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# Analysis of the Effect of Sales and Customer Satisfaction at Cafe Tentador on the Marketing Strategy Optimization Using Fuzzy Logic

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**Abstract – Business competition in the culinary industry has become increasingly intense, particularly in strategic areas such as Pangkajene District, Pangkep Regency. One of the cafes operating in this area is Tentador Cafe, which experienced sales fluctuations from 2020 to 2023 due to various factors, including the impact of the COVID-19 pandemic. In addition to sales performance, customer satisfaction plays a crucial role in sustaining business competitiveness. Therefore, this study aims to analyze the influence of sales performance and customer satisfaction on the optimization of marketing strategies at Tentador Cafe using the Fuzzy Logic approach. The analysis employed the Mamdani Fuzzy Logic method to evaluate the effectiveness of existing marketing strategies by considering sales and customer satisfaction variables. The results indicate that the current marketing strategy is at a moderate or fairly good level, with a defuzzification value of 0.57, suggesting that although the strategy has a positive impact on company performance, there remains significant potential for improvement and greater effectiveness.**

**Keywords: Sales, Satisfaction, Marketing, Fuzzy Logic, Tentador**



## I. Introduction

Recently, the business world has been developing rapidly [1]. This is marked by the increasing number of new companies and innovative ideas for business development, such as offering promotions and seeking to increase profits in order to ensure continuous growth. These efforts also aim to provide a sense of satisfaction for consumers engaging in purchases [2].

Marketing strategy is a critical aspect to consider, as it encompasses the processes of analysis, planning, implementation, and control aimed at achieving the company's long-term objectives [3]. Planning in this context includes all marketing-related activities such as production, pricing, promotion, and distribution [4]. According to (Mubarok, 2017), a marketing strategy is a set of goals and objectives, guidelines, and rules that define the direction, reference, and allocation of marketing activities at each level, primarily as a company's response to dynamic environmental conditions and market competition [5]. Marketing itself can be defined as a comprehensive system of business activities aimed at planning, pricing, promoting, and distributing goods and services to meet consumer needs [6].

Based on the above facts, many companies are increasingly interested in entering the culinary business to meet this growing demand [7]. In addition to requiring relatively lower investment, the culinary sector also offers significant market potential [8]. This has become one of the driving factors behind the rapid growth of culinary tourism, which has increased by 14% annually (CNN, 2017). The intense competition among numerous business actors consequently demands their ability to adapt to the evolving business environment [9]

The development of Pangkajene District as the capital of Pangkajene dan Kepulauan Regency has brought about significant changes in the local business landscape. The most evident change is the increasing number of new businesses, particularly due to the district's strategic location. A strategic location is one of the key factors that greatly determines the success of a business [10]. This situation has encouraged investors to invest in local enterprises. As a result, the growing number of consumers visiting the area has led to a proliferation of culinary businesses, particularly cafes and restaurants.

Various restaurants and cafes are competing to create comfort and have pleasant experience for their customers [8]. One example is Cafe Tentador, located in the office area of Pangkajene District, which was established to enliven the area and serve as a comfortable space for creativity and building close relationships, with a particular focus on engaging

young people. This study was motivated by field observations showing fluctuations in sales data from 2020 to 2023 at this cafe. The following section presents the sales data of Cafe Tentador and Bistro:

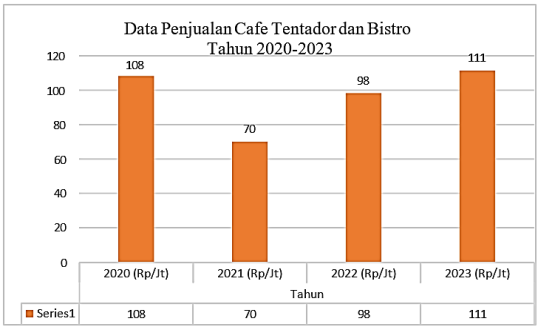


Figure 1. Sales Data of Cafe Tentador

Figure 1 illustrates that sales at Cafe Tentador experienced a decline in 2021.Nevertheless, subsequent years witnessed an uptick. This decline was due to the peak of the Covid-19 pandemic in 2021, during which work-from-home policies were implemented, significantly affecting the national economy. The Covid-19 pandemic had a substantial impact on culinary business operators. During this period, business owners were required to demonstrate a high degree of resourcefulness in order to maintain the financial health of their businesses and ensure their survival [11]

To ensure business sustainability, entrepreneurs must pay attention to consumer satisfaction, in addition to sales[12]. Customer satisfaction is essential for every company, particularly in the culinary industry, as it plays a vital role in daily business operations [13]. Today, many companies recognize the importance of customer satisfaction and develop strategies to enhance it [14]. A related study conducted by Sutrisno et al. (2022) highlights that customer satisfaction is a key factor in maintaining loyalty and increasing sales in the culinary industry [15]

With increasing competition, business owners are required not only to provide high-quality products but also to ensure that customers are satisfied with the services offered [16]. Hilal & Djatola, 2018 state that high-performing service are those which successfully address customer needs, thereby surpassing customer expectations [17]. However, it is not easy to measure customer satisfaction manually. Therefore many companies have begun to adopt technologies such as Fuzzy Logic to facilitate the decision-making process [18]. Fuzzy Logic is considered superior in this context because it does not merely calculate probabilities, as in conventional statistical methods, but instead models ambiguity and uncertainty inherent in human perceptions. At Tentador Cafe, the primary challenge lies not only in determining how many customers make purchases, but also in understanding why customers feel satisfied under specific conditions. Fuzzy Logic provides the flexibility to capture such subjective and vague factors, allowing decision-makers to translate customer perceptions into more adaptive and targeted marketing strategies. Based on the findings, several strategic insights are recommended, including enhancing customer satisfaction through satisfaction surveys, loyalty programs, and responsive customer service, as well as increasing sales through attractive promotions, collaborations with influencers, and menu innovation.

The Fuzzy Logic system is recognized as an effective method for managing communication and data variability, particularly in subjective assessments such as customer satisfaction [19]. According to a study by Albérico Travassos Rosário (2023), Fuzzy Logic can be utilized to optimize marketing strategies by processing sales data and customer feedback, thereby generating more accurate recommendations for business managers [20]. The implementation of this system enables entrepreneurs at Cafe Tentador in Pangkep to design more targeted marketing strategies based on an analysis of customer needs and preferences [21].

Several researchers have previously conducted studies on the factors influencing sales and customer satisfaction. However, as stated in the research problem, there are still notable differences or gaps in these studies. One example is the study of *Analis Kepuasan Konsumen Dengan Metode Fuzzy – Servqual Dan Quality Function Deployment* (Case Study Café Right Time Malang) by Bayu Yushila et al., 2017. The results of the analysis using the fuzzy Servqual method indicated that the main priority attributes influencing customer satisfaction at Café Right Time were fast and accurate when serving of food and beverages (-0.96), clarity and fairness of the prices offered (-0.94), and consistent portion sizes of food and beverages (-0.77) [22].

In addition, there is also a study by Ikhwan et al., 2019, *Analisis Tingkat Kepuasan Pelanggan Menggunakan Fuzzy Mamdani* (Case Study: Busrain Bakery). The results obtained from the provided inputs revealed a food taste score of 8 within the domain [6 10]. It indicates that the food taste variable is categorized as good. The service quality input receiver a score of 7 in the domain [3 7], meaning that the service quality variable is deemed to be fairly good. The resultant output, as indicated by these inputs, demonstrated a customer satisfaction level of 85.96%, indicating that customers were satisfied with both the taste of the food and the quality of service provided by Busrain Bakery [23].

There is another similar study, entitled *Analisis Kepuasan Konsumen Berdasarkan Pelayan Dan Kualitas Makanan Menggunakan MetodFuzzy Mamdani* (Case Study: Cafe Talasi) by Ama et al., 2023. The result found that food taste input had a score of 4 within the domain [4 5], indicating that the food taste variable was categorized as good. The service quality input received a score of 3 within the domain [3 4], meaning that the service quality variable was considered as fairly good. The resultant output, as indicated by these inputs, demonstrated a customer

satisfaction level of 4.93%, indicating that customers were satisfied with both the food taste and the service quality provided by Cafe Talasi [24].

## II. METHOD AND DESIGN

This chapter discusses data used in the study and the procedures for testing data quality.

### A. Data

This study used two types of data: sales data and questionnaire data. The sales data used were data from January to December 2024, while the questionnaire was distributed online to residents of Pangkajene District regarding Cafe Tentador, resulting in 100 responses. Both datasets were compiled in Microsoft Excel to be analyzed using fuzzy logic.

The sales data used in this analysis consists of transaction records from Cafe Tentador during the period of January to December 2024. This dataset captures the total sales from each individual transaction, making it possible to analyze sales trends over the course of a full year. In total, 240 transaction records were analyzed to understand sales patterns, identify the best-performing months, and determine the factors that may influence sales performance, as presented in Table 1 below:

Table 1. Sales Data

| No. | Month | Product Name | Price | Sold | Total Sale |
|---|---|---|---|---|---|
| 1 | January | Matcha Greentea | 23.000 | 29 | 667.000 |
| 2 | January | Brown Milk Tea | 22.000 | 31 | 682.000 |
| 3 | January | Ice Thai Tea | 18.000 | 28 | 504.000 |
| 4 | January | Ice Lemon Tea | 18.000 | 30 | 540.000 |
| 5 | January | Fresh Lime Tea | 18.000 | 28 | 504.000 |
| . | . | . | . | . | . |
| . | . | . | . | . | . |
| . | . | . | . | . | . |
| 236 | December | Kwetiau Goreng | 30.000 | 22 | 660.000 |
| 237 | December | Nasi Ayam Betutu | 34.000 | 23 | 782.000 |
| 238 | December | Sate Taichan | 27.000 | 22 | 594.000 |
| 239 | December | Spaghetti Carbonara | 25.000 | 21 | 525.000 |
| 240 | December | Ayam Geprek | 25.000 | 22 | 550.000 |

Customer satisfaction data were collected through an online questionnaire distributed to visitors of Tentador Cafe. The questionnaire was designed to measure satisfaction levels across various service aspects, using indicators X1 (marketing strategy), X2 (sales), and X3 (customer satisfaction), comprising a total of 24 items. Responses were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A total of 100 respondents participated in the survey and provided feedback for the study. In addition, sales data were analyzed to support the evaluation of marketing strategy performance.

Table 2. Questionnaire Data

| No. | Name |
|---|---|
| 1 | Salsabila Nur |
| 2 | Cicah |
| 3 | Hafizah Khayyirah |
| 4 | Sherina |
| 5 | Moza ghea |
| - | - |
| - | - |
| 95 | Rifki |
| 96 | Afnan |
| 97 | Rezky |
| 98 | Alfred Victor Putra |
| 99 | A. Azhifa Anatasyah |
| 100 | Muhammad Andey Permana |

### B. Data Test

Data quality testing was conducted through validity and reliability tests to determine whether the questionnaire data used in this study was valid and reliable. Data used in the data quality test was questionnaire. The data quality tests were performed using Python programming language in Google Colab.

The data used for the validity test consisted of questionnaire responses from 100 respondents. The validity test was conducted by performing a significance test, comparing the value of r-count to r-table. If r-count is higher than r-table, the data is considered valid. The determination of r-table value can be found in Table 3 below

Table 3. R-Table

| df=(n-2) | Significance Level 5% |
|---|---|
| 97 | 0.1975 |
| 98 | 0.1966 |
| 99 | 0.1956 |
| 100 | 0.1946 |

Based on Table 3 above, the data validation process was carried out by comparing *r*-count value of the variables with the *r*-table value at a 5% significance level. The 5% significance level is commonly used in research. Degrees of freedom (*df*) are calculated using the formula df = (n-2) = 100 – 2 = 98. Therefore, the *r*-table value used is 0.1966 at a 5% significance level. The results can be seen in Table 4 below:

Table 4, Validity Test

| Variable | Pert | r-count | r-table | p-value | Desc |
|---|---|---|---|---|---|
| Marketing Strategy (X1) | A1 | 0.846 | 0.1966 | 0.000 | Valid |
| | A2 | 0.852 | 0.1966 | 0.000 | Valid |
| | A3 | 0.890 | 0.1966 | 0.000 | Valid |
| | A4 | 0.876 | 0.1966 | 0.000 | Valid |
| | A5 | 0.783 | 0.1966 | 0.000 | Valid |
| | A6 | 0.903 | 0.1966 | 0.000 | Valid |
| | A7 | 0.878 | 0.1966 | 0.000 | Valid |
| | A8 | 0.859 | 0.1966 | 0.000 | Valid |
| | A9 | 0.873 | 0.1966 | 0.000 | Valid |
| Sales (X2) | B1 | 0.882 | 0.1966 | 0.000 | Valid |
| | B2 | 0.849 | 0.1966 | 0.000 | Valid |
| | B3 | 0.931 | 0.1966 | 0.000 | Valid |
| | B4 | 0.898 | 0.1966 | 0.000 | Valid |
| | B5 | 0.920 | 0.1966 | 0.000 | Valid |
| | B6 | 0.873 | 0.1966 | 0.000 | Valid |
| Customer Satisfaction (X3) | C1 | 0.885 | 0.1966 | 0.000 | Valid |
| | C2 | 0.882 | 0.1966 | 0.000 | Valid |
| | C3 | 0.880 | 0.1966 | 0.000 | Valid |
| | C4 | 0.856 | 0.1966 | 0.000 | Valid |
| | C5 | 0.888 | 0.1966 | 0.000 | Valid |
| | C6 | 0.899 | 0.1966 | 0.000 | Valid |
| | C7 | 0.908 | 0.1966 | 0.000 | Valid |
| | C8 | 0.835 | 0.1966 | 0.000 | Valid |
| | C9 | 0.893 | 0.1966 | 0.000 | Valid |

Based on Table 4 above, X1 to X3 represent the variables used in this study.

X1 = Marketing Strategy, which consists of 9 question items A1, A2, A3, A4, A5, A6, A7, A8, A9

X2 = Sales, which consists of 6 question items B1, B2, B3, B4, B5, B6,

X3 = Customer Satisfaction, which consists of 9 question items C1, C2, C3, C4, C5, C6, C7, C8, C9

Thus, the total number of questionnaire items is 24.

Based on the results of the validity test using 100 respondents, it was found that each questionnaire item had *r*-count value that is higher than the *r*-table value (0.1966), indicating that all items are **valid**.

The reliability test was conducted to determine the reability of the data. A minimum threshold of 0.6 was used, based on Cronbach's Alpha. Reliability results must exceed 0.6; otherwise, the data is considered unreliable and cannot be used. The results of the reliability test, conducted using Python programming language in Google Colab, are presented in Table 5 below:

Table 5. Reliability Test

| Variable | *Cronbach's Alpha* | Description |
|---|---|---|
| Marketing Strategy (X1) | 0.957 | Reliable |
| Sales (X2) | 0.948 | Reliable |
| Customer Satisfaction (X3) | 0.964 | Reliable |

Based on Table 5, it can be seen that the Cronbach's Alpha values are 0.957 for variable X1, 0.948 for X2, and 0.964 for X3, meaning all of which are higher than the minimum threshold of 0.6. Therefore, it can be concluded that the data used in this study is **reliable**.

## III. RESULTS AND DISCUSSION

### A. Fuzzy Logic

The data obtained in this study was processed using the Mamdani fuzzy logic method in Python to produce output. The process involved determining the fuzzy sets, fuzzification, rule formation, inference, and defuzzification.

Table 6. Input and Output Variable

| Input Variable | Output Variable |
|---|---|
| Sales | Marketing Strategy |
| Satisfaction | |

The input variables used in this study are sales (taken from the dataset column "total sales") and customer satisfaction (taken from the dataset column "satisfaction"). The output variable is marketing strategy, representing the expected result of this study for Cafe Tentador.

Table 7. Variable and Fuzzy Set

| Variable | Sub-variable | Set | Domain | Universe of discourse |
|---|---|---|---|---|
| Input | Sales | Low | [400 - 500] | [400 - 900] |
| | | Medium | [500 -700] | |
| | | High | [700 - 900] | |
| | Satisfaction | Not Satisfied | [49.5 -85.5] | [49,5 – 120.0] |
| | | Satisfied | [70 -109.5] | |
| | | Very Satisfied | [96.0 -120.0] | |
| Output | Marketing Strategy | Bad | [0 - 0,25] | [0 – 1.0] |
| | | Fairly Good | [0.2 – 0.8] | |
| | | Good | [0.6 – 1.0] | |

Based on the previously defined variables, the following step was to determine the membership

functions for each variable and calculate the membership values (or degrees of membership) according to the predefined membership functions.

a. Sales

The sales variable (independent) consists of three fuzzy set: low, medium, and high.

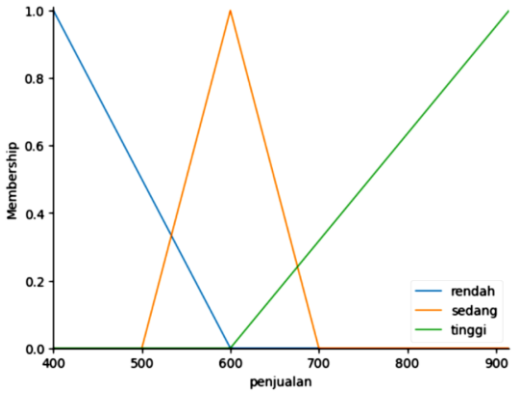


Figure 2. Sales Variable

Based on figure above, the degree of membership for the sales variable can be summarized as follows:

Data range: 400 – 915
Fuzzy set: Low, Medium, High
The membership function for the sales variable is defined as follows:

Formula: $\mu(x)=\frac{x-b}{a-b}$, for $b \leq x \leq a$

Fuzzy set Low:

$$\mu_{low}(600) = \frac{600-400}{600-400} = 0$$

Fuzzy set Medium:

$$\mu_{medium}(600) = \frac{600-500}{700-600} = 0{,}5$$

Fuzzy set High:

$$\mu_{high}(600) = \frac{600-600}{915-600} = 0$$

b. Satisfaction

Satisfaction variable (Independent) consists of three sets: Not Satisfied, Satisfied, and Very Satisfied.

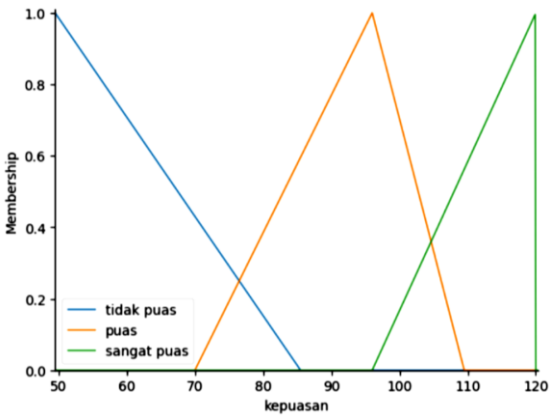


Figure 3. Satisfaction Variable

Based on figure above, the degree of membership for the satisfaction variable can be summarized as follows:

Data range: 49,5 – 120
Fuzzy set: Not satisfied, Satisfied, Very satisfied
The membership function for the satisfaction variable is defined as follows:

Formula: $\mu(x)=\frac{x-b}{a-b}$, for $b \leq x \leq a$

Fuzzy set Not Satisfied:

$$\mu_{not\ satisfied}(96) = \frac{96-49.5}{85.5-49.5} = 0$$

Fuzzy set Satisfied:

$$\mu_{satisfied}(96) = \frac{96-70}{109.5-70} = 0{,}65$$

Fuzzy set Very Satisfied:

$$\mu_{very\ satisfied}(96) = \frac{120-96}{120-96} = 1$$

c. Marketing Strategy

Marketing strategy variable (Independent) consists of three sets: bad, fairly good, good.

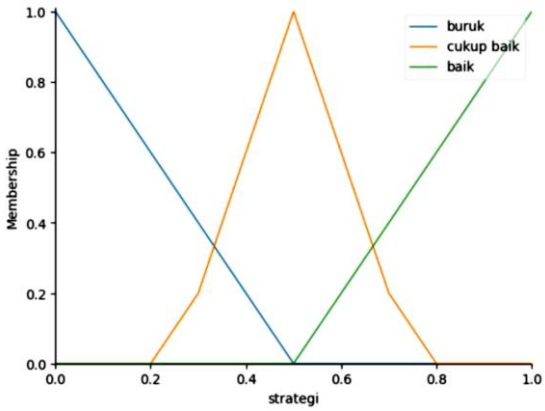


Figure 4. Marketing Strategy Variable

Data range: 0 - 1
Fuzzy set: Bad, Fairly Good, Good
The membership function for the marketing strategy variable is defined as follows:

Formula: $\mu(x)=\frac{x-b}{a-b}$, for $b \leq x \leq a$

Fuzzy set Bad:

$$\mu_{bad}(0.5) = \frac{0.5-0}{0.5-0} = 0$$

Fuzzy set Fairly Good:

$$\mu_{fairly\ good}(0.5) = 0{,}65$$

Fuzzy set Good:

$$\mu_{good}(0.5) = \frac{1-0.5}{1-0.5} = 1$$

d. Fuzzy Logic Rules

Based on the available data, the following rules were established, where X1 = Sales, X2 = Satisfaction, and Y = Marketing Strategy.

[R1] If (X1 is low) and (X2 is not satisfied), Then (Y is bad)

[R2] If (X1 is low) and (X2 is satisfied), Then (Y is fairly good)

[R3] If (X1 is low) and (X2 is very satisfied), Then (Y is good)

[R4] If (X1 is medium) and (X2 is not satisfied), Then (Y is fairly good)

[R5] If (X1 is medium) and (X2 is satisfied), Then (Y is fairly good)

[R6] If (X1 is medium) and (X2 is very satisfied), Then (Y is good)

[R7] If (X1 is high) and (X2 is not satisfied), Then (Y is fairly good)

[R8] If (X1 is high) and (X2 is satisfied), Then (Y is good)

[R9] If (X1 is high) and (X2 is very satisfied), Then (Y is good)

e. Rule composition, using the minimum function

Predicate1 = μLow ∩ μNot Satisfied
= min[0 : 0]
= min[0]

Predicate2 = μLow ∩ μSatisfied
= min[0 : 0.65]
= min[0]

Predicate3 = μLow ∩ μVery Satisfied
= min[0 : 1]
= min[0]

Predicate4 = μMedium ∩ μ μNot Satisfied
= min[0.5 : 0]
= min[0]

Predicate5 = μMedium ∩ μSatisfied
= min[0.5 : 0.65]
= min[0,5]

Predicate6 = μLow ∩ μVery Satisfied
= min[0.5 : 1]
= min[0.5]

Predicate7 = μHigh ∩ μ μNot Satisfied
= min[0 : 0]
= min[0]

Predicate8 = μHigh ∩ μSatisfied
= min[0 : 0.65]
= min[0]

Predicate9 = μHigh ∩ μVery Satisfied
= min[1 : 0] 50

f. Defuzzification, Calculating crips value by CENTROID (*Center of Area)* method
Representative value:

Bad = 0

Fairly Good = 0.5

Good = 0.5

Midpoint of category:

Bad = 0.2

Fairly Good = 0.43

Good = 0.72

Centroid calculation:

$$Y^* = \frac{\sum(\mu i \ x \ yi)}{\sum \mu i}$$

$$Y^* = \frac{(0) + (0.5 \ x \ 0.43) + (0.50 \ x \ 0.72)}{1}$$

$$= \frac{0.215+0.36}{1}$$

$$= \frac{0.575}{1}$$

$$= 0.57$$

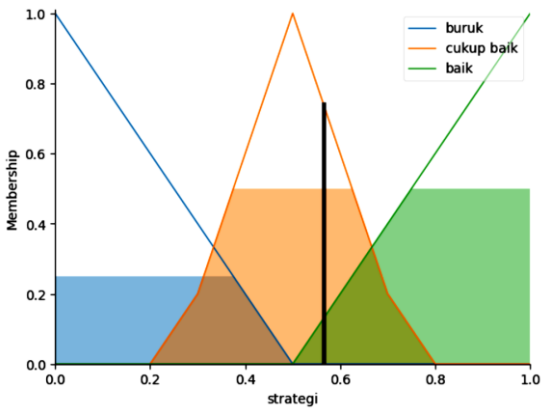


Figure 5. Result

Based on the defuzzification result of **0.57**, it can be concluded that according to the developed fuzzy logic model, the current level of marketing strategy effectiveness or profitability is at a moderate level. This value indicates that the ongoing marketing strategy is reasonably effective, but there is still a room for improvement.

Thus, the following recommendations and insight can be provided for Cafe Tentador:

a. Improving Customer Satisfaction
   1. Conduct regular surveys to identify aspects of service and product quality that need improvement.
   2. Implement loyalty program to make loyal customers feel valued.

3. Provide prompt responses to customer complaints or feedback in a professional manner.

b. Increasing Sales
   1. Develop attractive promotions that are relevant to the target market.
   2. Collaborate with local influencers to expand market reach.
   3. Introduce new menu items or interesting variations to keep offering fresh and appealing.

## IV. CONCLUSION

The level of marketing strategy effectiveness is 0.57, based on sales and customer satisfaction data from January to December. This indicates that the current marketing strategy is at a moderate level of effectiveness. Although the strategy has had a positive impact on business performance, there is a room for improvement and enhancement. The defuzzification result not reaching the optimal level (1.0) suggests that there is still space for the development of marketing strategies. Therefore, the company is advised to further evaluate the components of its current strategy, including product adjustments, choice of marketing media, and target audience alignment, in order to increase overall effectiveness. Recommended insights include increasing customer satisfaction through regular satisfaction surveys, implementing loyalty programs, and providing fast responses to customer complaints. To boost sales, businesses are encouraged to apply engaging promotional strategies, collaborate with local influencers, and develop more innovative products or menu options.

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