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COMPARISON OF PROFILE MATCHING AND MOORA METHODS IN DETERMINING LOAN ELIGIBILITY

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Abstract *— The objective of this research is to analyze the comparison between the profile matching method and MOORA in supporting decision-making for loan approvals at the Widya Dharma Student Cooperative (KOPMA). The criteria used in this research include basic salary, length of service, loan duration, membership status, loan amount, and number of dependents. These two methods are compared based on their accuracy levels. The accuracy levels are obtained through testing with the Mean Average Precision (MAP) technique, which measures the accuracy in ranking. The testing is conducted by comparing the ranking results from the method calculations with the rankings from the KOPMA chairman. The analysis results show that the Profile Matching method has a higher accuracy rate, which is 67.83%, compared to the MOORA method, which has an accuracy rate of 45.46%. Besides method testing, system testing was also conducted using the User Acceptance Test (UAT) technique. The UAT results indicate that the developed system aligns with the business processes in determining loan eligibility, the menu layout and contents within the system are well-organized, the system features function properly and are easy to understand, and the system meets expectations.*

Keywords*: decision making, loan approval, Mean Average Precision (MAP), MOORA, profile matching.*

Intisari *— Tujuan penelitian ini adalah untuk menganalisis perbandingan antara metode profile matching dan MOORA dalam mendukung pengambilan keputusan pemberian pinjaman di Koperasi Mahasiswa (KOPMA) Widya Dharma. Kriteria yang digunakan dalam penelitian ini meliputi gaji pokok, masa kerja, durasi pinjaman, status keanggotaan, jumlah pinjaman, dan jumlah tanggungan. Kedua metode tersebut dibandingkan berdasarkan tingkat akurasi. Tingkat akurasi diperoleh melalui pengujian dengan teknik Mean Average Precision (MAP) yang mengukur tingkat akurasi dalam sebuah perangkingan. Pengujian dilakukan dengan membandingkan hasil perangkingan dari perhitungan metode dengan perangkingan dari ketua KOPMA. Hasil analisis menunjukkan bahwa metode Profile Matching memiliki tingkat akurasi lebih tinggi, yaitu 67,83%, dibandingkan metode MOORA yang memiliki tingkat akurasi 45,46%. Selain pengujian metode, dilakukan juga pengujian sistem menggunakan teknik User Acceptance Test (UAT). Hasil uji UAT menunjukkan bahwa sistem yang dibangun sesuai dengan proses bisnis dalam menentukan kelayakan pemberian pinjaman, tata letak menu dan isi setiap menu dalam sistem tertata rapi, fitur-fitur pada sistem berfungsi dengan baik dan mudah dipahami, serta sistem sudah sesuai dengan harapan.*

Kata Kunci*: pengambilan keputusan, persetujuan pinjaman, Mean Average Precision (MAP), MOORA, pencocokan profil.*

INTRODUCTION

Kopma Widya Dharma is a student cooperative located at Jalan Wagimin No. 8 Kediri, Tabanan-Bali. Kopma Widya Dharma provides savings and loan services to its members, which now number 1,600 members. Even though it has been operating from 1996 until now, in practice, problems often occur

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related to the feasibility of providing loans that are not optimal and processing loan data is currently done manually by writing it in a ledger and then inputting it back into the Microsoft application. excel, this process causes a very high risk of human error and also takes quite a lot of time. Not to mention that when providing loans, Kopma Widya Dharma limits the number of loans given to its members, each month, only 5 applicants will get a loan. Currently, Kopma Widya Dharma does not have an adequate evaluation system to assess the suitability of prospective borrowers. Lending decisions are often based on subjective judgment, which can lead to inaccuracies in risk assessment.

Several phenomena that emerge in the field include high levels of bad loans. Many borrowers fail to repay their loans on time, which has a direct impact on the cooperative's financial health. Bad loans will have an impact on reducing the cooperative's ability to provide loans to other members who need it more. Based on data from Kopma Widya Dharma, in 2023, bad loans amounted to 33%, which was caused by the absence of an effective evaluation tool to assess the suitability of prospective borrowers. If this problem continues to occur, it will cause the cooperative to face significant financial risks and reduce members' trust in the system. cooperative management. The importance of a system in providing loans to Cooperatives cannot be ignored[1].

This system must be able to identify the profile of potential borrowers correctly, minimize the risk of bad credit, and increase cooperative members' trust in the loan granting process. In addition, cooperatives are expected to be able to optimize existing resources to ensure healthy and sustainable financial continuity[2]. Responding to these challenges, the development of computer-based systems, especially decision support systems, is an important solution. DSS expands decision-making capabilities through efficient data processing[3]. DSS is a computer-based system that is adaptive, flexible and interactive to overcome unstructured problems and increase decision value. To get the best decision in SPK it must be supported by several decision making methods to reduce the risk of errors and time efficiency in decision making[4].

In this research, two SPK methods were used, namely Profile Matching and MOORA. These two methods are expected to be able to provide better and more efficient decision making in determining loan eligibility, reduce the risk of errors, and speed up decision making [5]. The Profile Matching method was chosen in this research because it is an approach based on the match between the prospective borrower's profile and the ideal profile that has been determined by the cooperative.[6]. This approach allows a comprehensive assessment of various aspects, such as financial capabilities, loan history, and personal characteristics of potential borrowers[7]. Meanwhile, the MOORA method was chosen because it provides a solution using multi-criteria decision making techniques. This method allows cooperatives to consider various criteria simultaneously and determine priorities based on the ratio resulting from calculating the weight of each criterion. MOORA is able to integrate quantitative and qualitative data, resulting in a more holistic and in-depth evaluation[8].

Several previous studies that serve as references for this research include the study conducted [9] on the "Comparison of MOORA and Profile Matching Algorithms in the Fertilizer Selection System for Porang Plants," which concluded that the analysis results showed that both algorithms produced relatively similar outcomes in determining the final decision. Next is the study [10] on "Determining the Eligibility of Credit Approval in Cooperatives Using the Profile Matching Method," which concluded that the application of the Profile Matching method is highly recommended as an alternative to assist decision-making. The study [11] "Application of the MOORA Method in the DSS for Credit Approval for SMEs in Lubuklinggau City (Case Study: BRI Bank Lubuklinggau Branch)," concluded that the implementation of DSS using the MOORA method facilitates the management of potential debtor data, thus speeding up the credit approval decision-making process.

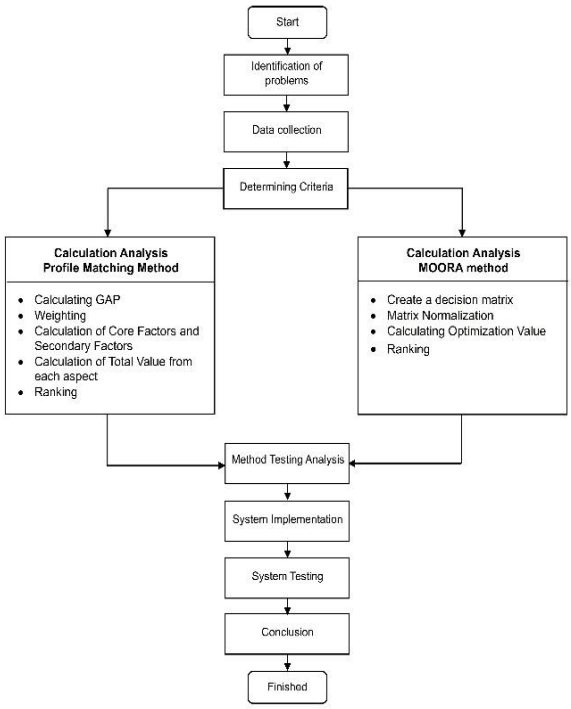
The study [12] on the "Sensitivity Testing Analysis of the Profile Matching, TOPSIS, and MOORA Decision-Making Method Determining the Best Employee," concluded that the MOORA method is the best method based on its sensitivity testing. The study [13] on "Scholarship Acceptance Analysis in the Computer Science Department Using the MOORA and TOPSIS Methods," concluded that the MOORA method is superior in terms of accuracy compared to the TOPSIS method. The study [14] on the "Comparison of AHP, TOPSIS, and MOORA Methods for Scholarship Recommendation for Underprivileged Students" concluded that based on sensitivity testing, the MOORA method is regarded as the most effective, as it produced the two lowest values in the three sensitivity tests performed.

Based on the explanation above, this research will carry out a comparative analysis between the Profile Matching and MOORA methods in order to determine the level of accuracy that is considered

suitable for supporting decision making on lending to Kopma Widya Dharma and also to determine the level of accuracy of each method which is expected to be achieved in the future. could be an academic reference in the same case. So it is necessary to carry out further research in SPK with the title "Comparative Analysis of Profile Matching and MOORA Methods in Decision Support Systems to Support Decision Making on Loans at Kopma Widya Dharma".

MATERIALS AND METHODS

This research includes steps or procedures that will be carried out in the process of supporting the decision-making for loan approval at Kopma Widya Dharma, University of Tabanan. Figure 1 shows the research flow diagram of the research conducted in this study.



Source: (Research Results, 2024)

Figure 1. Research Flow Diagram

From the Figure 1 above, it can be explained, among others:

1. Identification of problems

This research began with direct observation to identify problems in the decision-making process related to loan approvals at Kopma Widya Dharma, University of Tabanan. In the current loan approval process, there are often challenges when loans that have been approved for members encounter issues later on, caused by various factors, one of which is the credit approval decisions made by humans with limited analytical capabilities, considering the large volume of data required. Therefore, a system is needed that can provide accurate analysis to support credit approval decision-making. In the context of this research, a comparative analysis was conducted between the Profile Matching and MOORA methods to support the decision-making process related to loan approvals at Kopma Widya Dharma, University of Tabanan.

2. Method of Collecting Data

The data collection conducted by researchers involved two types of data, namely:

a. Primary data
Primary data is information collected directly by researchers through methods like observations and interviews.

b. Secondary Data
Secondary data refers to information obtained indirectly by the researchers, such as through literature reviews and related documents that support the research.

3. Criteria and Sub-Criteria

The decision-making criteria were identified based on observations and interviews with the Head of the Kopma Widya Dharma Cooperative. The requirements set include Length of service, Basic salary, Member status, Length of loan, Amount of loan, and Number of dependents. For further information, see Tables 1 to Table 6.

Table 1. Criteria for Work Period

No	Member Service	Information	Value
1	> 15 Years	Very good	5
2	> 10 – 15 Years	Good	4
3	> 5 – 10 Years	Enough	3
4	> 1 – 5 Years	Not enough	2
5	< 1 Year	Very less	1

Source: (Research Results, 2024)

Table 2. Basic Salary Criteria

No	Member Basic Salary	Information	Value
1	> 5,000,000	Very good	5
2	> 4,000,000 – 5,000,000	Good	4
3	> 3,000,000 – 4,000,000	Enough	3
4	> 2,000,000 – 3,000,000	Not enough	2
5	< 2,000,000	Very less	1

Source: (Research Results, 2024)

Table 3. Member Status Criteria

No	Member Status	Information	Value
1	Still	Very good	5
2	Contract	Good	4
3	Seconded	Enough	3
4	Honorary	Not enough	2

Source: (Research Results, 2024)

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Table 4. Loan Length Criteria

No	Length of Loan	Information	Value
1	> 48 Months	Very good	5
2	> 24 – 48 Months	Good	4
3	> 12 – 24 Months	Enough	3
4	> 6 – 12 Months	Not enough	2
5	< 6 Months	Very less	1

Source: (Research Results, 2024)

Table 5. Loan Amount Criteria

No	Loan Amount	Information	Value
1	> 50,000,000	Very good	5
2	> 30,000,000 – 50,000,000	Good	4
3	> 15,000,000 – 30,000,000	Enough	3
4	> 5,000,000 – 15,000,000	Not enough	2
5	< 5,000,000	Very less	1

Source: (Research Results, 2024)

Table 6. Criteria for Number of Dependents

No	Dependents	Information	Value
1	0	Very good	5
2	1	Good	4
3	2	Enough	3
4	3	Not enough	2
5	> 4	Very less	1

Source: (Research Results, 2024)

4. Calculation Stages of Profile Matching and MOORA Methods

a. *Profile Matching*

The Profile Matching method involves five key steps: Determine the GAP value, Perform the weighting process, Calculate and categorize core and secondary factors, Compute the total value for each component, and conduct ranking calculations [15].

1) Calculating the GAP Value

GAP is the variance between the position profile value determined by the company and the employee profile value obtained from individual assessments [16]. GAP can be defined as the variance between the employee's values and the job [17]. In this study, the formula used is GAP = Kopma member profile value - Loan eligibility profile value.

2) Weighting

After obtaining the GAP for each profile, the next step is to assign a weighted value based on a predetermined table that specifies the weight for the GAP value. [18].

Table 7. GAP Value Weights

No	GAP	Value	Information
1	0	5	No GAP (competence as required)
2	1	4.5	Individual competency exceeds 1 level/level
3	-1	4	Individual competency is less than 1 level/level
4	2	3.5	Individual competency exceeds 2 levels/levels
5	-2	3	Individual competency is less than 2 levels/level
6	3	2.5	Individual competency is superior to 3 levels/levels
7	-3	2	Individual competency is less than 3 levels/levels
8	4	1.5	Individual competency is over 4 levels/levels
9	-4	1	Individual competency is less than 4 levels/levels

Source: (Cassia Putra et al., 2023)

3) Calculation and Categorization of Core and Secondary Factors

The main factor (core factor) is a competency element that is essential for achieving optimal performance. On the other hand, supporting factors (secondary factors) refer to elements other than the aspects contained in the main factor[19]. The core factor calculation can be done using equation (1).

$$NCF = \frac{\sum NC}{\sum IC} \quad (1)$$

Information :
NCF = Average value of core factor
NC = Total number of core factor values
IC = Number of core factor items

Meanwhile, secondary factor calculations can use equation (2).

$$NSF = \frac{\sum NS}{\sum IS} \quad (2)$$

Information :
NSF = Valueaverage secondary factor
NS = Total number of secondary factor values
IS = Number of secondary factor items

4) Total Value Calculation

By using the total value obtained from the previous calculation, the percentage of core and secondary factors affecting the performance of each profile can be calculated [12]. The total value for each aspect can be calculated using the equation (3).

$$NT = (X)\%*NCF + (Y)\%*NSF \quad (3)$$

Information :
NT = Total value
NCF = Average value of core factor
NSF = Average value of secondary factors
(X)% = Percentage value of core factor
(Y)% = Percentage value of the secondary factor

The first step, according to this formula, is to calculate the percentage for the Core Factor and the Secondary Factor. The Core Factor is assigned 60%, and the Secondary Factor is assigned 40%.

5) Ranking

After all the total values are calculated, the next step is to rank them by sorting all the alternatives based on the total value from largest to smallest.[20].

b. Multi-Objective Optimization on the basis of Ratio Analysis (MOORA)

Four steps must be carried out in the MOORA process: Making a Decision Matrix, Normalizing the Matrix, Optimizing Attributes in the Normalized Matrix, and Determining Yi Values for the Ranking Process. The Yi value is obtained by subtracting the Max value (total value of profit criteria) from the criteria with the Min value (total value of cost criteria). The Yi value can be positive or negative based on the comparison between the Max and Min values of the cost and profit criteria [21].

1) Creating a Decision Matrix

The decision matrix lists all the available information for each attribute [13]. For the data found in equation (4), it can be described as a matrix (Xm xn), where the element (xij) reflects The performance measurement of the alternative on the attribute (-j). In this scenario, there are m alternatives and n criteria or attributes. Next, a ratio system is established to compare the performance of each alternative by displaying how each alternative is represented on a specific attribute [22]. The criteria values are converted into a decision matrix as follows:

$$X = \begin{bmatrix} x_{11} & x_{1i} & x_{1n} \\ & \vdots & \\ x_{ji} & x_{ij} & x_{jn} \\ & \vdots & \\ x_{m1} & x_{mi} & x_{mn} \end{bmatrix} \quad (4)$$

Information :
Xij = Alternative response j on criterion i
i = 1,2,3,..., n is the attribute sequence number or criteria
j = 1,2,3,..., m is the sequence number alternative
X = Decision matrix

2) Matrix Normalization

The goal of normalization is to unite all matrix elements so that the value of each element is uniform. The conclusion that can be drawn is, for the denominator in calculating the normalization matrix, the optimal choice is to take the square root of the sum of the squares for each alternative per attribute [22]. Matrix normalization calculations can use equation (5).

$$X^*_{ij} = \frac{X_{ij}}{\sqrt{\sum_j^m=1 \, x^2_{ij}}} \quad (5)$$

Information :
Xij = Alternative response j on criterion i
i = 1,2,3,..., n is the sequence number attributes or criteria
j = 1,2,3,..., m is the sequence number alternative
X*ij = Alternative normalization matrix j on criteria i

3) Calculating Optimization Value

To calculate the multi-objective optimization value using the MOORA method, this is done by multiplying the criteria weight by the Maximum attribute value and subtracting it by multiplying the criteria weight by the Minimum attribute value for each criterion or attribute [11]. This method considers that a higher criteria weight value indicates the level of importance of the criterion, which is then multiplied by the significance coefficient to indicate the level of importance in calculating the optimization value [23]. Equation (6) is used to calculate the value of this equation.

$$Yi = \sum_{j=1}^{g} W_j X^*_{ij} - \sum_{j=g+1}^{n} W_j X^*_{ij} \quad (6)$$

Information :
i = 1, 2, 3,..., g are criteria/attributes maximized
j = g+1, g+2, g+3,..., n is criteria/attribute minimized
Wj = Weight value of alternative j
Yi = Value of existing assessments normalized from alternative j against all attributes

4) Ranking

When ranking Yi values, their positivity or negativity is determined by the highest total value in the decision matrix, which represents the favorable attribute [24]. The order of Yi values ranks preferences, with the highest Yi value indicating the best alternative among all options. On the other hand, the alternative with the lowest Yi value is seen as the least preferable or poorest alternative based on the available data. The

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alternative with the highest Yi value will be selected as the optimal solution based on current requirements. Conversely, the alternative with the lowest Yi value will be avoided as it is viewed as the least favorable option [9].

RESULTS AND DISCUSSION

1. Determination of Criteria and Vulnerable Subcriteria Values

In this study, 6 criteria were utilized for decision-making following interviews with the Chairman of Kopma Widya Dharma. The vulnerability of sub-criteria values was determined using a Likert scale assessment, with a rating of vulnerability ranging from 1 to 5. The conditions for the ratings were as follows: 1 = Very Poor, 2 = Poor, 3 = Fair, 4 = Good, and 5 = Very Good. Determination of the vulnerable sub-criteria values is also determined by the Chairman of Kopma Widya Dharma. Determination of criteria and sub-criteria can be seen in tables 1 to 6.

2. Method Calculation Results

In this research, a sample of 10 data from Kopma Widya Dharma members who applied for a loan was taken. The member data is coded (A1) to (A10) and has data that has been converted into numbers using a Likert scale with a rating range from 1 to 5 as in table 9.

Table 9. Borrower Profile Values

Code	Criteria					
	C1	C2	C3	C4	C5	C6
A1	5	5	5	4	4	2
A2	5	3	5	2	2	2
A3	2	2	5	3	2	3
A4	5	5	5	5	5	2
A5	5	4	5	5	5	1
A6	5	3	5	5	5	3
A7	5	3	5	5	5	2
A8	3	2	5	5	5	3
A9	2	2	4	2	1	1
A10	4	3	5	5	5	2

Source: (Research Results, 2024)

a. Profile Matching Method Calculation Results

The first step in using the Profile Matching method is to identify the main factor (core factor), secondary factor, and target value for loan approval, as specified by the Chairman of Kopma Widya Dharma. Types of criteria and target values are listed in Table 10.

Table 10. Types of Criteria and Target Values

Criteria	Type	Target Value
C1	*Core Factor*	3
C2	*Core Factor*	3
C3	*Secondary Factors*	4
C4	*Core Factor*	4
C5	*Core Factor*	3
C6	*Secondary Factors*	3

Source: (Chairman of Kopma Widya Dharma)

Next, calculate the GAP value. Where GAP Value = Borrower Profile - Loan Eligibility Profile (Target Value determined by the Chairman of Kopma Widya Dharma in table 10). The results of calculating the GAP value can be seen in table 11.

Table 11. GAP Value Calculation Results

Code	Criteria					
	C1	C2	C3	C4	C5	C6
A1	2	2	1	0	1	-1
A2	2	0	1	-2	-1	-1
A3	-1	-1	1	-1	-1	0
A4	2	2	1	1	2	-1
A5	2	1	1	1	2	-2
A6	2	0	1	1	2	0
A7	2	0	1	1	2	-1
A8	0	-1	1	1	2	0
A9	-1	-1	0	-2	-2	-2
A10	1	0	1	1	2	-1

Source: (Research Results, 2024)

Next, each profile is assigned a weighted value by consulting the GAP value weighting table. The weight value for each alternative is determined using Table 7. The GAP values weighting results are displayed in Table 12.

Table 12. Results of GAP Value Weighting

Code	Criteria					
	C1	C2	C3	C4	C5	C6
A1	3.5	3.5	4.5	5	4.5	4
A2	3.5	5	4.5	3	4	4
A3	4	4	4.5	4	4	5
A4	3.5	3.5	4.5	4.5	3.5	4
A5	3.5	4.5	4.5	4.5	3.5	3
A6	3.5	5	4.5	4.5	3.5	5
A7	3.5	5	4.5	4.5	3.5	4
A8	5	4	4.5	4.5	3.5	5
A9	4	4	5	3	3	3
A10	4.5	5	4.5	4.5	3.5	4

Source: (Research Results, 2024)

After getting the GAP value weights, the next step is to calculate and group the Core Factor (CF) and Secondary Factor (SF) values. In this research, the CF and SF determination was carried out by the Chairman of Kopma Widya Dharma, with the CF value set at 60% and the SF value at 40%. CF and SF groupings are based on Table 10. CF calculations use equation (1) and SF use equation (2). The results of CF and SF calculations can be seen in Table 13.

Table 13. CF and SF calculation results

Code	Criteria					
	C1	C2	C4	C5	C3	C6
	CF (60%)				*SF*(40%)	
A1	4,125				4.25	

Code	Criteria					
	C1	C2	C4	C5	C3	C6
		CF (60%)			*SF*(40%)	
A2		3,875			4.25	
A3		4,000			4.75	
A4		3,750			4.25	
A5		4,000			3.75	
A6		4,125			4.75	
A7		4,125			4.25	
A8		4,250			4.75	
A9		3,500			4.00	
A10		4,375			4.25	

Source: (Research Results, 2024)

After obtaining the CF and SF calculation results, the next step is to calculate the total value for each aspect using equation (3) and rank them. The total score and ranking results are displayed in Table 14.

Table 14. Total Value Calculation Results

Code	Total Value	Rank
A8	4.45	*Rank 1*
A6	4.38	*Rank 2*
A10	4.33	*Rank 3*
A3	4.30	*Rank 4*
A1	4.18	*Rank 5*
A7	4.18	*Rank 6*
A2	4.03	*Rank 7*
A4	3.95	*Rank 8*
A5	3.90	*Rank 9*
A9	3.70	*Rank 10*

Source: (Research Results, 2024)

Referring to Table 14, members with code A8 are ranked first with a score of 4.45, while members with code A9 are ranked last with a score of 3.70.

b. MOORA Method Calculation Results

The initial step in calculating the MOORA method is to determine the weight for each criterion. The process of determining the weight of the criteria was carried out based on the results of an interview with the chairman of Kopma Widya Dharma. The total weight of all criteria must be equal to 1 or 100%. After determining the weight of the criteria, the next step is to determine the cost and benefit values for each criterion. The benefit criterion is a criterion where the higher the value, the better, while the cost criterion is a criterion where the lower the value, the better. The results of determining the weights and types of criteria for the MOORA method can be seen in Table 15.

Table 15. Weight Values and Types of Criteria

Criteria	Value Weight		Type
C1	15%	*0.15*	*Benefits*
C2	25%	*0.25*	*Benefits*
C3	15%	*0.15*	*Benefits*
C4	20%	*0.20*	*Benefits*
C5	15%	*0.15*	*Benefits*
C6	10%	*0.10*	*Cost*
Total	100%	1	-

Source: (Chairman of Kopma Widya Dharma)

After getting the weight values and types of criteria, the next step is to create a decision matrix. The data used refers to table 9. The data is converted into a decision matrix using equation (4).

$$X = \begin{bmatrix} 5 & 5 & 5 & 4 & 4 & 2 \\ 5 & 3 & 5 & 2 & 2 & 2 \\ 2 & 2 & 5 & 3 & 2 & 3 \\ 5 & 5 & 5 & 5 & 5 & 2 \\ 5 & 4 & 5 & 5 & 5 & 1 \\ 5 & 3 & 5 & 5 & 5 & 3 \\ 5 & 3 & 5 & 5 & 5 & 2 \\ 3 & 2 & 5 & 5 & 5 & 3 \\ 2 & 2 & 4 & 2 & 1 & 1 \\ 4 & 3 & 5 & 5 & 5 & 2 \end{bmatrix}$$

Next, normalize the decision matrix using equation (5). The normalization process divides each data value by the square root of the sum of the squares of the data on one criterion. Then, the result is multiplied by the weight value of the criteria. The outcome of the decision matrix normalization calculation is displayed in Table 16.

Table 16. Matrix Normalization Calculation Results

Code	Criteria					
	C1	C2	C3	C4	C5	C6
A1	0.0597	0.1325	0.0510	0.0619	0.0476	0.0298
A2	0.0597	0.0795	0.0510	0.0310	0.0238	0.0298
A3	0.0239	0.0530	0.0510	0.0464	0.0238	0.0447
A4	0.0597	0.1325	0.0510	0.0774	0.0595	0.0298
A5	0.0597	0.1060	0.0510	0.0774	0.0595	0.0149
A6	0.0597	0.0795	0.0510	0.0774	0.0595	0.0447
A7	0.0597	0.0795	0.0510	0.0774	0.0595	0.0298
A8	0.0358	0.0530	0.0510	0.0774	0.0595	0.0447
A9	0.0239	0.0530	0.0408	0.0310	0.0119	0.0149
A10	0.0477	0.0795	0.0510	0.0774	0.0595	0.0298

Source: (Research Results, 2024)

Next, calculate the MOORA Multi-Objective optimization value (max-min). To calculate the optimization value, the first step is to add up all the values for the criteria that are profitable (Benefit) and then subtract all the criteria that are unprofitable (Cost). Referring to equation (6). For the types of criteria that are benefit or cost, refer to table 15. The results of calculating optimization and ranking values can be seen in Table 17.

Table 17. Results of Optimization and Ranking Values

Code	*Max/Benefit*	*Min/Cost*	*Yi = (Max - Min)*	Rank
A4	0.3801	0.0298	0.3502	*Rank 1*
A10	0.3536	0.0298	0.3237	*Rank 2*
A3	0.3527	0.0447	0.3080	*Rank 3*

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Code	*Max/Benefit*	*Min/Cost*	*Yi = (Max - Min)*	Rank
A5	0.3151	0.0149	0.3002	*Rank 4*
A1	0.3271	0.0298	0.2972	*Rank 5*
A8	0.3271	0.0447	0.2823	*Rank 6*
A9	0.2767	0.0149	0.2618	*Rank 7*
A7	0.2449	0.0298	0.2151	*Rank 8*
A2	0.1981	0.0298	0.1683	*Rank 9*
A6	0.1605	0.0447	0.1158	*Rank 10*

Source: (Research Results, 2024)

Referring to Table 17, members with code A4 are ranked first with an optimization value of 0.3502, while members with code A6 are ranked last with an optimization value of 0.1158.

3. Method Testing

The Mean Average Precision (MAP) technique was used in testing the method in this research. Testing was carried out using ranking results from the profile matching and MOORA methods, as well as ranking results from the chairman of Kopma Widya Dharma. The purpose of this MAP test is to measure the level of accuracy or success of the method in predicting rankings. The more successful or suitable the ranking produced by the calculation method with the ranking determined by the Chairman of Kopma Widya Dharma, the higher the resulting MAP value.

Table 18 shows the results of the analysis of method testing using the MAP technique which is a summary of the test results for each method by testing the level of accuracy obtained from the ranking results that have been carried out.

Table 18. Results of Method Testing Analysis with MAP

Method tested	MAP test accuracy value
Profile Matching	67.83%
MOORA	45.46%

Source: (Research Results, 2024)

Based on the test results of each method using the MAP technique, the Profile Matching method demonstrated the highest accuracy at 67.83% with 10 data points. This is because the Profile Matching method shows the highest match in ranking, where of the 10 data tested, this method succeeded in matching 5 rankings with the results determined by the Chairman of Kopma Widya Dharma, namely ranking 1, 4, 5, 6, and 8.

The MOORA method is in second place with the best accuracy, with a MAP value of 45.46% using 10 ranking data. The MOORA method succeeded in matching 5 ranks with the results determined by the Chairman of Kopma Widya Dharma, namely ranks 2, 5, 7, 9 and 10.

In testing using the MAP technique, the ranking position and the number of rankings that match the calculation results of the method and the ranking determined by the Chairman of Kopma Widya Dharma influence the final results of the testing.

4. System Implementation

System implementation is the process of realizing the method that is considered the best or most relevant between the Profile Matching and MOORA methods into a DSS in this research. The Profile Matching method was chosen as the best or most relevant method because it has the highest level of accuracy based on testing with the MAP technique.

The results of implementing the DSS for loan eligibility at Kopma Widya Dharma through the interface are as follows:

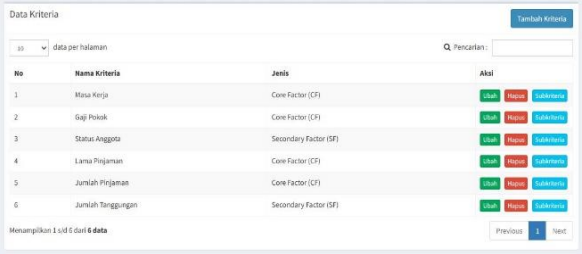
a. Login Page

The login page is a page to validate the access that the user has. To log in to the decision support system, you need to input the correct username and password. The login page is depicted in Figure 2.

Source: (Research Results, 2024)
Figure 2. Login page

b. Criteria Data Page

The criteria data page functions to display the criteria and sub-criteria as well as the weight value of each criterion and sub-criteria which is used as a guide in the assessment. Data on this criteria page can be added, changed or deleted. Figure 3 is a criteria data page.



Source: (Research Results, 2024)
Figure 3. Criteria Data Page

c. Alternative/Applicant Data Page

This page displays data on members who apply for loans which will later be processed using a decision support system. Users can also add,

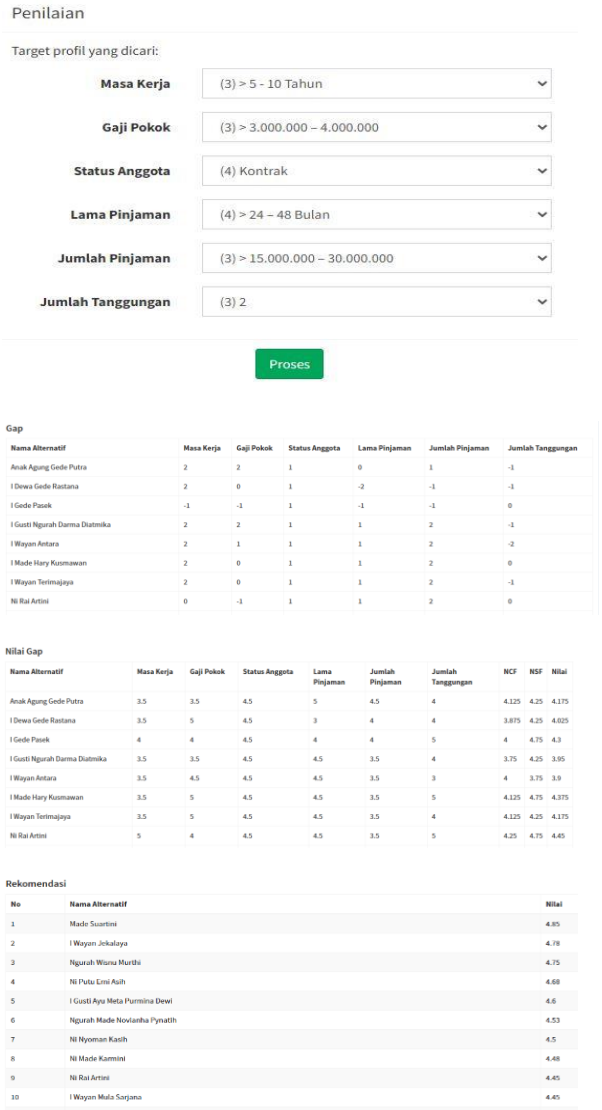
change and delete applicant data. In figure 4 is the applicant data page.

Source: (Research Results, 2024)

Figure 4. Applicant Data Page

d. SPK Calculation Page

The SPK calculation page is a page that functions to assess the feasibility of providing a loan for each alternative. The calculation page can be seen in Figure 5.



Source: (Research Results, 2024)

Figure 5. SPK Calculation Page

5. System Testing

System testing used the User Acceptance Test (UAT) technique, involving five respondents to fill out a questionnaire, namely: Chairman of Kopma Widya Dharma, Treasurer, Analysis Staff, Accounting Staff, and ordinary staff. The questionnaire consists of 6 questions, each answer to the question has a weight and percentage value, each question given to respondents has 5 scales using a Likert scale that can be selected. The UAT test results can be seen in table 18.

Table 18. UAT Test Results

Question	A	B	Total	Average	Results
Is this system in accordance with business processes in determining the feasibility of providing loans?	15	8	23	4.6	92%
Does this system make it easy to determine?eligibility for lending?	10	12	22	4.4	88%
Are the menu layout and contents of each menu in the system appropriate?	10	12	22	4.4	88%
Are the features in the system running well?	20	4	24	4.8	96%
Are the menus in the system easy to understand?	20	4	24	4.8	96%
Is the system this is appropriate with expectations?	15	8	23	4.6	92%

Source: (Research Results, 2024)

The results of the UAT test calculations in table 18 can be interpreted as follows:

1. The first question received a percentage score of 92%, which means that the system is very suitable for the business process in determining the feasibility of granting a loan.
2. Furthermore, the second question got a percentage value of 88%, which means the system makes it very easy to determine the feasibility of giving a loan.
3. Furthermore, the third question received a percentage score of 88% which stated that each menu and its layout were appropriate.
4. Furthermore, the fourth question received a percentage score of 96%, which means that the features in the system have worked very well.
5. The fifth question received a percentage score of 96%, which means the menus in the system are very easy to understand.
6. The last question/sixth question received a percentage score of 92%, which means the system is in line with expectations.

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From the results of the UAT test analysis, it can be concluded that the system built is in accordance with the business process in determining the feasibility of providing loans and the content and layout of the menus in the system are neat. The features of the system also work well and are easy to understand and the system meets expectations.

CONCLUSION

Implementation of the Profile Matching and MOORA methods in ranking to support decision making in granting loans at Kopma Widya Dharma produces different calculations. The results of the Profile Matching method show that members with code A8 are in first place with a value of 4.45, while members with code A9 are in last place with a value of 3.70. On the other hand, the calculation results using the MOORA method show that members with code A4 are in first place with an optimization value of 0.3502, while members with code A6 are in last place with an optimization value of 0.1158. A comparison between the Profile Matching and MOORA methods tested using the Mean Average Precision (MAP) technique shows that the Profile Matching method has the best accuracy with a value of 67.83% based on 10 data tested. Meanwhile, the MOORA method is the method with the second best accuracy with a value of 45.46% based on 10 data tested.

REFERENCES

[1] N. Aisyah and A. S. Putra, "Sistem Pendukung Keputusan Rekomendasi Pemilihan Manajer Terbaik Menggunakan Metode AHP (Analytic Hierarchy Process)," *Jurnal Esensi Infokom : Jurnal Esensi Sistem Informasi dan Sistem Komputer*, vol. 5, no. 2, 2022, doi: 10.55886/infokom.v5i2.275.

[2] L. M. Huizen, N. Hidayati, and M. B. Ardima, "Perbandingan Metode MOORA dan SMART dalam Kelayakan Pemberian Kredit pada Calon Debitur Koperasi," *AITI*, vol. 20, no. 1, 2023, doi: 10.24246/aiti.v20i1.95-110.

[3] N. Luh, P. Puspayani, E. M. Dharma, and K. T. Werthi, "Model Sistem Pendukung Keputusan Pemberian Kredit Menggunakan Metode Profile Matching pada LPD Dukuh Buahan" *Progresif: Jurnal Ilmiah Komputer*, vol. 16, no. 2, pp. 31-42, 2020, doi: 10.35889/progresif.v16i2.507.

[4] N. W. A. Ulandari, N. L. G. Pivin Suwirmayanti, I. P. Warma Putra, and N. M. Astiti, "Spk Seleksi Penerima Beasiswa pada ITB Stikom Bali dengan Metode Codas," *Jurnal Teknik Informatika UNIKA Santo Thomas*, vol. 6, no. 2, pp. 206-216, 2021, doi: 10.54367/jtiust.v6i2.1497.

[5] A. Y. Saputra and Y. Primadasa, "Penerapan Metode MOORA Dalam Pemilihan Sekolah Dasar," *SISTEMASI: Jurnal Sistem Informasi*, vol. 8, no. 2, pp. 305-312, 2019.

[6] R. Puspa and Nurahman, "Pembaruan Teknologi Informasi Untuk Sistem Pendukung Keputusan Pemberian Kelayakan Kredit Menerapkan Metode Profile Matching dan Metode Fuzzy Mamdani," *Journal of Computer System and Informatics (JoSYC)*, vol. 2, no. 1, pp.77-83, 2020.

[7] I. Fadhli, A. Karim, A. Putra Yunanda, and H. Rahmawati, "Sistem Pendukung Keputusan Menggunakan Metode Profile Matchin Untuk Kelayakan Pemberian Kredit Sepeda Motor (Studi Kasus : Adira Multifinance Kecamatan IV Jurai Painan)," *Jurnal Ilmiah METADATA*, vol. 2, no. 3, pp. 196-213, 2020, doi: 10.47652/metadata.v2i3.31.

[8] K. Harianto, I. Arfyanti, and A. Yusika, "Penerapan Metode MOORA pada Sistem Pendukung Keputusan Pemilihan Kepala Laboran," *Building of Informatics, Technology and Science (BITS)*, vol. 4, no. 3, pp. 1255-1261, 2022, doi: 10.47065/bits.v4i3.2288.

[9] F. Akbar Siregar, F. Sari Hutagalung, and M. Basri, "Perbandingan Algoritma MOORA dan Profile Matching pada Sistem Pemilihan Pupuk untuk Tanaman Porang," *Jurnal Sistem Komputer dan Informatika (JSON) Hal: 150–*, vol. 159, no. 1, pp.150-159, 2023, doi: 10.30865/json.v5i1.6772.

[10] Y. Yunita, S. Nurhidayati, and A. Setiadi, "Penentuan Kelayakan Pemberian Kredit Pada Koperasi Menggunakan Metode Profile Matching," *Reputasi: Jurnal Rekayasa Perangkat Lunak*, vol. 2, no. 2, pp.111-116, 2021, doi: 10.31294/reputasi.v2i2.936.

[11] A. A. Tri susilo, L. Sunardi, and H. O. LW, "Penerapan Metode Multi Objective Optimization On The Basis Of Ratio Analysis (Moora) Pada Sistem Pendukung Keputusan Pemberian Kredit Bagi Umkm Di Kota Lubuklinggau (Studi Kasus : Bank BRI Cabang Lubuklinggau)," *Jurnal Digital Teknologi Informasi*, vol. 5, no. 1, pp. 1-6, 2022, doi: 10.32502/digital.v5i1.4200.

[12] Dimasqi Ramadhani and Galandaru Swalaganata, "Analisis Pengujian Sensitivitas Penggunaan Metode Pengambilan Keputusan Profile Matching,

Topsis Dan Moora Dalam Menentukan Karyawan Terbaik," *NUANSA INFORMATIKA*, vol. 18, no. 1, pp.135-145, 2024, doi: 10.25134/ilkom.v18i1.94.

[13] Y. S. Siregar, "Analisis Penerima Bantuan Beasiswa Program Studi Teknik Informatika Menggunakan Metode Moora Dan Topsis," *JITEKH*, vol. 9, no. 1, pp. 58–64, 2021, doi: https://doi.org/10.35447/jitekh.v9i1.399

[14] N. Nurhaliza and R. Adha, "Perbandingan Metode Ahp, Topsis, Dan Moora Untuk Rekomendasi Penerima Beasiswa Kurang Mampu," *Jurnal Ilmiah Rekayasa dan Manajemen Sistem Informasi*, vol. 8, no. 1, pp. 23–30, 2022, doi: http://dx.doi.org/10.24014/rmsi.v8i1.15298

[15] I. Fadhli, A. Karim, A. Putra Yunanda, and H. Rahmawati, "Sistem Pendukung Keputusan Menggunakan Metode Profile Matchin Untuk Kelayakan Pemberian Kredit Sepeda Motor (Studi Kasus : Adira Multifinance Kecamatan IV Jurai Painan)," *Jurnal Ilmiah METADATA*, vol. 2, no. 3, pp.196-213, 2020, doi: 10.47652/metadata.v2i3.31.

[16] Y. Yunita, S. Nurhidayati, and A. Setiadi, "Penentuan Kelayakan Pemberian Kredit Pada Koperasi Menggunakan Metode Profile Matching," *Reputasi: Jurnal Rekayasa Perangkat Lunak*, vol. 2, no. 2, pp.111-116, 2021, doi: 10.31294/reputasi.v2i2.936.

[17] M. Badrul, "Penerapan Metode Profile Matching Untuk Menunjang Keputusan Seleksi Pegawai Baru," *PROSISKO: Jurnal Pengembangan Riset dan Observasi Sistem Komputer*, vol. 8, no. 1, pp.75-82, 2021, doi: 10.30656/prosisko.v8i1.2815.

[18] B. Cassia Putra, R. Roestam, M. Sistem Informasi, U. Dinamika Bangsa, and J. Jl Jend Sudirman Thehok-Jambi, "Sistem Pendukung Keputusan Penerima Beasiswa Kurang Mampu Menggunakan Metode Profile Matching Pada SMA Negeri 1 Sungai Penuh," *Jurnal Informatika Upgris*, vol 6, no. 1, pp. 12-16, 2023, doi: https://doi.org/10.26877/jiu.v6i1.4896

[19] E. I. Rati and R. Agustina, "Implementasi Metode Profile Matching Pada Sistem Pendukung Keputusan Pemilihan Penerima Bantuan Langsung Tunai di Desa Pondo Kecamatan Lembor," *SMATIKA JURNAL*, vol. 12, no. 01, pp.123-134, 2022, doi: 10.32664/smatika.v12i01.671.

[20] T. Radillah, "Analisa Metode Profile Matching Dalam Menentukan Kelayakan Pemberian Kredit Kepemilikan Rumah (KPR)," *I N F O R M A T I K A*, vol. 13, no. 1, pp.69-76, 2021, doi: 10.36723/juri.v13i1.261.

[21] R. P. Sari and A. M. Alliandaw, "Penerapan Metode MOORA Pada Sistem Penentuan Penerimaan Bidikmisi UNTAN," *Jurnal SISFOKOM (Sistem informasi dan Komputer)*, vol. 11, no. 2, pp. 242-250, 2022, doi: 10.32736/ sisfokom.v11i2.1420.

[22] Mustakim, "*Multi-Objective Optimization on the basis of Ratio Analysis (MOORA)*" Riau: Research Organization of Predatech UIN Sultan Syarif Kasim Riau, 2018.

[23] Isa Rosita, Gunawan, and Desi Apriani, "Penerapan Metode Moora Pada Sistem Pendukung Keputusan Pemilihan Media Promosi Sekolah (Studi Kasus: SMK Airlangga Balikpapan)," *METIK JURNAL*, vol. 4, no. 2, pp.55-61, 2020, doi: 10.47002/metik.v4i2.191.

[24] N. K. Mastrini, I Gst. Agung Pramesti Dwi Putri, and I Nyoman Yudi Anggara Wijaya, "Penerapan Metode MOORA dalam Pemberian Kredit di LPD Desa Sengkidu," *INFORMASI (Jurnal Informatika dan Sistem Informasi)*, vol. 15, no. 2, pp.136-154, 2023, doi: 10.37424/informasi.v15i2.245.

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