

Customer Service Recruitment Decision Support System Applying MAUT Method

Ruziana binti Mohamad Rasli¹, Mesran^{2,*}, Febrianus Gea², Setiawansyah³

¹School of Multimedia Technology and Communication, Universiti Utara Malaysia, Kedah Darul Aman, Malaysia

²Faculty of Computer Science and Information Technology, Informatics Engineering, Universitas Budi Darma, Medan, Indonesia

³Faculty Engineering and Computer Science, Informatics, Unviersitas Teknokrat Indonesia, Bandar Lampung, Indonesia

Email: ¹ruziana@uum.edu.my, ^{2,*}mesran.skom.mkom@gmail.com, ³febrianusgeaboy@gmail.com,

⁴setiawansyah@teknokrat.ac.id

Corresponding author's email: mesran.skom.mkom@gmail.com

Abstract—Customer service is a service provided by the company to consumers who are controlled online or offline by employees of the company, either before or after purchasing products or services. Eligibility in recruitment is very important where a customer service must be able to have good and clear public speaking so that it has an impact on customers. The expected labour problem is not easy and simple, this is because the process is still manual and only based on career level, age and experience. Where, these problems also lack qualified human resources and this makes the recruitment process inaccurate and in accordance with the desired demands. So the solution is provided through a decision support system, a highly interactive computer-based system that assists in making a decision to utilise data and models in solving unstructured and semi-structured problems. In making decisions apply the MAUT method. In this research conducted using the Multi Attribute Utility Theory (MAUT) Method which is able to obtain maximum results to obtain superior recruitment personnel, namely alternative A1 with a result of 0.8975 as the top alternative after going through the method application stage.

Keywords: Customer Service; MAUT Method; Recruitment; Decision Support System

1. INTRODUCTION

The development of an increasingly advanced and competitive corporate world makes labour a top priority in the success of a company. Employees are human resources for the company as a support and complement to the company, one of which is PT Equityworld Futures Medan. PT Equityworld Futures Medan is a company engaged in futures investment services, where this company is able to compete and increase public interest in investing in financial products. Customer service is a service from the company for customers, either after or before buying a product or using a service. The main purpose of customer service is to provide services in helping and answering customer complaints and questions that have problems[1].

Eligibility in recruitment is very important where a customer service must be able to have good and clear public speaking so that it has an impact on customers. The company's problem is the lack of an adequate number of workers who are currently working, this is because the process is still manual and only based on career level, age, and experience. Where the problem is also the lack of qualified human resources and this makes the recruitment process inaccurate and in accordance with the desired demands. In addition, there are also many prospective workers who register but do not meet the requirements and criteria that have been determined by the company which can later assist in obtaining accurate and efficient results in decision making. Therefore, a Decision Support System (SPK) is needed that is able to process the data for determining the best flight attendant in order to produce a more effective and efficient conclusion value in determining flight attendants who have a good attitude, quality service and are competent in their fields. The research method used is the Multi Attribute Utility Theory (MAUT) method, which is a scheme in which the final evaluation $v(x)$ of an object x is interpreted as a weight summed with the value relevant to its dimension value. In other words, it is referred to as the utility value. The Multi Attribute Utility Theory (MAUT) method is used to convert multiple interests into numerical values on a scale of 0-1 where 0 represents the worst choice and 1 the best choice[2][3].

As for some related research that discusses the MAUT method, namely research conducted by Dhea Safitri, et al in 2021 which discusses purchasing a new car using the MAUT method, where in this study there are several alternatives and criteria that become references so as to produce the best preference in A3 with an optimisation value of 25 which is the best alternative in the first position [4]. Research conducted by Rita Novita Sari, et al in 2019 which discusses the application of the MAUT method in the selection of boarding houses, where in this study there are several alternatives and criteria that become references so as to produce the best preference in A2 with an optimisation value of 0.96 which is an alternative in the first position [5]. Research conducted by Yolanda Agustina Situmorang, et al in 2018 which discusses the application of the MAUT method to the selection of the best intensive guidance in Pematangsiantar, where in this study there are several alternatives and criteria that become references so as to produce the best preference in A1 with an optimisation value of 2.43 which is the best alternative [6]. Research conducted by Dasril Aldo, et al in 2019 which discusses the decision support system for lecturer performance appraisal using the MAUT method, where in this study in the form of lecturer decisions that have good performance and lecturers have poor performance, where the value > 0.60 has a good performance predicate and < 0.60 has poor performance [7]. Research conducted by Hot Riris Siburian et al, in 2018 which discusses the selection of the best airlines using the WASPAS method, where in this study there are several alternatives and criteria used in decision

making resulting in the best preference in Q1 with an optimisation value of 0.8562 so it can be concluded that A1 is the best airline selection [8]. In 2021, research conducted by Rosmita Sari discussed the feasibility of providing PKH assistance using the MAUT method. Then the calculation results are obtained through alternatives and predetermined criteria, that the method is able to obtain an optimisation value of 0.72349 on alternative A11 as the highest ranking eligible for assistance [9].

From the discussion above, the author is interested in conducting research on customer service recruitment applying the Multi Attribute Utility Theory (MAUT) method to obtain data in determining customer service recruitment criteria. The application of the MAUT method is expected to provide benefits to obtain the optimal alternative value from a certain number of alternatives and criteria which are then continued with the ranking process. The assessment based on the criteria described above is expected to be able to get more precise and accurate results.

2. RESEARCH METHODOLOGY

2.1 Research Stages

In this study, there are several stages of research that must be carried out so that the research is more structured and systematic, the stages of the research can be described in the following chart (figure) 1:

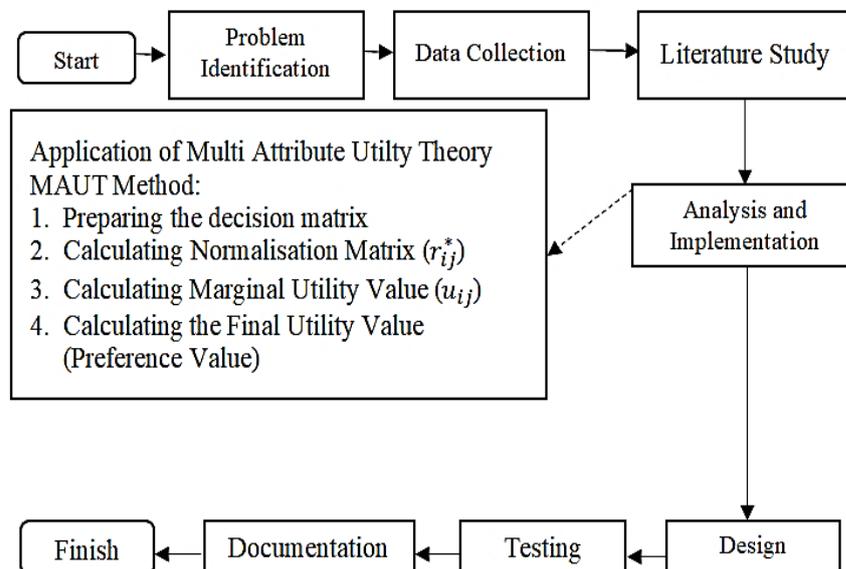


Figure 1. Research Stages Framework

Based on figure 1 above, for an explanation of each stage carried out in this study can be seen in the following explanation:

1. Problem Identification Stage

In this part of the stage, namely the way the author does in estimating and describing things that are a problem in the customer service recruitment process at PT Equityworld Futures Medan.

2. Data Collection Stage

At this stage the author collects data related to research in making a system, namely observations and interviews.

a. Observation

Observation is a form of activity carried out on a process in conducting direct research in determining a problem that can be solved. As for some prospective customer service data obtained in 2022 as an alternative as much as 15 recruitment data for new customer service candidates at PT. Equityworld Futures Medan and criteria data.

b. Interview

After conducting research observations, the authors also conducted interviews with the Branch Manager of PT. Equityworld Futures in obtaining some of the necessary data.

3. Literature Study Stage

At this stage, the author conducts an understanding of the objects and data being studied, such as by reading references from books, journals, or from various other sources.

4. Stage of Analysis and Application of MAUT Method

At this stage it is necessary to know what is the main problem in recruiting customer service at PT. Equityworld Futures so that a solution can be obtained that provides accurate results to match expectations in overcoming existing problems.

5. Design Stage

At this stage the author provides several descriptions in recruiting customer service. The system design stage is a data that has been analysed into a form that is easier for users to understand.

6. Testing Stage

At this stage the author implements the results of the calculation of the method used. After calculating the method, the next step is testing the method to produce the greatest preference value and optimisation value with the MAUT method in the customer service recruitment process.

7. Documentation

At the documentation stage is the final part of conducting research to make the research into a report. This documentation is also made to provide an explanation of the application so that it can facilitate users who want to develop the application of this system further.

2.2 Decision Support System

A decision support system (DSS) is a way of organising information that is intended for use in making decisions. Some define that a decision support system is an approach to support decision making. Decision support systems use data, provide easy user interfaces and can incorporate decision-making thinking[10]–[16].

2.3 MAUT Method

The Multi Attribute Utility Theory (MAUT) method is a scheme in which the final evaluation, $v(x)$, of an object x is defined as the weight summed with a value relevant to its dimensional value, in other words referred to as the utility value [15], [17]–[20] This method is used to convert multiple interests into numerical values on a scale of 0-1 where 0 represents the worst choice and 1 the best choice. The steps of the Multi Attribute Utility Theory (MAUT) method are as follows[21]–[28]:

1. In the first step, prepare the decision matrix (X_{ij})

$$X_{ij} = \begin{bmatrix} r_{11} & \dots & r_{1j} & \dots & r_{1n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{i1} & \dots & r_{ij} & \dots & r_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{m1} & \dots & r_{mj} & \dots & r_{mn} \end{bmatrix} ; i = 1, \dots, m, j = 1, \dots, n \tag{1}$$

The explanation for each formula used in determining the decision matrix includes X_{ij} is the Decision Matrix for alternative i on criterion j , r_{ij} is an element of the decision matrix for alternatives with attribute j , i is an alternative, j is an attribute or criterion and n is the number of attributes or the number of alternatives.

2. Calculating the Normalisation Matrix (r_{ij}^*)

Normalisation for Benefit criteria

$$(r_{ij}^*) = \frac{r_{ij} - \min(r_{ij})}{\max(r_{ij}) - \min(r_{ij})} \tag{2}$$

Normalisation for Cost criteria

$$r_{ij}^* = 1 + \left(\frac{\min(r_{ij}) - r_{ij}}{\max(r_{ij}) - \min(r_{ij})} \right) \tag{3}$$

The explanation for the formula used in calculating the normalisation matrix includes r_{ij}^* is the normalised sum of the decision matrix of alternatives, r_{ij} is an element of the decision matrix for alternatives with attribute j , i is an alternative, n is the number of criteria and j is the criteria.

3. Calculating the Marginal Value of Utility (u_{ij})

$$u_{ij} = \frac{e^{(r_{ij}^*)^2} - 1}{1,71} \tag{4}$$

The explanation for each formula used in Calculating the Marginal Value of Utility includes u_{ij} which is the Marginal Utility, r_{ij}^* is the normalised sum of the decision matrix of alternatives, e is Exponential, i is the Alternative (Row) and j is the Attribute/Criteria (Column).

4. Calculating the Final Utility Value (Preference Value)

$$U_i = \sum_j^n = 1 u_{ij} \cdot w_j \tag{5}$$

Explanations for each formula used in calculating Final Utility Value include u_i which is Final Utility, u_{ij} is Marginal Utility, w_{ij} is Alternative Weight i to j , i is an Alternative (Row) and j is an Attribute/Criteria (Column).

2.4 Customer Service Recruitment

Recruitment is the process of attracting and selecting labour to fill available positions, where human resources who have the ability in accordance with the qualifications and needs of a company. Customer service is a service provided by the company to consumers who are controlled online or offline by employees of the company, either before or after purchasing a product or service. The process of customer service recruitment involves identifying and choosing suitable individuals to be a part of the customer service team within an organization. The customer service representatives are crucial in guaranteeing customer satisfaction by handling inquiries, addressing concerns, and offering exceptional service[29][30].

3. RESULTS AND DISCUSSION

3.1 Determination of Criteria and weights

In producing a decision in determining the recruitment of customer service at PT Equityworld Futures, it requires some data on prospective customer service that will be recruited as well as criteria and weights to make an assessment. In this study there are 15 customer service candidates who will be used as alternatives and 5 (five) criteria that are used as rules in making a selection. The following table 1 is a list of prospective customer service that will be selected.

Table 1. Customer Service Candidate Alternative Data

| Alternative Codes | Name |
|-------------------|------------------------------|
| A1 | Deddy Laia, S.Kep |
| A2 | Khairini Shiva |
| A3 | Frendy Oktavianus |
| A4 | Chairul Rizali |
| A5 | Chandra Emilson |
| A6 | Syukurman Gea |
| A7 | Jessica Melati Debora, S.Kom |
| A8 | Ira Dwi Wanti, S.Kom |
| A9 | Irwan Sanjaya |
| A10 | Lukman Harianto |
| A11 | Rian Sembiring |
| A12 | Suprianto Manurung |
| A13 | Muhammad Gilang |
| A14 | Anggi Rosdika, S.E |
| A15 | Yohanna Octaviani, S.E |

Based on the prospective customer service data table that has been determined in table 1, the following is a table of criteria that will be used in recruiting customer service in this study.

Table 2. Criteria Data

| Criteria | Description | Weight | Benefit/Cost |
|----------|--------------------|--------|--------------|
| C1 | Language Skills | 0.456 | Benefit |
| C2 | Psychological Test | 0.256 | Benefit |
| C3 | Recent Education | 0.156 | Benefit |
| C4 | Work Experience | 0.09 | Benefit |
| C5 | Age | 0.04 | Cost |

Based on table 2, there are five criteria that will be used as an assessment of 15 customer service candidates, there are four criteria that are of the benefit type and only one criterion (age criterion) is of the cost type. For the weight of the criteria, it is determined using the ROC method where the first criterion is prioritised over the second criterion, and so on so that for the C1 criterion the largest weight value is 0.456 or which has a higher level of importance and the C5 criterion has the lowest priority level which is only 0.04. Of the five criteria, here is an explanation of each criterion.

- Language Ability : Language skills are where the ability of a person or individual to communicate and convey good words when interacting.
- Psychological Tests : Psychological tests are a field of tests in the form of samples to be used in testing the behaviour, psychological and thinking abilities of each individual which are marked by giving a score where 60 - 70 > sufficient, 71 - 85 > satisfactory, 86 -100 > very satisfactory and labelled as eligibility.
- Last Education : The last education is the final limit of education of each person who has been taken or completed with a diploma.

- Work Experience : Work experience is a form of knowledge, abilities, and skills possessed by each individual and the process of experience gained in a career.
- Age : The age criteria explain that the customer service recruitment process requires mature workers, who must be at least 18 years old or a maximum of 35 years old.

Table 3. Sample Data

| Nama | Language Skills | Psychological Test | Last Education | Work Experience (Year) | Age (Year) |
|------------------------------|-----------------|---------------------|--------------------|------------------------|------------|
| Deddy Laia, S.Kep | Very Good | Very Satisfactory | Bachelor | 2 | 24 |
| Khairini Shiva | Good | Satisfactory | Senior High School | 2 | 20 |
| Frendy Oktavianus | Less Good | Satisfactory Enough | Senior High School | 1 | 20 |
| Chairul Rizali | Good | Satisfactory | Senior High School | 4 | 23 |
| Chandra Emilson | Good | Satisfactory | Senior High School | 5 | 25 |
| Syukurman Gea | Less Good | Satisfactory Enough | Senior High School | 1 | 20 |
| Jessica Melati Debora, S.Kom | Good | Satisfactory | Bachelor | 2 | 24 |
| Ira Dwi Wanti, S.Kom | Very Good | Satisfactory | Bachelor | 1 | 23 |
| Irwan Sanjaya | Good | Satisfactory | Senior High School | 5 | 26 |
| Lukman Harianto | Good | Satisfactory Enough | Senior High School | 5 | 26 |
| Rian Sembiring | Less Good | Satisfactory | Senior High School | 2 | 22 |
| Suprianto Manurung | Less Good | Satisfactory Enough | Senior High School | 2 | 22 |
| Muhammad Gilang | Good | Very Satisfactory | Senior High School | 3 | 23 |
| Anggi Rosdika, S.E | Good | Satisfactory | Bachelor | 1 | 24 |
| Yohanna Octaviani, S.E | Very Good | Satisfactory | Bachelor | 1 | 24 |

Based on table 3, there are three criteria that have linguistic values so that it is necessary to fix the weights so that the calculation process can be carried out with a predetermined method, while for criteria that have numerical values or numbers there is no need to fix the weights again. The following is a weight improvement table for the Language Skills (C1), Psychological Test (C2) and Last Education (C3) criteria.

Table 4. Improvement of linguistic criteria weights

| Criteria Codes | Description | Weight |
|----------------|---|--------|
| C1 | Very Good | 3 |
| | Good | 2 |
| | Less Good | 1 |
| C2 | Very Satisfactory | 3 |
| | Satisfactory | 2 |
| | Satisfactory Enough | 1 |
| C3 | Bachelor | 2 |
| | Senior High School/Vocational High School | 1 |

After determining the weight of the linguistic criteria in table 4, it is necessary to adjust the sample data with the weight improvement table so that a match rating between alternatives and criteria is formed, the following match rating table can be seen in table 5 below.

Table 5. Rating of Suitability between Alternatives and Criteria

| Alternative | C ₁ | C ₂ | C ₃ | C ₄ | C ₅ |
|----------------|----------------|----------------|----------------|----------------|----------------|
| A ₁ | 3 | 3 | 2 | 2 | 24 |
| A ₂ | 2 | 2 | 1 | 2 | 20 |
| A ₃ | 1 | 1 | 1 | 1 | 20 |
| A ₄ | 2 | 2 | 1 | 4 | 23 |
| A ₅ | 2 | 2 | 1 | 5 | 25 |

| Alternative | C ₁ | C ₂ | C ₃ | C ₄ | C ₅ |
|-----------------|----------------|----------------|----------------|----------------|----------------|
| A ₆ | 1 | 1 | 1 | 1 | 20 |
| A ₇ | 2 | 2 | 2 | 2 | 24 |
| A ₈ | 3 | 2 | 2 | 1 | 23 |
| A ₉ | 2 | 2 | 1 | 5 | 26 |
| A ₁₀ | 2 | 1 | 1 | 5 | 26 |
| A ₁₁ | 1 | 2 | 1 | 2 | 22 |
| A ₁₂ | 1 | 1 | 1 | 2 | 22 |
| A ₁₃ | 2 | 3 | 1 | 3 | 23 |
| A ₁₄ | 2 | 2 | 2 | 1 | 24 |
| A ₁₅ | 3 | 2 | 2 | 1 | 24 |

3.2 Calculation Using the MAUT Method

The MAUT method is a method used in carrying out the value calculation process through determining rankings from the lowest to the highest value. So as for the settlement steps with the MAUT method in recruiting customer service as follows:

1. Form a decision matrix

$$X_{ij} = \begin{bmatrix} 3 & 3 & 2 & 2 & 24 \\ 2 & 2 & 1 & 2 & 20 \\ 1 & 1 & 1 & 1 & 20 \\ 2 & 2 & 1 & 4 & 23 \\ 2 & 2 & 1 & 5 & 25 \\ 1 & 2 & 1 & 1 & 20 \\ 2 & 2 & 2 & 2 & 24 \\ 3 & 2 & 2 & 1 & 23 \\ 2 & 2 & 1 & 5 & 26 \\ 2 & 1 & 1 & 5 & 26 \\ 1 & 2 & 1 & 2 & 22 \\ 1 & 1 & 1 & 2 & 22 \\ 2 & 3 & 1 & 3 & 23 \\ 2 & 2 & 2 & 1 & 24 \\ 3 & 2 & 2 & 1 & 24 \end{bmatrix}$$

2. Calculating the Normalisation Matrix (r_{ij}^*)

Normalisation for benefit criteria (C1)

$$r_{11}^* = \frac{3-1}{3-1} = 1$$

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

$$r_{31}^* = \frac{1-1}{3-1} = 0$$

$$r_{41}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{51}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{61}^* = \frac{1-1}{3-1} = 0$$

$$r_{71}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{81}^* = \frac{3-1}{3-1} = 1$$

$$r_{91}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{10.1}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{11.1}^* = \frac{1-1}{3-1} = 0$$

$$r_{12.1}^* = \frac{1-1}{3-1} = 0$$

$$r_{13.1}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{14.1}^* = \frac{2-1}{3-1} = 0,5$$

$$r_{15.1}^* = \frac{3-1}{3-1} = 1$$

Normalisation for cost criteria (C5)

$$r_{15}^* = 1 + \frac{20-24}{26-20} = 0.33$$

$$r_{25}^* = 1 + \frac{20-20}{26-20} = 1$$

$$r_{35}^* = 1 + \frac{20-20}{26-20} = 1$$

$$r_{45}^* = 1 + \frac{20-23}{26-20} = 0.5$$

$$r_{55}^* = 1 + \frac{20-25}{26-20} = 0.16$$

$$r_{65}^* = 1 + \frac{20-20}{26-20} = 1$$

$$r_{75}^* = 1 + \frac{20-24}{26-20} = 0.33$$

$$r_{85}^* = 1 + \frac{20-23}{26-20} = 0.5$$

$$r_{95}^* = 1 + \frac{20-26}{26-20} = 0$$

$$r_{10.5}^* = 1 + \frac{20-26}{26-20} = 0$$

$$r_{11.5}^* = 1 + \frac{20-22}{26-20} = 0.66$$

$$r_{12.5}^* = 1 + \frac{20-22}{26-20} = 0.66$$

$$r_{13.5}^* = 1 + \frac{20-23}{26-20} = 0.5$$

$$r_{14.5}^* = 1 + \frac{20-24}{26-20} = 0.33$$

$$r_{15.5}^* = 1 + \frac{20-24}{26-20} = 0.33$$

Based on the calculation of finding the normalised value of all criteria that have been carried out, Carry out the normalization process for criteria C2 (benefit) and C3 (benefit) and C4 in the same way as calculating criteria C1 so as to obtain a normalised matrix as below.

$$r_{ij}^* = \begin{vmatrix} 1 & 1 & 1 & 0.25 & 0.33 \\ 0.5 & 0.5 & 0 & 0.25 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0.5 & 0.5 & 0 & 0.75 & 0.5 \\ 0.5 & 0.5 & 0 & 1 & 0.16 \\ 0 & 0.5 & 0 & 0 & 1 \\ 0.5 & 0.5 & 1 & 0.25 & 0.33 \\ 1 & 0.5 & 1 & 0 & 0.5 \\ 0.5 & 0.5 & 0 & 1 & 0 \\ 0.5 & 0 & 0 & 1 & 0 \\ 0 & 0.5 & 0 & 0.25 & 0.66 \\ 0 & 0 & 0 & 0.25 & 0.66 \\ 0.5 & 1 & 0 & 0.5 & 0.5 \\ 0.5 & 0.5 & 1 & 0 & 0.33 \\ 1 & 0.5 & 1 & 0 & 0.33 \end{vmatrix}$$

3. Calculating the Marginal Value of Utility (U_{ij})

Marginal utility value for criterion C1

$$U_{11} = \frac{e^{(1)^2} - 1}{1.71} = 1$$

$$U_{21} = \frac{e^{(0.5)^2} - 1}{1.71} = 0.17$$

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

$$U_{41} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{51} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{61} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{71} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{81} = \frac{e^{(1)^2 - 1}}{1.71} = 1$$

$$U_{91} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{10.1} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{11.1} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{12.1} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{13.1} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{14.1} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{15.1} = \frac{e^{(1)^2 - 1}}{1.71} = 1$$

Marginal utility value for criterion C2

$$U_{12} = \frac{e^{(1)^2 - 1}}{1.71} = 1$$

$$U_{22} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{32} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{42} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{52} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{62} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{72} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{82} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{92} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{10.2} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{11.2} = \frac{e^{(0.5)^2 - 1}}{1.71} = 0.17$$

$$U_{12.2} = \frac{e^{(0)^2 - 1}}{1.71} = 0$$

$$U_{13.2} = \frac{e^{(1)^2 - 1}}{1.71} = 1$$

$$U_{14.2} = \frac{e^{(0.5)^2} - 1}{1.71} = 0.17$$

$$U_{15.2} = \frac{e^{(0.5)^2} - 1}{1.71} = 0.17$$

Search for Marginal Utility values against criteria C3, criteria C4 and criteria C5 like searching for Marginal Utility values for criteria C1 and C2 above. Based on the calculation of finding the marginal utility value that has been carried out on all criteria, the following matrix of marginal utility values is obtained.

$$u_{ij} = \begin{pmatrix} 1 & 1 & 1 & 0.03 & 0.67 \\ 0.17 & 0.17 & 0 & 0.03 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0.17 & 0.17 & 0 & 0.44 & 0.17 \\ 0.17 & 0.17 & 0 & 1 & 0.15 \\ 0 & 0.17 & 0 & 0 & 1 \\ 0.17 & 0.17 & 1 & 0.03 & 0.67 \\ 1 & 0.17 & 1 & 0 & 0.17 \\ 0.17 & 0.17 & 0 & 1 & 0 \\ 0.17 & 0 & 0 & 1 & 0 \\ 0 & 0.17 & 0 & 0.03 & 0.31 \\ 0 & 0 & 0 & 0.03 & 0.31 \\ 0.17 & 1 & 0 & 0.17 & 0.17 \\ 0.17 & 0.17 & 1 & 0 & 0.67 \\ 1 & 0.17 & 1 & 0 & 0.67 \end{pmatrix}$$

4. Calculating the Final Utility Value (U_i)

$$U_1 = (1 * 0.456) + (1 * 0.256) + (1 * 0.156) + (0.03 * 0.09) + (0.67 * 0.04) = 0.8975$$

$$U_2 = (0.17 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (0.03 * 0.09) + (1 * 0.04) = 0.16374$$

$$U_3 = (0 * 0.456) + (0 * 0.256) + (0 * 0.156) + (0 * 0.09) + (1 * 0.04) = 0.04$$

$$U_4 = (0.17 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (0.44 * 0.09) + (0.17 * 0.04) = 0.16744$$

$$U_5 = (0.17 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (1 * 0.09) + (0.15 * 0.04) = 0.21704$$

$$U_6 = (0 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (0 * 0.09) + (1 * 0.04) = 0.08352$$

$$U_7 = (0.17 * 0.456) + (0.17 * 0.256) + (1 * 0.156) + (0.03 * 0.09) + (0.67 * 0.04) = 0.30654$$

$$U_8 = (1 * 0.456) + (0.17 * 0.256) + (1 * 0.156) + (0 * 0.09) + (0.17 * 0.04) = 0.66232$$

$$U_9 = (0.17 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (1 * 0.09) + (0 * 0.04) = 0.21104$$

$$U_{10} = (0.17 * 0.456) + (0 * 0.256) + (0 * 0.156) + (1 * 0.09) + (0 * 0.04) = 0.16752$$

$$U_{11} = (0 * 0.456) + (0.17 * 0.256) + (0 * 0.156) + (0.03 * 0.09) + (0.31 * 0.04) = 0.05862$$

$$U_{12} = (0 * 0.456) + (0 * 0.256) + (0 * 0.156) + (0.03 * 0.09) + (0.31 * 0.04) = 0.0151$$

$$U_{13} = (0.17 * 0.456) + (1 * 0.256) + (0 * 0.156) + (0.17 * 0.09) + (0.17 * 0.04) = 0.35562$$

$$U_{14} = (0.17 * 0.456) + (0.17 * 0.256) + (1 * 0.156) + (0 * 0.09) + (0.67 * 0.04) = 0.30384$$

$$U_{15} = (1 * 0.456) + (0.17 * 0.256) + (1 * 0.156) + (0 * 0.09) + (0.67 * 0.04) = 0.68232$$

After the process of applying the MAUT method to the 15 customer service candidates, starting from the process of forming a normalisation matrix to finding the final utility value, the following final results and ranking of each alternative can be seen in table 6 below.

Table 6. Customer Service Candidate Ranking Results

| Alternative | Name | U_i Velues | Rank |
|-------------|------------------------------|--------------|------|
| A1 | Deddy Laia, S.Kep | 0.8975 | 1 |
| A2 | Khairini Shiva | 0.16374 | 11 |
| A3 | Frendy Oktavianus | 0.04 | 14 |
| A4 | Chairul Rizali | 0.16744 | 10 |
| A5 | Chandra Emilson | 0.21704 | 7 |
| A6 | Syukurman Gea | 0.08352 | 12 |
| A7 | Jessica Melati Debora, S.Kom | 0.30654 | 5 |

| Alternative | Name | U_i Velues | Rank |
|-------------|------------------------|--------------|------|
| A8 | Ira Dwi Wanti, S.Kom | 0.66232 | 3 |
| A9 | Irwan Sanjaya | 0.21104 | 8 |
| A10 | Lukman Harianto | 0.16752 | 9 |
| A11 | Rian Sembiring | 0.05862 | 13 |
| A12 | Suprianto Manurung | 0.0151 | 15 |
| A13 | Muhammad Gilang | 0.35562 | 4 |
| A14 | Anggi Rosdika, S.E | 0.30384 | 6 |
| A15 | Yohanna Octaviani, S.E | 0.68232 | 2 |

Based on table 6 above, then from the results of calculations using the MAUT method with ROC weighting which has been obtained that the qualified and feasible alternative according to the specified criteria is A1 with a value of 0.8975 with the name Deddy Laia, S.Kep as the best recruitment of several data samples used.

3. CONCLUSION

In selecting 15 people who nominate themselves as candidates for customer service, where there are five criteria used in the selection process including Language Skills, Psychological Test, Last Education, Work Experience, and Age in order to obtain a satisfactory decision. The conclusion that can be drawn from this research is that the application of the MAUT method is considered successful and has the final result in the form of a satisfactory final decision, where the prospective customer who will be accepted is the first alternative on behalf of Deddy Laia, S.Kep with a final value of 0.8975, then followed by alternative A15 on behalf of Yohanna Octaviani, S.E with a final value of 0.68232 and the alternative that is considered completely rejected and has the lowest final value among all prospective customer service is alternative A12 on behalf of Suprianto Manurung with a final value of only 0.0151.

REFERENCES

- [1] J. Wiratama *et al.*, “RANCANG BANGUN FITUR CHATBOT CUSTOMER SERVICE,” vol. 19, no. 1, pp. 25–37, 2022.
- [2] A. Karim, S. Esabella, and K. Kusmanto, “Analisa Penerapan Metode Operational Competitiveness Rating Analysis (OCRA) dan Metode Multi Attribute Utility Theory (MAUT) Dalam Pemilihan Calon Karyawan ...,” *J. Media ...*, vol. 5, pp. 1674–1687, 2021, doi: 10.30865/mib.v5i4.3265.
- [3] W. Harry, B. Lumban, R. Adrian, F. S. Simanjuntak, and K. Yudha, “Sistem Pendukung Keputusan Penentuan Mahasiswa Penerima Bantuan UKT Dengan Menerapkan Metode ROC dan MAUT,” pp. 15–21, 2021.
- [4] M. L. O. Mardin, A. Fuad, and H. K. Sirajuddin, “Sistem Pendukung Keputusan Pemilihan Perumahan Dengan Menggunakan Metode Multi Attribute Utility Theory,” *J. Ilm. Ilk. - Ilmu Komput. Inform.*, vol. 4, no. 2, pp. 85–92, 2021, doi: 10.47324/ilkominfo.v4i2.129.
- [5] R. N. Sari and R. S. Hayati, “Penerapan Metode Multi Attribute Utility Theory (MAUT) Dalam Pemilihan Rumah Kost,” vol. 3, no. September, pp. 243–251, 2019.
- [6] Y. A. Situmorang, N. Dalimunthe, I. Parlina, M. R. Lubis, and P. Tinggi, “TERBAIK DI PEMATANGSIANTAR,” vol. 2, pp. 249–255, 2018.
- [7] D. Aldo, N. Putra, and Z. Munir, “Sistem Pendukung Keputusan Penilaian Kinerja Dosen Dengan Menggunakan Metode Multi Attribute Utility Theory (Maut),” *JURSIMA (Jurnal Sist. Inf. dan Manajemen)*, vol. 7, no. 2, pp. 76–82, 2019.
- [8] S. R. T. Hot Riris Siburian, Kristin Sinaga, “Sistem Pendukung Keputusan Pemilihan Maskapai Terbaik Dengan Menggunakan Metode WASPAS,” *Semin. Nas. Sains Teknol. Inf.*, pp. 597–604, 2018.
- [9] R. Sari, “Sistem Pendukung Keputusan Kelayakan Pemberian Bantuan PKH Dengan Metode Multi Attribute Utility Theory (MAUT) (Studi Kasus : Desa Bulumario Kecamatan Sipirok),” vol. 5, pp. 234–239, 2021, doi: 10.30865/komik.v5i1.3736.
- [10] I. Alfansyah, J. Sibagariang, R. Fadillah, and D. Assarani, “Sistem Pendukung Keputusan Seleksi Dosen Non Komputer Terbaik Menerapkan Metode SAW,” *J. Decis. Support Syst. Res.*, vol. 1, no. 1, pp. 30–36, 2023.
- [11] M. Mesran, A. Triayudi, D. Nofrisa, and R. Fadillah, “Penerapan Metode EXPROM II Dalam Menentukan Tempat Wisata Pantai Terbaik,” *J. Sist. Komput. dan Inform.*, vol. 5, no. 2, pp. 337–346, 2023.
- [12] D. A. Megawaty and A. Silitonga, “Decision Support System Feasibility for Promotion using the Profile Matching Method,” *J. Data Sci. Inf. Syst.*, vol. 1, no. 2, pp. 50–56, 2023.
- [13] A. Berelaku, D. C. Mongkau, and D. Moeis, “Analisis Pemilihan Marketplace Terbaik Di Kalangan Remaja Menggunakan Metode Multi-Attribute Utility Theory di Kota Makassar,” *Digit. Transform. Technol.*, vol. 3, no. 2, pp. 371–379, 2023.
- [14] M. A. Abdullah and R. T. Aldisa, “Penerapan Metode MOOSRA Dalam Penentuan Penerimaan Frontliner Menggunakan Pembobotan Metode ROC,” *JURIKOM (Jurnal Ris. Komputer)*, vol. 10, no. 1, pp. 330–337, 2023.

- [15] S. Sukamto and A. Fitriansyah, “Application of the MAUT Method to Determine Eligibility for Accredited School Libraries,” *CESS (Journal Comput. Eng. Syst. Sci.)*, vol. 8, no. 2, pp. 384–392.
- [16] Mesran and D. P. Indini, “Analisis Dalam Pendukung Keputusan Seleksi Content Creator Mahasiswa Terbaik Menerapkan Metode EDAS dan ROC,” *J. Comput. Syst. Informatics*, vol. 4, no. 4, pp. 912–921, 2023, doi: 10.47065/josyc.v4i4.4093.
- [17] B. Okmarizal and S. Defit, “Implementasi Metode AHP Dan Maut untuk Rekomendasi Produk Tupperware Terlaris,” *J. KomtekInfo*, pp. 109–115, 2023.
- [18] E. Y. Dewasmita and H. Hendry, “Perbandingan Metode SAW, MAUT, ORESTE, TOPSIS dalam Pendukung Keputusan Pembangunan Supermarket di Kabupaten Pati,” *J-SAKTI (Jurnal Sains Komput. dan Inform.)*, vol. 7, no. 2, pp. 555–569, 2023.
- [19] A. Rifqi and R. T. Aldisa, “Analisa Perbandingan Metode MAUT dan Metode TOPSIS Dengan Menggunakan Pembobotan ROC Dalam Sistem Pendukung Keputusan Pemilihan Calon Kepala Desa,” *J. Inf. Syst. Res.*, vol. 4, no. 4, pp. 1413–1422, 2023.
- [20] M. A. Bianto and M. R. Aprillya, “Sistem Pendukung Keputusan Identifikasi Daerah Potensi Banjir Dengan Metode Multi Attribute Utility Theory (Studi Kasus : Kabupaten Lamongan),” pp. 116–124, 2023.
- [21] M. N. Rifqi *et al.*, “Sistem Pendukung Keputusan Penentuan Lokasi Pabrik Baru Menggunakan Metode ROC dan MAUT,” vol. 5, no. 2, pp. 315–324, 2024, doi: 10.47065/josyc.v5i2.4893.
- [22] D. Tampake, M. Malau, and A. Iskandar, “Penerapan Metode Metode Multi Attribute Utility (MAUT) dengan Pembobotan Rank Order Centroid (ROC) dalam Pendukung Keputusan Pemilihan Mahasiswa Berprestasi,” *J. Inf. Syst. Res.*, vol. 5, no. 2, pp. 531–541, 2024.
- [23] W. Saputra, S. A. Wardana, H. Wahyuda, and D. A. Megawaty, “Penerapan Kombinasi Metode Multi-Attribute Utility Theory (MAUT) dan Rank Sum Dalam Pemilihan Siswa Terbaik,” *J. Inf. Technol. Softw. Eng. Comput. Sci.*, vol. 2, no. 1, pp. 12–21, 2024.
- [24] M. Z. Lubis, R. Fadillah, and R. M. F. Lubis, “Decision Support System for Determining New Branch Locations Applying the Multi Attribute Utility Theory (MAUT) Method,” *Int. J. Informatics Data Sci.*, vol. 1, no. 1, pp. 36–45, 2023.
- [25] A. A. Kusuma, R. Maya, and F. Lubis, “Decision Support System for Determining New Branch Location Applying the MAUT Method with ROC Weighting,” vol. 2, no. 2, pp. 67–76, 2023, doi: 10.61944/bids.v2i2.76.
- [26] M. Yahya, J. M. Parenreng, F. Fathahillah, M. S. N. Wahid, and A. Wahid, “A Decision Support System to Determine the Family’s Economic Status for Certificate of The Low-Income Household Using MAUT Method,” *J. Inovtek Polbeng Seri Inform.*, vol. 7, no. 2, pp. 185–192, 2022.
- [27] W. H. B. L. Batu, M. Mesran, and S. Aripin, “Sistem Pendukung Keputusan Rekrutmen Tenaga Kerja Mandiri Menerapkan Metode OCRA,” *J-SAKTI (Jurnal Sains Komput. dan Inform.)*, vol. 6, no. 2, pp. 1183–1192, 2022.
- [28] S. Erlinda and T. A. Fitri, “Recommendations For Repairing Uninhabitable Homes Using the Multi-Attribute Utility Theory (MAUT) Method,” vol. 5, no. 1, pp. 43–50, 2022, doi: 10.36378/jtos.
- [29] J. Pragantha and M. Dolok Lauro, “Jurnal Ilmu Komputer dan Sistem Informasi SPK REKRUTMEN MENGGUNAKAN METODE SIMPLE ADDITIVE WEIGHTING BERBASIS WEBSITE”.
- [30] S. Yakub, P. S. Ramadhan, S. Zahara, and J. Halim, “Analisis Sistem Pendukung Keputusan Menentukan Kualitas Pelayanan Pada Hotel Grandhika Menggunakan Metode Customer Satisfaction Index dan Service Quality,” *J. SAINTIKOM (Jurnal Sains Manaj. Inform. dan Komputer)*, vol. 19, no. 2, p. 85, 2021, doi: 10.53513/jis.v19i2.2619.