TOURIST HOTEL LOCATION SELECTION WITH ANALYTIC HIERARCHY PROCESS*

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ABSTRACT

Selection of tourist hotel location is a multi-criteria decision making (MCDM) problem and has a strategic importance for the hotel management. In tourism sector, location selection decisions are critical as they are costly and difficult to reverse, and entail a long term commitment. For this reason, in this study AHP (Analytic Hierarchy Process) method is proposed to help the hotel management to select the most proper location for their new tourist hotel investment. In the application part, selection of tourist hotel location in Denizli, Turkey is conducted to demonstrate the computational process and effectiveness of AHP method.

Key words: *Hotel Location Selection; Multi-Criteria Decision Making (MCDM); Analytic Hierarchy Process (AHP)*

JEL Classification*: C02, C44, L83*

1. INTRODUCTION

Hotel location selection is the determination of a geographic site on which to locate a hotel's operations. Selecting a hotel location is an important and a critical decision due to the high cost of relocation and reconfiguration. Proper hotel location not only help to increase market share and profitability but also enhance the convenience of customer lodging as establishing a fine location will shorten the payoff period for fixed capital investments.

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Furthermore, in the age of customer-based service, satisfying customer requirements or enhancing the convenience of customer lodging will directly raise customer loyalty (Chou et al, 2008). Also in the long term, location of a tourist hotel influences its operation performance. So selection of tourist hotel location has a strategic importance for the hotel management.

The hotel location selection process encompasses the identification, analysis, evaluation and selection among alternatives. The general procedure for making location decisions usually consists of the following steps:

- Decide on the criteria that will be used to evaluate location alternatives,
- Identify criteria that are important,
- Develop location alternatives,
- Evaluate the alternatives and make a selection (Stevenson, 1993).

Tourist hotel location is directly related to the level of hotel business activity, the income of the hotel, and also will affect future hotel customer quantity (Chou et al, 2008). Therefore, developing a method for the selection of tourist hotel location and selecting the best location alternative is important for the hotel management to increase their competitive advantage. For this reason, in this study AHP method is proposed for the selection of tourist hotel location in Denizli, Turkey. AHP is a popular MCDM method commonly used in finding a solution to the location selection problem. In AHP, decision makers are only required to give verbal, qualitative statements regarding the relative importance of one criterion over another and similarly regarding the relative preference of one location to another on a criterion (Chou et al, 2008). Both qualitative and quantitative criteria can be evaluated with AHP method, so AHP method is more appropriate for location decisions than other scoring methods.

In the literature, there are other studies that consider hotel location selection. Chou et al. (2008) presented a fuzzy multi-criteria decision making model for international tourist hotel location selection. In this article, they used fuzzy AHP for selecting the international tourist hotel location in Taiwan. Lin and Juan (2010) proposed a modified Delphi model for determining the optimality of an international resort park location. They organized a panel with 16 experts from various backgrounds, including academia, government and business, provided input for the selection of location factors. After three discussions, panel members reached consensus and selected 26 factors under the dimensions of "factor endowments, demand conditions, firm strategy structure and rivalry, related and supporting industries, government, chance" for optimizing location selection for international resort parks. Adam (2012) identified the people involved in hotel location decisions and assessed the reasons why they are involved. Data was collected from hotel owners in the Kumasi Metropolis and analyzed with the chi-square test of independence. In this study, it was concluded that hotel owners in the Kumasi Metropolis involve their family members in the location choice for non-professional reasons. Yang, Luo and Law (2014) reviewed past literature on hotel location models. They divided hotel location models into three major categories as theoretical models, empirical models, and operational models. Four theoretical hotel location models were reviewed and discussed, including the tourist-historic city model, the mono-centric model, the agglomeration model and the multi-dimensional model. Based on previous literature, six empirical models and three operational models of hotel location were elaborated. In particular, they advocated the development of more sophisticated hotel location models and the use of Geographic Information System in hotel location analysis. Also in another study, Urtasun and Gutierrez (2006) investigated geographic location, price, size and services to determine how the positioning of new hotels is affected by the distribution of similar incumbent competitors. In this study, with the data of all 240 hotels operating in the city of Madrid between 1936 and 1998, a model of geographic and product location at the time of the hotels' foundings was estimated. The findings suggested that agglomeration occurs only among differentiated establishments.

The remainder of this paper is organized as follows. In the first section, AHP method is introduced and the steps of the method are given. In the second section, an application of tourist hotel selection in Denizli, Turkey is given. And last section concludes the paper.

2. ANALYTIC HIERARCHY PROCESS

Analytic **H**ierarchy **P**rocess (AHP) is developed by Saaty (1980) and then it is used widely as an efficient multi-criteria decision making (MCDM) method for ranking alternatives. AHP is based on three principles: structure of the model; comparative judgment of the alternatives and the criteria; synthesis of the priorities (Dağdeviren et al, 2009). One of the main advantages of this method is the relative ease with which it handles multiple criteria. In addition to this, AHP is easier to understand and it can effectively handle both qualitative and quantitative data. The use of AHP does not involve cumbersome mathematics (kahraman et al, 2004). Because of these reasons AHP has been applied many areas such as personal, social, manufacturing sector, political, engineering, education, industry, government and others which include sports, management, etc. (Omkarprasad and Kumar, 2006). AHP can efficiently be integrated with other methods like mathematical programming, quality function deployment, meta-heuristics, SWOT analysis and data envelopment analysis (Ho, 2008).

The main steps of AHP are given in the following:

Step 1. First of all, criteria and alternatives of the problem are defined. Then problem is organized hierarchically. The overall goal of this decision making problem is at the highest level and the alternatives are at the lowest level. Criteria and sub-criteria are placed between them (Wang et al, 2007).

Step 2. A pairwise comparison of relative importance between the *n* criteria is defined (Caputo et al, 2013). In each level, the criteria are compared pairwise according to their levels of influence and based on the specified criteria in the higher level (Albayrak and Erensal, 2004; Dağdeviren et al, 2009). Saaty's 1-to-9 scale shown in Table 1 is used while comparing *n* criteria in the same level. For each level a *n* x *n* pairwise comparison matrix A is obtained based on the decision maker's judgments a_{ij} (Aragonés-Beltrán et al, 2014).

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{21} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad \text{where } a_{ji}=1/a_{ij} \text{ ; } i,j = 1,2,\ldots,n$$

In this formula, $a_{ij}>0$, $a_{ji}=1/a_{ij}$, $a_{ii}=1$ and a_{ij} is the decision maker's rating of relative importance of criterion *i* respect to criterion *j*. In case criteria *i* and *j* are equal relative importance then $a_{ij} = a_{ji} = 1$ (Caputo et al, 2008).

Table 1. Saaty's 1-9 scale

Intensity of importance	*Definition*
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2, 4, 6, 8	Intermediate values

Step 3. Local weights (priorities), priorities of elements in the same level, from judgment matrices are calculated. This results in a weight vector shown as

$$W = [w_1, w_2, \ldots, w_n]^T \qquad i=1,2,\ldots,n$$

which is the normalized principal eigenvector of matrix A. For simplicity the elements of the weight vector are computed as the average value of the rows in the normalized pairwise comparison matrix A (Caputo et al, 2013),

$$w_i = \frac{1}{n}\sum_j \left(\frac{a_{ij}}{\sum_i a_{ij}} \right) \qquad i,j = 1,2,\ldots,n$$

Step 4. The consistency ratio (CR) is measured by the help of the following formula

CR = CI / RI

where

$CI = (\lambda_{max} - n)/(n-1)$ and λ_{max} is the largest eigenvalue of A. RI is the average value of CI one would obtain were the entries in A chosen at random, subject that all diagonal entries must equal 1 (Caputo et al, 2013). RI values can be obtained from Table 2 for different *n* values.

Table 2. RI values

n	1	2	3	4	5	6	7	8	9	10	11	12
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.51	1.54

This practice is to ascertain that the experts are consistent in rating the relative importance of the criteria. AHP does not demand perfect consistency but a judgment is only considered acceptable when $CR \leq 0.1$. If the CR value cannot pass such acceptable level, it is certain that the experts make judgments arbitrarily or mistakenly and then they have to do it again (Lee and Chan, 2008).

Step 5. A matrix of pairwise comparison between alternatives is then built for each criterion, following the procedure of Step (2). This allows expressing a judgment about how well any alternative compares to the others respect to the considered criterion (Caputo et al, 2013).

Step 6. A normalized relative rating b_{ij} is computed for each *i*th alternative respect to any judgment criterion C_j, in comparison with the other alternatives. The normalized relative rankings are obtained by applying the same procedure of Steps (2) and (3) to the pairwise alternatives comparison matrices built at Step (5) (Caputo et al, 2013).

Step 7. The final step is obtaining global priorities (including global weights and global scores) by aggregating all local priorities with the application of a simple weighted sum. A ranking score R_i is given to the *i*th alternative simply as;

$$R_i = \sum_j b_{ij} w_j$$

Then the final ranking of the alternatives are determined on the basis of these global priorities.

3. APPLICATION OF AHP TO TOURIST HOTEL LOCATION SELECTION

Denizli is a city in the southwestern part of Turkey and it takes place in the Aegean Region (http://www.goturkey.com/en/city/content/732/climate). The city has a population of 525,497 (http://en.wikipedia.org/wiki/Denizli). Denizli has a rapidly growing industry especially textile and it is one of the leading destination of Turkey in the tourism sector with the culture and tourism values. It is famous with roosters and attracts the tourists all year around with its Hierapolis, Laodikeia, Tripolis, antic cities, hot springs (http://www.kultur.gov.tr/EN,34088/denizli.html), natural wonder Pamukkale with its travertine, forests, botanical and ornithological tourism, diverse thermal spas, slope parachute on Pamukkale, caves, ancient ruins, and tumuli in addition to them; mountaineering, trekking, plateau tourism, biking tours, faith tourism, congress tourism and the other alternative tourism opportunities (http://www.pau.edu.tr/uluslararasi/en/sayfa/about-denizli). Denizli also attracts many visitors to the nearby mineral-coated hillside hot spring of Pamukkale, and with red color thermal water spa hotels Karahayıt, just 5 kilometers north of Pamukkale. Recently, Denizli becomes a major domestic tourism destination due to the various types of thermal waters in Sarayköy, Karahayıt, Pamukkale, Akköy, Buldan, Çardak districts (http://en.wikipedia.org/wiki/Denizli). In Denizli, there are a total of 233 facilities with 18,308 beds which services to tourism. Every year approximately more than 3 million tourists visit Denizli. Especially with the investment in thermal tourism in the next 10 years this number will increase to at least twice (http://www.pamukkale.gov.tr). So there is need to build new hotels to meet the visitors' requirements. Because of these reasons Denizli is seen so attractive for making investments by the entrepreneurs.

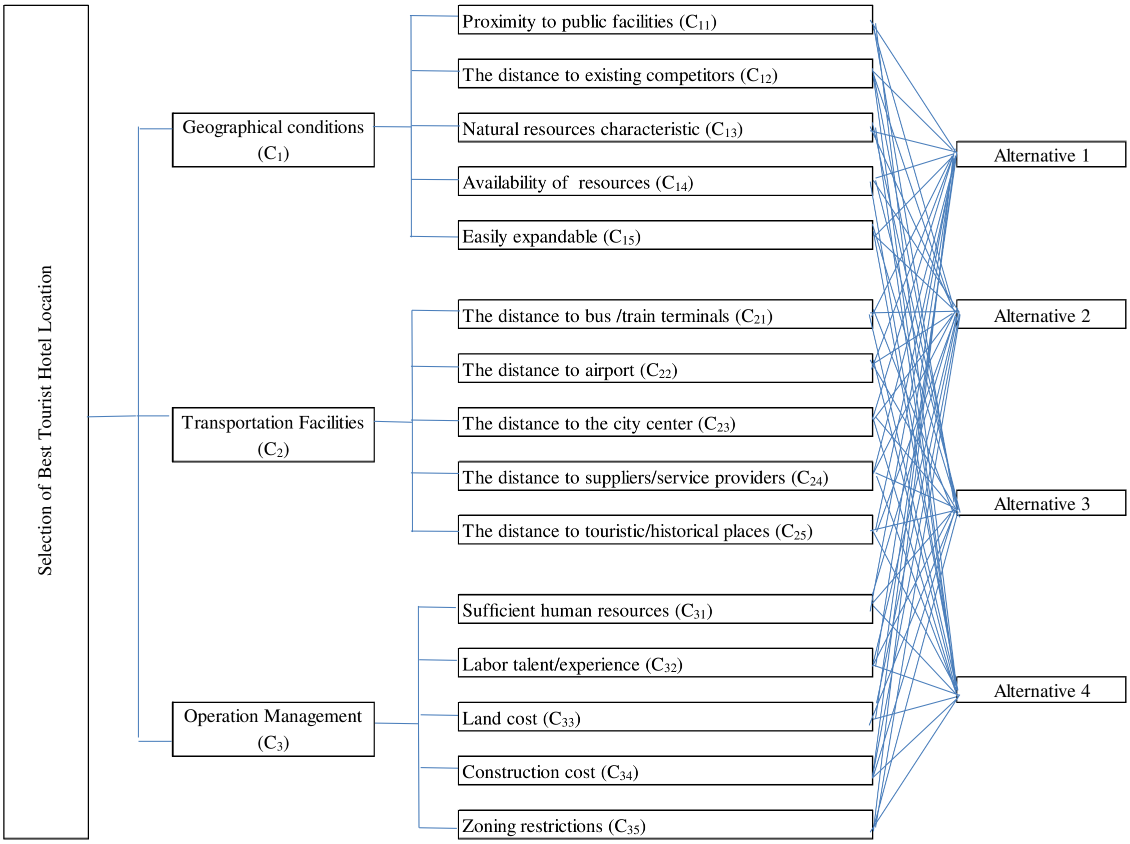
In this part a real case study is considered. Two entrepreneurs have decided to build a new tourist hotel in Denizli. They have four hotel location alternatives around Denizli. They are Pamukkale (A_1), Denizli city center (A_2), Sarayköy (A_3) and Denizli industrial zone (A_4). They want to choose the best hotel location for their new tourist hotel investment. There are many criteria that affect selection process so it is multi-criteria decision making problem. In this study solution of this selection problem is found with AHP method. For selecting the best tourist hotel location with AHP method, 3 main criteria and 15 sub-criteria are taken into consideration. These main criteria and sub-criteria for tourist hotel location selection and short explanation of each sub-criterion are listed in Table 3.

Table 3. Criteria and sub-criteria for tourist hotel location selection

Criteria	***Sub-criteria***	***Explanations***
Geographical Conditions (C_1)	Proximity to public facilities (C_{11})	Accessibility to facilities such as banks and hospitals
	The distance to existing competitors (C_{12})	Agglomeration effect
	Natural resources characteristic (C_{13})	Having characteristics such as thermal water
	Availability of resources (C_{14})	Availability of water, electricity, natural gas, heating
	Easily expandable (C_{15})	Opportunity for constructing additional buildings if it is required
Transportation Facilities (C_2)	The distance to bus/train terminals (C_{21})	Accessibility to bus/train station
	The distance to airport (C_{22})	Accessibility to airport
	The distance to the city center (C_{23})	Accessibility to the city center
	The distance to suppliers/service providers (C_{24})	Accessibility to suppliers/service providers
	The distance to touristic/historical places (C_{25})	Accessibility to touristic/historical places
Operation Management (C_3)	Sufficient human resources (C_{31})	Sufficient workforce
	Labor talent/experience (C_{32})	Qualification of labors
	Land cost (C_{33})	Purchasing price of land
	Construction cost (C_{34})	Cost for constructing building a new hotel
	Zoning restrictions (C_{35})	Regulation restrictions such as building height

Hierarchy structured with criteria, sub-criteria and hotel location alternatives is given in Figure 1. There are four levels in the hierarchy structured for the tourist hotel location selection problem. The overall goal of the decision process determined as "the selection of best tourist hotel location" is on the first level of the hierarchy. The main criteria are on the second level, the sub-criteria are on the third level and hotel location alternatives are on the fourth level of the hierarchy.

Figure 1. Hierarchical structure of tourist hotel location selection process



After structuring the problem as hierarchy, entrepreneurs form pairwise comparison matrices for criteria, sub-criteria by using the 9 point scale given in Table 1. Table 4 and Table 5 show the pairwise comparison matrix for main criteria and the pairwise comparison matrix for the sub-criteria of the first main criterion respectively. These pairwise comparison matrices reflect entrepreneurs' common thought. The pairwise comparison matrices for other criteria don't be given because of the page constraint.

Table 4. The pairwise comparison matrix for main criteria

	C_1	C_2	C_3
C_1	1	5	3
C_2		1	1/3
C_3			1
CR: 0.04			

Table 5. The pairwise comparison matrix for Geographical Conditions (C_1)

C_1	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
C_{11}	1	3	1/3	1/7	1/5
C_{12}		1	1/5	1/9	1/7
C_{13}			1	1/5	1/3
C_{14}				1	3
C_{15}					1
CR: 0.05					

Calculations are obtained by the help of computer software called Expert Choice. Consistency ratios of the pairwise comparison matrices are calculated. They are less than 0.10 so the importance weights are accepted as consistent and they are used as an input in the selection process. The results obtained from the computations based on the pairwise comparison matrices are shown in the Table 6.

Table 6. Importance weight of criteria and sub-criteria

Geographical Conditions (63.70 %)	Proximity to public facilities (6.34 %)
	The distance to existing competitors (3.33 %)
	Natural resources characteristic (12.9 %)
	Availability of resources (51.28 %)
	Easily expandable (26.15 %)
Transportation Facilities (10.47 %)	The distance to bus/train terminals (20.1 %)
	The distance to airport (20.1 %)
	The distance to the city center (8.62 %)
	The distance to suppliers/service providers (4.27 %)
	The distance to touristic/historical places (46.91 %)
Operation Management (25.83 %)	Sufficient human resources (5.29 %)
	Labor talent/experience (5.29 %)
	Land cost (51.4 %)
	Construction cost (12.23 %)
	Zoning restrictions (25.8 %)

The same procedure is followed for the alternatives. The entrepreneurs are asked to establish the pairwise comparison matrices by comparing alternatives under each criterion separately. As a result of this process, 15 pairwise comparison matrices for alternatives under each criterion are formed and all of them is found as consistent. As an example one of them is given in Table 7.

Table 7. The pairwise comparison matrix for the alternatives under proximity to public facilities (C_{11})

C_{11}	A_1	A_2	A_3	A_4
A_1	1	1/3	5	3
A_2		1	7	5
A_3			1	1/3
A_4				1
CR: 0.04				

The results obtained from the computations based on the pairwise comparison matrices are shown in the Table 8.

Table 8. Importance weight of hotel location alternatives

A_1	33.38 %
A_2	31.20 %
A_3	17.47 %
A_4	17.95 %

Alternative 1 which has the highest importance weight is selected as the best tourist hotel location. The ranking order of the alternatives with AHP method is A_1, A_2, A_4 and A_3. The entrepreneurs have found the application results satisfactory and decided to select first alternative for tourist hotel location.

4. CONCLUSIONS

Tourist hotel location selection involves complex decision making situations that require efficient methods to make decisions. So in this study AHP is used as a decision making method that allows the consideration of multiple criteria. This method helps decision makers choose the best solution from several alternatives and selection criteria. In order to select the best hotel location 3 main criteria and 15 sub-criteria are taken into consideration. As a result of main criteria comparison C_1 (Geographical Conditions) is the most important criteria with the importance weight 63.7 % and it is followed by C_3 (Operation Management) with 25.83 % and C_2 (Transportation Facilities) with 10.47 %. Finally A_1 (Pamukkale) is selected as a best tourist hotel location alternative, after comparing alternatives with respect to each main and sub-criterion.

Results demonstrate that the method can provide a framework to assist entrepreneurs in analyzing location criteria and making an objective location selection. Also they can understand the organizational goal and decision process. They gain competitive advantage and go one step further by making efficient location selection.

In future studies, other MCDM methods can be used for tourist hotel location selection and results from different methods can be compared. Additional criteria can be taken into consideration to meet changing profile of customers. And the proposed method in the study can also be applied in other sectors of tourism, such as airlines, restaurants and shopping.

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