



DECISION SUPPORT SYSTEM FOR DETERMINING INDIGENT PUBLIC HEALTH INSURANCE PARTICIPANTS WITH WEIGHTED PRODUCT METHOD IN PRINGSEWU

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Abstract

JAMKESMAS to realize health equity is one of the programs implemented by the Government of Indonesia through the Social Service and Health Office, this program is implemented in rural and suburban areas. The JAMKESMAS program is aimed at people who are deprived or have low income in rural areas. With JAMKESMAS, it is hoped that they can get assistance in the health sector in Indonesia. The implementation of this program is in order to support the achievement of targets through mainstreaming and expanding community-based development approaches. However, to determine the participants of JAMKESMAS is very difficult because many people will be selected. This is what makes the author want to do research and create a decision support system so that it is fast in the selection process. The method used is the WP method. The result of this decision support system is that the provision of assistance to JAMKESMAS is right on target for families who really need this assistance.

1.0 INTRODUCTION

Health care is a right for every citizen, including those who are in a financially disadvantaged condition. However, the implementation of the Indigent Public Health Insurance (JKTM) program is often faced with challenges of limited resources and the complexity of determining eligible participants. The government based on article 28 of the 1945 Constitution provides health services to ensure access to the poor by issuing JAMKESMAS. However, the current JAMKESMAS program has problems in terms of determining JAMKESMAS beneficiaries. Because in decision making there is still subjectivity and the selection process runs less quickly [1].

Based on research conducted [1], The Weighted Product (WPM) method is used to determine PKH social assistance recipients. WPM aims to minimize cost criteria and maximize benefit criteria, resulting in an ideal solution that sequences PKH alternatives. The stability of the ranking position of PKH participants was tested using 6 variations in the weight of criteria. The results showed that the WPM method was considered stable, with 21.6% of ranking positions very stable and 67.5% stable. This means that 89.1% of ranking positions are considered stable. The study used a dataset consisting of 292 PKH social aid recipients in Kelurahan Ilir Barat I Kota

Palembang. The data includes information such as PKH number, participant name, address, number of children, occupation, living conditions, education level of the head of the family, and other relevant details. Questionnaires were also distributed to 35 PKH assistants to determine the weight of the criteria. The study also analyzed the sensitivity of criterion weights using one-dimensional sensitivity analysis. The results showed that the WPM method was relatively stable with some changes in ranking positions. Research conducted [2] shows that the implementation of decision support systems with weighted product methods and RSA algorithms can overcome the problem of ineffectiveness of aid distribution. Decision support systems help in selecting direct beneficiaries more effectively and efficiently by considering various criteria and assessments. The weighted product method allows accurate calculation and rating of beneficiaries. In addition, RSA algorithms ensure strong data security by encrypting and decrypting sensitive information, making it harder for unauthorized individuals to access data. This research makes a valuable contribution in improving aid distribution and ensuring data confidentiality. Based on research conducted [3] shows that the implementation of the Weighted Product algorithm in the decision support system for determining Smart Indonesia Card (KIP) recipients at SMA Negeri 03 South Bengkulu has been successful. This system is able to assist schools in providing appropriate assistance to eligible students. This system utilizes a MySQL database to store and manage information and data inputted into the decision support system. The study also mentions the use of blackbox testing as a method for testing applications, specifically focusing on the user interface. The research also highlights the importance of education and its contribution to the progress of a nation. Education is seen as a means of transmitting knowledge, beliefs, values, skills, and other important aspects from one generation to the next.

The research that has been carried out emphasizes the study of accurate and valid data in the distribution of KIP, because errors in allocating KIP can occur if not given to eligible recipients. While the research conducted focuses on the study of variables that are used as a benchmark for decision making, as well as methods used in the decision-making process. By accepting JAMKESMAS, it is expected to encourage changes in the behavior of JAMKESMAS recipients to attend school and access health facilities, but so far policy makers do not require JAMKESMAS recipients to use JAMKESMAS assistance money for access to education and health. This is not in line with the original purpose of providing JAMKESMAS assistance. So it is necessary to conduct research on the accuracy of the target of JAMKESMAS assistance, which means whether the assistance received by RTSM is used for things that support the objectives of JAMKESMAS. At this time the determination of JAMKESMAS participants is very difficult, this is due to the large number of underprivileged communities, to avoid providing inappropriate assistance, it is necessary to have a system that can help speed up the process of determining JAMKESMAS participants.

Therefore, an efficient and objective decision support system is needed to determine who is eligible to benefit from the program. The weighted method is a relevant choice because it can provide an assessment structure based on predetermined criteria. With the use of a weighted method-based decision support system, the selection process for JKTM participants can be carried out transparently and fairly, reducing the risk of bias and discrimination in decision making. In addition, advances in information technology also allow faster and more accurate data processing, so that this system can be adapted to changes in social, demographic, and public health service priorities. Thus, a decision support system with a weighted method will make a positive contribution in ensuring equal access to health for underprivileged people and strengthen policy evaluation for the improvement and development of the JKTM program in the future.

2.0 THEORETICAL

2.1. Definition of Decision Support System

Decision Support System or Decision Support System is generally defined as a system that is able to provide both problem-solving and communication skills for semi-structured problems. In particular, DSS is defined as a system that supports the work of a manager or a group of managers in solving semi-structured problems by providing information or proposals leading to certain decisions (Hermawan, 2013)[4].

Decision making is the primary function of a manager or administrator. Decision-making activities include identifying problems, finding alternative problem solving, evaluating these alternatives and selecting the best decision alternatives. A manager's ability to make decisions can be improved if he knows and masters the theories and techniques of decision making. With the improvement of the manager's ability to make decisions, it is expected to improve the quality of the decisions he makes, and this will certainly increase the work efficiency of the manager concerned. According to Turban (2014), the objectives of DSS are as follows: [5][6].

- 1) Assist in decision making on structured issues
- 2) Provide support for managerial considerations rather than being intended to replace the manager's function.
- 3) Increase the effectiveness of decisions taken rather than improvements in their efficiency.
- 4) Computing speed Increase productivity
- 5) Quality support
- 6) Competitive
- 7) Overcoming cognitive limitations in processing and storage

The characteristics of DSS formulated by Kusri (2012) are as follows: [5]

- 1) DSS is intended to help with less structured decisions.
- 2) DSS is a combination of qualitative capital sets and data sets.
- 3) DSS is flexible and can adjust to changes that occur.

2.2. JAMKESMAS

JAMKESMAS is a social assistance program for health services for poor and underprivileged people. This program is organized nationally so that cross-subsidies occur in order to realize comprehensive health services for the poor. In essence, health services to the poor are the responsibility and are carried out jointly by the Central, Province/District/City Government, which is obliged to contribute so as to produce optimal services.

The main objective of this JAMKESMAS is to reduce the number and break the chain of poverty, improve the quality of human resources, and change the less supportive behavior of the poorest groups. This goal is directly related to efforts to accelerate the achievement of the *Millennium Development Goals* (MDGs) target. In addition to this, there are still several other purposes of this JAMKESMAS both specifically and in general.

2.3 Weighted Product (WP) Method

The Weighted Product (WP) method uses multiplication to link attribute ratings, where the rating of each attribute must first be raised to the weight of the attribute concerned. The process is the same as normalization. The weighted product method can help in making decisions, but calculations using the weighted product method only produce the largest value that will be selected as the best alternative. The calculation will be in accordance with this method if the selected alternative meets the predetermined criteria. Method *Weighted Product* It is more efficient because the time required in calculations is shorter [7][8][9].

Multi Attribute Decision Making (MADM) is a method used to find the most optimal alternative from a number of optimal alternatives with certain criteria. The essence of MADM is to determine the weight value for each attribute, then proceed with the ranking process that will select alternatives that have been given. *Weighted Product* (WP) is one of the methods used to solve MADM problems. WP is a method that uses multiplication to relate attribute ratings, where *rating* Each attribute must first be raised to the rank of the corresponding weight. This process is the same as the normalization process[10].

The WP method can help in making laptop selection decisions, but calculations using this WP method only produce the largest value that will be chosen as the best alternative. The calculation will be in accordance with this method if the selected alternative meets the predetermined criteria. This WP method is more efficient because the time required in calculations is shorter. The weight for the benefit attribute serves as a positive power in the multiplication process, while the cost weight serves as a negative power [9]. Fix weight for = 1 using the equation $\sum W_j$ [6].

$$W_j = \frac{w}{\sum w} \quad (1)$$

The variable W is a positive value power for profit tribute and a negative value for cost tribute. Preference for alternative $S_i = (2) \prod_j x_{xij}^{wj}$ with $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$, as attributes.

The largest value of V_i states that the alternative A_i is chosen. The steps on the WP calculation are as follows:

1. Switches all attributes for all alternatives with W (weight) as a positive power for the profit attribute and a negative value for the cost attribute.
2. The multiplication results are summed to produce a value on each alternative.
3. Divide the value of V for each alternative by the total value of all alternatives.
4. Found the best alternative order that will be the decision. [10][4], [11], [12]

3.0 METHODOLOGY

3.1 Data Collection Methods

The methods that the author does are as follows [13]:

1. Interview methods
This method is by the author conducting interviews with social service employees.
2. Observation methods
The author made observations on objects directly at the JAMKESMAS office.
3. Documentation methods
This method the author uses to find out the processes of selecting JAMKESMAS recipients.
4. Bibliography method
The author utilizes existing theories concerning the sciences of information systems and information technology, especially in the field of the web.

3.2. Observation Methods

In designing this system using the *waterfall* method is a method that is often used by system analyzers in general. The essence of the *waterfall* method is that the work of a system is carried out sequentially or linearly. So if step 1 has not been done, then step 2 cannot be done. If the 2nd step has not been done then the 3rd step cannot be done either, and so on. Automatically the 3rd step will be able to be done if the 1st and 2nd steps have been done. In the *waterfall* method go through stages such as:

- a. Needs Analysis
This step is an analysis of system requirements. Data collection in this stage by conducting a study, interviews and literature studies. System analyst by extracting as much information as possible from *the user* so that it will create a computer system that can perform the tasks desired by the *user*. This stage will produce *user requirement* documents or can be said to be data related to user wishes in making the system. This document will be a reference for system analysts to translate into the language of programmers.
- b. System Design
The stage where the pouring of thought and system design for the solution of existing problems is carried out using system modeling tools such as *data flow diagrams*, *entity relationship diagrams* and data structure and discussion.
- c. Program Code Writing
Writing program code or *coding* is a translation of *design* in a language that can be recognized by a computer. Done by programmers who will translate transactions requested by users. This stage is the real stage in working on a system. In the sense that the use of computers will be maximized in this stage. After the coding is complete, testing will be carried out on the system that has been created earlier. The purpose of *testing* is to find errors in the system and then they can be corrected.
- d. Program Testing

The final stage where the new system is tested for its ability and effectiveness so that the shortcomings and weaknesses of the system are obtained which are then reviewed and improved on the application to be better and perfect.

e. Program Implementation and Maintenance

Software that has been delivered to prospective new student applicants will definitely undergo changes. The change could be due to an error because the software must adapt to a new environment (peripheral or operating system), or because prospective new students need functional development.

4.0 RESULTANTS

4.1. Weighted Product (WP) Calculation

The Weighted Product Method Application System to select superior JAMKESMAS recipients has a four-stage process to obtain the recommendation results of superior JAMKESMAS recipients. The first stage of the admin fills in the superior JAMKESMAS recipient data, in the form of information on thin meat thickness, large JAMKESMAS recipient seed size, white meat color, little meat moisture content (dry), smooth meat texture with little fiber, large fruit size, stimulating strong aroma. Then the system will process converting the input of land criteria data in the form of land status, land area, population density and distance from settlements into match rating value data. The second stage of the process of applying the weighted product method is weight improvement, by means of data on the weight value of meat thickness, size of seeds receiving JAMKESMAS, meat color, meat texture, fruit size, fruit aroma as a whole are added to get the results of the amount of weight. Then proceed the initial weight of each criterion of meat thickness, size of seeds receiving JAMKESMAS, meat color, texture of meat, size of fruit, fruit aroma of each criterion divided by the results of the number of criteria weights to get a weight improvement value. The third stage of the process of applying the weighted product method is to find the vector S value by means of data for each alternative match rating value of the superior JAMKESMAS recipient multiplied and ranked with the results of the criterion weight improvement value. The fourth stage of the process of applying the weighted product method is to find the value of vector V by means of which the final value of each preference vector S is added to get the sum result, after getting the sum result then proceed with each alternative preference of vector S results divided by the number of vector S results to get the value of vector V from each alternative. The fifth stage of the system will rank the highest vector V value of each alternative land that has been processed using the weighted product method to get superior JAMKESMAS recipients. The method used in making decisions to select superior JAMKESMAS recipient seeds is the Weighted Product (WP) method. Here is the system analysis and calculation of the WP method.

1. Determine the types of selection criteria for seed recipients of superior JAMKESMAS. In this study, the criteria needed to select the recipient of superior JAMKESMAS are the thickness of the fruit flesh, the size of the seed, the color of the flesh, the texture of the flesh, the size of the fruit, the aroma, the weight of the seed.
2. Determining alternative weights on each criterion is assessed with 1 to 5, this gradation of weighting refers to the Likert scale, namely:
 - 1 = Very unimportant
 - 2 = Not important
 - 3 = Hesitate
 - 4 = Important
 - 5 = Very Important

The weighting of the criteria can be seen in table 1 below:

Criterion	Scale	Weight
Revenue per month	50.000 – 100.000	5
	100.100 – 200.000	4
	200.100 – 300.000	3
	300.100 – 400.000	2

	400.100 – 500.000	1
Number of dependents of schoolchildren	> 5	5
	4-5	4
	3-4	3
	2-3	2
	0-1	1
Residence	Rent	5
	Own place to edit	3
	Hitchhiking a relative's place	2
	Boarding the parents' place	1

3. In this study, seven samples of JAMKESMAS beneficiary data will be used. Table 2 shows the data of JAMKESMAS recipients.

Table 2 Recipient data

No	Alternative	Revenue per month	Number of dependents of schoolchildren	Residence
1	A	5	5	5
2	B	4	4	3
3	C	3	2	2
4	D	2	3	1
5	E	1	1	3
6	F	2	2	2
7	G	3	3	2

4. In this system, the user or farmer enters the importance weight for each criterion. Table 4 shows the weight of user input.
5. Next, weight repairs will be carried out first. The initial weight $W = (4, 3, 3)$ will be fixed so that the total weight, where W is the weight of each criterion that the user enters, As for the calculation of improving the criteria using the equation. $\sum W_j = 1$

Table 4 User Input Weights

Criterion	User Feedback
Revenue per month	4
Number of dependents of schoolchildren	3
Residence	5

$$W1 = 0.33 \frac{4}{4+3+5}$$

$$W2 = 0.25 \frac{3}{4+3+5}$$

$$W3 = 0.416 \frac{5}{4+3+5}$$

6. Table 5 shows the weight improvement of user input.

Table 5 Weight improvements from user input

Criterion	User Feedback	Weight improvement
Income	4	0.33
Number of dependents	3	0.25
Residence	5	0.416

7. Then the next step is to calculate vector S , which is the value of each alternative.

Alternative JAMKESMAS 1 Beneficiaries

$$S1 = 1,302(5^{0.33})(5^{0.25})(5^{-0.416})$$

Alternative JAMKESMAS 2 Recipients

$$S2 = 0,023(4^{0.33})(4^{0.25})(3^{-0.416})$$

Alternative JAMKESMAS Recipients 3

$$S3 = 0,095(3^{0.33})(2^{0.25})(2^{-0.416})$$

Alternative JAMKESMAS Recipients 4

$$S4 = 1,654(2^{0.33})(3^{0.25})(1^{-0.416})$$

Alternative JAMKESMAS Beneficiaries 5

$$S5 = 0,010(1^{0.33})(1^{0.25})(3^{-0.416})$$

Alternative JAMKESMAS Recipients 6

$$S6 = 0,083(2^{0.33})(2^{0.25})(2^{-0.416})$$

Alternative JAMKESMAS Recipients 7

$$S7 = 0,105(3^{0.33})(3^{0.25})(2^{-0.416})$$

8. After calculating the value of vector V, the largest value is obtained which is the best alternative. Table 6 shows the results of the ranking of alternative JAMKESMAS recipients.

Level	Alternative	Result
1	D	0,397
2	E	0,007
3	G	0,029
4	C	0,505
5	F	0,003
6	A	0,025
7	B	0,032

5.0 CONCLUSION

Based on the research that has been carried out, the support system for JAMKESMAS participants is designed using the WP method, conclusions are obtained to determine the recipients of JAMKESMAS by taking three criteria, namely: income per month, number of dependents, place of residence. Suggestions submitted for future development to test the success rate of the WP (*Simple Additive Weight*) method should be carried out in several different areas with different parameter criteria values for each alternative so that the success rate of this method can be calculated with the results in the field. Further research can also be done by integrating the existing participant determination system so that it can be seen what criteria are suitable.

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