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Comparison of SAW methods with WP method laptop recommendations

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ABSTRACT

In this era, laptop users are increasing rapidly to support people's work. Various types and brands of laptops have been produced and distributed on the Indonesian market with various specifications and different uses. Survey results from indonesiabaik.id show that the use of laptops without internet for work is 54.55%. Meanwhile, laptops used for entertainment were 34.94%. With various types, specifications and uses of laptops having varying prices from cheap to expensive, this creates a dilemma for people in choosing a laptop that suits their needs. Many people have already bought laptops, but the increasing demand ends up having to buy another laptop to suit the increasing work and entertainment needs. The method used for comparison is the SAW method with the WP method in a web-based application that can recommend laptops. The results of this research show that recommending laptops using the SAW method or the functionally WP method is very helpful in finding out the overall ranking or level of the laptop. However, in terms of effectiveness, the SAW method still has the possibility of having the same ranking value and that could cause a dilemma for people in determining the ranking order on laptops. Meanwhile, the WP method has the possibility of the same ranking value being very small so it can determine the laptop ranking order better than the SAW method. From the overall comparison, it can be concluded that the WP method is better in recommending laptops.

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1. INTRODUCTION

A laptop is an electronic device created from technological advances that people use to search for information, process data, graphic design, play games and many other uses for laptops among the public (Khasanah, 2019). In this era, laptop users are increasing rapidly to support people's work. Various types and brands of laptops have been produced and distributed on the Indonesian market with various specifications and different uses (Firdaus & Nuraeni, 2022). Survey results from indonesiabaik.id show that the use of laptops without internet for work is 54.55%. Meanwhile, laptops used for entertainment were 34.94% (Herald et al., 2021).

With various types, specifications and uses of laptops having varying prices from cheap to expensive, this creates a dilemma for people in choosing a laptop that suits their needs (Ade et al., 2023). Many people have already bought laptops, but the increasing demand for them ends up

having to buy another laptop to suit the increasing work and entertainment needs (Wahyuningrum & Januarita, 2014).

In previous research written by Abdiel Pandapotan Manullang, Alan Prahutama and Rukun Santoso in 2018 on a similar case which used the SAW and WP methods. However, this research has differences in terms of laptop components which are outdated compared to current technology (Manullang et al., 2018). In this research, the results showed that the SAW method and WP method could be used in a decision support system for laptop recommendations (Aria & Susilowati, 2019).

From the case that has been described, the author conducted research regarding a decision support system for laptop recommendations using the SAW method with the WP method as a comparison in order to find out a more effective method in determining a laptop that suits your needs (Zidifaldi, 2020).

2. RESEARCH METHOD

There are three methods used in this research, including data collection methods, system development methods, and software development methods (. et al., 2021). The method used has been described as in Figure 1.

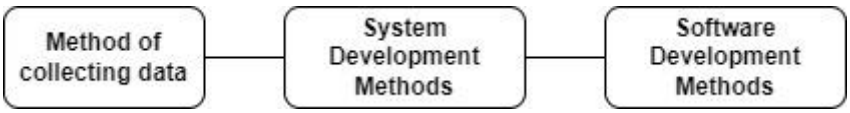

Figure 1. Research methods

1. Method of collecting data

Data collection methods are approaches applied to obtain the information needed in a study (Laluma et al., 2021). In this research, the data acquisition method applied involves literature study, where information is taken from various literature sources and online references (Sugiarto, 2021).

2. System Development Methods

In this system development method the author uses two methods to make comparisons (Rahayu et al., 2012). The first is the SAW method. The SAW method is a method that adds up the weights of each criterion to find the highest rating value for each attribute (Novianti & Yanto, 2019). The stages of the SAW method have been described in Figure 2.

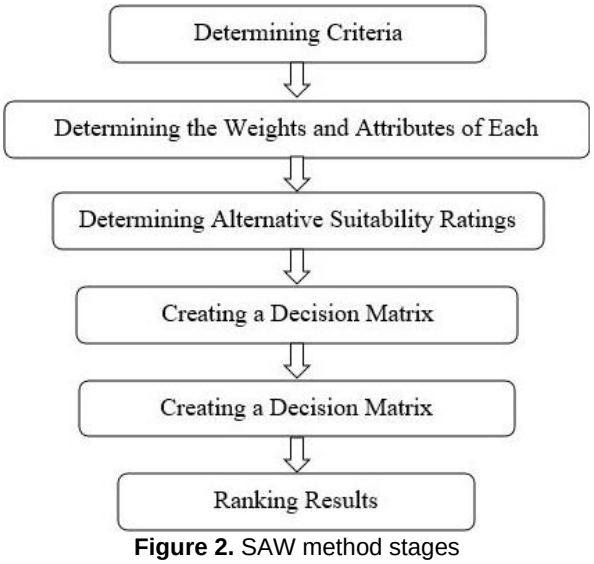

Figure 2. SAW method stages

The second is the WP method. The WP method is a method of increasing the rating value and connecting the multiplication of the weights of each attribute (Rakasiwi, 2020). The stages of the WP method have been described in Figure 2 (Cahya et al., 2020).

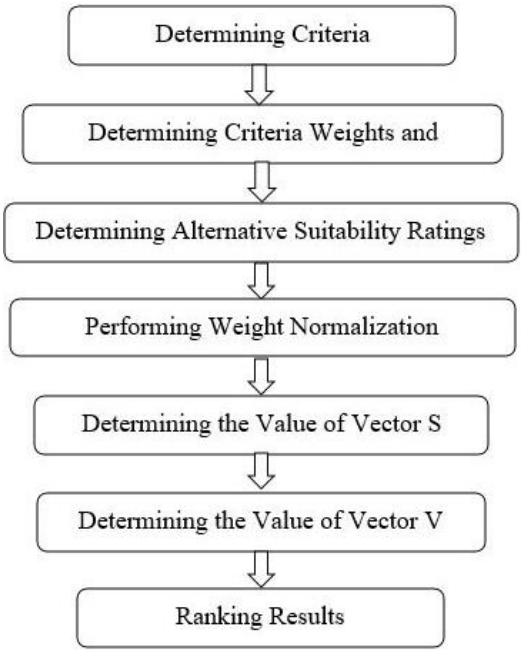

Figure 3. WP method stages

3. Software Development Methods

The method applied in software development is RAD. Rapid Application Development is an information system development strategy aimed at quickly creating solutions that best suit e-commerce needs (Hariyanto et al., 2021). A literary approach is used in RAD, starting with the creation of an initial system framework to identify user needs and address challenges that may arise throughout the development process (Cikutra & Barat, 2016). The stages of the RAD method have been described in Figure 4.

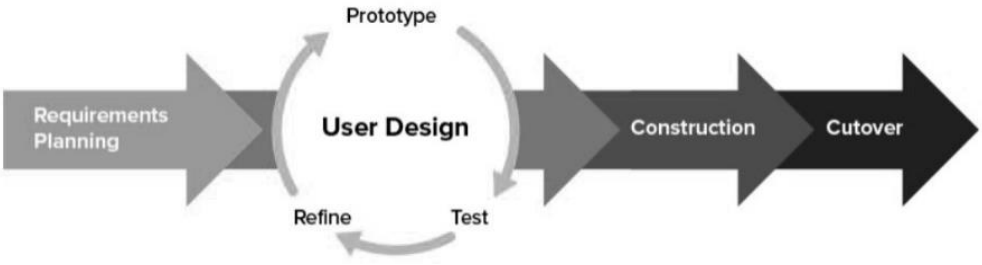

Figure 4. RAD method stages

3. RESULTS AND DISCUSSIONS

1. Calculation Variables

Identifying criteria factors as a guide in the decision making process (Azfandi, 2011). There are important criteria elements for assessing which laptop has the highest level of demand and best suits your needs (Syahril & Suharjo, 2021). In this research, six criteria indicators are required as in table 1.

Table 1. Criteria

Criteria	Name
C1	Price

C2	Prosesor
C3	SSD
C4	RAM
C5	VGA
C6	Display Size

After determining the criteria, it is necessary to determine the weights and attributes of each criterion as in table 2 (Putri et al., 2020).

Table 2. Weights and attributes

Criteria	Weights	Atribute
C1	15	Cost
C2	20	Benefit
C3	20	Benefit
C4	20	Benefit
C5	15	Benefit
C6	10	Benefit
Total	100	Benefit

Once the weights and attributes are known, it is necessary to determine the required alternatives along with the suitability rating for each alternative which has been determined in table 3 (Khasanah & Setiyadi, 2019).

Table 3. Alternative suitability rating

Alternative	Brand	Criteria					
		C1	C2	C3	C4	C5	C6
L1	Lenovo	4	3	2	4	2	4
L2	Acer	2	1	1	3	1	2
L3	Asus	3	4	4	3	4	2
L4	HP	1	3	4	1	4	2
L5	MSI	4	3	4	4	3	4
L6	Jumper	3	2	4	3	2	4

2. SAW Method Calculation

a. Carrying out the Normalization Process

The normalization process involves the process of changing the weights of criteria and alternative values into a consistent scale (Triawan, 2021). This is done to ensure that all criteria have a balanced impact in the final calculation. If the criteria have a cost attribute, the minimum value of all these criteria is divided by the calculated criteria value (Dewi et al., 2020). However, if the criterion has a benefit attribute, the calculated criterion value is divided by all the maximum values of that criterion. Carrying out normalization with criteria with the cost attribute:

$$r11 = \frac{\min(4,2,3,1,4,3)}{4} = \frac{1}{4} = 0{,}25$$
$$r21 = \frac{\min(4,2,3,1,4,3)}{2} = \frac{1}{2} = 0{,}5$$
$$r31 = \frac{\min(4,2,3,1,4,3)}{3} = \frac{1}{3} = 0{,}33$$
$$r41 = \frac{\min(4,2,3,1,4,3)}{1} = \frac{1}{1} = 1$$
$$r51 = \frac{\min(4,2,3,1,4,3)}{4} = \frac{1}{4} = 0{,}25$$
$$r61 = \frac{\min(4,2,3,1,4,3)}{3} = \frac{1}{3} = 0{,}33$$

Carrying out normalization with criteria with the benefit attribute:

$$r12 = \frac{3}{\max(3,1,4,3,3,2)} = \frac{3}{4} = 0{,}75$$
$$r22 = \frac{1}{\max(3,1,4,3,3,2)} = \frac{1}{4} = 0{,}25$$

$$r32 = \frac{4}{\max(3,1,4,3,3,2)} = \frac{4}{4} = 1$$
$$r42 = \frac{4}{\max(3,1,4,3,3,2)} = \frac{4}{4} = 1$$
$$r52 = \frac{4}{\max(3,1,4,3,3,2)} = \frac{4}{4} = 1$$
$$r62 = \frac{4}{\max(3,1,4,3,3,2)} = \frac{4}{4} = 1$$

b. Ranking results

After normalizing, the normalization results are multiplied by the weight and totaled by all the criteria (Siringoringo, 2023).

V_1 = (0,25*15) + (0,75*20) + (0,5*20) + (1*20) + (0,5*15) + (1*10)

V_2 = 3,75 + 15 + 10 + 20 + 7,5 + 10

V_3 = 66,25

So the ranking results for each criterion are as in table 4.

Table 4. Ranking results

C1	C2	C3	C4	C5	C6	the final result	Ranking
0,25	0,75	0,5	1	0,5	1	66,25	5
0,5	0,25	0,25	0,75	0,25	0,5	41,25	6
0,3333333	1	1	0,75	1	0,5	80	1
1	0,75	1	0,25	1	0,5	75	3
0,25	0,75	1	1	0,75	1	80	2
0,3333333	0,5	1	0,75	0,5	1	67,5	4

3. WP Method Calculation

a. Performing weight normalization

$$W_1 = \frac{15}{\max(15,20,20,20,15,10)} = \frac{15}{100} = 0{,}15$$
$$W_2 = \frac{20}{\max(15,20,20,20,15,10)} = \frac{20}{100} = 0{,}2$$
$$W_3 = \frac{20}{\max(15,20,20,20,15,10)} = \frac{20}{100} = 0{,}2$$
$$W_4 = \frac{20}{\max(15,20,20,20,15,10)} = \frac{20}{100} = 0{,}2$$
$$W_5 = \frac{15}{\max(15,20,20,20,15,10)} = \frac{15}{100} = 0{,}15$$
$$W_6 = \frac{10}{\max(15,20,20,20,15,10)} = \frac{10}{100} = 0{,}1$$

After the weights have been normalized, the criteria that have the cost attribute are changed to mines numbers as in table 5.

Table 5. Normalization results

Criteria	C1	C2	C3	C4	C5	C6
Weights	0,15	0,2	0,2	0,2	0,15	0,1
Rank	-0,15	0,2	0,2	0,2	0,15	0,1

b. Determining the value of vector S

Calculating the value of the vector S involves an assessment and calculation process which aims to provide an overview of the preferences or relative performance of each alternative in a decision making method (Taufikurrahman & Gunawansyah, 2022). In certain contexts, the vector value S can be seen as the final result of processing data or information used to evaluate alternatives. The resulting power of the normalized weights is raised to the power of the alternative criteria and multiplied as follows:

$S_1 = (-0{,}15^4)*(0{,}2^3)*(0{,}2^2)*(0{,}2^4)*(0{,}15^2)*(0{,}1^4) = 1{,}954761371$

$S_2 = (-0{,}15^2)*(0{,}2^1)*(0{,}2^1)*(0{,}2^3)*(0{,}15^1)*(0{,}1^2) = 1{,}203296771$
$S_3 = (-0{,}15^2)*(0{,}2^4)*(0{,}2^4)*(0{,}2^3)*(0{,}15^4)*(0{,}1^2) = 2{,}427124519$
$S_4 = (-0{,}15^1)*(0{,}2^3)*(0{,}2^4)*(0{,}2^1)*(0{,}15^4)*(0{,}1^2) = 2{,}168943542$
$S_5 = (-0{,}15^4)*(0{,}2^3)*(0{,}2^4)*(0{,}2^4)*(0{,}15^3)*(0{,}1^4) = 2{,}386236235$
$S_5 = (-0{,}15^3)*(0{,}2^2)*(0{,}2^4)*(0{,}2^3)*(0{,}15^2)*(0{,}1^4) = 2{,}040960307$

The results of calculating the vector value s have been described in table 6.

Table 6. Vector S value results

Alternative	Vektor S
L1	1,954761371
L2	1,203296771
L3	2,427124519
L4	2,168943542
L5	2,386236235
L6	2,040960307
Total	12,18132274

c. Determining the value of vector V

Determining the vector value v is the final form of ranking the WP method by dividing the vector value v by the total vector value as follows:

$V_1 = \frac{1{,}954761371}{12{,}18132274} = 0{,}160472012$
$V_2 = \frac{1{,}203296771}{12{,}18132274} = 0{,}098782111$
$V_3 = \frac{2{,}427124519}{12{,}18132274} = 0{,}199249669$
$V_4 = \frac{2{,}168943542}{12{,}18132274} = 0{,}178054846$
$V_5 = \frac{2{,}386236235}{12{,}18132274} = 0{,}195893031$
$V_6 = \frac{2{,}040960307}{12{,}18132274} = 0{,}167548332$

The ranking results obtained from the vector v values are as in table 7.

Table 7. Ranking results

Alternative	Vektor V	Rangking
L1	0,160472012	5
L2	0,098782111	6
L3	0,199249669	1
L4	0,178054846	3
L5	0,195893031	2
L6	0,167548332	4

4. Implementation

System implementation is a critical phase in the technology development cycle because it moves concepts and designs into a reality that can provide added value to the organization or end user.

a. Login page

The login page is the page where the user enters the user and password to access the website. The following is the form of the login page as in Figure 5.

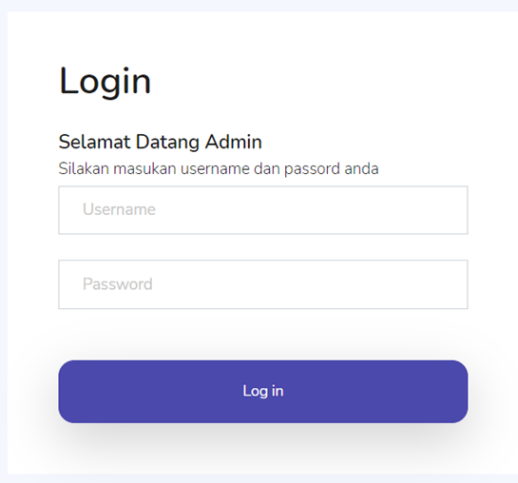

Figure 5. Login page

b. Criteria and weights page

The Criteria and Weights page is a page for users to change the weights so they can search for laptops according to their priority needs. The following is the Criteria and Weights page as in Figure 6.

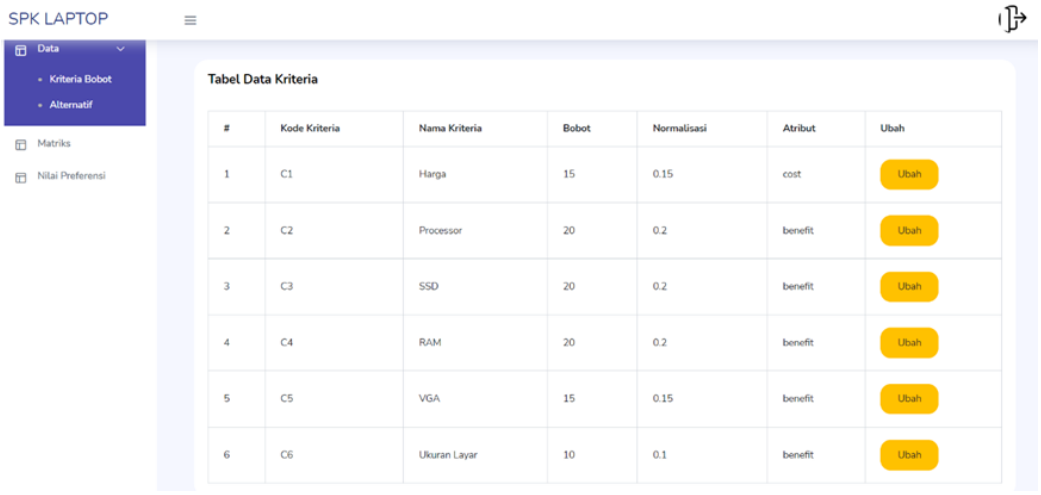

Figure 6. Criteria and weights page

c. Matrix page

The matrix page is a page that displays the laptop brand and the value of each criterion. The following is the matrix page as in Figure 7.

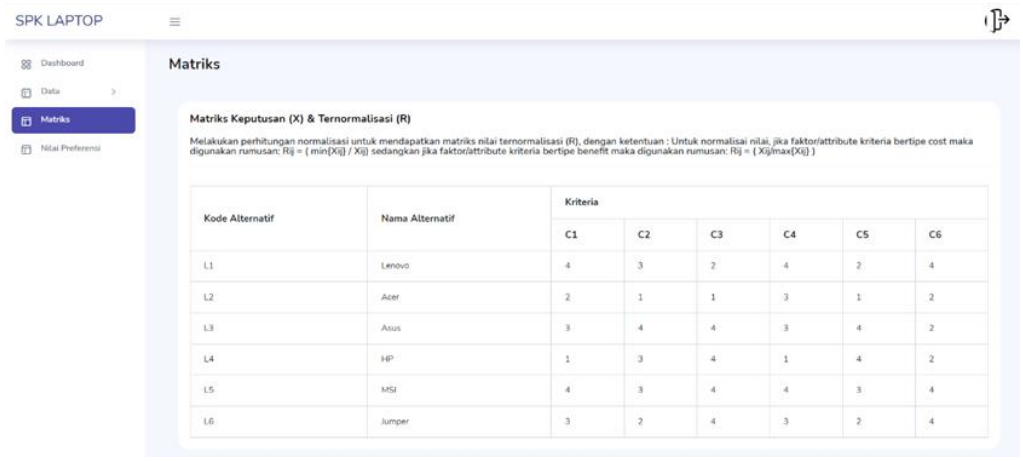

Figure 7. Matrix page

d. Preference results page

The Preference Results Page is a page of calculation results for the SAW method and WP method. The following is the preference results page as in Figure 8.

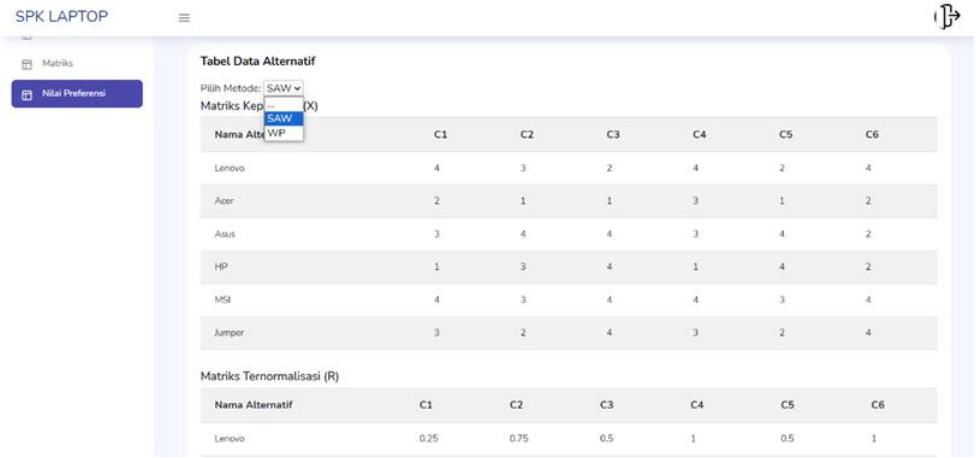

Figure 8. Preference Results Page

4. CONCLUSION

In terms of effectiveness, the simple additive weighting method still has the possibility of having the same rating value and that could cause confusion in the order of the same rating. Just as in this study, alternatives L3 and L5 have the same value, namely 80. Meanwhile, the weighted product method has the possibility of having the same rating value. is very small so that it can determine the rating order with certainty, just as alternative L3 has a value of 0.199249669 and L5 has a value of 0.195893031. From the overall comparison, it can be concluded that the weighted product method is better in recommending laptops. A Decision Support System using the WP method can recommend laptops according to customer needs by changing the weight based on the priorities sought. It is recommended to further explore the comparison of SAW and WP methods and explore the use of other methods in the context of decision support systems. In particular, research could consider the use of more sophisticated ranking techniques such as Analytic Hierarchy Process (AHP) or Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) that can address ambiguity in ranking more effectively. In addition, focus can be placed on developing more relevant and adaptive criteria for product recommendations, such as laptops, which can help improve the accuracy of the rating results. This could also include aspects such as quality, price, and user preferences. Finally, research can explore the application of machine learning or artificial intelligence techniques to improve recommendations and help customers make better decisions.

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