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Decision support system in determining best sales using Simple Additive Weighting (SAW) method

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A R T I C L E I N F O

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ABSTRACT

This research problem takes the case of a food menu, one of which is dumpling sales data under the auspices of CV. Ayu Megapolitan, the aim is to find out what menus consumers want in order to maximize production materials. Siomay sales data at CV Ayu Megapolitan requires a determination in the manufacturing process, so that it meets what consumers expect. The menu is: original siomay, fried siomay, soup siomay, chicken siomay. These variants are taken into account to determine the best variant according to sales data using the method to be used. The development method used is the Simple Additive Weighting (SAW) method by finding the weighted sum of the performance ratings for each alternative on all attributes. It is hoped that the results of this research will help in decision making to determine dumpling sales data.

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1. INTRODUCTION

A decision support system (DSS) is an interactive system that provides information, modeling and manipulation of semi-structured situations and unstructured situations, The basic concept of Simple Additive Weighting (SAW) is to find the weighted sum of the performance of each alternative on all attributes (Fajar et al., 2017). Considering that SPK is a branch of science that can solve ranking problems, the author uses SPK in order to determine the best food menu sales data, where it is very necessary to have a long process from determining criteria to a continuous and continuous assessment process. Researchers use the SAW method (Simple Additive Weighting) to process the final value data for each assessment criterion (Sanjaya & Hamdani, 2021). In SAW because the best alternative calculation results are obtained from multiplying the performance rating value and then raising it to the power by the corrected weight value (Pasaribu & Darussalam, 2022).

One example of a journal reference case related to the title decision support system for coconut sales to tokes using the saw method in the sungai piring district stated the results. So far, farmers sell their coconuts to tokes randomly, and some others sell coconuts to one toke because they have debts to them. the toke. Therefore, researchers want to create a decision support system using the SAW method to determine the best toke for selling coconuts from farmers' products (Kurniawan et al.,

2022). In this research, it was carried out by taking the case of a food menu seller, one of which was sales data for dumplings under the auspices of CV Ayu Megapolitan. Now many people are starting to try to move into the business world. One of them is a snack business. Work this does not require special skills, just buy snack products from several manufacturers later sell it to consumers (Hasibuan & Sembiring, 2022). This business was first formed by selling at both booths at bazaar events which are often held by the CV Ayu Megapolitan company and with enthusiastic visitors at every event, this dumpling business is still running. Decision support systems or more commonly known by the abbreviation SPK are a combination of methods and information technology to support the best alternative decisions in a company or related organization (Syaputra & Eirlangga, 2023).

The above problem can be fixed by building a Decision Support System by applying the ranking method (Sigit Eko Wiyono, 2017), The business was established with the aim of providing various benefits not only to the business owner but also to the community around the business environment and even benefiting the development of the area (Syahriani et al., 2022).

There is similar research conducted by I Wayan Surya Pramana and friends, with the title Analysis of Decision Support System the author recommends combining the AHP method and the SAW method in a decision support system for selecting the best time for hotel dynamic price changes considering the validity of the matrix and ease of process calculations, in the hope that a decision is produced more accurate with less risk of error (Pramana et al., 2019). Then there is research on Bread Selection Using the Simple Additive Weighting Algorithm by Riyanto and friends. This research is useful for creating a decision support system application for selecting food menus at the Barokah Bakery using the simple additive weighting (SAW) method and the results are in the form of an application for ranking cakes This bread will be very helpful for both restaurant owners and potential buyers (Riyanto & Rina Firliana, 2019). Then there is also related research by I Gede Jana Adi Putra decission suport system is a calculation method that uses the SAW method as a decision support for selecting the best customer whose decision making technique has a criteria weighting calculation that is not too complex, so it is easy to learn for writers and readers. From the research results, an application for driving decisions was produced in the hope of producing the best customer decisions on CV. Bali Media. by determining the Max (Highest Data) and Min (Lowest Data) values for each data category above and determining the sub-normalization that will be used as a reference for normalization data (Putra et al., 2021). Therefore using calculations with this method will produce diverse (non-identical) and more specific values so that managers and leaders have recommendations which is more accurate (Londong et al., 2020).

This company has many businesses, one of which is the Siomay business. For sellers to know what menus consumers are interested in so they can maximize their production ingredients, Siomay sales data at CV Ayu Megapolitan requires a determination in the manufacturing process. There are several variants of siomay that will be sold at CV Ayu Megapolitan, namely: Original Siomay, Fried Siomay, Soup Siomay, Chicken Siomay. These variants are taken into account to determine the best variant according to sales data using the method to be used. Therefore

This research uses the Simple Additive Weighting (SAW) method because it can find a rating for each alternative on all attributes. Apart from that, the Simple Additive Weighting (SAW) method compared to other methods lies in its ability to carry out assessments more precisely. It is hoped that this research can help in decision making to determine dumpling sales data.

2. RESEARCH METHOD

The simple additive weighting method has the advantage of being able to carry out assessments more precisely because it is based on predetermined criteria values and preference weights (Rachman, 2019). A decision making method to determine the best alternative from a number of alternatives based on certain criteria. General Features (Febriyanto & Rusi, 2020): Alternative, Attribute, Conflict between criteria, Decision weight, Decision matrix. SAW method steps (Rusdiansah & Wulansari, 2022): Determine the criteria on which decisions will be made. Determine the suitability rating of each alternative for each criterion. Create a decision matrix based on criteria (Ci), then normalize it based on attribute type to obtain the R attribute. The final result is obtained from the ranking process, namely the sum of the multiplication of the normalized matrix R with the weight vector to obtain the largest value which is chosen as the best alternative Ai as a solution.

If the decision to be made is easy, humans can easily make decisions. However, if the decision to be taken is complex with large risks, such as policy formulation, decision makers often need tools that are scientific, logical and structured (Nugraha & Nursholihah, 2020). Research methodology is the stages of solving existing problems. For this reason, it is necessary to prepare clear stages, so that the problems achieved are clearer and more detailed so that the research carried out is more focused and makes it easier to solve a problem (Nelfiyanti, 2016).

2.1 Data Pre-processing

After conducting observations and interviews, the research is to assess the best items based on predetermined criteria (Maela & Perdananto, 2022). there are several criteria in the sales data, namely available stock, quantity sold, price and quantity. Based on the decision support system there is data criteria that must be supported, as follows:

Table 1. Criteria

Cj	Criteria
C1	Stock Sold
C2	Stock Sold
C3	Price
C4	Quantity

Source: Processed Data Results

2.2 Determine the attributes for each criterion, whether benefits or costs.

Based on the decision support system there is data attributes of each criteria that must be supported, as follows:

Table 2. Attributes of each criteria

Cj	Atribut
C1	Benefit
C2	Benefit
C3	cost
C4	Cost

Source: Processed Data Results

2.3 Determine the weight of each criterion

Based on the decision support system there is data weight of each criteria that must be supported, as follows:

Tabel 3. Weight of each criteria

Cj	W	Weight
C1	W1	0,4
C2	W2	0,3

C3	W3	0,2
C4	W4	1

Source: Processed Data Results

2.4 Determine crips for each criteria

There are several data that must be conditioned, as follows the table that must be fulfilled:

a. Determine the weight value for available stock

Based on the decision support system there is data stock available that must be supported, as follows:

Table 4. Stock available

Value	Weight
<=50	1
>50 <=60	2
>60 <=70	3
>70 <=80	4
>90	5

Source: Processed Data Results

b. Determine the weight value of the shares sold

Based on the decision support system there is data stock sold that must be supported, as follows:

Table 5. Stock sold

Value	Weight
<=50	1
>50 <=60	2
>60 <=70	3
>70 <=80	4
>90	5

Source: Processed Data Results

c. Determine the weight value in the selling price

Based on the decision support system there is data selling price that must be supported, as follows:

Table 6. Selling price

Value	Weight
<= 5000	1
>5000 <=10000	2
>1000 <=20000	3
>20000 <=30000	4
>30000	5

Source: Processed Data Results

d. Determine the weight value of the total selling price

Based on the decision support system there is data total selling price that must be supported, as follows:

Table 7. Total selling price

Nilai	Bobot
<= 400000	1
>400000 <=600000	2
>600000 <=800000	3
>800000 <=1000000	4
>1000000	5

Source: Processed Data Results

2.5 Calculating Matrix Normalization

To normalize the formula is as follows (Frieyadie, 2016):

$$Ri \begin{cases} \frac{Xij}{Max\ Xij} \\ \\ \frac{Min\ Xij}{Xij} \end{cases} \quad (1)$$

Explanation :
Ri = Normalized performance rating
Maxij = Maximum value of each row and column
Minij = Minimum value of each row and column
Xij = Rows and columns of the matrix
Rij is alternative Ai to attribute Cj; i =1,2,...m and j= 1,2,...,n.

2.6 Assess the results for each Alternative

The multiplication of the normalized matrix R with the weight vector (W) produces the largest value which is selected as the best alternative Ai.

$$vi = \sum_{j=1}^{n} wj.Rij \quad (2)$$

Explanation (Putri et al., 2023) :
Vi: final value of the alternative
Wj: the weight value that has been determined

2.7 Ranking

At this stage, participant data is sorted based on highest to lowest results. Data collection methods in this research, researchers use quantitative data collection methods, where data collection techniques can be carried out by interviews, questionnaires and observation (Purwanto et al., 2021). To obtain valid data, the author used several methods, such as: Secondary data collection methods, namely methods used to obtain data indirectly (Adriantama & Brianorman, 2021). Interview method is the method used by the author to collect data by asking directly to the party concerned (Yulianto et al., 2023).

3 RESULTS AND DISCUSSIONS

The process of determining the desired food menu according to sales data has problems in determining criteria and variations in processing sales data, so that entrepreneurs often experience losses in producing food ingredients. Because in the previous system the company still used manual methods in processing sales data. So in this research, researchers created a system that is used by 2 users, namely admin users and employee users. In designing this system, researchers only need to be able to determine decision criteria on sales data for the dumpling menu, and process sales data therein. with the aim of a decision support system in determining sales data with criteria that are in high demand using the simple additive weighting (SAW) method which can work and help companies upgrade their business to become more technological.

In the subjective approach that several factors in the alternative ranking process can be determined freely. Meanwhile, in the objective approach, the weight values are calculated mathematically, thereby ignoring the subjectivity of the decision maker (Patisera & Hidayatullah, 2019).

the results of realizing a decision support system require several stages that are needed, such as attribute data, weights and alternatives. The author will analyze the attributes or criteria for determining aid program recipients (Umar et al., 2022).

3.1 Based on interviews and supported by the results of literature studies, 4 criteria were obtained which can be seen from the following table:

Table 8. Table Criteria

Cj	Criteria	weight
C1	Stock available	0,4
C2	sold	0,3
C3	price	0,2
C4	Total	1

Source: Processed Data Results

3.2 From these four criteria, the attributes for each criterion will then be determined with benefit or cost values. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes (Aldisa et al., 2022).

Table 9. Attributes for each criteria

Cj	Atribut
C1	Benefit
C2	Benefit
C3	Cost
C4	Cost

Source: Processed Data Results

3.3 The samples that will be taken in determining the food menu according to this sales data are 5 food menus as an example of applying the Simple Additive Weighting (SAW) method. The following is an alternative food menu, namely: Original Siomay (A1), Cheese Siomay (A2), Tofu Siomay (A3), Pare Siomay (A4), Potato Siomay (A5)

Table 10. Sales data

Kode (Ai)	Information	C1	C2	C3	C4
A1	Siomay Original	50	25	5000	125000
A2	Siomay Cheese	60	50	10000	500000
A3	Siomay Tofu	70	20	15000	300000
A4	Siomay Pare	50	30	15000	450000
A5	Siomay Potato	70	56	15000	840000

Source: Processed Data Results

3.4 Based on the table above, a decision matrix X can be formed as follows:

$$X = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 1 & 2 & 2 \\ 3 & 1 & 3 & 1 \\ 2 & 1 & 3 & 2 \\ 3 & 2 & 3 & 4 \end{bmatrix}$$

3.5 Then normalize the matrix X based on the following equation:

a. C1

$$R11 = \frac{3}{Max\{1,2,3,2,3\}} = \frac{3}{1} = 0.33$$

$$R21 = \frac{3}{Max\{1,2,3,2,3\}} = \frac{3}{2} = 0.67$$

$$R31 = \frac{3}{Max\{1,2,3,2,3\}} = \frac{3}{3} = 1$$

$$41 = \frac{3}{Max\{1,2,3,2,3\}} = \frac{3}{2} = 0.67$$

$$R51 = \frac{3}{Max\{1,2,3,2,3\}} = \frac{3}{3} = 1$$

b. C2

$$R12 = \frac{2}{Max\{1,1,1,1,2\}} = \frac{2}{1} = 0.5$$

$$R22 = \frac{2}{Max\{1,1,1,1,2\}} = \frac{2}{1} = 0.5$$

$$R23 = \frac{2}{Max\{1,1,1,1,2\}} = \frac{2}{1} = 0.5$$

$$R24 = \frac{2}{Max\{1,1,1,1,2\}} = \frac{2}{1} = 0.5$$

$$R25 = \frac{2}{Max\{1,1,1,1,2\}} = \frac{2}{2} = 1$$

c. C3

$$R13 = \frac{1}{Max\{1,2,3,3,3\}} = \frac{1}{1} = 1$$

$$R23 = \frac{1}{Max\{1,2,3,3,3\}} = \frac{1}{2} = 0.5$$

$$R33 = \frac{1}{Max\{1,2,3,3,3\}} = \frac{1}{3} = 0.33$$

$$R43 = \frac{1}{Max\{1,2,3,3,3\}} = \frac{1}{3} = 0.33$$

$$R53 = \frac{1}{Max\{1,2,3,3,3\}} = \frac{1}{3} = 0.33$$

d. C4

$$R14 = \frac{1}{Max\{1,2,1,2,4\}} = \frac{1}{1} = 1$$

$$R24 = \frac{1}{Max\{1,2,1,2,4\}} = \frac{1}{2} = 0.5$$

$$R34 = \frac{1}{Max\{1,2,1,2,4\}} = \frac{1}{1} = 1$$

$$R44 = \frac{1}{Max\{1,2,1,2,4\}} = \frac{1}{2} = 0.5$$

$$R54 = \frac{1}{Max\{1,2,1,2,4\}} = \frac{1}{4} = 0.25$$

From the normalization calculation X, the normalized matrix R is obtained as follows:

$$X = \begin{bmatrix} 0,33 & 0,5 & 1 & 1 \\ 0.67 & 0,5 & 0,5 & 0,5 \\ 1 & 0,5 & 0,33 & 1 \\ 0.67 & 0,5 & 0,33 & 0.5 \\ 1 & 1 & 0,33 & 0,25 \end{bmatrix}$$

3.6 Carry out the ranking process by multiplying the normalized matrix (R) by the preference weight value (W) = {0.4, 0.3, 0.2, 1}.

$V1 = (0.4).(0,33) + (0.3).(1) + (0.2).(1) + (1).(1) = 1.28$
$V2 = (0.4).(0,67) + (0.3).(0.5) + (0.2).(0.5) + (1).(0.5) = 3.16$
$V3 = (0.4).(1) + (0.3).(0.5) + (0.2).(0.33) + (1).(1) = 3.2$
$V4 = (0.4).(0,67) + (0.3).(1) + (0.2).(0.33) + (1).(0.25) = 4.92$

After carrying out the ranking process, it can be seen that the results obtained from the five food menus used as samples were the Potato Siomay food menu (A5) with a value of 4.92, the advantage of this system is that it can determine the food menu that consumers are interested in according to sales data using the Simple Additive Weighting (SAW) method.

The company's old system only relied on the cashier to see which items were frequently purchased on the menu but there was no data in the system or calculations. Meanwhile, the current research compared with the previous one shows that the current performance system has succeeded in recording data in detail and clearly to see the details of the data. You can find out the food menu that consumers are interested in according to sales data using the Simple Additive Weighting (SAW) method. In this system the company can also process and store data. Daily sales are more practical and can be computerized well.

4 CONCLUSION

Provide based on the research results from the development of a sales data decision support system at CV Ayu Megapolitan, conclusions can be drawn first this decision support system application can help users to search for sales data using the Simple Additive Weighting (SAW) method on CV Ayu Megapolitan and requires a high level of understanding in its use, second Simple Additive Weighting (SAW) method can produce the best food alternative values according to existing sales data and third decision making for sales data becomes more detailed and the data is more accurate.

Research contributions are very important for companies to choose the best menu for consumers and become important data for companies in decision making. The limitations of this research are that this system can only determine decision support systems and can only store sales data. Suggestions for this research: Researchers might use other methods such as the Analytical Hierarchy Process (AHP) method, Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Product Wheigthing (WP) and collaborate with the Simple Additive Weighting (SAW) method. Advanced researchers may be able to develop this decision support system into a buying and selling transaction system that is included in the SPK calculation. There is a need for maintenance and supervision in the use of this application system.

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