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Recommendation System For Choosing The Best Laptop For Informatics Students Using The SMART Method

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Abstract
In the rapidly advancing digital era, the use of laptops has become an essential need, especially for students. The problem of choosing the right laptop is still often experienced by many students. This issue arises due to a lack of knowledge in selecting laptops with good specifications and affordable prices, so purchasing decisions are often based on friends' recommendations or advertisements that do not always meet their academic needs optimally. This research uses the Simple Multi Attribute Rating Technique (SMART) method. SMART is a flexible decision-making method. The process of determining the best laptop involves criteria such as price, processor type, monitor screen size, operating system, RAM, VGA type, and storage. The system provides solutions by using the SMART method to evaluate the weights and criteria that have been determined. The ranking process is carried out to determine the best laptop for students majoring in informatics. From 10 data samples for the Informatics department, the highest alternative value (A4) was obtained, namely "ACER Swift X 14 SFX14-71G-70KB" with a final score of 0.866666667, and the lowest alternative value (A8) was "ASUS VivoBook 14 A1404ZA-IPS321" with a final score of 0.166666667. The process of determining the best laptop using the Simple Multi Attribute Rating Technique (SMART) method aims to help informatics students choose laptops that suit their academic needs.
Keywords: Recommendation, Selection, Students, Laptop, SMART

Introduction
Technological advancements today are progressing rapidly, especially in the digital sector. In fact, technology has become inseparable from human life. Laptops are one of the technologies that have become an essential part of everyday life. In 2020, the Central Bureau of Statistics reported that the percentage of households owning a laptop was 18.83%. Furthermore, internet penetration in Indonesia reached around 79.5% of the total population, with more than 221 million people using the internet in 2024. Laptops are devices that help simplify daily tasks due to their practicality, making them easy to carry to various places. Completing tasks would be much less efficient if everything were still done manually. With the presence of laptops, all work can be managed in a short amount of time, and the risk of errors can be minimized [1].

The issue of choosing a laptop is still frequently experienced by many students. This problem arises from a lack of knowledge in selecting good specifications for laptops that are also budget-friendly, leading to purchase decisions often based on friends' recommendations or advertisements that do not always meet their academic needs optimally. This issue is also faced by CV. Power Computer, which often receives complaints from customers, particularly informatics and students, who are dissatisfied with the performance of the laptops they purchased, as they do not meet the demands of their study programs. This research uses the Simple Multi-Attribute Rating Technique (SMART) method. The process of determining the best laptops involves seven criteria: price, processor type, screen size, operating system, RAM, VGA type, and storage [2].

Several previous studies have been conducted using existing methods. Among them, a study by Nasution in 2021 discussed a decision support system utilizing the SMART and MAUT methods in a study titled "Comparison of SMART and MAUT Methods in Employee Selection at Merapi Online Corporation." This research found that both methods are viable and effective in identifying the best employees with equal criterion weights. However, the SMART method produced 22 classifications, while the MAUT method yielded 18 classifications. The emergence of various reviews

indicates that these methods can help reduce the number of choices when making more precise investment alternatives [3].

Another study was conducted by Magrisa in 2018 titled "Implementation of the SMART Method in a Decision Support System for Extracurricular Activity Selection for High School Students." This research concluded that the accuracy level achieved was 84.39%, and based on the feedback from respondents, the system was accepted with a score of 83.089% [4]. The process of determining the best laptop selection using the Simple Multi-Attribute Rating Technique (SMART) aims to assist informatics students in choosing laptops according to their needs.

Literature Review

1. System

The term "system" comes from Greek, meaning a unity. A system is a collection of interrelated parts that cannot be separated from one another, working together to achieve a specific goal [5].

2. Decision Support System

The decision support system was initially introduced by G. Anthony Gorry and Michael S. Scott Morton. They developed a framework related to the use of computer applications in the decision-making process at the managerial level. A decision support system can be defined as closely related to information systems and analytical models that assist decision-makers in obtaining accurate information [6].

3. Simple Multi-Attribute Rating Technique (SMART)

The Simple Multi-Attribute Rating Technique (SMART) is a multi-attribute decision-making method developed by Edward in 1977. This multi-attribute decision-making technique is based on the theory that each alternative consists of several combinations of values, and each measurement has a weight that illustrates its importance. These weights are used to enhance each option in order to obtain the best choice [7]. here are several stages that must be carried out when using the SMART method, including:

1. Defining the criteria.
2. Establishing a scale of 0-100 based on priorities to assess weights, which facilitates normalization.

$$nWj\,\frac{Wj}{\sum Wj} \tag{1}$$

Explanation:
Wj = Normalization of the weight of criterion j
$\sum Wj$ = Total weight of all criteria

Assign a weight to each sub-criteria, with the minimum value of 0 and a maximum of 100. If the weight is unknown, it is necessary to calculate the utility value of the sub-criteria weights.

4. Calculate the utility value for each individual criterion.

5. Calculate the final value for each.

$$\sum Wj * u \tag{2}$$

Explanation:
Wj = Weight Normalization
u = Utility Score of Sub-Criteria Weights

6. Laptop

A laptop is a portable computer designed for ease of use and mobility. It integrates all the main components of a computer, such as the screen, keyboard, touchpad (as a replacement for a mouse), and battery into a single unit that can be folded and easily transported.

Research Methods

1. Object

This research is conducted at Pocut Baren Street No. 96A, Kuta Alam District, Banda Aceh City.

2. Data Collection Method

The data collection process consists of two stages:

1. Observation
   This stage involves activities related to observation and data collection from CV. Power Computer Banda Aceh, utilizing attributes such as what, when, where, who, how, and why.
2. Literature Review
   In this stage, the researcher collects references by reading books and scientific journals to obtain theories and concepts that support the research related to the SMART method.
3. Interviews

During the observation process, the author conducts interviews with the source, specifically the owner of CV. Power Computer Banda Aceh.

Results and Discussion

1. System Analysis

In the system to be designed, several processes occur, starting with the user inputting criterion and sub-criterion data, as well as providing importance ratings for each sub-criterion. Then, alternatives are added, weight values are assigned according to the user's priorities for each criterion, commands are executed to perform calculations, and the system will calculate using a specific method.

2. Manual Calculation For The Informatics Major

Below is the manual calculation of the SMART method for a recommendation system to select the best laptops for students in the Informatics major using the SMART method.

1. Determining Criteria

Table 1. Informatics Criteria Data

Code	Criterion	Type
C1	Price	Cost
C2	Processor Type	Benefit
C3	Screen Size	Benefit
C4	Operating System	Benefit
C5	RAM Capacity	Benefit
C6	VGA Type	Benefit
C7	Storage Capacity	Benefit

2. Weighting

After deciding on the criterion data, the next step is to assign weights to each criterion as follows:

Table 2. Weight Values for Each Informatics Criterion

Criterion	Weight
Price	25%
Processor Type	20%
Screen Size	10%
Operating System	5%
RAM Capacity	15%
VGA Type	10%
Storage Capacity	15%

3. The weights assigned to each criterion are then normalized using the normalization formula as follows:

Table 3. Normalization Values

Code	Criteria	Weight	Normalization
C1	Price	25%	0,25
C2	Processor Type	15%	0,15
C3	Screen Size	10%	0,10
C4	Operating System	15%	0,15
C5	RAM Capacity	10%	0,10
C6	VGA Type	15%	0,15
C7	Storage	10%	0,10
Total		100	1

After assigning weights to each criterion and normalizing them, the next step is to assign values to sub-criteria for each criterion.

a) **Sub-criterion Price**

Table 4. Price Sub-criteria

No	Sub-criterion Name	Value
1	Very Expensive (> 25 Million)	1

No	Sub-criterion Name	Value
2	Expensive (20-25 Million)	2
3	Moderate (15-20 Million)	3
4	Cheap (10-15 Million)	4
5	Very Cheap (< 10 Million)	5

b) **Sub-criterion Processor Type**

Table 5. Processor Type Sub-criteria

No	Sub-criterion Name	Value
1	Intel Core i3 / AMD Quad Core	1
2	Intel Core i5 / AMD Hexa Core	2
3	Intel Core i7 / AMD Octa Core	3
4	Intel Core i9 / AMD Deca Core	4
5	AMD Ryzen 5 / Intel Xeon	5

c) **Sub-criterion Screen Size**

Table 6. Screen Size Sub-criteria

No	Sub-criterion Name	Value
1	< 11 Inch	1
2	12-14.5 Inch	3
3	≤ 15 Inch	5

d) **Sub-criterion Operating System**

Table 7. Operating System Sub-criteria

No	Sub-criterion Name	Value
	Windows 10 Home	1
	Windows 11 Home	2

e) **Sub-criterion RAM Capacity**

Table 8. RAM Capacity Sub-criteria

No	Sub-criterion Name	Value
1	< 4GB	1
2	4-8 GB	2
3	8-12 GB	3
4	12-16 GB	4
5	> 16 GB	5

f) **Sub-criterion VGA Type**

Table 9. VGA Type Sub-criteria
(Data not provided)

g) **Sub-criterion Storage Capacity**

Table 10. Storage Capacity Sub-criteria

No	Sub-criterion Name	Value
1	< 256 GB	1
2	256 - 512 GB	3
3	256 - 512 GB	3

4. Determining Criterion Values
   In the process of determining criterion values, alternative data from each criterion is needed:

C3=0
C4=0.05
C5=0.15
C6=0.066666667
C7=0.15
Final Result = 0.866666667

Code A5:
- C1 = 0.125
- C2 = 0.25
- C3 = 0.1
- C4 = 0
- C5 = 0.075
- C6 = 0
- C7=0

Final Result = 0.55

Code A6:
- C1 = 0.0625
- C2 = 0.2
- C3 = 0.1
- C4 = 0.05
- C5 = 0
- C6 = 0
- C7=0

Final Result = 0.4125

Code A7:
- C1 = 0.0625
- C2 = 0.2
- C3 = 0.1
- C4 = 0.05
- C5 = 0.075
- C6 = 0
- C7=0

Final Result = 0.4875

Code A8:
- C1 = 0
- C2 = 0
- C3 = 0.1
- C4 = 0
- C5 = 0
- C6 = 0.066666667
- C7=0

Final Result = 0.166666667

Code A9:
- C1 = 0.0625
- C2 = 0.1
- C3 = 0.1
- C4 = 0.05
- C5 = 0
- C6 = 0.066666667
- C7=0

Final Result = 0.379166667

Code A10:
- C1 = 0.125
- C2 = 0.1
- C3 = 0.1

- C4 = 0.05
- C5 = 0.075
- C6 = 0.066666667
- C7=0

Final Result = 0.516666667

After obtaining the final calculation results, the ranking of each alternative from the highest to the lowest value is as follows:

Table 13. Ranking for Information Technology

Code	Final Value	Rangking
A1	0,708333333	3
A2	0,7125	2
A3	0,5	6
A4	0,866666667	1
A5	0,55	4
A6	0,4125	8
A7	0,4875	7
A8	0,166666667	10
A9	0,379166667	9
A10	0,516666667	5

Below is the ranking graph for laptop recommendations for the Informatics department based on final scores using the SMART method.

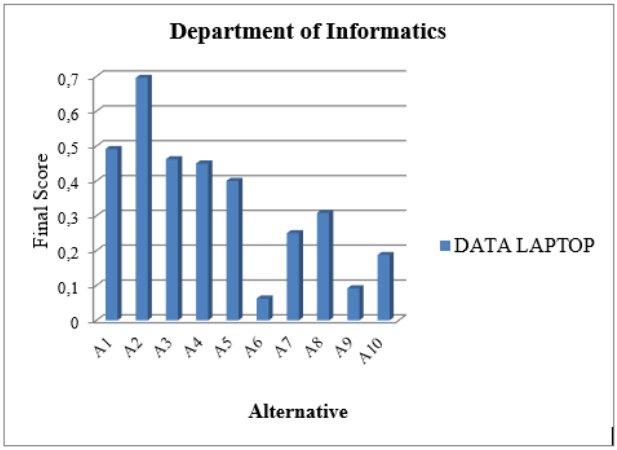

Figure 1. Ranking Graph

Conclusions

The recommendation system for selecting the best laptop for informatics students using the SMART method has been successfully developed, resulting in rankings.

From 10 data samples for the Informatics program, the highest-rated alternative (A4) is "ACER Swift X 14 SFX14-71G-70KB" with a final score of 0.866666667, while the lowest-rated alternative (A8) is "ASUS VivoBook 14 A1404ZA-IPS321" with a final score of 0.166666667.

The testing was conducted with 10 alternatives for the Informatics program and, using 7 criteria: price, processor type, screen size, operating system, RAM capacity, VGA type, and storage.

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