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Leadership Support System for the Selection of Outstanding Students Using the MAUT Method

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Abstract−A student is a person who is currently in education. Outstanding students are students who are studying or studying in higher education, both in universities, as well as institutes or academies that are being followed in order to achieve their desired goals. They are people who are prospective intellectuals who are registered as students at a college or university called students. Based on the problems that often occur, a decision support system is needed to be used in solving these problems, so every student who is continuing their education is expected to study seriously for the sake of achieving achievements according to what is desired so that in the future they will become the next generation for the nation. In this study, 7 criteria were used in the selection of outstanding students that became a reference or assessment worthy of becoming outstanding students, including activeness, certificates obtained during lectures, cumulative achievement index scores, behavior in lectures, written works, the number of parental dependents, and income. Based on the problems that often occur, a decision support system is needed to be used in solving these problems, so every student who is continuing their education is expected to study seriously for the sake of achieving achievements according to what is desired so that in the future they will become the next generation for the nation. Therefore, a decision support system is needed to solve a problem by applying the *Centroid Rank Order* (ROC) Method used to carry out weighting and the *Multi Attribute Utility Theory* (MAUT) Method which is used to solve the problem by including weighting. From the test results, the best alternative that is considered worthy as an outstanding student is in the A3 alternative for Ira using the *Rank Order Centroid* (ROC) Method and *the Multi Attribute Utility Theory* (MAUT) method with a score of 1.297.

Keywords: Decision Support System; Selection of Outstanding Students; ROC; MAUT Method

1. INTRODUCTION

In the selection of outstanding students, universities have the meaning of being a place to get an education according to the abilities of each student or the results of achievement obtained by students. Students are people who are participating in education. Outstanding students are students who are studying or studying in higher education, either in universities, or institutes or academies that are being followed in order to achieve their desired goals[1]. They are people who are prospective intellectuals who have good personality values who are registered as students at a college or at a university called students. It can be said in a nutshell that it is a group in society that obtains status because it has ties to universities, universities, institutes or in academics. So that with the achievement of students will be able to support a better life in the future because they already have achievements [2].

Based on the problems that often occur, a decision support system is needed to be used in solving these problems, so every student who is continuing their education is expected to study seriously for the sake of achieving achievements according to what is desired so that in the future they will become the next generation for the nation. In this study, 7 criteria were used in the selection of outstanding students that became a reference or assessment that is worthy of becoming an outstanding student, including activeness, certificates obtained during lectures, cumulative achievement index scores, behavior in lectures, written works, the number of parental dependents, and income[3]. There are also references that hinder students in achieving their achievements, namely the lack of learning intention or intention to follow every learning in lectures so that it causes students' grades to be not good.

The decision support system according to experts Bonczek et al is a book *Decision Support System And Intelligent Systems* which defines SPK as a computer-based system consisting of several component parts including the interaction of the language system between users, the problem domain retention system and the problem processing system. A decision support system is also an information system that can be used to solve a problem regarding data that includes about computers[4],[5]. Decision support systems can be used in decision-making in problems with structured or semi-structured situations that provide information as well as data modeling or manipulation.

The ROC (Rank Order Centroid) and MAUT (Multi-Attribute Utility Theory) methods were used in this study as a multicriteria decision-making approach. ROC functions to determine the weight of the importance of each criterion based on a simple and systematic order of priorities, while MAUT is used to process the weight and value of each criterion into a utility value to produce objective and measurable decisions [6].

Some of the related research used includes research conducted by Abdul Karim et al in 2021 which discusses the analysis of the application of the method *Multi Attribute Utility Theory (*MAUT) and *Rank Order Centroid* (ROC) with a final result of 0.456[7]. The research conducted by Amanudiin Harahap et al in 2022 discusses the decision support system for selecting new features of website applications using the Method *Multi Attribute Utility Theory* (MAUT)

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obtained with a final result of 0.754. The research conducted by Wahyu Harry Bai Lumbanbatu et al in 2022 which discussed the decision support system for determining the transfer of football players applying the ROC and MAUT methods with a final research result of 0.587[8]. In a study conducted by Sri Fransika Pantatu et al in 2022 which discussed the decision support system for MSME assistance recipients using the *Multi Attribute Utility Theory* (MAUT)with a final result of 1.05 [9]

In this study, the author is interested in using the *Multi Attribute Utility Theory* (MAUT) Method to obtain the best alternative value according to the criteria determined by the weighting value obtained from the application of *the Rank Order Centroid* (ROC) method. The purpose of this research is to determine a decision support system in the selection of outstanding students.

2. RESEARCH METHODOLOGY

2.1 Decision Support System

The decision support system according to experts Bonczek et al is a book *Decision Support System And Intelligent Systems* which defines SPK as a computer-based system consisting of several component parts including the interaction of the language system between users, the problem domain retention system and the problem processing system. A decision support system is also an information system that can be used to solve a problem regarding data that includes about computers [10],[11],[12].

2.2 Outstanding Students

Outstanding students are students who are studying or studying in higher education, both in universities, as well as institutes or academies that are being followed in order to achieve their desired goals. They are people who are intellectual candidates who are registered as students at a college called students [13],[14],[15],[16].

2.3 Centroid Rank Order (ROC) Method

The Centroid Rank Order (ROC) method is one of the techniques to give weight to each criterion according to the ranking of the level of importance which is assessed based on the level of priority Focus on Criteria First, who has because of the priority Higher So that the criteria are very important to be sorted first from the second criterion so too Criteria third[17],[18],[19].

This can be confirmed by equation 1 as follows:

$$C_r \geq \geq \geq \ldots \geq C_{r_2} C_{r_3} C_m \tag{1}$$

So that after doing the process, it will make equation 2:

$$W_1 \geq \geq \geq \ldots \geq W_2 W_3 W_m \tag{2}$$

To get a weight value (W), use equation 3 as follows:

$$\mathrm{W_m} = \frac{1}{\mathrm{m}} \sum_{1=1}^{\mathrm{m}} \left(\frac{1}{\mathrm{i}}\right) \tag{3}$$

As a result of the total, this is worth 1.W_m

2.4 Multi Attribute Utility Theory Method (MAUT)

The Multi Attribute Utility Theory (MAUT) method is a decision-making method by conducting a group comparison between the selection criteria and also a group comparison between existing options where the final score v(x) of an object x is defined as a weight added to the value [20]**. Next** Steps to complete the MAUT method [16],[21],[22] :

a. Preparing the Decision Matrix ()X_{ij}

$$X_{ij} = \begin{bmatrix} x_{11} & \cdots & x_{1j} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \cdots & x_{ij} & \cdots & x_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mj} & \cdots & x_{mn} \end{bmatrix} \tag{4}$$

b. Calculating Decision Matrix Normalization ()r_{ij}^*

$$r_{ij}^* = \frac{x_{ij-\min(x_{ij})}}{max(x_{ij})-\min(x_{ij})} \,(\max) \tag{5}$$

$$r_{ij}^* = 1 + \left(\frac{min(x_{ij})-x_{ij}}{max(x_{ij})-min(x_{ij})}\right) \,(\min) \tag{6}$$

c. Calculating Marginal Utilities ()u_{ij}

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$$u_{ij} = \frac{exp^{\left(r_{ij}^{*}\right)^{2}} - 1}{1.71} \quad (7)$$

d. Calculating Final Utility ()u_i

$$u_i = \sum_{j=1}^{n} u_{ij} * w_{ij} \quad (8)$$

2.5 Research Stages

In making this research, there are several stages that the author does which are explained in the following discussion:

a. Problem Analysis
   This stage is carried out to analyze the problems that will be faced in the research
b. Data Collection
   In this stage, data collection is carried out to find the same material as the case from several sources related to the internet
c. Literature Studies
   In this stage, a literature study is made to find out a number of references used in the research
d. Application of the MAUT Method
   In this stage, the problems faced with a data are solved through the application of the MAUT Method
e. ROC Method Weighting
   In this stage, the ROC method is needed to obtain a weight value that will be used in the data testing
f. Creation of research reports
   In this stage, a research report is made with the aim of clearly explaining the final results of the problem that has been solved

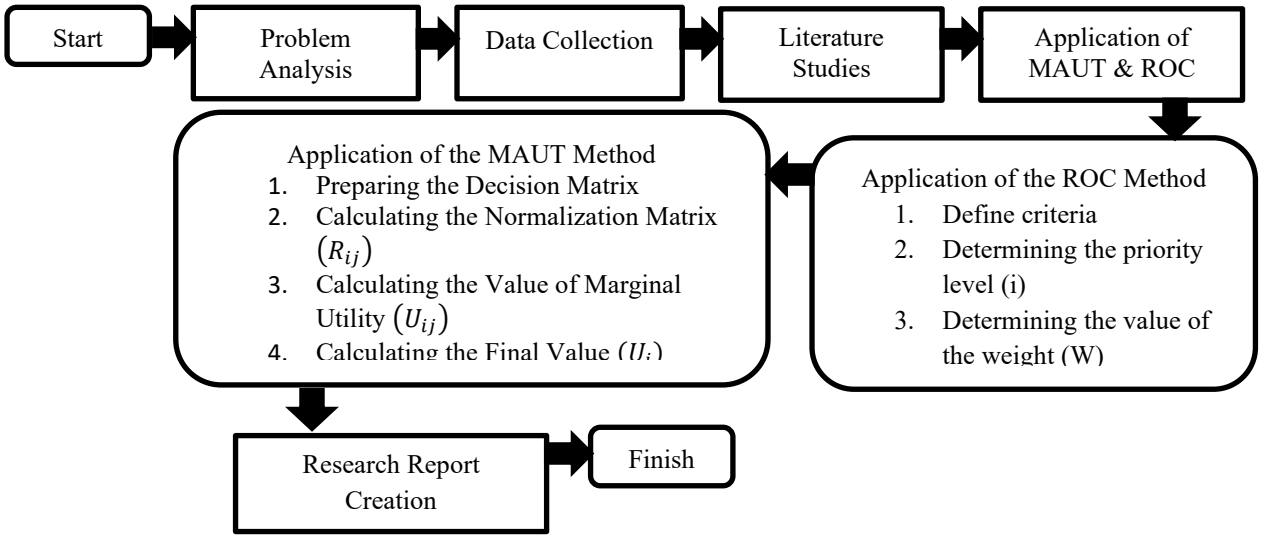

Figure 1. Research Stages

3. RESULTS AND DISCUSSION

The Multi Attribute Utility Theory (MAUT) method is used to solve the problem of Outstanding Student Selection by connecting seven illustrations of alternative data that have met the criteria.

3.1 Alternative Implementation

In the Alternative Implementation, the role is to select outstanding prospective students who have met the criteria that have been set. The following is alternative student data in Table 1 below:

Table 1. Alternatives

Alternatives	Student Name
A1	Yuliana
A2	Dwi
A3	Ira
A4	Elfrida
A5	Reza
A6	Amad

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Alternatives	Student Name
A7	Rizki

3.2 Application of Criteria

In determining prospective outstanding students, there are criteria that must be met, such as Table 2 below:

Table 2. Criteria Data

Criteria	Remarks	Type
C1	GPA	Benefit
C2	Certificate of achievement	Benefit
C3	Semester	Benefit
C4	Behavior	Benefit
C5	Written Works	Benefit
C6	Quantity	Cost
C7	Revenue	Cost

Description of the criteria in Table 2:
a. GPA: The grades obtained by students in each semester
b. Certificate of achievement: Number of student achievement certificates in attending lectures
c. Semester: Student level in lectures
d. Behavior: Student behavior in lectures
e. Writing: The results of students' writings in each lecture
f. Number : number of children borne by parents
g. Occupation: Work from the student's parents

3.3 Application of Centroid Rank Order (ROC) Method

In determining the selection of outstanding students, there are several criteria that can be met, the use of weights in this study uses *the Rank Order Centroid* (ROC) method. Weighting the value using the *Centroid Rank Order* (ROC) Method meets the above criteria by producing the calculation below:

$$W_1 = \frac{1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}37$$

$$W_2 = \frac{0+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}23$$

$$W_3 = \frac{0+0+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}16$$

$$W_4 = \frac{0+0+0+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}11$$

$$W_5 = \frac{0+0+0+0+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}07$$

$$W_6 = \frac{0+0+0+0+0+\frac{1}{6}+\frac{1}{7}}{7} = 0{,}04$$

$$W_6 = \frac{0+0+0+0+0+0+\frac{1}{7}}{7} = 0{,}02$$

The result of C1 Weighting is 0.37, C2 is 0.23, C3 is 0.16, C4 is 0.11, C5 is 0.07, C6 is 0.04, and C7 is 0.02. Alternatives and criteria that have been weighted previously can be seen in Table 3 below:

Table 3. Weights and Student Criteria Data

Criteria	Remarks	Weight	Type
C1	GPA	0,37	Benefit
C2	Certificate of achievement	0,23	Benefit
C3	Semester	0,16	Benefit
C4	Behavior	0,11	Benefit
C5	Written Works	0,07	Benefit
C6	Quantity	0,04	Cost
C7	Revenue	0,02	Cost

After determining the weight of the criteria, then in the following Table 4 determines the assessment of each alternative based on the criteria.

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Table 4. Alternative Assessment Based on Criteria

Alternatives	GPA (C1)	Certificate of Achievement (C2)	Semester (C3)	Behavior (C4)	Written Works (C5)	Quantity (C6)	Revenue (C7)
A1	3,33	2	6	Good	2	2	3000000
A2	3,50	3	6	Enough	3	5	4000000
A3	3,25	2	6	Very Good	4	2	2000000
A4	3,32	1	6	Good	3	4	2000000
A5	3,40	2	6	VeryGood	2	3	2000000
A6	3,60	2	8	Enough	2	5	3000000
A7	3,25	1	8	Good	5	4	3000000

In table 4 above, there is still data of a linguistic type, therefore it requires weighting to get the value in Table 5 as follows:

Table 5. Personality Criteria

Remarks	Value
Excellent	4
Good	3
Enough	2
Not Good	1

Table 6 presents the matching rating data of each alternative to each criterion (C1 to C7) after the weighting process is carried out. This data is used as a basis in the later calculation stage to determine the value of preferences and alternative ratings based on the method applied.

Table 6. Match Rating Data

Alternatives	C1	C2	C3	C4	C5	C6	C7
A1	3,33	2	6	3	2	2	3000000
A2	3,50	3	6	2	3	5	4000000
A3	3,25	2	6	4	4	2	2000000
A4	3,32	1	6	3	3	4	2000000
A5	3,40	2	6	4	2	3	2000000
A6	3,60	2	8	2	2	5	3000000
A7	3,25	1	8	3	5	4	3000000

3.4 Application of Multi Attribute Utility Theory (MAUT) Method

Here are the steps in the application of *the Multi Attribute Utility Theory* (MAUT) method:

a. Preparing the Decision Matrix

$$X_{ij} = \begin{bmatrix} 3,33 & 2 & 6 & 3 & 2 & 2 & 3000000 \\ 3,50 & 3 & 6 & 2 & 3 & 5 & 4000000 \\ 3,25 & 2 & 6 & 4 & 4 & 2 & 2000000 \\ 3,32 & 1 & 6 & 3 & 3 & 4 & 2000000 \\ 3,40 & 2 & 6 & 4 & 2 & 3 & 2000000 \\ 3,60 & 2 & 8 & 2 & 2 & 5 & 3000000 \\ 3,25 & 1 & 8 & 3 & 5 & 4 & 3000000 \end{bmatrix}$$

b. Calculating Decision Matrix Normalization

For Criterion C1 (Benefit)

$$r_{11}^{*} = \frac{3,33-3,25}{3,60-3,25} = \frac{0,08}{0,35} = 0,228$$

$$r_{21}^{*} = \frac{3,50-3,25}{3,60-3,25} = \frac{0,25}{0,35} = 0,714$$

$$r_{31}^{*} = \frac{3,25-3,25}{3,60-3,25} = \frac{0}{0,35} = 0$$

$$r_{41}^{*} = \frac{3,32-3,25}{3,60-3,25} = \frac{0,07}{0,35} = 0,2$$

$$r_{51}^{*} = \frac{3,40-3,25}{3,60-3,25} = \frac{0,15}{0,35} = 0,428$$

$$r_{61}^{*} = \frac{3,60-3,25}{3,60-3,25} = \frac{0,35}{0,35} = 1$$

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$r_{71}^{*} = \frac{3,25-3,25}{3,60-3,25} = \frac{0}{0,35} = 0$

For Criterion C2 (Benefit)

$r_{12}^{*} = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$

$r_{22}^{*} = \frac{3-1}{3-1} = \frac{2}{2} = 1$

$r_{32}^{*} = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$

$r_{42}^{*} = \frac{1-1}{3-1} = \frac{0}{2} = 0$

$r_{21}^{*} = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$

$r_{62}^{*} = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$

$r_{72}^{*} = \frac{2-1}{3-1} = \frac{1}{2} = 0,5$

For C3 (Benefit) Criteria

$r_{13}^{*} = \frac{6-6}{8-6} = \frac{1}{2} = 0,5$

$r_{23}^{*} = \frac{6-6}{8-6} = \frac{1}{2} = 0,5$

$r_{33}^{*} = \frac{6-6}{8-6} = \frac{1}{2} = 0,5$

$r_{43}^{*} = \frac{6-6}{8-6} = \frac{1}{2} = 0,5$

$r_{53}^{*} = \frac{6-6}{8-6} = \frac{1}{2} = 0,5$

$r_{63}^{*} = \frac{8-6}{8-6} = \frac{2}{2} = 1$

$r_{73}^{*} = \frac{8-6}{8-6} = \frac{2}{2} = 1$

For C4 (Benefit) Criteria

$r_{14}^{*} = \frac{3-2}{4-2} = \frac{1}{2} = 0,5$

$r_{24}^{*} = \frac{2-2}{4-2} = \frac{1}{2} = 0,5$

$r_{34}^{*} = \frac{4-2}{4-2} = \frac{2}{2} = 0$

$r_{44}^{*} = \frac{3-2}{4-2} = \frac{1}{2} = 0,5$

$r_{54}^{*} = \frac{4-2}{4-2} = \frac{2}{2} = 0$

$r_{64}^{*} = \frac{2-2}{4-2} = \frac{1}{2} = 0,5$

$r_{74}^{*} = \frac{3-2}{4-2} = \frac{1}{2} = 0,5$

For criterion C5 (Benefit)

$r_{15}^{*} = \frac{2-2}{5-2} = \frac{0}{3} = 0$

$r_{25}^{*} = \frac{3-2}{5-2} = \frac{1}{3} = 0,333$

$r_{35}^{*} = \frac{4-2}{5-2} = \frac{2}{3} = 0,666$

$r_{45}^{*} = \frac{3-2}{5-2} = \frac{1}{3} = 0,333$

$r_{55}^{*} = \frac{2-2}{5-2} = \frac{0}{3} = 0$

$r_{65}^{*} = \frac{2-2}{5-2} = \frac{0}{3} = 0$

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$$r_{75}^{*} = \frac{5-2}{5-2} = \frac{3}{3} = 1$$

For criterion C6 (cost)

$$r_{16}^{*} = 1 + \left(\frac{2-2}{5-2}\right) = 1 + \left(\frac{3}{3}\right) = 1$$

$$r_{26}^{*} = 1 + \left(\frac{5-2}{5-2}\right) = 1 + \left(\frac{3}{3}\right) = 0$$

$$r_{36}^{*} = 1 + \left(\frac{2-2}{5-2}\right) = 1 + \left(\frac{0}{3}\right) = 1$$

$$r_{46}^{*} = 1 + \left(\frac{4-2}{5-2}\right) = 1 + \left(\frac{2}{3}\right) = 0{,}333$$

$$r_{56}^{*} = 1 + \left(\frac{3-2}{5-2}\right) = 1 + \left(\frac{1}{3}\right) = 0{,}666$$

$$r_{66}^{*} = 1 + \left(\frac{5-2}{5-2}\right) = 1 + \left(\frac{3}{3}\right) = 0$$

$$r_{76}^{*} = 1 + \left(\frac{4-2}{5-2}\right) = 1 + \left(\frac{2}{3}\right) = 0{,}333$$

For criterion C7 (cost)

$$r_{17}^{*} = 1 + \left(\frac{3000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{1000000}{2000000}\right) = 0{,}5$$

$$r_{27}^{*} = 1 + \left(\frac{4000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{2000000}{2000000}\right) = 0$$

$$r_{37}^{*} = 1 + \left(\frac{2000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{0}{3000000}\right) = 1$$

$$r_{47}^{*} = 1 + \left(\frac{2000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{0}{2000000}\right) = 1$$

$$r_{57}^{*} = 1 + \left(\frac{2000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{0}{2000000}\right) = 1$$

$$r_{67}^{*} = 1 + \left(\frac{3000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{1000000}{2000000}\right) = 0{,}5$$

$$r_{77}^{*} = 1 + \left(\frac{3000000-2000000}{4000000-2000000}\right) = 1 + \left(\frac{1000000}{2000000}\right) = 0{,}5$$

c. Calculating Marginal Utility

For Criterion C1 (Benefit)

$$u_{11} = \frac{e^{(0{,}228)^2}-1}{1.71} = 0{,}013$$

$$u_{21} = \frac{e^{(0{,}714)^2}-1}{1.71} = 0{,}389$$

$$u_{31} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{31} = \frac{e^{(0{,}2)^2}-1}{1.71} = 0{,}023$$

$$u_{31} = \frac{e^{(0{,}428)^2}-1}{1.71} = 0{,}117$$

$$u_{31} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

$$u_{31} = \frac{e^{(0)^2}-1}{1.71} = 0$$

For Criterion C2 (Benefit)

$$u_{12} = \frac{e^{(0{,}5)^2}-1}{1.71} = 0{,}166$$

$$u_{22} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

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$$u_{32} = \frac{e^{(0,5)^2}-1}{1.71} = 1,166$$

$$u_{42} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{52} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{62} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{72} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

For C3 (Benefit) Criteria

$$u_{13} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{23} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{33} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{43} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{53} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{63} = \frac{e^{(1)^2}-1}{1.71} = 1,004$$

$$u_{73} = \frac{e^{(1)^2}-1}{1.71} = 1,004$$

For C4 (Benefit) Criteria

$$u_{14} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{24} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{34} = \frac{e^{(1)^2}-1}{1.71} = 1,004$$

$$u_{44} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

$$u_{54} = \frac{e^{(1)^2}-1}{1.71} = 1,004$$

$$u_{64} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{74} = \frac{e^{(0,5)^2}-1}{1.71} = 0,166$$

For criterion C5 (Benefit)

$$u_{15} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{25} = \frac{e^{(0,333)^2}-1}{1.71} = 0,068$$

$$u_{35} = \frac{e^{(0,666)^2}-1}{1.71} = 0,327$$

$$u_{45} = \frac{e^{(0,333)^2}-1}{1.71} = 0,068$$

$$u_{55} = \frac{e^{(0)^2}-1}{1.71} = 0$$

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$$u_{65} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{75} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

For criterion C6 (cost)

$$u_{16} = \frac{e^{(1)^2}-1}{1.71} = 0{,}004$$

$$u_{26} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{36} = \frac{e^{(0)^2}-1}{1.71} = 1{,}004$$

$$u_{46} = \frac{e^{(0{,}333)^2}-1}{1.71} = 0{,}068$$

$$u_{56} = \frac{e^{(0{,}666)^2}-1}{1.71} = 0.327$$

$$u_{66} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{76} = \frac{e^{(0{,}333)^2}-1}{1.71} = 0{,}068$$

For criterion C7 (cost)

$$u_{17} = \frac{e^{(0{,}5)^2}-1}{1.71} = 0{,}166$$

$$u_{27} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$u_{37} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

$$u_{47} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

$$u_{57} = \frac{e^{(1)^2}-1}{1.71} = 1{,}004$$

$$u_{67} = \frac{e^{(0{,}5)^2}-1}{1.71} = 0{,}166$$

$$u_{77} = \frac{e^{(0{,}5)^2}-1}{1.71} = 0{,}166$$

d. Calculating the Final Utility

$$u_1 = (0{,}011 * 0{,}37) + (0{,}061 * 0{,}23) + (0 * 0{,}16) + (0{,}061 * 0{,}11) + (0 * 0{,}07) + (0{,}31 * 0{,}04) + (0{,}061 * 0{,}02) = 0{,}567$$

$$u_2 = (0{,}144 * 0{,}37) + (0{,}371 * 0{,}23) + (0 * 0{,}16) + (0 * 0{,}11) + (0{,}025 * 0{,}07) + (0 * 0{,}04) + (0 * 0{,}02) = 0{,}541$$

$$u_3 = (0 * 0{,}37) + (0{,}061 * 0{,}23) + (0 * 0{,}16) + (0{,}371 * 0{,}11) + (0{,}121 * 0{,}07) + (0{,}31 * 0{,}04) + (0{,}371 * 0{,}02) = 1{,}297$$

$$u_4 = (0{,}008 * 0{,}37) + (0 * 0{,}23) + (0 * 0{,}16) + (0{,}061 * 0{,}11) + (0{,}025 * 0{,}07) + (0{,}025 * 0{,}04) + (0{,}371 * 0{,}02) = 0{,}492$$

$$u_5 = (0{,}043 * 0{,}37) + (0{,}061 * 0{,}23) + (0 * 0{,}16) + (0{,}371 * 0{,}11) + (0 * 0{,}07) + (0{,}121 * 0{,}04) + (0{,}371 * 0{,}02) = 0{,}969$$

$$u_6 = (0{,}371 * 0{,}37) + (0{,}061 * 0{,}23) + (0{,}371 * 0{,}16) + (0 * 0{,}11) + (0 * 0{,}07) + (0 * 0{,}04) + (0{,}061 * 0{,}02) = 0{,}866$$

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$u_7 = (0 * 0{,}37) + (0{,}061 * 0{,}23) + (0{,}371 * 0{,}16) + (0{,}061 * 0{,}11) + (0{,}371 * 0{,}07) + (0{,}025 * 0{,}04) + (0{,}061 * 0{,}02)$

$= 0{,}953$

Table 7. Ranking Results

Alternatives	Student Name	Value	Ranking
A3	Yuliana	1,297	1
A5	Dwi	0,969	2
A7	Ira	0,953	3
A6	Elfrida	0,866	4
A1	Reza	0,567	5
A2	Amad	0,541	6
A4	Rizki	0,492	7

Based on the ranking results obtained from the table above in the table above in the application of the MAUT method, the best alternative was obtained, namely A3 for Ira with a value of 1.297. It can then be seen in the form of a diagram in Figure 2 below.

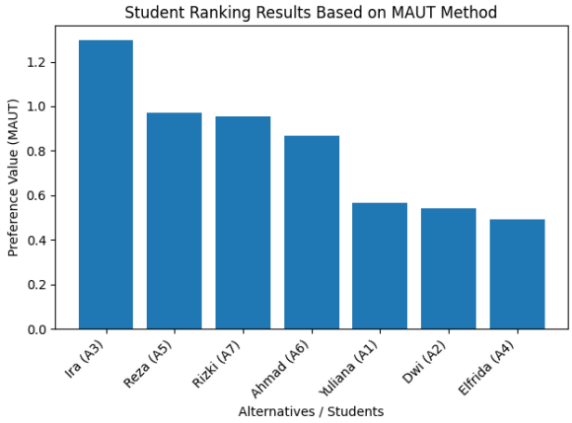

Figure 2. Bar Chart

Figure 2 shows a diagram of the ranking results of outstanding students based on preference scores obtained from the application of the MAUT method. This chart shows the value ratio of each alternative, where the highest-rated alternative ranks top. Based on the diagram, the A3 alternative in Ira's name obtained the highest preference score so that it was declared the best outstanding student.

4. CONCLUSION

From the results and discussion above regarding the Selection of Outstanding Students who use the Decision Support System in the selection of outstanding students, it can be done with a weighting value applied with the ROC method and the MAUT method to obtain a ranking of the selection of outstanding students used to obtain decision-making results. In the selection of outstanding students, 7 criteria were used in the assessment, namely: GPA {C1}, certificate of achievement {C2}, Semester {C3}, Behavior {C4}, Writing {C5}, Amount {C6}, income {C7} and 7 alternative student names: Yuliana {A1}, Dwi {A2}, Ira {A3}, Elfrida {A4}, Reza {A5}, Ahmad {A6}, Rizki {A7}. With the results that have been obtained from the above research, that the application of the ROC and MAUT Methods is used an alternative number calculation technique from an algorithm that produces the process of doing the best ranking in selecting outstanding students with the criteria that have been set, the best alternative ranking results are obtained, namely A3 for Ira with a score of 1.297.

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