



Article

# Analysis And Design Of Web-Based Decision Support System With Simple Additive Weighting (SAW) And Weight Product (WP) Methods

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## A B S T R A C T

The selection of worship leaders who are still the concept of kinship will produce non-selective results. A mandatory system that can help in the selection of worship leaders in the GSJK HALL 4. The results of discussions are often influenced by several factors because there is no systematic way to assess the eligibility of candidates to lead the congregation. The purpose to be achieved in this study is to build a decision support system application for the determination of worship leaders by applying simple additive weighting (SAW) and weight product (WP) strategies in a network of choices that support emotionally chosen love pioneers to get specific results. The use of a decision support system for the selection of worship leaders is expected to get differences in the results of the selection by using predetermined weights and being able to support the decisions of the selection of worship leaders by providing alternative rankings that help facilitate the decision-making process for the selection of worship leaders. GSJK HALL 4 will have a decision support system application selection of worship leaders.

## INTRODUCTION

Houses of worship are of many agencies that answer the mechanical change of events. One of its developments is the utilization of advances in data innovation. Advances in PC innovation can support the handling of information and data. Varioust holy places can take advantage of innovative technological advances, one of which is GSJK HALL 4 which has designed a system

supporting the decision to elect Web-based worship leaders.

GSJK is one of the churches in Tangerang located in Taman golf west 1 blok EG1 no 49. modern city Tangerang. GSJK Hall 4 Church has been established in 2000 by Mr. Sudianto located in Tangerang in the west golf park 1 block EG1 no 49. modern city of Tangerang, Modernland, Banten. First GSJK Hall 4 there was only a Sunday school for children. As the GSJK Hall 4 Church grew,

public worship was opened. Most of the public worship congregations are from Jakarta. As of today GSJK Hall 4 already has 130 adult congregations and 30 children's congregations.

The problem that occurs in the GSJK Hall 4 is that there is no process of selecting worship leaders in a structured manner or using the system. GSJK Hall 4 has not used the system in choosing the leadership of the congregational service. In the process of selecting the leader of the congregational worship, the decisions taken are sometimes influenced by subjectivity factors that do not use systematic standard methods to obtain a viable and ideal candidate for the leadership of the siding worship. The mechanism for determining the leadership of the congregational worship does not have a liter of judgment in terms of calculation and systematic.

his method of weighting basic additives (SAW) requires the leader to decide on the weight of each property. An elective full score is obtained by entering all the results of duplication between the score (which can be measured among ascribes) and a load of each property. The score of each property must be without facets because it goes through the previous network standardization process. The score of each quality must be sans aspects because it goes through the process of standardizing the framework of the past.

Based on the data processing problem of the Church of Christ congregation (GSJK) Hall 4, it is proposed to create a Decision Support System with simple additive weighting and weight product methods. It is hoped that the decision support information system can be helpful and useful for operational activities in any Church, especially the GSJK Hall 4 in making or determining decisions in determining individual competence for worship session leaders.

## I. METHOD

### 1.1. *Decision Support System*

Emotionally supportive option is a PC that assists dynamic interactions to aid decision-making by using some information and certain models to solve some unstructured problems [1].

With the different amazing characters above, SPK can provide different advantages and benefits. The advantages that can be taken from the DSS as per the content is recorded as a hard copy the DSS increases the capacity of the head to handle information/data for the client, the DSS helps the leaders to overcome problems, especially various very complicated and unstructured problems, the DSS can make the settings faster and the results are solid [2].

Basically SPK is designed to support all stages of decision making ranging from identify problems, select relevant data, determine the approach used in the process decision-making, until the evaluation of the election [3].

Decision support system is a computer-based system intended to assist decision makers in utilizing data and specific model to solve a variety of unstructured problems, namely the search for solutions that involve human intuition in making decisions right on target and very useful for the organization [4].

Based on the definition above, Decision Support System can be said to be in several stages related in terms of decisions in an agency that functions to find the best results from data using method calculations.

### 1.2. *Simple Additive Weigting*

Simple Additive Weighting for scholarships, this direct additional weighting (SAW) requires leaders to decide the weight of each property. An elective all-out score is obtained by including all the augmentation results between the scores (which can be measured between credits) and a load of each trait [5].

The Direct Additional Substance Weighting technique is to track the weighted amount of presentation assessment on each option, all things considered. Direct Added Substance Weighting Strategies are recommended for choice in multi-process dynamic frameworks [6].

The method is often also known the term weighted summation method. The basic concept of the SAW method is to find the weighted sum of the performance twigs on each alternative on all attributes. In the SAW method there are two attributes, such as profit criteria (benefit) and cost criteria (cost). Both criteria are the basis for selection criteria when making decisions[7].

Given this definition, it tends to assume that direct additional weighting is one of the multi-attribute techniques that calculate more than one attribute and alternative to determine and support decision-making in an agency.

The formula for carrying out such normalization:

$$r_{ij} = \frac{x_{ij}}{\frac{Max\ x_{ij}}{Min\ x_{ij}}} \quad (1)$$

Where:

$r_{ij}$  = Normalized performance rating

Max  $ij$  = Maximum value of each row and column

Min  $ij$  = Minimum value of each row and column

$X_{ij}$  = Rows and columns of the matrix

With  $r_{ij}$  is the normalized performance rating of  $a_i$  alternatives on  $C_j$  attributes;

$i=1,2,..., m$  and  $j = 1,2,...,n$ .

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

Information:

$V_i$  : Value Final obtained through alternatives

$w_j$  : Determination weight

$r_{ij}$  : Matrix that should be normalized

### 1.3. Weight Product

Weight Product requires normalization cooperation because this procedure ignores the results of the assessment of each quality. The augmentation results are insignificant if they have not been analyzed (separated) by standard values [8].

Weighted product method uses multiplication to linking attribute rating, where the rating of each attribute must be raised first by the weight concerned. This process is similar to the normalization process [9].

Weighted Product (WP) is in most cases called a weighted expansion strategy, and is one of the techniques remembered for dealing with the multi-model navigation (MCDM) problem by looking for the consequences of duplicating elective standard values against the severity of actions [10].

Methods of Multiple Attribute Decision Making (MADM). MADM is a method used to find the optimal alternative from a number of alternatives with specific criteria. The essence of MADM is to determine the weight value for each attribute, then proceed with ranking process that will select alternatives already provided. Weighted Product method of weighted summation is weighted, and is one of the remembered techniques for overcoming the problem of Multi Measures Direction (MCDM), in which this strategy uses the ideal option of various options with certain rules to achieve the goal of this strategy[11].

Weighted products is a well known multi-Criteria Decision Analysis (MCDA) technique in which a finite set of choice alternatives is represented in terms of a number of decision criteria[12].

Common multi-criteria decision analysis and method of multi-criteria decision making.

WP, like all FMADM approaches, is a finite set of decisions defined by certain decision criteria. Weighted product techniques connect attributes by multiplication, where the rating of each attribute should be advanced with the matching attribute weights. This procedure is comparable to the normalization process. Weighted product derived using the interest rate. Method of product weighted level of interest[13]. Through applying the Weight Product approach in the computation to find alternative decisions, alternate data and criteria may be computed. At the first step, the administrator enters the data of the best lecturer candidates as an alternative, then enters the data criteria into the calculation process of the weight value of each criterion and obtains the preference value as a ranking value that becomes an alternative decision[14].

Weighted Product is a way of solving that involves employing multiplication to connect attribute values, where the value must first be raised to the weight of the attribute in question. This procedure is comparable to process normalization[15].

In carrying out normalization in WP the formulas used are as follows:

Normalization for alternatives, as follows:

$$S_i = \prod_{j=1}^n x_{ij}w_j \quad (3)$$

With S= Normalization Value; X= Alternative rating;

- $i = 1, 2, \dots, m$ ; where  $\sum w_j = 1$ .
- $w_j$  is a positive value rank for the profit attribute, and a negative value for the cost attribute.

## II. RESULT

Next will obtain the results or a list of criteria and alternatives from the results of the interview with the Shepherd. A list of criteria and alternatives will be formed table as follows:

**Table 1. 1 Alternative Table**

Alternative	
Code	Name
A1	Sarinah's mother
A2	Mr . Harley
A3	Mr Santosa
A4	Mr. Philemon Kurniawan
A5	Mrs. Bong Linda

**Table 1. 2 Criteria Table**

Code	Criterion (C)	Weight (W)	Attribute
C1	Mature age	4	B
C2	Ministry in the Church	5	B
C3	Bible Knowledge	4	B
C4	Active Sharing	3	B

Code	Name	Age	Service Period	Understanding	Sharing
A1	Sarinah's mother	3	3	3	2
A2	Mr . Harley	3	4	4	1
A3	Mr Santosa	4	4	3	1
A4	Mr. Philemon Kurniawan	4	4	4	3
A5	Mrs. Bong Linda	3	3	3	3

$$W = 0.25; w_2 = 0.3125; w_3 = 0.25; w_4 = 0.1875$$

**Table 1. 3 Assessment Table**

Explanation and development of variable values in the criteria that have been obtained in the selection of worship leaders, namely: Adult age, age is one of the criteria in the selection of worship leaders, which is needed to find candidates for worship leaders from the experience they have, here is the assessment:

- More than 70thn with a weight of 5
- 60 – 69 with a weight of 4
- 40 – 50thn with a weight of 3
- 30 – 39thn with a weight of 2
- 25 – 29thn with a weight of 1

The period of service in the church, judging from each year the activeness of the ministry in church activities, with the following supervision:

- More than 6 years with a weight of 5
- 5-6 years with a weight of 4
- 4-5 years with a weight of 3
- 3-4 years with a weight of 2
- 1-2 years with a weight of 1

Bible Knowledge, seen from spiritual understanding by understanding God's words well in each worship leader with the following assessment:

- Very Familiar with weight 4
- Familiar with weight 3
- Pretty Familiar with weight 2
- Less Familiar with weight 1

Activeness of Sharing, seen in the actives during the sharing session at each assessment service as follows:

- 1 time in one week with a weight of 1
- 2 times a week with a weight of 2
- 3 times a week with a weight of 3

### III. DISCUSSION

#### 3.1 Simple Additive Weighting and Weight Product calculations

In the information obtained from the meeting with the herders will be resolved using the SAW and WP procedures that will make the positioning. Values from

the rating or load table will be normalized. Normalization involves the state of the SAW and WP systems in computing again to find the reference price.

The result of normalization is obtained from the weight value divided by the value present in the scoring or weighting table. Larger value will be the denominator if the benefit attribute and vice versa if the cost attribute. An example of a manual calculation:

SAW calculation stage

$$A1 = (3/4)(3/4) (3/4)(2/4)$$

$$A2 = (3/4)(4/4) (4/4)(1/4)$$

$$A3 = (4/4)(4/4) (3/4)(1/4)$$

$$A4 = (4/4)(4/4) (4/4)(3/4)$$

$$A5 = (3/4)(3/4) (3/4)(3/4)$$

The result of the hiutulation will be formed into a normalization table

Table 1. 4 Normalization Table

Code	Age	Servi ce Perio d	Bible Knowledge	Sharin g
A1	0.75	0.75	0.75	0.666 7
A2	0.75	1	1	0,333 3
A3	1	1	0.75	0.333 3
A4	1	1	1	1
A5	0.75	0.75	0.75	1

The normalization value will be calculated to be the reference value Here's the normal calculation:

$$A1 = 0.25(0.75) + 0.3125(0.75) + 0.25(0.75) + 0.1875(0.6666) = 0.7344$$

$$A2 = 0.25(0.75) + 0.3125(1) + 0.25(1) + 0.1875(0.3333) = 0.8125$$

$$A3 = 0.25(1) + 0.3125(1) + 0.25(0.75) + 0.1875(0.3333) = 0.8125$$

$$A4 = 0.25(1) + 0.3125(1) + 0.25(1) + 0.1875(1) = 1$$

$$A5 = 0.25(0.75) + 0.3125(0.75) + 0.25(0.75) + 0.1875(1) = 0.7969$$

The results of the calculation of the preference value obtained will be entered in the form of a ranking table, as follows:

**Table 1. 5 SAW Preference Value Table**

Ranking	Pref Value	Alternative Names
1	1	Mr. Philemon Kurniawan
2	0.8125	Mr . Harley
3	0.8125	Mr Santosa
4	0.7969	Mrs. Bong Linda
5	0.7344	Sarinah's mother

**WP Calculation Stage**

Correct the weight first as so that = 1, obtained : $\sum w_j$

$$w1 = 0.25; w2 = 0.3125; w3 = 0.25; w4 = 0.1875$$

Normalization S can be calculated as follows:

$$S1 = (3^{0.25})(3^{0.3125})(3^{0.25})(2^{0.1875}) = 2.7804$$

$$S2 = (3^{0.25})(4^{0.3125})(4^{0.25})(1^{0.1875}) = 2.8704$$

$$S3 = (4^{0.25})(4^{0.3125})(3^{0.25})(1^{0.1875}) = 2.8704$$

$$S4 = (4^{0.25})(4^{0.3125})(4^{0.25})(3^{0.1875}) = 3.79$$

$$S5 = (3^{0.25})(3^{0.3125})(3^{0.25})(3^{0.1875}) = 3$$

The value of Preference V to be used for ranking can be calculated as follows:

$$V1 = \frac{2.7804}{2.7804 + 2.9740 + 2.8740 + 3.79 + 3} = 0.1816$$

$$V2 = \frac{2.9740}{2.7804 + 2.9740 + 2.8740 + 3.79 + 3} = 0.1875$$

$$V3 = \frac{2.8740}{2.7804 + 2.9740 + 2.8740 + 3.79 + 3} = 0.1875$$

$$V4 = \frac{3.79}{2.7804 + 2.9740 + 2.8740 + 3.79 + 3} = 0.2475$$

$$V5 = \frac{3}{2.7804 + 2.9740 + 2.8740 + 3.79 + 3} = 0.1956$$

Here are the results of the calculation of the total and ranking of WP:

**Table 1. 6 WP Preference Value Table**

Ranking	Pref Value	Alternative Names
1	0.2475	Mr. Philemon Kurniawan
2	0.1959	Mrs. Bong Linda
3	0.1875	Mr. Harley
4	0.1875	Mr Santosa
5	0.1816	Mr Sarinah

### 3.2 Program View

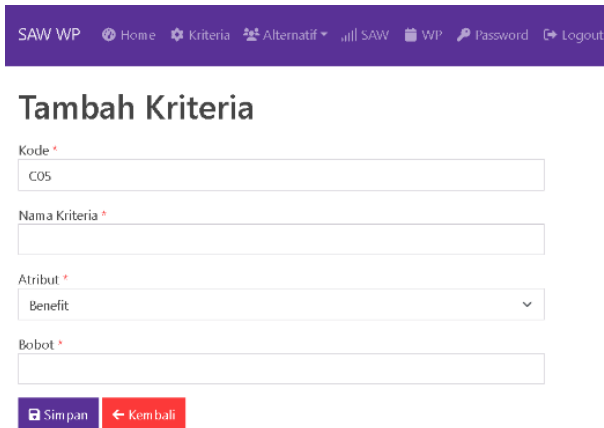


Figure 1. 1 Image Add Criteria

A criteria and attribute input page that serves to enter what criteria will be determined by the admin and attributes of those criteria.

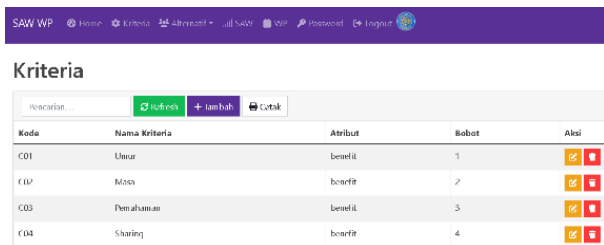


Figure 1. 2 Menu Images Add Criteria

After inputting the criteria name and attributes, the next mapping or criteria table will appear

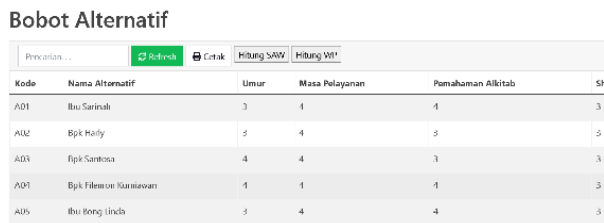


Figure 1. 3 Alternative Weight Images

The Weights page of each alternative that would be a candidate for worship leadership, on this page can change the weight of the criteria. On this page, you will immediately be able to click the calculate button.

### Perhitungan SAW

Data Alternatif					
Kode	Nama	Umur yang Dewasa	Masa Pelayanan di Gereja	Pemahaman Alkitab	Keaktifan Sharing
A01	Ibu Sarinah	3	3	3	2
A02	Bpk Harly	3	4	4	1
A03	Bpk Santosa	4	4	3	1
A04	Bpk Filemon Kumawan	4	4	4	3
A05	Ibu Bong Linda	3	3	3	3
	Max	4	4	4	3
	Min	3	3	3	1
	Atribut	benefit	benefit	benefit	benefit
	Bobot	4	5	4	3
	Bobot (Normal)	0.25	0.3125	0.25	0.1875

Normalisasi				
Kode	Umur yang Dewasa	Masa Pelayanan di Gereja	Pemahaman Alkitab	Keaktifan Sharing
A01	0.75	0.75	0.75	0.6667
A02	0.75	1	1	0.3333
A03	1	1	0.75	0.3333
A04	1	1	1	1
A05	0.75	0.75	0.75	1

Figure 1. 4 SAW Calculation Display Image

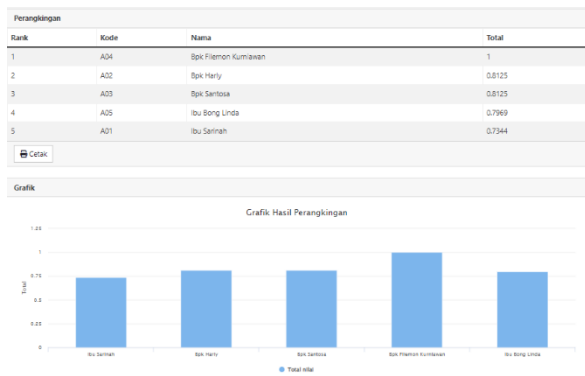


Figure 1. 5 SAW Calculation Display Image

Later, the click button on calculate SAW will display the calculation details along with the calculation process that there is a ranking chart.

### Perhitungan WP

Data Alternatif					
Kode	Nama	Umur yang Dewasa	Masa Pelayanan di Gereja	Pemahaman Alkitab	Keaktifan Sharing
A01	Ibu Sarinah	3	3	3	2
A02	Bpk Harly	3	4	4	1
A03	Bpk Santosa	4	4	3	1
A04	Bpk Filemon Kumawan	4	4	4	3
A05	Ibu Bong Linda	3	3	3	3
	Atribut	benefit	benefit	benefit	benefit
	Bobot	4	5	4	3
	Bobot (Normal)	0.25	0.3125	0.25	0.1875

Normalisasi	
Kode	Vektor S
A04	3.79
A05	3
A02	2.8704
A03	2.8704
A01	2.7804

Figure 1. 6 WP Display Image

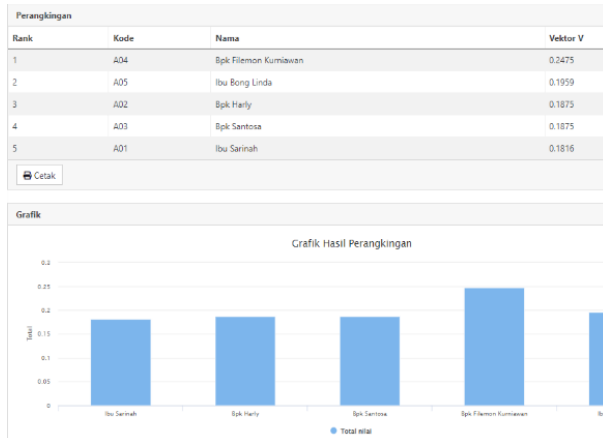


Figure 1. 7 WP Calculation Display Image

The click button calculate WP will also display the calculation details along with the calculation process that there is a ranking chart.

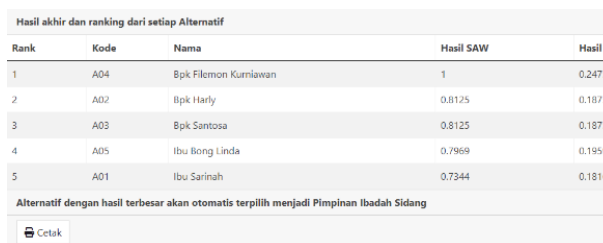


Figure 1. 8 Final Result Display Image

In the end, there will be a final results page after the SAW and WP calculation process that will be able to see who is elected to be the leader of worship.

## IV. CONCLUSIONS AND SUGGESTIONS

### 4.1 Conclusion

Judging from the exploration that has been carried out involving the SAW and WP strategies in the selection of love pioneers in GSJK CHURCH Hallway 4, the creator can conclude that.

1. The use of a decision support system for the selection of worship leaders in GSJK Hall 4 will result in selective and subjective selection using predetermined weight assessments.
2. The Simple Additive Weighting (SAW) and Weight Product (WP) methods can

uphold the determination of the pioneers of worship leaders by providing elective rankings.

3. The decision support system that is built can facilitate the decision process that will be decided in choosing worship leaders.

### 4.2 Suggestion

Given this whole explored conversation, very well can be proposed several ideas, which are the following:

1. The use of a decision support system for the selection of worship leaders in GSJK Hall 4 will result in selective and subjective selection using the specified priority value or weight.
2. The Simple Additive Weighting (SAW) and Weight Product (WP) methods are able to support the selection of worship leaders by providing alternative rankings.
3. The decision support system that is built can facilitate the decision process that will be decided in choosing worship leaders.



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### **BIOGRAPHY**

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