

Election of the Chairperson of the Padre Pio Parish PSPM Cooperative Using Fuzzy Logic and the Moora Method (Multi Objective Optimization on The Basis of Ratio Analysis)

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ABSTRACT

The Padrepio Helvetia Medan Parish Mandiri Savings and Loans Association Cooperative is one of the cooperatives engaged in the savings and loan sector by prioritizing members' desire to save so that they can create joint capital for members to borrow with appropriate loan services for welfare purposes. The Annual Members' Meeting is an annual agenda as a media for management to be accountable for their performance for one year. The chairman of the cooperative is the highest structural position of the administrator who has duties and responsibilities both inside and outside the cooperative in controlling all cooperative activities. The process of electing the chairman of the Padre Pio Parish Savings and Loans Association cooperative is still being carried out only by pointing to and mentioning someone's name from among the names of the management and then conveying it to members to approve. The determination of the chairman which is carried out using the arbitrary model is not in accordance with the terms and criteria of an optimal cooperative chairman because the elected chairman is not necessarily the most competent of the candidates and often happens just because of friendship so the results are not objective. With the reasons described, the researcher applied the Multi Objective Optimization On The Basis Of Rasio Analysis (MOORA) method. The application of the MOORA method to the election of the chairman of the Padre Pio Helvetia Medan Parish Independent Savings and Loans cooperative can help determine a more objective chairman based on terms and criteria by solving problems through complex mathematical calculations, determining the weight value for each attribute, then proceed with the ranking process which will select the alternative that has been given. In this study the criteria determined consisted of background and educational level, certificate ownership, age, and length of time being a member. In the objective approach, the weight value is calculated mathematically so that it ignores the subjectivity of the decision maker. With the application of the Multi Objective Optimization On The Basis Of Rasio Analysis method, several alternatives that meet the requirements and criteria can be determined which is the best to serve as chairman. The best ranking results are those who are most worthy of being the head of a more objective cooperative.

Keywords: Election; Chairman; Cooperative; Method; MOORA

INTRODUCTION

The Padrepio Parish Independent Savings and Loans Association Cooperative is located at Jl. Beringin No 2 Medan, Medan Helvetia District, North Sumatra. So far, the election of the chairman is only by appointing a person's name, which is then announced to members and authorized to become chairman of the cooperative for one period. The process of electing a cooperative chairman is still based on subjective friendships or family relationships, so that the elected cooperative chairman is not necessarily the most competent of the candidates. The terms and conditions for becoming a cooperative chairman have not been used as criteria for a cooperative chairman so that cooperative leadership is not optimal. The accountability of the management of the cooperative at the Annual Member Meeting to members often occurs with problems such as the incorrect amount of mandatory and voluntary savings, the number of shares of each member that is not transparent, and the distribution of loan services that are not appropriate. What if this problem occurs every year at the Annual Member Meeting and is not resolved as soon as possible, then over time the members will withdraw their shares and resign as members. The impact of members who resigned resulted in an unhealthy cooperative or a term called *collep*. To determine the election of a more competent cooperative chairman is to use an election that applies the terms and conditions in accordance with those stated in the Cooperative household rules (RI, 2018). The terms and conditions are the criteria used in selecting the cooperative chairman. The criteria are the initial data that will be processed by a certain method so that the results will determine a cooperative chairman who is elected to be more selective, transparent and objective. The selection of the chairman of the cooperative by

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applying the method will fulfill the terms and conditions of the Indonesian Cooperative Law. The structural requirements for being a cooperative chairman are based on the applicable bylaws.

Based on the problems that have been described, the researcher applies fuzzy logic and the multi-objective optimization method on the basis of ratio analysis to help select cooperative leaders who are more objective. The Multi-Objective Optimization On The Basis Of Ratio Analysis method is a multi-objective system that optimizes two or more conflicting attributes simultaneously. This method is applied to solve problems with complex mathematical calculations, determine the weight value for each attribute, then proceed with the ranking process which will select the alternatives that have been given. This method has calculations with minimum and very simple calculations (Wardani et al., 2018) Research that has been done previously states that determining the chairman of the Leka Mandiri cooperative using the web-based SMATER method has more optimal results compared to the manual method. (Harpad et al., 2023) The research was conducted based on remote voting so it is done through the web-based SMATER method (Octaviani et al., 2020). The application of the Multi-Objective Optimization On The Basis Of Ratio Analysis method has been applied to previous research in the selection of branch heads of PT. Dakota Buana Semesta (Arista, 2020). The decision support system measures the performance level of lecturers using the Multi Objective Optimization on The Basis Of Ratio Analysis method. In the objective approach, the weight value is calculated mathematically so that it ignores the subjectivity of the decision maker. Research on the election of the chairman of the cooperative Decision Support System for the Selection of the Chairperson of the Cooperative at Parulian Medan (Tamba et al., 2019) Private Vocational High School Using the Multi Objective Optimization On The Basis Of Ratio Analysis Method. The research was conducted on school cooperatives with a management structure and homogeneous members, so it is necessary to conduct research on heterogeneous administrators and membership. objective, but the calculations have steps that are less systematic, with the Multi Objective Optimization On The Basis Of Ratio Analysis method, calculations with the simplest steps⁹. Designing a savings and loan application at the Sahabat cooperative based on mobile programming, (Yunus & Senung, 2021). Implementation of the Padrepio Parish independent savings and loan association application (Megaria, 2021).

This study aims to apply the Multi Objective Optimization On The Basis Of Ratio Analysis method to determine the chairman of the Padrepio Parish Mandiri Savings and Loan Association Cooperative. Alternative data in the form of qualitative will be converted to numerical values by applying Fuzzy logic through identifying evaluation attributes that determine the criteria, weight and alternative values. Fuzzy Multiple Attribute Decision (Nasir et al., 2017) Making Model to determine the weight value of each criterion. Each criterion is given a weight value and then completed using the Multi-Objective Optimization On The Basis Of Ratio Analysis method with the hope that the determination of the chairman of the cooperative will be more transparent, objective and competent so that the cooperative will increasingly exist in running its business.

LITERATURE REVIEW

Padreerativepio Parish PSPM Coop

Cooperatives are business entities consisting of people or legal entities. Types of Cooperatives According to PP No. 60/1959 (RI, 2018) the Padrepio Parish PSPM Cooperative is a Savings and Loans Cooperative (KSP). KSP is a cooperative that has a single business, which is to accommodate members' savings and serve loans. Members who save (save) will get a service fee and the borrower is subject to service. The amount of services for savers and borrowers is determined through a member meeting. From here, cooperative business activities can be said "from, by, and for members." The Indonesian Cooperative Symbol has a deep meaning and meaning and reflects the basic philosophy of cooperatives (Megaria, 2021). Image of the Indonesian Cooperative Symbol can be seen in its appearance as shown in Figure 1.



Figure 1. Indonesian Cooperative Symbol

The power possessed by the management of the cooperative is under the authority of the meeting of members. The board is only a mandate holder who is elected, appointed and dismissed by members. The board of directors must

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make policies that do not deviate from the Statutes and Bylaws and the results of the decisions of the members' meeting then at the end of their term of office must be accountable for the results of their work to the members.

The elements of the Management of the Padre Pio Parish PSPM Cooperative consist of: Chairperson, Deputy Chairperson, Secretary, Treasurer, Collectors and Sections. Cooperative members who can be elected as Cooperative Chairmen are those who meet the following requirements:

1. Have honest nature and work skills (Involved in Management).
2. Have knowledge of cooperatives (Certificate).
3. Have a sense of discipline and responsibility for the course of cooperative business activities.
4. Have a background level of education (minimum high school)
5. Age considerations (minimum 21 years and maximum 60 years).

The Chairperson of the Padre Pio Parish PSPM Cooperative has responsibilities both within and outside the organization, with a job description of leading the cooperative and coordinating the activities of all members of the board, representing the cooperative inside and outside the court, carrying out all actions in accordance with the decisions of the members meeting and the board meeting, the Chairman is responsible answer to the Members Meeting.

Metode MOORA

MOORA (Multi-Objective Optimization On The Basis Of Ratio Analysis) is a multi-objective system that optimizes two or more conflicting attributes simultaneously. This method is applied to solve problems with complex mathematical calculations. Moora was introduced by Brauers and Zavadskas in 2006. Decision Support System for the Election of Cooperative Chairmen at the Ministry of Law and Human Rights of North Sumatra Using the Method). Initially this method was introduced by Brauers in 2004 as "Multi Objective Optimization" which can be used to solve various complex decision-making problems in a factory environment. The MOORA method is applied to solve many economic, managerial and construction problems in a company or project. (Ichsan et al., 2014) IMPLEMENTATION OF THE MOORA METHOD (Multi – Objective Optimization On The Basis Of) Fuzzy Multiple Attribute Decision Making (FMADM) is used to find optimal alternatives from a number of alternatives with certain criteria. The essence of FMADM is to determine the weight value for each attribute, then proceed with a ranking process that will select the alternatives that have been given. Basically, there are 3 (three) approaches to finding attribute weight values, namely the subjective approach, the objective approach and the integration approach between subjective and objective. Each approach has advantages and disadvantages (Septian & Purnomo, 2017). In the subjective approach, the weight value is determined based on the subjectivity of the decision makers, so that several factors in the alternative ranking process can be determined independently (Situmorang, 2020). In the objective approach, the weight value is calculated mathematically so that it ignores the subjectivity of the decision maker. Problems In selecting the chairman of the cooperative at PSPM Padre Pio, the Fuzzy Multiple Attribute Decision Making (FMADM) model was used to determine the weight value of each criterion. After each criterion is given a weight value then it is completed using the MOORA method. In completing the MOORA method, the weight value of each criterion is first converted to matrix form, then normalized. After the results of normalization are obtained, then they are converted again into matrix form. The next step is to determine the weight value, then the weight value will be multiplied by the results of normalization where at this stage the max value is added up and then subtracted by the sum of the min values so that a normalized value is obtained from the alternatives to all attributes then determines the final result in the form of the best value or the highest value of the alternatives. The steps of the MOORA method can be seen as follows:

1. Determine the purpose of identifying the evaluation attributes concerned, namely determining the value Criteria, Weights and Alternatives.
2. Changing the criterion value into a decision matrix

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1j} \\ x_{21} & x_{22} & \dots & x_{2j} \\ \dots & \dots & \dots & \dots \\ x_{i1} & x_{i2} & \dots & x_{ij} \end{bmatrix}$$

Information

x_{ij} : Alternative candidate i on criterion j

i : 1,2,3, ..., n is the attribute or criterion sequence number

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j : 1,2,3, ..., m are alternative sequence numbers

X : Decision Matrix

3. Matrix Normalization

$$X_{ij}^* = \frac{X_{ij}}{\sqrt{\sum_{j=1}^m X_{ij}^2}} \quad (1)$$

Information

xij : Alternative matrix i on criteria j

i : 1,2,3, ..., m is the attribute or criterion sequence number

j : 1,2,3, ..., n are alternative sequence numbers

X*ij : Alternative Normalization Matrix j on criterion i

4. Calculating the Optimum Value, namely Reducing the Maximax and Minimax Values

5. Ranking, namely the results of the calculation values are arranged from the highest to the lowest.

Fuzzy Method

Fuzzy Multiple Attribute Decision Making (FMADM) is a method used to find optimal alternatives from a number of alternatives with certain criteria (Arista, 2020)

For the selection of the chairman of the Padrepio parish PSPM cooperative, the Fuzzy Multiple Attribute Decision Making (FMADM) model was used to determine the weight value of each criterion (Ichsan et al., 2014). After each criterion is given a weight value then it is completed using the moora method. In completing the moora method, the weight value of each criterion is first converted to matrix form, then normalized. After the results of normalization are obtained, they are then converted again into matrix form. The next step is to determine the weight value (W), then the weight value will be multiplied by the result of normalization where at this stage the max value is added up and subtracted by the sum of the min values so that yi is obtained (the normalized value of the alternatives for all attributes) then determines the final result is the best value or the highest value of the alternative.

METHOD

The flow of research conducted can be seen in Figure 2.

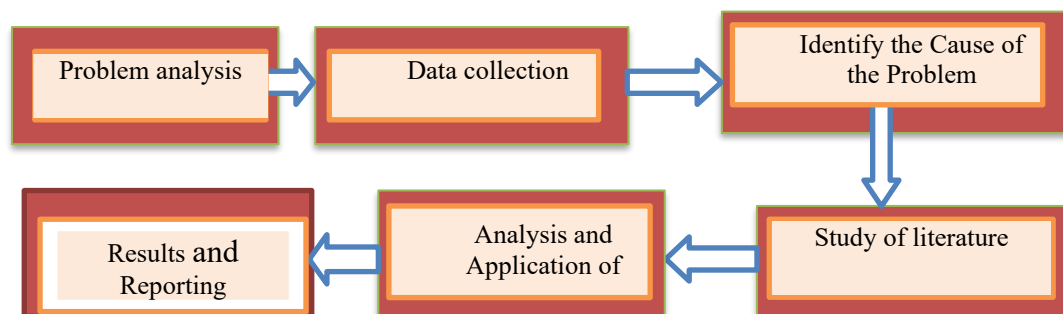


Figure 2. Research Flowchart

To carry out this research carried out in several stages, namely:

Problem analysis

The selection of a chairman from among the management of the Padre Pio Parish PSPM Cooperative so far has only indicated a person's name and then announced to the members to agree. The appointment of a chairman by appointing one name is not objective because the one appointed does not necessarily have the requirements and criteria of a chairman who is the best among several management of the Padre Pio Parish PSPM cooperative as a candidate or candidate.

Data collection

Data collection was carried out directly to the field, namely the PSPM Padrepio Parish Cooperative office, Jalan Beringin, Medan Helvetia sub-district. The data was obtained through interviews with the management and several

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members. Then the personal data file of each candidate or candidate who is eligible to become chairman of the selected cooperative is photographed which is used as data for the research process

Identify the Cause of the Problem

Identification of the problem is from the results of the data obtained during data collection and the results of the analysis, the causes of the problem can be identified, namely the problem in the research stems from the problem of determining a chairman who is not in accordance with the cooperative law regarding the terms and criteria of a cooperative chairman. still manual is not objective.

Study of literature

Literature studies are carried out in order to understand more deeply about the problem under study through information on books, journals, and media related to the research topic so that the research results will be more accurate. Extensive insight into the problem under study, the better when conducting research because it will experience better observations and considerations.

Analysis and Application of Methods

In selecting the head of the research cooperative using the Fuzzy Multiple Attribute Decision Making (FMADM) model with the Multi-objective optimization on the basis of ratio analysis (MOORA) method, criteria and weights are needed to carry out the calculation process so that the best alternative will be obtained. To determine the best cooperative leader for Padre Pio Parish PSPM Cooperative, criteria and weighting of fuzzy numbers can be converted to crisp numbers. More specifically, the data on the value of fuzzy numbers in the weighting for each criterion is determined from the level of importance of each criterion.

Results and Reporting

The results of the research will answer the problem and will be concluded as a solution to the existing problem, the next writer will make a final report which is useful as documentation and as a reference for further researchers.

RESULT

Research result

For the selection of the head of the PSPM Padrepio parish cooperative, the Fuzzy Multiple Attribute Decision Making (FMADM) model was used to determine the weight value of each criterion. After each criterion is given a weight value then it is completed using the moora method. In completing the moora method, the weight value of each criterion is first converted to matrix form, then normalized. After the results of normalization are obtained, they are then converted again into matrix form. The next step is to determine the weight value (W), then the weight value will be multiplied by the result of normalization where at this stage the max value is added up and subtracted by the sum of the min values so that y_i is obtained (the normalized value of the alternatives for all attributes) then determines the final result is the best value or the highest value of the alternative.

FMADM Model Analysis Using the MOORA Method In selecting cooperative heads using the Fuzzy Multiple Attribute Decision Making (FMADM) model with the Multi-objective optimization on the basis of ratio analysis (MOORA) method, criteria and weights are needed to carry out the calculation process so that the best alternative will be obtained. Criteria and weights in this stage require criteria that will be used as material for calculations in the process of selecting the chairman of the cooperative. This was intended to determine the best cooperative chairman to help the Padrepio Helvetia Medan Parish PSPM Cooperative. Based on the survey results, there were 10 people who were candidates or candidates to be elected as a cooperative chairman. Data from the 10 candidates collected will be arranged in a table, namely the data needed to support the determination of the chairperson of the Padre Pio Parish PSPM cooperative can be seen in table 1

Table1
Data on Candidates for the Chairperson of the PSPM Cooperative

Name	Position	Knowledge	Education	Age	of membership
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Samsudin Pandiangan	Treasurer	certificate	S-1	62	25 years
S.Sagala	Secretary	certificate	S-2	52	23years
Yustina R.Horbo	collector	certificate	S-2	55	10 years
M.Simamora	Business section	self-taught	S-1	58	25 years
T.Tampubon	collector	self-taught	S-1	45	10years
M.Purba	collector	self-taught	S-2	53	15 years
L.Br Simarmata	collector	self-taught	S-1	52	20 years
M Marhingga	collector	self-taught	Senior High School	46	22 years
M.Br Tamba	-	self-taught	Senior High School	35	10 years
S.Samosir	-	self-taught	Senior High School	38	8 years

Based on the interview, the most influential candidates for determining the chairman of a cooperative are starting from position, level of education, knowledge in the field of cooperatives, while the factors of age and length of time being a member of a cooperative are less influential. For more details, the level of influence is called the criterion value (benefit) and those that are less influential can be seen in table 2

Table 2
Criteria and weights

Criteria	Description	Weight	Description
K ₁	Position	0,30	Maxium
K ₂	Knowledge	0,2	Maximum
K ₃	Education	0,2	Maximum
K ₄	Age	0,15	Minimum
K ₅	of membership	0,15	Minimum

The application of the Fuzzy Method for determining criteria and weights based on tables 1 and 2 can be seen in Figure 2 and classified into tables.

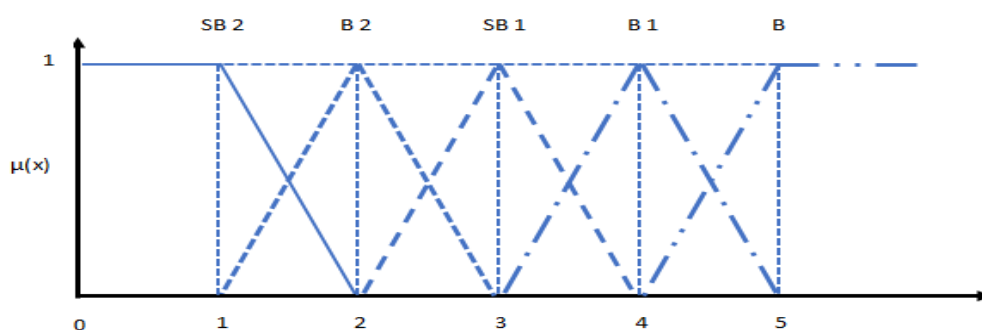


Figure 2. Criteria values with fuzzy numbers

information:

SB = Very Good

B2 = Fine

SB1 = Fairly Good

B1 = Less Good

B = Bad

Fuzzy Numbers for Job Position Criteria

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The determination of the value of the fuzzy number for the criteria for positions held by the candidates for chairman of the Padrepio Parish PSPM cooperative (K1) can be seen in table 3.

Table 3
Criteria Values for positions held

Position in the lap of	Value Fuzzy	Numbers
Secretary	Very good	50
Treasurer	good	40
Business section	Pretty good	30
colector	Not good	20
Non job	Bad	10

Fuzzy Numbers for Cooperative Knowledge Criteria

Determination of the value of fuzzy numbers for the criteria for knowledge in the field of cooperatives owned by the prospective chairman of the Padrepio Parish PSPM cooperative (K2) can be seen in table 4.

Table 4
Criteria Values for positions held

Knowledge of Cooperative	Value Fuzzy	Number
Diploma	Very good	50
Certificate	Good	40
Self-taught	Pretty good	30

Fuzzy Numbers for Educational Level Criteria

The determination of the value of the fuzzy number for the criteria for the level of education owned by the prospective chairman of the Padrepio Parish PSPM cooperative (K3) can be seen in table 5.

Table 5
Educational Level Criteria Value

Education	Value Fuzzy	Number
S2	Very good	50
S1	Good	40
Senior High School	Pretty good	30

Fuzzy Numbers for Age Criteria

Determination of the value of the fuzzy number for the age criteria owned by the prospective chairman of the Padrepio Parish PSPM cooperative (K4) can be seen in table 6.

Table 6
Age Criteria Value

Age(x)	Value Fuzzy	Number
$X > 60$	Not good	20
$50 < x \leq 60$	Pretty good	30
$40 < x \leq 50$	Good	40
$30 < x \leq 40$	Very good	50

Fuzzy Numbers for Old Criteria to Become a Member

Determination of the value of the fuzzy number for the criterion of length of time being a member of the cooperative owned by the prospective chairman of the Padrepio Parish PSPM cooperative (K2) can be seen in table 7.

Table 7
Old Membership Criteria Value

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Membership Period (years)	Value Fuzzy	Number
$x < 10$	Not good	20
$10 \leq x < 15$	Pretty good	30
$15 \leq x < 20$	Good	40
$20 \leq x$	Very good	50

The results of alternative values that have been weighted based on Fuzzy rules are presented in table 8

Table 8.

Value Weighting Results

Alternative	Name	K1	K2	K3	K4	K5
	Samsudin Pandiangan	40	40	40	20	50
A2	S.Sagala	50	40	50	30	50
A3	Yustina Rumah Horbo	30	40	50	30	30
A4	M.Simamora	30	30	40	30	50
A5	T.Tampubon	20	30	40	40	20
A6	M.Purba	20	30	40	30	40
A7	L.Br Simarmata	20	30	40	30	50
A8	M. Marhingga	20	30	30	40	50
A9	M. Br Tamba	10	30	30	50	30
A10	S.Samosir	10	30	30	50	20

Step 2: Changing the criterion values into the X decision matrix taken from table 8

$$X = \begin{bmatrix} 40 & 40 & 40 & 20 & 50 \\ 50 & 40 & 50 & 30 & 50 \\ 30 & 40 & 50 & 30 & 30 \\ 30 & 30 & 40 & 30 & 50 \\ 20 & 30 & 40 & 40 & 20 \\ 20 & 30 & 40 & 30 & 40 \\ 20 & 30 & 40 & 30 & 50 \\ 20 & 30 & 30 & 40 & 50 \\ 10 & 30 & 30 & 50 & 30 \\ 10 & 30 & 30 & 50 & 20 \end{bmatrix}$$

Step 3 : Then normalize the X matrix using the 1st equation $X_{ij}^* = \frac{x_{ij}}{\sqrt{\sum_{j=1}^m x_{ij}^2}}$ (1)

$$K1 = \sqrt{40^2 + 50^2 + 30^2 + 30^2 + 20^2 + 20^2 + 20^2 + 20^2 + 10^2 + 10^2}$$

$$= 87,74964387$$

$$X_{11} = \frac{40}{87,74964387} = 0,455842306$$

$$X_{12} = \frac{50}{87,74964387} = 0,569802882$$

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$$\begin{aligned}
 X_{13} &= \frac{30}{87,74964387} = 0,341881729 \\
 X_{14} &= \frac{30}{87,74964387} = 0,341881729 \\
 X_{15} &= \frac{20}{87,74964387} = 0,227921153 \\
 X_{16} &= \frac{20}{87,74964387} = 0,227921153 \\
 X_{17} &= \frac{20}{87,74964387} = 0,227921153 \\
 X_{18} &= \frac{20}{87,74964387} = 0,227921153 \\
 X_{19} &= \frac{10}{87,74964387} = 0,113960576 \\
 X_{10} &= \frac{10}{87,74964387} = 0,113960576 \\
 K_2 &= \sqrt{40^2 + 40^2 + 40^2 + 30^2 + 30^2 + 30^2 + 30^2 + 30^2 + 30^2 + 30^2} \\
 &= 105,3565375 \\
 X_{21} &= \frac{40}{105,3565375} = 0,379663198 \\
 X_{22} &= \frac{40}{105,3565375} = 0,379663198 \\
 X_{23} &= \frac{40}{105,3565375} = 0,379663198 \\
 X_{24} &= \frac{30}{105,3565375} = 0,284747399 \\
 X_{25} &= \frac{30}{105,3565375} = 0,284747399 \\
 X_{26} &= \frac{30}{105,3565375} = 0,284747399 \\
 X_{27} &= \frac{30}{105,3565375} = 0,284747399 \\
 X_{28} &= \frac{30}{105,3565375} = 0,284747399
 \end{aligned}$$

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$$\begin{aligned}
 X_{29} &= \frac{30}{105,3565375} = 0,284747399 \\
 X_{210} &= \frac{30}{105,3565375} = 0,284747399 \\
 K_3 &= \sqrt{40^2 + 50^2 + 50^2 + 40^2 + 40^2 + 40^2 + 40^2 + 30^2 + 30^2 + 30^2} \\
 &= 125,2996409 \\
 X_{31} &= \frac{40}{125,2996409} = 0,319234754 \\
 X_{32} &= \frac{50}{125,2996409} = 0,399043442 \\
 X_{33} &= \frac{50}{125,2996409} = 0,399043442 \\
 X_{34} &= \frac{40}{125,2996409} = 0,319234754 \\
 X_{35} &= \frac{40}{125,2996409} = 0,319234754 \\
 X_{36} &= \frac{40}{125,2996409} = 0,319234754 \\
 X_{37} &= \frac{40}{125,2996409} = 0,319234754 \\
 X_{38} &= \frac{30}{125,2996409} = 0,239426065 \\
 X_{39} &= \frac{30}{125,2996409} = 0,239426065 \\
 X_{310} &= \frac{30}{125,2996409} = 0,239426065 \\
 K_4 &= \sqrt{20^2 + 30^2 + 30^2 + 30^2 + 40^2 + 30^2 + 30^2 + 40^2 + 50^2 + 50^2} \\
 &= 114,4552314 \\
 X_{41} &= \frac{20}{114,4552314} = 0,174740811 \\
 X_{42} &= \frac{30}{114,4552314} = 0,262111217
 \end{aligned}$$

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$$X_{43} = \frac{30}{114,4552314} = 0,262111217$$

$$X_{44} = \frac{30}{114,4552314} = 0,262111217$$

$$X_{45} = \frac{40}{114,4552314} = 0,349481623$$

$$X_{46} = \frac{30}{114,4552314} = 0,262111217$$

$$X_{47} = \frac{30}{114,4552314} = 0,262111217$$

$$X_{48} = \frac{40}{114,4552314} = 0,349481623$$

$$X_{49} = \frac{50}{114,4552314} = 0,436852028$$

$$X_{410} = \frac{50}{114,4552314} = 0,436852028$$

$$K5 = \sqrt{50^2 + 50^2 + 30^2 + 50^2 + 20^2 + 40^2 + 50^2 + 50^2 + 30^2 + 20^2}$$

$$= 129,2284798$$

$$X_{51} = \frac{50}{129,2284798} = 0,386911616$$

$$X_{52} = \frac{50}{129,2284798} = 0,386911616$$

$$X_{53} = \frac{30}{129,2284798} = 0,23214697$$

$$X_{54} = \frac{50}{129,2284798} = 0,386911616$$

$$X_{55} = \frac{20}{129,2284798} = 0,154764647$$

$$X_{56} = \frac{40}{129,2284798} = 0,309529293$$

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$$X_{57} = \frac{50}{129,2284798} = 0,386911616$$

$$X_{58} = \frac{50}{129,2284798} = 0,386911616$$

$$X_{59} = \frac{30}{129,2284798} = 0,23214697$$

$$X_{510} = \frac{20}{129,2284798} = 0,154764647$$

From the calculation of the data, we can normalize the matrix:

$$X_{ij}^* = \begin{bmatrix} 0,45 & 0,38 & 0,32 & 0,17 & 0,39 \\ 0,57 & 0,38 & 0,40 & 0,26 & 0,39 \\ 0,34 & 0,38 & 0,40 & 0,26 & 0,23 \\ 0,23 & 0,28 & 0,32 & 0,26 & 0,39 \\ 0,23 & 0,28 & 0,32 & 0,26 & 0,15 \\ 0,23 & 0,28 & 0,32 & 0,35 & 0,31 \\ 0,23 & 0,28 & 0,32 & 0,26 & 0,39 \\ 0,23 & 0,28 & 0,24 & 0,35 & 0,39 \\ 0,11 & 0,28 & 0,24 & 0,44 & 0,23 \\ 0,11 & 0,28 & 0,24 & 0,44 & 0,15 \end{bmatrix}$$

Step 4: Calculating the Optimum Value, namely Reducing the Maximax and Minimax Values by using the formula:

$$Y_i = \sum_{j=1}^g w_j x_{ij}^* - \sum_{j=g+1}^{n+1} w_j x_{ij}^* \quad (2)$$

So that it can be like in table 9:

Table 9.
Optimum Value

No	Alternatif	K1(maks)	K2(maks)	K3(maks)	K4(min)	K5Min)	Y Maks	Y Min	Ymak- min
1	A1	0,136753	0,075933	0,063847	0,026211	0,058037	0,276532	0,084248	0,192284
2	A2	0,170941	0,075933	0,079809	0,039317	0,058037	0,326682	0,097353	0,229329
3	A3	0,102565	0,075933	0,079809	0,039317	0,034822	0,258306	0,074139	0,184167
4	A4	0,102565	0,056949	0,063847	0,039317	0,058037	0,223361	0,097353	0,126008
5	A5	0,068376	0,056949	0,063847	0,052422	0,023215	0,189173	0,075637	0,113536
6	A6	0,068376	0,056949	0,063847	0,039317	0,046429	0,189173	0,085746	0,103427
7	A7	0,068376	0,056949	0,063847	0,039317	0,058037	0,189173	0,097353	0,091819
8	A8	0,068376	0,056949	0,047885	0,052422	0,058037	0,173211	0,110459	0,062752
9	A9	0,034188	0,056949	0,047885	0,065528	0,034822	0,139023	0,10035	0,038673
10	A10	0,034188	0,056949	0,047885	0,065528	0,023215	0,139023	0,088743	0,05028

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Step 5 : Ranking

Based on the calculation results of the MOORA method, the ranking results with the largest order are as shown in table 10 .

Table 10.
Ranking Results

No	Alternatif	Name	Rank	value (Y)
1	A1	Samsudin andiangnan	2	0,192284
2	A2	S.Sagala	1	0,229329
3	A3	Yustina Rumah Horbo	3	0,184167
4	A4	M.Simamora	4	0,126008
5	A5	T.Tampubon	5	0,113536
6	A6	M.Purba	6	0,103427
7	A7	L.Br Simarmata	7	0,091819
8	A8	M Marhingga	8	0,062752
9	A9	M br Tamba	10	0,038673
10	A10	S.Samosir	9	0,05028

DISCUSSIONS

The application of the MOORA (Multi Objective Optimization On The Basis Of Ratio Analysis) method can determine the chairman of the Padrepio Parish Independent Savings and Loan Association cooperative based on the best and competent ranking results, namely no 1 out of 10 alternative candidates is Alternative A2 named S.Sagala with a value of 0.229329. The results of this study can solve the problem of determining the cooperative chairman who is manually subjective, closed, and incompetent to determine cooperatives based on criteria whose data has been processed based on calculations so that they are objective, transparent, and more competent.

REFERENCES

- Arista, R. D. (2020). MOORA sebagai Sistem Pendukung Keputusan Dalam Mengukur Tingkat Kinerja Dosen (Universitas Pembangunan Panca Budi Medan). *Jurnal Informatika Ekonomi Bisnis*, 104–110. <https://doi.org/10.37034/inf.v2i4.52>
- Harpad, B., Yusnita, A., & Priscila, H. (2023). Sistem Pendukung Keputusan Penentuan Ketua Koperasi Pada Koperasi Leka Mandiri Menggunakan Metode Smarter Berbasis Web. *Jurnal INFORMATIKA*, 13(1), 1–7. <https://doi.org/10.46984/inf-wcd.2200>
- Ichsan, M., Syah, R., & Iqbal, M. (2014). *Pengembangan Model Fuzzy Multiple Attribute Decision Making (Fmadm) Untuk Pengelolaan Lowongan Kerja*.
- Megaria, P. (2021). Aplikasi Koperasi Simpan Pinjam Mandiri Paroki Padre Pio Medam. *Widya*, 1, 47–52.
- Nasir, J., Suprianto, J., Studi, P., Informatika, T., & Putera, U. (2017). Analisis Fuzzy Logic Menentukan. *Jurnal Edik Informatika*, 2, 177–186.
- Octaviani, R., Amalia, F., & Brata, A. H. (2020). Pengembangan Sistem Informasi Manajemen Dinda Salon Di Kota Malang Berbasis Website. *Jurnal Pengembangan Teknologi Informasi Dan Ilmu Komputer (JPTIIK) Universitas Brawijaya*, 4(11), 3804–3812.
- RI, P. B. (2018). Berita Negara. In *Peraturan Menteri Kesehatan Republik Indonesia Nomor 4 Tahun 2018* (Vol. 151, Issue 2).
- Septian, M. R. N., & Purnomo, A. S. (2017). Sistem Penilaian Pegawai Menggunakan Metode Fuzzy Multiple Attribute Decision Making (FMADM) dan Weighted Product (WP). *JMAI (Jurnal Multimedia & Artificial Intelligence)*, 1(1), 27–33. <https://doi.org/10.26486/jmai.v1i1.49>
- Situmorang, H. (2020). Sistem Pendukung Keputusan Pemilihan Ketua Koperasi Pada Kementerian Hukum Dan Hak Asasi Manusia Sumatera Utara Menggunakan Metode Promethee II. *Jurnal Pelita Informatika*, 8(3).
- Tamba, F. S., Guidio L. Ginting, & Hondro, R. K. (2019). Sistem Pendukung Keputusan Pemilihan Ketua Koperasi

* Corresponding author



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Informasi Dan ..., 6, 83–88. <http://www.ejurnal.stmik-budidarma.ac.id/index.php/inti/article/view/1025%0Ahttps://www.ejurnal.stmik-budidarma.ac.id/index.php/inti/article/download/1025/888>

- Wardani, S., Parlina, I., & Rev, A. (2018). Analisis Perhitungan Metode MOORA Dalam Pemilihan Suplier Bahan Bangunan Di Toko Megah Gracindo Jaya. *Jurnal Nasional Informatika Dan Teknologi Jaringan*, 3(1), 95–99.
- Yunus, Y., & Senung, B. (2021). Sistem Pendukung Keputusan Seleksi Penerimaan Bantuan Koperasi Dengan Penerapan Metode Moora Berbasis Android Pada Dinas Tenaga Kerja, Koperasi Dan Ukm Kota Gorontalo. *Seminar Nasional & Konferensi Ilmiah Sistem Informasi, Informatika & Komunikasi*, 186–195.