Board President quickly and efficiently. The criteria used are communication skills (C1), leadership attitude (C2), vision and mission (C3), skills (C4), and organizational experience (C5). Each criterion is weighted where the total weight of all criteria equals 1. Next, calculate the evaluation weight value (EW), total evaluation weight (TEW), and ranking. The research results show that alternative 7 (A7) with the highest score of 4.35, is the student candidate with the top ranking, meaning A7 is the most recommended to be elected as President of the Student Executive Board. With this DSS, we can provide appropriate recommendations for Student Executive Board Presidential candidates and assist universities and students in carrying out the selection process quickly and efficiently.

Keywords: DSS; MFEP; Weighting System; Evaluation Weight; Student Executive Board

1. INTRODUCTION

Student Executive Board is a student organization or intra-campus executive institution found in every university (Hidayah & Erwadi, 2019), and can represent the existence of a university. The student Executive Board is headed by the Student Executive Board President, who is assisted by the Secretary-General, three Coordinating Ministers, and several ministries that represent student needs. In carrying out its function as the highest position holder in the organization as well as a forum for student aspirations to make changes (agent of change) in paradigm, emotional, intellectual as well as religious values, the Student Executive Board requires student candidates who are in synergy with their vision and mission. The Student Executive Board Presidential election is held every year (Waleng et al., 2023).

A large number of prospective Student Executive Board Presidential candidates make students, in this case, prospective voters, need a lot of time to find out and evaluate the suitability of prospective candidates so that the elected President of the Student Executive Board meets the criteria for carrying out the functions or vision and mission of the organization. Elections are usually carried out democratically through direct voting or e-voting of students who are still actively studying at universities. Using a Decision Support System (DSS), you can minimize the number of potential candidates who will be chosen democratically by students.

A DSS is intended to support managerial decision-makers in semi-structured decision situations (Lestari et al., 2021). DSS is part of a computer-based information system, including a knowledge-based system (knowledge management) that is used to support decision-making (Muzakkir, 2017). The decision-making process begins with

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problem identification and goal setting, which involves selecting alternatives. Decision-making is the process of choosing between various options or paths of action based on available information and analysis (Gunawan et al., 2023).

One of the DSS methods that can be used is implementing the MFEP method. MFEP is a DSS method with a quantitative approach that uses a weighting system (Wahyuni & Niska, 2019). For decisions that have a strategic impact, it is more advisable to use a quantitative approach such as MFEP (Fazri, 2021). The advantage of the MFEP method is that it is a scale score that requires a comparison norm so that it can be interpreted qualitatively (Siburian et al., 2018).

Several studies related to the Student Executive Board presidential election have been carried out, including research conducted by (Gelu et al., 2022), in this research, an application was built to facilitate the process of voter registration, voting, and vote counting. The method used in this research is the waterfall method. Other related research was conducted by (Suarnatha, 2023), in this research, a Decision Support System (DSS) was built using the Profile Matching Method to calculate the value of the profile of each alternative with the target/expected profile. There are three criteria used, namely academic (GPA, Vision & Mission, Semester, and Achievement), non-academic (Recommendations, Age, Participation in Non-Campus Organizations), and attitudes and behavior (Leadership, Loyalty, Discipline, and Cooperation). Apart from that, in research conducted by (Hamidani & Etriyanti, 2023), an information system was built that can support academic staff in decision-making, especially in selecting the chairperson of the student executive body. This system uses 4 criteria: GPA, Semester, Achievements, and Organizational Experience.

Several methods have been implemented in selecting the Student Executive Board chairman, but the criteria used are also different. Therefore, the research carried out implemented the MFEP method using 5 criteria, namely communication skills (C1), Leadership Attitude (C2), Vision and Mission (C3), Skills (C4), and Organizational Experience (C5). Other related research that uses the MFEP method is conducted by (Sovia & Hadi, 2019), in this research, an analysis of the use of Decision Support Systems (DSS) was carried out using the SAW and MFEP methods to make it easier to determine majors. This research used three criteria, namely National Science Examination scores, psychological tests, and interests.

The built-in Decision Support System (DSS) is used to determine the alternatives with the highest final score that can be recommended for the election of the Student Executive Board president based on predetermined criteria. This system can help universities and students facilitate the process of selecting the Student Executive Board president correctly.

2. LITERATURE REVIEW

DSS can help stakeholders make the right policies to produce added value for an organization (Megawaty & Ulfa, 2020). DSS using the MFEP method is carried out subjectively by weighing factors that significantly influence various alternative choices. MFEP is an approach to decision-making that considers factor weights and evaluation weights. The MFEP method can analyze alternatives based on existing criteria simply and accurately (Afrisawati & Irianto, 2019). Each of the selected factors is ranked in order of importance. Next, an evaluation of alternative options is carried out using factors. Decision-making is done by comparing the total evaluation weights and selecting the alternative with the highest evaluation weight. The following are the steps in the calculation process using the MFEP method, namely (Pratama et al., 2024):

1. Determine factors and factor weights, where the total weighting equals 1.
2. Give weight to each alternative against the specified evaluation which the value is 0 to 1.
3. Weight calculation process: this weight evaluation stage will carry out a weight calculation process based on alternative values and criteria that have been determined using the formula:

$$EW = WF \times EF \quad (1)$$

EW : Evaluation Weight

WF : Weight Factor

EF : Evaluasi Faktor

The next stage is to find the total evaluation weight values for each alternative using the formula:

$$TEW = \sum n(EW) \quad (2)$$

TEW : Total Evaluation Weight

EW : Evaluation Weight

n : Total Factor

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Ranking results

The total evaluation weight value results in the previous process will be ranked based on the highest value.

3. METHOD

The research method used can be seen in the following diagram in figure 1:



Figure 1. Research Flow Diagram

The research method begins with problem identification, namely the research problem is initially identified through a general topic (Nasution, 2021). DSS will identify opportunities and conditions and recognize existing problems. Next, determine the criteria and alternatives, namely identifying and determining the criteria that influence or determine in percentage value or weight value. The higher the weight value, the more influence it whether or not an alternative can be selected. Next, determine the weight of the criteria, namely determining the priority value of the criteria or, in other words, how influential a criterion is written has on determining the selected alternative. Next, normalize the weights of the criteria, namely normalizing the weights of criteria with significant differences, where the total weights, when added together, equal 1. Next, problem formulation (Weight Evaluation and Total Evaluation Weight) calculates Weight Evaluation and total evaluation weights using the MFEP formula. Once the total weight is known, each alternative is evaluated, and the output is obtained in the form of recommendations in the form of alternatives with the highest final value or ranking 1, and so on.

4. RESULT AND DISCUSSION

The MFEP method initiates by establishing factors and their respective weights, ensuring the total weighting equals one. Subsequently, values are assigned to each sub-factor or criterion, reflecting their impact on decision-making based on the input data to be processed. After this step, identify the quantity of alternatives, representing materials to be assessed through the MFEP algorithm. Incorporate the sub-factor or criteria values for each selected alternative, followed by the multiplication of criteria weight values by their respective sub-factor values within the alternative (weight x evaluation). Finally, computing the overall weight evaluation reflecting the total impact of criteria weights on the sub-factor values across all alternatives, and subsequently establishing the ranking based on the total weight evaluation for all alternatives. In general, the MFEP method comprises the following procedural steps:

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Step 1. Determine factors and factor weights (Factor Weight), where the total weighting (where the total weighting is equal to 1).

The factors or criteria used in the SPK for selecting the President of the Student Executive Board can be seen in Table 1 below:

Table 1. Selection Criteria

No.	Criteria Name	Criteria Code	Weight Value	Normalized Weight Value
1	Communication Skills	C1	30%	0,3
2	Leadership Attitude	C2	25%	0,25
3	Vision And Mission	C3	15%	0,15
4	Skills	C4	10%	0,1
5	Organizational Experience	C5	20%	0,2
Total				1

Table 1 illustrates that among the 5 criteria employed, the Communication Skills criterion holds the greatest sway in The Student Executive Board Presidential election, with a weight value of 30%. Simultaneously, additional influential criteria, as indicated by their respective weight values, are presented in Table 1.

The assessment scale for each criterion is 1 to 5; each value can be seen in Table 2 below:

Table 2. Assessment Scale

Value	Description
1	Less
2	Not Enough
3	Enough
4	Good
5	Very Good

The scale for evaluating the 5 criteria ranges from 1 to 5, where each criterion serves as a benefit criterion. A higher criterion value indicates better performance, with 1 denoting less and progressing up to 5 signifying excellent or very good.

Step 2. Give weight to each alternative against the specified factor (Factor Evaluation) with a value of 0-1.

Data alternatif yang berisi penilaian setiap alternatif berdasarkan 5 kriteria dapat dilihat pada tabel 3 berikut: The data presenting evaluations for each alternative according to the 5 criteria is available in Table 3 as follows:

Table 3. The normalized alternative data

	C1	C2	C3	C4	C5
A1	3	5	4	4	2
A2	2	4	3	4	5
A3	2	4	2	2	2
A4	2	4	2	3	2
A5	5	3	5	4	4
A6	5	4	2	3	3
A7	5	5	4	4	3
A8	3	5	2	2	4
A9	2	4	2	5	2
A10	5	2	3	2	3
A11	2	3	4	3	4
A12	3	4	2	5	3
A13	3	2	2	2	2
A14	3	4	4	3	2
A15	3	4	4	2	4

The normalized alternative data used consists of 15 students who are prospective Student Executive Board Presidential candidates. The weight of each criterion is obtained based on the results of interviews and assessments carried out by decision-makers

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Step 3. The process of calculating evaluation weights

The obtained evaluation weights can be viewed in the following Table 4:

Table 4. MFEP Results

Alternative	TEW
A1	3,55
A2	3,45
A3	2,5
A4	2,6
A5	4,2
A6	3,7
A7	4,35
A8	3,45
A9	2,8
A10	3,25
A11	3,05
A12	3,3
A13	2,3
A14	3,2
A15	3,5

Nilai TEW diperoleh dari proses perhitungan sebagai berikut:

$$TEW A1 = (3 \times 0,30) + (5 \times 0,25) + (4 \times 0,15) + (4 \times 0,10) + (2 \times 0,20) = 3,55$$

$$TEW A2 = (2 \times 0,30) + (4 \times 0,25) + (3 \times 0,15) + (4 \times 0,10) + (5 \times 0,20) = 3,45$$

$$TEW A3 = (2 \times 0,30) + (4 \times 0,25) + (2 \times 0,15) + (2 \times 0,10) + (2 \times 0,20) = 2,5$$

$$TEW A4 = (2 \times 0,30) + (4 \times 0,25) + (2 \times 0,15) + (3 \times 0,10) + (2 \times 0,20) = 2,6$$

$$TEW A5 = (5 \times 0,30) + (3 \times 0,25) + (5 \times 0,15) + (4 \times 0,10) + (4 \times 0,20) = 4,2$$

$$TEW A6 = (5 \times 0,30) + (4 \times 0,25) + (2 \times 0,15) + (3 \times 0,10) + (3 \times 0,20) = 3,7$$

$$TEW A7 = (5 \times 0,30) + (5 \times 0,25) + (4 \times 0,15) + (4 \times 0,10) + (3 \times 0,20) = 4,35$$

$$TEW A8 = (3 \times 0,30) + (5 \times 0,25) + (2 \times 0,15) + (2 \times 0,10) + (4 \times 0,20) = 3,45$$

$$TEW A9 = (2 \times 0,30) + (4 \times 0,25) + (2 \times 0,15) + (5 \times 0,10) + (2 \times 0,20) = 2,8$$

$$TEW A10 = (5 \times 0,30) + (2 \times 0,25) + (3 \times 0,15) + (2 \times 0,10) + (3 \times 0,20) = 3,25$$

$$TEW A11 = (2 \times 0,30) + (3 \times 0,25) + (4 \times 0,15) + (3 \times 0,10) + (4 \times 0,20) = 3,05$$

$$TEW A12 = (3 \times 0,30) + (4 \times 0,25) + (2 \times 0,15) + (5 \times 0,10) + (3 \times 0,20) = 3,3$$

$$TEW A13 = (3 \times 0,30) + (2 \times 0,25) + (2 \times 0,15) + (2 \times 0,10) + (2 \times 0,20) = 2,3$$

$$TEW A14 = (3 \times 0,30) + (4 \times 0,25) + (4 \times 0,15) + (3 \times 0,10) + (2 \times 0,20) = 3,2$$

$$TEW A15 = (3 \times 0,30) + (4 \times 0,25) + (4 \times 0,15) + (2 \times 0,10) + (4 \times 0,20) = 3,5$$

Upon obtaining the TEW value, proceed to arrange it in descending order, ranking from the highest TEW value to the lowest. The outcome of this ranking is depicted in Table 5 below:

Table 5. Ranking Results

Rank	Alternative	TEW
1	A7	4,35
2	A5	4,2
3	A6	3,7
4	A1	3,55
5	A15	3,5
6	A2	3,45
7	A8	3,45
8	A12	3,3
9	A10	3,25
10	A14	3,2
11	A11	3,05
12	A9	2,8

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13	A4	2,6
14	A3	2,5
15	A13	2,3

Based on the ranking results, the highest TEW value, amounting to 4.35, was achieved by alternative 7 (A7), followed by descending values, culminating in the lowest TEW value of 2.3 for alternative 13 (A13).

The presentation of these outcomes can be observed in the visual representation provided in Figure 2 below:

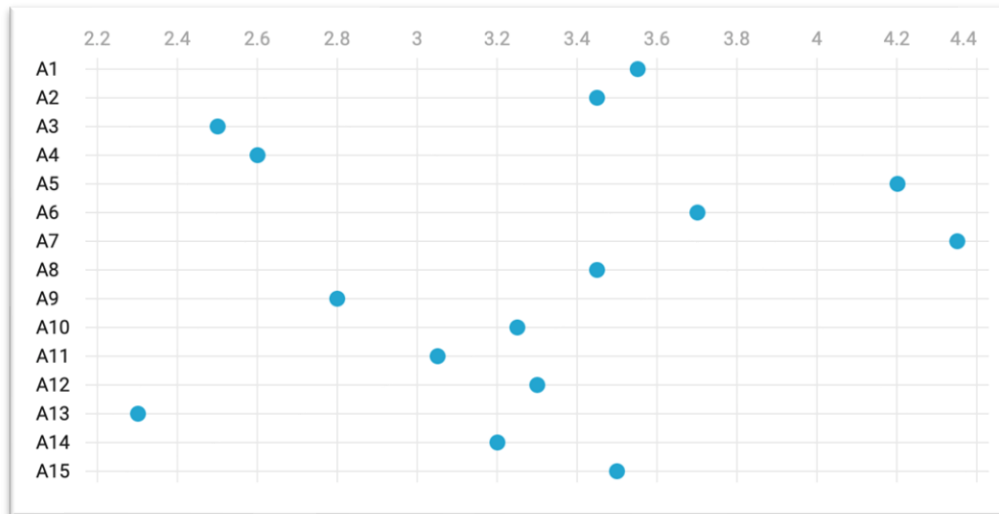


Figure 2. Visualization of Data Results

5. CONCLUSION

Based on the results of implementing the Multi-Factor Evaluation Process (MFEP) method in the Decision Support System (DSS) using 5 criteria, namely communication skills (C1), leadership attitudes (C2), vision and mission (C3), skills (C4), and organizational experience (C5) produces a total evaluation weight (TEW) value that varies for each alternative. The ranking results show that alternative 7 (A7) has the highest TEW value, namely 4.35, meaning that A7 is the most recommended alternative to be elected as Student Executive Board President. With this Decision Support System (DSS), we can provide appropriate recommendations for Student Executive Board Presidential candidates and assist universities and students in carrying out the selection process quickly and efficiently.

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