

The Decision Support System for Cashier Recruitment Implements the Multi-Attribute Utility Theory Method

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Abstract—CV.Sumber Segar Lestari is a five-star supermarket that serves the best products on the market, namely imported products. High quality human resources are very necessary to improve a company. In searching for quality human resources according to the company's needs, CV.Sumber Segar Lestari is still carried out manually, namely the cashier reception process at CV.Sumber Segar Lestari (Brastagi Supermarket) uses a cashier reception system based on the Company's Operational Standards guidelines. Starting from the cashier acceptance process by selecting each incoming job application. Then the process of evaluating prospective cashier employees is carried out, including: examining applications and required documents, conducting written tests, interviews, and deciding whether to accept or reject the prospective cashier employee. This method of assessment takes a long time and is prone to errors. Especially if many applicants submit applications. In addition, the assessment process and results can only be seen by personnel, it is very possible to manipulate test results. To solve this problem, this research uses the Multi Attribute Utility Theory method. The Multi Attribute Utility Theory method is a quantitative comparison method that usually combines measurements of different risk costs and benefits. The Multi Attribute Utility Theory method is used to provide an assessment and consideration of the best alternative from various existing options. Processing values using the death method will produce rankings. The final result obtained was alternative A3 which had the highest final score of 0.595 in the name of Mulia Dinda Ramadani.

Keywords: Cashier Recruitmen; DSS; MAUT Method

1. INTRODUCTION

Cashiers at CV.Sumber Segar Lestari (Brastagi Supermarket) must have good performance. Good performance itself is the potential that every cashier must have to complete every task and responsibility given. With good performance, each cashier can effectively solve all company problems effectively and efficiently, so that the problems that occur in the company can be resolved properly. Cashiers are expected to maximise their job-related responsibilities. To get prospective cashier employees, it requires selection and assessment based on predetermined criteria.

CV.Sumber Segar Lestari (Brastagi Supermarket) evaluates all prospective cashier employees, the selection of prospective cashier employees is a very important part, because with good quality cashiers will get good work results too, so that the target of CV.Sumber Segar Lestari (Brastagi Supermarket) can be achieved optimally. The success of a company can be seen from the performance of employees produced in carrying out their duties in accordance with the responsibilities given to them. Every company tries to improve the performance of its employees in order to achieve the goals of the company itself. If human resources run effectively, the company will continue to run effectively. Because the sustainability of a company depends on employee performance.

However, currently the cashier reception process at CV.Sumber Segar Lestari (Brastagi Supermarket) uses a cashier reception system based on the Company's Standard Operating Guidelines. Starting from the cashier recruitment process by selecting each incoming job application. Then the process of evaluating prospective cashier employees includes: examining applications and required documents, conducting written tests, interviews, and decisions on whether to accept or reject the prospective cashier employee. This method of assessment is time consuming and error-prone. Especially if there are many applicants who submit applications. In addition, the assessment process and results can only be seen by personnel, manipulation of test results is very possible.

Based on these problems, an effective decision support system is needed and can help decision makers in selecting new cashier employees at CV.Sumber Segar Lestari (Brastagi Supermarket) with criteria determined by company management. Decision Support System (SPK) or Decision Support System (DSS) is a system that is able to provide the ability to solve problems or the ability to communicate in problems with semi-structured and unstructured conditions. This system is also used to assist in decision making in semi-structured and unstructured situations, where no one knows exactly how a decision is made[1]–[7].

If the process of hiring new cashiers is carried out with a computer system in carrying out calculations and considerations then, each assessment can be done properly. It is possible to reduce subjectivity in decision making and select employees with the best ability to become employees. To calculate the evaluation of the new cashier acceptance process, the method used is Multi Attribute Utility Theory (MAUT). The Multi Attribute Utility Theory (MAUT) method is a quantitative comparison method that generally combines measurements of different risk costs and benefits. Each existing standard has several alternatives that can provide solutions. To find and identify alternatives that are close to the user's wishes, multiplication is carried out for predetermined priorities. So that the best and closest result from these alternatives will be taken as a solution[8]–[11].

A study that has been conducted by Mesran and several other research colleagues precisely in 2023. The research explains that the ideal location for a new branch should be convenient for customers, with easy access to the services or products offered. Many companies rely on outdated methods to assess potential branch locations, which can lead to poor strategic choices. Finding the right location can be a challenge, but technology offers entrepreneurs efficient, easy-to-use and versatile solutions, especially when it comes to choosing a new branch location. Decision support systems can be a valuable tool in this process, helping with the selection of optimal and strategic locations. One such system uses the MAUT method with ROC weighting to evaluate various criteria and alternatives. By analysing these factors, the system can identify the best choice, as shown in this case by alternative A6 with a score of 0.6847[12].

Further research was conducted in 2022 by Muhammad Yahya and other friends. The research discusses the problem of unemployment and poverty in Indonesia which is still a big challenge. The high growth of the working-age population is not matched by the availability of adequate employment opportunities. Government efforts to distribute social assistance through the Village Information System (SID) in Laguruda Village have shown positive results. The SID uses the MAUT method with 14 Ministry of Social Affairs criteria to estimate the eligibility of beneficiaries. As a result, of the 49 samples, 57.14% were categorised as moderate, 36.73% as rich, 4.08% as poor, and 2.04% as very poor. This shows the effectiveness of the SID in screening poverty certification requests and assisting village officials in determining targeted beneficiaries[13].

Research conducted by Wahyu Harry Bai Lumban Batu and several other research colleagues in 2022 explains that independent workers have an important role in supporting the success of entrepreneurial businesses. Planning workforce needs is an inseparable part of the recruitment program to attract quality workers to an agency or company. However, not all selection processes are successful in attracting workers as expected. Therefore, it is important for a Decision Support System (DSS) to help solve this problem. In this research, using the OCRA method, the best alternative, namely A9 for Irna Yuni, S.Sos, has a score of 0.552[14].

Further research conducted by Cesmawati Cesmawati and several other researchers, they conducted research in 2022. The research explained that everyone desires a house that is livable, clean, and has good infrastructure. However, there are still many houses that do not meet these standards, causing discomfort and health risks for the occupants. The PUPR Office of Riau Province is faced with the challenge of manually determining recommendations for beneficiaries of uninhabitable house repairs. To overcome this, they used the MAUT method which assigns a utility value to each criterion with a range of 0-1, where 0 indicates the worst choice and 1 indicates the best choice. The application of the MAUT method produced a ranking result with the highest value of 18.0 on behalf of the head of household Siswanto. This shows that Siswanto is eligible for home improvement assistance from the Riau Provincial Government[15].

2. RESEARCH METHODOLOGY

2.1 Research Stages

Research stages are a series of systematic steps taken to obtain data, analyse information, and achieve research objectives. The stages of research can vary depending on the method used, in this research will perform several stages according to the following figure 1:

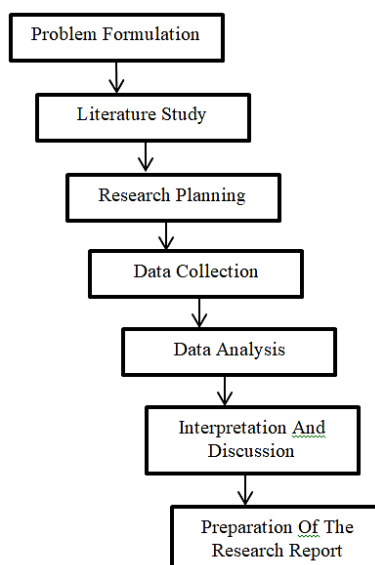


Figure 1. Research Stages

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

- a. Problem formulation, This stage involves identifying and formulating the research problem to be solved. The research problem should be clear, relevant, and investigable.
- b. Literature study, This stage involves studying relevant literature to understand previous research that has been done in the same field. Literature review helps the researcher in avoiding repetition and building a strong knowledge base.
- c. Research planning, At this stage, the researcher plans and designs the research study. This includes determining the population and sample, data collection methods, research instruments, and statistical analyses to be used.
- d. Data collection, This stage involves collecting data that is relevant and appropriate to the research objectives. Data collection can be done through surveys, interviews, observations, or using secondary data sources.
- e. Data analysis, Once the data has been collected, this stage involves analysing the data using the MAUT method. The purpose of data analysis is to look for answers or patterns that can answer the research questions.
- f. Interpretation and discussion, This stage involves interpreting the results of data analysis and summarising the research findings. The researcher also discusses the implications of the research results and refers back to relevant theories.
- g. Preparation of the research report, The final stage is to compile a research report that covers the entire research process, methods, results, and conclusions. The research report should be prepared using a clear and easy-to-understand format.

2.2 Decision Support System

Decision Support System (DSS) is a system that provides problem-solving skills, or communication skills in semi-structured and unstructured conditions, where no one knows exactly how decisions should be made. SPK aims to provide information, guide, predict and guide information users to make better decisions. SPK is the implementation of decision theory introduced in sciences such as operations research and management science, the only difference is that if the solution to a problem has been found the literacy calculations must be done manually (usually by finding the minimum, maximum, or optimum), nowadays PC computers offer the ability to solve the same problem in a relatively short time. There are many methods that can be used in making a decision including WASPAS, MAUT, MOORA, OCRA, MOOSRA, SAW, TOPSIS, EXPROM I, EXPROM II, AHP, WP, ROC and many more[16]–[24].

2.2 Multi Attribute Utility Theory (MAUT) Methode

The MAUT method is a comparison that combines different risks and criteria to provide a solution. The MAUT method also describes the problem by converting various criteria into values or numbers using a 0-1 scale, where 0 is the worst and 3-1 is the best[6], [25]–[28].

- a. Creating a Decision Matrix

$$X_{ij} = \begin{bmatrix} r_{11} & r_{1j} & \cdots & r_{1n} \\ r_{i1} & r_{ij} & \cdots & r_{in} \\ r_{m1} & r_{mj} & \cdots & r_{mn} \end{bmatrix} \quad (1)$$

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

Normalisation for Benefit criteria:

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

Normalisation for Cost criteria:

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

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

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

- d. Calculating the Final Utility Value (Preference Value)

$$U_j = \sum_j^n = 1 U_{ij} \cdot W_j \quad (5)$$

U_j is the Overall Evaluation value for each alternative, W_j is the weight that determines the impact of the evaluation attribute on the dimension and U_{ij} is the evaluation of the actual level. The alternative with the highest utility value is the best alternative.

3. RESULTS AND DISCUSSION



3.1 Analysis

At this stage the cashier recruitment process will be discussed at PT Jaya Anugrah Sukses Abadi, to recruit prospective cashier employees at CV.Sumber Segar Lestari applying the Multi Attribute Utility Theory method using data samples or alternatives and criteria to solve this problem.

3.2 Determination of Criteria

In this study, using several criteria used in the recruitment process of cashier employees at CV.Sumber Segar Lestari as a consideration for the selection of prospective cashier employees. The criteria data used in this study are as follows:

Table 1. Criteria Table

Criteria	Description	Weight Value	Criteria	Type
C1	Education	0,25		Benefit
C2	Age	0,20		Cost
C3	Height	0,20		Benefit
C4	Body Height	0,20		Benefit
C5	Work Experience	0,15		Benefit

In Table 1, the weight values are obtained from applying the Rank Order Centroid (ROC) method. The ROC method is based on the level of importance or priority of the criteria. The requirement for the weight value for all criteria is equal to 1 (One). For this reason, $0.25+0.20+0.20+0.20+0.15 = 1$.

3.3 Alternative Assignment

To simplify calculations using the Multi Attribute Utility Theory method, each alternative is given a code according to a predetermined code. The following is alternative data for prospective cashier employees:

Table 2. Alternative Criteria Table

Alternative	Description
A1	Indah Nandhira Sari
A2	Lailana Mutia Nasution
A3	Mulia Dinda Ramadani
A4	Nur Bani
A5	Mutiara Jihan Daulay
A6	Ratu Tia Andini
A7	Muhammad Nazril

Based on the value of the criteria or alternatives that have been determined in table 2 above, the analysis of the assessment obtained is as follows:

Table 3. Sampel Data

Name	Criteria				
	Education	Age	Height (cm)	Body Height (kg)	Work Experience
Indah Nandhira Sari	Senior High School	22	155	48	1
Lailana Mutia Nasution	Senior High School	20	153	45	1
Mulia Dinda Ramadani	Bachelor's Degree	25	158	52	3
Nur Bani	Vocational High School	22	150	43	2
Mutiara Jihan Daulay	Senior High School	21	154	46	1
Ratu Tia Andini	Vocational High School	23	157	50	2
Muhammad Nazril	Vocational High School	24	160	55	2

In table 3 above, it can be seen that there is still linguistic data, so it requires weighting to produce numeric values as in table 4 below:

Table 4. Education Weight Value (C1)

Keterangan	Nilai Kriteria
Bachelor's Degree	5
Senior High School / Vocational High School	4
Junior High School	3
Elementary School	2
Out of school	1

After correcting the weights for the criteria that are classified as linguistics, namely criterion C1, the following is the suitability rating table which has been adjusted based on tables 3 and 4.



Table 5. Suitability Rating Data After Weighting

Alternative Code	Criteria				
	C1	C2	C3	C4	C5
A1	4	22	155	48	1
A2	4	20	153	45	1
A3	5	25	158	52	3
A4	4	22	150	43	2
A5	4	21	154	46	1
A6	4	23	157	50	2
A7	4	24	160	55	2

From table 5 above, it can be seen that in recruiting prospective cashier employees, 7 alternatives and 5 criteria are used as consideration in producing competent and appropriate selections to be recruited as cashier employees at CV.Sumber Segar Lestari.

3.4 Calculations Using the Multi Attribute Utility Theory Method

When carrying out calculations using the Multi Attribute Utility Theory (MAUT) method, what must be done is ranking. The following is a description of the steps for completing the Multi Attribute Utility Theory method in recruiting cashier employees:

1. Prepare a Decision Matrix

$$X = \begin{pmatrix} 4 & 22 & 155 & 48 & 1 \\ 4 & 20 & 153 & 45 & 1 \\ 5 & 25 & 158 & 52 & 3 \\ 4 & 22 & 150 & 43 & 2 \\ 4 & 21 & 154 & 46 & 1 \\ 4 & 23 & 157 & 50 & 2 \\ 4 & 24 & 160 & 55 & 2 \end{pmatrix}$$

When carrying out calculations using the Multi Attribute Utility Theory (MAUT) method, what must be done is ranking. The following is a description of the steps for completing the Multi Attribute Utility Theory method in recruiting cashier employees:

2. Calculate the normalization matrix (r_{ij}^*)

- a. Criterion C1 (Benefit)

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

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

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

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

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

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

$$r_{6,1}^* = \frac{4-4}{5-4} = 0$$

$$r_{7,1}^* = \frac{4-4}{5-4} = 0$$

- b. Kriteria C₂ (Cost)

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

$$r_{1,2}^* = 1 + \frac{20-22}{25-20} = 0,6$$

$$r_{2,2}^* = 1 + \frac{20-20}{25-20} = 1$$

$$r_{3,2}^* = 1 + \frac{20-25}{25-20} = 0$$

$$r_{4,2}^* = 1 + \frac{20-22}{25-20} = 0,6$$



$$r_{5,2}^* = 1 + \frac{20-21}{25-20} = 0,8$$

$$r_{6,2}^* = 1 + \frac{20-23}{25-20} = 0,4$$

$$r_{7,2}^* = 1 + \frac{20-24}{25-20} = 0,2$$

c. Kriteria C3 (Benefit)

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

$$r_{1,3}^* = \frac{155-150}{160-150} = 0,5$$

$$r_{2,3}^* = \frac{153-150}{160-150} = 0,3$$

$$r_{3,3}^* = \frac{158-150}{160-150} = 0,8$$

$$r_{4,3}^* = \frac{150-150}{160-150} = 0$$

$$r_{5,3}^* = \frac{154-150}{160-150} = 0,4$$

$$r_{6,3}^* = \frac{157-150}{160-150} = 0,7$$

$$r_{7,3}^* = \frac{160-150}{160-150} = 1$$

Carry out the normalization process for criteria C4 (benefit) and C5 (benefit) in the same way as calculating criteria C1 and C3. After carrying out the normalization process for all criteria, the normalization results obtained can be seen in the following matrix.

$$r_{ij}^* = \begin{vmatrix} 0 & 0,6 & 0,5 & 0,417 & 0 \\ 0 & 1 & 0,3 & 0,167 & 0 \\ 1 & 0 & 0,8 & 0,75 & 1 \\ 0 & 0,6 & 0 & 0 & 0,5 \\ 0 & 0,8 & 0,4 & 0,25 & 0 \\ 0 & 0,4 & 0,7 & 0,583 & 0,5 \\ 0 & 0,2 & 1 & 1 & 0,5 \end{vmatrix}$$

3. Calculating Marginal Utilitas Value (u_{ij})

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

a. Kriteria C₁

$$U_{1,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

$$U_{2,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

$$U_{3,1}^* = \frac{e^{(1)^2} - 1}{1,71} = 1$$

$$U_{4,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

$$U_{5,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

$$U_{6,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

$$U_{7,1}^* = \frac{e^{(0)^2} - 1}{1,71} = 0$$

b. Kriteria C₂

$$U_{1,2}^* = \frac{e^{(0,6)^2} - 1}{1,71} = 0,253$$

$$U_{2,2}^* = \frac{e^{(1)^2} - 1}{1,71} = 1,005$$



$$U_{3,2}^* = \frac{e^{(0)^2}-1}{1,71} = 0,000$$

$$U_{4,2}^* = \frac{e^{(0,6)^2}-1}{1,71} = 0,253$$

$$U_{5,2}^* = \frac{e^{(0,8)^2}-1}{1,71} = 0,524$$

$$U_{6,2}^* = \frac{e^{(0,4)^2}-1}{1,71} = 0,101$$

$$U_{7,2}^* = \frac{e^{(0,2)^2}-1}{1,71} = 0,024$$

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. After calculating the Marginal Utility search for all criteria, the following Marginal Utility matrix is obtained.

$$U_{ij} = \begin{vmatrix} 0,000 & 0,253 & 0,166 & 0,111 & 0,000 \\ 0,000 & 1,005 & 0,055 & 0,016 & 0,000 \\ 1,005 & 0,000 & 0,524 & 0,442 & 1,005 \\ 0,000 & 0,253 & 0,000 & 0,000 & 0,166 \\ 0,000 & 0,524 & 0,101 & 0,038 & 0,000 \\ 0,000 & 0,101 & 0,370 & 0,237 & 0,166 \\ 0,000 & 0,024 & 1,005 & 1,005 & 0,166 \end{vmatrix}$$

4. Calculate the final utility value (U_i)

$$U_1 = (0,000 * 0,25) + (0,253 * 0,20) + (0,166 * 0,20) + (0,111 * 0,20) + (0,000 * 0,15) = 0,106$$

$$U_2 = (0,000 * 0,25) + (1,005 * 0,20) + (0,055 * 0,20) + (0,016 * 0,20) + (0,000 * 0,15) = 0,215$$

$$U_3 = (1,005 * 0,25) + (0,000 * 0,20) + (0,524 * 0,20) + (0,442 * 0,20) + (1,005 * 0,15) = 0,595$$

$$U_4 = (0,000 * 0,25) + (0,253 * 0,20) + (0,000 * 0,20) + (0,000 * 0,20) + (0,166 * 0,15) = 0,076$$

$$U_5 = (0,000 * 0,25) + (0,524 * 0,20) + (0,101 * 0,20) + (0,038 * 0,20) + (0,000 * 0,15) = 0,133$$

$$U_6 = (0,000 * 0,25) + (0,101 * 0,20) + (0,370 * 0,20) + (0,237 * 0,20) + (0,166 * 0,15) = 0,167$$

$$U_7 = (0,000 * 0,25) + (0,024 * 0,20) + (1,005 * 0,20) + (1,005 * 0,20) + (0,166 * 0,15) = 0,432$$

After carrying out calculations starting from determining the decision matrix, normalization to calculating the final utility value, the final results are ranked against all alternatives, the following is the ranking table obtained.

Table 6. Ranking Results

Alternative	Name	U_i	Rank
A1	Indah Nandhira Sari	0,106	6
A2	Lailana Mutia Nasution	0,215	3
A3	Mulia Dinda Ramadani	0,595	1
A4	Nur Bani	0,076	7
A5	Mutiara Jihan Daulay	0,133	5
A6	Ratu Tia Andini	0,167	4
A7	Muhammad Nazril	0,432	2

Based on table 6 above, it can be seen that the results of obtaining the highest ranking score for prospective cashier employees fall on alternative A3 (Mulia Dinda Ramadani) with a result of 0.595.

4. CONCLUSION

Based on the research that has been conducted, the conclusion can be drawn that CV.Sumber Segar Lestari is a five-star supermarket that specializes in imported products. The company recognizes the importance of high-quality human resources and is currently conducting manual processes for cashier recruitment, which can be time-consuming and prone to errors, especially with a large number of applicants. To address this issue, the research mentioned in the paragraph proposes the use of the Multi Attribute Utility Theory method to assess and consider the best alternative from various options. The results of the research indicate that alternative A3, represented by Mulia Dinda Ramadani, obtained the highest final score of 0.595, suggesting that this candidate is the most suitable for the cashier position at CV. Sumber Segar Lestari.

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