Application of the Simple Multi Attribute Rating Technique (SMART) Method on the Selection of Anti Mosquito Lotion based on the Consumer

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Abstract

The purpose of this study is to select the best anti-mosquito lotion based on consumers by utilizing decision support system techniques. The method used is the Simple Multi Attribute Rating Technique (SMART). The research data were obtained by observing, interviewing and administering random questionnaires to 150 respondents. The location of the study was conducted in Pondok Cina, Beji District, Depok City, West Java. The results of the questionnaire will be processed first by using Microsoft Excel before using the SMART method in completion. From the questionnaire distribution, several assessment criteria were obtained in the selection of anti-mosquito lotions, namely: Product Safety (C1), Price (C2), Product Quality (C3), Halal Label (C4), Product Health. While the alternatives used in the selection of anti-mosquito lotions based on observations, interviews and questionnaires are: Soffel (A1), Lavenda (A2), Caladine (A3), Autan (A4) and Neem Lotion (A5). the results of the calculation of the SMART method obtained alternative Autan (A4) as the best alternative for anti-mosquito lotion with a value (48.31). The results of the election can be used as information for users of anti-mosquito lotions.

Keywords: *Decision Support System, SMART Method, Anti-Mosquito Lotion, Ranking.*

1. Introduction

Mosquitoes are animals that belong to the class of insects classified in the order diptera, genera including Anopheles, Culex, Psorophora, Ochlerotatus and Aede. The total number encompasses 2700 species. Mosquitoes have two scaly wings, a slim body and six feet long; between species differ but rarely exceed 15 mm []. Mosquito bites are very annoying and uncomfortable, because of the itching and bumps left on the surface of the skin. In addition to these mild effects, even dangerous mosquito bites can put us at risk for diseases such as dengue fever. Therefore, to prevent undesirable events, the use of anti-mosquito lotion is recommended. Therefore, the authors conducted observations and surveys to the public who use anti-mosquito lotions with various brands of lotions, here the authors make calculations from the questionnaire that the author has shared with the public to find out which anti-mosquito lotion is the best and most widely used by the community. So an assessment is needed in the form of ranking the selection of the best anti-mosquito lotion based on people's choices. This research was conducted in the village of pondok Cina, Beji Subdistrict, Depok City, West Java. The method used to do the ranking that is often used is a decision support system [1]–[5]. One method that is often used for ranking with decision support systems is the Simple Multi Attribute Rating Technique (SMART) method [6]. This method has the ability to not depend on alternatives [7]. The SMART method also will not change the decision of a number of original alternatives when changing the number of alternatives so this is useful when new alternatives are added [8]. Besides that the SMART method uses a ratio scale approach to assess panelist preferences [6] and
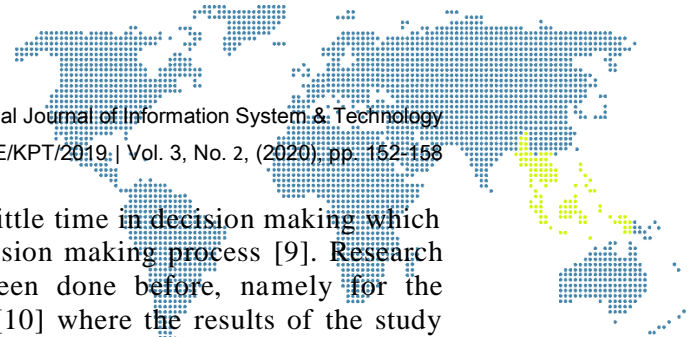
this method is quite simple, easy and requires a little time in decision making which is quite important for those involved in the decision making process [9]. Research using the SMART method for ranking has been done before, namely for the selection of exemplary employees at PT. XYZ [10] where the results of the study mentioned from the distribution of questionnaires to Admin obtained the results of the percentage of the system is in the range of 83.57% and Manager obtained the results of the percentage of the system is in the range of 83%. So that the system can help recommend in the assessment of the selection of exemplary employees. It is expected that from the strengths and previous studies, research results can recommend the selection of anti-mosquito lotions based on consumers.

2. Research Methodology
2.1. Decision Support System
Decision Support System is an interactive information system provide information, modeling, and manipulation of data that can help in recommending decision-making in semi-structured and unstructured situations, where no one knows for sure how decisions should be made [11].

2.2. Simple Multi Attribute Rating Technique (SMART) Method
The SMART method is a multi-criteria decision making technique based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that illustrates how important it is compared to other criteria. This weighting is used to assess each alternative in order to obtain the best alternative [10]. The steps to complete the SMART method are as follows:

a) The models used in SMART are:

$$(a_i) = \sum_{j=1}^{m} W_J \ U_I(ai)i = 1,2 \ldots \ldots m \tag{1}$$

Information:
W_j = value of weighting criteria to j
$U_i(ai)$ = value of the criterion utility i

b) Determine the number of criteria

c) Determine the percentage of weight criteria, weighting for each criterion is carried out in accordance with the ranking given based on priority level. Usually formed with the statement "criterion 1 is more important than criterion 2, more important than criterion 2" and so on until the nth criterion is written. Normalization results are written with the formula:

$$\text{Normalization} = \frac{w_j}{\sum w_j} \tag{2}$$

Information:
w_j = the weight of a criterion
$\sum w_j$ = Total weight of all criteria

d) Calculate the ultility value for each of the respective sub-criteria

$$u_i(a_i) = 100\% \ \frac{(Cmax - Cout\ i)}{(Cmax - Cmin)} \tag{3}$$

Information:
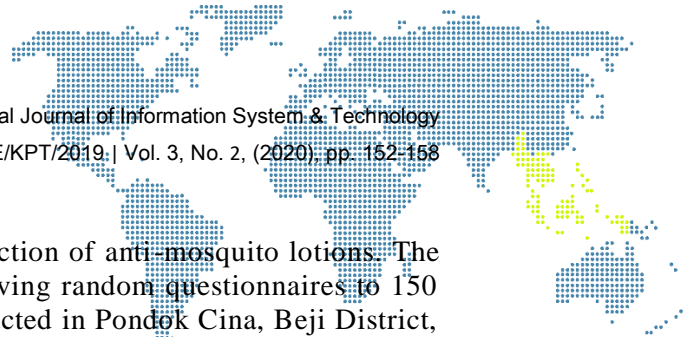$U_i(ai)$ = the value of the utility criteria to i for criteria to i
C_{max} = maximum criterion value
C_{min} = minimum criterion value
Cout i   = value criterion to i

e) Calculate the final value of each using the formula from the SMART method

$$u(a_i) = \sum_{j=1}^{m} W_J \ U_I(ai)i = 1,2 \ldots \ldots m \tag{4}$$

2.3. Data source

Application of the SMART method in the selection of anti-mosquito lotions. The research data were obtained by observing and giving random questionnaires to 150 respondents. The location of the study was conducted in Pondok Cina, Beji District, Depok City, West Java. The results of the questionnaire will be processed first by using Microsoft Excel before using the SMART method in completion. From the questionnaire distribution, several assessment criteria were obtained in the selection of anti-mosquito lotions, namely: Product Safety (C1), Price (C2), Product Quality (C3), Halal Label (C4), Product Health (C5). While the alternatives used in the selection of anti-mosquito lotion based on observations, interviews and questionnaires are: Soffel, Lavenda, Caladine, Autan and Neem Lotion.

3. Results and Discussion

In applying the SMART method for selecting anti-mosquito lotions, there are a number of things that need to be done before calculating values, one of which is:

a) Identifying criteria and alternatives for selecting the best anti-mosquito lotion as shown in the following table:

Table 1. Assessment criteria

No	Criteria	Information	Weight
1	C1	Product Safety	45%
2	C2	Price	25%
3	C3	Product Quality	15%
4	C4	Halal Label	10%
5	C5	Product Health	5%

Table 2. alternatives

No	Alternatives	Information
1	A1	Soffel
2	A2	Lavenda
3	A3	Caladine
4	A4	Autan
5	A5	Neem Lotion

Based on table 1, it can be explained as follows:

C1: Product Safety

The product used can provide security when using mosquito repellent lotion.

C2: Price

Consumers choose varying prices in choosing mosquito repellent products as needed.

C3: Product Quality

Consumers choose mosquito repellent products with a good or bad level of a brand.

C4: Halal Label

Halal label is used to give consumers confidence in choosing anti-mosquito lotion that the product is safe to use.

C5: Product Health

Consumers choose a product based on the condition or condition of the skin as needed.

b) Giving Criteria Weight

Giving criteria weights is obtained through the results of the questionnaire based on giving the largest weight to the smallest weight at intervals of 0-100 (%) and is made the default value on the system. Giving weights uses the concept of
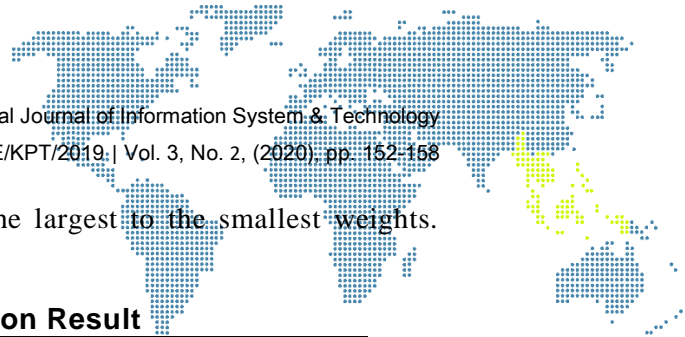
reasoning according to which criteria have the largest to the smallest weights. Then the value is added up.

Table 3. Normalization Result

No	Criteria	Information	Weight	Amount
1	C1	Product Safety	45%	45/100 = 0.45
2	C2	Price	25%	25/100 = 0,25
3	C3	Product Quality	15%	15/100 = 0,15
4	C4	Halal Label	10%	10/100 = 0,1
5	C5	Product Health	5%	5/100 = 0,05

c) Calculate the ultility value for each of the respective sub-criteria
How to get the ultility value as follows:
1) Criteria for alternative Soffel (A1)

$$C1 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C2 = 75 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-75)}{(85-70)} = 66,66$$

$$C3 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C4 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

$$C5 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

2) Criteria for alternative Lavenda (A2)

$$C1 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

$$C2 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C3 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

$$C4 = 70 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-70)}{(85-70)} = 100$$

$$C5 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

3) Criteria for alternative Caladine (A3)

$$C1 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C2 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

$$C3 = 70 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-70)}{(85-70)} = 100$$

$$C4 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C5 = 70 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-70)}{(85-70)} = 100$$
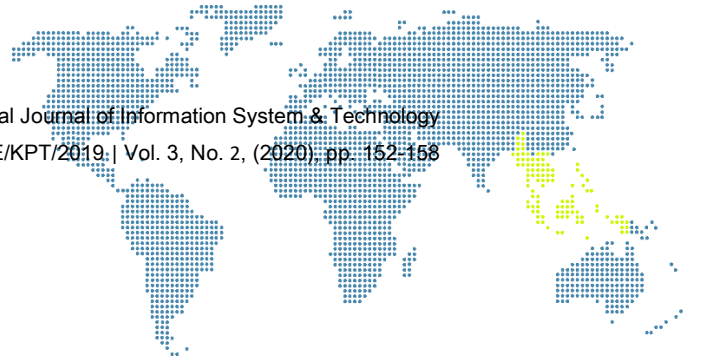
4) Criteria for alternative Autan (A4)

$$C1 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

$$C2 = 70 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-70)}{(85-70)} = 100$$

$$C3 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$$

$$C4 = 75 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-75)}{(85-70)} = 66,66$$

$$C5 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$$

5) Criteria for alternative Neem Lotion (A5)

$C1 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$

$C2 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$

$C3 = 70 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-70)}{(85-70)} = 100$

$C4 = 80 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-80)}{(85-70)} = 33,33$

$C5 = 85 \rightarrow U_i((a_i)) = 100 \quad \frac{(85-85)}{(85-70)} = 0$

d) Value of results

Result = value of utility x normalization

1) Sum of all Criteria for Soffel alternatives
   C1 = 0 x 0,45 = 0
   C2 = 66,66 x 0,25 = 16,66
   C3 = 0 x 0,15 = 0
   C4 = 33,33 x 0,1 = 3,33
   C5 = 33,33 x 0,05 = 1,66
   Overall results: 21,65

2) Sum of all Criteria for Lavenda alternatives
   C1 = 33,33 x 0,45 = 14,99
   C2 = 0 x 0,25 = 0
   C3 = 33,33 x 0,15 = 4,99
   C4 = 100 x 0,1 = 10
   C5 = 33,33 x 0,05 = 1,66
   Overall results: 31,64

3) Sum of all Criteria for Caladine alternatives
   C1 = 0 x 0,45 = 0
   C2 = 33,33 x 0,25 = 8,33
   C3 = 100 x 0,15 = 15
   C4 = 0 x 0,1 = 0
   C5 = 100 x 0,05 = 5
   Overall results: 28,33

4) Sum of all Criteria for Autan alternatives
   C1 = 33,33 x 0,45 = 14,99
   C2 = 100 x 0,25 = 25
   C3 = 0 x 0,15 = 0
   C4 = 66,66 x 0,1 = 6,66
   C5 = 33,33 x 0,05 = 1,66
   Overall results: 48,31

5) Sum of all Criteria for Neem Lotion alternatives
   C1 = 33,33 x 0,45 = 14,99
   C2 = 33,33 x 0,25 = 8,33
   C3 = 100 x 0,15 = 15
   C4 = 33,33 x 0,1 = 3,33
   C5 = 0 x 0,05 = 0
   Overall results: 41,65

Table 4. The final results of the ranking using the SMART method

| No	Alternatives	Information	The final results of the ranking
1	A1	Soffel	21,65
2	A2	Lavenda	31,64
3	A3	Caladine	28,33
4	A4	Autan	48,31
5	A5	Neem Lotion	41,65

Based on table 4, the calculation results obtained in the selection of the best anti-mosquito lotion based on consumers using the SMART method are alternative Autan (A4) with a value (48.31).

4. Conclusion

Based on the results of the study it can be concluded that the application of the SMART method can be done in the selection of the best anti-mosquito lotion based on consumers by using 5 assessment criteria and 5 alternatives. From the calculation results obtained alternative Autan (A4) as the best alternative for anti-mosquito lotion.

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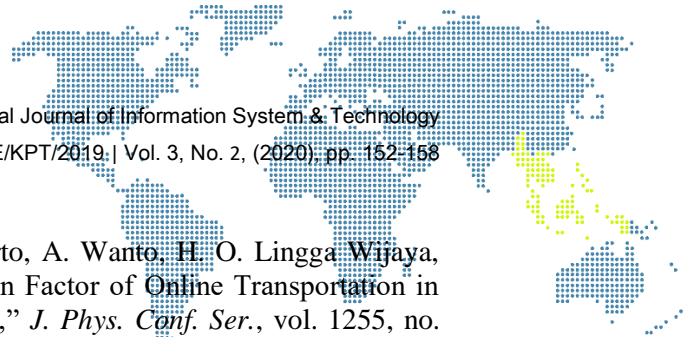
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