



Decision Analysis on the Feasibility of Granting People's Business Credit at PT. Bank Negara Indonesia Using the Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA) Method

Nasya Ananda Rozi^{1*}, Shafly Muhammad Ardhana², Yustian Servanda³

^{1,2,3}Universitas Mulia
nasyanandaroz@gmail.com^{1*}

Abstract

In selecting credit recipients, it is necessary to have a recipient selection system that can overcome the problem of bad credit that often occurs (loans that are not repaid by the debtor). Based on this problem, a decision support system is needed that helps identify the wrong recipient. The method used in this study is the Moora method, namely the method for determining priorities. A decision support system is a computer-based system consisting of interacting components: a language system component, a knowledge system component, and a problem-handling system component, and uses data and decisionmaking models to create semistructured problems. It solves structured problems and semi-structured problems and assist in decision making. Structured and unstructured problems, this system helps you get information about your customers, the results are more accurate and on target.

Keywords: Multi-Objective, Optimization, Ratio Analysis, Business Credit

1. Introduction

Empowerment of micro, small and medium enterprises (MSMEs) is one form of economic system activity that pays attention to the common people and is also a form of government initiative in overcoming the global crisis. In fact, most businesses in Indonesia are micro, small and medium enterprises (MSMEs). This is because MSMEs have the potential to overcome poverty in Indonesia. Several studies on MSMEs that have been conducted show that during a crisis, small-scale businesses have relatively better resilience than large businesses. In addition to acting as a buffer for the national economy, MSMEs play a positive role in opening up jobs and overcoming poverty, especially when many large businesses are falling. The obstacles and challenges faced by MSME entrepreneurs in increasing business capabilities are very complex and cover various aspects, one of which is interrelated with the other, including; lack of capital in terms of quantity and source, lack of managerial ability and operational skills and the absence of formal form of the company, weak organization and limited marketing.

The existence of several obstacles, the government created a credit called People's Business Credit (KUR) which was inaugurated by the President of the Republic of Indonesia Susilo Bambang Yudhoyono on November 5, 2007. People's Business Credit (KUR) is credit or financing to Micro, Small and Medium Enterprises (MSMEs) in the form of providing working capital and investment supported by guarantee facilities for productive and feasible businesses. However, in providing KUR, there are also certain requirements or criteria so that the party providing KUR can determine whether the KUR recipient customer is eligible to receive KUR or not because the requirements or criteria are insufficient or do not comply with those stated in the KUR provision regulations. Until now, the development of methods applied to decision-making systems has been very rapid, starting from simple methods such as WSM, MOORA, SMART, to complex methods such as Fuzzy Tsumakoto, Promethee II, EXPROM II. One of the methods used in this study is Multi-Objective Optimization On The Basis of Ratio Analysis (MOORA).

The use of a decision support system using the MOORA method is very appropriate if applied to help determine the eligibility of receiving People's Business Credit (KUR). In providing KUR, there are several criteria that must be considered before providing KUR to prospective KUR recipients. In previous research, the decision support system for providing people's business credit used the WASPAS method. By using this MOORA method and using several existing criteria, it is hoped that it can help determine the eligibility of providing people's business credit to customers. The development of a Decision Support System is not only in the field of technology, but also extends to the

field of economics, the Decision Support System can be used to select strategic business locations, or complex business sustainability, by using alternatives as candidates to be selected, it can produce very effective decision support.

2. Research Methodology

In conducting this research, systematic steps are needed to obtain relevant data and information. This stage involves various activities ranging from planning, problem analysis, data collection, and data processing to obtain the final results. The stages carried out are structured, logical, and systematic as seen in Picture 1.

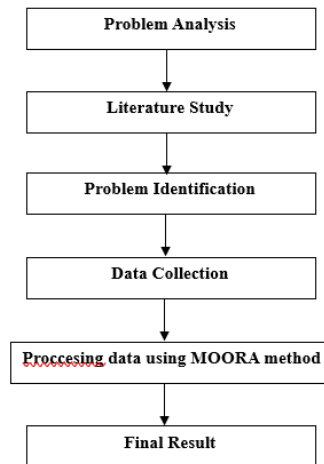


Fig. 1: Research Methodology

2.1. Literature Study

Literature study or commonly called literature review, is a process where researchers will collect, evaluate, and analyze the information needed in conducting a study. The information collected comes from books and existing scientific journals. The purpose of collecting this information is to find the right solution to the problem by analyzing the results of existing research.

2.2. Problem Identification

Problem identification is the stage where researchers conduct analysis and understand the problems that are occurring. In the identification process, planning is needed because the results of the identification will affect the use of methods, and determine the next steps. The purpose of identification is to gain a basic understanding of the problem at hand, for example to find out the causes and effects of the problem.

2.3. Data Collection

Data collection was carried out to be used in creating research articles by conducting observations which were used to better understand the process of determining credit recipient customers.

2.4. Data Processing

At this stage, the author applies the MOORA and MOOSRA methods in carrying out calculations, where both methods function to make the decision-making process more effective.

2.5. Final Result

At this stage the final results of the research will be presented in the form of tables and conclusions that can be used as evaluation and analysis materials for solving the problems carried out. The final results are not only used as absolute values, but can also be used to evaluate the performance of the methods used in the research, and can also be used to compare the effectiveness of using existing methods with other methods.

3. Result and Discussion

3.1. Data Survey

From the results of data collection with a structured questionnaire distributed using Google Form, 7 respondents were obtained. The data obtained has been previously verified to remove invalid data that will affect the results of the research data analysis. The respondent profile in this study was observed to provide an overview of what the sample of this study is like. The sample from the results of this questionnaire

will be used as alternative data and criteria in the Moora method to determine the ranking in this study. Respondents are categorized into several groups based on gender, age, occupation, income, collateral and dependents of the respondents.

The following are respondents who participated in filling out the questionnaire "Feasibility of Providing People's Business Credit"

Robi saputra
M.Dimas
Syaffaa Amalia
Darmawanti
Audila Mahresta Rozalin Putri
muhammad nur aditya
Ahmad Yazid Bustomi

Fig. 2: Respondent

Based on gender, there were 4 people (42.9%) respondents and the number of female respondents was 3 people (57.1%).

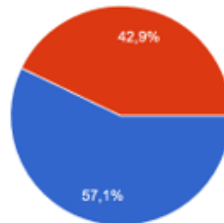


Fig. 3: Based on gender

Based on age group, there are 2 youngest people, namely 22 years old (28.6%), namely Syaffaa and Aditya, 2 people aged 24 years old, namely Dimas and Yazid (28.6%), 1 person aged 26 years old (14.3%), namely Audila, 1 person aged 31 years old (14.1%), namely Robi, and 1 person aged 47 years old (14.1%), namely Darmawanti.

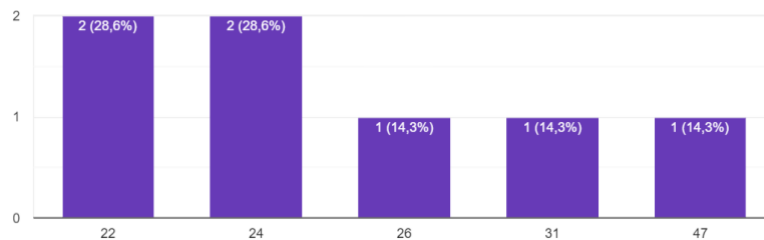


Fig. 4: Based on age group

Based on the job group, there is 1 person who is a civil servant (14.3%), namely Aditya, 1 person who works as a private employee (14.3%), namely Yazid, 2 people who work as employees (28.6%), namely Dimas and Syaffaa, and 3 people (42.9%) who are self-employed/entrepreneurs, namely Robi, Darmawanti, and Audila.

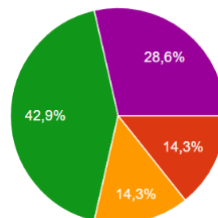


Fig. 5: Based on the job group

Based on income groups, there are three people (42.9%) who earn more than IDR 8 million, namely Robi, Dimas, and Yazid, three people (42.9%) who earn IDR 5 million – IDR 8 million, namely Darmwanti, Audila, and Aditya, and one person (14.3%) who earns IDR 1 million – IDR 3 million, namely Syaffaa.

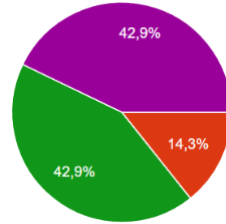


Fig. 6: Based on income groups

Based on the guarantee, there is one person who uses the certificate and land as collateral, namely Yazid, two people who use 4-wheeled vehicles as collateral, namely Robi and Darmawanti, 3 people who provide 2-wheeled vehicles as collateral, namely Dimas, Syaffaa, and Aditya, and there is 1 person who does not provide any collateral, namely Audila.

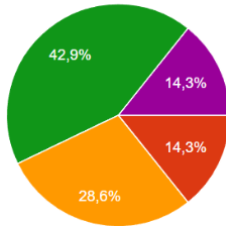


Fig. 7: Based on the guarantee

Based on dependents, there are two people who have 2 dependents, namely Syaffaa and Darmawanti, two people who have 3 dependents, namely Robi and Audila, one person who has the most dependents, namely 7 dependents, namely Aditya, and two people who have no dependents, namely Dimas and Yazid.

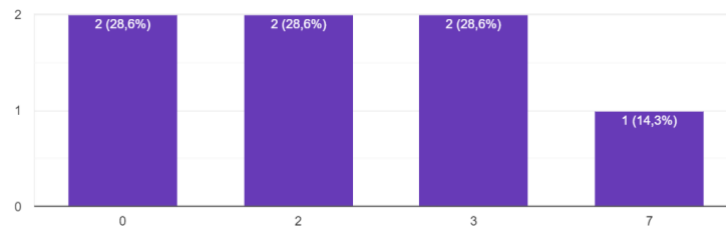


Fig. 8: Based on dependents

3.2. Alternative

The following is Table 1, a table containing alternative data for determining the eligibility of credit recipient customers.

Table 1: Alternative

Code	Name
A1	Robi
A2	Dimas
A3	Syaffaa
A4	Darmawanti
A5	Audila
A6	Aditya
A7	Yazid

3.3. Criteria

In determining the eligibility of credit recipients, there must be criteria. From the sample questionnaire results above, there are the following criteria data.

Table 2: Criteria

Code	Criteria	Characteristic
C1	Income	Benefit
C2	Guarantee	Benefit
C3	Job	Benefity
C4	Age	Benefit
C5	Dependent	Cost

Next, to calculate the steps in solving the method contained in the decision support system, a weight value is needed for each criterion. The following can be seen in table 3 below.

Table 3: Criteria Weight

Code	Wight	Criteria	Characteristic
C1	0,3	Income	Benefit
C2	0,25	Guarantee	Benefit
C3	0,25	Job	Benefity
C4	0,15	Age	Benefit
C5	0,05	Dependent	Cost

Table 4: Criteria Job

Job	Value	Grade
Civil Servant	Very Good	5
Private Employee	Good	4
Entrepreneur	Good enough	3
Employee	Bad	2
Unemployment	Very Bad	1

Table 5: Criteria Income

Income	Value	Grade
< IDR 8 million	Very Good	5
IDR 5 million – 8 million	Good	4
IDR 3 million – 5 million	Good enough	3
IDR 1 million – 3 million	Bad	2
> IDR 1 million	Very Bad	1

Table 6: Criteria Guarantee

Guarantee	Value	Grade
Sertificate of bulding and estate, vehicle	Very Good	5
Sertificate of bulding and estate	Good	4
4-wheeled vehicles	Good enough	3
2-wheeled vehicles	Bad	2
No guarantee	Very Bad	1

Table 7: Alternative Data and Credit Recipient

Code	Name	C1	C2	C3	C4	C5
A1	Robi	Very Good	Good Enough	Good Enough	31	3
A2	Dimas	Very Good	Bad	Bad	24	0
A3	Syaffaa	Bad	Bad	Bad	22	2
A4	Darmawanti	Good	Good Enough	Good Enough	47	2
A5	Audila	Good	Very Bad	Good Enough	26	3
A6	Aditya	Good	Bad	Very Good	22	7
A7	Yazid	Very Good	Good	Good	24	0

Table 8: Compatibility Rating

Code	Name	C1	C2	C3	C4	C5
A1	ROBI	5	3	3	31	3
A2	DIMAS	5	2	2	24	0
A3	SYAFFAA	2	2	2	22	2
A4	DARMAWANTI	4	3	3	47	2
A5	AUDILA	4	1	3	26	3
A6	ADITYA	4	2	5	22	7
A7	YAZID	5	4	4	24	0

3.4. MOORA Method Calculation Process

After knowing the alternative values in the criteria, the next step is to carry out the following steps.

Step 1: Prepare the Decision Matrix X

$$X_{ij} = \begin{bmatrix} 5 & 3 & 3 & 31 & 3 \\ 5 & 2 & 2 & 24 & 0 \\ 2 & 2 & 2 & 22 & 2 \\ 4 & 3 & 3 & 47 & 2 \\ 4 & 1 & 3 & 26 & 3 \\ 4 & 2 & 5 & 22 & 7 \\ 5 & 4 & 4 & 24 & 0 \end{bmatrix}$$

Step 2: Perform matrix normalization

$$C1 = \sqrt{5^2 + 5^2 + 2^2 + 4^2 + 4^2 + 4^2 + 5^2} = 11,2694$$

$$A11 = 5 / 11,269 = 0,4436$$

$$A21 = 5 / 11,269 = 0,4436$$

$$A31 = 2 / 11,269 = 0,1774$$

$$A41 = 4 / 11,269 = 0,3549$$

$$A51 = 4 / 11,269 = 0,3549$$

$$A61 = 4 / 11,269 = 0,3549$$

$$A71 = 5 / 11,269 = 0,4436$$

$$C2 = \sqrt{3^2 + 2^2 + 2^2 + 3^2 + 1^2 + 2^2 + 4^2} = 6,8556$$

$$A12 = 3 / 6,8556 = 0,4375$$

$$A22 = 2 / 6,8556 = 0,2917$$

$$A32 = 2 / 6,8556 = 0,2917$$

$$A42 = 3 / 6,8556 = 0,4375$$

$$A52 = 1 / 6,8556 = 0,1458$$

$$A62 = 2 / 6,8556 = 0,2917$$

$$A72 = 4 / 6,8556 = 0,5834$$

$$C3 = \sqrt{3^2 + 2^2 + 2^2 + 3^2 + 3^2 + 5^2 + 4^2} = 8,7178$$

$$A13 = 3 / 8,7178 = 0,3441$$

$$A23 = 2 / 8,7178 = 0,2294$$

$$A33 = 2 / 8,7178 = 0,2294$$

$$A43 = 3 / 8,7178 = 0,3441$$

$$A53 = 3 / 8,7178 = 0,3441$$

$$A63 = 5 / 8,7178 = 0,5735$$

$$A73 = 4 / 8,7178 = 0,4588$$

$$C4 = \sqrt{31^2 + 24^2 + 22^2 + 47^2 + 26^2 + 22^2 + 24^2} = 77,2399$$

$$A14 = 31 / 77,2399 = 0,4013$$

$$A24 = 24 / 77,2399 = 0,3107$$

$$A34 = 22 / 77,2399 = 0,2848$$

$$A44 = 47 / 77,2399 = 0,6084$$

$$A54 = 26 / 77,2399 = 0,3366$$

$$A64 = 22 / 77,2399 = 0,2848$$

$$A74 = 24 / 77,2399 = 0,3107$$

$$C5 = \sqrt{3^2 + 0^2 + 2^2 + 2^2 + 3^2 + 7^2 + 0^2} = 8,6602$$

$$A15 = 3 / 8,6602 = 0,3464$$

$$A25 = 0 / 8,6602 = 0$$

$$A35 = 2 / 8,6602 = 0,2309$$

$$A45 = 2 / 8,6602 = 0,2309$$

$$A55 = 3 / 8,6602 = 0,3464$$

$$A65 = 7 / 8,6602 = 0,8082$$

$$A75 = 0 / 8,6602 = 0$$

Based on the calculations above, a decision matrix is formed, as follows.

$$X_{ij} = \begin{bmatrix} 0,4436 & 0,4375 & 0,3441 & 0,4013 & 0,3464 \\ 0,4436 & 0,2917 & 0,2294 & 0,3107 & 0 \\ 0,1774 & 0,2917 & 0,2294 & 0,2848 & 0,2309 \\ 0,3549 & 0,4375 & 0,3441 & 0,6084 & 0,2309 \\ 0,3549 & 0,1458 & 0,3441 & 0,3366 & 0,3464 \\ 0,3549 & 0,2917 & 0,5735 & 0,2848 & 0,8082 \\ 0,4436 & 0,5834 & 0,4588 & 0,3107 & 0 \end{bmatrix}$$

Step 3: Determining final values/preferences

$$X_{wj} = \begin{bmatrix} 0,4436 \cdot (0,30) & 0,4375 \cdot (0,25) & 0,3441 \cdot (0,25) & 0,4013 \cdot (0,15) & 0,3464 \cdot (0,10) \\ 0,4436 \cdot (0,30) & 0,2917 \cdot (0,25) & 0,2294 \cdot (0,25) & 0,3107 \cdot (0,15) & 0 \cdot (0,10) \\ 0,1774 \cdot (0,30) & 0,2917 \cdot (0,25) & 0,2294 \cdot (0,25) & 0,2848 \cdot (0,15) & 0,2309 \cdot (0,10) \\ 0,3549 \cdot (0,30) & 0,4375 \cdot (0,25) & 0,3441 \cdot (0,25) & 0,6084 \cdot (0,15) & 0,2309 \cdot (0,10) \\ 0,3549 \cdot (0,30) & 0,1458 \cdot (0,25) & 0,3441 \cdot (0,25) & 0,3366 \cdot (0,15) & 0,3464 \cdot (0,10) \\ 0,3549 \cdot (0,30) & 0,2917 \cdot (0,25) & 0,5735 \cdot (0,25) & 0,2848 \cdot (0,15) & 0,8082 \cdot (0,10) \\ 0,4436 \cdot (0,30) & 0,5834 \cdot (0,25) & 0,4588 \cdot (0,25) & 0,3107 \cdot (0,15) & 0 \cdot (0,10) \end{bmatrix}$$

The result of multiplying the criteria weights is:

$$X = \begin{bmatrix} 0,1331 & 0,1094 & 0,0860 & 0,0602 & 0,0173 \\ 0,1331 & 0,0729 & 0,0573 & 0,0466 & 0 \\ 0,0532 & 0,0729 & 0,0573 & 0,0427 & 0,0115 \\ 0,1064 & 0,1094 & 0,0860 & 0,0912 & 0,0115 \\ 0,1064 & 0,0364 & 0,0860 & 0,0504 & 0,0173 \\ 0,1064 & 0,0729 & 0,1433 & 0,0427 & 0,0404 \\ 0,1331 & 0,1458 & 0,1147 & 0,0466 & 0 \end{bmatrix}$$

Next, to calculate the preference value, it can be assessed in Table 9 as follows.

Table 9: Yi Value

Code	Benefit Value (C1+C2+C3+C4)	Total Benefit Value – Cost (C5)	Yi
A1	0,1331 + 0,1094 + 0,0860 + 0,0602 = 0,3887	0,3887 – 0,0173	0,3714
A2	0,1331 + 0,0729 + 0,0573 + 0,0466 = 0,3099	0,3099 – 0	0,3099
A3	0,0532 + 0,0729 + 0,0573 + 0,0427 = 0,2262	0,2262 – 0,0115	0,2147
A4	0,1064 + 0,1094 + 0,0860 + 0,0912 = 0,3931	0,3931 – 0,0115	0,3816
A5	0,1064 + 0,0364 + 0,0860 + 0,0504 = 0,2794	0,2794 – 0,0173	0,2621
A6	0,1064 + 0,0729 + 0,1433 + 0,0427 = 0,3655	0,3655 – 0,0404	0,3251
A7	0,1331 + 0,1458 + 0,1147 + 0,0466 = 0,4402	0,4402 – 0	0,4402

From the results of Yi's calculations, a ranking of the best customers to be recommended as credit recipients can be obtained, which can be seen in Table 10.

Table 10: Ranking

Code	Name	Result	Rank
A7	Yazid	0,4402	1
A4	Darmawanti	0,3816	2
A1	Robi	0,3714	3
A6	Aditya	0,3251	4
A2	Dimas	0,3099	5
A5	Audila	0,2621	6
A3	Syaffaa	0,2147	7

4. Conclusion

The results of the research that has been conducted can be concluded, that the results of data processing on the feasibility of providing People's Business Credit (KUR) using the MOORA method can be implemented in a decision support system to assess the feasibility of providing People's Business Credit so that it can help the authorities in making decisions in accordance with the existing criteria. After the calculation process is carried out by applying the MOORA method, the final result is obtained in the form of a ranking based on the highest value. This value is obtained from the results of the matrix formulation which is carried out in stages and comprehensively. The highest value automatically becomes rank 1 and is entitled to be given credit. The highest value obtained is a value of 0.4402 and the one who gets rank 1 is Yazid. In accordance with the provisions and criteria in this study. The ranking results also show that the higher the ranking results produced, the greater the possibility of accepting the credit application submitted by the Bank.

References

- [1] Kusmano, M. B. K. Nasution, S. Suryadi, and A. Karim. "Decision Support System in Recommendation of Customer Eligibility for Credit Recipients Applying the MOORA and MOOSRA Methods". Vol.2, No.3. 2022.
- [2] A. R. Nainggolan, H. Winata, and M. Zunaidi. "Implementation of Decision Support in Determining the Eligibility of Recipients of PNPM Business Capital Loan Funds in Parmonangan District Using the MOORA Method". Vol.3, No.9. 2021.
- [3] A. Nugroho, Kusrini, and M. R. Arief. "Decision Support System for People's Business Credit PT. Bank Rakyat Indonesia Unit Kaliangkrik Magelang". Vol.2, No.1. 2015.
- [4] M. Ickhsan, D. Anggraini, R. Haryono, S. H. Sahir, and Rohminatin. "Decision Support System for Granting People's Business Credit Using the Weighted Aggregated Sum Product Assessment (WASPAS) Method". Vol.5, No.2, 2018.
- [5] R. A. Cahyani, H. O. Lingga, L. Hakim. "Decision Support System in Recommendation of Customer Eligibility for Credit Recipients Applying the Multi Object Optimization Method on the Basis of Ration Analysis". Vol.4, No.5. Pages 3147-3154. 2024.
- [6] A. Wahyuni, Y. T. Widayati, S. Suwarno, and E. R. Sulistyawati. "Decision Support System for Determining the Eligibility of People's Business Credit (KUR) Customers Using the MOORA Method". Vol.5, No.2. 2020
- [7] M. H. Lenny, H. Nurtriana, and M. B. Ardima. "Comparison of MOORA and SMART Methods in the Feasibility of Providing Credit to Prospective Cooperative Debtors". Vol 2:1. 2023.
- [8] M. S. Faisal and O. K. Sulaiman. "Multi Objective Optimization Method On The Basis Of Ratio Analysis (Moora) on the Feasibility of Providing Business Capital Loans at Bank Syariah Mandiri". Vol 4:1. 2019.
- [9] D. Wahyudi. "Analysis of the Feasibility of Providing KUR Credit at PT Bank Rakyat Indonesia Pinrang Branch". Vol 2:2. 2021.
- [10] Y. Rahman, F. Malik, B. Hamka, and N.A. Salsabila. "Analysis of the Process of Providing People's Business Credit (Kur) to Minimize NPL (Non Performing Loan) Customers at PT. Bank Sulselbar Sidrap Branch". Vol 5:5. 2024.