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Decision Support System for Laptop Selection Recommendations Using the Weighted Product (WP) Method

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ABSTRACT

The many types of specifications, colors and brands of laptops are complicated and confusing for ordinary people who are going to buy laptops. The reason is, there are many variants of laptops on the market with different specifications. To help potential consumers in choosing a laptop that suits their needs, a decision support system (SPK) is needed that can provide the most appropriate laptop recommendations. This study discusses the decision support system for laptop selection recommendations using the Weighted Product (WP) method. This method is used to help consumers choose a laptop that suits their needs based on predetermined criteria, such as processor, RAM, Storage, and Price. After a search of the vector to get the ranking, the largest vector value of 0.124 was obtained on Sony, Appel, and Dell Alternatives to be recommended in the selection of laptops. Based on the results of the research, it can be concluded that the decision support system (SPK) with the Weighted Product (WP) method can provide laptop recommendations that suit the needs of users. This research provides benefits for users in choosing the right laptop that suits their needs. In addition, this research can also be the basis for the development of a decision support system for the selection of laptops or computers in other fields.

Keywords: Laptop; DSS; Weighted Product (WP)

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1. INTRODUCTION

In today's digital era, laptops are one of the important needs for many people. The existence of laptops can help in work, school or even in the entertainment world with various specifications, colors and brands. The specifications themselves such as the type of processor used, the choice of RAM capacity, storage space to the graphics card. The many types of specifications, colors and brands of laptops are complicated and confusing for ordinary people who are going to buy laptops. The reason is, there are many variants of laptops on the market with different specifications.

To help potential consumers in choosing a laptop that suits their needs, a decision support system (SPK) is needed that can provide the most appropriate laptop recommendations. A decision support system is a specific information system that is intended to assist management in making decisions related to semi-structured issues effectively and efficiently, and does not replace the decision-making function in making

decisions [1][2][3]. A decision support system is a specific information system aimed at solving a specific problem that must be solved [4][5].

Currently, there are many studies related to decision support systems applied in various fields, such as the Application of the EDAS Method in the Selection of Prospective Kosgoro Scholarship Recipients [6], Application of the MAUT Method in the Decision Support System for Determining the Best Doctor, Application of the Simple Additive Weighting Method for Lecturer Performance Assessment by Kuswanto [7], Application of the SMART Method in the New Employee Recruitment Decision Support System by Hasugian [8], Decision support system in determining priorities for disaster management of infrastructure development at the village level using the SAW method [9].

Based on previous research, it can be said that the decision support system was built not to replace the role of decision-makers, but only to help provide alternative recommendations in effective and efficient decision-making. Through this research, a decision support system for laptop selection recommendations using the *Weighted Product* (WP). Method *Weighted Product* (WP) is a multi-criteria decision-making method used to solve problems with many attributes [10][11]. This method can be used to determine criteria that affect decisions. Application of the method *Weighted Product* (WP) can help consumers in choosing a laptop because the decision-making process is more efficient, the calculations are easier to understand, can select the best alternatives, the judgment is more precise, and the concept is simple. Application of the method *Weighted Product* (WP) itself has been carried out by Yonathan (2024) with the title Decision Support System for Recommendations for the Selection of Light Steel Using the Weighted Product (WP) Method [12], by Widianata (2024) with the title Application of the WP Method in Determining the Most In-Demand Items in Accessories Stores [13].

2. RESEARCH METHOD

2.1. Research Stages

The stages carried out in this study are as follows:

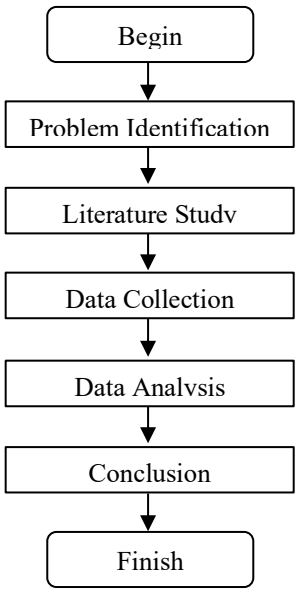

Figure 1. Research Stages

The first step in this research is to identify problems, which at this stage is by identifying problems in the form of problems and solutions in the selection of laptops based on predetermined criteria. Furthermore, by conducting a literature study, namely by looking for reference sources in the form of previous research articles related to decision support systems, decision support system methods and Weighted Product (WP) methods. Next, they collect alternative data and criteria that will be used in the research. After the data is obtained, the next step is to analyze the data manually using the Weighted Product (WP) method. The final stage is to draw conclusions obtained from the results of data analysis using the Weighted Product (WP) method.

2.2. Weighted Product (WP)

The method used in this study is the *Weighted Product* (WP). *Weighted Product* (WP) is one of the methods used to solve MADM problems [15]. Method *Weighted Product* is a multi-criteria decision-making method used to resolve cases that have data with many attributes [16]. In the WP method, before multiplying the value of each attribute, normalization is carried out first. Weight values that are profits (*Benefit*) then the value of the appointment is positive while the cost (*Cost*) the appointment is negative [17].

Steps to perform calculations with the *Weighted Product* (WP) is as follows [1]:

1. Determine the criteria, where the criteria that will be used as a reference in decision-making, namely Ci and the nature of each criteria.

2. Determine the match rating, which is the match rating of each alternative on each criteria and create a decision matrix.

3. Normalize weight
   Normalized Weight = Weight of each criteria / sum of all criteria weights.
   The value of the total weight must meet the following equation [18]:
   $W_j = \frac{W_j}{\sum W_j}$ (1)

4. Determining the value of the S vector
   By multiplying all the criteria for an alternative with the weight as the positive power for *the benefit* criteria and the weight functions as the negative power of the *cost criteria*.
   The formula for calculating the preference value for the Ai alternative, is given as follows [19]:
   $S_i = \Pi_{j=1}^{n} X_{ij}^{Wj}$ (2)

   where i = 1, 2, ..., m
   Information:
   S : expresses an alternative preference analogous to the S vector
   x : expresses the value of the criteria
   w : states the weight of the criteria
   i : to state an alternative
   j : states the criteria
   n : states the many criteria

5. Determines the value of the vector V. That is the value to be used for ranking. The relative preference value of each alternative can be calculated by the following formula:
   $V_i = \frac{\Pi_{j=1}^{n} X_{ij}^{Wj}}{\Pi_{j=1}^{n} X_{ij*Wj}}$ (3)
   Information:
   V : expresses an alternative preference analogous to the V vector
   x : expresses the value of the criteria
   w : states the weight of the criteria
   i : to state an alternative
   j : states the criteria
   n : states the many criteria

6. Rank the value of Vector V. When the value of V is obtained, the next step is to sort the value of V from the largest. The largest V value here is the best alternative value.

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3. RESULTS AND DISCUSSION

This research is to apply *the Weighted Product* (WP) method for laptop selection with the following steps:

1. Determine the criteria that are used as a reference in decision-making:

Table 1. Determination of Criteria

Criteria Code	Criteria Name	Sub Criteria	Characteristic
C1	Processor	3 = AMD 4 = Intel	Benefit
C2	RAM	2 GB = 1 4 GB = 2 8 GB = 3 16 GB = 4	Benefit
C3	Storange	320 GB = 1 512 GB = 2 1TB = 3 2 TB = 4	Benefit
C4	Price	< 5 jt = 1 5-7 jt = 2 7-10 jt = 3 >10 jt = 4	Benefit

2. Determining Match Ratings
   The second step is to determine the match rating for each predetermined criteria.

Table 2. Weighting Criteria

Criteria Code	Criteria	Weight (W)
C1	Processor	4
C2	RAM	3
C3	Storange	3
C7	Price	4

The process of determining the match rating of each alternative on each criteria is as follows:

Table 3. Match Rating of Each Alternative

Alternative	C1	C2	C3	C4
Lenovo	3	2	2	4
Sony	4	3	4	3
ASUS	3	2	3	3
HP	3	4	4	2
Dell	3	4	3	3
Apple	4	3	3	4
Acer	3	2	4	3
Toshiba	3	3	2	2
Axio	3	3	3	2

3. Normalizing Weight
   Normalize the weight by calculating the weight improvement value based on the priority value of each criteria that has been determined in accordance with the formula (1) with the following calculations:

$$W1 = \frac{4}{4+3+3+4} = \frac{4}{14} = 0{,}29$$

$$W2 = \frac{3}{4+3+3+4} = \frac{3}{14} = 0{,}21$$

$$W3 = \frac{3}{4+3+3+4} = \frac{3}{14} = 0{,}21$$

$$W4 = \frac{4}{4+3+3+4} = \frac{4}{14} = 0{,}29$$

At the stage of normalizing the weight above the criteria that include benefits, the weight of the criteria is positive, and if the criteria is *cost* , the weight is negative.

4. Calculating Vector Values S
   In searching for the S vector value, that is, by way the alternative preference value in the table is ranked by the weight of each criteria that has been normalized.
   The calculation process of the S vector is carried out using formula (2) with the following calculation results:
   S1 = $(3^{0,29})(2^{0,21})(2^{0,21})(4^{0,29})$ = 2,74
   S2 = $(4^{0,29})(3^{0,21})(3^{0,21})(3^{0,29})$ = 3,46
   S3 = $(3^{0,29})(2^{0,21})(3^{0,21})(3^{0,29})$ = 2,75
   S4 = $(3^{0,29})(2^{0,21})(4^{0,21})(2^{0,29})$ = 3,02
   S5 = $(3^{0,29})(3^{0,21})(3^{0,21})(3^{0,29})$ = 3,19
   S6 = $(4^{0,29})(3^{0,21})(3^{0,21})(3^{0,29})$ = 3,54
   S7 = $(3^{0,29})(2^{0,21})(4^{0,21})(3^{0,29})$ = 2,93
   S8 = $(3^{0,29})(3^{0,21})(2^{0,21})(2^{0,29})$ = 2,45
   S9 = $(3^{0,29})(3^{0,21})(3^{0,21})(4^{0,29})$ = 2,67

5. Calculating the Vector Value of V
   This stage is the last stage, which is to determine the vector. The process of determining vector values can be calculated using the formula (3)
   For the value $\Pi_{j=1}^{n} X_{ij} * Wj$ is
   = 2,74 + 3,46 + 2,75 + 3,02 + 3,19 + 3,54 + 2,93 + 2,45 + 2,67 = 26,74

   The results of the calculation are as follows:
   V1 = 2,74/26,74 = 0,10234
   V2 = 3,46/26,74 = 0,12951
   V3 = 2,75/26,74 = 0,10283
   V4 = 3,02/26,74 = 0,11300
   V5 = 3,19/26,74 = 0,11929
   V6 = 3,54/26,74 = 0,13220
   V7 = 2,93/26,74 = 0,10936
   V8 = 2,45/26,74 = 0,09158
   V9 = 2,67/26,74 = 0,09989

6. Ranking Vector Values
   The results of the calculation of alternative data of 9 data are as follows:

Table 4. Data on laptop selection recommendations

Alternative	Vector	Ranking
Apple	0,13220	1
Sony	0,12951	2
Dell	0,11929	3
HP	0,11300	4
Acer	0,10936	5
ASUS	0,10283	6
Lenovo	0,10234	7
Axio	0,09989	8
Toshiba	0,09158	9

After a search for a vector to get a ranking, the largest vector value of 0.13220 was obtained on Appel Alternatives to be recommended in laptop selection. This alternative recommendation data is obtained based on the weighting of each predetermined criterion as presented in table 3.

4. CONCLUSION

Based on the results of the research, it can be concluded that the decision support system (SPK) with the Weighted Product (WP) method can provide laptop recommendations that suit the needs of users. The selection of the Weighted Product (WP) method in this study has several advantages, namely: the calculation process is easier to understand and can select the best alternatives, the assessment is more precise, and the concept is simple. This research provides benefits for users in choosing the right laptop that suits their needs.

In addition, this research can also be the basis for the development of a decision support system for the selection of laptops or computers in other fields. In the next research, development and improvement can be carried out on the Weighted Product (WP) method used as well as the use of wider and diverse data to improve the accuracy of recommendations provided by the system.

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