Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

Hotel Selection Decision Support System with the Simple Additive Weighting (SAW) Method

Annisaa Utami[1], Muhammad Lulu Latif Usman[1], Ike Fitria Ramadhani[2], Siti Nur Fadilah Syam[2], Fikrian Akmal Fauzan[1]

[1]Fakultas Informatika, Program Studi Teknik Informatika, Institut Teknologi Telkom Purwokerto, Purwokerto, Indonesia
[2]Fakultas Informatika, Program Rekayasa Perangkat Lunak , Institut Teknologi Telkom Purwokerto, Purwokerto, Indonesia
Email: [1]annisaa@ittelkom-pwt.ac.id, [2]lulu@ittelkom-pwt.ac.id, [3]20104032@ittelkom-pwt.ac.id,
[4]20104046@ittelkom-pwt.ac.id, [5]21102151@ ittelkom-pwt.ac.id
Email Penulis Korespondensi: annisaa@ittelkom-pwt.ac.id
Submitted: **12/09/2022**; Accepted: **04/10/2022**; Published**: 30/12/2022**

Abstract−Purwokerto as the city center in southwestern Central Java which is one of the tourism places in Central Java with a fairly large number of enthusiasts. Purwokerto City has a wide selection of tourist attraction destinations that can be visited by tourists. There are not a few tourists who come from outside the city and do tours for more than one day. If you look at these conditions, a temporary stopover place is needed, namely a hotel. Purwokerto City provides so many choices of hotels spread across various locations with lodging classes, rental prices, facilities and services that are diverse. With the existence of many and different hotel facilities, of course, visitors will find it difficult to find and determine a hotel that matches the desired criteria. In addition, they will also find it difficult in finding the location of the desired hotel. The calculation results using the SAW (Simple Additive Weighting) Method found that Java Heritage Hotel got a value of 0.9, Resort and Hotel Atrium by 0.77, Surya Yudha Hotel by 0.65 and Trisno Hotel by 0.55. And get the same result between manual calculations and calculations from the system.. Based on the description above, in this study a decision support system was developed that can help tourists to determine hotels according to the wishes and needs of tourists using the SAW Method (Simple Additive Weighting).

Keywords: Purwokerto; Hotel; SAW; Tourists; Decision Support System

1. INTRODUCTION

Indonesia is a country consisting of diverse tribes, languages, cultures, races, religions, flora and fauna. Indonesia has approximately 17,504 islands consisting of large islands (Java, Sumatra, Kalimantan, Sulawesi and Papua) [1]. With tourism, it is certainly one of the sources for regional income that can increase regional smoking. Thus, it is possible to encourage local communities to better maintain and manage their natural and cultural wealth.

The city of Purwokerto as the center of the city in southwestern Central Java, is one of the tourism places in Central Java with a large number of tourist enthusiasts. Many tours are offered such as natural tourism, culinary tours, and others. Many tourists come from outside the city and do tours for more than one day. Seeing these conditions, a temporary stopover place is needed, namely a hotel.[2]

The choice of hotel is greatly influenced by the destination and needs of tourists. In addition, a strategic location and a comfortable atmosphere are taken into consideration. The lack of information about hotels becomes one of the problems for tourists when it comes to a city to determine the hotel.[3]

Purwokerto City provides a wide selection of hotels located in various locations with hotel classes, rental prices, facilities and services that are diverse. With the existence of many and different hotel facilities, of course, tourists will find it difficult to find and determine hotels according to the desired criteria. Another problem, namely that they will also have difficulty in finding the location of the desired hotel. [4]

However, to make a hotel selection in Purwokerto City, there is no computerized system. Thus, to overcome these problems, it is carried out by implementing the Decision Support System (SPK). Decision support system as an interactive system, which helps decision makers through the use of data and decision models to solve problems of a semi-structured and unstructured nature. [5]

Research using the Simple Additive Weighting Method was conducted by V.D.Kumenap year 2018 [6], V. S. Zuliyanti and D. Hartam year 2019 [7] and W. Adisaputra et al. year 2020[8]. Research conducted by Wahyudi in 2020 on the accuracy of decisions in determining outstanding teachers using the Additive Weighting Complex Method received an accuracy value of 80%[9]. It's just that, it hasn't been implemented into a system yet. The author chose to use the Simple Additive Weighting (SAW) Method because it has the advantage of being able to make an assessment more precisely because it is based on the value of the criteria and preference weights that have been determined, besides that the Simple Additive Weighting (SAW) Method can select the best alternatives from a number of alternatives because of the ranking process after determining the weight for each attribute. [10].

The basic concept of the Simple Additive Weighting (SAW) Method is to look for the weighted summation of the performance rating on each alternative on all attributes.[11]. The basic concept of the Simple Additive Weighting (SAW) Method is comprehensive decision making. In its implementation, the selection of hotels requires several criteria that will be used. Each criterion, has each weight of the criteria to determine the best hotel. In dealing with this problem, the author uses the Simple Additive Weighting (SAW) Method. The research was conducted by looking for weight values for each attribute, then a ranking process was carried out that would determine the optimal alternative to get hotel quality in Purwokerto City.[12]

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

2. RESEARCH METHODOLOGY

2.1 *Simple Additive Weighting* Method

The Simple Additive Weighting method is often known as the weighted summation method. The basic concept is to look for weighted summation. The basic concept of the SAW Method is to look for the weighted summation of the performance rating on each alternative on all attributes. [13][14][15]
Saw Method completion steps :

a. Determining the criteria that are used as a reference for decision making
b. Determine the match rating of each alternative on each criterion.
c. Making a decision matrix based on criteria, after which the normalization of the matrix based on equations adapted to the type of attribute is obtained so that a normalized matrix R is obtained.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max_i(x_{ij})} & Jika\ j\ adalah\ kriteria\ keuntungan\ (benefit) \\ \dfrac{Min(x_{ij})}{x_{ij}} & Jika\ j\ adalah\ kriteria\ biaya\ (cost) \end{cases} \quad (1)$$

Information:
r_{ij} : Normalized performance rating value
x_{ij} : Attribute values that belong to each criterion
$\frac{x_{ij}}{Max(x_{ij})}$: The greatest value of each criterion
$\frac{Min(x_{ij})}{x_{ij}}$: The smallest value of each criterion
Benefi : if the greatest value is best
Cost : if the smallest value is best

d. The final result is obtained from the ranking process, namely the summation of the multiplication of the normalized matrix R with the weight vector so that the largest value is obtained, which is chosen as an alternative solution.

$$V_i = \sum_{j=1}^{n} w_j\, r_{ij} \quad (2)$$

Information:
v_i = Rankings for each alternative
w_j = The weight value of each criterion
r_{ij} = Normalized performance rating value

2.2 Stages of Research

The research framework is depicted in figure 1. The stages carried out with the SAW (Simple Additive Weighting) Method are as follows [16]:

a. Identify the problem.
Identification is defining the problem of research. The problem in this study is that the lack of information about hotels is one of the problems for tourists when it comes to a city to determine a hotel.
b. Literature Study
used to find and read references based on books and journals related to research, namely decision support system books and books
c. Data Collection
This study used data from the Youth, Sports, Culture and Tourism Office of Banyumas Regency
d. Data Analysis using the SAW Method
In this study, the analysis used was quantitative analysis. Where an analysis of the data is used, if the conclusions obtained can be proven by numbers and also calculations used formulas related to the analysis. This study used the SAW (Simple Additive Weighting) Method. The stages in the SAW Method are as follows:
   1. Determine the criteria that are used as a reference for decision making
   2. Determine the match rating of each alternative on each criterion
   3. Make a decision matrix based on criteria, after which the normalization of the matrix based on equations adapted to the type of attribute is obtained so that a normalized matrix is obtained
   4. The final result is obtained from the ranking process, which is the summation of the multiplication of the normalized matrix R with the weight vector so that the largest value is obtained as an alternative solution.
e. The results of the analysis using the SAW Method
The result of the calculation using the SAW Method

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

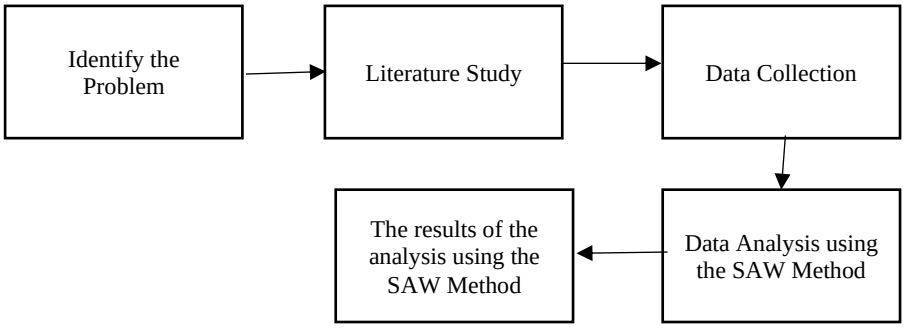


Figure 1. Research Flowchart

3. RESULTS AND DISCUSSION

3.1 Decision Making Process

In selecting the determination of hotels that are in accordance with the desired criteria with the Simple Additive Weighting (SAW) Method. This method requires criteria and weights to perform the calculation so that it can produce the best alternative. In this research method, there are weights and criteria needed in determining the hotel that will be selected as the best hotel. The criteria used can be seen in Table 1. Calculation of the SAW (Simple Additive Weighting) Method using alternative data from Hotels in Purwokerto City shown in the table below

a. Determining Criteria

Criteria are attributes of an object or solution that will be assessed after being classified according to needs. These criteria will later be assessed using the system. Then, the data is recorded into the form provided based on these criteria. Then later the value will be processed by the system to get the final result of the calculation. The table of weighting criteria of the SAW Method is like table 1 below:

Table 1. Criteria Determination

No	Criterion Name	W	Kind
1.	Price	0.15	*Cost*
2.	Hotel Location	0.4	*Benefit*
3.	Hotel Facilitie	0.35	*Benefit*
4.	Hotel Class	0.1	*Benefit*

b. Determining Alternatives

An alternative is an object or solution that will be calculated in value by the system. This study used alternative hotel data which can be seen in Table 2.

Table 2. Determination of Hotel Alternatives

Code	Alternatives
A1	Trisno Hotel
A2	Atrium Resort and Hotel
A3	Java Heritage
A4	Surya Yudha

c. Determining the Value of Subcriteria

Table 3 below is the Sub Criteria Values used in this study. The data used in this study were the rental price of hotel facilities, location and class of the hotel.

Table 3. Sub Criteria Value Data

Criterion	Sub criteria	*Range*	Weight Value
Rental Price (*Cost)*	Very Expensive	>=821.000	0.4
	Expensive	621.000-820.000	0.3
	Cheap	321.000-620.000	0.2
	Very Cheap	<=320.000	0.1
Hotel Facilities (*benefit)*	Very Complete	14-17 Facilities	0.4
	Complete	9-13 Facilities	0.3
Location (*benefit*)	quite	4-8 Facilities	0.2
	Little	1-4 Facilities	0.1
	Very Close	0-2100 meter	0.4
	Near	2101-5000 meter	0.3

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

	Far	5001-9000 meter	0.2
	very far away	9001-20000 meter	0.1
Hotel Class (*benefit)*	5-star hotel	5	0.4
	3-4star hotel	3-4	0.3
	1-2star hotel	1-2	0.2
	No star hotel	0	0.1

d. Alternate Value Contents

In the alternative sample data, there are Alternative Code fields, namely: A1, A2, A3, A4, A5 which are alternatives (A_i). By criteria (C_j) i.e. price, hotel location, hotel facilities and hotel class. The following is the data from each alternative alternative which can be seen in Table 4 below:

Table 4. Alternative Filling and Fit to each Criterion

Alternative	Criterion			
	C1	C2	C3	C4
A1	0.1	0.2	0.1	0.1
A2	0.3	0.3	0.2	0.2
A3	0.4	0.3	0.3	0.3
A4	0.4	0.1	0.3	0.3

The first step in calculating the Simple Additive Weighting Method is to normalize the matrix

a. Finding the Value of Price Criteria (C1):

$$R11 = \frac{\min\{0.1,0.3,0.4,0.4,0.4\}}{0.1} = \frac{0.1}{0.1} = 1$$

$$R21 = \frac{\min\{0.1,0.3,0.4,0.4,0.4\}}{0.3} = \frac{0.1}{0.3} = 0.33$$

$$R31 = \frac{\min\{0.1,0.3,0.4,0.4,0.4\}}{0.4} = \frac{0.1}{0.4} = 0.25$$

$$R41 = \frac{\min\{0.1,0.3,0.4,0.4,0.4\}}{0.4} = \frac{0.1}{0.4} = 0.25$$

b. Finding the Value Criteria of facilities (C2):

$$R12 = \frac{0.2}{\max\{0.2,0.3,0.3,0.1,0.2\}} = \frac{0.2}{0.3} = 0.67$$

$$R22 = \frac{0.3}{\max\{0.2,0.3,0.3,0.1,0.2\}} = \frac{0.3}{0.3} = 1$$

$$R32 = \frac{0.3}{\max\{0.2,0.3,0.3,0.1,0.2\}} = \frac{0.3}{0.3} = 1$$

$$R42 = \frac{0.1}{\max\{0.2,0.3,0.3,0.1,0.2\}} = \frac{0.1}{0.3} = 0.33$$

c. Finding Hotel Location Value (C3):

$$R13 = \frac{0.1}{\max\{0.1,0.2,0.3,0.3,0.1\}} = \frac{0.1}{0.3} = 0.33$$

$$R23 = \frac{0.2}{\max\{0.1,0.2,0.3,0.3,0.1\}} = \frac{0.2}{0.3} = 0.67$$

$$R33 = \frac{0.3}{\max\{0.1,0.2,0.3,0.3,0.1\}} = \frac{0.3}{0.3} = 1$$

$$R43 = \frac{0.3}{\max\{0.1,0.2,0.3,0.3,0.1\}} = \frac{0.3}{0.3} = 1$$

d. Finding Hotel Class Grades (C4):

$$R14 = \frac{0.1}{\max\{0.1,0.3,0.3,0.3,0.3\}} = \frac{0.1}{0.3} = 0.33$$

$$R24 = \frac{0.3}{\max\{0.1,0.3,0.3,0.3,0.3\}} = \frac{0.3}{0.3} = 1$$

$$R34 = \frac{0.3}{\max\{0.1,0.3,0.3,0.3,0.3\}} = \frac{0.3}{0.3} = 1$$

$$R44 = \frac{0.3}{\max\{0.1,0.3,0.3,0.3,0.3\}} = \frac{0.3}{0.3} = 1$$

So:

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

1	0.67	0.33	0.33
0.33	1	0.67	1
0.25	1	1	1
0.25	0.33	1	1

3.2 Rangking Process

In finding the value of each alternative in determining the ranking using a formula like the following, the value

$$V_i=\sum_{j=}^{n} w_j\, r_{ij} \quad (2)$$

Where the W for each criterion can be seen in Table 1. Then determine the value of V_1 up to V_5 that is :
V_1 =(0.15*1)+(0.35*0.67)+(0.4*0.33)+(0.1*0.33) =0.55
V_2 =(0.15*0.33)+(0.35*1)+(0.4*0.67)+(0.1*1) =0.77
V_3 =(0.15*0.25)+(0.35*1)+(0.4*1)+(0.1*1) =0.9
V_4 =(0.15*0.25)+(0.35*0.33)+(0.4*1)+(0.1*1) =0.65

3.3. Research Results

This study obtained the results by calculating the SAW Method that java heritage hotels were 0.9, resort and hotel atriums were 0.77, Surya Yudha hotels were 0.65 and Trisno hotels were 0.55. Based on the results of the initial calculation to the ranking process, it can be seen in Table 5 below:

Table 5. Rangking Results

Alternative Code	Alternative Name	Result Value	Rangking
A1	Trisno Hotel	0.55	4
A2	Atrium Resort and Hotel	0.77	2
A3	**Java Heritage**	**0.9**	**1**
A4	Surya Yudha	0.65	3

3.3. System Implementation

a. Add Hotel Page

The admin first inputs the data of the hotel name, hotel photo, price, hotel location, facilities and hotel class which can be seen in Figure 2. After that, calculations are carried out using the SAW Method so that the results can be seen in Figure 3.

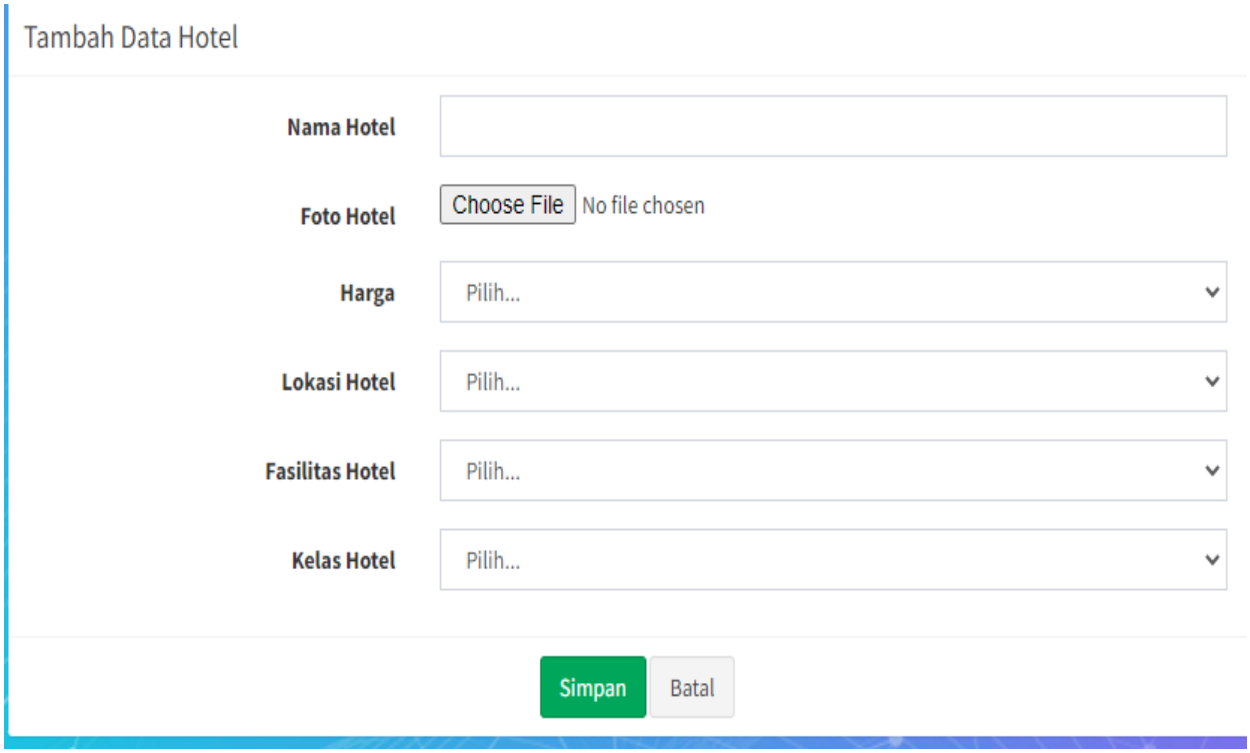


Figure 2. Add Hotel Page

The implementation of the system can be seen in Figure 3. In figure 3, it is the result of the hotel's recommendation after calculations using the SAW (Simple Additive Weighting) Method

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

Hotel Rekomendasi

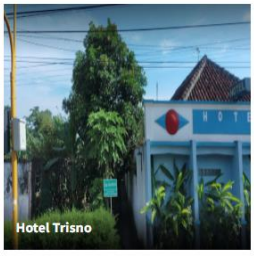
No	Foto	Hotel	Nilai
1		Java Heritage	0.9
2		Atrium Resort dan Hotel	0.7667
3		surya yudha	0.6542
4		Hotel Trisno	0.55

Figure 3. Results of Hotel Recommendations with the SAW Method

4. CONCLUSION

The results of the calculation process using the Simple Additive Weighting Method for hotel selection in Purwokerto City can be used as consideration for determining the best hotel quality. This study uses the criteria of price, facilities, hotel location and hotel class. From the results of the analysis carried out using the Simple Additive Weighting method using 4 alternative hotels, it was found that the A3 alternative was a hotel that had good quality. Further research can use other than the SAW method or can also make comparisons with other methods

REFERENCES

[1] D. U. Khasanah and D. R. Ningsih, "Jujuran Culture in Banjar Tribal Marriage in South Kalimantan," vol. 17, no. 4, 2020.
[2] Y. Kristian, "Sistem pendukung keputusan pemilihanhotel di purwokerto dengan menggunakan metode electre," 2019.
[3] Syafrianto, "Sistem pendukung keputusan menggunakan metode kuantitatif dengan himpunan fuzzy untuk pemilihan hotel berdasarkan kebutuhan pengunjung," Universitas Gadjah Mada Yogyakarta, 2010.
[4] A. J. Ternando, R. Efendi, and E. P. Purwandari, "Sistem Pendukung Keputusan Dalam Pemilihan Penginapan di Kota Bengkulu Menggunakan Metode Simple Additive Weighting (SAW)," *J. Rekursif*, vol. 6, no. 1, pp. 24–35, 2018, [Online]. Available: https://ejournal.unib.ac.id/index.php/rekursif/article/view/4360.
[5] dan D. U. Daihani, *Komputerisasi Pengambilan Keputusan*. Jakarta: Elex Media Komputindo, 2001.
[6] V. D. Kumenap, "Perancangan Model Sistem Pendukung Keputusan Pemilihan Hotel Di Kota Manado Menggunakan Metode Simple Additive Weighting (Saw)," *J. Ilm. Realt.*, vol. 14, no. 1, pp. 37–41, 2018, doi: 10.52159/realtech.v14i1.114.
[7] V. S. Zuliyanti and D. Hartama, "Sistem Pendukung Keputusan Pemilihan Hotel Terbaik di Kota Padang Menggunakan Metode SAW," vol. 1, pp. 760–766, 2019.
[8] W. Adisaputra *et al.*, "Sistem Penunjang Keputusan Pemilihan Hotel di Kota Tanjungpinang dan Pulau Bintan menggunakan Metode Simple Additive Weighting," vol. 3, pp. 697–708, 2020.
[9] W. Wahyudi, J. Santony, and G. W. Nurcahyo, "Akurasi Keputusan dalam Penentuan Guru Berprestasi dengan Menggunakan Metode Simple Additive Weighting," *J. Sistim Inf. dan Teknol.*, vol. 2, no. 2017, pp. 9–14, 2020, doi:

Building of Informatics, Technology and Science (BITS)
Volume 4, No 3, Desember 2022 Page: 1181−1187
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v4i2.2262

10.37034/jsisfotek.v2i1.15.

[10] D. Citra, "Sistem Pendukung Keputusan Pemilihan Hotel Di Kota Palembang Dengan Metode SAW," *J. Sist. Inf.*, vol. 5, no. 1, pp. 546–565, 2013.

[11] T. R. Adianto, Z. Arifin, D. M. Khairina, G. Mahakam, and G. Palm, "Sistem Pendukung Keputusan Pemilihan Rumah Tinggal Di Perumahan Menggunakan Metode Simple Additive Weighting (Saw) (Studi Kasus : Kota Samarinda)," *Pros. Semin. Ilmu Komput. dan Teknol. Inf.*, vol. 2, no. 1, pp. 197–201, 2017.

[12] R. C. dkk Supiyandi, Hariyanto, Eko, "Sistem Pendukung Keputusan Menentukan Kualitas Ayam Petelur Menggunakan Metode Simple Additive Weighting," *Expert J. Manaj. Sist. Inf. dan Teknol.*, vol. 7, no. 1, pp. 256–262, 2017, doi: 10.36448/jmsit.v7i1.871.

[13] P. D. Sugiyono, "Sistem Informasi Penentuan Siswa Berprestasi Dengan Metode Simple Additive Weighting (Saw)," *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2016.

[14] F. Haswan, "Decision Support System For Election Of Members Unit Patients Pamong Praja," *Int. J. Artif. Intell. Res.*, vol. 1, no. 1, p. 21, 2017, doi: 10.29099/ijair.v1i1.14.

[15] S. H. Zanakis, A. Solomon, N. Wishart, and S. Dublish, "Multi-attribute decision making: A simulation comparison of select methods," *Eur. J. Oper. Res.*, vol. 107, no. 3, pp. 507–529, 1998, doi: 10.1016/S0377-2217(97)00147-1.

[16] A. P. Windarto, "Penilaian Prestasi Kerja Karyawan PTPN III Pematangsiantar Dengan Metode Simple Additive Weighting (SAW)," *Jurasik (Jurnal Ris. Sist. Inf. dan Tek. Inform.*, vol. 2, no. 1, p. 84, 2017, doi: 10.30645/jurasik.v2i1.22.