A FUZZY APPROACH FOR HOTEL LOCATION SELECTION IN MUGLA, TURKEY

Ali Fuat Guneri[1], Muhammet Gul[1] and Mehmet Lok[1]

[1]*Department of Industrial Engineering, Yıldız Technical University, 34349, Besiktas, Istanbul, TURKEY*
mgul@yildiz.edu.tr, guneri@yildiz.edu.tr, mehmet_lok@msn.com

ABSTRACT

In recent years, there is a growth trend in hospitality industry together with positive economic development in Turkey. The selection of hotel location is of high priority and significance for domestic and foreign entrepreneurs. It is also complex and challenging due to the involvement of multiple decision makers, the multi-criteria nature of the decision process and the subjectivity and uncertainty in the decision making process. To effectively solve this problem, this paper aims to determine the importance of the criteria on hotel location via Fuzzy Analytic Hierarchy Process (FAHP) and to select the optimal via Fuzzy Technique for Order Preference By Similarity To An Ideal Solution (FTOPSIS) from a number of potential locations in Mugla which is a city in the top three by the number of tourists. As a result, FTOPSIS method combined with FAHP is an efficient decision tool and it can successfully be applied in solving hotel location selection problem for a real case.

Keywords: FAHP, FTOPSIS, hotel location selection, multi criteria decision making.

INTRODUCTION

The competition in the hospitality sector is increasing day by day as well as in other sectors. With the growth in the transportation systems, peoples want to see all around the world, they want to spend their holiday on other cities and other countries, and they want to discover new places. Hospitality managers working on how to be more chosen by these people and how to provide permanency; they want to sell all of the rooms, they want to spend all season nearly full capacity. At the same time, reducing the passengers' costs, enforce the return ratio efficiency of guest rooms and enhance total operating performance are keeping managers' minds busy. At this point, location is one of the most important factors for a new hotel establishment. Newell and Seabrook (2006) evaluate the decision-making process of hotel investment, and identify location as one of the five key criteria. We can mention that the influential factors for hotels to achieve success are reputation, building style, financial structure, marketing, staffs' quality, and initial location selection. But location is the significant factor influencing operation performance in the future (Chou et al., 2008). When located, it can be of high cost for relocation and reconfiguration (Urtasun and Gutiérrez, 2006). On the other hand, the hotel's location is an essential factor that strongly influences a tourist's hotel selection decision (Chou et al., 2008).

The importance of location cannot be overemphasized. Many studies have investigate determinants of hotel location (Yang et al., 2012). These include geographical conditions, traffic conditions, hotel characteristic and operation management (Chou et al., 2008). There are many methods developed for location selection. Especially in the service industry, Chen (1996) applies mathematical programming for a location selection model for distribution centers. Teng (2000) uses multi-criteria decision-making method on the site selection of restaurants.

In this paper, we use FAHP and FTOPSIS methods. First, we use FAHP for weighting the criteria, then FTOPSIS for evaluation of the alternatives. AHP is one of the most using techniques for facility location, but it has not been used FAHP and FTOPSIS together for hotel location selection yet. We use fuzzy numbers in this work, because the thoughts on those criteria are not crisp and it may indicate some subjectivity. The location decision problem shows qualitative and quantitative characteristics in the same time. Because of that it's complicated to solve this problem and it's fit for using fuzzy multiple criteria decision analysis.

RELATED WORKS

Importance of the location decision is studied in the literature. There are a lot of methods developed for location decision. In the service industry, while Tengilimoglu (2001) studies on hospital location, some others such as Tzeng et al. (2002) for restaurant location, Cheng et al. (2005) for shopping mall location, Catay (2011) for fire station location.

AHP is a common method for location decision (Chou et al., 2008). Aras et al. (2004) try to select the best location of wind observation station by AHP. In the other hand TOPSIS is a less preferred method for location decision against AHP, but it's useful for evaluating alternatives' specialties. Kengpol at al. (2013) use TOPSIS for selection of solar power plant locations.

Also, there is a few works considering hotel location selection. Ertugral (1998) makes a criteria analysis for 4 and 5 star hotels in Istanbul. He makes a survey about hotel location criteria with tourism experts and as a result, he found that "touristic attractiveness of the area" as the most important criteria. Gray and Liguori (2003) define the most important criteria as "local economic environment, legislation, building height, auto parks, public areas, traffic and transportation, geographical factors, natural resources and land size". Urtasun and Gutierrez (2006) point the importance "geographical location, room price, room size, the services". Chou et al. (2008) develop a fuzzy multi criteria model and evaluated twenty one criteria including; geographical location (Surrounding environment, rest resources), traffic conditions (accessibility, convenience), the hotel characteristics (internal and external development), and operations management (human resources, operating conditions). Yang et al. (2012) use ordered logit model for an evidence from hotels in Beijing and used accessibility, agglomeration effect, public goods and services, urban development as the key factors. Ar et al. (2014) make an approach for Rize (one of the North-Eastern city of Turkey), and they evaluate three alternatives and use land size, surrounding environment, transportation, operating costs, legislation, local people and location main criteria, as a result they point that location selection is a strategic decision and it is hard to change facilities location. It effects long term costs and especially revenues. In the other hand, they advert that decision selection process include some uncertainties and risks.

It is difficult to express the character and significance of criteria exactly or clearly through traditional methods. We mentioned that pure AHP isn't enough to solve to the location decision process because the subjectivity and uncertainty in the decision making process. In this paper, we use FAHP for weighting criteria and FTOPSIS for evaluating alternatives. Due to the first study combining FAHP and FTOPSIS, this study contributes significant view to the literature.

METHODOLOGY

3.1 Fuzzy AHP

Fuzzy AHP is one of the extensively used multi-criteria decision-making methods based on fuzzy set theory. AHP doesn't still specify the subjective thinking style. So, FAHP is developed to solve hierarchical fuzzy problems. There are many FAHP methods proposed by various authors. Buckley (1985) determines fuzzy priorities of comparison ratios whose membership functions trapezoidal. Chang (1996) introduces a new approach for handling FAHP, with the use of triangular fuzzy numbers for pair wise comparison scale of FAHP, and the use of the extent analysis method for the synthetic extent values of the pair wise comparisons. In our study we use the method of Buckley's (1985). Because in other methods, there are some limitations. For example, the extent analysis method could not make full use of all the fuzzy comparison matrices information, and might cause an irrational zero weight to the selection criteria (Chan and Wang, 2013). The procedure of the method is defined in four steps in the following (Tzeng and Huang, 2011; Gul et al. 2012).

Step 1: Pair wise comparison matrices are constructed among all the elements/criteria in the dimensions of the hierarchy system. Linguistic terms to the pair wise comparisons are assigned by asking which is the more important of each two elements/criteria, such as.

$$\tilde{M} = \begin{pmatrix} 1 & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ \tilde{a}_{21} & 1 & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \cdots & 1 \end{pmatrix} = \begin{pmatrix} 1 & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ 1/\tilde{a}_{21} & 1 & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/\tilde{a}_{n1} & \tilde{a}_{n2} & \cdots & 1 \end{pmatrix}$$

(1)

$$\tilde{a}_{ij} = \begin{cases} \tilde{1},\tilde{3},\tilde{5},\tilde{7},\tilde{9} & \text{criterion } i \text{ is of relative importance to criterion } j \\ 1 & i = j \\ \tilde{1}^{-1},\tilde{3}^{-1},\tilde{5}^{-1},\tilde{7}^{-1},\tilde{9}^{-1} & \text{criterion } j \text{ is of relative importance to criterion } i \end{cases}$$

(2)

Step 2: Using the geometric mean technique the fuzzy geometric mean matrix is defined.

$$\tilde{r}_i = \left(\tilde{a}_{i1} \otimes \tilde{a}_{i2} \otimes \cdots \otimes \tilde{a}_{in} \right)^{1/n}$$

(3)

Step 3: Fuzzy weights of each criterion is calculated by the equation (4) below.

$$\tilde{w}_i = \tilde{r}_i \otimes \left(\tilde{r}_1 \oplus \tilde{r}_2 \oplus \cdots \oplus \tilde{r}_n \right)^{-1}$$

(4)

Here, $\tilde{w}_i$ is the fuzzy weight of criterion *i*. And $\tilde{w}_i = (lw_i, mw_i, uw_i)$.

Here, lw_i , mw_i , uw_i justify lower, middle and upper value of the fuzzy weight of criterion *i*.

Step 4: To find the best non-fuzzy performance (BNP), CoA (center of area) method is used as in the eq. (5)

$$w_i = [(uw_i - lw_i) + (mw_i - lw_i)] / 3 + lw_i$$

(5)

3.2 Fuzzy TOPSIS

The Technique for Order Preferences by Similarity to an Ideal Solution (TOPSIS) was developed by Hwang and Yoon (1981) to determine the best alternative based on the concepts of the compromise solution. The compromise solution can be regarded as choosing the solution with the shortest distance from the ideal solution and the farthest distance from the negative ideal solution. Since the preferred ratings usually refer to the subjective uncertainty, it is natural to extend TOPSIS to consider the situation of fuzzy numbers (Tzeng and Huang, 2011).

The procedure of the FTOPSIS method is defined in six steps in the following (Tzeng and Huang, 2011):

Step 1: The set of alternatives and criteria are determined. While $A = \{A_k \mid k = 1, ..., n\}$ shows the set of alternatives, $C = \{C_j \mid j = 1, ..., m\}$ represent the criteria set. Where $X = \{X_{kj} \mid k = 1, ..., n;\ j = 1, ..., m\}$ denotes the set of fuzzy ratings and $\tilde{w} = \{\tilde{w}_j \mid j = 1, ..., m\}$ is the set of fuzzy weights.

Step 2: Normalized ratings are determined by eq. (6).

$$\tilde{r}_{kj} = \frac{\tilde{x}_{kj}}{\sqrt{\sum_{k=1}^{n} \tilde{x}_{kj}^2}}, \quad k = 1, ..., n;\ j = 1, ..., m$$

(6)

Step 3: Weighted normalized ratings are determined by eq. (7).

$$\tilde{v}_{ij}(x) = \tilde{w}_j \tilde{r}_{ij}(x), \quad k = 1, ..., n;\ j = 1, ..., m$$

(7)

Step 4: The fuzzy positive ideal point (PIS) and the negative ideal point (NIS) are derived as in eqs. (8-9). Where J_1 and J_2 are the benefit and the cost attributes, respectively.

$$\text{FPIS}=\tilde{A}^{+} = \{\tilde{v}_1^{+}(x), \tilde{v}_2^{+}(x), ..., \tilde{v}_j^{+}(x)\} = \{(\underset{k}{mak}\,\tilde{v}_{kj}(x) \mid j \in J_1), (\underset{k}{\min}\,\tilde{v}_{kj}(x) \mid j \in J_2) \mid k = 1, ..., n\}$$

(8)

$$\text{FNIS}=\tilde{A}^{-} = \{\tilde{v}_1^{-}(x), \tilde{v}_2^{-}(x), ..., \tilde{v}_j^{-}(x)\} = \{(\underset{k}{\min}\,\tilde{v}_{kj}(x) \mid j \in J_1), (\underset{k}{mak}\,\tilde{v}_{kj}(x) \mid j \in J_2) \mid k = 1, ..., n\}$$

(9)

Step 5: Similar to the crisp situation, the next step is to calculate the separation from the FPIS and the FNIS between the alternatives. The separation values can also be measured using the Euclidean distance as in eqs.(10-11):

$$\tilde{S}_k^{+} = \sqrt{\sum_{k=1}^{m} [\tilde{v}_{kj}(x) - \tilde{v}_j^{+}(x)]^2}, \quad k = 1, ..., n$$

(10)

$$\tilde{S}_k^{-} = \sqrt{\sum_{j=1}^{m} [\tilde{v}_{kj}(x) - \tilde{v}_j^{-}(x)]^2}, \quad k = 1, ..., n$$

(11)

Step 6: Then, the defuzzified separation values are derived using the CoA (centre of area) defuzzification method, such as, to calculate the similarities to the PIS. Next, the similarities to the PIS are given as eq.(12).

$$C_k^{*} = D(S_k^{-}) / [D(S_k^{+}) + D(S_k^{-})], \quad k = 1, ..., n$$

(12)

Finally, the preferred orders are ranked according to C_k^{*} in descending order to choose the best alternatives.

EMPIRICAL STUDY

In this stage, a numerical example is illustrated and the gathering data is used for selecting hotel location according to decision maker or expert preference. As the numerical example, three alternatives from Mugla, where one of the most visited touristic places in Turkey, are set and the mentioned FAHP-FTOPSIS method is used for ranking the alternatives. Following steps of the study are shown in the Figure 1.

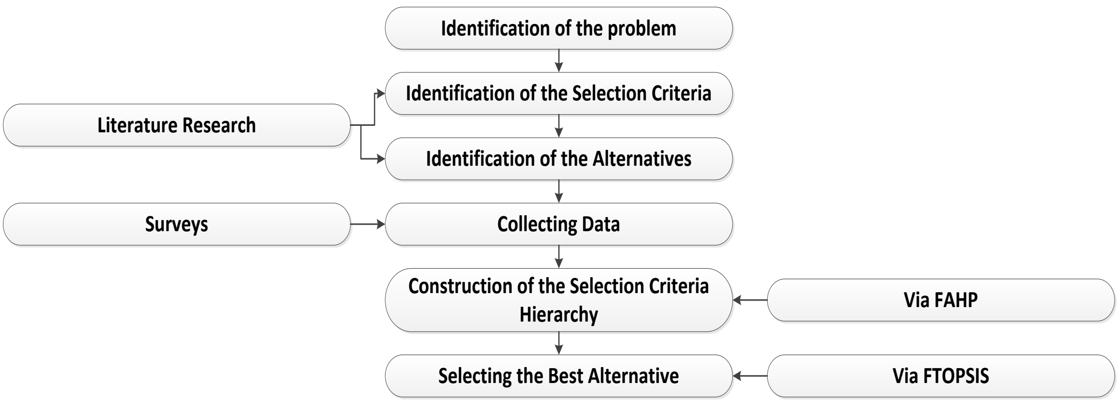

Figure 1: The evaluation procedure

4.1 Selection criteria

As a result of research conducted in the literature, the seven criteria that given Table 1 is used for evaluating the alternatives but unlike the other studies "Operating Costs" criterion include land cost and other costs and "Location" criterion basically refers to the proximity to the natural beauties. Other descriptions are given in the Table 1.

Table 1: Selection criteria, brief description and sources

Criteria	Description	Literature
Land Size (C_1)	Size of the evaluating area	Crecente et al. (2012), Ar et. Al. (2014
Surrounding Environment (C_2)	Distance to the public facilities such as theatre or large park, nearby recreational activities and leisure facilities	Chou et al. (2008), Yang et al. (2012) , Ar et al. (2014)
Transportation (C_3)	The distance to airport or freeway, the distance to downtown area, the distance to tourism scenic spots, variety of transportation modes	Chou et al. (2008), Yang et al. (2012), Ar et al. (2014)
Operating costs (C_4)	Land cost, human resource, quality of manpower, the average salaries in the area.	Chou et al. (2008), Ar et al. (2014)
Legislation (C_5)	Legal rules is good for hotel developing or not	Crecente et al (2012) Ar et al. (2014)
Local people (C_6)	Local people's behavior against tourism and tourists	Ar et al. (2014)
Location (C_7)	Geographical location of the facility	Crecente et al. (2012), Ar et al. (2014)

4.2. Alternatives

This empirical study is conducted for Mugla because so many alternatives is available in the province and also number of annually visitors rising day by day and with 1.124 km has the longest coastline in Turkey (Baldemir, 2013). Three alternatives are available to this empirical study and the details of these alternatives are described as follows and also the geographical locations are shown in the Figure 2.

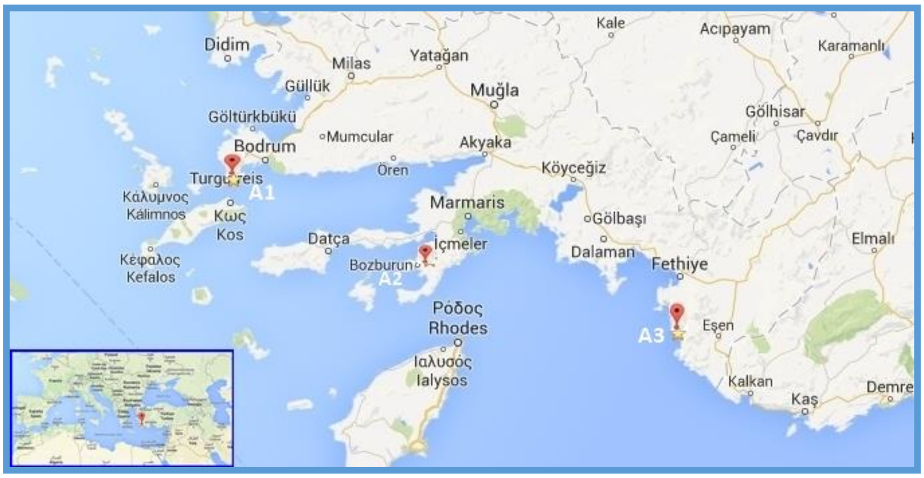

Figure 2: Map of the alternative hotel locations

Alternative 1 (A_1): The area is located in the Akyarlar which is a village of the Bodrum district with a nice beach and sparkling sea. Size of the area is 11300 m^2. It is 21 km away from Bodrum district center and 58 km from Milas-Bodrum airport. One of the most convenient ways to travel to Bodrum is to take a direct flight from any of the airports in Turkey to Milas-Bodrum Airport in Mugla. Shuttle services and other transportation vehicles stationed outside of the gates will transfer you to Bodrum in the shortest time possible. Also Bodrum district is one of the most popular holiday destinations rich in natural beauties in Turkey. Organizing many festivals and events amidst the unique and colorful nature and welcomes participants from all over the world. Furthermore, the Bodrum International Dance Festival, Europe's most comprehensive dance festival including more than 80 performances, is held every year in May. Also the area's nearby locations are very famous touristic destinations in Turkey (www.goturkey.com).

Alternative 2 (A_2): This area is located in Selimiye which is a village of the Marmaris district of Mugla province. Size of the area is 14000 m^2. The site is 35 km away from Marmaris is situated in the province of Mugla which has highly advanced transportation facilities. The district accessible in a short time both via airway or highway. Also Sıgliman Bay which is one of Turkey's leading marina, also located in Selimiye. Mugla Dalaman Airport receiving direct flights from nearly all cities in Turkey is very close to all the districts located in Mugla province. The shuttle services and other transportation vehicles stationed outside the exit gates of the airport will take you to Marmaris within a short time. Moreover there is many activities organizing in Marmaris including The International Marmaris Maritime and Spring Festival organized annually in May with participants from all over the world, is celebrated with various activities such as competitions, concerts and dance shows. Held in June every year, the Marmaris Motorcycle Festival is an international festival offering a rich program including motorcycle driving tours and concerts. Also the historical and cultural monuments of the ancient cities shed light on the history of the region (www.goturkey.com).

Alternative 3 (A_3): This area is located in Uzunyurt-a village of Fethiye district. Size of the area is 30000 m^2. This site is nearly twice of the others, very close to the sea but also has a disadvantage that hasn't got a border of seaside. 25 km away from Fethiye district center. It is possible to get to Fethiye either by plane or by bus. There are direct flights between Istanbul and Mugla Dalaman Airport which is 55 km away from Fethiye. The shuttles and similar transportation facilities leaving from the airport will take you to your destination. Fethiye is situated on one of the major highway conjunctions and easy to reach by bus from every province. Some bus companies offer direct trips to Fethiye while others offer fares directly to Mugla where passengers to Fethiye can get on shuttles or minibuses that leave from the city bus terminal. Also there are activities nearby of the site. Such as, International Oludeniz Air Games Festival is performed in October every year and the site of many colorful events. The Lycian Way Ultra Marathon, which starts in Oludeniz and covers a distance of 509 km, in September every year. On the other hand, the numerous panels and exhibitions organized at the annual Fethiye Culture and Art Festival, turn the town literally into a cultural center (www.goturkey.com).

4.3. Construction of the criteria hierarchy

Step 1: Pair wise comparison matrix is constructed with gaining information from three experts and one academician. The information matrices integrated via geometric mean. The integrated pair wise matrix is given in Table 3. Linguistic terms to the pair wise comparisons are assigned by asking which is the more important of each two criteria and the linguistic scale for the comparison is given in Table 2 (Chou, 2008).

Table 2: Linguistic scale for importance

Linguistic scale for importance	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Just equal (JE)	(1, 1, 1)	(1, 1, 1)
Equally important (EI)	(1/2, 1, 3/2)	(2/3, 1, 2)
Weakly more important (WMI)	(1, 3/2, 2)	(1/2, 2/3, 1)
Strongly more important (SMI)	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly more important (VSMI)	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Absolutely more important (AMI)	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

The consistency index for defuzzied version of pair wise comparison matrix is calculated as; 0,034 via related equations. Due to CI<0.1, this matrix is acceptable (Wang & Chen, 2008).

Step 2: Fuzzy weights of each criterion is calculated via Buckley's geometric mean method and the results is given in Table 3, also defuzzied and normalized weights of each criteria are given in the Table 3.

Table 3: Fuzzy weights of each criterion

	l	*m*	*u*	Normalized and non-fuzzy weights of each criterion
W_1	0,062296	0,119285	0,224955	0,120319459
W_2	0,071697	0,132509	0,245723	0,133162043
W_3	0,082415	0,150948	0,270053	0,148991968
W_4	0,098195	0,17985	0,317597	0,176287436
W_5	0,071532	0,129023	0,243104	0,131306279
W_6	0,062528	0,112932	0,227702	0,119320807
W_7	0,096783	0,175453	0,30423	0,170612008

Priority weights calculated after the normalization as (0,120; 0,133; 0,149; 0,176; 0,131; 0,119; 0,171). Then, the determined criteria's weights and priority values of hotels location decisions are close to each other. "Operating costs (C_4)" criterion comes out as having the highest priority (0,176). After that, the highest priority belongs to "location (C_7)" criterion that we define as the proximity to the natural beauties.

Step 3: In this stage, for evaluating the alternatives via FTOPSIS and using the determined weights from step 2, we also gather the data from the mentioned experts. For each expert with the same importance, this study employs the method of average value to integrate the fuzzy judgment values of different experts. Linguistic scale for rating each alternatives is given in the Table 4.

Table 4: Linguistic scale for the alternatives

Linguistic scale for the alternatives	
Very Bad (VB)	(0; 0; 1)
Bad (B)	(0; 1; 3)
Average Bad (AB)	(1; 3; 5)
Average (A)	(3; 5; 7)
Average Good (AG)	(5; 7; 9)
Good (G)	(7; 9; 10)
Very Good (VG)	(9; 10; 10)

Step 4: First, we take the average of each evaluators' alternative vs. criteria matrices and then, using Eq. (6), we normalize the fuzzy-decision matrix. After that, using eq. (7) we determine the normalized fuzzy weighted decision matrix. Here, the weights from Table 4 is normalized and using the construction of the Table 6. After that, we used the Table 6 to non-fuzzy via CoA. New results are given in Table 7. The fuzzy positive ideal points (PISs) and the negative ideal points (NISs) are calculated by eqs. (8-9) and shown in the Table 8.

Table 5: Normalized fuzzy-weighted decision matrix

	C_1			C_2			C_3			C_4			C_5			C_6			C_7	
	l	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*	*l*	*m*	*u*	*l*	*m*
	0.013	0.051	0.176	0.037	0.088	0.206	0.038	0.108	0.292	0.036	0.112	0.335	0.033	0.087	0.235	0.027	0.071	0.21	0.057	0.124
	0.013	0.051	0.176	0.03	0.079	0.201	0.03	0.09	0.27	0.036	0.112	0.344	0.026	0.076	0.235	0.025	0.069	0.21	0.047	0.115
	0.033	0.094	0.261	0.019	0.058	0.17	0.013	0.054	0.189	0.023	0.082	0.269	0.016	0.056	0.184	0.017	0.053	0.177	0.012	0.043

Table 6: Non-fuzzy form of Table 6

	C_1	C_2	C_3	C_4	C_5	C_6	C_7
A_1	0.080	0.111	0.146	0.162	0.119	0.103	0.146
A_2	0.080	0.104	0.130	0.165	0.113	0.102	0.140
A_3	0.130	0.083	0.086	0.125	0.086	0.083	0.066

Table 7: PIS and NIS values

$\tilde{A}^+$	0.130	0.111	0.146	0.165	0.119	0.103	0.146
$\tilde{A}^-$	0.080	0.083	0.086	0.125	0.086	0.083	0.066

Similar to the crisp situation, the next step is to calculate the separation from the FPIS and the FNIS between the alternatives. The separation values are also measured using the Euclidean distance as in eqs. (10-11). Also FTOPSIS results are shown in the Table 9. Normalized final rankings are derived as in Table 10.

Table 8: FTOPSIS results

PIS	NIS	FTOPSIS result
0.050	0.117	0.702
0.053	0.102	0.658
0.118	0.050	0.296

Table 3: Final rankings

Alternatives	Normalized rankings
A_1	0.424 **(1)**
A_2	0.397 (2)
A_3	0.179 (3)

From the proposed methods-FAHP and FTOPSIS, we find out the best alternative as (A_1). And the most important criterion is operating costs (C_4).

CONCLUSIONS, LIMITATIONS AND FUTURE WORK

This article presents a hybrid fuzzy multi-criteria decision model for selecting a hotel location for the city, Mugla. We use FAHP and FTOPSIS methods in order to find the most appropriate location with the aid of an easy-to-understand empirical study. Results show that the hybrid model can provide a framework to help entrepreneurs in analyzing location factors and making an objective location selection. First, based on the requirements and the demands of the decision makers the hotel location selection criteria are determined. Then, the alternative locations are investigated and determined likewise by the experts. After determining the hotel location selection criteria and alternative locations, Buckley's FAHP methodology is applied. Specifically, the importance/weights of the hotel location selection criteria are obtained based on the triangular fuzzy preference scales. Then these weights are used in selection process of alternative locations via FTOPSIS. To the best of our knowledge, a study that is mainly concerned about hotel location selection by FAHP-FTOPSIS hybrid method is not yet available. It should be acknowledged that the current study has some limitations. First one is the independent structure of the selection criteria. Since the comparisons are made in pair wise style, reaching the true optimal may not be possible. Also, some additional criteria that are not mentioned in the literature can appear with respect to the hospitality sector. The second one is about consideration of the number of alternative locations. In the current study, we compare three alternatives but this can vary related to the flexibility of the entrepreneurs. For future studies, some of the other MCDM techniques with their fuzzy versions such as PROMETHEE, GRA, MOORA, ELECTRE, and so on can be used in combination of the ones used in this study to assess the viability and utility of new hybrid methodologies.

REFERENCES

Newell, G., & Seabrook, R. (2006). Factors influencing hotel investment decision making. Journal of Property Investment & Finance, 24(4), 279-294.

Chou, T. Y., Hsu, C. L., & Chen, M. C. (2008). A fuzzy multi-criteria decision model for international tourist hotels location selection. International journal of hospitality management, 27(2), 293-301.

Urtasun, A., & Gutiérrez, I. (2006). Hotel location in tourism cities: Madrid 1936–1998. Annals of Tourism Research, 33(2), 382-402.

Yang, Y., Wong, K. K., & Wang, T. (2012). How do hotels choose their location? Evidence from hotels in Beijing. International Journal of Hospitality Management, 31(3), 675-685.

Chen, C. Y. (1996). Delivery systems of distribution centers in Taiwan. Journal of the Chinese Institute of Transportation, 9(1), 65-80.

Teng, M. H. (2000). Application of multi-criteria decision making for site selection of restaurants: case study of Pao-San restaurant. Journal of Living Science, 6, 47-62.

Tengilimoglu, D. (2001). Hastane secimine etkili olan faktorler: Bir alan uygulaması. İktisadi ve İdari Bilimler Fakultesi Dergisi, 3(1), 1-13.

Tzeng, G. H., Teng, M. H., Chen, J. J., & Opricovic, S. (2002). Multicriteria selection for a restaurant location in Taipei. International Journal of Hospitality Management, 21(2), 171-187.

Cheng, E. W., Li, H., & Yu, L. (2005). The analytic network process (ANP) approach to location selection: a shopping mall illustration. Construction Innovation: Information, Process, Management, 5(2), 83-97.

Catay, B. (2011). İstanbul'da itfaiye istasyonu yer seciminde risk faktorune dayali bir coklu kapsama yaklasimi. Endustri Muhendisligi Dergisi, 22(2), 33-44.

Aras, H., Erdogmus, S., & Koc, E. (2004). Multi-criteria selection for a wind observation station location using analytic hierarchy process. Renewable Energy, 29(8), 1383-1392.

Kengpol, A., Rontlaong, P., & Tuominen, M. (2013). A Decision Support System for Selection of Solar Power Plant Locations by Applying Fuzzy AHP and TOPSIS: An Empirical Study.

Ertugral, S.M. (1998), "Otel İsletmelerinde Kurulus Yeri Secimi: İstanbul'daki Dort ve Bes Yildızli Oteller ile İlgili Bir Alan Arastirmasi", Anatolia: Turizm Arastirmalari Dergisi, 9, 33-38.

Gray, W.S., Liguori, S.C., 1998. Hotel and Motel Management and Operations, third ed. Prentice-Hall, Englewood Cliffs, NJ.

Ar, İ. M., Baki, B., & Ozdemir, F. (2014). Kurulus Yeri Seciminde Bulanik AHS-VIKOR Yaklasiminin Kullanimi: Otel Sektorunde Bir Uygulama. Uluslararası İktisadi ve İdari İncelemeler Dergisi, 13(13), 93-114.

Buckley, J.J. (1985) "Fuzzy Hierarchical Analysis", Fuzzy Sets and Systems, Vol. 17 No. 3, pp. 233–247.

Chang, D.Y. (1996) "Applications of the Extent Analysis Method on Fuzzy AHP", European Journal of Operational Research, Vol. 95 No. 3, pp. 649-655.

Chan, H.K., and Wang, X. (2013) "Fuzzy Extent Analysis for Food Risk Assessment", In Fuzzy Hierarchical Model for Risk Assessment (pp. 89-114). Springer London.

Tzeng, G.H., and Huang, J.J. (2011). Multiple attribute decision making: methods and applications. CRC Press.

Gul, M., Celik, E., Guneri, A. F., & Gumus, A. T. (2012). Simulation with integrated multi criteria decision making: An application of scenario selection for a hospital emergency department. Istanbul CommerceUniversity Journal of Science, 22, 1-18.

Hwang, C.L., ve Yoon, K., (1981), Multiple Attribute Decision Making-Methods and Applications: A State of the Art Survey, Springer, New York.

Crecente, J. M., Santé, I., Díaz, C., & Crecente, R. (2012). A multicriteria approach to support the location of thalassotherapy (seawater therapy) resorts: Application to Galicia region, NW Spain. Landscape and Urban Planning, 104(1), 135-147.

Baldemir, E., & Akyurt Kurnaz, H. (2013). İcelerin turizm potansiyellerinin analitik hiyerarsi yontemi ile siralanmasi: Mugla ornegi. Sosyal bilimler ensitusu dergisi, (30), 51-67.

http://www.goturkey.com