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Combination of PIPRECIA and Multi-Attributive Ideal-Real Comparative Analysis for the Determination of Scholarship Students

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Abstract−Scholarships are a form of financial assistance given to individuals to support their education. Criteria considered in the determination of scholarship recipients may include academic achievement, special talents, financial need, participation in extracurricular activities, and potential contributions to the community. The combination of weighting using PIPRECIA and MAIRCA can be a powerful approach in determining scholarship recipients. With PIPRECIA, scholarship providers can gather preferences from various relevant parties to determine the relative weight of each evaluation criterion. Furthermore, by applying MAIRCA, scholarship recipients can be evaluated based on these criteria by comparing between ideal attributes that reflect expected standards with real attributes that reflect the actual conditions of each recipient. By integrating these two methods, the process of determining scholarship recipients becomes more structured, transparent, and takes into account diverse preferences and priorities, ensuring that aid is distributed to the most deserving and needy individuals. The results of alternative rankings in determining scholarship recipients are 1st place with a final score of 0.071 obtained on behalf of Yusuf Maqdis, 2nd place with a final score of 0.068 obtained on behalf of Kurniawansyah, and 3rd place with a final score of 0.062 obtained on behalf of Ketut Purwanti. The contribution of this research lies in the combination of PIPRECIA and MARICA methods to determine potential scholarship recipients. The combination of these two methods provides a comprehensive and objective approach to the assessment and selection of potential scholarship recipients, ensuring that the selected candidates have a high potential for success in their studies.

Keywords: Combination, Determining, MAIRCA, PIPRECIA, Rankings.

1. INTRODUCTION

Scholarships are a form of financial assistance given to individuals to support their education. Scholarships can come from a variety of sources, including the government, private institutions, companies, or non-profit organizations[1][2]. The main purpose of scholarships is to help individuals who have academic potential or special talents but are financially constrained to access the education they need. Scholarships not only provide financial benefits, but also provide a motivational boost for recipients to excel in their studies. Through scholarships, many individuals have the opportunity to achieve their dreams and contribute positively to the development of society and the nation. The determination of scholarship recipients involves a series of careful and fair evaluation processes to select the most deserving candidates[3]. Criteria considered in the determination of scholarship recipients may include academic achievement, special talents, financial need, participation in extracurricular activities, and potential contributions to the community. Scholarship awarding authorities usually conduct in-depth analyses of applicants' applications, academic history, letters of recommendation, and statements of purpose. This process aims to ensure that aid is awarded to individuals who have a high commitment to education, have the potential to succeed, and will make the best use of the scholarship. The alignment of the individual's goals with the mission and values of the scholarship provider is also an important consideration in determining the right scholarship recipient.

Research related to the determination of scholarships are the student affairs division selects scholarship recipients by considering predetermined criteria. In this process, the division faces difficulties in selecting potential recipients due to the different criteria weights for each type of scholarship. Calculation of criteria weights requires high accuracy. This research aims to use a decision support system with the Simple Additive Weighting (SAW) method to determine outstanding scholarship recipients [4]. Further research determines that scholarships are available to those who meet the predetermined requirements. However, problems arise when students who have achievements outside the scope of school or non-academic achievements do not get scholarships. This research aims to find the best solution according to predetermined criteria, using the SAW method in providing scholarship recommendations [5]. Finally, the University set up a commission to select deserving students to benefit from the available scholarships. With a limited number of scholarships, the commission has the responsibility to select the most suitable candidates. In determining the scholarship recipients, researchers and social assistance service experts participated by using the VIKOR method for objective evaluation and speeding up the selection process [6]. Based on previous research that has been done in determining scholarship recipients using a decision support system.

A Decision Support System (DSS) is a system designed to assist decision making using certain data, models, and techniques [7][9]. DSS assists users in overcoming the complexity, uncertainty, and diversity of information involved in the decision-making process. Through the integration of information technology and analysis

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methodology, DSS is able to present relevant information, in-depth analysis, and decision options supported by data. These systems can be used in a variety of contexts, from business, management, health, to the environment, to help users make better and more effective decisions. With DSS, decision makers can utilize available information more efficiently, thereby improving the quality of decisions taken and optimizing the final results of a decision process. DSS offers a wide array of methods and techniques, including statistical analysis, mathematical modeling, simulation, and artificial intelligence, which are used to process data and generate recommendations that decision makers can consider [10][13]. In addition, DSS also facilitates users in identifying decision alternatives, evaluating the consequences of each of these alternatives, and taking into account their preferences and limitations. Thus, DSS not only speeds up the decision-making process, but also helps reduce risks and increase transparency and accountability in the process. As a system that continues to evolve, DSS continues to utilize advances in information technology and analytical methodologies to provide better support in decision making in various areas and levels of the organization. One of the methods used in DSS is Multi-Attributive Ideal-Real Comparative Analysis.

Multi-Attributive Ideal-Real Comparative Analysis (MAIRCA) is a decision analysis method used to compare alternatives based on certain criteria, which may be qualitative or quantitative [14][15]. In MAIRCA, each alternative is assessed against two sets of attributes: ideal attributes that reflect the desired expectations or targets, and real attributes that reflect the actual conditions of those alternatives. By comparing these two sets of attributes, MAIRCA helps decision makers understand the extent to which an alternative meets expectations and how actual conditions compare to those expectations [16][17]. With this approach, MAIRCA helps identify gaps between ideals and reality, and enables decision makers to formulate appropriate strategies or actions to overcome these differences [18][19]. MAIRCA is often used in the context of project evaluation, product or service selection, and decision making involving a variety of complex considerations. MAIRCA is a decision analysis method used to compare alternatives based on certain criteria, which may be qualitative or quantitative. In MAIRCA, each alternative is assessed against two sets of attributes: ideal attributes that reflect the desired expectations or targets, and real attributes that reflect the actual conditions of those alternatives [20][21]. By comparing these two sets of attributes, MAIRCA helps decision makers understand the extent to which an alternative meets expectations and how actual conditions compare to those expectations. With this approach, MAIRCA helps identify gaps between ideals and reality, and enables decision makers to formulate appropriate strategies or actions to overcome these differences [22][23]. MAIRCA is often used in the context of project evaluation, product or service selection, and decision making involving a variety of complex considerations. One of the main weaknesses of MAIRCA is in the determination of the weighting of criteria. MAIRCA requires assigning weights to each criterion used in the evaluation, which is an important aspect in determining the relative importance of each criterion in decision making. However, assigning proper weight is often a difficult task and prone to decision-making subjectivity. Without a clear method for assigning these weights, there is a risk that individual preferences or uncontrollable factors could significantly affect the results of the analysis. This may result in uncertainty in the interpretation of the results and limit the usefulness of MAIRCA as a reliable decision-making tool. In practice, addressing these weaknesses requires a careful approach and balanced selection of criteria weights, often through collaborative discussion and in-depth analysis. One method of weighting criteria to overcome the weaknesses of MAIRCA is using the Pivot Pairwise Relative Criteria Importance Assessment.

The weighting method using the Pivot Pairwise Relative Criteria Importance Assessment (PIPRECIA) is an approach used in the decision-making process to assign weights to each relevant criterion. In PIPRECIA, each criterion is evaluated in pairs to determine its relative importance in decision making. These criteria evaluated in pairs are compared with each other in terms of importance, and the preferences between those criteria are set by the decision maker [24][25]. By collecting these preferences, the relative weights of each criterion can be calculated, providing a more detailed view of the importance of each criterion in the context of the decision at hand. One of the main advantages of the weighting method using PIPRECIA is its ability to describe the preferences and priorities of decision makers in detail. By comparing criteria in pairs, PIPRECIA allows decision makers to directly evaluate the importance of each criterion in the context of the decision at hand [26][27]. This approach helps in reducing subjectivity and increasing transparency in the determination of weights, as individual preferences are reflected through direct comparisons between criteria.

The difference with previous research that became the literature in this study is that this study uses the criteria weighting method, namely PIPRECIA and the MAIRCA method in determining scholarship recipients. The combination of weighting using PIPRECIA and MAIRCA can be a powerful approach in determining scholarship recipients. With PIPRECIA, scholarship providers can gather preferences from various relevant parties to determine the relative weight of each evaluation criterion. Furthermore, by applying MAIRCA, scholarship recipients can be evaluated based on these criteria by comparing between ideal attributes that reflect expected standards with real attributes that reflect the actual conditions of each recipient. By integrating these two methods, the process of determining scholarship recipients becomes more structured, transparent, and takes into account diverse preferences and priorities, ensuring that aid is distributed to the most deserving and needy individuals. The use of a combination of PIPRECIA and MARICA to determine potential scholarship recipients is considered appropriate because these two methods complement each other in dealing with the complexity of the assessment criteria. This combination allows for a more transparent and objective selection process, minimizes subjectivity, and helps ensure that only candidates with the best potential are selected. This study aims to apply the combination of PIPRECIA and MAIRCA in determining scholarship recipients so that it will be a decision recommendation for universities in providing

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scholarship assistance. The contribution of this research lies in the combination of PIPRECIA and MARICA methods to determine potential scholarship recipients. The combination of these two methods provides a comprehensive and objective approach to the assessment and selection of potential scholarship recipients, ensuring that the selected candidates have a high potential for success in their studies.

2. RESEARCH METHODOLOGY

A research conceptual framework is a conceptual structure that provides guidance on how a study will be carried out and structured. This conceptual framework not only helps the researcher to direct the focus of the study, but also provides a clear structure in planning and carrying out the research, as well as assisting in interpreting the results obtained. Thus, the research concept framework becomes an important foundation in ensuring that research is carried out with the right methodology and can produce meaningful findings. By following a solid conceptual framework, researchers can increase the validity, reliability, and generality of their research, resulting in meaningful contributions to knowledge in the field. Figure 1 is the conceptual framework of the research conducted in this study.

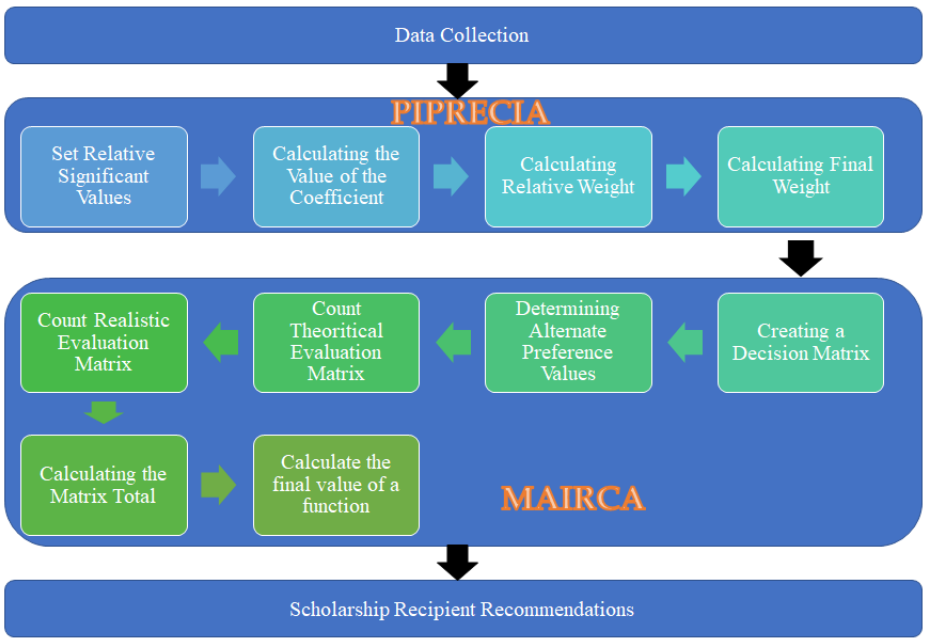

Figure 1. Conceptual Framework

The following is a detailed explanation for each stage carried out by the conceptual framework. These stages are systematically designed to support the achievement of research objectives. Each step has a specific role that is interconnected, forming a unified analysis flow.

2.1. Data Collection

Requirement gathering in the determination of scholarship recipients is a critical stage in the selection process that ensures that criteria relevant and appropriate to the scholarship objectives are comprehensively taken into account. The selection team must actively communicate with various relevant parties, including prospective recipients, academics, and other stakeholders, to understand the social, economic, and academic context of prospective recipients. This approach allows for the identification of each candidate's unique challenges and needs, including aspects such as academic performance, financial need, out-of-school achievement, and social or community contributions. By gaining a deep understanding of individual needs, the selection team can make more informed and fair decisions in determining the most deserving scholarship recipients and maximizing their positive impact in supporting the academic and social development of scholarship recipients. Table 1 is the result of the collection of criteria used in determining scholarship recipients.

Table 1. Scholarship recipient criteria data

Criteria Code	Criteria Name	Criteria Type	Initial Weight Criteria
CS-1	Parents' Income	Cost	1
CS-2	Grade Point Average	Benefit	1
CS-3	Number of Achievements	Benefit	1
CS-4	Number of Brothers	Benefit	0.8

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The results of data collection with the student affairs section of XYZ University in determining scholarship recipients were obtained the criteria used in table 1. The next process is to collect assessment data on scholarship receipts shown in table 2.

Table 2. Scholarship recipient assessment result data

Name of Scholarship Recipient	Criteria Code			
	CS-1	CS-2	CS-3	CS-4
Sandias Arsya	3100000	3.33	4	3
Ardi Pradana	2750000	3.65	3	2
Ketut Purwanti	2500000	3.45	2	2
Dema Ramadani	3375000	3.67	3	4
Yusuf Maqdis	2500000	3.05	4	1
Widiya Kusumaningrum	2250000	3.59	5	2
Zainal Arifin	3250000	3.51	4	3
Raka Sulistiyo	2800000	3.28	3	2
Kurniawansyah	2000000	3.37	2	3

The data on the assessment of scholarship recipients in table 2 is obtained based on the results of data collection with the student affairs department of XYZ University by conducting interviews with students who apply for scholarships, the data will be processed using the MAIRCA method and will produce a ranking of scholarship recipients.

2.2. PIPRECIA Method

The pivot pairwise relative criteria importance assessment method is an approach used to evaluate the importance of various criteria in the context of decision making. In this method, each criterion is compared in pairs with each other, using a relative rating scale [28][29]. The comparison process is done by selecting one criterion as the pivot or reference point, and then measuring the relative importance of the other criteria to that pivot criterion. Comparison results are collected for each criterion, allowing accurate and proportional weighting to be used in decision making. This approach facilitates a more subjective and contextual assessment of a range of relevant criteria, helping decision makers to set priorities and focus in complex decision-making processes. The stages in calculating the PIPRECIA method are first calculating the value Relative significance using the equation below.

$$S_j = \begin{cases} 1 \; if \; c_j > c_1 \\ 1 \; if \; c_j = c_1 \\ 1 \; if \; c_j < c_1 \end{cases} \quad (1)$$

S_j is a Notation that represents the preference ranking for candidate j. It shows how candidate j compares to the c_j criteria. The next process in PIPRECIA is to calculate the value of the coefficient using the equation below.

$$K_j = \begin{cases} 1 \; if \; j = 1 \\ 2 - S_j \; if \; j > 1 \end{cases} \quad (2)$$

K_j is a notation that represents the preference ranking for candidate j. It shows how candidate j compares to all other candidates. The next process in PIPRECIA is to calculate, calculate weights using the equation below.

$$q_j = \begin{cases} 1 \; if \; j = 1 \\ \frac{1}{k_j} \; if \; j > 1 \end{cases} \quad (3)$$

w_j is a notation that represents the preference rank of candidate J. This shows how candidate j compares to other candidates. The final process in PIPRECIA is to calculate the relative final weight of each criterion using the equation below.

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_k} \quad (4)$$

The weight of criterion w_j preference, which shows the relative contribution of criterion j to total preference.

2.3. MAIRCA Method

The MAIRCA method is a decision analysis tool used to evaluate alternatives based on various relevant attributes or criteria [23]. In this method, each alternative is assessed by comparing it against two reference points: ideal and real. Ideality is understood as the desired ideal value for each attribute, while reality refers to the value found in the alternative being evaluated. MAIRCA makes it possible to measure how close or far an alternative value is in the context of a defined attribute [30]. Thus, this method provides a systematic way to evaluate and compare alternatives in a relative way, which can then be used in decision making to select the solution that best suits existing needs or preferences [31]. The first process of the MAIRCA method creates a decision matrix using the equation below.

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$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (5)$$

Where x_{mn} is the value of each alternative based on the m[th] criteria. Next calculate the alternative preference value using the following equation.

$$P_{ai} = \frac{1}{m} \sum_{i=1}^{m} P_{ai} = 1 \quad (6)$$

m is the number of available alternatives, while P_{ai} is the preference value of each alternative, and the overall P_{ai} value is 1. The preference value is made with the equation below.

$$P_{a1} = P_{a2} = P_{a3} = P_{am} \quad (7)$$

The next process of the MAIRCA method is to calculate the value of the theoretical evaluation matrix using the equation below.

$$T_p = \begin{bmatrix} t_{p11} & \cdots & t_{p1n} \\ \vdots & \ddots & \vdots \\ t_{pm1} & \cdots & t_{pmn} \end{bmatrix} = \begin{bmatrix} p_{a11} * w_1 & \cdots & p_{a1n} * w_n \\ \vdots & \ddots & \vdots \\ p_{am1} * w_1 & \cdots & p_{amn} * w_n \end{bmatrix} \quad (8)$$

Where T_p is the theoretical evaluation value of the matrix and p_a is the reference value of each alternative, and w_n is the weight value of the criterion. The next process of the MAIRCA method is to calculate the value of the realistic evaluation matrix using the equation below.

$$T_r = \begin{bmatrix} t_{r11} & \cdots & t_{r1n} \\ \vdots & \ddots & \vdots \\ t_{rm1} & \cdots & t_{rmn} \end{bmatrix} \quad (9)$$

Where T_r is the realistic evaluation value of the alternative, the criteria for benefit types will be calculated using the following equation.

$$t_{rij} = t_{pij} \left(\frac{x_{ij} - x_{ij}^{-}}{x_{ij}^{+} - x_{ij}^{-}} \right) \quad (10)$$

t_{rij} is the realistic matrix evaluation value while t_{pij} is the alternative preference value, and x_{ij} is the alternative value for each criterion. Next the Calculating the Total Gap Matrix using the following equation.

$$G_{ij} = t_{pij} - t_{rij} \quad (11)$$

Where G_{ij} is the total matrix gap value, and finally calculate the Final Value of a function using the following equation.

$$Q_i = \sum_{j=1}^{n} g_{ij} \quad (12)$$

Where Q_i is the final score of each alternative based on the assessment that has been carried out using the MAIRCA method.

2.4. Scholarship Recipienct Recommendeations

In the context of scholarship recipient recommendations, the Multi Attribute Ideal Real Comparative Analysis (MAIRCA) method can be a useful tool in the selection process. This method allows the selection team to evaluate prospective scholarship recipients based on a predetermined set of criteria, such as academic achievement, financial need, participation in extracurricular activities, and social contribution. Each candidate is assessed by comparing their grades to the expected ideal standards as well as the realities contained in their profile. MAIRCA provides a systematic framework for measuring how close or far a candidate is from the desired ideality in each criterion. Thus, this method makes it possible to make more informed and fair recommendations based on a holistic evaluation of potential scholarship recipients, which can help maximize the positive impact of the financial aid provided to them.

3. RESULT AND DISCUSSION

The combination of the PIPRECIA method and the MAIRCA method is a strong approach in decision making, especially in the context of scholarship recipient recommendations. Using PPIPRECIA, the selection team can identify the most important criteria in determining scholarship recipients by comparing the relative importance between criteria. Once the important criteria are determined, the MAIRCA method is used to evaluate each prospective scholarship recipient based on those criteria, comparing between expected (ideal) and existing (real) values in their profiles. The combination of these two methods allows the selection team to make more informed and objective recommendations, taking into account the relative importance of each criterion and assessing the proximity of prospective scholarship recipients to the ideal desired standard in determining scholarship recipients. Thus, this

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approach can ensure that the decisions taken are in accordance with the goals and values to be achieved by the scholarship program, and can provide optimal benefits to the scholarship recipients. The combination of these two methods provides a comprehensive and structured framework for selecting the most suitable scholarship recipients, according to the goals and values to be achieved by the scholarship program.

3.1. Implementation of the Criteria Weighting Method Using PIPRECIA

The application of this method allows the selection team to make more informed and objective decisions in selecting scholarship recipients who best suit the needs and goals of the scholarship program offered. The implementation of PIPRECIA helps ensure that the decisions taken are the result of a systematic and objective process, which aligns with the priorities and values that the scholarship program seeks to achieve. The results of calculating the relative significant value using (1), the coefficient value using (2), the weight value using (3), and the relative final weight of each criterion using (4) as shown in Table 3.

Table 3. Results of criterion weights using PIPRECIA

Criteria Code	S_j	K_j	Q_j	W_j
CS-1	1	1	1	0.261
CS-2	1	1	1	0.261
CS-3	1	1	1	0.261
CS-4	0.8	1.2	0.833	0.217

Table 3 presents the results of the calculation of the weight of the criteria using the PIPRECIA method for the determination of scholarships. Each column in this table provides details on how each criterion is considered based on the score calculated using PIPRECIA. Based on the results of the calculation of the weight of the criteria using the PIPRECIA method in table 3, the Parents' Income criterion has a weight of 0.261, the Grade Point Average criterion has a weight of 0.261, the Number of Achievements criterion has a weight of 0.261, and the criterion has a Number of Brothers weight of 0.217.

3.2. Implementation of MAIRCA Method in Determining Scholarship Recipients

The implementation of the multi attribute ideal real comparative analysis (MAIRCA) method in determining scholarship recipients opens up opportunities for holistic evaluation of prospective recipients. In the first step, the selection team establishes relevant criteria, such as academic achievement, financial need, participation in extracurricular activities, and social contribution. Next, each criterion is assigned the desired ideal value as well as the real value found in the prospective recipient's profile. By comparing these two values, MAIRCA makes it possible to determine how close or far each candidate is from the desired ideal standard. This evaluation process allows the selection team to make decisions based on a comprehensive understanding of each candidate's abilities and qualifications. Thus, the implementation of MAIRCA helps ensure that the selected scholarship recipients are those who best match the goals and values that the scholarship program seeks to achieve. The first stage of the MAIRCA method creates a decision matrix using equation (5) based on the assessment data shown in table 2. The following are the results of the decision matrix made.

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{31} & x_{41} \\ x_{12} & x_{22} & x_{32} & x_{42} \\ x_{13} & x_{23} & x_{33} & x_{43} \\ x_{14} & x_{24} & x_{34} & x_{44} \\ x_{15} & x_{25} & x_{35} & x_{45} \\ x_{16} & x_{26} & x_{36} & x_{46} \\ x_{17} & x_{27} & x_{37} & x_{47} \\ x_{18} & x_{28} & x_{38} & x_{48} \\ x_{19} & x_{29} & x_{39} & x_{49} \end{bmatrix} \Rightarrow X = \begin{bmatrix} 3100000 & 3.33 & 4 & 3 \\ 2750000 & 3.65 & 3 & 2 \\ 2500000 & 3.45 & 2 & 2 \\ 3375000 & 3.67 & 3 & 3 \\ 2500000 & 3.05 & 4 & 1 \\ 2250000 & 3.59 & 5 & 2 \\ 3250000 & 3.51 & 4 & 3 \\ 2800000 & 3.28 & 3 & 2 \\ 2000000 & 3.37 & 2 & 3 \end{bmatrix}$$

The next stage of the MAIRCA method calculate s the value of alternative preferences using equations (6) and (7), Table 4 is the result of calculating the value of alternative preferences.

Table 4. Alternative preference value

Name of Scholarship Recipient	Criteria Code			
	CS-1	CS-2	CS-3	CS-4
Sandias Arsya	0.111	0.111	0.111	0.111
Ardi Pradana	0.111	0.111	0.111	0.111
Ketut Purwanti	0.111	0.111	0.111	0.111
Dema Ramadani	0.111	0.111	0.111	0.111
Yusuf Maqdis	0.111	0.111	0.111	0.111
Widiya Kusumaningrum	0.111	0.111	0.111	0.111
Zainal Arifin	0.111	0.111	0.111	0.111

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Raka Sulistiyo	0.111	0.111	0.111	0.111
Kurniawansyah	0.111	0.111	0.111	0.111

In Table 4, it is shown that each scholarship recipient is given a preference score for various criteria that have been set. Each line represents one student with its preferred value for each of the specified criteria, coded as CS-1 through CS-4. This preference value shows the extent to which each student meets or does not meet the criteria that have been set. The next stage of the MAIRCA method calculates the value of the theoretical evaluation matrix using equation (8), Table 5 is the result of calculating the value of the theoretical evaluation matrix.

Table 5. The theoretical evaluation matrix

Name of Scholarship Recipient	Criteria Code			
	CS-1	CS-2	CS-3	CS-4
Sandias Arsya	0.027	0.027	0.022	0.020
Ardi Pradana	0.027	0.027	0.022	0.020
Ketut Purwanti	0.027	0.027	0.022	0.020
Dema Ramadani	0.027	0.027	0.022	0.020
Yusuf Maqdis	0.027	0.027	0.022	0.020
Widiya Kusumaningrum	0.027	0.027	0.022	0.020
Zainal Arifin	0.027	0.027	0.022	0.020
Raka Sulistiyo	0.027	0.027	0.022	0.020
Kurniawansyah	0.027	0.027	0.022	0.020

Table 5 is a theoretical evaluation matrix for scholarship recipients based on various criteria. Each row in this table shows the theoretical value for one student given for each of the criteria mentioned, ranging from CS-1 to CS-4. Each score represents a score that indicates the extent to which each student meets or does not meet the existing criteria. The next stage calculates realistic evaluation matrix value using (9), benefit criteria using (10), while cost criteria using (11). The results as in Table 6.

Table 6. The realistic evaluation matrix

Name of Scholarship Recipient	Criteria Code			
	CS-1	CS-2	CS-3	CS-4
Sandias Arsya	0.021	0.012	0.015	0.014
Ardi Pradana	0.014	0.026	0.007	0.007
Ketut Purwanti	0.010	0.017	0.000	0.007
Dema Ramadani	0.027	0.027	0.007	0.020
Yusuf Maqdis	0.010	0.000	0.015	0.000
Widiya Kusumaningrum	0.005	0.023	0.022	0.007
Zainal Arifin	0.024	0.020	0.015	0.014
Raka Sulistiyo	0.015	0.010	0.007	0.007
Kurniawansyah	0.000	0.014	0.000	0.014

Table 6 presents a realistic evaluation matrix for scholarship recipients based on various criteria. Each row in this table shows a realistic score for one student, given for each of the criteria mentioned, ranging from CS-1 to CS-4. Each score represents a score that shows the extent to which each student meets or does not meet the criteria that exist in a more realistic scenario. The next stage of the MAIRCA total gap matrix method uses equation (12), Table 7 is the result of the calculation of the total gap matrix.

Table 7. Total gap matrix

Name of Scholarship Recipient	Criteria Code			
	CS-1	CS-2	CS-3	CS-4
Sandias Arsya	0.005	0.015	0.007	0.007
Ardi Pradana	0.012	0.001	0.015	0.014
Ketut Purwanti	0.017	0.009	0.022	0.014
Dema Ramadani	0.000	0.000	0.015	0.000
Yusuf Maqdis	0.017	0.027	0.007	0.020
Widiya Kusumaningrum	0.022	0.003	0.000	0.014
Zainal Arifin	0.002	0.007	0.007	0.007
Raka Sulistiyo	0.011	0.017	0.015	0.014
Kurniawansyah	0.027	0.013	0.022	0.007

Table 7 shows the matrix of total differences for scholarship recipients based on various criteria. Each row in this table represents the difference between the theoretical and realistic scores of each student for each given criterion, from CS-1 to CS-4. This total difference provides insight into the difference in student performance in a more tangible

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context compared to the previously defined theoretical standard. The last stage of the MAIRCA method calculates the final value of each alternative using (13), table 8 is the result of the calculation of the final value.

Table 8. Final alternative value

Name of Scholarship Recipient	Total Value
Sandias Arsya	0.034
Ardi Pradana	0.041
Ketut Purwanti	0.062
Dema Ramadani	0.015
Yusuf Maqdis	0.071
Widiya Kusumaningrum	0.039
Zainal Arifin	0.023
Raka Sulistiyo	0.056
Kurniawansyah	0.068

Table 8 presents alternative final scores for scholarship recipients based on a combination of various evaluation matrices that have been calculated previously. Each line shows the total score generated for each student based on a theoretical and realistic assessment of the set criteria. This value represents the final preference of each student in terms of meeting the criteria for getting a scholarship.

3.3. Scholarship Recipients Recommendations

Scholarship recipient recommendations are the result of an in-depth evaluation of prospective recipients based on predetermined criteria. After an evaluation process using criteria weighting methods such as PIPRECIA or MAIRCA, the selection team makes recommendations based on a holistic analysis of each candidate. Prospective recipients who have high academic performance, urgent financial needs, are active in extracurricular activities, and have significant social contributions tend to get greater attention. These recommendations may also take into account specific criteria that may be relevant to a particular scholarship program, such as specific needs in a particular field of study or socioeconomic environmental conditions. By taking these various aspects into account thoroughly, scholarship recipient recommendations are generated with the aim of maximizing benefits for prospective recipients and achieving the goals to be achieved by the scholarship program. Figure 2 is the result of the alternative ranking of scholarship recipients.

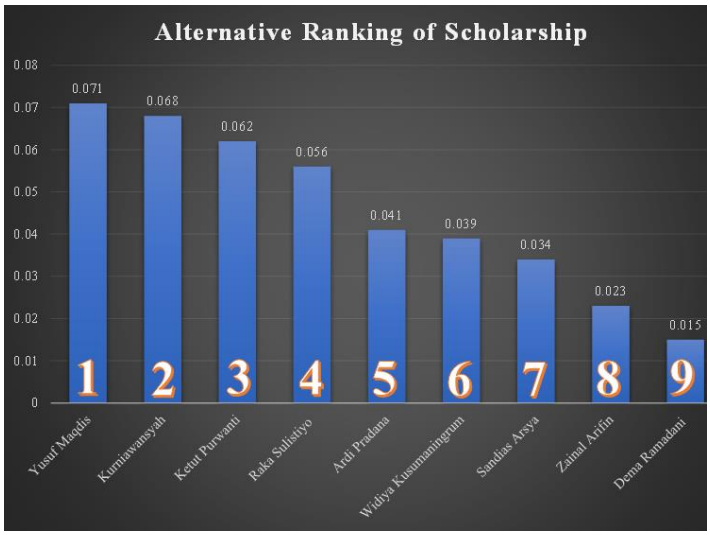

Figure 2. Alternative Ranking of Scholarship

Figure 2 shows the alternative ranking of scholarship recipients based on their total grade score. In this graph, each bar represents one scholarship recipient, sorted from highest to lowest score. Yusuf Maqdis ranked first with the highest total score of 0.071, indicating that he has the most suitable criteria in the assessment to get the scholarship. The second to third places were filled by Kurniawansyah with a score of 0.068 and Ketut Purwanti with a score of 0.062, who had a slightly lower score compared to Yusuf Maqdis but remained in the top position. Raka Sulistiyo with a score of 0.056 and Ardi Pradana with a score of 0.041 ranked fourth and fifth with relatively equal scores. Furthermore, Widiya Kusumaningrum with a score of 0.039, Sandias Arsya with a score of 0.034, Zainal Arifin with a score of 0.023, and Dema Ramadani with a score of 0.015 occupy a lower position, reflecting that they have a lower total score compared to the scholarship recipients in the top rank. This graph provides a clear picture of the relative ranking of each scholarship recipient based on the criteria assessed in the selection process.

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3.4. Discussion

The combination of PIPRECIA and MARICA offers several advantages in determining scholarship recipients. PIPRECIA provides an objective method to compare criteria using simple logical preferences, making it easier to evaluate each candidate based on predetermined criteria. This allows for fairer and more transparent evaluations. MARICA then went on to provide a more detailed preference ranking, considering the preference contrast value and preference weights for each candidate, thus providing a more comprehensive view of the candidate's performance in meeting the scholarship criteria. This combination allows the integration of various criteria with different weights, resulting in more accurate and measurable rankings. However, this combination also has some drawbacks. One of them is the complexity of calculating and integrating various criteria using several analysis steps. This can add to the computational burden and require more in-depth technical knowledge from the party applying this method. In addition, although MARICA provides a more detailed rating, the final result may still depend on the quality of the initial data input and the level of objectivity of the criteria values used. This has the potential to cause bias if not managed properly. Therefore, careful regulation and special attention to data management are needed to minimize the impact of such bias.

4. CONCLUSION

This study aims to apply the combination of PIPRECIA and MAIRCA in determining scholarship recipients so that it will be a decision recommendation for universities in providing scholarship assistance. The combination of weighting using PIPRECIA and MAIRCA can be a powerful approach in determining scholarship recipients. With PIPRECIA, scholarship providers can gather preferences from various relevant parties to determine the relative weight of each evaluation criterion. Furthermore, by applying MAIRCA, scholarship recipients can be evaluated based on these criteria by comparing between ideal attributes that reflect expected standards with real attributes that reflect the actual conditions of each recipient. By integrating these two methods, the process of determining scholarship recipients becomes more structured, transparent, and takes into account diverse preferences and priorities, ensuring that aid is distributed to the most deserving and needy individuals. The results of the alternative ranking using a combination of PIPRECIA and MAIRCA in determining scholarship recipients, Yusuf Maqdis occupies the first position with a final score of 0.071, followed by Kurniawansyah in second place with a score of 0.068, and Ketut Purwanti is in third place with a score of 0.062. This study combines the PIPRECIA method and to determine scholarship recipients more objectively. PIPRECIA is used to simplify the comparison of criteria and allocate preference weights to each criterion by using simple logical preferences. This allows for a fairer evaluation of each candidate based on a variety of criteria. Furthermore, MARICA is used to provide a more detailed preference rating to each candidate by taking into account the preference contrast value and preference weight, resulting in a more measurable and objective rating. The findings of the study show that this combination successfully integrates various criteria by considering different weights, resulting in a more accurate ranking in determining scholarship recipients. The performance of the method showed that the combination of PIPRECIA and MARICA provided adequate results in determining scholarship recipients. This method successfully addresses the subjectivity issues that often arise in the scholarship selection process, by providing a more objective preference ranking based on a complex analysis of criteria. In addition, the results of the performance test show that this method is able to capture the difference in student performance better than the traditional method that only uses one dimension of assessment. This advantage allows the identification of the most qualified candidates for the scholarship based on several relevant assessment factors.

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