

SISTEM PENDUKUNG KEPUTUSAN PENENTUAN BANTUAN RASKIN MENGUNAKAN METODE ELECTRE

DECISION SUPPORT SYSTEM FOR DETERMINING RASKIN ASSISTANCE USING THE ELECTRE METHOD

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ABSTRACT

The problem of poverty remains the biggest problem to date. The government, as the responsible for this problem, always tries its best to solve this problem. One of the solutions that the government has provided in this regard is to launch social programs such as the Raskin program. Raskin as a program has many benefits such as food security and social protection for poor households. This research attempts to support the government in this program, by developing a program to determine the right target of Raskin beneficiaries. This program is built on a web base by adopting a decision support system using the electre method. This method is a multi-criteria method based on ranking. Based on the results of calculations using this program, it is concluded that the best alternatives are Dea, Fadil and Fitri

Keywords: Decision support system, Electre Method, Raskin

INTRODUCTION

Information technology at present is a method, tool or method used by humans to solve a problem in order to make it more efficient and convenient. For this reason, all agency resources must be optimally and professionally mobilized to support the agency's success. One of the tasks which must be performed by a government is to provide assistance to the poor who are in the territory of its government, one form of this government assistance is Raskin (Miskin Rice) assistance to the poor who are in the Lawe Alas District, regency of southeastern Aceh. The government publishes a budget for social assistance every year. Raskin is a government social assistance program aimed at providing protection and increasing food security for poor households. With the Raskin program, he can ease the burden in economic terms to meet the food needs of poor households. Each poor household will receive aid in the form of rice up to 15 kg/head of household/month. Since 1998, the Raskin program has been launched, called Special Market Operation (OPK). This program has the function of an emergency program

(social safety net) to strengthen the food security of poor households. Then from 2002 it was changed to raskin which operates under the community social welfare (welfare) scheme. Then, currently, the Raskin beneficiary mechanism has also been designed by the government by implementing a card to access all the aid that comes from the government ((Syahril & Kurniawan, 2019) dan (Wiryan, Suardika, & Putu S, 2020).

The problem encountered in determining the distribution of raskin which is suitable for the population, the employees still do it by viewing classic documents and always using excel applications, and analyzing the reports of the distribution of raskin, this method requires time which is ineffective and ineffective. To solve this problem, it is necessary to pay attention to the determination of Raskin, namely the status of the construction of the house, the materials of the walls, the occupation, the income, the number of dependents, the source of drinking water, the finance department, the electricity source and Raskin's distribution policy. (Brice for the Poor) is a success if 8 political indicators

determine that the raskin (Rice for the Poor) program can be carried out correctly and that it will achieve the objectives that have been set. However, in the distribution of raskin (rice for the poor) in the field, there were 4 indicators that were not properly implemented, namely the right target, the right quality, the right price and the right time.

The Raskin (Beras Miskin) program in the Lawe Alas sub-district serves to reduce the cost of expenditures of poor households. In this case, the District often experiences difficulties due to the large amount of data and criteria to be taken into account in the processing of the data, which is why it is very important to use a decision support system. Therefore, to determine whether Raskin is suitable for housewives, a system is needed to handle this problem. So that it can improve the performance of employees to be more effective and efficient. Therefore, in order for the calculations on this decision support system to be more accurate, an electre method is used. Decision support system is an interactive computer system that helps to make decisions by using data and models to solve unstructured problems (Herlinawati, Adil, & Yunus, 2019).

An information system that provides modeling, information, and data manipulation is the definition of a decision support system (Asrul & Zuhriyah, 2021). SPK is a system for assembling and integrating every intellectual resource from individuals with computer skills to improve the quality of the resulting decisions (Satria, Santoso, & Wahyuni, 2019). Decisions can also be interpreted as an activity of choosing a strategy or action in solving problems (Butet, 2021). In making decisions, data and information processing needs to be done which aims to produce alternative decisions that can be taken (Hariyanto & Maslihah, 2017). Decision making must be based on logical considerations so that it can be accepted by all parties who are the target of the decision. Basically a decision-making system is

designed to support all stages of decision-making starting from identifying problems, selecting relevant data, determining the approach used in the decision-making process, to evaluating alternative choices (Nas, Defit, & Santoni, 2018). For this reason, a system is needed that can help produce decisions. The decision-making system is a computer-based interactive system that is intended to assist in making decisions by utilizing data and models to solve an unstructured problem.

The research will use the Elimination and Choice Translation Reality (ELECTRE) method. ELECTRE is a multi-criteria decision support method based on the concept of outranking using pairwise comparisons of alternatives according to each appropriate criterion.

According to (Sopianti & Bahtiar, 2015) the Electre method is a method used in determining multi-criteria analysis by determining sequence (priority). Its main issues are simplicity, clarity, and stability. In the electre method, the conjecture and domination of the criteria used are the use of the relationship value of the outranking method. The application of the electre method is used in conditions that produce suitable alternatives but in conditions that are not suitable between alternatives to the criteria. Electre can also be used in cases that have few alternatives and are only used in a few criteria according to (Mesran, Pristiwanto, & Sihombing, 2018). The ELECTRE method is a multi-criteria decision-making method based on the Outranking concept by using pairwise comparisons of alternatives based on each appropriate criterion. Decision is an activity to choose a strategy or action in problem solving (Delmayanti, Yunus, & Santony, 2020).

The ELECTRE method is used under conditions where alternatives that do not meet the criteria are eliminated and suitable alternatives can be generated. In other words, the ELECTRE method is suitable for cases with many alternatives but only a

few criteria are involved (Ningsih, Damanik, Gunawan, & Saputra, 2017).

The advantage of the ELECTRE method is that it makes it easier for decision makers to make decisions based on ambiguity and uncertainty in a case that has many alternatives (Yosi, Martha, & Imro'ah, 2020). The disadvantage of the ELECTRE method is that it involves only a few criteria. In this study, the Elimination and Choice Translating Reality (ELECTRE) method was used for the selection process and the Weighted Product method for the specialization process.

Electre is based on the concept of ranking by performing pairwise comparisons between alternatives and criteria. Between 2 alternatives A_k and A_1 in the ranking relationship can be denoted by $A_k RA_1$ if the k -th alternative does not affect the 1st alternative quantitatively, so it is better for decision-making to take the risk of A_k than A_1 (Mada, Resmawan, & Nuha, 2023).

The results of the I-3 accuracy test have an adequacy level of 84.37%. The research of (Kurniawan, Candiasa., & Aryanto, 2019) developed a decision support system to select outstanding students at Dhyana Pura University using AHP, ELECTRE and TOPSIS methods (Kurniawan, Candiasa., & Aryanto, 2019). In this study, the AHP method was used to determine the weighting value of each criterion and to rank the participants' data, while the ELECTRE and TOPSIS methods were used in the ranking process in comparison with the ranking results of the AHP method. According to the results of the tests carried out from the data of 20 students, the AHP method has an accuracy rate of 60%, the ELECTRE method has an accuracy rate of 50% and the TOPSIS method has an accuracy rate of 50%. Thus, the core concept of electre is to compare partners based on criteria, but keep in mind that decision support systems (DSS) are only used to provide alternative choices, not to determine the final decision. This method can bring the right solution to the recipients

of Raskin (Beras Miskin) assistance who deserve it. The above description is a problem that the author will solve through this final project research titled "Decision Support System for Determining Raskin Assistance in Paye Munje Village, Lawe Alas District, Southern District -east of Aceh using the Electree method". The purpose of this study was to design and build an application to determine Raskin beneficiaries in Paye Munje village, Lawe Alas district. Next to learn how to compare Raskin recipient criteria using the Electree method. And to present the information necessary to determine the Raskin criteria such as employment, income, number of dependents, ownership of the dwelling, building area, condition of the dwelling and electricity

RESEARCH METHOD

The research methodology has a very important role in the research of the final assignment, because this research methodology describes the systematic steps followed to solve the problems raised. The description is completed by the presentation of a research implementation flowchart to facilitate the understanding of the research stages. Here is the methodology used in the final research of the project titled "Decision Support System to Determine Raskin Assistance in Paye Muje Village, Lawe Alas District, Southeast Aceh District using of the Electree method". For more details on the methodology of this research can be seen in the following figure:



Figure 1. Research Methodology Flowchart

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How many ways to solve a problem with the following electre method:

Step 1: Normalize the decision matrix

Normalize the matrix r_{ij} can be done with the following equation:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}, \text{ for } i = 1, 2, 3, \dots, m \text{ and } j = 1, 2, 3, \dots, n$$

So obtained matrix r results normalization

$$r = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \dots & \dots & \dots & \dots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

r is matrix that has normalized or called *normalized decision matrix*, with m denoting Lots alternative, n states Lots criteria and r_{ij} is a measurement of the choice of the i -th alternative in relation to the j -th criterion.

Step 2: Weighting on the matrices that have been normalized.

After normalized, every column from matrix r multiplied with weight criteria with equality following:

$$v_{ij} = w_i r_{ij}$$

Step 3: Determine set of concordance and discordance index

For every pair of alternative k and l ($k, l = 1, 2, 3, \dots, m$ and $k \neq l$) set criteria j divided into two subsets, ie *concordance and discordance*.

When A criteria in something alternative including *concordances* are :

$c_{kl} = \{j | y_{kj} \leq y_{lj}\}$, untuk $j = 1, 2, 3, \dots, n$ otherwise, complementary from *subset*

This is *discordance*, that is if :

$d_{kl} = \{j | y_{kj} < y_{lj}\}$, untuk $j = 1, 2, 3, \dots, n$

Step 4: Count matrix *concordance and discordance*

Concordance

For determine mark from elements in the *concordance matrix* is with sum up weights included in *concordance subsets* :

$$c_{kl} = \sum_{j \in C_{kl}} w_j$$

so that the resulting *concordance matrix* are :

$$c = \begin{bmatrix} - & c_{12} & c_{13} & \dots & c_{1n} \\ c_{21} & - & c_{23} & \dots & c_{2n} \\ \dots & \dots & \dots & \dots & \dots \\ c_{m1} & c_{m2} & c_{m3} & \dots & - \end{bmatrix}$$

Discordance

For determine mark from the elements in the *discordance matrix* are with share maximum difference mark included criteria in *discordance subset* with maximum difference mark whole existing criteria, in a the math are :

$$d_{kl} = \frac{\max\{|v_{kj} - v_{lj}|\} j \in d_{kl}}{\max\{|v_{kj} - v_{lj}|\} \forall j}$$

furthermore obtained matrix discordance :

$$d = \begin{bmatrix} - & d_{12} & d_{13} & \dots & d_{1n} \\ d_{21} & - & d_{23} & \dots & d_{2n} \\ \dots & \dots & \dots & \dots & \dots \\ d_{m1} & d_{m2} & d_{m3} & \dots & - \end{bmatrix}$$

Step 5: Determine *matrix dominant concordance and discordance*

Concordance

Count matrix *dominant concordance*

$$\underline{c} = \frac{\sum_{k=1}^m \sum_{l=1}^n c_{kl}}{m \cdot (m - 1)}$$

and value every matrix element f as *matrix dominant concordance* determined as following :

$$f_{kl} = 1, \text{ jika } c_{kl} \geq \underline{c} \text{ dan } f_{kl} = 0, \text{ jika } c_{kl} < \underline{c}$$

Discordance

For build *matrix dominant discordance* also uses help mark *thresholds*, namely :

$$\underline{d} = \frac{\sum_{k=1}^n \sum_{l=1}^n d_{kl}}{m(m - 1)}$$

and value every element For matrix g as *matrix dominant discordance* determined as following :

$$g_{kl} = 1, \text{ jika } d_{kl} \geq \underline{d} \text{ dan } g_{kl} = 0, \text{ jika } d_{kl} < \underline{d}$$

Step 6: Determine *aggregate dominance matrix* .

Next step is determine *aggregate dominance matrix* as matrix e , which every the elements is multiplication between element matrix f with element matrix g , as following :

$$e_{kl} = f_{kl} \times g_{kl}$$

from equality the produce matrix e give order choice from every alternative , ie when $e_{kl} = 1$, then alternative is A_k a better choice than A_r so the rows in matrix e have amount $e_{kl} = 1$ least _ can eliminated . Thus _ alternative best is dominating _ alternative other

RESULTS AND ANALYSIS

Based on the system design performed in this study, it was found that this research resulted in a web-based system with the application of the electre method as a decision support system to determine the recipient of Raskin.

1. System analysis

Weighting and criteria, in this process, weighting and criteria are used in the absolute value of each criterion, and then assimilation is performed in the electre method. In this section, weights consistent with standard determinations of prior research sources and reference journals will be used, as shown in tables 1-6 below.

Table 1. Alternative Sample

Alternative Samples
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10

The table above is intended to display a list of samples used later in system testing.

Tabel 2. Criteria

Criteria	Variable
Status of the construction of the house	C1
Wall Materials	C2
Work	C3
Income	C4
The Number of Dependents	C5
Drinking water source	C6
Financial	C7
Energy source	C8

The table above is intended to provide the criteria used to further determine Raskin recipients. This is in line with Raskin General Guidelines 2014.

Tabel 3. Criteria Weighting

Criteria	Rating weight
Status of the construction of the house	4
Wall Materials	3
Work	5
Income	4
The Number of Dependents	5
Drinking water source	3
Financial	4
Energy source	2

The table above is the weighting of the criteria which will later be used for the weighting of the normalized matrix.

Tabel 4. The Weighting of The Sub Criteria is Based on The Similarity Rating

Criteria	Sub Criteria	Rating weight
Status of the construction of the house	Street	5
	Rent (Luxury)	4
	Rent (Economy)	3
	Rent (Without Paying)	2
	Private property	1
Wall Materials	Tepas Leaf	5
	Tarp	4
	Board	3
	Board and Cement	2
	Cement	1
Work	Unemployment	4

	Not fixed	3
	Freelancer	2
	Permanent	1
	Worker	
Income	Nothing	4
	Not fixed	3
	Fixed (Less)	2
	Fixed (More)	1
The Number of Dependents	≥ 4 people	5
	3 people	4
	2 persons	3
	1 person	2
	Nothing	1
Drinking water source	Not enough	3
	Good	2
	Very good	1
Financial	Not enough	3
	Good	2
	Very good	1
Energy source	Nothing	3
	Limited	2
	Exist	1

The table above is the weighting of each sub-criterion which will be used as an assessment to determine Raskin recipients later.

2. Flowchart

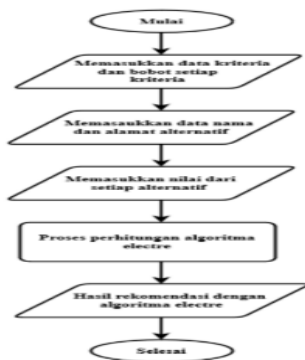


Figure 2. Flowchart

The system flowchart in Figure 2, explains the workflow of a decision support system using the electre algorithm. The system is run by the user or the administrator. Before entering the system algorithm, the user enters the criteria data and the weight of each criterion. Once the criteria data and criteria weights have been entered into the system, the user enters the name and address data for each alternative. The alternative names contain 10 data entered in a system, the user enters the

value of each alternative obtained from the value of each sub-criterion. In the calculation process, there are several steps to produce recommendations with the electre algorithm. The results of system calculations using the electre algorithm rank the best recommendations.

3. System view

a. Login Page

On this page, it will display the initial page of the system being built. Administrators and users will be prompted for a username and password in order to use the system.

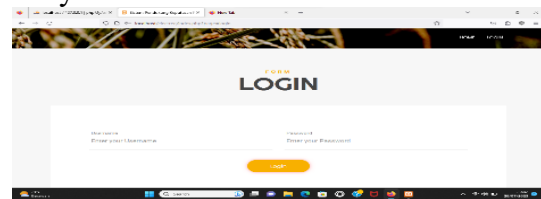


Figure 3. Login Page

b. Home page

On this page is the main page of the SPK system providing several features or menus that can be used by users. The main page contains the home menu, participants, criteria, weight, value and number of participants, and logout.



Figure 4. Home Page

c. Add Participant Page

On this page, we can enter participants who will be tested later as Raskin recipients. The entry method is only to enter the name of the participant, the address of the participant and the telephone number belonging to the participant.

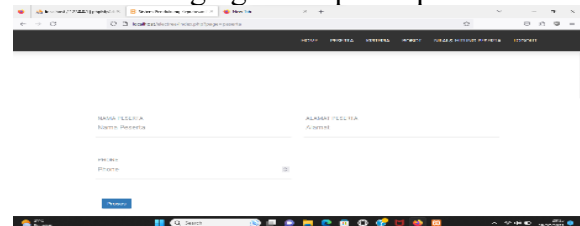


Figure 5. Add Participant Page

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the decision support system used can recommend owners who are right and fast in determining Raskin recipients according to predetermined criteria. Then, based on the existing data, it is known that the results of the calculations using this program, it is concluded that the best alternatives qualified to receive Raskin are Dea, Fadil and Fitri.

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