

## Determining the Criteria of Choosing Tour Packages in Langkawi Island Using FAHP

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Received Date: 15 July 2022

Accepted Date: 25 July 2022

Revised Date: 10 August 2022

Published Date: 1 September 2022

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### HIGHLIGHTS

- The five criteria of choosing tour packages were listed
- The criteria were ranked by using Fuzzy Analytical Hierarchy Process
- It is determined that 'Transportation' is the most important criteria

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### ABSTRACT

Malaysia enters the endemic phase of Covid-19 on 1<sup>st</sup> April 2022. Since then, the Malaysia's economy has started to recover, and domestic tourism has also restarted. Tourism is one of the factors that contributed to the economy. Avoiding the headache to plan their own trips, tourists usually count on tour operators to turn their dream vacations into realities. Booking a tour is the easiest way for a traveller to experience a foreign land and at the same time they could enjoy their vacation and visit the best spots. The main objective of this study is to determine the main criteria of a tour packages in Langkawi Island by using Fuzzy Analytical Hierarchy Process (FAHP). The five criteria identified are transportation, cost, food service, accommodation, and tour guide. Results showed that the transportation is the most important criteria a tourist look forward in the selection of a tour package.

**Keywords:** Tour Package, Tourism, Langkawi Island, Fuzzy Analytical Hierarchy Process

### INTRODUCTION

Malaysia has become endemic from Covid-19 on 1<sup>st</sup> April 2022, so the economy is starting to build up, and one of them is tourism. Tourism is one of the key factors for a successful industry. Tourists count on tour operators to turn their dream vacations into realities. Booking a tour is an easy way for a traveler to experience a foreign land and make sure they hit the best spots.



When going on an international trip for example a holiday vacation to United States of America (USA) or to Europe, it is essential to choose an exclusive tour package. As these international trips are expensive, they need to be efficiently arranged, so that the money invested in it is a valuable one. There are numbers of companies that provide tour packages. Hence, it is important to carefully evaluate the holiday packages before choosing one.

In Malaysia, Langkawi Island in Kedah was the first place to be opened after MCO restriction is lifted. It is opened under a travel bubble project. The Kedah government has set a target of attracting 2.5 million visitors to Langkawi Island by this year following the reopening of Malaysia's borders (Osman, 2022). This is because Langkawi Island is one of the places that contributed to the tourism economy. In 2019, Malaysia received 26 million foreign tourists with a revenue of RM89.1 billion, exceeding the exports of palm oil at RM70 billion and rubber gloves at RM22 billion (Aman, 2021).

Langkawi is a splendid island where people can explore nature; there are beautiful forests, beaches, waterfalls and other great attractions. The island has a considerable number of resorts, some of them on the best spot on the island. For example, both Tanjung Rhu Resort and the Four Seasons are renowned worldwide. Langkawi Island is different from the island in Penang as Penang Island provide cultural and heritage sites and wide range of food variations (Ferrarese, 2022).

## RELATED LITERATURE

Previously, Ruiz-Meza, Brito, and Montoya-Torres (2021) proposed a mixed integer linear programming for sustainable itineraries which modeled planning for a group of tourists with different preferences and transport selection. The model considered environmental impact while optimizing the three objectives functions which is minimizing the carbon dioxide (CO<sub>2</sub>) emission from the transportation part.

Utomo (2021) suggested that to assist travelers in determining the most cost-effective or finest packages, the price of the package, the number of participants, and the number of amenities obtained are the factors to be consider. The Triangular Fuzzy Number (TFN) and the Simple Additive Weighting (SAW) methods were proposed for the problem.

Benjamin, Abdullah, Abdul-Rahman, Nazri, and Yahaya (2019) proposed to create tour packages based on survey of sixty visitor preferences by using heuristic method. As trips required meticulous organization, the authors main objective is to visit as many places as possible in a short amount of time. This is because most of travelers have difficulty in choosing and planning their Point of Interest (POI). Guo and Sun (2016) proposed the uses of entropy to calculate the relative weights for tourist attractions' indexes. They use grey relation analysis (GRA) which makes use of the index system and data to rank the tourist attractions.

Hsu and Lin (2014) proposed to provide a decision-making process in which intrinsic risk is identified through a comparison of criteria rather than absolute quantitative metrics. The fuzzy Preference Ranking Organization METHod for Enrichment Evaluations (PROMETHEE) method was proposed in their study with the aim to obtain results that reflect the uncertainties associated with group package tour itineraries.



## METHODOLOGY

In this study, the solution methodology used is the Fuzzy Analytical Hierarchy Process (FAHP) method. The method is suitable as there are multi criteria, specifically five criteria considered in determining a good tour package.

### Data collection

The FAHP make use of judgement provided by expert. It is common to use a small number of experts (Peterson, Silsbee, & Schmoltdt, 1994). Hence, the data collected through a questionnaire and interview session with limited number of experts. Three experts were carefully selected from Ministry of Tourism, Arts & Culture Kedah, where each of them must have at least 5 years of experience in tourism. The consistency ratio values of the experts selected is less than 10%.

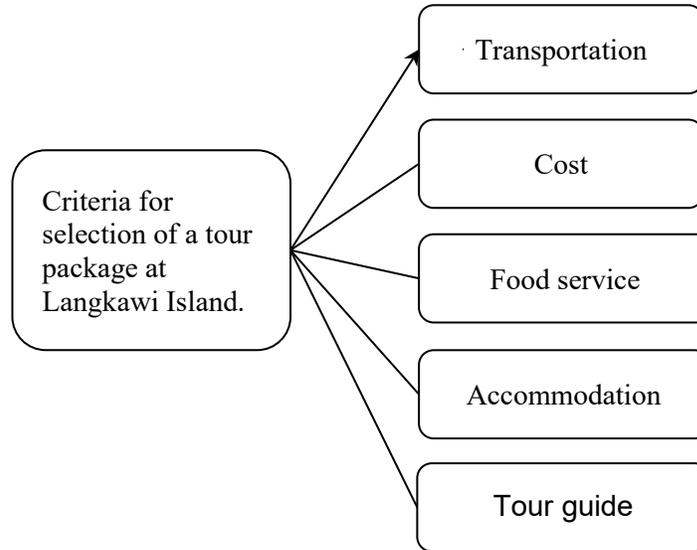
The criteria were chosen from Josmani (2007) where they identified the most important criteria for Malaysian in choosing tour packages in Malaysia. Out of the 30 criteria listed by Wong and Kwong (2004), the author concluded that Malaysian are very particular about the price of the tour package, followed by tour guide, transportation and food. In this study, using the similar list, the five criteria are cost, tour guide, transportation, food service and accommodation. As Langkawi is an island which can either be travel by ferry or airplane where tourist commonly chose to spend the night instead of a one day traveling. Hence the accommodation is included as one of the main criteria. Figure 1 listed out the criteria considered.

### Fuzzy Analytical Hierarchy Process (FAHP)

The FAHP is the effective ways to help the tourist choose the best alternative tour packages that are provided by agents. As the problem considered multi criteria, specifically 5 criteria that are important in choosing tour packages. The FAHP is a fuzzy logic-based approach. Decision makers utilize FAHP to determine the weights of the criteria, and then AHP determines the ranks of the techniques (Naghadehi, Mikaeil, & Ataei, 2009).

This method is often used as in solving various multi-criteria decision problems as it can easily handle the multiple criteria. The consistency of a human thinking is structured in a form of hierarchy level. Detailed steps of the FAHP were described in many research. For example, Naghadehi et al. (2009) described the steps of FAHP and implemented to optimum mining method, Ayhan (2013) tackles supplier selection method and Fauzi, Munawar, and Ab Halim (2020) implemented it to determine the drinking water preferences among students.





**Figure 1:** Criteria of choosing a tour package in Langkawi

FAHP makes use of the triangular fuzzy number,  $M$ . A triangular fuzzy number converted the linguistic values to triangular fuzzy number. The triangular number is a real number  $(a, b, c)$  which is represented by the function (1),  $\mu_M$ . The  $a$ ,  $b$  and  $c$  are the lower, middle and upper values of the function respectively. Table 1 given is the triangular fuzzy numbers with its corresponding linguistic term.

$$\mu_M = \begin{cases} \frac{x-a}{b-a} & a \leq x \leq b \\ \frac{c-x}{c-b} & b \leq x \leq c \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

**Table 1:** Triangular fuzzy number

Linguistic Variable	Triangular Fuzzy Number
Equally Important (EI)	(1,1,1)
Weakly Important (WI)	(2,3,4)
Fairly Important (FI)	(4,5,6)
Strongly Important (SI)	(6,7,8)
Absolutely Important (AI)	(9,9,9)
The intermittent values between two adjacent scales	(1,2,3)
	(3,4,5)
	(5,6,7)
	(7,8,9)

Based on Table 1, if the decision maker declares "Criterion 1 (C1) is Weakly Important than Criterion 2 (C2)" according to the appropriate triangular fuzzy numbers of these linguistic phrases (2, 3, 4). On the other hand, in the pairwise contribution matrix of the criteria, the comparison of C2 to C1 will be done on



a fuzzy triangular scale of (1/4, 1/3, 1/2). Many literatures describe the steps of FAHP in details. We refer reader to Zhu, Jing, and Chang (1999) and Liu, Eckert, and Earl (2020).

The expert opinion or decision makers preferences are averaged, and the value will be used to find the geometric means value,  $r_i$ . The geometric mean value is then used to find the fuzzy weights,  $w_i$  of each criterion. As the value found are still fuzzy triangular numbers, hence they must be defuzzified using the Center of Area method and defuzzified number,  $M_i$ . Then the normalized Fuzzy Weight,  $N_i$  will be calculated and the resulting final ranking can be obtained.

## FINDINGS AND DISCUSSIONS

To determine the criteria that are important in choosing tour packages, three experts with the knowledge and experience in the field of tourism are selected. Based on the research of data are collected based on the most important criteria layout by Josmani (2007) which are transportation, food services, accommodation, cost and tour guide. The description of the criteria was presented in Table 2.

**Table 2:** Criteria Tour Package

Criteria	Definition
T	Transportation (Car, motorcycle and van provided by tour packages or have voucher to claim the transport at jetty)
C	Cost (The range of the price)
FS	Food Service (Provide the food at the hotel or giving the voucher based on the restaurant that have been selected)
A	Accommodation (Pool, Wi-Fi, air conditioner, nearby beach)
TG	Tour Guide (Provided or not)

All the expert opinion were collected and converted into triangular fuzzy number. The matrices of pairwise comparison were calculated and the updated pairwise comparison matrix is given in Table 3.

**Table 3:** The updated Pairwise Comparison Matrix

Criteria	T	C	FS	A	TG
T	(1,1,1)	(3.000, 3.6667, 4.3333)	(5.3333, 6.3333, 7.3333)	(5.3333, 6.3333, 7.3333)	(4.6667, 4.6667, 6.6667)
C	(0.4444, 0.4667, 0.5000)	(1,1,1)	(3.6667, 4.3333, 5.000)	(3.6667, 5.0000, 5.0000)	(4.3333, 5.0000, 5.6667)
FS	(0.1389, 0.1619, 0.1944)	(0.4306, 0.4476, 0.4722)	(1,1,1)	(2.3333, 3.0000, 3.6667)	(1.6667, 2.3333, 3.0000)



<b>A</b>	(0.1389, 0.1619, 0.1944)	(0.4306, 0.4476, 0.4722)	(0.4722, 0.5111, 0.5833)	(1,1,1)	(3.0000, 3.6667, 4.3333)
<b>TG</b>	(0.1528, 0.1810, 0.2222)	(0.4167, 0.4286, 0.4444)	(0.5000, 0.5556, 0.6667)	(0.4444, 0.4667, 0.5000)	(1,1,1)

For each of the criteria, the geometric mean of fuzzy comparison values were calculated. The geometric mean and reverse values totals are also calculated and sorted in increasing order. The power of -1 is denoted as  $P(-1)$ . These values were tabulated in Table 4. Its relative fuzzy weight,  $w_i$  were computed by multiplying the geometric mean of fuzzy comparison with the vector summation. Table 5 showed the values found.

**Table 4:** Geometric Mean of Fuzzy

Criteria	$r_i$		
<b>T</b>	3.3115	3.8386	4.3478
<b>C</b>	1.9171	2.1296	2.3445
<b>FS</b>	0.7470	0.8731	1.0020
<b>A</b>	0.6104	0.6708	0.7467
<b>TG</b>	0.4267	0.4578	0.5052
<b>Total</b>	7.0126	7.9700	8.9462
<b>P(-1)</b>	0.1426	0.1255	0.1118
<b>Increasing Order</b>	0.1426	0.1255	0.1118

**Table 5:** Fuzzy Weights

Criteria	$w_i$		
<b>T</b>	0.3702	0.4816	0.6200
<b>C</b>	0.2143	0.2672	0.3343
<b>FS</b>	0.0835	0.1095	0.1429
<b>A</b>	0.0682	0.0842	0.1065
<b>TG</b>	0.0477	0.0574	0.0720

Lastly, in the calculation of defuzzify of the weight value were calculated by multiplying the total of each element by three. The defuzzified weight is then normalized as stated in Table 6. Given also is the final rank of all the criteria.

**Table 6:** Defuzzified ( $M_i$ ) and Normalized ( $N_i$ ) Fuzzy Weights.

Criteria	$M_i$	$N_i$	Rank
<b>T</b>	0.4906	0.4810	1
<b>C</b>	0.2719	0.2666	2
<b>FS</b>	0.1120	0.1098	3



<b>A</b>	0.0863	0.0846	4
<b>TG</b>	0.0591	0.0579	5
<b>TOTAL</b>	1.0199	1.000	-

As the final result based on Table 6, it is shown that “Transportation” is the strongest criteria that contributed to the tour package in Langkawi Island with a percentage of 48.10% followed by “Cost”, “Food Service”, “Accommodation” and “Tour Guide” with a percentage of 26.67%, 10.98%, 8.46% and 5.79% respectively.

## CONCLUSION AND RECOMMENDATIONS

In this study, the Fuzzy Analytical Hierarchy Process (FAHP) was used to determine the criteria that are important for a tourist when selecting the best tour packages in Langkawi Island. The criteria listed are Transportation, Cost, Food Service, Tour Guide and Accommodation. The first four criteria are similar to the previous literature, Josmani (2007), and the last criteria was added because of the travel time duration and traveling method. Langkawi Island can only be visited by ferry or airplane, hence tourist usually opted to stay overnight in the island because of the schedule. The results found in this study determine the transportation criteria as the most important criteria with percentage 48.1% followed by cost, food service, accommodation and lastly, tour guide. It is assumed, as the Langkawi Island is geographically dominated by forest covered mountains and hills, hence having a good transportation would make tourists visit more comfortable and enjoyable. Its noted that previous literature by Josmani (2007) rank the cost as the most important criteria.

Tourism is one of the many industries that contributed to the economic sector. From the study, the industries may benefit from it by designing tour packages that embedded these important criteria. Hence, for future research direction, designing and analyzing variation of tour packages that offer these criteria would benefit the economic. Additionally, other important criteria such as culture, the schedule and the safety would be a good add to consider. Langkawi Island itself is full of cultural destination such as Padang Matsirat and Mahsuri’s tomb.

## ACKNOWLEDGMENTS

The authors would like to thank the experts from Ministry of Tourism, Arts & Culture Kedah.

## CONFLICT OF INTEREST DISCLOSURE

The authors declared that they have no conflicts of interest to disclose.

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