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Utilization of IT Business Management for Marketing Development using the Analytical Hierarchy Process Method

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Abstract

Marketing development is an important factor in a business that must be considered to increase market share. Choosing the right marketing strategy greatly influences the smooth running of sales. This research aims to determine a decision on the right marketing method so that it can be implemented by the Rozi bicycle shop in expanding its market share. The marketing strategy for the Rozi bicycle shop is determined based on four criteria, namely organization, product, place and distribution channels. These four criteria are analyzed and processed using the *Analytical Hierarchy Process* (AHP) method to obtain the right marketing decision to implement. method *Analytical Hierarchy Process* (AHP) is a multi-criteria decision method for solving complex or complicated problems, in an unstructured citation into parts (variables) which are then formed into a functional hierarchy or structured network. The results of calculations using the AHP method show that Strategy A (Technological Innovation) gets the highest value, namely 0.46984 . The results obtained from this research are a decision-making system designed using the AHP method and the application of IT business management in developing the store's marketing.

Keywords: IT Business Management , Analytical Hierarchy Process Method, Multicriteria, System.

1. Introduction

The development of the digital economy in Indonesia is experiencing changes along with changes in people's behavior, 49.6 % of consumers search for product information online before making a purchase (Alvara Research in Fuadi et al., 2021). This is an opportunity for MSMEs to expand market access and a challenge to be able to survive in the era of digitalization. Micro businesses have an important role in the economy, so collaboration is needed to help digitize the economy. According to Kominfo in Fuadi et al., (2021), the number of MSMEs in Indonesia is 59.2 million, of which 3.79 million or 8% have gone digital. The function of using technology to make every transaction easier is less utilized by MSMEs [1].

At the beginning of 2020, the Covid-19 outbreak which occurred globally almost throughout the world, including in Indonesia, has triggered negative sentiment towards various business lines, especially MSME businesses. The negative impact of the Covid-19 outbreak is hampering the growth of MSME businesses, where the movement of MSME businesses that require showrooms or promotions is hampered by the Large-Scale Social Restrictions (PSBB) movement which is considered to be able to accelerate the response and prevention of the increasingly widespread spread of Covid-19 in Indonesia. Apart from that, one of the indicators of the success of a region or region is from an economic perspective, then economic growth will be seen from the increasing number of entrepreneurs who initially started at the micro and small business level and continue to develop into large businesses. Due to Covid-19, MSMEs are the sector that has suffered the most, stating that around 96% of MSMEs have experienced a negative impact on their business and 75% of them have experienced a decline in product sales. The main problem faced by MSMEs is none other than the significant decline in demand from the public or consumers [2].

Marketing has an organizational function and a set of processes for creating, communicating, and delivering value to customers and managing customer relationships in ways that benefit the organization and its shareholders. In this modern era, with increasingly tight competition, businesses must have a strategy in meeting consumer needs to be able to compete in marketing their products. Companies must be able to design the right strategy in marketing their products. Implementing the right marketing strategy can influence potential consumers to make purchasing decisions [3] [4].

To find out, the AHP (*Analytical Hierarchy Process*) method is used. The AHP method is used for decision making from various existing decisions. The AHP method uses pairwise comparisons, calculates weighting factors and produces relative priorities among existing alternatives [5]. AHP is a practical approach to solving complex decision problems that involve comparing alternatives. AHP also allows

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decision making to present hierarchical relationships between factors, attributes, characteristics or alternatives in the decision making environment [6].

Analytical Hierarchy Process (AHP) is a multi-criteria decision method for solving complex or complicated problems, in an unstructured citation into parts (variables) which are then formed into a functional hierarchy or network structure to display the problems to be solved and then build a priority order for alternatives through pairwise comparison of existing alternatives based on the decision maker's assessment of the system [7].

In this research, the Analytic Hierarchy Process (AHP) method is used as an analytical framework to overcome the complexity of decision making in the research context. The AHP method is used to measure relative preferences and develop weights that will help us evaluate alternatives and make more informed and structured decisions.

2. Research methodology

A framework is a basic conceptual structure for solving or dealing with a complex problem. In this research method, a framework is created with the aim of getting the expected results and making it easier to solve problems and easy to understand. The steps that will be taken in this research are arranged in a systematic way and can be seen in Figure 1 below:

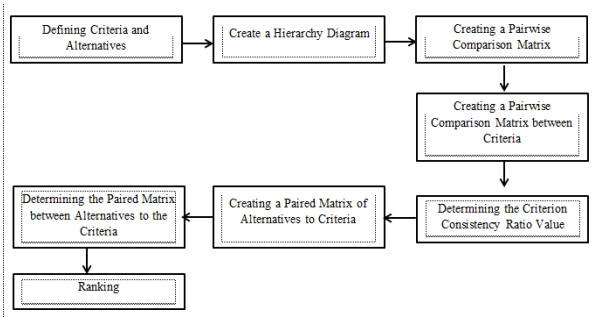

Figure 1. Research Framework

Research stages are the steps that must be taken in conducting research. The stages of this research are the stages of the AHP method that will carry out calculations. The steps that need to be taken in carrying out the analysis and calculation process to determine appropriate criteria to obtain the best alternative results using the Analytical Hierarchy Process method are as follows:

1. Defining problems, determining goals, criteria and alternative solutions

Identify and understand existing problems by gathering relevant information. Once the problem is defined, the next step is to set goals that are specific, measurable, achievable, relevant, and have a time limit as a guide. The criteria are then used as parameters or standards to evaluate various alternative solutions that can be taken in order to achieve these goals, with a process of exploring, evaluating and comparing various alternative solutions.

2. Create a Hierarchy Diagram

Create a hierarchy diagram with three levels, namely main objectives at the top level, criteria at the middle level, and alternatives at the bottom level. Link each criterion to the main objective and each alternative to the relevant criteria

3. Create a pairwise comparison matrix . Criteria

Each criterion is compared with the other criteria to determine how more important one criterion is than the others. This process helps in measuring the relative preferences or priorities between these criteria. A pairwise comparison matrix is used to generate relative weights for each criterion in the decision hierarchy, which are then used in calculations to determine the final weights and make better decisions. The results of this comparison will reflect the level of importance of each criterion in achieving goals or solving problems that have been determined in the decision analysis.

4. Determining the Pairwise Comparison Matrix Between Criteria

The process of relative comparison between predetermined criteria in a decision hierarchy. The goal of this step is to obtain information about how more important one criterion is compared to another.

5. Determining the Criterion Consistency Ratio Value

Determine the value $\lambda(\max) = \frac{jumlah}{n}$

Information :
Total = The sum of the results table
n = Many Criteria

Determine the value $CI = \frac{\lambda(\max)-n}{n-1}$

Information :
CI = Consistency Index
λ(max) = The quotient of the sum with many criteria
n = Many Criteria

3. Results and Discussion

3.1 Data analysis

Data analysis aims to limit the subjects and objects to be studied so that it becomes information that is more systematic and easy to understand. To obtain data or information in this case, the author first carried out data collection activities that were useful as support for determining the research object. Process Analysis. In this research, the author obtained data from two data sources, namely primary sources, where the author obtained data directly from the owner of the Rozi bicycle shop. Next is secondary data sources, namely indirect sources, in this case the author gets data from books, journals, the internet and other references.

3.2 Process Analysis

At the process analysis stage, reporting is done by looking for references from various websites, internet forums, books and journals. This research optimizes the role of IT business management by applying the AHP algorithm in the process of analyzing effective marketing strategies for marketing the Rozi bicycle shop. Process Analysis is carried out to design data processing system processes which can later provide suggestions and an overview of system performance, so that you can understand the system processes that will later be used . In the process of getting the best marketing strategy, the strategy in question must be appropriate to the standards set **.**

The steps that need to be taken in carrying out the analysis and calculation process using the Analytical Hierarchy Process method are as follows:

1. Defining problems, determining goals, criteria and alternative solutions.

The problem experienced is the difficulty of determining the best marketing strategy for the Rozi bicycle shop, with the aim of getting a marketing strategy that is effective and right on target. Therefore, the following criteria data were obtained:

Table 1. Criteria Variables

Variable	Criteria
1	Organization
2	Product
3	Place
4	Distribution channel

From the criteria above it will be used as a marketing strategy, then the marketing strategy will be processed together with the criteria so as to get the best value from one of these strategies, where the strategies obtained are 3 alternatives, namely:

Table 2 Alternative Strategies

Alternative	Marketing strategy
1	Strategy A (Technological Innovation)
2	Strategy B (Building a Partnership Network)
3	Strategy C (Product Innovation)

2. Create a Hierarchy Diagram

Creating a hierarchy diagram aims to make the Process Analysis structured and directed by determining the levels from top to bottom starting with Goals, Criteria and Solution Alternatives following the hierarchical structure image:

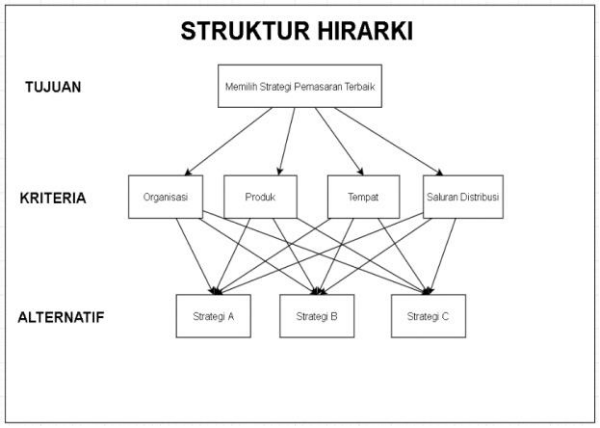

Figure 2. Hierarchical Structure

3. Create a pairwise comparison matrix . Criteria

Before creating a pairwise comparison matrix, determine the value of each Level of Importance:

Table 3. List of Importance Values

Importance Value	Level of Interest *(Preference)*
1	Equally important *(Equal Importance)*
2	Same to slightly more important
3	*Slightly more* important
4	A little more is definitely more important
5	Clearly more important *(Materially more important)*
6	Clear to very clear is more important
7	Very clearly more important *(Significantly more important)*
8	It's so obvious that it's absolutely more important
9	Absolutely more important *(Absolutely more important)*

Next, a comparison of each criterion will be carried out to obtain the priority value as in the following table:

Table 4. Criteria Comparison Values

Criteria	Importance Value	Criteria
Organization	3	Product
Organization	3	Place
Organization	3	Distribution channel
Product	1	Place
Product	1	Distribution channel
Place	1	Distribution channel

This importance value was chosen based on an assessment from the researcher's perspective of the results of interviews with the owner of the Rozi bicycle shop regarding its marketing.

A summary of the results of interviews with shop owners is as follows:

1. The store has an organization with many other stores.
2. The shop chooses quality products such as Pacific, Polygon, and so on to market so that there are rarely complaints about damage from customers.
3. The shop is located around a market that is busy with buyers, namely the Monday market in Tarik sub-district, Mukomuko district, Bengkulu.
4. The shop's distribution channel is to buy from bicycle suppliers, then market them directly to consumers.

The assessment benchmarks are as follows:

1. Organization is slightly more important than product
   reason: because with the organization, the shop is better known to the wider community.
2. Organization is a little more important than place
   reason: because the place is easy to find, if there are relationships between organizations.
3. Organization is slightly more important than distribution channels
   reason: because distribution channels can run well if the organization is close.
4. Product is as important as place
   reason: because the product must choose strategic location coverage.
5. Products are as important as distribution channels
   reason: because a good product will maintain smooth distribution channels to customers.
6. Place is as important as distribution channels
   reason: strategic location facilitates distribution channels.

4. Determining the Pairwise Comparison Matrix Between Criteria

After determining the importance value for comparison of each existing criterion, proceed by determining the pairwise comparison matrix between criteria by dividing each value of the criteria being compared according to the column as in the following table:

Table 5. Comparison matrix between criteria

Criteria	Organisasi	Product	Place	Distribution channel	Priority
Organization	0.5	0.5	0.5	0.5	0.5
Product	0.16667	0.16667	0.16667	0.16667	0.16667
Place	0.16667	0.16667	0.16667	0.16667	0.16667
Distribution channel	0.16667	0.16667	0.16667	0.16667	0.16667

5. Determining the Criterion Consistency Ratio Value

Before determining the value of the criterion consistency ratio, first look for the value of λ (max) and CI.

Determining the value of λ(max)

$$\lambda(\max) = \frac{16}{4} = 4$$

Determine the CI value

$$ci = \frac{4-4}{4-1} = 0$$

Determine the CR=CI/IR value
Information :
CR = Consistency Ratio (CR < 0.1 Reason Accepted)
IR = Random Index (obtained based on many criteria with rules as in the table) and the IR value is standard data that has been determined.

Table 6. Random Criteria and Alternative (IR) Index Table

Matrix Order	IR	Matrix Order	IR	Matrix Order	IR
1	0	6	1.24	11	1.51
2	0	7	1.32	12	1.48
3	0.58	8	1.41	13	1.56
4	0.9	9	1.45	14	1.57
5	1.12	10	1.49	15	1.59

So CR =0/0.9=0

6. Create a pairwise comparison matrix of Alternatives to Organizational Criteria

Table 7. Comparison of alternative organizational criteria

Alternative	Importance Value	Alternative
Strategy A (Technological Innovation)	1	Strategy B (Building a Partnership Network)
Strategy A (Technological Innovation)	3	Strategy C (Product Innovation)
Strategy B (Building a Partnership Network)	3	Strategy C (Product Innovation)

7. Determining a Pairwise Comparison Matrix Between Alternatives Against Organizational Criteria

Table 8. Priority of alternative organizational criteria

Alternative	Technological Innovation	Building Partnership Networks	Product Innovation
Technological Innovation	1	1	3
Building Partnership Networks	1	1	3
Product Innovation	0.333333	0.333333	1
Total	2.333333	2.333333	7

Determining the value of λ (max)
$\lambda(\max) = 9/3 = 3$

Determine the CI value = $CI = \frac{3-3}{3-1} = 0$

Determining the CR Value = $CR = \frac{0}{0.58} = 0$

8. Create a pairwise comparison matrix of Alternatives to Product Criteria

Table 9. Comparison of alternative organizational criteria

Alternative	Importance Value	Alternative
Strategy A (Technological Innovation)	3	Strategy B (Building a Partnership Network)
Strategy A (Technological Innovation)	3	Strategy C (Product Innovation)
Strategy B (Building a Partnership Network)	1	Strategy C (Product Innovation)

9. Determining a Pairwise Comparison Matrix Between Alternatives to Product Criteria

Table 10. Alternative priorities for product criteria

Alternative	Technological Innovation	Building Partnership Networks	Product Innovation
Technological Innovation	1	3	3
Building Partnership Networks	0.333333	1	1
Product Innovation	0.333333	1	1
Total	1.666667	5	5

Determining the value of λ (max)
$\lambda(\max) = 9/3 = 3$

Determine the CI value
$CI = \frac{3-3}{3-1} = 0$

Determine the CR=CI/IR value
$CR = \frac{0}{0.58} = 0$

Consistency Ratio (CR < 0.1 Reason Accepted)

10. Create a pairwise comparison matrix of Alternatives to Place Criteria

Table 11. Comparison of alternatives to criteria

Alternative	Importance Value	Alternative
Strategy A (Technological Innovation)	1	Strategy B (Building a Partnership Network)
Strategy A (Technological Innovation)	1	Strategy C (Product Innovation)
Strategy B (Building a Partnership Network	1	Strategy C (Product Innovation)

11. Determining a Pairwise Comparison Matrix Between Alternatives Against Place Criteria

Table 12. Alternative priorities for Place criteria

Alternative	Technological Innovation	Building Partnership Networks	Product Innovation
Technological Innovation	1	1	1
Building Partnership Networks	1	1	1
Product Innovation	1	1	1
Total	3	3	3

Determining the value of λ (max)
$\lambda(\max) = 9/3 = 3$

Determine the CI value
$CI = \frac{3-3}{3-1} = 0$

Determine the CR=CI/IR value
$CR = \frac{0}{0.58} = 0$
(Consistency Ratio (CR < 0.1 Reason Accepted)

12. Determining a Pairwise Comparison Matrix Between Alternatives Against Distribution Channel Criteria

Table 13. Comparison of alternative Distribution Channel criteria

Alternative	Importance Value	Alternative
Strategy A (Technological Innovation)	3	Strategy B (Building a Partnership Network)
Strategy A (Technological Innovation)	3	Strategy C (Product Innovation)
Strategy B (Building a Partnership Network)	1	Strategy C (Product Innovation)

13. Determining a Pairwise Comparison Matrix Between Alternatives Against Distribution Channel Criteria

Table 14. Alternative priorities for Distribution Channel criteria

Alternative	Technological Innovation	Building Partnership Networks	Product Innovation
Technological Innovation	1	3	3
Building Partnership Networks	0.333333	1	1
Product Innovation	0.333333	1	1
Total	1.666667	5	5

Determining the value of λ (max)
$\lambda(\max) = 9/3 = 3$

Determine the CI value
$CI = \frac{3-3}{3-1} = 0$

Determine the CR=CI/IR value

$$CR = \frac{0}{0.58} = 0$$

Consistency Ratio (CR < 0.1 Reason Accepted)

14. Ranking Stages

Table 15 Priority Criteria and Alternatives

Criterion Name	Criteria Priority Value	Strategy A (Technological innovation)	Strategy B (Building a Partnership Network)	Strategy C (Product Innovation)
Organization	0.5	0.42857	0.42857	0.142856
Product	0.16667	0.6	0.2	0.2
Place	0.16667	0.33333	0.33333	0.33333
Distribution channel	0.16667	0.6	0.2	0.2

Table 16 multiplication of priority criteria and alternatives

Criterion Name	Strategy A (Technological Innovation)	Strategy B (Building a Partnership Network)	Strategy C (Product Innovation)
Organization	0.214285714	0.214285714	0.071428571
Product	0.1	0.033333	0.033333
Place	0.055556	0.055556	0.055556
Distribution Channel	0.1	0.033333	0.033333

Table 17 Ranking of Decision Results

Rank	Alternative	Mark	Information
1	Strategy A (Technological Innovation)	0.469842	Priority 1
2	Strategy B (Building a Partnership Network)	0.336508	Priority 2
3	Strategy C (Product Innovation)	0.193651	Priority 3

From the table above, it can be decided that Strategy A (Technological Innovation) gets the highest score, namely 0.46984 . In this way, technological innovation can be used as a new marketing technique or strategy to be applied in developing marketing.

3.3 System Testing

System testing and implementation aims to see whether the designed system is in accordance with what is desired or not . After testing and implementation, the quality of a system will be visible. The program display is a sub-chapter that explains the process in the program, both the program input process and the output execution of the program being run. The following is the program display that has been built, including an admin login page which is the initial display when the website is accessed. On this page display there are two forms for username/email and password. As in Figure 3 below:

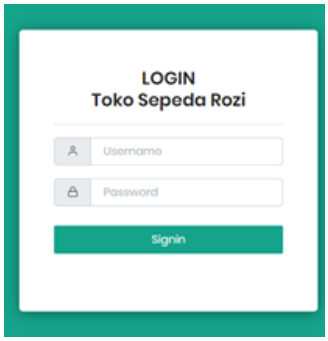

Figure 3 Rozi Shop Login

Then the admin is directed to the dashboard as shown in the image below :

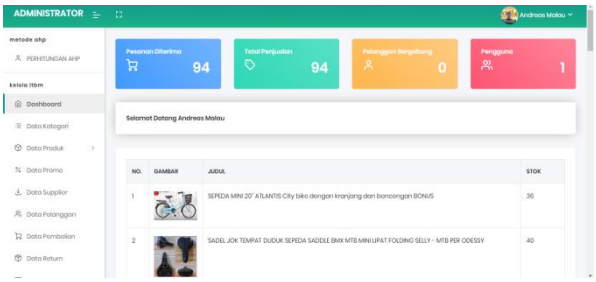

Figure 4 Admin dashboard

Then to carry out the calculation, the admin will have to go to the AHP calculation menu, until the following page appears:

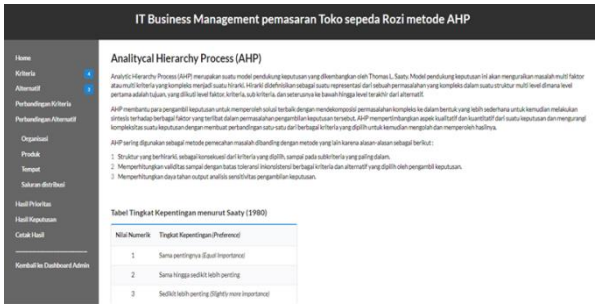

Figure 5 AHP Calculation Dashboard

After inputting, a decision result will be displayed as shown in the image below:

Figure 6 Decision Results

4. Conclusion _

Based on research conducted on the use of IT business management for marketing development using the *Analytical Hierarchy Process method* , this can help the Rozi bicycle shop in making decisions about the bicycle marketing strategy that must be implemented, which is based on four criteria, namely organization, product, place and distribution channels. You can find out the right marketing strategy to implement and it can be easier to manage your business because the IT business management function works well. As well as being able to carry out calculations effectively and the system can also carry out bicycle marketing through technological innovations that have been selected as a result of marketing strategy decisions so that the market share is wider and customers are more easily known.

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