



## **IMPLEMENTATION OF THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD FOR SELECTION OF SALESPERSON**

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### **Abstract**

*The purpose of this study is to apply the Simple Additive Weighting (SAW) method in determining the best salesperson at XYZ company in terms of sales performance. This SAW method is considered very suitable in determining the best salesperson because the SAW method carries out a weighted summation process based on the performance rating of each alternative on all existing attributes. The calculation process for selecting the best salesperson is carried out based on criteria that have been determined by the company based on the results of discussions and each criterion has weight. In the best salesperson assessment, the Company determines the criteria that become a reference in decision making. The criteria used are total sales, attendance, product knowledge, communication, and creativity. The results of the calculation of the final score obtained by the best salesperson ranked 1st were Rangga Dwi Nugroho getting a final score of 0.9. Rank 2 Nurlia Arbaini got a final score of 0.8436. And in 3rd place, Defri Akbarias got a final score of 0.8364. From the results of these calculations, it shows that the SAW method has provided more effective results in terms of providing the best salesperson assessment results, so this is a very important information for company leaders in determining outstanding salesperson based on existing criteria using the SAW method.*

**Keyword:** *Best Salesperson, Companies, Decision Making, Decision Support System, SAW*

## **1. INTRODUCING**

The sales department is the most important thing in a company that is responsible for selling products owned by the company. The sales department also has the task of being able to expand the market or marketing reach of the company's products through salespersons. The salesperson's job in general is to achieve carefully predetermined sales targets. Through ideal and measurable efforts, these targets can be achieved so that the salesperson's duties can be carried out properly. The task of a salesperson is not an easy and simple task, but it is very possible that it can be completed properly if the planning is thorough. This is what causes the salesperson to be part of the company which has quite an important role. There are several criteria for the best salesperson that companies need, such as persistence, good time management, having empathy, and telling the product well. A good salesperson is also able to analyze client needs and do it professionally.

Generally, in making a decision, the aim is to make a choice to become a solution to a problem from several systematic solution options [1]. Decision Support System (DSS) has a definition, namely a computer-based system that is useful for assisting in decision making that makes it easier for decision makers to solve problems through the best alternative recommendations [2]–[4]. DSS is also defined as a computer system that manages data into information that is useful in helping to make decisions for solving semi-structured problems [5]. In addition, DSS is a system that provides information, provides recommendations and supports decision making in order to obtain the best solution based on rational decisions based on existing data and facts [6]. This DSS can be described as a system that has the ability to support ad hoc data analysis and decision modeling oriented towards future planning. DSS has the goal of being able to present information, recommend, predict, and choose alternatives to provide solutions to users so they can make good decisions. In the processing process, DSS is assisted by various other systems such as Artificial Intelligence (AI), Expert System (ES), Fuzzy Logic, and so on. Thus, the objectives of implementing this DSS are as follows to help solve problems that are formed semi-structurally, able to support manager activities in making a decision in a problem, and able to increase effectiveness, not the level of efficiency in decision making [7]. In making a decision support system, we must be able to achieve the objectives of the decision support system, which is to provide predictions and direct so that we can make decisions or help determine or solve problems so that better decisions are made. This decision support system also has



benefits, in addition to facilitating decision making for users or decision makers, another benefit is as a tool in solving problems, especially various complex and unstructured problems, besides that using this decision support system can provide various solutions more quickly and the results are reliable as well.

Related research to determine the best salesperson with the SAW method has been carried out by several researchers. The first researcher determined the best salesperson using the SAW method [8]. Based on all the criteria and alternatives in this study, it resulted in the selection of the best salesperson using the SAW method which is an effective and practical method in calculating to determine the best employee recommendations, so that decision makers can consider these recommendations according to predetermined priorities. Further research on decision support systems determines the best salesperson [9]. The calculation of the best sales using the SAW method refers to an assessment based on predetermined criteria, namely the number of sales, services, behavior, discipline, cooperation, and length of work. The SAW method is able to provide more effective results in providing the information needed by decision makers. Further research, regarding the decision support system determines the best sales employee [10]. This method is considered to be able to produce data information in the form of assessing the performance value of employees in the sales department based on criteria such as attendance, perseverance, sales targets, creativity, product knowledge, solutions, and appearance.

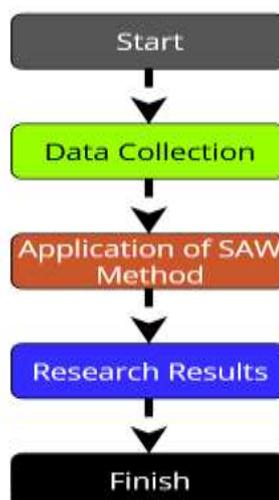
The SAW method is known as the weighted sum approach. It is called this term, because basically SAW will do a weighted sum for all the attributes of each alternative [11]. The ultimate goal is for SAW to compare alternatives in a more balanced manner and produce better calculations. The SAW method is one of several approaches to solving Fuzzy Multiple Attribute Decision Making (FMADM) decisions. Where this approach is useful in searching for optimal alternatives from several alternatives with multiple criteria [12]. The basic concept of the SAW method is to look for weighted summation of the performance rating on each alternative on all attributes [13]. This method requires normalizing the decision matrix  $X$  to a scale that can be compared with all existing alternative ratings. The SAW method has the advantage of giving a more precise value, this is because the scoring is based on the criteria and weight values and then a weighted summation process is carried out to get the preference value so as to produce an alternative ranking.

Based on the previous explanation, this study aims to solve the problem of determining the best salesperson through a decision support system approach that will result in ranking using the SAW method. Through this decision support system developed, it will produce rankings and scores from all existing salespersons by going through a computerized assessment process using a web-based application as the tool used in determining the best salesperson.

## 2. RESEARCH METHODS

### 2.1 Stage of Research

To carry out research in order to produce research that can solve problems appropriately, it is necessary to arrange research stages that include a step-by-step process for researchers to conduct research [14]. Where the stages exist have processes that are carried out in a structured, sequence, standard, logical and systematic manner. The stages carried out in this study are as shown in Figure 1.



**Figure 1.** Stage of Research



Based on Figure 1, there are several stages, namely data collection is determining the problem in the process of determining the best sales, here is the explanation.

- a. Data collection is the determination of problems in the process of selecting the best salesperson. Data collection is a determination of the problem in the process of selecting the best salesperson. Problem identification is used to get the focus of problems that are resolved, especially related to the constraints faced [15]. The problem faced is that the process of selecting the best salesperson is still based on sales targets and does not use other existing criteria.
- b. The application of the SAW method in determining the best salesperson is determining the criteria, weights and alternatives for further matriculation decisions. After the decision matrix is obtained, then calculate the normalization matrix and calculate the preference value so that it will produce the total value and the best salesperson ranking.
- c. The results of this study will produce a solution in determining the best salesperson through a decision support system approach that will produce a ranking using the SAW method.

## 2.2 Simple Additive Weighting (SAW) Method

The Simple Additive Weighting (SAW) method is also known as the weighted sum approach. The SAW method focuses on getting the best alternative from the weighted sum to get the performance of each alternative. This approach uses the X decision matrix normalization technique to make comparisons of all available alternative ratings possible. The formula for carrying out the normalization can use equation (1).

- a. Defining Criteria, Alternatives and Weights.

Creating a Decision Matrix

$$X_{IJ} = \begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{1n} \\ x_{21} & x_{22} & x_{23} & x_{2n} \\ x_{i1} & x_{i2} & x_{i3} & x_{in} \end{bmatrix} \quad (1)$$

- b. Calculating the Normalization Matrix

The criterion for benefits is the criterion that the higher the value of the decision matrix, the better the results are likely to be. While the cost criterion, on the contrary, if the lower the value of the decision matrix, the better the opportunity. To calculate the normalized matrix, if the criterion is benefit, then use equation (2) and the cost criterion uses equation (3).

$$R_{ij} = \frac{x_{ij}}{\max x_{ij}} \quad (2)$$

$$R_{ij} = \frac{\min x_{ij}}{x_{ij}} \quad (3)$$

- c. Calculating Preferences

In this final stage to determine the rating value of each alternative. A larger preference value indicates that the  $A_i$  alternative is more selected. To calculate the reference value ( $A_i$ ), you can use equation (4).

$$V_i = \sum_{j=1}^n W_j R_{ij} \quad (4)$$

## 3. RESULT AND DISCUSSIONS

The process of calculating the selection of the best salesperson is carried out based on criteria that have been determined by the company based on the results of discussions and each criterion has a weight. In evaluating the best salesperson, the company determines the criteria that are used as a reference in making decisions. The criteria used are total sales, attendance, product knowledge, communication, and creativity.

The following are the steps for determining the best salesperson using the SAW method approach.

### 3.1 Determining Criteria, Weight of Criteria, and Alternatives

The criteria and weights of the criteria used in determining the best salesperson are as shown in Table 1.



**Table 1.** Criteria, Weight of Criteria

Code Criteria	Name Criteria	Weight Criteria
C1	Total Sales	30%
C2	Attendance	25%
C3	Product Knowledge	20%
C4	Communication	15%
C5	Creativity	10%

For the variable’s attendance, product knowledge, communication, and creativity are divided into 5, as in Table 2.

**Table 2.** Value and Name Value variables

Value	Name Value
1	Very Bad
2	Bad
3	Enough
4	Good
5	Very Good

For alternative data in the form of salesperson data that has been taken at the company, it can be seen in Table 3.

**Table 3.** Alternative Data

Code Alternative	Name Salesperson	C1	C2	C3	C4	C5
S1	Paulina	125 Million	Good	Good	Enough	Enough
S2	Vivi Atvilina	98 Million	Very Good	Very Good	Good	Very Bad
S3	Galih Budianto	112 Million	Very Good	Bad	Good	Good
S4	Rangga Dwi Nugroho	165 Million	Very Good	Enough	Good	Good
S5	Setia Ningsih	90 Million	Very Good	Bad	Enough	Good
S6	Ryan Adi Saputra	88 Million	Good	Very Good	Enough	Enough
S7	Sinar Putri	107 Million	Good	Enough	Good	Good
S8	Margina Femi Ati	88 Million	Enough	Enough	Good	Good
S9	Ardian Saputra	90 Million	Enough	Very Good	Good	Good
S10	Rosanti	95 Million	Very Good	Enough	Good	Good
S11	Defri Akbarias	119 Million	Very Good	Enough	Good	Very Good
S12	Nurlia Arbaini	145 Million	Very Good	Enough	Good	Enough
S13	Bayu Kusumo Hadi	100 Million	Good	Bad	Good	Very Good
S14	M. Ravi Afrianto	116 Million	Enough	Very Good	Good	Enough
S15	Yayah Ainiah	97 Million	Good	Enough	Good	Very Good

After obtaining assessment data from each salesperson based on criteria and alternatives, then determine the rating of each alternative from salesperson for each criterion. The alternate match rating results can be seen in table 4 below.

**Table 4.** Alternate Match Rating By Criteria

Code Alternative	C1	C2	C3	C4	C5
S1	125	4	4	3	3
S2	98	5	5	4	1
S3	112	5	2	4	4
S4	165	5	3	4	4
S5	90	5	2	3	4
S6	88	4	5	3	3
S7	107	4	3	4	4
S8	88	3	3	4	4
S9	90	3	5	4	4
S10	95	5	3	4	4
S11	119	5	3	4	5



S12	145	5	3	4	3
S13	100	4	2	4	5
S14	116	3	5	4	3
S15	97	4	3	4	5

### 3.2 Creating a Decision Matrix

After assigning a conformity rating of each alternative on each criterion, the next thing is to create a matrix of decision X, as follows:

$$X = \begin{bmatrix} 125 & 4 & 4 & 3 & 3 \\ 98 & 5 & 5 & 4 & 2 \\ 112 & 5 & 2 & 4 & 4 \\ 165 & 5 & 3 & 4 & 4 \\ 90 & 5 & 2 & 3 & 4 \\ 88 & 4 & 5 & 3 & 3 \\ 107 & 4 & 3 & 4 & 4 \\ 88 & 3 & 3 & 4 & 4 \\ 90 & 3 & 5 & 4 & 4 \\ 95 & 5 & 3 & 4 & 4 \\ 119 & 5 & 3 & 4 & 5 \\ 145 & 5 & 3 & 4 & 3 \\ 100 & 4 & 2 & 4 & 5 \\ 116 & 3 & 5 & 4 & 3 \\ 97 & 4 & 3 & 4 & 5 \end{bmatrix}$$

### 3.3 Calculating the Normalization Matrix

The next thing to do is to normalize the X matrix to calculate the value of each criterion based on the criteria that are assumed to be the benefit criteria and the cost criteria. The normalization matrix results are calculated using the benefit formula, because all the criteria used are benefits.

The normalization results for criterion C1 (Total Sales) of each alternative are

$$\begin{aligned} R_{11} &= 125 / 165 = 0,76 \\ R_{12} &= 98 / 165 = 0,59 \\ R_{13} &= 112 / 165 = 0,68 \\ R_{14} &= 165 / 165 = 1,00 \\ R_{15} &= 90 / 165 = 0,55 \\ R_{16} &= 88 / 165 = 0,53 \\ R_{17} &= 107 / 165 = 0,65 \\ R_{18} &= 88 / 165 = 0,53 \\ R_{19} &= 90 / 165 = 0,55 \\ R_{10} &= 95 / 165 = 0,58 \\ R_{11} &= 119 / 165 = 0,72 \\ R_{112} &= 145 / 165 = 0,88 \\ R_{113} &= 100 / 165 = 0,61 \\ R_{114} &= 116 / 165 = 0,70 \\ R_{115} &= 97 / 165 = 0,59 \end{aligned}$$

The normalization results for criterion C2 (Attendance) of each alternative are

$$\begin{aligned} R_{21} &= 4 / 5 = 0,8 \\ R_{22} &= 5 / 5 = 1 \\ R_{23} &= 5 / 5 = 1 \\ R_{24} &= 5 / 5 = 1 \\ R_{25} &= 5 / 5 = 1 \\ R_{26} &= 4 / 5 = 0,8 \\ R_{27} &= 4 / 5 = 0,8 \\ R_{28} &= 3 / 5 = 0,6 \\ R_{29} &= 3 / 5 = 0,6 \end{aligned}$$



$$\begin{aligned} R_{210} &= 5 / 5 = 1 \\ R_{211} &= 5 / 5 = 1 \\ R_{212} &= 5 / 5 = 1 \\ R_{213} &= 4 / 5 = 0,8 \\ R_{214} &= 3 / 5 = 0,6 \\ R_{215} &= 4 / 5 = 0,8 \end{aligned}$$

The normalization results for criterion C3 (Product Knowledge) of each alternative are

$$\begin{aligned} R_{31} &= 4 / 5 = 0,8 \\ R_{32} &= 5 / 5 = 1 \\ R_{33} &= 2 / 5 = 0,4 \\ R_{34} &= 3 / 5 = 0,6 \\ R_{35} &= 2 / 5 = 0,4 \\ R_{36} &= 5 / 5 = 1 \\ R_{37} &= 3 / 5 = 0,6 \\ R_{38} &= 3 / 5 = 0,6 \\ R_{39} &= 5 / 5 = 1 \\ R_{310} &= 3 / 5 = 0,6 \\ R_{311} &= 3 / 5 = 0,6 \\ R_{312} &= 3 / 5 = 0,6 \\ R_{313} &= 2 / 5 = 0,4 \\ R_{314} &= 5 / 5 = 1 \\ R_{315} &= 3 / 5 = 0,6 \end{aligned}$$

The normalization results for criterion C4 (Communication) of each alternative are

$$\begin{aligned} R_{41} &= 3 / 4 = 0,75 \\ R_{42} &= 4 / 4 = 1 \\ R_{43} &= 4 / 4 = 1 \\ R_{44} &= 4 / 4 = 1 \\ R_{45} &= 3 / 4 = 0,75 \\ R_{46} &= 3 / 4 = 0,75 \\ R_{47} &= 4 / 4 = 1 \\ R_{48} &= 4 / 4 = 1 \\ R_{49} &= 4 / 4 = 1 \\ R_{410} &= 4 / 4 = 1 \\ R_{411} &= 4 / 4 = 1 \\ R_{412} &= 4 / 4 = 1 \\ R_{413} &= 4 / 4 = 1 \\ R_{414} &= 4 / 4 = 1 \\ R_{415} &= 4 / 4 = 1 \end{aligned}$$

The normalization results for criterion C5 (Creativity) of each alternative are

$$\begin{aligned} R_{51} &= 3 / 5 = 0,6 \\ R_{52} &= 1 / 5 = 0,2 \\ R_{53} &= 4 / 5 = 0,8 \\ R_{54} &= 4 / 5 = 0,8 \\ R_{55} &= 4 / 5 = 0,8 \\ R_{56} &= 3 / 5 = 0,6 \\ R_{57} &= 4 / 5 = 0,8 \\ R_{58} &= 4 / 5 = 0,8 \\ R_{59} &= 4 / 5 = 0,8 \\ R_{510} &= 4 / 5 = 0,8 \\ R_{511} &= 5 / 5 = 1 \\ R_{512} &= 3 / 5 = 0,6 \\ R_{513} &= 5 / 5 = 1 \end{aligned}$$



$$R_{S14} = 3 / 5 = 0,6$$

$$R_{S15} = 5 / 5 = 1$$

**3.4 Calculating Preference Values and Rankings**

The final stage of the SAW method is to calculate the preference value of each alternative. The preference value of each alternative is as follows

$$V_1 = \sum (0,76*0,3) + (0,8*0,25) + (0,76*0,2) + (0,75*0,15) + (0,6*0,1) = 0,7598$$

$$V_2 = \sum (0,59*0,3) + (1*0,25) + (0,59*0,2) + (1*0,15) + (0,2*0,1) = 0,7982$$

$$V_3 = \sum (0,68*0,3) + (1*0,25) + (0,68*0,2) + (1*0,15) + (0,8*0,1) = 0,7636$$

$$V_4 = \sum (1,00*0,3) + (1*0,25) + (1,00*0,2) + (1*0,15) + (0,8*0,1) = 0,9000$$

$$V_5 = \sum (0,55*0,3) + (1*0,25) + (0,55*0,2) + (0,75*0,15) + (0,8*0,1) = 0,6861$$

$$V_6 = \sum (0,53*0,3) + (0,8*0,25) + (0,53*0,2) + (0,75*0,15) + (0,6*0,1) = 0,7325$$

$$V_7 = \sum (0,65*0,3) + (0,8*0,25) + (0,65*0,2) + (1*0,15) + (0,8*0,1) = 0,7445$$

$$V_8 = \sum (0,53*0,3) + (0,6*0,25) + (0,53*0,2) + (1*0,15) + (0,8*0,1) = 0,6600$$

$$V_9 = \sum (0,55*0,3) + (0,6*0,25) + (0,55*0,2) + (1*0,15) + (0,8*0,1) = 0,7436$$

$$V_{10} = \sum (0,58*0,3) + (1*0,25) + (0,58*0,2) + (1*0,15) + (0,8*0,1) = 0,7727$$

$$V_{11} = \sum (0,72*0,3) + (1*0,25) + (0,72*0,2) + (1*0,15) + (1*0,1) = 0,8364$$

$$V_{12} = \sum (0,88*0,3) + (1*0,25) + (0,88*0,2) + (1*0,15) + (0,6*0,1) = 0,8436$$

$$V_{13} = \sum (0,61*0,3) + (0,8*0,25) + (0,61*0,2) + (1*0,15) + (1*0,1) = 0,7118$$

$$V_{14} = \sum (0,70*0,3) + (0,6*0,25) + (0,70*0,2) + (1*0,15) + (0,6*0,1) = 0,7709$$

$$V_{15} = \sum (0,59*0,3) + (0,8*0,25) + (0,59*0,2) + (1*0,15) + (1*0,1) = 0,7464$$

The difference in the results of the calculation of the preference value is then made a table of the results of the ranking based on the calculation of the preference value that has been carried out. The results of the ranking of determining the best salesperson are shown in table 5.

**Table 5.** Salesperson Ranking Results

Code Alternative	Name Salesperson	Total Value $V_i$	Rank
S1	Paulina	0,7598	8
S2	Vivi Atvilina	0,7982	4
S3	Galih Budianto	0,7636	7
S4	Rangga Dwi Nugroho	0,9	1
S5	Setia Ningsih	0,6861	14
S6	Ryan Adi Saputra	0,7325	12
S7	Sinar Putri	0,7445	10
S8	Margina Femi Ati	0,66	15
S9	Ardian Saputra	0,7436	11
S10	Rosanti	0,7727	5
S11	Defri Akbarias	0,8364	3
S12	Nurlia Arbaini	0,8436	2
S13	Bayu Kusumo Hadi	0,7118	13
S14	M. Ravi Afrianto	0,7709	6
S15	Yayah Ainiah	0,7464	9



Based on Table 5, it shows that the result of calculating the final value of the best salesperson rank 1st is Rangga Dwi Nugroho getting the final score of 0.9. Ranked 2nd is Nurlia Arbaini getting a final score of 0.8436. And ranked 3rd, Defri Akbarias got the final score of 0.8364.

## 4. CONCLUSION

The results of the research on the implementation of the SAW method in determining the best salesperson were concluded in the process of calculating the best salesperson by applying the SAW method to the assessment of salesperson performance that has been determined based on criteria, namely total sales, attendance, product knowledge, communication, and creativity. The results of the final value calculation showed that the salesperson with the highest final preference value of 0.9 were obtained by Rangga Dwi Nugroho. From the results of these calculations, it shows that the SAW method has provided more effective results in terms of providing the best salesperson assessment results, so this is a very important information for company leaders in determining outstanding salesperson based on existing criteria using the SAW method.

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