



Application of the Simple Additive Weighting (SAW) Method in Determining The Best Customers for Home Furniture

Britoloni Emanuel Waruwu¹, Agustina Simangunsong²

^{1,2}Informatics Engineering Study Program, STMIK Pelita Nusantara, Medan, Indonesia.

Article Info

Article history:

Received, Dec 02, 2020

Revised, Dec 18, 2020

Accepted, Dec 23, 2020

Keywords:

Customers,
Application,
Simple Additive Weighting.

ABSTRACT

To face this competition, there are many ways that Home Furniture does to maintain its customers, including by analyzing these customers and choosing the best customers. The best customers will be the top priority for Home Furniture, such as giving rewards and establishing cooperation with customers. The system that has been running so far in determining the best customer at Home Furniture is still using a random lottery for its customers, where the system is not accurate nor on target. Therefore, we need a Decision Support System to analyze and select the best customers based on predetermined criteria, so that the decisions given can be right on target. The method used in this decision support system uses the SAW (Simple Addictive Waiting) method in the process of selecting the best customer at Home Furniture.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Britoloni Emanuel Waruwu,
Informatics Engineering Study Program,
STMIK Pelita Nusantara, Medan, Indonesia,
Jl. Iskandar Muda No.1, Merdeka, Kec. Medan Baru, Kota Medan, Sumatera Utara 20154.
Email: waruwu14gws@gmail.com

1. INTRODUCTION

Marketing is one of the most important activities carried out by entrepreneurs in maintaining their survival, development, and to compete for profit. This competition causes entrepreneurs to be more observant in selecting customers who deserve awards or awards to increase customer loyalty so that all the goals to be achieved in the sales planning can be carried out well.

Home Furniture is a furniture store that sells a wide variety to meet the needs of the people in Sibolga City. However, Home Furniture is not the only Furniture Store in the city of Sibolga, but there are still many Furniture stores that are engaged in the same field, so this will lead to business competition between Furniture stores. To face this competition, there are many ways that Home Furniture does to maintain its customers, including by analyzing these customers and choosing the best customers. The best customers will be the top priority for Home Furniture, such as giving rewards and establishing cooperation with customers. The system that has been running so far in determining the best customer at Home Furniture is still using a random lottery for its customers, which is not accurate and not on target yet. Therefore, we need a Decision Support System to analyze and select the best customers based on predetermined criteria, so that the decisions given can be right on target.

The method used in this decision support system uses the SAW (Simple Addictive Waiting) method in the process of selecting the best customer at Home Furniture. Because it can determine the weight value for each attribute, then it is followed by a ranking process which will select the best

alternative from a number of alternatives (Eniyati, 2011). The results of this system design are expected to be one of the tools for Home Furniture management in analyzing and deciding on the best customers and will also refer other customers to be active in shopping.

2. RESEARCH METHOD

2.1. Research Framework

Research on the selection of the Best Customer the author conducted research on Home Furniture. And related parties who are the object of research are Owner Home Furniture. The author is looking for information about customer data, best customer selection procedures and assessment criteria.

To complete this research, the authors used some data related to the Application of the SAW Method to Determine the Best Customers, namely:

a. Primary Data

Is data obtained directly from the object of research or from the field, and obtained from sources that have the authority to provide data. Such data includes data on the number of customers, the number of purchases each month, and other data related to customer data.

b. Secondary Data

It is data that is already available so that we just need to find and collect data obtained from other sources in the form of reports or publications. The data is like journals that discuss the selection of the best customers.

In completing this research, the authors used the following stages:

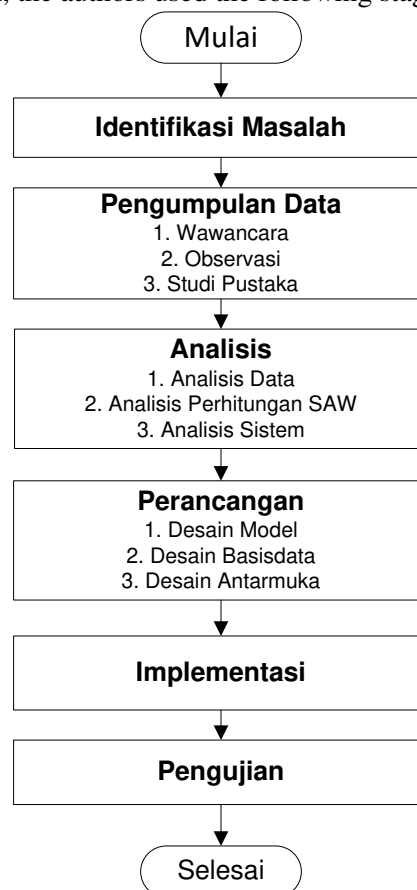


Figure 1. Research Framework

2.2. Simple Additive Weighting (SAW)

The basic concept of the SAW method is to find the weighted summation of the performance rating for each alternative on all criteria[2]. The SAW method requires a decision matrix

normalization process (X) to a scale that can be compared with all available alternative ratings[3]. The SAW method recognizes 2 (two) attributes, namely the benefit criteria and the cost criteria. The fundamental difference between these two criteria is in the selection of criteria when making decisions[4]–[6].

The Concept of Calculation with the SAW Method

The settlement steps in using the SAW method are as follows[7]–[9]:

- a. Determine the alternative, namely A_i .
- b. Determine the criteria that will be used as a reference in making decisions, namely C_j .
- c. Determine the weight of preference or level of importance (W) of each criterion.
 $W = [W_1, W_2, W_3, \dots, W_j]$
- d. Create a table of suitability rating for each alternative on each criterion.
- e. Make a decision matrix (X) which is formed from the results of the suitability rating table of each alternative on each criterion. The X value of each alternative (A_i) on each criterion (C_j) that has been determined where, $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$ [10].

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1j} \\ \vdots & \vdots & \ddots & \vdots \\ x_{i1} & x_{i2} & \dots & x_{ij} \end{bmatrix}$$

- f. Normalizing the decision matrix by calculating the normalized performance rating (r_{ij}) value of alternative A_i with the C_j criteria[11].

$$r_{ij} = \begin{cases} \frac{x_{ij}}{\max_i x_{ij}} \\ \frac{x_{ij}}{\min_i x_{ij}} \end{cases}$$

Information :

- a. The profit criterion is carried out if the value provides an advantage for the decision maker. Conversely, the cost criterion is carried out if it incurs costs to decision makers.
- b. If it is a profit criterion, the value is divided by the value of each column. As for the cost criterion, the value of each column is divided by the value.
- g. The results of the normalized performance rating (r_{ij}) form a normalized matrix (R)[12].

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1j} \\ \vdots & \vdots & \ddots & \vdots \\ r_{i1} & r_{i2} & \dots & r_{ij} \end{bmatrix}$$

- h. The final result of the preference value (V_i) is obtained from the addition and multiplication of the normalized matrix row elements (R) with the preference weight (W) corresponding to the matrix column element (W)[13].

$$V_i = \sum_{j=1}^n W_j r_{ij}$$

3. RESULTS AND DISCUSSION

Based on the steps to solve the problem using the Simple Additive Weighting method, what must be done is as follows:

- a. Give the value of each alternative (A_i) on each criterion (C_j) that has been determined.

Table 1. Alternative Value Data

Kode	Alternatif	Kriteria				
		K1	K2	K3	K4	K5
A1	Ibu Meylisa Tanjung	6.000.000	6 kali	Cash	Sofa	1 km

A2	Bapak Jimmy Panggabean	3.800.000	4 kali	Cash	Sofa	3,5 km
A3	Ibu Herlinda Sibarani	6.800.000	9 kali	Kredit	Aksesoris dan Dekorasi	2 km
A4	Ibu Aulia Siregar	5.500.000	4 kali	Kredit	Meja dan Kursi	>5 km
A5	Ibu Yohana Tamba	7.300.000	8 kali	Cash	Aksesoris dan Dekorasi	3 km

b. Alternative Match Ratings

The table below shows the suitability rating of each alternative on each criterion.

Table 2. Suitability Rating of Each Alternative for Each Criterion.

Alternatif	K1	K2	K3	K4	K5
A1	4	3	3	3	3
A2	2	2	4	2	2
A3	3	3	1	1	2
A4	3	2	3	2	1
A5	4	3	4	1	2

c. Criteria Based Decision Matrix

From the alternative suitability rating table above, it will be converted into a decision matrix X as follows:

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

d. Normalize matrix X to matrix R based on equation

The normalization for the criteria can be seen as follows.

1. Quality of Work Criteria (K1).

$$r_{1,1} = \frac{4}{\max\{4,2,3,3,4\}} = \frac{4}{4} = 1$$

$$r_{2,1} = \frac{2}{\max\{4,2,3,3,4\}} = \frac{2}{4} = 0.5$$

$$r_{3,1} = \frac{3}{\max\{4,2,3,3,4\}} = \frac{3}{4} = 0.75$$

$$r_{4,1} = \frac{3}{\max\{4,2,3,3,4\}} = \frac{3}{4} = 0.75$$

$$r_{5,1} = \frac{4}{\max\{4,2,3,3,4\}} = \frac{4}{4} = 1$$

2. Cooperation Criteria (K2).

$$r_{1,2} = \frac{3}{\max\{3,2,3,2,3\}} = \frac{3}{3} = 1$$

$$r_{2,2} = \frac{2}{\max\{3,2,3,2,3\}} = \frac{2}{3} = 0.666$$

$$r_{3,2} = \frac{3}{\text{Max}\{3,2,3,2,3\}} = \frac{3}{3} = 1$$

$$r_{4,2} = \frac{2}{\text{Max}\{3,2,3,2,3\}} = \frac{2}{3} = 0.666$$

$$r_{5,2} = \frac{3}{\text{Max}\{3,2,3,2,3\}} = \frac{3}{3} = 1$$

3. Service Criteria (K3).

$$r_{1,3} = \frac{3}{\text{Max}\{3,4,1,3,4\}} = \frac{3}{4} = 0.75$$

$$r_{2,3} = \frac{4}{\text{Max}\{3,4,1,3,4\}} = \frac{4}{4} = 1$$

$$r_{3,3} = \frac{1}{\text{Max}\{3,4,1,3,4\}} = \frac{1}{4} = 0.25$$

$$r_{4,3} = \frac{3}{\text{Max}\{3,4,1,3,4\}} = \frac{3}{4} = 0.75$$

$$r_{5,3} = \frac{4}{\text{Max}\{3,4,1,3,4\}} = \frac{4}{4} = 1$$

4. Integrity Criteria (K4).

$$r_{1,4} = \frac{3}{\text{Max}\{3,2,1,2,1\}} = \frac{3}{3} = 1$$

$$r_{2,4} = \frac{2}{\text{Max}\{3,2,1,2,1\}} = \frac{2}{3} = 0.666$$

$$r_{3,4} = \frac{1}{\text{Max}\{3,2,1,2,1\}} = \frac{1}{3} = 0.333$$

$$r_{4,4} = \frac{2}{\text{Max}\{3,2,1,2,1\}} = \frac{2}{3} = 0.666$$

$$r_{5,4} = \frac{1}{\text{Max}\{3,2,1,2,1\}} = \frac{1}{3} = 0.333$$

5. Discipline Criteria (K5).

$$r_{1,5} = \frac{3}{\text{Max}\{3,2,2,1,2\}} = \frac{3}{3} = 1$$

$$r_{2,5} = \frac{2}{\text{Max}\{3,2,2,1,2\}} = \frac{2}{3} = 0.666$$

$$r_{3,5} = \frac{2}{\text{Max}\{3,2,2,1,2\}} = \frac{2}{3} = 0.666$$

$$r_{4,5} = \frac{1}{\text{Max}\{3,2,2,1,2\}} = \frac{1}{3} = 0.333$$

$$r_{5,5} = \frac{2}{\text{Max}\{3,2,2,1,2\}} = \frac{2}{3} = 0.666$$

Then from the calculation above, the normalization matrix value is obtained, the value will be made into the normalization matrix. The following is the calculation result of the normalization matrix:

$$X = \begin{matrix} & \begin{matrix} 1 & 1 & 0.75 & 1 & 1 \end{matrix} \\ \begin{matrix} 0.5 & 0.666 & 1 & 0.666 & 0.666 \\ 0.75 & 1 & 0.25 & 0.333 & 0.666 \\ 0.75 & 0.666 & 0.75 & 0.666 & 0.333 \\ 1 & 1 & 1 & 0.333 & 0.666 \end{matrix} \end{matrix}$$

e. Ranking

Next, the multiplication of the $W * R$ matrix will be made and the sum of the multiplication results to get the best alternative by ranking the largest values as follows:

The value of W is the percentage of the weighted value of each of the determined assessment criteria, namely ($C = 25\%$, $C2 = 35\%$, $C3 = 20\%$, $C4 = 15\%$, $C5 = 5\%$) then the value of A is $W = (0.25; 0.35; 0.20; 0.15; 0.05)$ and the calculations are as follows:

$$\begin{aligned}
 A1 &= (0.25 \times 1) + (0.35 \times 1) + (0.20 \times 0.75) + (0.15 \times 1) + (0.05 \times 1) \\
 &= 0.25 + 0.35 + 0.15 + 0.15 + 0.05 \\
 &= 0.95 \\
 A2 &= (0.25 \times 0.5) + (0.35 \times 0.666) + (0.20 \times 1) + (0.15 \times 0.666) + (0.05 \times 0.666) \\
 &= 0.625 + 0.233 + 0.20 + 0.0999 + 0.0333 \\
 &= 0.6916 \\
 A3 &= (0.25 \times 0.75) + (0.35 \times 1) + (0.20 \times 0.25) + (0.15 \times 0.333) + (0.05 \times 0.666) \\
 &= 0.1875 + 0.35 + 0.05 + 0.0499 + 0.0333 \\
 &= 0.67083 \\
 A4 &= (0.25 \times 0.75) + (0.35 \times 0.666) + (0.20 \times 0.75) + (0.15 \times 0.666) + (0.05 \times 0.333) \\
 &= 0.1875 + 0.2333 + 0.15 + 0.0999 + 0.01666 \\
 &= 0.6875 \\
 A5 &= (0.25 \times 1) + (0.35 \times 1) + (0.20 \times 1) + (0.15 \times 0.333) + (0.05 \times 0.666) \\
 &= 0.25 + 0.35 + 0.20 + 0.0499 + 0.0333 \\
 &= 0.8833
 \end{aligned}$$

After getting the multiplication result with the $W * R$ matrix and the sum of the multiplication results, the final result will be the following decision values:

Table 3. Results of Best Customer Decisions

Kode	Alternatif	Nilai (%)
A5	Ibu Yohana Tamba	0.95
A3	Ibu Herlinda Sibarani	0.691
A4	Ibu Aulia Siregar	0.670
A2	Bapak Jimmy Panggabean	0.6875
A1	Ibu Meylisa Tanjung	0.883

Based on the table above, it can be seen that the best selected customers were Mrs. Yohana Tamba at 0.95, while the next ranking was Mrs. Meylisa Tanjung at 0.883, Mrs. Herlinda Sibarani at 0.691, Mrs. Aulia Siregar at 0.670, and Mr. Jimmy Panggabean at 0.6708.

4. CONCLUSION

With the application that has been built, it can apply the SAW method in determining the best customer in Home Furniture. To build a decision support system for choosing the best customer by using the Simple Additive Weighting (SAW) method, the authors first perform a system requirements analysis, perform calculations using the SAW method, the design used is Adobe Dreamweaver CS6, Xampp, Mysql and Mozilla Firefox software successfully designed and can be used. to select the best customer determination in Home Furniture.

REFERENCES

- [1] T. Limbong *et al.*, *Sistem Pendukung Keputusan Metode & Implementasi*. 2020.
- [2] A. Rikki, "Pengujian Sistem Pendukung Keputusan Metode Simple Additive Weighting dan Weighted Product dengan Matlab," *MEANS (Media Inf. Anal. dan Sist.*, vol. 2, no. 1, pp. 47–51, 2017.
- [3] P. M. Hasugian, "Perancangan Sistem Pendukung Keputusan Dalam Menentukan Dosen Berprestasi Dengan Metode Simple Additive Weighting," *J. Inform. Pelita Nusantara*, 2019.
- [4] S. Wardani and A. Revi, "Analisis Sistem Pendukung Keputusan Penyeleksian Siswa Calon Peserta Olimpiade Dengan Metode MOORA," *J. Teknovasi*, 2018.
- [5] S. W. Sari and B. Purba, "Sistem Pendukung Keputusan Pemilihan Ketua Danru Terbaik Menggunakan Metode ARAS," *Semin. Nas. Teknol. Komput. Sains SAINTEKs 2019*, 2019.
- [6] I. Septiana, M. Irfan, A. R. Atmadja, and B. Subaeki, "Sistem Pendukung Keputusan Penentu

- Dosen Penguji Dan Pembimbing Tugas Akhir Menggunakan Fuzzy Multiple Attribute Decision Making dengan Simple Additive Weighting (Studi Kasus: Jurusan Teknik Informatika UIN SGD Bandung),” *J. Online Inform.*, 2016, doi: 10.15575/join.v1i1.10.
- [7] G. S. Mahendra and K. Y. Ernanda Aryanto, “SPK Penentuan Lokasi ATM Menggunakan Metode AHP dan SAW,” *J. Nas. Teknol. dan Sist. Inf.*, 2019, doi: 10.25077/teknosi.v5i1.2019.49-56.
- [8] E. S. Nabila, R. Rahmawati, and T. Widiari, “IMPLEMENTASI METODE SAW DAN WASPAS DENGAN PEMBOBOTAN ROC DALAM SELEKSI PENERIMAAN PESERTA DIDIK BARU (Studi Kasus: Madrasah Tsanawiyah (MTs) Negeri Kisaran Kabupaten Asahan Provinsi Sumatera Utara Tahun Ajaran 2018/2019),” *J. Gaussian*, 2019, doi: 10.14710/j.gauss.v8i4.26723.
- [9] N. Nuraeni, “PENERAPAN METODE SIMPLE ADDITIVE WEIGHTING (SAW) DALAM SELEKSI CALON KARYAWAN,” *Swabumi*, 2018, doi: 10.31294/swabumi.v6i1.3317.
- [10] P. Diah, S. Dewi, and S. Suryati, “Penerapan Metode AHP dan SAW untuk Penentuan Kenaikan Jabatan Karyawan,” *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*, 2018, doi: 10.35957/jatisi.v5i1.130.
- [11] A. Setiadi, Y. Yunita, and A. R. Ningsih, “Penerapan Metode Simple Additive Weighting(SAW) Untuk Pemilihan Siswa Terbaik,” *J. Sisfokom (Sistem Inf. dan Komputer)*, 2018, doi: 10.32736/sisfokom.v7i2.572.
- [12] N. Oktaviani, N. Merlina, and N. Nurmalasari, “Pemilihan Jasa Pengiriman Terbaik Menggunakan Metode Simple Additive Weighting (SAW),” *J. Sist. dan Teknol. Inf.*, 2018, doi: 10.26418/justin.v6i4.29126.
- [13] S. Nurlela, A. Akmaludin, S. Hadiani, and L. Yusuf, “PENYELEKSIAN JURUSAN TERFAVORIT PADA SMK SIRAJUL FALAH DENGAN METODE SAW,” *J. Pilar Nusa Mandiri*, 2019, doi: 10.33480/pilar.v15i1.1.