



Consumer Behavior & Decision-Making Processes

Selection of Vegetarian Restaurant Recommendations Using the AHP Method

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A B S T R A C T
Purchasing activities are activities that need to be carried out by the community to meet the needs of life. Vegetarian restaurants are one of the businesses that sell food needs. However, during the purchase process there is a level of satisfaction from consumers. These levels are influenced by various factors or criteria. The purpose of this study is to measure and rank the recommended vegetarian restaurant rankings and the criteria that affect the purchase process using the Analytical Hierarchy Process (AHP) method. The results of this study are Cafe Abang restaurant (A1) with a weight value of 0.379, the second place is the Kedai Bo Bak restaurant (A3) with a weight value of 0.25, the Sweet Veggie restaurant (A2) is in third place with a weight value of 0.191, and RM. Healthy Vegetarian (A4) with a weight value of 0.18. While the criteria for food and beverage menu prices (C3) with a weight value of 0.311, the second place is the operational time criterion (C4) with a weight value of 0.228, the third place is with the restaurant location distance criterion (C5) with a weight value of 0.216, the fourth place is with the number of food and beverage menu variants (C1) with a weight value of 0.153, and ranked fifth with the criterion of the number of restaurant facilities (C2) with a weight value of 0.092.

1. INTRODUCTION

Purchasing is an activity performed by the community with the goal of acquiring goods or services in the marketplace to meet its needs or desires [1]. The purchase of a good or service can be accomplished by exchanging assets or goods provided by the seller for goods or services owned by the buyer or consumer. Currently, people can use money as a medium of exchange in the purchasing process. Goods can be purchased in the form of raw materials, semi-finished goods, and finished goods, as opposed to services, which are purchased in the form of the seller's labor or skills, or labor.

Human needs are divided into three categories: clothing, food, and shelter [2]. People need to make or buy food and beverages to meet their nutritional needs. A restaurant is a business that sells various types of ready-to-eat foods and beverages and various unprocessed foods and beverages. Restaurants are included in the Culinary Business category. This

business can be found everywhere because food and drink is one of the basic human needs that must be met in order to survive [3].

Today, it is common to find various foods and beverages labeled as vegetarian. Vegetarian foods and beverages are processed products that are plant-based or without the use of animal ingredients that can be consumed directly or need to be processed [4]. The definition of a vegetarian restaurant is a restaurant that sells or provides food and beverages that are plant-based or without animal products. Incorporating vegetarianism into one's daily diet can provide consumers with a wide range of benefits, including a lower risk of developing diabetes, lower cholesterol levels, improved mood, reduced risk of developing cataracts and kidney stones, and reduced risk of developing cardiovascular disease and cancer [5]. The research area used is the Kintamani commercial and residential area, Batam Kota, Riau Islands. This area was chosen because there are many vegetarian restaurants. Therefore, it is necessary to find the best vegetarian restaurant according to the judgment of vegetarian experts using the Analytical Hierarchy Process (AHP) method.

2. LITERATURE REVIEW

2.1. Analytical Hierarchy Process

Analytical Hierarchy Process (AHP) is a method developed in the 1970s by Thomas L. Saaty. He is a mathematician from the University of Pittsburgh. The AHP method aims to solve a problem that has a large number of criteria and sub-criteria. One of the advantages of this method is that it can solve a problem that can be quantitative as well as problems that require opinions or arguments (qualitative). This method can use experts as input data in the initial calculation process (pairwise matrix). The expert in question is someone who has a deep understanding of the problem being tested, and the expert can also feel the impact of the problem and has an interest related to the problem [6].

Using the AHP method, the most influential criteria can be determined from the various criteria tested. The determination is based on the greatest weight value of the criteria tested. In addition, there is a consistency test for each criterion used in a study [6]. In this research, the AHP method is used to obtain the weight value for each criterion and to rank the recommended restaurants based on the largest weight value [7].

The answer given by the AHP source or respondent is in the form of a value or score from 1 to 9. The interpretation of the score is that the higher the score given, the more important the evaluated criteria can be said to be than other criteria. The following is a description of the scores included in the AHP method [8]:

Table 1. AHP Score Description [9]

Score	Description
1	The selected criteria are equally important.
3	The selected criteria are slightly more important than the other criteria.
5	The selected criteria are more important than the other criteria.
7	The selected criteria are very important compared to the other criteria.
9	The selected criterion is extremely important compared to the other criteria.
2, 4, 6, 8	The middle value between the two values above.

Here is an example of the question form of the AHP questionnaire:

Table 2. AHP Criteria Scale Shape

Kriteria Skor																		
C _m	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	C _n

There are several stages of calculation in the AHP method developed by him to get the final result of the AHP calculation [10], namely:

- Summation of pairwise matrix values
This pairwise matrix is used to display each interviewee's or respondent's response score with respect to the evaluation criteria or alternative solutions. The following is the form of a Pairwise Matrix:

$$A = [a_{jk}] = \begin{bmatrix} 1 & a_{21} & \dots & a_{n1} \\ \frac{1}{a_{12}} & 1 & \dots & a_{n2} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix} \tag{1}$$

Where, α was Saaty value or evaluation score on the pairwise matrix.

After that, the paired matrix can be continued with the following formula:

$$\sum \text{column } A = 1 + \frac{1}{a_{12}} + \dots + \frac{1}{a_{1n}} \tag{2}$$

- Normalization of pairwise matrix
AHP matrix normalization can be done using the following formula:

$$A = [a_{jk}] = \begin{bmatrix} \frac{1}{\sum \text{column } A} & \frac{a_{21}}{\sum \text{column } B} & \dots & \frac{a_{n1}}{\sum \text{column } n} \\ \frac{1}{a_{12}} & \frac{1}{\sum \text{column } B} & \dots & \frac{a_{n2}}{\sum \text{column } n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & \frac{1}{\sum \text{column } n} \end{bmatrix} \tag{3}$$

- Calculating criteria weights
Calculation of criteria weights can be done using the following formula:

$$\text{Score}_A = \frac{1}{\frac{1}{\sum \text{column } A} + \frac{a_{21}}{\sum \text{column } B} + \dots + \frac{a_{n1}}{\sum \text{column } n}} \tag{4}$$

- Calculating lambda max
The calculation of the lambda value can be done using the following formula:

$$A = [a_{jk}] = \begin{bmatrix} 1 & a_{21} & \dots & a_{n1} \\ \frac{1}{a_{12}} & 1 & \dots & a_{n2} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix} \times \begin{bmatrix} W_A \\ W_B \\ \vdots \\ W_n \end{bmatrix} \tag{5}$$

After the above step is done, the next step is to share the value of the multiplication result with the value of the criteria weight. After that, each result obtained will be summed up and shared with the number of criteria owned, with the following formula:

$$\lambda_{maks} = \frac{\sum \lambda}{n} \tag{6}$$

- Calculating consistency
The next step aims to determine whether the values of the criteria weights obtained are consistent or not. There are 2 variables needed, namely Consistency Index (CI) and Consistency Ratio (CR). The following are each of the calculation formulas:

$$CI = \frac{\lambda_{maks} - n}{n - 1} \tag{7}$$

$$CR = \frac{CI}{RI} \tag{8}$$

Where, n was the number of alternative solutions.

The magnitude of the RI or Random Index value is determined based on the number of criteria used. The following is a table of each RI value:

Table 3. Random Index Value [11]

Criteria	Random Index
1	0,0
2	0,0
3	0,58
4	0,9
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49
11	1,51
12	1,54
13	1,56
14	1,57
15	1,58

2.2. Expert Judgment

Expert judgment is a term given to someone who is experienced or an expert in their field. Expert judgment can be an option in a study, if there is a small amount of data that can be used [12]. There are 2 ways that can be used to get data from expert judgment, namely individual review and interactive group [13]. In the individual review approach, this can be done by interviewing the interviewee face-to-face. However, in the interactive group approach, it can be done by discussing in groups with several sources and interviewers.

2.3. Thinking Framework

There are 5 types of criteria that could be used as criteria in terms of selecting a restaurant, namely Food and Beverage Menu Variants, Facilities, Food and Beverage Menu Prices, Operating Times, and Restaurant Location [14]. The following is the framework of this research:

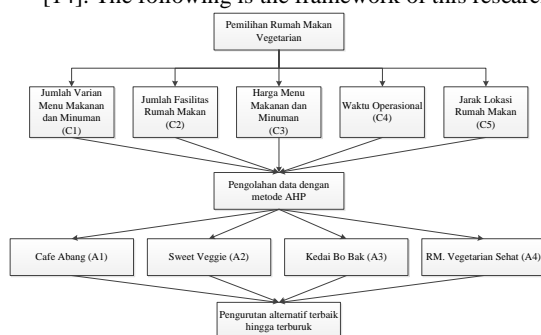


Figure 1. Framework

3. METHODOLOGY

The following is the flow of the research to be carried out:

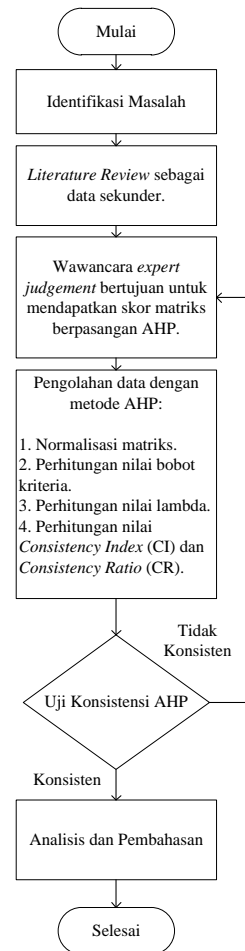


Figure 2. Research methodology

1. Problem identification is done to find out what problems to be tested in a study. In this research, because there are several vegetarian restaurants in Kintamani shopping and residential area, Batam Kota, Riau Islands, the question arises which vegetarian restaurant is the most recommended based on the views of vegetarian expert judgment.
2. Literature Review is needed to collect some information related to the theoretical basis used. This is obtained from books, articles and so on.
3. Expert Judgment Interviews are conducted to obtain Saaty values or scores from the AHP assessment. This interview was conducted by communicating directly and online with the source. The criteria used in this research expert judgment are vegetarian experience for at least 10 years and have eaten in the four vegetarian restaurants to be tested. The number of experts used is 3 people.
4. Data processing with AHP is carried out by applying the steps described in subsection 2.1.

4. RESULTS AND DISCUSSION

The following were various tables from the results of data processing using the AHP method. The software used was Microsoft Excel.

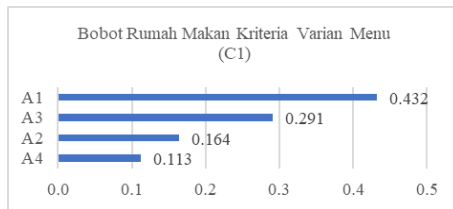


Figure 3. Restaurant ranking from menu variant criteria

Based on Figure 3, it can be seen that based on the views of the three expert judgment, Cafe Abang restaurant (A1) was the most recommended restaurant from the criteria for the number of food and beverage menu variants. Followed by the second rank, Kedai Bo Bak (A3), Sweet Veggie (A2) in the third rank, and RM. Healthy Vegetarian (A4) in fourth place.

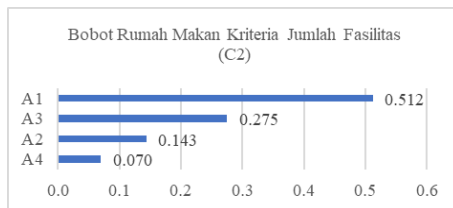


Figure 4. Restaurant ranking from the number of facilities criteria

Based on Figure 4, it can be seen that based on the views of the three expert judgment, Cafe Abang restaurant (A1) was the most recommended restaurant from the criteria for the number of restaurant facilities. Followed by the second rank, Kedai Bo Bak (A3), Sweet Veggie (A2) in the third rank, and RM. Healthy Vegetarian (A4) in fourth place.

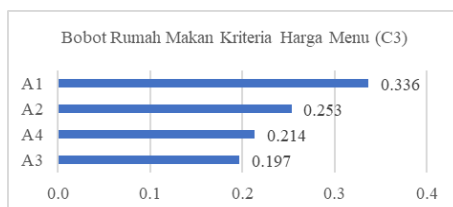


Figure 5. Restaurant ranking from menu price criteria

Based on Figure 5, it can be seen that based on the views of the three expert judgment, Cafe Abang restaurant (A1) was the most recommended restaurant from the food and beverage menu price criteria. Followed by the second rank is Sweet Veggie restaurant (A2), RM. Healthy Vegetarian (A4) in third place, and Kedai Bo Bak (A3) in fourth place.

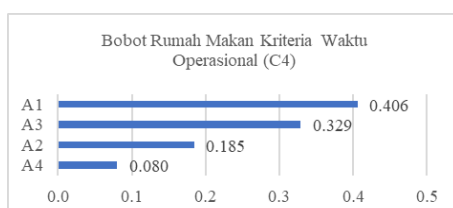


Figure 6. Restaurant ranking from operational time criteria

Based on Figure 6, it can be seen that based on the views of the three expert judgment, Cafe Abang restaurant (A1) is the most recommended restaurant from the criteria of operating time.

Followed by the second rank is Kedai Bo Bak restaurant (A3), Sweet Veggie restaurant (A2) in the third rank, and RM. Healthy Vegetarian (A4) in fourth place.

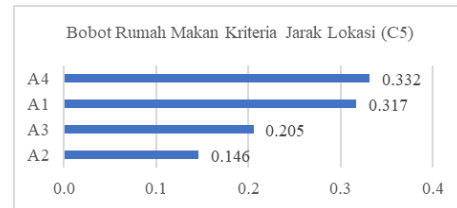


Figure 7. Restaurant ranking from location distance criteria

Based on Figure 7, it could be seen that based on the views of the three expert judgment, RM. Vegetarian Sehat (A4) was the most recommended restaurant from the criteria of the location of the restaurant. Followed by the second rank is Cafe Abang (A1), Kedai Bo Bak (A3) in the third rank, and Sweet Veggie (A2) in the fourth rank..

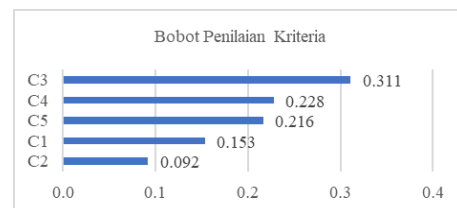


Figure 8. Criteria assessment rating

Based on Figure 8, it can be seen that based on the views of the three expert judgment, the criteria for the price of food and beverage menus (C3) were the most influential criteria for consumers when buying at vegetarian restaurants. Followed by the second rank is the criteria for operating time (C4), the criteria for the distance of the restaurant location (C5) in the third rank, the criteria for the number of food and beverage menu variants (C1) in the first rank, and the criteria for the number of restaurant facilities (C2) in the fifth rank.

If each vegetarian restaurant's weight value in each criterion has been obtained, the next step is to calculate the global weight that determines the overall ranking of vegetarian restaurants. The following is a table of the final results of the AHP calculation:

Table 4. AHP Calculation Results

	A1	A2	A3	A4	Score
C1	0.432	0.164	0.291	0.113	0.153
C2	0.512	0.143	0.275	0.070	0.092
C3	0.336	0.253	0.197	0.214	0.311
C4	0.406	0.185	0.329	0.080	0.228
C5	0.317	0.146	0.205	0.332	0.216
Global Score	0.379	0.191	0.25	0.18	1

Based on Table 4, it can be seen that overall, Cafe Abang (A1) was the most recommended restaurant because it has the greatest score, which is 0.379. In second place was Kedai Bo Bak (A3) with a score of 0.25, Sweet Veggie (A2) in third place with a score of 0.191, and RM. Healthy Vegetarian (A4) with a score of 0.18.

5. CONCLUSION

The conclusion that can be drawn from this study is that by using the AHP method, it was possible to generate a ranking of recommended vegetarian restaurants and a ranking of the most influential criteria for selecting a restaurant based on the expert judgment of vegetarians. The most recommended restaurant was Cafe Abang (A1) with a score of 0.379. In second place was Kedai Bo Bak (A3) with a score of 0.25, Sweet Veggje (A2) ranked third with a score of 0.191, and RM. Vegetarian Sehat (A4) with a score of 0.18.

The ranking of criteria that most influenced consumers when choosing a vegetarian restaurant, based on the expert judgment of vegetarians, was led by the menu and beverage price criterion (C3) with a score of 0.311. In second place was the operational hours criterion (C4) with a score of 0.228, third place was the restaurant location distance criterion (C5) with a score of 0.216, fourth place was the number of menu variants criterion (C1) with a score of 0.153, and fifth place was the number of restaurant facilities criterion (C2) with a score of 0.092.

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