

## Analysis of SAW and WP Methods in Selecting the Best Employee

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### ABSTRACT

In today's digital era, selecting the best employees in this case effective *Customer Service* is one of the key factors in increasing customer satisfaction and brand loyalty. This article discusses the analysis of the Simple Additive Weighting (SAW) and Weighted Product (WP) methods in the context of selecting new employees. The SAW method is a decision-making technique that prioritizes the sum of the weights of predetermined criteria, while WP gives weight to each alternative based on the multiplication of relevant criteria. In this research, we conducted a case study on a company engaged in *Customer Service*. We identified several important criteria for customer service assessment, such as response speed, communication quality, and problem-solving rate. The results of the analysis show that the SAW method is simpler and easier for managers to understand in the decision-making process, while WP provides more comprehensive results by considering interactions between criteria. Although both methods show consistent results in the selection of the best *Customer Service*, the use of the WP method provides an advantage in situations where the interdependence between criteria is very significant. The conclusion of this article emphasizes the importance of choosing the right analysis method in making decisions regarding the best customer service. By understanding the advantages and disadvantages of each method, companies can be more effective in improving service quality and meeting customer expectations.

## INTRODUCTION

Consumers or customers are the main target for every company, so that in running their business, every company management will try as much as possible to provide satisfaction to customers. To be able to meet customer satisfaction, companies must know market needs, monitor sales and understand customer complaints and desires. To understand customer complaints, a means of liaison between customers and the company is needed. This aims to streamline communication between the company and customers, so that with this communication it can improve the quality of the company. Therefore, a Customer Service service was created. *Customer Service* is a job whose main task is to be a direct link between the company and its customers. (Kifti and Hasian 2021).

Every company needs *Customer Service* services in order to smooth the journey of its business. Therefore, *Customer Service* has an important role in improving the quality of sales from the company, whether the sale of goods, services or whatever business the company is running. With the existence of *Customer Service* or customer service perusahaan can show the existence of providing services in the form of information to customers. With the interaction between customers and customer service, it can ensure customer satisfaction so that customers are interested in making repeat purchases of both goods or services that have previously been purchased by these customers. (Ernantyo and Febry 2022). In this case, there are many automated services that companies can use. However, automated services cannot communicate all things that can be conveyed directly by humans. Therefore, companies really need *Customer Service* in running their business. (Novi Reza Pramasari, Wildan Wardhani, and Agus Eko Sujianto 2024)

In choosing a qualified *Customer Service*, it will be very difficult if done manually because it can produce incorrect decisions because the options selected manually are not guaranteed. Manual selection also risks getting subjective results. The wrong selection can reduce the quality of the company. Because if a non-computerized selection is made, it can choose a *Customer Service* that is not qualified and talented so that it can convey the wrong information to customers and can cause customers not to be interested in making repeat purchases. To overcome these problems, a computerized system is needed in selecting service customers. A good system to use is a decision support system. A decision support system is a system that has been used by many people in making choices or making decisions that have a large number of alternatives.

Decision support system (SPK) is a computerized system where the main purpose of this system is to help certain parties who are in difficulty in making a multi-choice decision. (Apriyanto and Fathoni 2024). In other words, this system was created to help companies/parties who are having difficulty making choices where the alternatives chosen are very large and complicated. This system is made using computer working principles so that the process that is passed in solving problems using mathematical and

systematized computer systematics. So that the results obtained from this system are accurate and reliable results because they are not done subjectively but based on accurate calculation results. In running this system, there are several requirements that must be met, namely there must be alternative data and criteria data. Alternative data is data that is used as an object to be selected. (Bagas Setiyaki, Budi Apriyanto 2024) In the selection of service costumes, the alternative data is data on people who apply for job applications. While the criterion data in *Customer Service* selection is a requirement that must be met by alternative data criteria.

The data criteria for *Customer Service* selection are the ability to communicate well, the latest education (it would be better if it is related to communication science), English language skills, work experience and age. With these criteria can assess the quality of work and personality of each applicant. In a decision support system, a method is also needed which becomes a mathematical system that is used as a calculation of the ranking value of each alternative data. There are many methods that can be used in SPK such as the WASPAS method, EDAS method, PROMITHE method and many other methods. In this research, the methods used are SAW method and WP method. These two methods are used because these methods are methods that can be used easily and the results obtained have accurate and reliable results.

Obtaining the weight value for each criterion is done by calculating each criterion data. At the time of calculating the search for the weight value of the criteria must begin by sorting from the most influential criteria data to the less influential criteria data. That is, the greater the influence of the criterion on the quality of work produced, the greater the value of the weight of the criterion so that the sequence must be the first to be done. In the selection of *Customer Service*, SAW method and WP method are also used.

The Simple Addictive Weighting (SAW) method is a method used in SPK in obtaining ranking calculations by performing weighted summation. (Kanim, Tukiyat, and Murni Handayani 2023).. This means that this method is carried out by summing up all criteria data on each alternative, initially the alternative value is multiplied by the weight value on each criterion. This method will finally produce a ranking value that will be used as a decision. (Ahmad and Kurniawan 2020). The second method used is the WP method. Weighted Product (WP) method is a method used in decision making by performing mathematical calculations, namely multiplying each criterion with the aim of connecting between alternative attributes and criteria then the results will be multiplied by the weight value on each criterion concerned].

Some research related to this research is research conducted by Agung Sugiarto et al. in 2021 in selecting recipients of work bonuses by applying the WP method by producing a value of 0.7978 as the best alternative on behalf of Meriana.(Sianturi et al. 2021). Research conducted by P. Mandarani et al.

in 2022 regarding decision support for selection The next research was conducted by Arista et al. which discussed the acceptance of new employees using the SAW method with a result of 0.967 as the first rank and the best alternative.(Yanto 2021)Research in 2021 conducted by Muhammad Risky Ramandan et al regarding outstanding students with research results of 0.859 as the best alternative.(Yanto 2021) Research conducted by siti nurlela in 2021 regarding the most favorite majors using the SAW method with research results of 0.9568 as the best alternative. (Sitanayah, Kansil, and Kumenap 2024).

## RESEARCH METHODOLOGY:

### 2.1 Research Stages

There are several stages of research that must be passed, namely:

a. Problem analysis

When starting to conduct research, researchers must know the problems that are happening and try to find solutions to these problems to be solved. After obtaining the problem, the writer analyzes the problem.

b. Data collection

The next stage of problem analysis is after predicting the best solution, the search for data needed to prove the offered solution is carried out. data can be collected by direct observation and by interview. In this study, the data needed are alternative data and criteria data.

c. Literature study

After obtaining and analyzing the problem, the author cannot solve the problem if the author does not have insight into the problem. to gain insight, the author will conduct a literature study. Literature study is learning about the topic being researched from books, journals and others.

d. Analysis and application of methods

After obtaining clear enough information and accurate data, the author will carry out the method application stage. In this research, the methods applied are the SAW method, the WP method

e. Research report

The final stage is writing the final research report which is carried out with the aim of creating documentation and helping other researchers who are researching methods, objects or anything related to this research and can be used as a reference.

For more details of the research stages can be seen in Figure 1 below

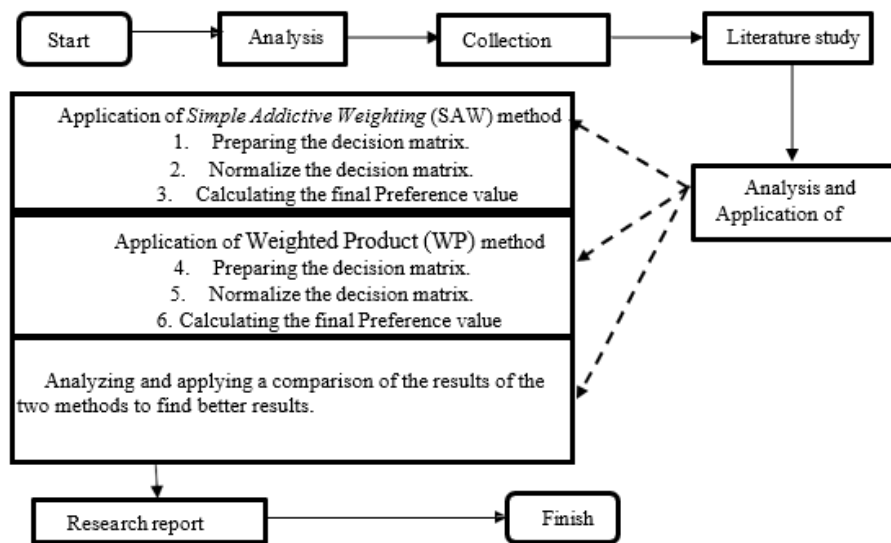


Figure 1: Research Stages

## 2.2 Decision Support System (DSS)

According to Toman SPK is a system developed in a computer where the workings of this system mimic the way computers work in performing a real performance. Decision support system (SPK) is a computerized system where the main purpose of this system is to help certain parties who are in difficulty in making a multi-choice decision.(Apriyanto and Fathoni 2024) In other words, this system was created to help companies/parties who are having difficulty making choices where the alternatives chosen are very large and complicated. This system is made using the principles of computer work so that the process that is passed in solving problems uses a mathematical and systematized computer systematic. So that the results obtained from this system are accurate and reliable results because they are not done subjectively but based on accurate calculation results.(Obeidat and Traini 2020) According to Nancy Nurjannah and friends "An SPK only provides alternative decisions and is then left to the user to make decisions. The motorcycle brands used as tests are Honda, Yamaha and Suzuki, because these three brands are very common in Indonesian society.(Eni 1967)

## 2.3 Customer Service

Every company needs customer service in order to smoothen its business journey. Therefore, Customer Service has an important role in improving the quality of sales from the company, whether the sale of goods, services or whatever business the company is running. With the existence of Customer Service or customer service, companies can show their existence regarding the provision of services in the form of information to customers. With the interaction between customers and customer service, it can ensure customer satisfaction so that customers are interested in making repeat purchases of either goods or services that have previously been purchased by these customers [2]. In this case, there are many automated

services that companies can use. However, automated services cannot communicate all things that can be conveyed directly by humans. Therefore, companies really need customer service in running their business

$$Cr_1 \geq Cr_2 \geq Cr_3 \geq \dots \geq C_m \tag{1}$$

So that after the process will produce:

$$W_1 \geq W_2 \geq W_3 \geq \dots \geq C_m \tag{2}$$

To get the weight value (W), the 3rd equation is used, as follows:

$$W = \sum_{m=1}^m \frac{1}{m} \tag{3}$$

With the stipulation that the result of the total  $W_m$  must be 1.

### 2.4 Simple Additive Weighting (SAW) Method

The Simple Addictive Weighting (SAW) method is a method used in SPK in obtaining ranking calculations by performing weighted summation.(Ahmad and Kurniawan 2020)This means that this method is done by summing up all criteria data on each alternative, initially the alternative value is multiplied by the weight value on each criterion. This method will finally produce a ranking value that will be used as a decision. The steps in *Simple Additive Weighting* (SAW) are as follows

1. Preparing the decision matrix.

$$x_{ij} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \tag{4}$$

2. Calculating the normalization matrix. |

$$R_{ij} = \frac{x_{ij}}{\text{Max } x_{ij}} \rightarrow \text{Jika jadalah atribut keuntungan (benefit)}$$

$$R_{ij} = \frac{\text{Min } x_{ij}}{x_{ij}} \rightarrow \text{Jika jadalah atribut biaya (cost)}$$
\tag{5}

3. Calculating the preference value.

$$V_i = \sum_{j=1}^n W_j R_{ij} \tag{6}$$

### 2.5 Weighted Product (WP) Method

The Weighted Product (WP) method is a method used in decision making by performing mathematical calculations, namely multiplying each criterion with the aim of connecting between alternative attributes and criteria then the results will be multiplied by the weight value on each criterion concerned[

1. Preparing the decision matrix. |

$$x_{ij} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \tag{7}$$

2. Calculating the normalization matrix.

$$s_i = \prod_{j=1}^n x_{ij} W_j \tag{8}$$

3. Calculating the preference value.

$$V = \frac{\prod_{j=1}^n x_{ij} W_j}{\prod_{j=1}^n (x_{ij}^*) W_j} \tag{9}$$

## RESULTS AND DISCUSSION

### 3.1 Determination of Alternatives and Criteria

In running this system, there are several requirements that must be met, namely there must be alternative data and criteria data. Alternative data is data that is used as an object to be selected. In the selection of customer service, the alternative data is data on people who apply for job applications. While the criteria data in the Customer Service selection is a requirement that must be met by alternative data criteria. Alternative determination is described in table 1 below:

**Table 1.** Alternative Data

Alternative	Description
A <sub>1</sub>	Riana Andira
A <sub>2</sub>	Verawati
A <sub>3</sub>	Hanna Naisa
A <sub>4</sub>	Danira
A <sub>5</sub>	Jayatri
A <sub>6</sub>	Denada Arina
A <sub>7</sub>	Feni Adinda

The data criteria for Customer Service selection are the ability to communicate well, the latest education (it would be better if it is related to communication science), English language skills, work experience and age. With these criteria can assess the quality of work and personality of each applicant. These criteria can be seen in table 2 below

**Table 2.** Criteria Data

Criteria	Description	Type
C <sub>1</sub>	Communication	Benefit
C <sub>2</sub>	Education	Benefit
C <sub>3</sub>	English Language Proficiency	Benefit
C <sub>4</sub>	Work experience	Benefit
C <sub>5</sub>	Age	Cost

**Table 3.** Alternative and criteria suitability rating data

Alternative	Communication	Education	English Language Proficiency	Experience work (in years)	Age (in years)
A <sub>1</sub>	Good	S1	Not good	3	30

Alternative	Communication	Education	English Language Proficiency	Work experience (in year)	Age (in years)
A <sub>2</sub>	Very good	with communication science S1 Related with communication science	Very good	5	32
A <sub>3</sub>	Not good	S1 Not related to science	Good	1	25
A <sub>4</sub>	Not good	HIGH SCHOOL	Good enough	2	21
A <sub>5</sub>	both	S1 Not related to science	Good enough	1	24
A <sub>6</sub>	both	HIGH SCHOOL	Not good	2	26
A <sub>7</sub>	Good	HIGH SCHOOL	Good enough	3	21

In table 3 there is still linguistic type data, so to be calculated, the data must be converted into numbers so that weighting must be done. Below is a table containing weighting for C<sub>1</sub>, C<sub>2</sub> and C<sub>3</sub>.

**Table 4.** Weight Value of C<sub>1</sub> and C<sub>2</sub>

Description	Weight
Very good	4
Good	3
Good enough	2
Not so good	1

**Table 5.** C-value<sub>j</sub>

Description	Weight
S1 Related to communication science	3
S1 Not related to communication science	2
HIGH SCHOOL	1

After weighting the criteria, the linguistic data has been weighted so that it becomes numeric data and can be seen in table 6 below:

**Table 6.** Alternative and criteria suitability rating data after weighting

Alternative	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>
A <sub>1</sub>	3	3	1	3	30
A <sub>2</sub>	4	3	4	5	32
A <sub>3</sub>	1	2	3	1	25
A <sub>4</sub>	1	1	2	2	21
A <sub>5</sub>	3	2	2	1	24
A <sub>6</sub>	3	1	1	2	26
A <sub>7</sub>	3	1	2	3	21

### 3.2 Application of SAW Method

The stages of the calculation process applying the WP method are explained in detail in the process below:

1. Preparing the decision matrix

$$\begin{array}{|c|c|c|c|c|}
 \hline
 3 & 3 & 1 & 3 & 30 \\
 \hline
 4 & 3 & 4 & 5 & 32 \\
 \hline
 1 & 1 & 2 & 2 & 21 \\
 \hline
 3 & 2 & 2 & 1 & 24 \\
 \hline
 3 & 1 & 1 & 2 & 26 \\
 \hline
 3 & 1 & 2 & 3 & 21 \\
 \hline
 \end{array}$$

2. Calculating the normalized matrix for criterion  $C_1$  (Benefit)

$$R_{11} = \frac{3}{4} = 0.7500$$

$$R_{21} = \frac{4}{4} = 1.0000$$

$$R_{31} = \frac{1}{4} = 0.2500$$

$$R_{51} = \frac{1}{4} = 0.2500$$

$$R_{61} = \frac{3}{4} = 0.7500$$

$$R_{71} = \frac{3}{4} = 0.7500$$

$$R_{71} = \frac{3}{4} = 0.7500$$

For criterion  $C_2$  (Benefit)

$$R_{12} = \frac{3}{3} = 1.0000$$

$$R_{22} = \frac{3}{3} = 1.0000$$

$$R_{32} = \frac{2}{3} = 0.6667$$

$$R_{42} = \frac{1}{3} = 0.3333$$

$$R_{52} = \frac{2}{3} = 0.6667$$

$$R_{62} = \frac{1}{3} = 0.3333$$

$$R72 = \frac{1}{3} = 0.3333$$

For criterion  $C_3$  (Benefit)

$$R13 = \frac{1}{4} = 0.2500$$

$$R23 = \frac{4}{4} = 1.0000$$

$$R33 = \frac{4}{4} = 1.0000$$

$$R43 = \frac{3}{4} = 0.7500$$

$$R53 = \frac{2}{4} = 0.5000$$

$$R63 = \frac{2}{4} = 0.5000$$

$$R73 = \frac{1}{4} = 0.2500$$

$$= \frac{2}{4} = 0.5000$$

For criterion  $C_4$  (Benefit)

$$R14 = \frac{3}{5} = 0.6000$$

$$R24 = \frac{5}{5} = 1.0000$$

$$R34 = \frac{5}{5} = 1.0000$$

$$R44 = \frac{1}{5} = 0.2000$$

$$R54 = \frac{2}{5} = 0.4000$$

$$R64 = \frac{1}{5} = 0.2000$$

$$R74 = \frac{5}{5} = 1.0000$$

$$= \frac{2}{5} = 0.4000$$

$$= \frac{3}{5} = 0.6000$$

For criterion  $C_5$  (Cost)

$$R15 = \frac{21}{30} = 0.7000$$

$$R25 = \frac{21}{32} = 0.6563$$

$$R35 = \frac{21}{25} = 0.8400$$

$$R45 = \frac{21}{21} = 1.0000$$

$$R55 = \frac{21}{24} = 0.8750$$

$$R75 = \frac{21}{26} = 0.8077$$

$$= \frac{21}{21} = 1.0000$$

Based on the results of the calculations obtained above, a normalized matrix value table can be formed which can be seen in table 8.

**Table 8.** Normalized Matrix Results

Alternative	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$
A <sub>1</sub>	0.7500	1.0000	0.2500	0.6000	0.7000
A <sub>2</sub>	1.0000	1.0000	1.0000	1.0000	0.6563
A <sub>3</sub>	0.2500	0.6667	0.7500	0.2000	0.8400
A <sub>4</sub>	0.2500	0.3333	0.5000	0.4000	1.0000
A <sub>5</sub>	0.7500	0.6667	0.5000	0.2000	0.8750
A <sub>6</sub>	0.7500	0.3333	0.2500	0.4000	0.8077
A <sub>7</sub>	0.7500	0.3333	0.5000	0.6000	1.0000

After obtaining table 10 above, the next step can be carried out, namely calculating the preference value.

### 3. Calculating the preference value

The next step is to find the preference value. The search for preference values can be done by performing a mathematical formula, namely by summing up each product between the value of each normalized matrix and the weight value of each criterion:

$$\begin{aligned}
 V_1 &= (0.456 * 0.7500) + (0.256 * 1.0000) + (0.156 * 0.2500) + (0.09 * 0.6000) + (0.04 * 0.7000) = 0.7190 \\
 V_2 &= (0.456 * 1.0000) + (0.256 * 1.0000) + (0.156 * 1.0000) + (0.09 * 1.0000) + (0.04 * 0.6563) = 0.9843 \\
 V_3 &= (0.456 * 0.2500) + (0.256 * 0.6667) + (0.156 * 0.7500) + (0.09 * 0.2000) + (0.04 * 0.8400) = 0.4533 \\
 V_4 &= (0.456 * 0.2500) + (0.256 * 0.3333) + (0.156 * 0.5000) + (0.09 * 0.4000) + (0.04 * 1.0000) = 0.3533 \\
 V_5 &= (0.456 * 0.7500) + (0.256 * 0.6667) + (0.156 * 0.5000) + (0.09 * 0.2000) + (0.04 * 0.8750) = 0.6437 \\
 V_6 &= (0.456 * 0.7500) + (0.256 * 0.3333) + (0.156 * 0.2500) + (0.09 * 0.4000) + (0.04 * 0.8077) = 0.5346 \\
 V_7 &= (0.456 * 0.7500) + (0.256 * 0.3333) + (0.156 * 0.5000) + (0.09 * 0.6000) + (0.04 * 1.0000) = 0.5993
 \end{aligned}$$

### 3.3 Application of WP Method

The stages of the calculation process applying the WP method are explained in detail in the process below:

#### 1. Preparing the decision matrix

$$X_{ij} = \begin{bmatrix} 3 & 3 & 13 & 30 \\ 4 & 3 & 45 & 32 \\ 1 & 2 & 31 & 25 \\ 1 & 1 & 22 & 21 \\ 3 & 2 & 2 & 1 \\ 3 & 1 & 1 & 2 \\ 3 & 1 & 2 & 3 \end{bmatrix}$$

#### 2. Calculating the Normalized Matrix

$$\begin{aligned}
 S_1 &= (3^{0.456}) * (3^{0.256}) * (1^{0.156}) * (3^{0.09}) * (30^{0.04}) = 2.7653 \\
 S_2 &= (4^{0.456}) * (3^{0.256}) * (4^{0.156}) * (5^{0.09}) * (32^{0.04}) = 4.1088 \\
 S_3 &= (1^{0.456}) * (2^{0.256}) * (3^{0.156}) * (1^{0.09}) * (25^{0.04}) = 1.6122 \\
 S_4 &= (1^{0.456}) * (1^{0.256}) * (2^{0.156}) * (2^{0.09}) * (21^{0.04}) = 1.3395 \\
 S_5 &= (3^{0.456}) * (2^{0.256}) * (2^{0.156}) * (1^{0.09}) * (24^{0.04}) = 2.4934 \\
 S_6 &= (3^{0.456}) * (1^{0.256}) * (1^{0.156}) * (2^{0.09}) * (26^{0.04}) = 2.0011 \\
 S_7 &= (3^{0.456}) * (1^{0.256}) * (2^{0.156}) * (3^{0.09}) * (21^{0.04}) = 2.2928
 \end{aligned}$$

#### 3. Calculating the preference value

$$\begin{aligned}
 V_1 &= \frac{2.7653}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.1665 \\
 V_2 &= \frac{4.1088}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.2473 \\
 V_3 &= \frac{1.6122}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.0970 \\
 V_4 &= \frac{1.3395}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.0806 \\
 V_5 &= \frac{2.4934}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.1501 \\
 V_6 &= \frac{2.0011}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.1205 \\
 V_7 &= \frac{2.2928}{2.7653 + 4.1088 + 1.6122 + 1.3395 + 2.4934 + 2.0011 + 2.2928} = 0.1380
 \end{aligned}$$

## CONCLUSIONS

From the results of this study, it is concluded that making a selection with a large number of alternative choices will be difficult if done manually, including the selection of service customers. Therefore, a decision support is needed. By utilizing the decision support system function by implementing the SAW and WP methods with ROC weighting can produce an accurate and reliable decision. From the calculations obtained by using the SAW and WP methods, the results of the calculation are by using the SAW method obtained a value of 0.9843 as alternative  $A_2$  on behalf of Verawati as the best alternative. While the calculation using the WP method obtained a value of 0.2473 as alternative  $A_2$  on behalf of Verawati as the best alternative. From these two results it can be seen that the best Customer Service candidate is Verawati. So that this can help those who need it in problems regarding decision making.

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