Implementation of the Multi-Objective Optimization Method based on Ratio Analysis (MOORA) in the Decision Support System for Determining the Beneficiary of BPJS Health Contribution Assistance (Case Study: Loru Village, Sigi Regency)

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ABSTRACT

Introduction: This study aims to build an application that can carry out the selection process for prospective recipients of contribution assistance so that it is easier and becomes an alternative choice for the Village Government in determining eligible residents for BPJS Health contribution assistance in Loru Village, Sigi Regency. **Methods:** This decision support system application is web-based using the Hypertext Preprocessor (PHP) programming language with the Multi-Objective Optimization method On The Basis Of The Ratio Analysis (MOORA), using sublime text three software and also MySQL as the database. In this study, 444 households were used as data for heads of households. With the system, orders will be carried out objectively and in detail. To determine which residents are truly entitled to receive assistance, this is done by compiling citizen data by considering the value of the MOORA method formula for each of the specified criteria. **Result:** The results that have been carried out by this author are a solution to determine the recipients of BPJS Health contribution assistance in Loru Village, Sigi Regency so that the selection process can be more effective in terms of time and operation. **Conclu**sions: Manual calculations as a comparison with the calculation of the system built, the same results were obtained. This shows that the system built can process the selection of potential recipients of contribution assistance. The result of the system process using the MOORA method is the ranking of PBI candidates with the highest rank to the lowest rank.

1. Introduction

BPJS Health for Contribution Assistance Recipients (PBI) based on PP No. 101 of 2012 concerning Recipients of Health Insurance Contribution Assistance Article 1 paragraph (4) are the

poor and the underprivileged as participants of the health insurance program, and paragraph (3) the health insurance program contributions for the poor and the underprivileged are paid by the government [1],[2]. Determining the recipient of contribution assistance is often a fairly complicated issue [3]–[5]. The dynamics of poverty data require a policy from the government, with data collection that goes directly to the field to get valid data [6]–[8]. However, determining the recipient of assistance is still done manually to provide justice for fellow poor households.

In making a decision to determine the family of contribution assistance recipients, a system is needed that can help overcome fraud or mistakes made by certain parties in selecting or deciding the recipients of contribution assistance [9]–[11]. This problem is also encountered in Loru Village, Sigi Regency, which causes the provision of assistance to be less effective and efficient. To make the selection process easier, the village government must change the manual selection process to a new computerized process because a large number of underprivileged residents will make the selection officer at the village office have difficulty in determining the eligible residents to be recipients of contribution assistance. An application system can simplify performance in processing data and reduce the occurrence of human errors [12]–[14]. The decision support system is a computer-based information system that produces various alternative decisions to assist management in dealing with semi-structured and unstructured problems using data and models [15], [16]. Currently, there are many decision support system methods that have emerged that can help humans to provide the best solution in making decisions, such as WP, PM, SAW, TOPSIS, AHP, WASPAS, PROMETHEE, MOORA, and others [17]. This study using the MOORA (Multi-Objective Optimization On The Basis Of Ratio Analysis) method. The advantage of the MOORA method is that the method is very simple and does not require an expert in mathematics to use it and the mathematical calculations are very simple. MOORA is a method that has a minimum and very simple calculation [18]. Based on the description of the problem, the author takes a solution to overcome this problem in the research entitled "Implementation of the Multi-Objective Optimization Method On The Basis Of Ratio Analysis (MOORA) in the Decision Support System for Determining the Beneficiary of BPJS Health Contribution Assistance (Case Study: Loru Village, District of Sigi)".

2. Materials and Method

The type of research conducted in this case is a descriptive qualitative research which states that the qualitative research method is a research method based on the philosophy of positivism, which is used to examine the condition of natural objects. In this study, the researcher is the key instrument. A sampling of data sources was carried out purposively and snowballing, combining techniques used triangulation (combined), data analysis was inductive/qualitative, and qualitative research results emphasized meaning rather than generalization. The system development method used in this research is the development of Extreme Programming. Extreme Programming is a software engineering process that tends to use an object-oriented approach, and the target of this method is a team formed on a small to medium scale; and this method is also suitable if the team is faced with unclear requirements or there are very fast changes in requirements. The analytical method used is Multi-Objective Optimization On The Basis Of Ratio Analysis (MOORA) because the basic concept of the MOORA method is to find the weighted summation of the performance ratings on each alternative of all attributes. The programming language used is PHP, while the database is MySQL. The method used to test this system is the Black Box Testing method, where testing is carried out by assessing software testing methods that test application functionality.

3. Result and Discussion

3.1. Proposed System Analysis System

The analysis starts from getting data on Loru Village office employees and the variables used in determining the prospective recipients of contribution assistance, and then a decision support system

application is built whose data is stored in a database. The application generates a recommendation report of family names based on ranking.

3.2. Analysis of MOORA Method

In determining the potential recipients of contribution assistance, there are 14 criteria that will become variables. These criteria are obtained from the research site and are usually used by the government in selecting prospective beneficiaries. Can be seen in Table 1.

Table 1. Criteria

No	Criteria	Value
C1	Status of the occupied residential building	9
C2	Status of occupied residential land	9
C3	Floor area	7
C4	The widest type of floor	8
C5	The widest type of wall	8
C6	The widest type of roof	7
C7	Source of drinking water	8
C8	The main source of light	8
C9	Main fuel/energy for cooking	6
C10	Use of defecation facilities	6
C11	Gold/jewelry & savings (worth 10 grams of gold)	5
C12	Motorcycle	5
C13	Car	5
C14	Family Income	9

Each alternative is given a value for the existing criteria, then given a weight value according to the weight on each criterion. The results can be seen in the weighted normalization matrix as follows :

Table 2. Normalization Matrix

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
0,218	0,267	0,408	0,087	0,147	0,147	0,089	0,267	0,105	0,267	0,333	0,408	0,408	0,218
0,872	0,801	0,816	0,786	0,884	0,884	0,890	0,801	0,843	0,801	0,666	0,816	0,816	0,872
0,436	0,534	0,408	0,611	0,442	0,442	0,445	0,534	0,527	0,534	0,666	0,408	0,408	0,436

Table 3. Weighted Normalization Matrix

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14

1,962	2,403	2,856	0,696	1,176	1,029	2,712	2,136	0,630	1,602	1,665	2,040	2,040	1,962
7,848	7,209	5,712	6,288	7,072	6,188	7,120	6,408	5,058	4,806	3,330	4,080	4,080	7,848
3,924	0,806	2,856	4,888	3,536	3,536	3,560	4,272	3,162	3,204	0,330	2,040	2,040	3,924

MOORA Multi-objective Optimization Value Calculation (max-min) in this case example, each criterion has its own weight (W). This optimization value is calculated for each given alternative. This value is the sum of the multiplication of the criteria weights with the maximum attribute value (max), which is the value of the benefit type attribute minus the number of multiplications of the criterion weight with the minimum attribute value (min), which is the cost type attribute value. Next, the Yi value is searched :

Table 4. Yi Value Search

Alternative	**Max (C1 + C2 + C3 + C4 + C5+C6+C7+C8+C9+C10+C11+C12+C13+C14)**	**Min (0)**	**Yi (Max – Min)**
Andi	1,962+2,403+2,856+0,696+1,176+1,029+2,712+2,136+0,630 +1,602+1,665+2,040+2,040+1,962	0	25,182
Bahar	7,848+7,209+5,712+6,288+7,072+6,188+7,120+6,408+5,058+4,806+3,330+4,080+4,080+7,848	0	83,047
Rahmat	3,924+0,806+2,856+4,888+3,536+3,536+3,560+4,272+3,162+3,204+0,330+2,040+2,040+3,924	0	40,038

Table 5. Ranking Results

No	**Alternative**	**Value**
1	Bahar	83,047
2	Rahmat	40,038
3	Andi	25,182

The result of the sum is the final value of each alternative. This value will determine who is entitled to be the recipient of BPJS Health contribution assistance. This MOORA method can be applied to a decision support system program for recipients of BPJS Health contributions in Loru Village, Sigi Regency. The MOORA method can calculate the weight of the criteria from all data on household heads that have been surveyed directly in the field. An example of this system working can be seen in Figure 4.30 on the next page. The author uses 444 original data from the Central Statistics Agency of Central Sulawesi Province. System testing that the author does is BlackBox testing and testing the MOORA method. In the BlackBox testing that the author did, it went well. The components in the system were running according to the author's expectations. In testing the MOORA method, the author performs a manual calculation process that intends to match the results of the calculations carried out by the system, and the results obtained by manual calculations and system calculations produce the same results.

4. Conclusion

Based on manual calculations as a comparison with the calculation of the system built, the same results were obtained. This shows that the system built can process the selection of potential

recipients of contribution assistance. The result of the system process using the MOORA method is the ranking of PBI candidates with the highest rank to the lowest rank. The results of this ranking become a recommendation for the Village office in determining prospective recipients of contribution assistance. The decision support system made can simplify and speed up data processing so as to create work effectiveness and efficiency.

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