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SELECTION OF THE MOST FAVORITE MINERAL WATER AMONG STUDENTS USING THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD

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Abstract. Mineral water is a type of water that contains natural minerals or other dissolved substances that can provide taste and health benefits. However, the selection of the most favorite mineral water among students is still not accurate. This is what makes the Simple Additive Weighting (SAW) method as data processing as the selection of the most favourite mineral water and generates a ranking of the weight calculation of the mineral water selection. The SAW method is used to solve qualitative problems in the selection of mineral water, comparing one criterion to another in order to assess each brand of mineral water in the UINSU Tuntungan area and provide the results of the selection of the most favourite mineral water. This study used 100 student data, 5 brands of mineral water, and 6 criteria, namely price, taste, packaging, water quality, brand, and availability. After determining the weight value of each attribute using Simple Additive Weighting (SAW), each alternative is chosen using ranking. This technique facilitates decision-making and yields the optimum outcome. When it comes to selecting mineral water, the findings of this study offer the finest option.

Keywords: **Selection of Mineral Water, Simple Additive Weighting (SAW) Method, Favorite Brands, Students.**

A. Introduction

Mineral water is water that contains natural minerals that can provide taste and benefits, especially health. Many minerals, including magnesium, calcium, sodium, and selenium, are contained in mineral water. The digestive system, heart, and bones are just a few of the body processes that depend on this mineral water. (Cutruvo, 2009).

Choosing the right mineral water for students is an important thing to support their daily activities. Students need mineral water that not only fulfills the body's nutrition and prevents their hydration but also has a reasonable cost and good quality. This study uses the Simple Additive Weighting (SAW) approach to find out which mineral water is preferred by students.

A simple and effective multicriteria decision-making technique is the Simple Additive Weighting (SAW) method. With this approach, each relevant criterion is given a weight, and the value of each alternative is then summed using the weight, normalizing the matrix that can be considered with the data that has been collected, and making assessment criteria based on the data (Pahlevy, 2010). Using this method, various brands of mineral water will be evaluated based on criteria such as price, taste, packaging, water quality, brand, and availability. A simple and effective multicriteria decision-making technique is the Simple Additive Weighting (SAW) method. With this approach, each relevant criterion is given a weight, and the value of each alternative is then summed using the weight, normalizing the matrix that can be considered with the data that has been collected, and making assessment criteria based on the data (Pahlevy, 2010). Using this method, various brands of mineral water will be evaluated based on criteria such as price, taste, packaging, water quality, brand, and availability.

The results of this study can provide valid recommendations regarding the mineral water brands that best suit students' preferences and needs. Thus, students can more easily choose the best mineral water for them, while improving their quality of life and health during their studies.

1. Theoretical basis

The selection of mineral water is a daily thing for every student. This is done to meet the fluids needed by the human body. Relevant criteria in the selection of mineral water include price, taste, water quality, packaging, brand, and availability. Each of these criteria has a significant influence on consumer preferences. For example, affordable prices are an important factor for students, while the quality and taste of mineral water are also no less important.

a) Decision Support System

This Decision Support System (DSS) is a mechanism for providing decisions between students and mineral water. And the decision support system between several other parts, general considerations needed to make decisions (Enyati, 2011).

The decision support system applied in this study is the identification of assessment criteria, data collection, use of the Simple Additive Weighting method, data processing, and data analysis to be used. The results of the study will be found with the stages applied.

b) Simple Additive Weighting (SAW)

Giving weight to each relevant criterion and then summing the value of each alternative according to its weight is known as Simple Additive Weighting or SAW. Calculating the final value for each alternative and normalizing the decision matrix are two steps in the SAW approach. (Pahlevy, 2010).

The implementation of Simple Additive Weighting in the selection of mineral water is in the form of identifying criteria, weighting each criterion, determining alternatives, collecting data, normalizing the decision matrix, calculating weight values, and then ranking. SAW allows objective decision making by relying on data from each criterion.

Each alternative is evaluated based on predetermined criteria, each criterion and alternative is assessed with a clear rating or numerical value, tolerating direct comparison between alternatives. This helps in determining the best choice based on accurate mathematical calculations. The calculation process and steps in the SAW method are simple and easy to understand, making it suitable for use in this study.

B. Research methods

This study uses a qualitative research methodology. Through data collection and analysis based on information obtained from the results of questionnaires filled out through Google Forms, this kind of qualitative research seeks to understand difficult research. The method used by researchers is the Simple Additive weighting method used in selecting the most favorite mineral water among students.

In this study, the researcher collects data using research data which will be of a qualitative type. When viewed from the source of the data, the data collection can use primary data. Primary data, according to Sugiyono (2017:137), is the data source that directly provides data to the data collector. The primary data in this study is a questionnaire distributed to students.

Research variables are everything that becomes the object of observation in a study. In the research or analysis regarding the selection of the most favored mineral water among students using the Simple Additive Weighting (SAW) method, the researcher has defined

several variables considered important in determining the selection of the most favored mineral water. These research variables are factors that will be classified as follows:

1. **Price (C1)**
   Price is an important factor in product selection. Students tend to choose products with affordable prices. Usually, the cheaper the price, the higher the value given, depending on the scale set.
2. **Taste (C2)**
   The taste of fresh or good mineral water is often the main consideration in product selection. Taste evaluation can be based on personal preference or the sensation of freshness felt after consumption.
3. **Packaging (C3)**
   Practical packaging, easy to carry, and environmentally friendly can be important factors in the purchasing decision. Evaluation can include aspects such as bottle size, packaging design, and packaging sustainability (e.g., using recyclable materials).
4. **Water Quality (C4)**
   Water quality, such as mineral content or pH levels, is a factor that might be considered by students who are more concerned with health aspects. This evaluation can be based on awareness or personal experience regarding the quality and benefits of the mineral water.
5. **Brand (C5)**
   A well-known or reputable brand often influences the purchasing decision. The evaluation scale is based on how much influence the brand has on the purchasing decision, considering trust in the brand.
6. **Availability (C6)**
   How easily students can find mineral water around their campus or place of residence. Availability in stores and small shops near campus significantly affects the student's choice.

Table 3.1 Research Variables Table

The research procedure outlines the systematic steps taken to collect, analyze, and interpret the data in order to achieve the objectives of this study. This section provides a detailed description of each stage involved in the research process, from formulating the research goals to drawing conclusions based on the findings

1. Formulate the Research Objective
   Determine the weights for each variable that reflect their importance in the mineral water selection decision. For example, taste and price may have higher weights compared to packaging or product variants.
2. Determine the Selection Criteria
   Define the criteria to be used to assess each alternative (mineral water), such as price, taste, packaging, water quality, brand, and availability.
3. Questionnaire Development
   a. Create a questionnaire that includes both open-ended and closed-ended questions to collect qualitative data.
   b. Ensure that the questions are designed to explore student preferences and the reasons behind their mineral water choices
   c. Define the population to be studied, which are students who consume mineral water.
   d. Select a sample using purposive sampling, where respondents are chosen based on specific criteria, such as those who have consumed various brands of mineral water.
4. Data Collection

a. Distribute the questionnaire to respondents through face-to-face or online methods.
b. Ensure that respondents understand the questions and encourage them to provide honest and detailed answers.

5. Observation and Interviews (Optional)
   a. Conduct observations or in-depth interviews with some respondents to gain further insights into their preferences.
   b. Record relevant observations and responses for further analysis.
   c. Categorize and code data from the questionnaire to identify patterns and themes.
   d. Use thematic analysis to analyze open-ended responses and link them to the predefined criteria.
6. Data Normalization (For SAW)
   a. Normalize the data from the questionnaire so that it can be objectively compared.
   b. Calculate the score for each alternative based on the weights of the criteria that have been determined.
7. Conclusions and Implications
   a. Draw conclusions based on the research results regarding the most favored mineral water selection among students.
   b. Discuss the implications of the findings for mineral water producers or other relevant stakeholders.

C. Results and Discussion

a) *Data collection*

Price, taste, packaging, water quality, brand, and availability are among the subcategories included in the questionnaire. Each statement has five weights in the weighting system: very expensive/very good 5. Good/expensive 4. Fair 2, very little/very cheap 3, cheap/fair 1.

b) *Observation*

Table 1. below displays the findings from this investigation:

Table 1. Observation Results Table

No	Criteria Code	Criteria Name	Weight	Weight Repair
1	C_1	Price	3	3/20=0,15
2	C_2	Flavor	3	3/20=0,15
3	C_3	Packaging	3	3/20=0,15
4	C_4	Water Quality	3	3/20=0,15
5	C_5	Brand	5	5/20=0.25
6	C_6	Availability	3	3/20=0,15
		Amount	20	1

c) *Simple Additive Weighting (SAW) Method*

Based on the stages that must be carried out in selecting the most favorite mineral water using the Simple Additive Weighting (SAW) method, the stages that must be carried out are:

a. Assign alternative values to each criterion

In the selection of the most favorite mineral water among students of the State Islamic University of North Sumatra (UINSU) Tuntungan, Weight and criteria are needed for calculations to obtain optimal choices when choosing mineral water using the simple additive weighting (SAW) approach. Based on interviews, the following criteria were collected to select mineral water:

Table 2. Criteria Table

No	Criteria *C*	Criteria Name
1	C_1	Price
2	C_2	Flavor
3	C_3	Packaging
4	C_4	Water Quality
5	C_5	Brand
6	C_6	Availability

b. Determine the weight of each criterion (*W*)
Determination of the weight (*W*) of the criteria to identify the level of relevance of mineral water choices. This study uses the criteria and weight (*W*) from the interview results. The weight of the criteria that have been determined are as follows:

Table 3. Weight value (*W*)

No	Criteria Code	Criteria Name	Weight (*W*)	Weight Repair
1	C_1	Price	3	3/20=0,15%
2	C_2	Flavor	3	3/20=0,15%
3	C_3	Packaging	3	3/20=0,15%
4	C_4	Water Quality	3	3/20=0,15%
5	C_5	Brand	5	5/20=0.25%
6	C_6	Availability	3	3/20=0,15%
Amount			20	1

c. Decision matrix
At the decision matrix stage, normalization is used. Each criterion requires an assessment of the formation of the decision matrix. Thus, the 5x5 decision matrix looks like this:

$$\begin{bmatrix} 0{,}154 & 0{,}242 & 0{,}238 & 0{,}238 & 0{,}26 & 0{,}238 \\ 0{,}032 & 0{,}054 & 0{,}052 & 0{,}054 & 0{,}06 & 0{,}054 \\ 0{,}016 & 0{,}018 & 0{,}018 & 0{,}018 & 0{,}02 & 0{,}018 \\ 0{,}336 & 0{,}558 & 0{,}556 & 0{,}544 & 0{,}64 & 0{,}566 \\ 0{,}016 & 0{,}02 & 0{,}02 & 0{,}02 & 0{,}02 & 0{,}02 \end{bmatrix}$$

d. Matrix normalization
The table below shows alternative normalizations:

Table 4. Alternative normalization table

Brand	C_1	C_2	C_3	C_4	C_5	C_6
Aqua	0,458	0,433	0,428	0,429	0,406	0,420
Nastle Pure Life	0,095	0,096	0,093	0,097	0,093	0,095
Ades	0,047	0,053	0,032	0,032	0,031	0,031
Le Mineral	1	1	1	1	1	1
Crystalline	0,047	0,035	0,035	0,035	0,031	0,035

Table 4 is the result of alternative normalization that will be formed into matrix normalization. Matrix normalization is done by normalizing the previously obtained matrix. Forming a decision matrix is done by rating each criterion. The decision matrix (X) is changed to a scale that is compared from all existing alternative ratings. Each mineral water selection criterion in the study is a benefit attribute. So in the normalization of the decision matrix, the equation is:

$$\boldsymbol{R_{ij} = \frac{X_{ij}}{Max_{ij} X_{ij}}}$$

The result of normalizing the matrix (R_{ij}) forms a normalized matrix (R). The form of the normalized matrix is as follows:

$$\begin{bmatrix} 0{,}458 & 0{,}433 & 0{,}428 & 0{,}429 & 0{,}406 & 0{,}420 \\ 0{,}095 & 0{,}096 & 0{,}093 & 0{,}097 & 0{,}093 & 0{,}095 \\ 0{,}047 & 0{,}053 & 0{,}032 & 0{,}032 & 0{,}031 & 0{,}031 \\ 1 & 1 & 1 & 1 & 1 & 1 \\ 0{,}047 & 0{,}035 & 0{,}035 & 0{,}035 & 0{,}035 & 0{,}035 \end{bmatrix}$$

e. Preference Value ($\boldsymbol{V_i}$) on Alternatives and Ranking
Using the alternative weights ($\boldsymbol{V_i}$) found in the matrix column elements, the brand value ($\boldsymbol{V_i}$) is then calculated by adding and multiplying the rows and columns of the normalized matrix ($\boldsymbol{V_i}$). Using the equation:

$$\boldsymbol{V1} = \sum_{\boldsymbol{j=1}}^{\boldsymbol{n}} \boldsymbol{W_j R_{ij}}$$

At this point, the ranking of the mineral water selection order is carried out to obtain the most preferred mineral water results after the preference value ($\boldsymbol{V_i}$) is obtained with other preference values. The ranking table of mineral water values is as follows:

Table 5. Ranking results.

No	Alternatif	V_i
1	**Aqua**	**8,534**
2	**Nestle Pure Life**	**1,703**
3	**Ades**	**0,74**
4	**Le Mineral**	**20**
5	**Crystalline**	**0,716**

From table 5 above, it can be seen that the most favorite mineral water among students has the highest value is Le Mineral with a value of 20. It can be concluded that Le Mineral, as a consideration of data to be selected as the most favorite mineral water with the selection of the best mineral water.

It can be seen from table 4 the results of alternative normalization, it can be concluded that the Le Mineral brand has the highest value both from the appropriate price, good taste, good packaging, good quality water, good brand, and availability that is easy for students to find.

Key Findings Analysis

To connect the results of the study of the selection of favorite mineral water among students with theories or literature studies related to Decision Support Systems (DSS) and consumer preferences, we can look at relevant previous research. According to Solomon (2018), consumer behavior includes all processes related to the selection, purchase, and use of products or services.

In this study, the consumer behavior of students in choosing the most favorite mineral water can be analyzed through predetermined criteria and the weight given to each criterion. The results of the study showing that the Le Mineral mineral water brand is the most preferred by students are consistent with the theory of consumer behavior, because it shows that purchasing decisions are based on consumer preferences and assessments of various criteria.

If there is a significant difference between the results of this study and previous studies, this may be caused by several factors, such as differences in population and samples that were only conducted among students, so that consumer preferences and behavior may differ from the general population.

D. Conclusion

From the explanation of the discussion that has been carried out in this research, the following conclusions can be drawn:

1. Based on the research, the mineral water brand that occupies the highest position in the ranking is Le Mineral. This shows that Le Mineral meets the main criteria that are consumer preferences, such as good taste, appropriate price, and good packaging, quality water quality, good brand, and easy availability.
2. The Simple Additive Weighting (SAW) method has proven effective in helping decision-making in choosing the most favorite mineral water. This method allows the calculation of weights from various criteria, such as taste, price, packaging, water quality, brand, and criteria, thus producing objective and measurable recommendations.
3. The result of the calculation is a ranking of the highest to lowest scores, with Le Mineral, which has the highest score of 20, being the result with the highest score..
4. The SAW method can be applied to various product selection contexts because the process is simple but provides accurate results. This system can also be integrated with web-based technology to facilitate users in decision making.
5. This shows that among students at the State Islamic University of North Sumatra (UINSU) Tuntungan, Le Mineral is the mineral water of choice.

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