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Decision Support System Using the Analytical Hierarchy Process (AHP) Method for Evaluating Marketing Strategy Effectiveness (Case Study: Gressoy Indonesia)

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Abstract — Gressoy Indonesia is a micro business in the food and beverage sector that faces challenges in increasing sales of its products. To assist decision-making in choosing the most effective marketing strategy, this research develops a decision support system using the Analytical Hierarchy Process (AHP) method. This method is used to develop a hierarchical structure based on objectives, evaluation criteria, and marketing strategy alternatives, then weighted through pairwise comparisons. Data was obtained through observation, interviews, and questionnaires with Gressoy management. There are four marketing strategies evaluated, namely promotion through social media, cooperation with partnerships, providing seasonal discounts, and participating in an event. The results of data processing show that the strategy of cooperation with partnerships is the top priority to be evaluated with the highest weighted value of 0.436 ıer strategies in order are participating in an event (0.270), giving seasonal discounts (0.187), and promotion ıhrough social media (0.106). The criteria that most influenced the decision was ease of implementation, followed by effectiveness in increasing sales, market reach, and cost. These results suggest that strategies that are easy to implement and have a direct impact on sales need to be the main concern. These findings are expected to help MSMEs in developing more effective and targeted marketing strategies to increase product sales

Keywords – AHP, Decision Support System, Evaluation, Marketing Strategy, MSMEs

I. INTRODUCTION

MSMEs (Micro, Small, and Medium Enterprises) are one of the important pillars of the Indonesian economy. Based on data from the Ministry of Cooperatives and SMEs in 2021, the number of MSMEs in Indonesia reached 64.2 million and contributed 61.07% to the GDP, or 8,573.89 trillion rupiah [1]. MSMEs also absorb 97% of the existing workforce and account for up to 60.4% of total investment [2], including in the food and beverage (F&B) sector.

MSMEs play a crucial role in driving inclusive economic growth in Indonesia by providing employment opportunities and increasing local community income [3]. There are approximately 6.4 million food and beverage businesses in Indonesia in 2023 [4], which shows the significant role of MSMEs in this sector as a major contributor to the national economy. Government support through MSME coaching and training programs has been proven to improve the ability to develop and implement effective marketing strategies, thereby strengthening business competitiveness and sustainability amid increasingly fierce market competition [5]. Especially for MSMEs such as Gressoy Indonesia, the development and implementation of appropriate marketing strategies are key factors in attracting customers and expanding market share at the local and national levels [6].

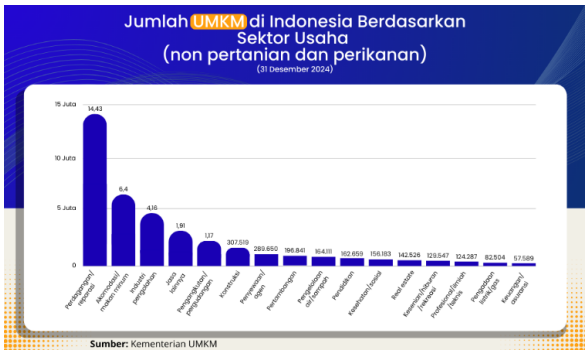

Fig. 1. Number of MSMEs in Indonesia by Business Sector

Source: Kadin Indonesia, 2025

One of the MSMEs engaged in this field is Gressoy Indonesia, a local F&B business located in Purwokerto, Central Java. Gressoy Indonesia focuses on providing creative and contemporary soy-based processed products, targeting the youth and urban family market segments. In the face of increasingly fierce business competition, Gressoy Indonesia is required to be able to formulate and implement the right marketing strategies to maintain its existence and increase its competitiveness in both the local and digital markets.

The implementation of effective marketing strategies is crucial to the success of MSMEs, especially in attracting consumers and building customer loyalty [7]. However, Gressoy Indonesia faces challenges in sales levels, requiring an evaluation of the effectiveness of the marketing strategies that have been used, such as promotion through social media, partnerships, seasonal discounts, and participation in events. These strategies need to be evaluated systematically to determine which ones have the greatest impact on increasing product sales.

To solve this problem, a Decision Support System (DSS) is needed to help management assess and select the best marketing strategy based on several standards [8]. Decision Support System (DSS) refers to any computer application that enhances the ability of a person or group to make decisions, such as interactive computer-based systems or subsystems used to assist decision makers in identifying and solving problems, completing tasks related to the decision-making process, and making decisions [9]. In addition, decision support systems also refer to an academic field of research that includes the design and analysis of information systems [10]. In general, decision support systems are a class of computerized information systems that assist in the decision-making process.

The Analytical Hierarchy Process (AHP) is one of the effective approaches in DSS for handling decision making that can assist management in evaluating the effectiveness of marketing strategies based on relevant criteria [11]. AHP is a multi-criteria decision-making method that creates a hierarchy of complex problems with many factors or criteria, taking into account various aspects to determine weights or priorities [12]. Therefore, management can develop a decision hierarchy consisting of main objectives, evaluation criteria such as costs incurred, market reach, effectiveness in increasing sales, and ease of implementation, as well as alternative marketing strategies.

This study aims to evaluate the effectiveness of the marketing strategy of Gressoy Indonesia MSMEs in Purwokerto by using a Decision Support System (DSS) based on the Analytical Hierarchy Process (AHP) to facilitate decision making. This study is expected to assist MSMEs in making more objective and focused decisions, as well as providing practical contributions and managerial implications for the development of MSME marketing in the F&B sector in the region.

Based on previous studies, there are various decision support system approaches with diverse methods. Research by Akbar and Aulawi (2021) in designing a sports jersey marketing strategy used the SWOT and AHP methods with criteria using an e-commerce sales system [13]. Furthermore, Dewi et al. (2024) used the ELECTRE method in determining the selection of computer laboratory assistants based on GPA and other criteria [14]. Gulo et al. (2024) applied the Analytical Network Process (ANP) method in determining the feasibility of accepting cultivated land assistance in Dusun III-A Selambo, Amplas Village, using income criteria [15]. In the same year, Noviana et al. (2024) used the Preference Selection Index (PSI) method for deciding on the selection of used cars based on document completeness criteria [16]. Then, Husnaini (2025) used the AHP-TOPSIS method to measure the welfare level of coastal communities in Pidie Regency with one of the criteria being monthly income [17]. Unlike these studies, this study uses the Analytical Hierarchy Process (AHP) method in the context of evaluating the effectiveness of marketing strategies, with criteria obtained from literature studies, interviews, and questionnaires with Gressoy Indonesia management.

With this approach, it is hoped that the evaluation results can provide appropriate and applicable recommendations for the future development of Gressoy Indonesia's MSME marketing strategy.

II. RESEARCH METHOD

The stages of activities carried out in this study are shown in Figure 2.

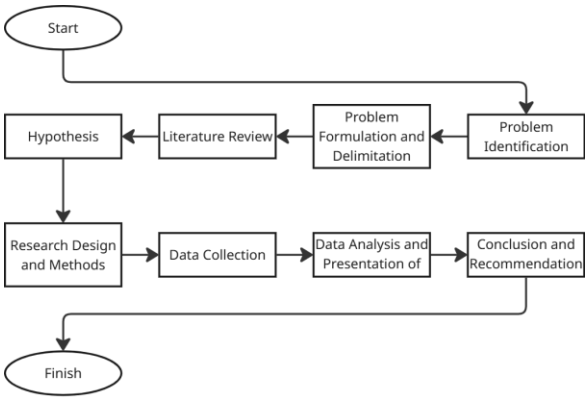

Fig. 2. Research Stages

Michael S. Scoot Morton introduced the term decision management for decision support systems (DSS) in the 1970s. DSSs are designed to assist in all stages of decision making, from identifying problems, selecting relevant data, and determining the methods used in the decision-making process, to evaluating

alternative options [18]. DSSs serve as tools that accelerate the decision-making process in an objective and structured manner, thereby helping to reduce bias and human error in selecting the best option [19].

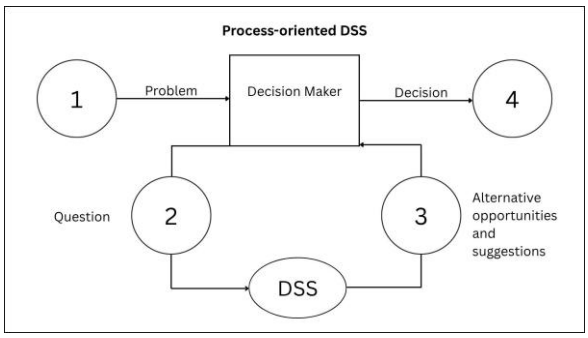

Fig. 3. Decision Support System (DSS) Process

This study uses the Analytical Hierarchy Process (AHP) because this method applies an assessment process based on several criteria that are compared in pairs to produce the best alternative [20]. The principle of AHP is to simplify various problems that arise and are something that must be chosen [21]. The stages of activities carried out to evaluate the effectiveness of the marketing strategy used by Gressoy Indonesia MSMEs using the Analytical Hierarchy Process method are shown in Figure 4.

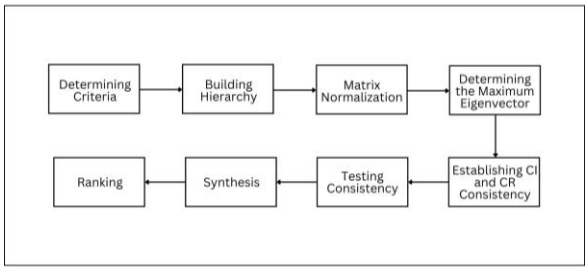

Fig. 4. Stages of Activities Using the AHP Method

Table 1 shows the values and definitions of qualitative opinions from the comparison scale, which is the best scale for expressing opinions when faced with many opinions.

Table 1. Pair Comparison Rating Scale

Intensity of Interest	Description
1	Both elements are equally important;
3	One element is slightly more important than the other;
5	One element is more important than the other;
7	One element is clearly more important than the others;
9	One element is absolutely more important than the other elements;
2,4,6,8	Values between two adjacent consideration values;
Opposite	If activity i receives one point compared to activity j, then i has the opposite value compared to i;

After the criteria and alternatives comparison step is complete, the next step is Synthesis of Priority, which involves pairwise comparisons of criteria and alternatives. The changes are arranged into a matrix to calculate priorities and weights. Logical Consistency will be generated from the calculation results. The formula for calculating the Consistency Index (CI) is CI = (λ max-n)/n, where n is the number of elements, which can be used to determine how good the consistency is. Next, to calculate the Consistency Ratio (CR) using the formula: CR = CI/RC, where RC is Random Consistency with a rating scale from 1 to 9, and the opposite is shown in Table 2. If the value is more than 10%, then the judgment data assessment must be corrected. However, the calculation results can be considered correct if the consistency ratio (CI/CR) is less than or equal to 0.1.

Table 2. List Random Index (RI)

Matrix Size	RI Value
1 and 2	0,000
3	0,580
4	0,900
5	1,120
6	1,240
7	1,320
8	1,410
9	1,450
10	1,490

III. RESULT

From the observations and interviews conducted, data was obtained on the marketing strategies used by Gressoy Indonesia MSMEs. The effectiveness of these marketing strategies will be evaluated with the aim of increasing product sales. The marketing strategies of Gressoy Indonesia MSMEs can be seen in Table 3.

Table 3. Marketing Strategy of Gressoy Indonesia MSME

No.	Marketing Strategy
1	Promotion Through Social Media (PS)
2	Cooperation with Partnerships (CP)
3	Seasonal Discounts (SD)
4	Participate in an Event (PE)

Furthermore, the following criteria are also based on interviews conducted with the person in charge of Gressoy Indonesia's MSMEs. Then, the Analytical Hierarchy Process (AHP) stage can be carried out by building a hierarchy by determining the objectives at the top level, which are the overall system targets as shown in Figure 5.

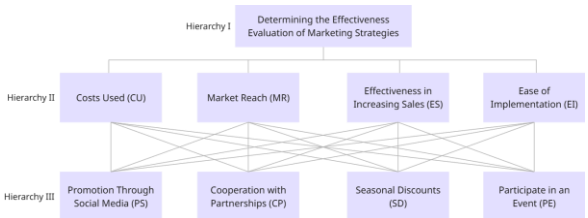

Fig. 5. Hierarchy for Determining the Effectiveness Evaluation of Marketing Strategies

The calculations in Table 4 begin with compiling a pairwise comparison matrix between criteria, namely CU, MR, ES, and EI. The values in the table show the relative importance of one criterion to another, based on the AHP comparison scale. The values in the pairwise comparison matrix are determined from the questionnaire results. The value in row 1 MR and column 2 CU means that MR is considered twice as important as CU. Conversely, the value 0.5 in row 2 CU and column 1 MR indicates that CU is considered much less important than MR (because 1/2 = 0.5). After all comparison values are entered, the sum of each column is calculated for use in the next normalization stage.

Table 4. Pairwise Comparison Criteria Matrix

Criteria	CU	MR	ES	EI
CU	1	0,5	0,333333	0,2
MR	2	1	0,5	0,25
ES	3	2	1	0,5
EI	5	4	2	1
Total	**11**	**7,5**	**3,833333**	**2,95**

The criterion normalization process is carried out by creating a pairwise comparison matrix for each criterion based on the AHP scale obtained from the previous step. Then, sum each column to obtain the total for each, followed by dividing each value in the matrix by the column total, then calculating the average of the normalization results for each row to produce the priority weight of each criterion (eigenvector). In this study, there are four criteria shown in Table 5.

Table 5. Normalization Matrix Criteria

Criteria	CU	MR	ES	EI	Total	Weight (EV)
CU	0,091	0,067	0,087	0,103	0,347	0,087
MR	0,182	0,133	0,130	0,128	0,574	0,143
ES	0,273	0,267	0,261	0,256	1,057	0,264
EI	0,455	0,533	0,522	0,513	2,022	0,506

This is followed by normalizing the alternative matrix for each criterion using the AHP method to obtain the priority value of each alternative. In the table, each value represents the extent to which the alternatives (PS, CP, SD, PE) meet certain criteria (CU, MR, ES, and EI). These values are obtained through a normalization process, so that the total is 1 in each column. In the next step, these results will be used to calculate the final score of each alternative based on the weight of each criterion.

Table 6. Normalization Matrix Alternative Criteria

Criteria/ Alternative	Priority Weight Value (EigenVector)			
	CU	***MR***	***ES***	***EI***
PS	0,070	0,159	0,072	0,104
CP	0,495	0,263	0,531	0,426
SD	0,157	0,077	0,153	0,328
PE	0,278	0,501	0,244	0,141
Total	**1**	**1**	**1**	**1**

In the AHP method, the calculation of λ max (maximum lambda) is very important because it is used to measure the Consistency Index (CI) level in the pairwise comparison matrix using equation 1:

$$\boldsymbol{\lambda}\ \mathbf{Max} = \Sigma\ (\text{EigenVector} \times \text{Total of Columns})$$

$$\boldsymbol{\lambda}\ \mathbf{Max} = 0{,}087 \times 11$$

This calculation is performed up to the priority value and the KI criteria matrix value. Then, λ max is obtained as shown in Table 7.

Table 7. Maximum Weight (EV) of Criteria

Criteria	EV * Total of Matrix
Costs Used (CU)	0,955
Market Reach (MR)	1,076
Effectiveness in Increasing Sales (ES)	1,013
Ease of Implementation (EI)	0,986

The same calculation was performed for alternatives for each criterion, resulting in the maximum λ value for alternatives for criteria as shown in Table 8.

Table 8. Maximum Weight (EV) of Alternative Criteria

Alternative	CU	MR	ES	EI
Promotion Through Social Media (PS)	0,979	1,167	0,933	0,938
Cooperation with Partnerships (CP)	0,949	1,227	0,946	0,924
Seasonal Discounts (SD)	1,296	0,922	1,123	1,177
Participate in an Event (PE)	1,019	0,935	1,161	1,197
λ Maks	**4,242**	**4,251**	**4,164**	**4,236**

The next step is to determine the Consistency Index (CI) value from the maximum λ value using the following equation 2 formula:

$$\mathbf{CI} = (\lambda\, Max - n) \div (n - 1)$$
$$\mathbf{CI} = (4{,}029 - 4) \div (4 - 1)$$
$$\mathbf{CI} = (0{,}029) \div (3) = 0{,}010$$

Thus, the CI values obtained are as shown in Table 9 below:

Table 9. Consistency Index (CI)

Matrix	CI Value
1	0,010
2	0,081
3	0,084
4	0,055
5	0,079

The CI values obtained in Table 9 are then compared with the Random Index (RI) values. For a matrix size = 4 (as shown in Table 2), the Random Index (RI) value used is 0.900. If the CR value is < 10% (CR < 0.1), the consistency is acceptable.

To obtain the Consistency Ratio (CR) value, use the following equation 3:

$$\mathbf{CR} = \boldsymbol{CI} \div \boldsymbol{RI}$$
$$\mathbf{CR} = \mathbf{0,010} \div \mathbf{0,900}$$

The results of the calculation from the above equation show that the CR value is < 0.1, which means that the weighting results are acceptable with consistent filling, as shown in Table 10.

Table 10. Consistency Ratio (CR)

Matrix	CI Value	RI Value	CR Value
1	0,010	**0,900**	0,011
2	0,081		0,090
3	0,084		0,093
4	0,055		0,061
5	0,079		0,087

The synthesis or iteration process of the matrix is performed to determine the priority weights of the criteria and alternative criteria by multiplication (row x column). The process aims to ensure that the iteration process is performed sufficiently to achieve stability [22]. The iteration results can be seen in Table 11 and Table 12.

Table 11. Criteria Priority Weight

Second Iteration (X)	Third Iteration (Y)	Difference (X-Y)
0,086	0,086	0
0,143	0,143	0
0,264	0,264	0
0,507	0,507	0

The difference value of the normalization result is zero during the synthesis process, which means that iteration is no longer necessary. Each element of the criteria can be arranged as follows: CU = 0.086, MR = 0.143, ES = 0.264, and EI = 0.507. The results show that the ease of implementation criterion is the main factor influencing decisions in evaluating the effectiveness of the marketing strategy of Gressoy Indonesia MSMEs.

Table 12. Alternative Priority Weight

Marketing Strategy	CU Weight	MR Weight	ES Weight	EI Weight
Promotion Through Social Media (PS)	0,056	0,215	0,052	0,112
Cooperation with Partnerships (CP)	0,508	0,435	0,478	0,402
Seasonal Discounts (SD)	0,191	0,051	0,146	0,247
Participate in an Event (PE)	0,245	0,299	0,323	0,239

During the calculation process, the synthesis process produces priority weights for criteria and priority weights for alternatives relative to criteria. Therefore, the ranking process can be carried out using the following equation 4 formula:

Result = *criteria priority x alternative priority*

The table shows the final results calculation.

Table 13. Final Result Calculation

Marketing Strategy	CU	MR	ES	EI
Promotion Through Social Media (PS)	0,005	0,031	0,014	0,057
Cooperation with Partnerships (CP)	0,044	0,062	0,126	0,204
Seasonal Discounts (SD)	0,016	0,007	0,039	0,125
Participate in an Event (PE)	0,021	0,043	0,085	0,121

Based on the calculations generated from Table 13 above, rankings were obtained for marketing strategies whose effectiveness will be evaluated in increasing product sales, from the highest to the lowest values, as shown in Table 14.

Table 14. Decision Ranking

Rank	Marketing Strategy	CU	MR	ES	EI	Result
1	Cooperation with Partnerships (CP)	0,044	0,062	0,126	0,204	0,436
2	Participate in an Event (PE)	0,021	0,043	0,085	0,121	0,270
3	Seasonal Discounts (SD)	0,016	0,007	0,039	0,125	0,187
4	Promotion Through Social Media (PS)	0,005	0,031	0,014	0,057	0,106

IV. DISCUSSION

According to the findings of the Analytical Hierarchy Process (AHP) analysis, the strategy of cooperation with partnerships has the greatest final weight value (0.436), followed by event participation (0.270), seasonal discounts (0.187), and social media promotion (0.106). These findings suggest that the best marketing approach for boosting product sales at Gressoy Indonesia MSME is partnership cooperation.

The ease of implementation criterion, which had the highest weight value of 0.507 among all criteria, has a significant impact on the partnership collaboration strategy's dominance. According to this study, management gives priority to marketing tactics that are realistic, resource-efficient, and repeatable. Through cooperation with other companies or communities, partnerships enable MSMEs to increase their market reach and establish reputation without having to make substantial financial investments.

Conversely, tactics with lower priority weights include social media promotion and seasonal discounts. Despite their widespread adoption, these strategies might only have temporary effects on sales growth or come with increased operating costs. In a similar vein, participation in events ranks second, showing that direct engagement and exposure through events can strengthen brand awareness, although its effectiveness may depend on frequency and event relevance.

In order to improve brand visibility and product distribution, Gressoy Indonesia should concentrate on fortifying partnership collaborations, such as those with local community organizations, online marketplaces, or cafés, according to these conclusions from a managerial standpoint. In order to ensure long-term sustainability and ongoing engagement with the target market, digital marketing initiatives should also be used in conjunction with partnership tactics. Furthermore, the findings support the suitability of the AHP-based Decision Support System (DSS) for assessing the efficacy of marketing strategies in MSMEs. By facilitating systematic decision-making that takes into account a variety of factors, the AHP approach assists MSME managers in avoiding subjectivity and bias when choosing solutions.

The study does have several drawbacks, though. The findings cannot be applied to other F&B MSMEs because it only looks at one MSME and has a small number of criteria and options. To evaluate and enhance the results, future studies could think about using additional decision-making techniques as TOPSIS or the Analytic Network Process (ANP).

V. CONCLUSION

The Analytical Hierarchy Process (AHP) method of analysis reveals that, with a weight value of 0.507, Ease of Implementation is the most important criterion in assessing the efficacy of Gressoy Indonesia MSME's marketing strategy. This suggests that management places a high priority on marketing plans that are simple to implement and effectively use resources. According to the final ranking findings, the approach of cooperation with partnerships strategy received the highest overall weight value of 0.436. It was followed by event participation (0.270), seasonal discounts (0.187), and social media promotion (0.106). These findings demonstrate that partnership-based strategies are perceived as the most effective in increasing sales and business competitiveness in the MSME sector.

From a managerial standpoint, these results suggest that Gressoy Indonesia should concentrate on creating and enhancing collaborative partnerships with pertinent parties, including distributors, cafés, and online marketplaces, in order to increase market penetration and brand awareness. While supporting tactics like event participation and seasonal discounts can still be used, they should be implemented in conjunction with the partnership-based strategy for long-term viability.

To increase the accuracy and generalizability of the results, it is advised that future research incorporate more MSME cases, expand the evaluation criteria (such as innovation, customer satisfaction, or digital engagement), and contrast the AHP results with those of other multi-criteria decision-making techniques like ANP or TOPSIS.

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