Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

Decision Support System for Determining the Best Coffee Shop Using the Multi Attribute Utility Theory (MAUT) Method with Rank Order Centroid (ROC) Weighting

Risa Ermis Claudia Malau[1], Mesran[2,*]

[1] Department of Informatics Engineering, Faculty of Computer Science and Information Technology, Universitas Budi Darma, Medan, Indonesia
[2] Management Study Program, Sekolah Tinggi Ilmu Manajemen Sukma Medan, Medan, Indonesia
Email: [1]risaclaudia72@gmail.com, [2,*]mesran.skom.mkom@gmail.com
Corresponding Author's Email: mesran.skom.mkom@gmail.com

Abstract–This study discusses the development of a decision support system (DSS) to determine the best coffee shop using the Multi Attribute Utility Theory (MAUT) method and Rank Order Centroid (ROC) weighting. The background of this research is based on the rapid growth of the coffee shop business, which has led to intense competition, requiring business owners to have appropriate strategies and decision-making in choosing a strategic location, adequate facilities, and competitive pricing. The MAUT method is applied because it can accommodate various attributes and criteria that influence decision-making, while ROC is utilized to assign objective weights to each criterion. This study involved five alternative coffee shops, and five evaluation criteria. The results of the calculations show that Coffee Lab achieved the highest final utility value of 0.718, thus being ranked as the best coffee shop, followed by Coffeenatics with 0.395 in second place, Dominico with 0.233 in third place, Kallia with 0.188 in fourth place, and Kopi Tuya with 0.054 in the last position. These findings demonstrate that the application of the MAUT method with ROC weighting can provide objective, systematic, and accurate recommendations in determining the best alternative based on the established criteria. Therefore, this research is expected to serve as a reference for the application of DSS in the coffee shop business sector as well as in other areas that require multi-criteria decision-making.

Keywords: DSS; Coffee Shop; MAUT Method; ROC Method

1. INTRODUCTION

Nowadays, the coffee shop business is growing rapidly. A coffee shop, also commonly referred to as a café, is a place established as a business venture focused on serving coffee. Currently, coffee shops are a popular topic of discussion among business owners because they have become highly attractive and in demand by many people. Typically, coffee shops sell various types of coffee and are often used as gathering places for socializing. Moreover, coffee shops are not only seen as places to drink coffee but also function as venues for many other activities. Owners also realize the importance of choosing high-quality coffee suppliers, as this plays a significant role in helping them develop their businesses. If entrepreneurs make mistakes in selecting coffee suppliers, it may lead to a decline in the quality of raw coffee materials, which in turn could reduce customer interest in visiting the coffee shop[1].

The coffee shop business is currently growing rapidly, and competition is becoming increasingly intense. Therefore, coffee shop owners must have the courage to compete in order to avoid failure in their business. Failures or losses in this competitive business often stem from a lack of experience, weak decision-making skills, and poor management of the coffee shop itself[2].

A decision support system (DSS) is a part of an interactive information system that provides information [3][4][5]. This system also aims to solve problems in semi-structured and unstructured situations [6]. In this study, the MAUT (Multi-Attribute Utility Theory) ranking method and the ROC (Rank Order Centroid) weighting method are applied to determine the best coffee shop.

The Multi Attribute Utility Theory (MAUT) method is an approach used to support decision-making in situations involving multiple criteria or attributes [7][8][9]. In the context of selecting the best coffee shop, MAUT allows decision-makers to assign weights to each criterion and measure preferences for the available alternatives. MAUT helps address the complexity of evaluating coffee shop alternatives by considering various relevant aspects.

The ROC weighting method is an effective tool for ranking alternatives based on the weights assigned to each criterion [10]. In the implementation of ROC, internal auditor candidates are evaluated based on the centroid values of the assigned weights [11]. The use of the ROC method in a DSS helps rank and simplify the evaluation process of determining the best coffee shop, so that the decisions made can be more informed and objective.

The essence of this research is based on previous studies that applied the same method. In 2021, a study conducted by Dhea Safitri et al. used the MAUT method to determine the purchase of a new car and produced the highest preference value for alternative A3 with a score of 25, namely the Yaris E Grade M/T [12]. Another study in 2021 by Rita Novita Sari et al. applied the MAUT method for the selection of Android smartphones and resulted in the best value on alternative A1 with a score of 1, which was the Infinix Zero X Neo smartphone [13]. In 2022, research conducted by Mesran et al. applied the MAUT method to the selection of employees who were deactivated during the pandemic, yielding a preference value of 0.9203 for alternative A1 [14]. Furthermore, in 2019, Dasril Aldo and his team investigated the use of the MAUT method to evaluate lecturer performance, with the findings showing that DSN-01 achieved the highest score of 0.9 [15].

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

The author conducted this research to determine the best coffee shop with appropriate weights and preferences, so that it is expected to provide optimal benefits based on the criteria that have been applied[16].

2. RESEARCH METHODOLOGY

2.1 Research Stages

The research stages are a systematic series designed to illustrate the implementation process of the study from beginning to end. The arrangement of these stages aims to ensure that the research runs in a structured and directed manner, as well as to facilitate the achievement of the predetermined objectives. To provide a clearer understanding of the research stages, they are presented in Figure 1, which visually illustrates the relationships between each step, thereby offering a comprehensive overview of the entire research process.

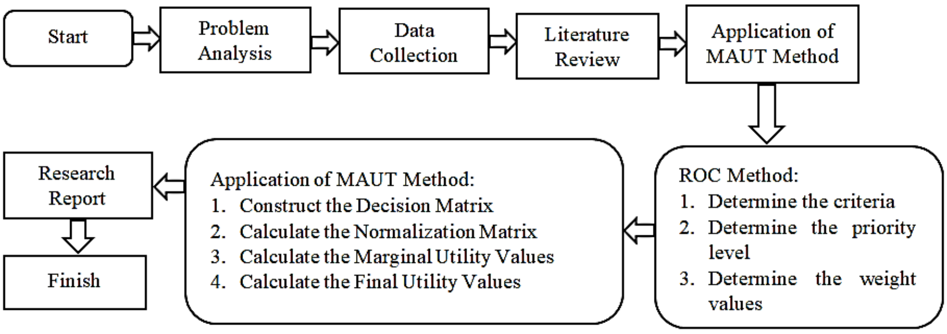

Figure 1. Research Stages

In conducting this research, the author followed several systematic stages, each designed to ensure clarity, accuracy, and scientific rigor. The stages are outlined as follows:

1. Problem Analysis
   The research process commenced with the identification and in-depth analysis of the problem under investigation. This stage aimed to establish a clear understanding of the research focus and to formulate a framework that is both appropriate and relevant.
2. Data Collection
   Once the research focus was determined, data were collected through observations, surveys, and other suitable methods. The data obtained at this stage served as the foundation for subsequent analysis and evaluation.
3. Literature Review
   A comprehensive literature review was conducted to gather theoretical insights and references related to decision support systems (DSS), particularly those employing the Multi-Attribute Utility Theory (MAUT) method. This stage ensured that the study was grounded in established theories and methodologies while expanding the researcher's understanding of the topic.
4. Application of MAUT and ROC
   At this stage, the MAUT (Multi-Attribute Utility Theory) and ROC (Rank Order Centroid) methods were applied to analyze the collected data. MAUT was used to evaluate and measure the utility of each decision alternative, while ROC was employed to assign weights to the criteria, thereby enhancing the objectivity and reliability of the evaluation process.
5. Research Reporting
   The final stage involved compiling the research findings into a structured report. This report presented the analyses, results, and conclusions in accordance with academic standards, serving as the formal outcome of the research.

2.2 MAUT Method

Multi-Attribute Utility Theory (MAUT) is one of the multi-criteria decision-making methods used to evaluate and select the best alternative based on a set of predetermined attributes or criteria. The initial stage involves constructing a decision matrix (Equation 1) for each alternative according to the criteria, followed by data normalization to allow for balanced comparison, using Equation 2 for benefit criteria and Equation 3 for cost criteria. Subsequently, the utility value of each alternative for each criterion is calculated using Equation 4, and then aggregated using Equation 5 (after multiplying by the corresponding criterion weights according to their level of importance), resulting in a final preference value that reflects the quality or feasibility of each alternative. MAUT is considered effective because it can address complex problems that involve multiple and diverse aspects, both benefit criteria and cost criteria. The strength of MAUT lies in its ability to generate systematic, objective, and transparent decisions, making it widely applied across various fields, including business, management, and decision support systems for selecting the best alternative among several options[17][18][19][20].

Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

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

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

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

$$\mathrm{Uij} = \frac{e^{(r_{ij}^{*})^{2}} - 1}{1.71} \quad (4)$$

$$\mathrm{Ui} = \sum_{j}^{n} = 1\ u_{ij}.w_{j} \quad (5)$$

In Equation (1), X_{ij} represents the decision matrix, where i denotes the i-th alternative and j denotes the j-th criterion. In Equations (2) and (3), r_{ij}^{*} refers to the normalized value of an alternative for a given criterion, where Equation (2) is applied for benefit criteria and Equation (3) for cost criteria. Here, X_{ij} is the initial score of an alternative on a specific criterion, while min X_{ij} and max X_{ij} indicate the minimum and maximum values of each criterion, respectively. In Equation (4), Uij represents the utility value of the i-th alternative with respect to the j-th criterion, reflecting the relative usefulness after normalization. Finally, in Equation (5), Ui is the overall utility score of the i-th alternative, obtained by summing the products of Uij and the weight w_j assigned to each criterion. Thus, each variable in the MAUT equations plays a crucial role in transforming the raw data into a final preference score that is objective and measurable[21][22].

2.3 ROC Method

Rank Order Centroid (ROC) is a simple and efficient method for determining the weight of criteria based on their level of importance. This method is used to assign weights to each criterion by considering their priority order, so that criteria deemed more important receive greater weights compared to others. The advantage of ROC lies in its ease of application, as it only requires the ranking order of criteria without the need for more complex pairwise comparisons such as those used in the Analytic Hierarchy Process (AHP) [23][24]. The level of importance of criteria in the ROC method can be illustrated using equation (6), while the weight value for each criterion W_m is calculated using equation (7) as follows[25][26]:

$$\mathrm{C1} > \mathrm{C2} > \mathrm{C3} > \mathrm{C_m} \quad (6)$$

$$W_m = \frac{1}{m} \sum_{1=1}^{m} \left(\frac{1}{i}\right) \quad (7)$$

In equation (6), C1 represents the criterion with the highest level of importance, while C_m denotes the criterion with the lowest importance. Furthermore, the weight of each criterion is calculated using equation (7). In this equation, W represents the weight value assigned to each criterion, m indicates the total number of criteria used in the study, and i refers to the rank position of the i-th criterion. Thus, the higher the rank of a criterion based on equation (6), the greater the weight value W obtained through the calculation in equation (7)[27][28][8].

2.4 Coffeeshop

Coffee shops are currently one of the most talked-about business opportunities, attracting the attention of many aspiring entrepreneurs. This growing popularity has led to an increasing number of coffee shop businesses, which in turn has intensified market competition. Therefore, each coffee shop owner must strive to provide the best possible service to retain their customers and avoid failure in the midst of such competitive rivalry[29][30][31][32].

3. RESULTS AND DISCUSSION

This section presents the findings obtained from the application of the Multi-Attribute Utility Theory (MAUT) method in the decision-making process for determining the best coffee shop. The MAUT method was selected as it provides a systematic solution for evaluating multiple alternatives based on predefined criteria. Through this approach, each coffee shop alternative is assessed quantitatively, resulting in an objective ranking. Thus, the analysis not only identifies the best coffee shop according to the calculations but also offers a comprehensive overview of the strengths and weaknesses of each alternative.

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

3.1 Alternative Data

In the decision-making process using the MAUT method, the initial step is to determine the alternatives to be evaluated. These alternatives represent the coffee shop options that serve as the focus of the study. Identifying the alternatives is crucial, as they form the foundation for subsequent assessments based on the predefined criteria. The coffee shop alternatives considered in this research are presented in Table 1 below:

Table 1. Alternative Data

Alternative	Location Name
A_1	Coffeenatics
A_2	Coffee Lab
A_3	Dominico
A_4	Kallia
A_5	Kopi Tuya

As shown in Table 1, there are five coffee shop alternatives that form the focus of the analysis, namely Coffeenatics (A_1), Coffee Lab (A_2), Dominico (A_3), Kallia (A_4), and Kopi Tuya (A_5). These alternatives will be further analyzed using the MAUT method to determine the best coffee shop based on the established evaluation criteria.

3.2 Criteria Data

In determining the best coffee shop, several criteria are required as the basis for evaluating each alternative. These criteria serve as benchmarks for assessing both the strengths and weaknesses of the coffee shops. The criteria used in this study include facilities, strategic location, crowd level, price, and rental cost. A detailed description of these criteria is presented in Table 2 below.

Table 2. Criteria Data

Criteria	Description	Type
C1	Facilities	Benefit
C2	Strategic	Benefit
C3	Crowd Level	Benefit
C4	Price	Cost
C5	Rental Cost	Cost

As shown in Table 2, the criteria categorized as benefit include facilities (C1), strategic location (C2), and crowd level (C3), since higher values for these attributes indicate better performance. Meanwhile, the criteria classified as cost consist of price (C4) and rental cost (C5), where lower values are considered more advantageous in the decision-making process. This classification ensures that each criterion is appropriately addressed in the MAUT calculation, leading to more accurate and objective evaluation results.

3.3 Application of the ROC Method

In selecting a strategic location for a millennial coffee shop, several criteria must be assigned weights during the calculation process. The ROC method is applied to provide the necessary weighting in the ranking of alternative values. The derivation of the weight values using equation (7) in the ROC method can be clearly observed in the calculations presented below:

$$W_1 = \frac{1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}}{5} = 0{,}42$$

$$W_2 = \frac{0+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}}{5} = 0{,}25$$

$$W_3 = \frac{0+0+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}}{5} = 0{,}15$$

$$W_4 = \frac{0+0+0+\frac{1}{4}+\frac{1}{5}}{5} = 0{,}09$$

$$W_5 = \frac{0+0+0+0+\frac{1}{5}}{5} = 0{,}04$$

Thus, the weight for C_1 is 0.42, C_2 is 0.25, C_3 is 0.15, C_4 is 0.09, and C_5 is 0.04. The decision-making process begins by establishing the importance (weight) of each criterion and its type. The defined weights and criteria characteristics are presented in Table 3 below.

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

Table 3. Weight Values & Criteria

Criteria	Description	Weight	Type
C_1	Facilities	0.42	Benefit
C_2	Strategic	0.25	Benefit
C_3	Crowd Level	0.15	Benefit
C_4	Price	0.09	Cost
C_5	Rental Cost	0.04	Cost

As shown in Table 3, the "Facilities" criterion (C_1) carries the highest weight (0.42), indicating it is the most critical factor in this decision. All criteria are categorized as either "Benefit" (where a higher value is better) or "Cost" (where a lower value is better). The raw data for each alternative across these criteria is then collected, as displayed in Table 4.

Table 4. Alternative Data and Criteria

Alternatif	C_1 (Facilities)	C_2 (Strategic)	C_3 (Crowd Level)	C_4 (Price)	C_5 (Rental Cost/Year)
A_1	Complete	Quite Strategic	Very Crowded	150.000	8.000.000
A_2	Very Complete	Very Strategic	Crowded	250.000	14.000.000
A_3	Complete	Strategic	Quite Crowded	240.000	11.000.000
A_4	Quite Complete	Quite Strategic	Crowded	130.000	12.000.000
A_5	Incomplete	Not Strategic	Not Crowded	170.000	9.000.000

Table 4 reveals that the data for criteria C_1, C_2, and C_3 are in linguistic form (e.g., " Complete," " Strategic "). To enable numerical calculation, these qualitative ratings must be converted into quantitative scores. The conversion scale used for this normalization is defined in Table 5.

Table 5. Weight Values for Linguistic Criteria

Criteria	Description	Weight
Facilities (C_1)	Very Complete	4
	Complete	3
	Quite Complete	2
	Incomplete	1
Strategic (C_2)	Very Strategic	4
	Strategic	3
	Less Strategic	2
	Not Strategic	1
Crowd Level(C_3)	Very Crowded	4
	Crowded	3
	Quite Crowded	2
	Not Crowded	1

By applying the conversion rules from Table 5, all linguistic data in Table 4 are transformed into numerical values. The results of this conversion, which produce a fully quantitative dataset ready for the next stage of analysis, are presented in Table 6.

Table 6. Data Rating After Weight Conversion

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	3	2	4	150000	8000000
A_2	4	4	3	250000	14000000
A_3	3	3	2	240000	11000000
A_4	2	2	3	130000	12000000
A_5	1	1	1	170000	9000000

The dataset in Table 6 is now entirely numerical, with criteria C_1, C_2, and C_3 converted into a 1-4 scale based on their linguistic descriptions. This unified numerical format is crucial for the subsequent steps of normalization and calculation in the decision-making method.

3.4 Application of the Multi-Attribute Utility Theory (MAUT) Method

The first step in applying the MAUT method is to prepare a decision matrix containing the numerical data of each alternative across all criteria. This matrix, presented in a rectangular form, serves as the foundation for all subsequent calculations. The data used in this matrix is taken directly from Table 6 (Data Rating After Weight Conversion), which has undergone the process of converting linguistic data into numerical data. Mathematically, the decision matrix X_{ij} can be represented as follows:

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

$$X_{ij} = \begin{bmatrix} 3 & 2 & 4 & 15000 & 8000000 \\ 4 & 4 & 3 & 25000 & 14000000 \\ 3 & 3 & 2 & 24000 & 11000000 \\ 2 & 2 & 3 & 13000 & 12000000 \\ 1 & 1 & 1 & 17000 & 9000000 \end{bmatrix}$$

Since the criteria have different types and units (there are benefit and cost criteria, as well as scales of 1-4 and Rupiah), normalization is required to standardize their scales to a range of 0 to 1. This process uses Formula (2) for Benefit criteria and Formula (3) for Cost criteria.

1. Formula (1) for Benefit Criteria (C_1, C_2, C_3)

$r_{11}^* = \frac{3-1}{4-1} = 0.66$

$r_{21}^* = \frac{4-1}{4-1} = 1$

$r_{31}^* = \frac{3-1}{4-1} = 0.66$

$r_{41}^* = \frac{2-1}{4-1} = 0.33$

$r_{51}^* = \frac{1-1}{4-1} = 0$

$r_{12}^* = \frac{2-1}{4-1} = 0.33$

$r_{22}^* = \frac{4-1}{4-1} = 1$

$r_{32}^* = \frac{3-1}{4-1} = 0.66$

$r_{42}^* = \frac{2-1}{4-1} = 0.33$

$r_{52}^* = \frac{1-1}{4-1} = 0$

$r_{13}^* = \frac{4-1}{4-1} = 1$

$r_{23}^* = \frac{3-1}{4-1} = 0.66$

$r_{33}^* = \frac{2-1}{4-1} = 0.33$

$r_{43}^* = \frac{3-1}{4-1} = 0.66$

$r_{53}^* = \frac{1-1}{4-1} = 0$

2. Formula (2) for Cost Criteria (C_4, C_5)

$r_{14}^* = 1 + \frac{13000-15000}{25000-13000} = 0.84$

$r_{24}^* = 1 + \frac{13000-25000}{25000-13000} = 0$

$r_{34}^* = 1 + \frac{13000-24000}{25000-13000} = 0.09$

$r_{44}^* = 1 + \frac{13000-13000}{25000-13000} = 1$

$r_{54}^* = 1 + \frac{13000-17000}{25000-13000} = 0.67$

$r_{15}^* = 1 + \frac{8000000-8000000}{14000000-8000000} = 1$

$r_{25}^* = 1 + \frac{8000000-14000000}{14000000-8000000} = 0$

$r_{35}^* = 1 + \frac{8000000-11000000}{14000000-8000000} = 0.5$

$r_{45}^* = 1 + \frac{8000000-12000000}{14000000-8000000} = 0.34$

$r_{55}^* = 1 + \frac{8000000-9000000}{14000000-8000000} = 0.84$

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

Based on the normalization calculations performed for all cells, a normalized matrix is obtained, the results of which are summarized in full in Table 7 below.

Table 7. Normalized Matrix Results

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	0.66	0.33	1	0.84	1
A_2	1	1	0.66	0	0
A_3	0.66	0.66	0.33	0.09	0.5
A_4	0.33	0.33	0.66	1	0.34
A_5	0	0	0	0.67	0.84

Table 7 shows that all criterion values are now on a uniform scale, between 0 and 1, where values closer to 1 are better for all criteria after normalization. The normalized values are then converted into utility (satisfaction) values using an exponential utility function. This function is capable of handling non-linear preferences for a value. This calculation uses Formula (4). The divisor 1.71 (which is $e-1$) ensures the final utility value remains within an appropriate range.

1. Calculation for C_1 on A_n

$$U_{11} = \frac{e^{(0.66)^2}-1}{1.71} = 0.32$$

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

$$U_{31} = \frac{e^{(0.66)^2}-1}{1.71} = 0.32$$

$$U_{41} = \frac{e^{(0.33)^2}-1}{1.71} = 0.07$$

$$U_{51} = \frac{e^{(0)^2}-1}{1.71} = 0$$

2. Calculation for C_2 on A_n

$$U_{12} = \frac{e^{(0.33)^2}-1}{1.71} = 0.07$$

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

$$U_{32} = \frac{e^{(0.66)^2}-1}{1.71} = 0.32$$

$$U_{42} = \frac{e^{(0.33)^2}-1}{1.71} = 0.07$$

$$U_{52} = \frac{e^{(0)^2}-1}{1.71} = 0$$

3. Calculation for C_3 on A_n

$$U_{13} = \frac{e^{(1)^2}-1}{1.71} = 1$$

$$U_{23} = \frac{e^{(0.66)^2}-1}{1.71} = 0.32$$

$$U_{33} = \frac{e^{(0.33)^2}-1}{1.71} = 0.07$$

$$U_{43} = \frac{e^{(0.66)^2}-1}{1.71} = 0.32$$

$$U_{53} = \frac{e^{(0)^2}-1}{1.71} = 0$$

4. Calculation for C_4 on A_n

$$U_{14} = \frac{e^{(0.84)^2}-1}{1.71} = 0.59$$

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

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

$$U_{34} = \frac{e^{(0.09)^2} - 1}{1.71} = 0.01$$

$$U_{44} = \frac{e^{(1)^2} - 1}{1.71} = 1$$

$$U_{54} = \frac{e^{(0.67)^2} - 1}{1.71} = 0.33$$

5. Calculation for C_5 on A_n

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

$$U_{25} = \frac{e^{(0)^2} - 1}{1.71} = 0$$

$$U_{35} = \frac{e^{(0.5)^2} - 1}{1.71} = 0.17$$

$$U_{45} = \frac{e^{(0.34)^2} - 1}{1.71} = 0.07$$

$$U_{55} = \frac{e^{(0.84)^2} - 1}{1.71} = 0.60$$

From the comprehensive series of marginal utility calculations, the final value for each alternative on each criterion is obtained. The results of these calculations are presented concisely in Table 8.

Table 8. Final Marginal Utility Results

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	0.32	0.07	1	0.59	1
A_2	1	1	0.32	0	0
A_3	0.32	0.32	0.07	0.01	0.17
A_4	0.07	0.07	0.32	1	0.07
A_5	0	0	0	0.33	0.60

Table 8 represents the level of satisfaction (utility) of each alternative for each individual criterion before aggregation. The final stage is to calculate the final utility value (*Ui*) for each alternative by aggregating all marginal utility values. Aggregation is done by summing the products of the marginal utility values (*Uij*) and the criterion weights (wj) previously established in Table 3. This calculation uses Formula (5):

$$U_1 = (0.42 * 0.32) + (0.25 * 0.07) + (0.15 * 1) + (0.09 * 0.59) + (0.04 * 1) = 0.395$$

$$U_2 = (0.42 * 1) + (0.25 * 1) + (0.15 * 0.32) + (0.09 * 0) + (0.04 * 0) = 0.718$$

$$U_3 = (0.42 * 0.32) + (0.25 * 0.32) + (0.15 * 0.07) + (0.09 * 0.01) + (0.04 * 0.17) = 0.233$$

$$U_4 = (0.42 * 0.07) + (0.25 * 0.07) + (0.15 * 0.32) + (0.09 * 1) + (0.04 * 0.07) = 0.188$$

$$U_5 = (0.42 * 0) + (0.25 * 0) + (0.15 * 0) + (0.09 * 0.33) + (0.04 * 0.60) = 0.054$$

The final utility value (UiUi) is the basis for decision-making. The alternative with the highest *Ui* value is considered the best alternative. The complete results of the final utility calculation and ranking are presented in Table 9.

Table 9. Alternative Ranking

Alternative	Coffeeshop Name		Alternative
A_1	Coffeenatics	0.395	2
A_2	Coffee Lab	0.718	1
A_3	Dominico	0.233	3
A_4	Kallia	0.188	4
A_5	Kopi Tuya	0.054	5

Table 9 shows the final ranking of all coffeeshop alternatives based on the resulting utility values. From this table, "Coffee Lab" (A_2) ranks first with a final utility value of 0.718. It is followed by "Coffeenatics" (A_1) with a value of 0.395, placing second. Next, "Dominico" (A_3) is in third place with a value of 0.233, "Kallia" (A_4) is in fourth place with a value of 0.188, and "Kopi Tuya" (A_5) occupies fifth place with a value of 0.054. Thus, based on the application of the MAUT method, Coffee Lab is the recommended best alternative.

4. CONCLUSION

Based on the results of the research conducted, it can be concluded that the application of the Multi Attribute Utility Theory (MAUT) method with Rank Order Centroid (ROC) weighting has proven effective in supporting the decision-making process for determining the best coffee shop based on several relevant criteria. Through weight determination using ROC, each criterion such as facilities, strategic location, crowd density, price, and rental cost can be assigned proportional values according to its level of importance. Furthermore, the application of MAUT allows for normalization, marginal utility calculation, and the acquisition of final utility values that objectively produce the ranking of coffee shop alternatives. The results of the study show that Coffee Lab ranked first with the highest utility value of 0.718, indicating that this coffee shop is able to meet most of the prioritized criteria. These findings not only provide practical recommendations for business owners or prospective coffee shop entrepreneurs in selecting the right location, but also demonstrate that a decision support system based on MAUT and ROC can serve as a reliable solution for handling multi-criteria decision-making problems in competitive business sectors. Thus, this research is expected to contribute theoretically to the development of DSS methodologies as well as provide practical benefits for coffee shop entrepreneurs to enhance the competitiveness of their businesses sustainably.

REFERENCES

[1] M. N. H. Alvianto dan S. Saifullah, "Sistem Pendukung Keputusan Pemilihan Cafe di Yogyakarta dengan Menggunakan Metode Simple Additive Weighting (SAW)," *J. Innov. Inf. Technol. Appl.*, vol. 2, no. 01, hal. 47–55, 2020, doi: 10.35970/jinita.v2i01.187.

[2] V. Alfheny dan A. Ibrahim, "Implementation of the simple multi-attribute rating technique (SMART) method for support selection of coffee shop business location," *J. Tek. Inform.*, vol. 3, no. 4, hal. 963–968, 2022, doi: https://doi.org/10.20884/1.jutif.2022.3.4.508.

[3] A. T. Hidayat, N. K. Daulay, dan Mesran, "Penerapan Metode Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA) dalam Pemilihan Wiraniaga Terbaik," *J. Comput. Syst. Informatics*, vol. 1, no. 4, hal. 367–372, 2020, [Daring]. Tersedia pada: https://ejurnal.seminar-id.com/index.php/josyc/article/view/444

[4] S. Rahayu dan A. S. Sinaga, "Sistem Pendukung Keputusan Penilaian Kinerja Guru Menggunakan Metode Simple Additive Weighting (SAW)," *J. SAINTIKOM (Jurnal Sains Manaj. Inform. dan Komputer)*, vol. 21, no. 1, hal. 16–24, 2022, doi: https://doi.org/10.54082/jiki.28.

[5] R. D. Gunawan, F. Ariany, dan N. Novriyadi, "Implementasi Metode SAW Dalam Sistem Pendukung Keputusan Pemilihan Plano Kertas," *J. Artif. Intell. Technol. Inf.*, vol. 1, no. 1, hal. 29–38, 2023, doi: https://doi.org/10.58602/jaiti.v1i1.23.

[6] R. F. Wahyu, H. Rohayani, V. Y. P. Ardhana, F. Frieyadie, A. Supriyatna, dan D. Desyanti, "Kombinasi Metode Rank Order Centroid (ROC) dan Operational Competitiveness Rating Analysis (OCRA) pada Sistem Pendukung Keputusan Penerimaan Kasir," *Bull. Informatics Data Sci.*, vol. 2, no. 1, hal. 30, 2023, doi: 10.61944/bids.v2i1.61.

[7] M. A. Abdullah dan R. T. Aldisa, "Implementasi Metode MAUT dalam Sistem Pendukung Keputusan Seleksi Penerimaan Stock Keeper Restoran dengan Pembobotan Rank Order Centroid," *Build. Informatics, Technol. Sci.*, vol. 4, no. 3, hal. 1422–1430, 2022, doi: 10.47065/bits.v4i3.2656.

[8] A. A. Kusuma, Z. M. Arini, U. Hasanah, dan Mesran, "Analisa Penerapan Metode Multi Attribute Utility Theory (MAUT) dengan Pembobotan Rank Order Centroid (ROC) Dalam Pemilihan Lokasi Strategis Coffeshop Milenial di Era New Normal," *J. Sist. Komput. dan Inform.*, vol. 3, no. 2, hal. 51–59, 2021, doi: 10.30865/json.v3i2.3575.

[9] M. A. Abdullah dan R. T. Aldisa, "Penerapan Metode MAUT Dalam Rekrutmen Kepala Gudang di Perusahaan Dengan Pembobotan ROC," *KLIK*, vol. 4, no. 2, hal. 1073–1079, 2023, doi: 10.30865/klik.v4i2.1323.

[10] M. A. Abdullah dan R. T. Aldisa, "Penerapan Metode MOOSRA Dalam Penentuan Penerimaan Frontliner Menggunakan Pembobotan Metode ROC," *J. Ris. Komputer)*, vol. 10, no. 1, hal. 330–337, 2023, doi: 10.30865/jurikom.v10i1.5647.

[11] M. R. Ramadhan, M. K. Nizam, dan Mesran, "Penerapan Metode SAW (Simple Additive Weighting) Dalam Pemilihan Siswa-Siswi Berprestasi Pada Sekolah SMK Swasta Mustafa," *TIN Terap. Inform. …*, vol. 1, no. 9, hal. 459–471, 2021, [Daring]. Tersedia pada: https://ejurnal.seminar-id.com/index.php/tin/article/view/655

[12] M. L. O. Mardin, A. Fuad, dan 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, hal. 85–92, 2021, doi: 10.47324/ilkominfo.v4i2.129.

[13] R. N. Sari dan I. Lazuli, "Penerapan Metode Maut Dalam Pemilihan Smartphone Android," *CSRID J.*, vol. 11, no. 3A, hal. 380–390, 2021.

[14] J. H. Lubis, S. Esabella, Mesran, Desyanti, dan D. M. Simanjuntak, "Penerapan Metode Multi Attribute Utility Theory (MAUT) Dalam Pemilihan Karyawan yang di Non-Aktifkan di Masa Pandemi," *J. MEDIA Inform. BUDIDARMA*, vol. 6, no. April, hal. 969–978, 2022, doi: 10.30865/mib.v6i2.3909.

[15] D. Aldo, "Sistem Pendukung Keputusan Penilaian Kinerja Dosen Dengan Menggunakan Metode Multi Attribute Utility Theory (Maut)," *JURSIMA (Jurnal Sist. Inf. dan Manajemen)*, vol. 7, no. 2, hal. 76–82, 2019, doi: 10.47024/js.v7i2.180.

[16] P. Purwadi, W. R. Maya, dan A. Calam, "Sistem Pendukung Keputusan Untuk Menentukan Pemasangan Lokasi Strategis Wifi.Id Pada Telkom (Studi Kasus Pada Pemsangan Wifi.Id Di Beberapa Lokasi Medan Menggunakan Metode Oreste," *J. SAINTIKOM (Jurnal Sains Manaj. Inform. dan Komputer)*, vol. 19, no. 1, hal. 110, 2020, doi: 10.53513/jis.v19i1.231.

[17] S. F. Pantatu dan I. C. R. Drajana, "Sistem Pendukung Keputusan Penerima Bantuan UMKM Menggunakan Metode MAUT," *J. Nas. Komputasi dan Teknol. Inf.*, vol. 5, no. 2, hal. 317–325, 2022, doi: 10.32672/jnkti.v5i2.4207.

[18] R. Ramadiani dan A. Rahmah, "Sistem pendukung keputusan pemilihan tenaga kesehatan teladan menggunakan metode Multi-Attribute Utility Theory," *Regist. J. Ilm. Teknol. Sist. Inf.*, vol. 5, no. 1, hal. 1, 2019, doi:

Journal of Decision Support System Research
Volume 2, No 2, January 2025 Page: 73−82
ISSN 3026-006X (media online)
DOI: doi.org/10.64366/dss.v2i2.94

10.26594/register.v5i1.1273.
[19] A. Perdana dan A. Budiman, “Analysis of Multi-attribute Utility Theory for College Ranking Decision Making,” *SinkrOn*, vol. 4, no. 2, hal. 19, 2020, doi: 10.33395/sinkron.v4i2.10232.
[20] R. N. Sari dan R. S. Hayati, “Penerapan Metode Multi Attribute Utility Theory (MAUT) Dalam Pemilihan Rumah Kost,” *J-SAKTI (Jurnal Sains Komput. dan Inform.*, vol. 3, no. 2, hal. 243, 2019, doi: 10.30645/j-sakti.v3i2.144.
[21] H. Sulistiani, Setiawansyah, P. Palupiningsih, F. Hamidy, P. L. Sari, dan Y. Khairunnisa, “Employee Performance Evaluation Using Multi-Attribute Utility Theory (MAUT) with PIPRECIA-S Weighting: A Case Study in Education Institution,” in *2023 International Conference on Informatics, Multimedia, Cyber and Informations System (ICIMCIS)*, 2023, hal. 369–373. doi: 10.1109/ICIMCIS60089.2023.10349017.
[22] Y. Setiawan dan S. Budilaksono, “Sistem Pendukung Keputusan Pemilihan Mahasiswa Lulusan Terbaik Dengan Menggunakan Metode Multi Attribute Utility Theory (Maut) DiStmik Antar Bangsa,” *Ikraith-Informatika*, vol. 6, no. 2, hal. 12–20, 2021, doi: 10.37817/ikraith-informatika.v6i2.1566.
[23] H. Haeruddin, R. T. Aldisa, K. Khairunnisa, M. Mesran, dan G. Ginting, “Sistem Pendukung Keputusan Penentuan Pelaku Pariwisata Terbaik dimasa Pandemi Covid-19 Menerapkan Metode OCRA dengan Pembobotan ROC,” *J. Media Inform. Budidarma*, vol. 6, no. 2, hal. 1056, 2022, doi: 10.30865/mib.v6i2.4000.
[24] D. P. Indini, K. Khairunnisa, N. D. Puspa, T. A. Siregar, dan M. Mesran, “Penerapan Metode OCRA dalam Menentukan Media Pembelajaran Online Terbaik di Masa Pandemi Covid-19 dengan Pembobotan ROC,” *J. Sist. Komput. dan Inform.*, vol. 3, no. 2, hal. 60–66, 2021, doi: 10.30865/json.v3i2.3576.
[25] M. Mesran, T. M. Diansyah, dan F. Fadlina, “Implemententasi Metode Rank Order Cendroid (ROC) dan Operational Competitiveness Rating Analysis (OCRA) dalam Penilaian Kinerja Dosen Komputer Menerapkan (Studi Kasus: STMIK Budi Darma),” *Pros. Semin. Nas. Ris. Inf. Sci.*, vol. 1, no. September, hal. 822, 2019, doi: 10.30645/senaris.v1i0.89.
[26] F. Mahdi, Faisal, D. P. Indini, dan Mesran, “Penerapan Metode WASPAS dan ROC (Rank Order Centroid) dalam Pengangkatan Karyawan Kontrak,” *Bull. Comput. Sci. Res.*, vol. 3, no. 2, hal. 197–202, 2023, doi: 10.47065/bulletincsr.v3i2.232.
[27] R. W. P. Pamungkas dan F. T. Waruwu, “Analisis Sistem Pendukung Keputusan Penentuan Kasi Terbaik Menerapkan Metode OCRA dengan Pembobotan Rank Order Centroid (ROC),” *Build. Informatics, Technol. Sci.*, vol. 3, no. 3, hal. 393–399, 2021, doi: 10.47065/bits.v3i3.1100.
[28] F. Setiawan dan P. S. Ramadhan, “Penerapan Kombinasi Metode MOORA dengan Pembobotan Rank Order Centroid Dalam Penentuan Guru Terbaik,” *J. Media Inform. Budidarma*, vol. 6, hal. 222–228, 2022, doi: 10.30865/mib.v6i1.3374.
[29] E. W. Ambarsari, H. Rohayani, A. I. A. Lubis, dan R. M. F. Lubis, “Decision Support System for Determining the Best Coffee Shop Applying the OCRA Method using ROC Weighting,” *J. Comput. Informatics Res.*, vol. 3, no. 1, hal. 126–132, 2023, doi: DOI 10.47065/comforch.v3i1.970.
[30] M. A. Abdullah dan R. T. Aldisa, “Penerapan Metode MABAC pada Penentuan Coffee Shop Terbaik,” *J. Ris. Komputer)*, vol. 10, no. 1, hal. 338–347, 2023, doi: 10.30865/jurikom.v10i1.5820.
[31] B. Setiawan, B. Selviana, dan A. S. Y. Irawan, “Mengoptimalkan Fungsi Payment Gateway Midtrans pada Website Coffee Shop Melalui Penggunaan Metode Prototype pada Proses Pengembangan,” *JRST (Jurnal Ris. Sains dan Teknol.*, vol. 7, no. 2, hal. 219–228, 2023, doi: 10.30595/jrst.v7i2.16964.
[32] A. Y. Chandra, D. Kurniawan, dan R. Musa, “Perancangan Chatbot Menggunakan Dialogflow Natural Language Processing (Studi Kasus: Sistem Pemesanan pada Coffee Shop),” *J. Media Inform. Budidarma*, vol. 4, no. 1, hal. 208, 2020, doi: 10.30865/mib.v4i1.1505.