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# Decision Support System for Selecting the Best Laptop for Students Using the SAW Method

Nabila Gandita[1,a)], Agnes Novita Ida Safitri[2,b)]

[1,2] *Information Systems Study Program, Faculty of Information Technology, Perbanas Institute, Jakarta, Indonesia*

[a)]Corresponding author: nabila.gandita14@perbanas.id
[(b)]agnes.novita@perbanas.id

**Abstract.** *The development of digital technology has increased public demand for laptops to support various activities, such as work, education, and entertainment. The many variations of laptops with different specifications and prices often make it difficult for users to choose the right device for their needs. Therefore, a system is needed that can help in the decision-making process in an objective and organized manner. The purpose of this study is to develop a Decision Support System (SPK) for laptop selection using the Simple Additive Weighting (SAW) method. Data for the study was collected through a questionnaire distributed to 30 respondents with reference to five criteria, namely RAM, price, internal memory, warranty, and processor. The SAW method is implemented through several steps, ranging from determining the match rating, normalizing the decision matrix, calculating preference values, to an alternative ranking process. The findings of the study show that MacBook alternatives get the highest preference value, which is 0.9625, followed by Asus at 0.9369, HP at 0.9122, and Lenovo at 0.9057. These results confirm that the SAW method is effective in helping users in making decisions to choose the best laptop according to their criteria.*

**Keywords:** Decision Support System, Simple Additive Weighting, Laptop Selection.

## INTRODUCTION

The rapid development of digital technology today has resulted in an increase in public demand for laptops, especially to support various work, academic, and professional activities. Laptops function in various activities such as data processing, graphic design creation, programming, online learning, and entertainment purposes. The variety of specifications, brands, and prices of laptops available in the market often make users feel confused in choosing the one that best suits their needs. Therefore, a system is needed that can help users determine the choice of laptop efficiently, effectively, and objectively based on certain criteria (Putri Sakinah & Syaputra, 2023).

The Decision Support System (SPK) is one of the solutions that can be applied to support the decision-making process based on a number of criteria. One of the methods commonly applied in SPK is Simple Additive Weighting (SAW). Previous research has shown that the SAW method is very useful in providing laptop recommendations through the weighting process and calculation of the preference value of each option (Nathaniel et al., 2024). Research carried out by (Herald et al., 2021) also indicates that the SAW method is very effective in helping users get laptop recommendations that suit their specific needs. In this study, the criteria considered consisted of brand, price, RAM, internal memory, warranty, processor, and price.

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Based on data collected from a questionnaire distributed to 30 people, and 1 resource person, it was found that the elements of price, RAM, processor, storage space, and price are the main considerations in choosing a laptop. These findings indicate that the laptop selection process cannot be done with just one criterion, but requires an approach that is able to integrate various criteria simultaneously. Therefore, this study aims to develop a Decision Support System for laptop selection by utilizing the Simple Additive Weighting (SAW) method, which is expected to help users in getting the most suitable laptop recommendations quickly and accurately.

# LITERATURE REVIEW

Studies on Decision Support Systems to determine laptop choices have been conducted extensively with various decision-making approaches involving many criteria. The research conducted by (Nathaniel et al., 2024) uses the Simple Additive Weighting approach in the decision support system for laptop selection. This study explains that the SAW approach operates through steps of weighting criteria, normalizing data, and calculating preference values to produce the best choice. The findings of this study show that the SAW method can help users get laptop recommendations in a more objective way based on the highest preference value from the calculation results.

A similar study was also conducted by (Herald et al., 2021) who designed a decision support system for laptop selection for architecture students using the SAW method. The findings of this study show that the SAW method can help users in choosing a laptop that suits their academic needs and required specifications. This method is considered effective because of its simple calculation process, easy to understand, and capable of handling various criteria simultaneously.

Another study conducted by (Ranreng et al., 2025) also applied the SAW method in the decision support system to choose a laptop based on the criteria needed by the user. The study considered several parameters such as cost, processor, VGA, RAM, storage space, and brand to provide an objective recommendation for the best laptop. The findings of this study indicate that a SAW-based decision support system has the potential to increase efficiency and accuracy in decision-making, so that users can receive laptop recommendations that are more in line with their needs and budget.

In addition, (Hadikurniawati et al., 2021) applied the combined SAW-TOPSIS method in the case of Multi Attribute Decision Making in choosing a laptop. The study concluded that laptop selection involves many attributes so that a decision-making method is needed that can systematically manage various criteria to produce more precise recommendations. Based on the results of several previous studies, the SAW method has proven to be relevant and effective to be applied in the laptop selection decision support system because it is able to provide objective recommendation results according to user needs.

# METHODS

The method proposed in this study is the SAW method. This method is also known as the weighted addition method, as it involves the summation of each criterion that has been multiplied by the corresponding weight. The SAW method is widely used because of its ease in applying and interpreting the results (Wulandari & Wijaya, 2024). The basic concept of the SAW method is to find the weighted sum of the performance rating of each alternative on all attributes. The SAW method also requires the process of normalizing the Decision matrix to a scale that can be compared with all existing alternative ratings (Ranreng et al., 2025). The steps in the SAW method are as follows:

1) Determine the criteria to be used as a reference in decision-making$(c_i)$
2) Determine the compatibility rating of each alternative on each criterion.
3) Make a decision matrix based on criteria and then normalize the matrix based on equations adjusted to the type of attribute (profit attribute or cost attribute) so that the matrix is normalized.$(c_i)$ $R$

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$$R_{ij} = \begin{cases} \dfrac{x_{ij}}{\text{Max } x_{ij}} \; Jika\ j\ adalah\ atribut\ keuntungan \text{ (benefit)} \\ \dfrac{\text{Min } x_{ij}}{x_i j} \; Jika\ j\ adalah\ atribut\ biaya \text{ (cost)} \end{cases}$$

Where:

$R_{ij}$ : Normalized performance rating value
$X_{ij}$ : The value of the attributes that each criterion has
Max $x_{ij}$ : The greatest value of each criterion
Min $x_{ij}$ : The smallest value of each criterion
*Benefit* : If the greatest value is the best solution
*Cost* : If the smallest value is the best solution
The preference values for each alternative are given as follows:

$$V_1 = \sum_{j=1}^{n} w_j r_i j$$

Where:

$V_i$ : Ranking for each alternative
$W_j$ : Value the weight of the data
$R_{ij}$ : Normalized rating value
A higher value indicates that the alternative is preferred.$V_i A_i$

The final result is obtained from the ranking process, which is the sum of the multiplication of the normalized matrix *R* with the preference weight vector so that the largest value is obtained which is chosen as the best alternative for example (A1) (Firdaus et al., 2022).

# RESULTS AND DISCUSSION

1. Menentuka Criteria

Determine the criteria that will be used as a reference in decision-making. In this research method, there are weights and criteria needed to determine the best laptop that is most often sought after and according to your needs. Based on observations and interviews with experts (adrian sakha), four alternatives and five criteria and weights were obtained as follows:

**TABLE 1**. Alternate Table

| Code | Alternative |
|---|---|
| A1 | Asus |
| A2 | Hp |
| A3 | Lenovo |
| A4 | MacBook |

**TABLE 2**. Table Criteria & Weight

| Code | Criteria | Weight | Jenis |
|---|---|---|---|
| C1 | RAM | 0,25 | Benefit |
| C2 | Pricing | 0,30 | Cost |
| C3 | Internal Memory | 0,15 | Benefit |
| C4 | Warranty | 0,10 | Benefit |
| C5 | Processor | 0,20 | Benefit |
| | Total | 1,00 | |

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The weight of the criteria is determined based on literature studies and the degree of influence of each criterion on the selection of laptops.

**TABLE 3**. Table Questioner Scale

| Remarks | Scale |
|---|---|
| Strongly Disagree | 1 |
| Disagree | 2 |
| Neutral | 3 |
| Setuju | 4 |
| Strongly agree | 5 |

The results of the questionnaire are then calculated to obtain the average score of each criterion. The average value is used as the initial weight in the calculation process of the SAW method.

2. Determining a Match Rating

At this stage, the author determines the compatibility rating between brand alternatives to the criteria that have been used as a reference such as; Brand alternatives with RAM, price, internal memory, garage and processor. The following is a match rating obtained from the average value of the questionnaire results given by respondents to each laptop alternative in Table 2.

**TABLE 4**. Table of Compability Rating

| Alternatif | C1 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|
| A1 | 3,77 | 3,77 | 3,83 | 3,63 | 3,73 |
| A2 | 3,60 | 3,60 | 3,57 | 3,43 | 3,50 |
| A3 | 3,43 | 3,43 | 3,43 | 3,53 | 3,36 |
| A4 | 4,00 | 3,90 | 3,80 | 4,03 | 3,97 |

Based on Table 4, it can be found the level of respondents' assessment of each laptop brand on each criterion. The value is then used as a decision matrix to find the maximum and minimum values in the SAW method, where the maximum value for *benefits* and the minimum value for *costs*.

**TABLE 5**. Table of Benefit & Cost

| Criteria | Jenis |
|---|---|
| C1 | Benefit |
| C2 | Cost |
| C3 | Benefit |
| C4 | Benefit |
| C5 | Benefit |

**TABLE 6**. Table of Values Maximum Benefit & Minimum Cost

| Criteria | Value |
|---|---|
| C1 | 4,00 |
| C2 | 3,43 |
| C3 | 3,83 |
| C4 | 4,03 |
| C5 | 3,97 |

3. Normalizing

After obtaining the decision matrix, the next step is to normalize all alternative values. The purpose of normalization is to equalize the scale of values so that each criterion can be compared proportionally

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(Dellia Nabila Sari, 2021). In this study, the price criterion (C2) includes the *cost*, while RAM (C1), Internal Memory (C3), Warranty (C4), and Processor (C5) include *benefit*. Here's how to Calculate normalization;

1.1. Normalization for A1 values

RAM (C1 – Benefit) $R_{11} = \frac{3,77}{4,00} = 0,943$

Price (C2 – Cost) $R_{12} = \frac{3,43}{3,77} = 0,910$

Internal Memory (C3 – Benefit) $R_{13} = \frac{3,83}{3,83} = 1,000$

Warranty (C4 – Benefit) $R_{14} = \frac{3,63}{4,03} = 0,901$

Processor (C5 – Benefit) $R_{15} = \frac{3,73}{3,97} = 0,940$

1.2. Normalization for A2 values

RAM (C1 – Benefit) $R_{21} = \frac{3,60}{4,00} = 0,900$

Price (C2 – Cost) $R_{12} = \frac{3,43}{3,60} = 0,959$

Internal Memory (C3 – Benefit) $R_{23} = \frac{3,57}{3,83} = 0,932$

Warranty (C4 – Benefit) $R_{24} = \frac{3,43}{4,03} = 0,851$

Processor (C5 – Benefit) $R_{25} = \frac{3,50}{3,97} = 0,882$

1.3. Normalization for A3 values

RAM (C1 – Benefit) $R_{31} = \frac{3,43}{4,00} = 0,858$

Price (C2 – Cost) $R_{32} = \frac{3,43}{3,43} = 1,000$

Internal Memory (C3 – Benefit) $R_{33} = \frac{3,43}{3,83} = 0,898$

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Warranty (C4 – Benefit) $R_{34} = \frac{3,53}{4,03} = 0,876$

Processor (C5 – Benefit) $R_{35} = \frac{3,36}{3,97} = 0,846$

1.4. Normalization for A4 grades

RAM (C1 – Benefit) $R_{41} = \frac{4,00}{4,00} = 1,000$

Price (C5 – Cost) $R_{42} = \frac{3,43}{3,90} = 0,879$

Internal Memory (C3 – Benefit) $R_{43} = \frac{3,80}{3,83} = 0,992$

Warranty (C4 – Benefit) $R_{44} = \frac{4,03}{4,03} = 1,000$

Processor (C5 – Benefit) $R_{45} = \frac{3,97}{3,97} = 1,000$

1.5. Table of normalization results

**TABLE 7**. Table of normalization results

| Alternative | C1 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|
| A1 | 0,943 | 0,910 | 1,000 | 0,901 | 0,940 |
| A2 | 0,900 | 0,953 | 0,932 | 0,851 | 0,882 |
| A3 | 0,858 | 1,000 | 0,896 | 0,876 | 0,846 |
| A4 | 1,000 | 0,879 | 0,992 | 1,000 | 1,000 |

1.6. Calculate the value of preferences

$$V_1 = \sum_{j=1}^{n} w_j r_i j$$

1.6.1. Preference Value A1

- V1 = (0,25×0,943) + (0,30×0,910) + (0,15×1,000) + (0,10×0,901) + (0,20×0,940)
  V1 = 0,2358 + 0,2730 + 0,1500 + 0,0901 + 0,1880
  V1 = 0,9369

1.6.2. A2 Preference Value

- V2 = (0,25×0,900) + (0,30×0,953) + (0,15×0,932) + (0,10×0,851) + (0,20×0,882)
  V2 = 0,2250 + 0,2859 + 0,1398 + 0,0851 + 0,1764
  V2 = 0,9122

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1.6.3. A3 Preference Value

- V3 = (0,25×0,858) + (0,30×1,000) + (0,15×0,896) + (0,10×0,876) + (0,20×0,846)
  V3 = 0,2145 + 0,3000 + 0,1344 + 0,0876 + 0,1692
  V3= 0,9057

1.6.4. A4 Preference Value

- V4 = (0,25×1,000) + (0,30×0,879) + (0,15×0,992) + (0,10×1,000) + (0,20×1,000)
  V4 = 0,2500 + 0,2637 + 0,1488 + 0,1000 + 0,2000
  V4 = 0,9625

4. Performing the Ranking Process

**TABLE 8**. Table of Ranking Results

| Alternative | Value Preferences | Rank |
|---|---|---|
| A4 | 0,9625 | 1 |
| A1 | 0,9369 | 2 |
| A2 | 0,9122 | 3 |
| A3 | 0,9057 | 4 |

Based on calculations using the SAW method, the MacBook (A4) laptop alternative recorded the highest preference value of 0.9625, making it the best choice. This figure is earned because the MacBook shows superior value on several important criteria, including RAM, warranty, and processor. In second place is Asus (A1) with a preference value of 0.9369, followed by HP (A2) with a value of 0.9122, and Lenovo (A3) with a value of 0.9057. These findings indicate that the SAW method is effective in providing recommendations for laptop selection based on a combination of several criteria set through weighting, normalization, and objective assessment. Therefore, the SAW method can function as a tool to support decisions in choosing the laptop that best suits user preferences.

# CONCLUSIONS

Based on the research that has been conducted, it can be concluded that the Simple Additive Weighting (SAW) method has been successfully applied in the Decision Support System to choose a laptop with five criteria, including RAM, price, internal memory, warranty, and processor. The data in this study was obtained from the distribution of questionnaires to 30 respondents, which were then processed through the steps of determining compatibility ratings, normalization, and calculation of preference values to create the best laptop recommendations. The results of the calculation using the SAW method show that the MacBook alternative (A4) gets the highest preference value of 0.9625, which puts it in the top position as the most recommended laptop. Furthermore, the second position is filled by Asus (A1) with a preference value of 0.9369, followed by HP (A2) with a value of 0.9122, and Lenovo (A3) with a value of 0.9057. These findings show that MacBooks have the highest suitability based on the criteria used in the study.

The use of the SAW method in this study serves to support the decision-making process in an objective and systematic way, because it takes into account all criteria that have been determined through the weighting and ranking process. In this way, the developed system can function as a tool in providing recommendations for selecting laptops that suit the user's needs and simplify the decision-making process compared to manual assessments. For further research, it is recommended that more laptop alternatives and assessment criteria be added to make the resulting recommendations more accurate. In addition, the SAW method can be combined with other decision-making techniques, such as TOPSIS, AHP, or Fuzzy, to obtain more comprehensive results that are tailored to the user's preferences.

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