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RESEARCH ARTICLE

Determining Online Travel Planning with AHP and TOPSIS Methods

Çevrimiçi Seyahat Planlamalarının AHP ve TOPSIS Yöntemleri ile Belirlenmesi

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ABSTRACT

Online shopping has become increasingly popular in recent years. Online shopping transactions, which are frequently carried out by consumers all over the world, are also very common in the tourism sector. Users avail themselves of a variety of alternative platforms such as websites, social media or recommendation systems in order to realize their travel plans. Travel transactions can be performed through many applications and platforms. Therefore, it is becoming increasingly important to make the right choice of platform in order to perform faster transactions and make the right decisions. Accordingly, it can sometimes be a difficult process for the user who intends to plan a journey choosing the most suitable online platform from among many alternatives. This study investigated which criteria are important in order to make online travel transactions. In addition, the study included research into which platforms the users can choose in accordance with the determined criteria. Thus, the correct order of the alternatives that people can choose is revealed. In the study, AHP and TOPSIS methods, which are multi-criteria decision-making methods, were preferred. Content quality, usefulness, satisfaction, interaction opportunity, accessibility and web design criteria were used as the main criteria. In addition, sub-criteria of the main criteria were also evaluated. Alternative options were determined such as websites, blogs, Instagram, Facebook, Twitter, Google Comments. The study concludes that the content quality feature is the most important criterion in online travel transactions. Of all the online platforms, websites took the first place among the determined alternatives.

Keywords: Travel planning, AHP, TOPSIS, social media

ÖZ

Online alışveriş günümüzde oldukça popüler hale gelmiştir. Tüm dünyada sıklıkla kullanılan bu işlemler turizm sektöründe de oldukça yaygındır. Kullanıcılar seyahat planlamalarını gerçekleştirmek adına web siteleri, sosyal medya veya öneri sistemleri gibi alternatif platformları kullanabilmektedirler. Bu bağlamda seyahat işlemleri birçok uygulama ve platform üzerinden yapılabilmektedir. Bu yüzden hızlı işlem yapıp doğru kararlar verebilme adına kullanılacak olan platform önem kazanmaktadır. Buna göre seyahat planlaması yapacak olan kullanıcının birçok alternatif içerisinden en uygun olanı seçmesi bazen zor bir süreç olabilmektedir. Bu çalışmada online olarak seyahat işlemlerini yapabilmek adına hangi kriterlerin önemli olduğu araştırılmıştır. Bununla beraber kullanıcıların belirlenmiş kriterler doğrultusunda hangi platformları tercih edebileceği de araştırılmıştır. Böylelikle kişilerin seçeceği alternatifler içerisinden doğru sıralamanın hangisi olduğu ortaya konulmuştur. Çalışmada çok kriterli karar verme yöntemlerinden AHP ve TOPSIS yöntemleri tercih edilmiştir. Çalışmada ana kriterler olarak içerik kalitesi, kullanışlılık, memnuniyet, etkileşim imkanı, erişilebilirlik ve web tasarımı kriterleri kullanılmıştır. Ayrıca ana kriterlerin alt kriterleri de değerlendirilmeye alınmıştır. Alternatif seçenekler ise web siteleri, bloglar, Instagram, Facebook, Twitter, Google Yorumlar olarak belirlenmiştir. Çalışma sonucunda online seyahat işlemlerinde içerik kalitesi özelliği en önemli kriter olmuştur. Belirlenmiş alternatifler içerisinden ilk sırayı web siteleri almıştır.

Anahtar Kelimeler: Seyahat planlaması, AHP, TOPSIS, sosyal medya

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1. INTRODUCTION

In parallel with developments in information and communication technologies, the trend of online shopping has become very popular all over the world. In this context, online tools are frequently used to meet the needs of people. The fact that online shopping has become so easy and convenient has brought innovations into the field of tourism as well as into many other sectors. (Tseng, 2017). Users can carry out their tourism activities through online websites, mobile applications or social networks. They can make plans according to their needs using their chosen online applications or websites. Therefore, research should be conducted into which applications among the many on offer are important for online travel planning. Consideration should be given to the quality elements of the digital platforms preferred by users .

Along with websites, social media platforms are used effectively in determining the travel plans of people. Social media tools play an important role in people's preferences by transferring their travel experiences and impressions to other users (Narangajavana et al., 2017). At the same time, in today's world where social media tools are quite common, tourism content producers also offer their products on social media channels to assist users in making travel plans (Mariani et al., 2017; Rathore et al., 2018). Social media and other web tools are important elements in product marketing and online shopping. With these tools, the company that markets any product and the real user meet in a common digital market. In order for a product to be marketed, the digital platform on which the product is located is expected to meet the expectations of the end user (Hänninen et al., 2018). Sufficient satisfaction of the platform used in product sales affects the marketing of the product and also the preference of the product. This is because the quality of the digital platform on which the product is presented affects the marketing of the product (Wang et al., 2019). In this sense, the quality of the digital platform becomes important. The aim of this study is to determine the importance levels of the factors affecting the quality of online tourism tools used for travel planning and to evaluate six online tourism tools. In this way, the platforms used by customers who carry out tourism activities with online tools will be ranked according to quality.

One of the main expectations of the tourism industry is customer loyalty. The quality of the service provided will affect customer choice of platform (Olorunniwo et al., 2006). If customers are satisfied with the platform they use when making a digital transaction, the expectation is that they will choose the same platform for their next transaction. Accordingly, the following questions were investigated in this study:

1. "Which criteria should be prioritized to assist a customer in choosing a particular digital platform for travel planning?" The aim of this question was to reveal the features that determine the quality of digital platforms used for travel planning. At the same time, the strengths and weaknesses of the digital platform were determined.
2. "Which digital tool is the best for travel planning?" This question was also addressed and evaluated in this study with the aim of creating a decision-making model that would help users choose the right digital platform.

In this study, clear criteria were determined in order to assess the quality of platforms used for travel planning. Multi-Criteria Decision Making-Methods (MCDM) were chosen for ranking these criteria. The Analytic Hierarchy Process (AHP) method, one of the multi-criteria decision-making methods, was used to solve the stated problem. With this method, the criteria are ranked among themselves. Then, the TOPSIS method was used to determine which digital platform is the best for travel planning (Filip, 2014). In this paper we first state the purpose and importance of the study to be conducted. This is followed by a literature review, after which multi-criteria decision-making methods are mentioned. Fourthly, AHP and TOPSIS methods are explained step by step. This is followed by a summary of the solutions developed using the AHP and TOPSIS methods in line with the data obtained from the users. Then the obtained results are presented, and alternative platforms are listed. In the last section, the results are evaluated, and suggestions are made.

2. LITERATURE REVIEW

As the internet has become an indispensable part of life, users have gained the opportunity to perform many transactions online thanks to easy access. According to TURKSTAT (2021) Household Information Technologies (IT) Usage Research data, the rate of internet use among the 16-74 age group in Turkey reached 82.6% as of 2021. Along with the high rate of

internet use, the rate of online shopping, which was 8.4% in 2011, increased to 44.3%. Such data clearly show that online shopping rates have been increasing over recent years. With the widespread use of online shopping, online transactions have also become very common in the tourism sector, as in many other areas as well. Accordingly, many tourism products have become more accessible online in recent years (Lin & Chen, 2013). Content providers in the tourism sector can best present their products to their users through online channels (Choi et al., 2018). Many online tools such as websites, social media platforms, blogs, forum sites, video sharing sites and digital encyclopedias are used effectively to deliver information to users (Gohil, 2015; Žanna, & Xuedong, 2016).

An examination of research conducted in recent years revealed that social media tools play a huge part in people's travel planning (Usui et al., 2018; Pop et al., 2021). According to GuestCentric's report for 2021, the use of social media is recognized as a growing trend for hotels to interact directly with guests and drive direct bookings. 48.75% of hoteliers who participated in the survey conducted in January 2021 see social media as the second most important sales and marketing priority. In this sense, social media has been found to be very important for hotel operators. Moreover, in recent years, recommendation systems have been used in travel planning. Recommendation systems aim to help individuals plan their travel by predicting their preferences and offering suggestions in line with their expectations. Thus, these systems aim to save time for users enabling them to make faster decisions.

The literature shows that multi-criteria decision-making methods are frequently used in research and aim to eliminate uncertainty (Bhole & Deshmukh, 2018). In online transactions, quality rankings of websites, social media tools or web tools can be made using multi-criteria decision-making methods. Kutbi and Alomar (2017) investigated the importance of social media tools in education in their study. Accordingly, video sharing tools were found to be important in education. Putri and Alawiah (2021) used the TOPSIS method to determine the right social media tool in product marketing. Bire et al. (2021) conducted a study to determine the order of importance of the factors affecting the destination choice of tourists. These researchers also used AHP and TOPSIS methods in their studies. As a result of the study, prominent tourism destinations were listed in line with certain criteria.

In the tourism sector, the importance of digital tools used in this field has increased with the increase in transactions, especially on the internet. Baki (2020) conducted a study that evaluates hotel websites according to the criteria of trust, information quality, customer relations, design and price with fuzzy AHP and fuzzy TOPSIS methods. Accordingly, information quality and trust criteria emerged as the most important criteria for hotel websites. Using the AHP-SAW method Sari (2021) tested a specific decision support system to determine the best tourism village . Accordingly, the alternatives most preferred by tourists were determined. Another study used the AHP method to examine the prominent factors in determining the travel preferences of tourists in rural areas (Hussain, & Wang, 2018). According to this study, social media tools were mostly preferred during the travel planning stage. Choedon and Lee (2018) conducted a study to classify and categorize service requirements in mobile tourism applications. Their study used the AHP method to determine the prominent criteria in the mobile travel application experiences of tourists. The study concluded that features such as geographic location map, language option, mobile ticketing, and mobile payment were found to be important in mobile tourism applications.

Various studies have been conducted in this area to improve tourism activities. While planning a trip, several challenges typically need to be addressed such as searching for a hotel, finding the most suitable ticket, and reaching the destination as soon as possible. It can sometimes take a long time to deal with these issues. Vieira (2018) conducted a study to reduce travel costs and optimize travel times. For this, travel data were evaluated using the ant colony optimization method. Thus, a model was developed for optimized travel planning. People also give importance to the opportunities offered by the destinations when planning their trips. In this direction, Gül and Topcu (2015) put forward a model that proposes activities for tourist candidates to spend their holidays more efficiently. In this study, a model was developed using AHP and TOPSIS methods that determines the activities that tourists may want to be engaged in according to their travel experiences . Chen and Wang (2021) conducted a study on travel planning during the Covid-19 period. Accordingly, they developed a model for travel destination recommendation using the fuzzy geometric mean (FGM) approach.

For many people, making travel plans in tourism has become an indispensable part of the whole travel experience. Sometimes, various problems can arise while planning a trip. These problems might include choosing a destination, choosing a hotel, or choosing a vehicle. Various studies have been carried out with the aim of eliminating these problems. Jiaoman et al. (2018) conducted a study to make destination selection more effective during travel procedures. They used fuzzy AHP method in their study on Japanese websites. The study concluded that travel planning design was found to be important. Different techniques have also been used to determine destinations through websites or applications. In their study, Alptekin and Büyüközkan developed an intelligent system proposal using case-based reasoning (CBR) and AHP methods to solve web-based destination determination problems. Combining two different techniques, this study yielded more effective results and the weaknesses of both techniques were eliminated. Do and Shih (2016) conducted a study to solve the destination determination problem during the travel planning phase. In this study, decision-making trial and evaluation laboratory (DEMATEL) and Analytic Network Process (ANP) models were combined. As a result of the research, the external search feature emerged as the most important criterion in determining the destination. As a result of the study tourists can make detailed searches on the web for their travel planning. In addition, they can benefit from the ideas of people who have had the same experience before in order to determine their destination. In this way, the comments on the websites are important in determining the destination. Ahani et al. (2019) discussed the comments on websites as a way of deciding on a hotel for a holiday. In this study, machine learning and TOPSIS methods were used with the aim of classifying tourists according to their satisfaction levels.

Since most travel planning is done in the digital environment, the features or quality of the digital platform used also shape the whole process of travel planning. Ip et al. (2012) conducted a study to determine the functionality of hotel websites. Using the fuzzy method, they listed the information that should be on the hotel websites in order to assist customers with their travel planning. The list includes a description of the hotel and its facilities , information on making a reservation, a description of the surrounding area , and user-generated information. The result of the study showed that the most important feature was the reservation information. A study conducted by Balouchi and Khanmohammadi (2015) investigated the priority features of social media platforms in tourism transactions. This study was conducted with Logarithmic fuzzy preference programming methodology (LFPP) and fuzzy AHP methods. The results of the study showed that, of the three stages when tourists might use social media platforms to assist them in travel arrangements, they mostly prefer to use the platforms before traveling (rather than during or after traveling) . In addition, the most important reason for the preference of these platforms was information sharing. Bire et al. (2021b) aimed to examine tourism supply chain management (TSCM) performance characteristics from the perspective of tourists. A questionnaire was used to obtain data which were evaluated with fuzzy AHP. In the research, the criteria of TSCM (reservation phase, pre-travel phase, travel phase, post-travel phase) were evaluated. According to the results of the research, the pre-travel performance criterion was found to be the most important step according to the tourists. Thus, when the studies in the literature are considered, the problems that require decision-making at the travel planning stage have been resolved. In many of these problems, multi-criteria decision-making methods were used.

3. MATERIALS AND METHODS

In order to carry out this research, data were obtained voluntarily from predetermined participants. The data obtained by the survey method were used in the main study by scoring. In this study, AHP and TOPSIS methods from multi-criteria decision-making methods were used. Ethics committee approval for this study was obtained from the Social and Human Sciences Publication Ethics Committee at Van Yüzüncü Yıl University.

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3.1. Multi-Criteria Decision-Making Methods (MCDM)

The decision-making process is the act of selecting one option from a set of choices in order to accomplish a specific objective. While it might sometimes be quite simple to find alternatives in this process, it can also occasionally take on a complex structure (Eren & Kaya, 2019). Essentially, the decision-making stage serves as a problem-solving stage. The elements of intellect, design, and selection serve as the foundation for this problem-solving phase (Aurum & Wohlin, 2003). Multi-criteria decision-making methods (MCDM) methods are used to solve problems when it becomes difficult to make a decision and the options increase. MCDM is accepted as an operations research field that aims to develop and apply decision support tools and methods to deal with decision problems that are not easy to solve, including a specific purpose or conflicting objectives, with many criteria (Akgün and Erdal, 2019). Multi-criteria decision-making enables people to make choices in accordance with their own value judgments in the evaluation of criteria that do not have the same value in conflicting situations (Karaatli et al., 2015). There are many methods for multi-criteria decision-making. These methods have various advantages according to the content and solution of the problem (Ersöz & Kabak, 2010). The aim of this study was to determine the hierarchical order of the criteria and the importance of the alternatives using the AHP and TOPSIS methods, which belong to the multi-criteria decision-making methods.

3.1.2 Method of AHP

The AHP method, developed by Saaty (1980), has been accepted as a new approach to solving problems involving complexity and uncertainty. The AHP method is effectively used in making decisions that include many interrelated and categorized factors. The stage of decision making takes place by transforming user intuitions, abstract and unmeasurable factors and subjectively obtained judgments into a numerical and common basis and integrating them into this process. (Shapira, 2005). In this process, it is aimed for decision makers to compare a number of alternatives in a consistent degree and to reveal the relative priorities of the alternatives within certain ratios (Al-Harbi, 2001).

With AHP, the aim is to create a hierarchical structure among many quantitative and qualitative factors by ordering the specific and uncertain criteria ideally in a complex problem (Badri, 1999). With AHP, the aim is to measure the criteria under a hierarchical structure under user control with the help of analyzes such as problem modeling, calculation of criterion weights and sensitivity analysis (Franek and Kresta, 2014). In order to rank the criteria with the AHP method, the data obtained from the individuals are processed with comparative analysis. The AHP process steps are performed in 5 steps.

Step 1: Creating the Hierarchical Structure

Firstly, the criteria to be determined by the AHP method and the sub-criteria belonging to these criteria are determined. Then, the alternatives supported by the criteria are determined and made into a hierarchical structure. In this way, the meaning of the problem to be decided is provided.

Step 2: Scoring the Criteria

For this step, the scoring scale developed by Saaty (1980) is used (Table 1). Experts perform comparative scoring according to the importance of the criteria.

Table 1
Binary Comparison Scale

Scale Values	**Value Definitions**
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
2-4-6-8	Intermediate Values

Step 3: Creating the pairwise comparison matrix

The criteria scored from 1 to 9 by the experts are compared among themselves in pairs. In these comparisons, values are entered into the columns by taking into account the relative importance of the i and j criteria (Table 2).

Table 2
Binary Comparison Matrix

$$A=\begin{bmatrix} 1 & a12 & \dots & a1n \\ \frac{1}{a12} & 1 & \dots & a2n \\ \vdots & \vdots & 1 & \vdots \\ \frac{1}{a1n} & \frac{1}{a2n} & \dots & 1 \end{bmatrix}$$

Step 4: Normalization of binary comparison matrices

In this step, the matrices are normalized by dividing each column value by the sum of the column values it is connected to. The weights of the criteria or sub-criteria are obtained by averaging the rows in the normalized matrix. Thus, the eigenvectors (W) of the criteria are obtained.

Step 5: Determining the Consistency Ratio

In order to calculate the consistency, first of all, the largest eigenvector value (λ max) should be obtained in the pairwise comparison matrix. In order for the obtained matrix to be fully consistent, the eigenvalue (λ max) must be equal to the number of elements (n) compared in the matrix (Saaty, 1990). In order to calculate this value, the values of the comparison matrix A are multiplied by the W column matrix and matrix D is obtained. The basic value E is obtained by dividing the row sums of this matrix by the previously obtained (W) eigenvector column elements. The arithmetic average of the E value gives the value (λ max) (Al-Harbi, 2001). The related equations are obtained as (1) and (2).

$$Ei = \frac{\mathrm{Di}}{\mathrm{Wi}} \quad (1) \tag{1}$$

$$\lambda \max = \frac{\sum_{i=1}^{n} Ei}{n} \tag{2}$$

After calculating the largest eigenvalue (λ max), the consistency ratio (CR) is determined and the consistency of the obtained matrix is tested. Thus, the degree of consistency between the comparisons made between the criteria is determined. Accordingly, the CR value is expected to be less than 0.10. The consistency ratio (CR) is obtained by dividing the CI given in equation (3) by the randomness index (RI) (Shapira, 2005).

$$CR = \frac{\mathrm{CI}}{\mathrm{RI}} \tag{3}$$

The CI value used in the equation is obtained as follows (4). The result is written in equation (3) instead of CI.

$$CI = \frac{\lambda \max - \mathrm{n}}{\mathrm{n}-1} \tag{4}$$

The RI value is obtained from the table below (Table 3).

Table 3
Random Index Values

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RI	0.00	0.00	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

3.1.3. TOPSIS Method

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is a method developed by Hwang and Yoon (1981) for ranking the determined alternatives. This method is preferred in determining the optimal alternatives in complex operations. Accordingly, in the TOPSIS method, the closest distance to the positive ideal solution and the farthest distance to the negative

ideal solution are preferred for the selection of alternatives (Opricovic and Tzeng, 2004). The implementation of the TOPSIS method takes place in 7 stages.

1. Creation of the Standard Decision Matrix

In the first stage, the initial matrix is created with the data obtained by the experts. In order to determine the advantages in this matrix (A), there are alternatives in the row and criteria in the column (1).

$$A_{ij} = \begin{bmatrix} a11 & a12 & \dots & a1n \\ a21 & a22 & \dots & a2n \\ \vdots & \vdots & \vdots & \vdots \\ am1 & am2 & \dots & amn \end{bmatrix} \quad (1)$$

2. Creation of Normalized Decision Matrix

At this stage, n_{ij} values are normalized according to the following formula (2).

$$n_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x^2_{ij}} \quad i=1,..,m,\ j=1,..n. \quad (2)$$

3. Creating Weighted Normalized Decision Matrix

The calculation of the weighted normalized decision matrix v_{ij} is shown in the following equation (3).

$$v_{ij} = w_j n_{ij} \quad i=1,..,m,\ j=1,..n. \quad w_j = \text{where wj is the weight of the ith criterion and } \sum_{j=1}^{n} w_j = 1 \quad (3)$$

4. Determining the Ideal Positive and Ideal Negative Solutions

In the V matrix, the column values give the highest values A^+ positive ideal solution values and the smallest values A^- negative ideal solution values. Accordingly, *I* represents the benefit and *J* represents the cost.

$$A^+ = \{ v_1^+, \dots, v_n^+ \} = \{(\max_j vij | i \in I), (\max_j vij | i \in J)\}$$

$$A^- = \{ v_1^-, \dots, v_n^- \} = \{(\min_j vij | i \in I), (\min_j vij | i \in J)\}$$

5. Calculating the Separation Measures

At this stage, it is ensured that the distances to the ideal solutions are expressed. Accordingly, the distance to the positive ideal solution and the distance to the negative ideal solution are obtained by the following equations (4) and (5).

$$s_i^+ = \{\sum_{j=1}^{n} (vij - v_j^+)^2\}^{1/2} \quad (4)$$

$$s_i^- = \{\sum_{j=1}^{n} (vij - v_n^-)^2\}^{1/2} \quad (5)$$

6. Calculating the Relative Closeness to The Ideal Solution

C_i^* value was calculated in order to find the relative closeness to the ideal solution (6).

$$C_i^* = \frac{s_i^-}{s_i^- + s_i^+} \quad 0 \le C_i^* \le 1 \quad (6) \quad (6)$$

7. Ranking the Alternatives

In this step, alternatives with values between 0 and 1 are sorted according to the highest value. According to this solution, the alternative with the largest coefficient supports the best solution.

4. APPLICATION

In order to carry out online travel planning, users make travel plans with the help of many websites, applications, and social media tools. The level of importance of the features of these applications in determining travel planning was investigated in this study. The aim of the study was to determine the quality of the application used to make travel transactions. In this application, depending on the problem identified, literature support and expert opinion support were applied. Then it was

decided by which methods the problem would be solved. Accordingly, AHP and TOPSIS methods were preferred and criteria and sub-criteria were determined. In determining the criteria, support was received from three academicians working in computer science and management information systems, all of whom are experts in their fields. Then, the alternatives were determined. Accordingly, the features to be measured by the AHP method were made into criteria and their importance was ranked. In addition, this study also investigated which application in the digital environment is more important for users wishing to perform their travel transactions. For this, pre-determined applications with the TOPSIS method were turned into alternatives. Finally, these alternatives were listed in order of importance. The path to be followed in choosing a digital application for online travel transactions is shown in Figure 1.

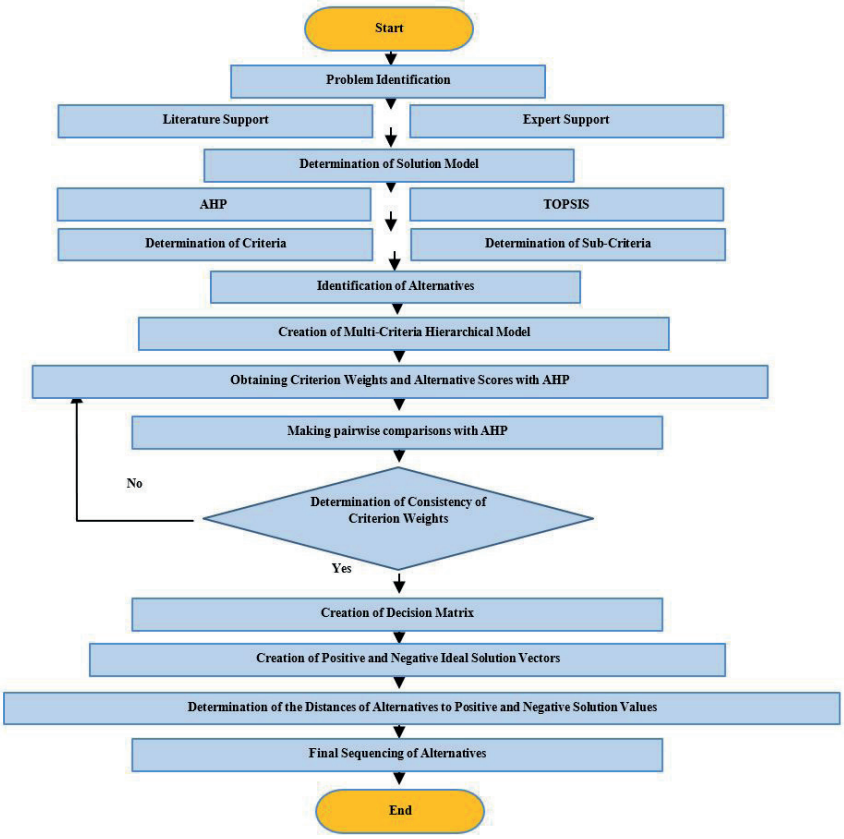

Figure 1. The Way to Choose a Digital Travel App

4.1. Solution with AHP Method

The first step in using the AHP method was that of determining the criteria that should be found in the web tools which perform travel transactions. Accordingly, the main criteria were determined as usability, satisfaction, interaction opportunity, accessibility, content quality and web design. In addition, sub-criteria supporting these criteria were created (Park et al., 2012; Cheng, 2014; Davis, 1989; Wang, 2008; Cheng, 2012; Wang et al., 2007). Once this had been done, alternatives were chosen for the determined criteria, which were Twitter, Instagram, Facebook, Blogs, Websites and Google Comments. The determined criteria, the sub-criteria belonging to these criteria, and the alternatives are shown in Figure 2.

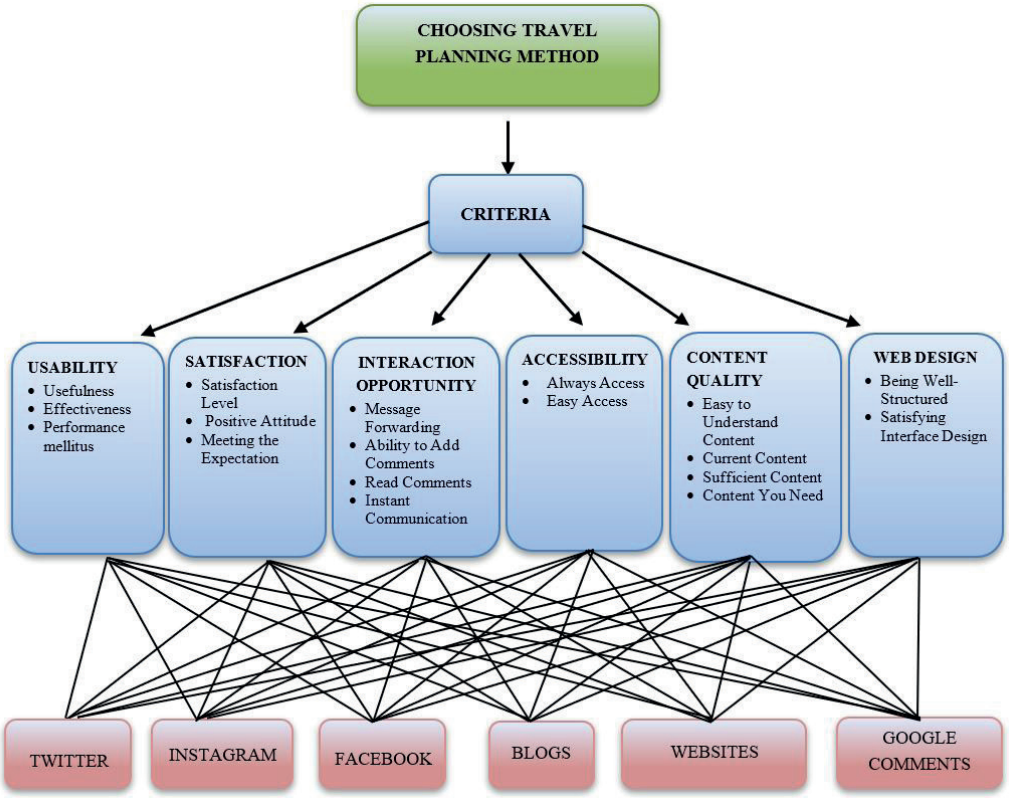

Figure 2. Criteria, Sub-Criteria and Alternatives

4.1.1. Weighting The Criteria

In order to conduct an analysis using AHP, 6 main criteria and 17 sub-criteria were evaluated. Following this, all criteria were converted into expert opinion forms. Sixteen participants, all of whom were academicians, were selected and asked to fill in the expert opinion forms. All the participants had a doctorate degree. Predetermined expert opinion forms were filled in during face-to-face interviews with the participants, all of whom had been selected due to their being frequent users of web tools and social media channels. In addition, all of them had done travel planning using online tools in the previous 5 years. The data obtained from the expert opinion forms were scored and placed in the comparison matrices. Pairwise comparison matrices were created by taking the geometric mean of individual matrix values to ensure the group decision (Saaty, 2008). In the next stages, the consistency of the final criterion weights obtained was tested.

The main criteria were determined as usability (USA), satisfaction (SAT), interaction opportunity (IO), accessibility (ACC), content quality (CQ) and web design (WD). After this, pairwise comparison matrices were created. Relative priorities were determined together with the weights obtained by scoring the criteria. In addition to these, (CR) consistency ratios were found to determine the consistency of the results. Table 4 shows how pairwise comparisons of the criteria were made and their superiority to each other proportioned. The general weights of the criteria were found in line with the determined ratios by normalizing the obtained matrix. It was also found to what extent the eigenvectors were consistent by using the obtained weights.

Table 4
Binary Comparison Matrix

Criteria	Interaction	Satisfaction	Usability	Accessibility	Content Quality	Web Design	Weights
Interaction	1.00	4.12	2.45	5.96	0.45	6.19	0.279
Satisfaction	0.24	1.00	0.37	2.71	0.19	3.66	0.093
Usability	0.41	2.69	1.00	4.43	0.49	4.23	0.175
Accessibility	0.17	0.02	0.23	1.00	0.16	2.71	0.051
Content Quality	2.21	5.14	2.06	6.24	1.00	5.38	0.363
Web Design	0.16	0.27	0.24	0.37	0.19	1.00	0.039
Consistency Rate	0.03						

After obtaining the main criteria, we worked on determining the relative weights of the sub-criteria. For this, the sub-criteria belonging to each criterion were compared with each other, just like the main criteria, and paired comparison matrices were created. Then, with the help of these normalized matrices, the eigenvectors of the sub-criteria were estimated, and their consistency calculated (Table 5). Accordingly, the global weights (W) of the sub-criteria were obtained by multiplying the sub-criteria with the weight of the main criterion to which they were attached. Thus, the final weights of the sub-criteria were revealed, and their importance levels were determined. In addition, all the obtained consistency ratios provided the desired criterion.

Table 5
Calculation of the Weights of the Main Criteria and Sub-Criteria

Criteria	Weights	Sub-Criteria	Weights	Global Weights (W)	Consistency Rate(CR)
Interaction Opportunity (IO)	0.279	IO1-Message Forwarding	0.326	0.091	0.033
		IO2-Ability to Add Comments	0.162	0.045	
		IO3-Ability to Read Comments	0.107	0.030	
		IO4-Instant Communication	0.405	0.113	
Satisfaction (SAT)	0.093	SAT1-Satisfaction Level	0.349	0.033	0.011
		SAT2-Positive Attitude	0.211	0.020	
		SAT3-Meeting the Expectation	0.440	0.041	
Usability (USA)	0.175	USA1-Usefulness	0.476	0.083	0.003
		USA2-Effectiveness	0.315	0.055	
		USA3-Performance	0.208	0.036	
Accessibility (ACC)	0.051	ACC1-Always Access	0.586	0.030	-----
		ACC2-Easy Access	0.414	0.021	
Content Quality (CQ)	0.363	CQ1-Easy to Understand Content	0.418	0.152	0.047
		CQ2-Current Content	0.254	0.092	
		CQ3-Sufficient Content	0.117	0.043	
		CQ4-Content You Need	0.211	0.077	
Web Design (WD)	0.039	WD1-Being Well Structured	0.390	0.015	-----
		WD2-Satisfying Interface Design	0.610	0.024	

5. RANKING WITH THE TOPSIS METHOD

The TOPSIS method was used to rank the alternative options to be used in travel planning. In order to do this, we first created a decision matrix. In the decision matrix, alternatives and options were scored according to all sub-criteria. According to this, the matrix to be created was scored by experts in a way to get values between 1-10. The final decision matrix was obtained by taking the geometric mean of the scores obtained from the experts (Table 6).

Table 6
Decision Matrix

	IO1	IO2	IO3	IO4	WD1	WD2	SAT1	SAT2	SAT3	ACC1	ACC2	CQ1	CQ2	CQ3	CQ4	USA1	USA2	USA3
A1-TWITTER	4.47	4.23	4.73	4.95	5.00	5.00	5.00	4.00	5.00	5.00	6.00	4.00	5.00	4.00	5.00	5.00	4.00	5.00
A2-INSTAGRAM	7.74	8.24	8.21	7.74	6.74	5.96	6.45	6.74	6.74	8.00	8.00	6.48	6.24	7.48	6.70	7.44	6.74	8.00
A3-FACEBOOK	7.74	8.45	8.24	8.21	6.00	6.74	7.00	6.74	6.96	8.24	8.74	6.24	7.24	6.48	7.48	6.00	6.00	6.00
A4-BLOGS	4.00	4.00	3.00	3.00	7.00	8.00	6.00	4.00	5.00	6.00	6.00	5.00	5.00	6.00	3.00	5.00	6.00	5.00
A5-WEBSITES	7.00	7.74	7.24	6.74	7.74	7.74	8.49	8.49	9.00	8.00	8.00	8.00	8.00	7.48	7.74	7.48	7.24	7.24
A6-GOOGLE COMMENTS	6.74	6.40	5.48	5.18	4.00	3.00	6.00	6.00	6.00	8.00	7.00	6.24	6.24	5.44	5.73	6.24	7.00	8,00

After the decision matrix was obtained, the matrix elements were normalized with the help of equation (2) used in the TOPSIS method (Table 7).

Table 7
Normalization Matrix

	IO1	IO2	IO3	IO4	WD1	WD2	SAT1	SAT2	SAT3	ACC1	ACC2	CQ1	CQ2	CQ3	CQ4	USA1	USA2	USA3
A1-TWITTER	0.283	0.255	0.300	0.324	0.329	0.324	0.310	0.263	0.310	0.279	0.333	0.267	0.320	0.261	0.331	0.325	0.261	0.306
A2-INSTAGRAM	0.489	0.498	0.520	0.507	0.443	0.386	0.400	0.443	0.417	0.447	0.444	0.432	0.399	0.488	0.444	0.484	0.440	0.490
A3-FACEBOOK	0.489	0.511	0.522	0.538	0.395	0.436	0.434	0.443	0.431	0.460	0.484	0.416	0.463	0.422	0.496	0.390	0.392	0.368
A4-BLOGS	0.253	0.242	0.190	0.197	0.460	0.518	0.372	0.263	0.310	0.335	0.333	0.334	0.320	0.391	0.199	0.325	0.392	0.306
A5-WEBSITES	0.443	0.467	0.459	0.441	0.509	0.501	0.527	0.559	0.557	0.447	0.444	0.534	0.512	0.488	0.513	0.487	0.472	0.443
A6-GOOGLE COMMENTS	0.426	0.387	0.347	0.339	0.263	0.194	0.372	0.395	0.371	0.447	0.388	0.416	0.399	0.354	0.380	0.406	0.457	0.490

After the normalization matrix was obtained, the global criteria weights (W) obtained by the AHP method were used in the weighted decision matrix. Accordingly, the weighted decision matrix was formed as a result of the multiplication of the normalized criterion values and (W) values (Table 8).

Table 8
Weighted Decision Matrix

	IO1	IO2	IO3	IO4	WD1	WD2	SAT1	SAT2	SAT3	ACC1	ACC2	CQ1	CQ2	CQ3	CQ4	USA1	USA2	USA3
W	0.091	0.045	0.030	0.113	0.015	0.024	0.033	0.020	0.041	0.030	0.021	0.152	0.092	0.043	0.077	0.083	0.055	0.036
A1-TWITTER	0.026	0.012	0.009	0.037	0.005	0.008	0.010	0.005	0.013	0.008	0.007	0.040	0.029	0.011	0.025	0.027	0.014	0.011
A2-INSTAGRAM	0.044	0.022	0.016	0.057	0.007	0.009	0.013	0.009	0.017	0.013	0.009	0.066	0.037	0.021	0.034	0.040	0.024	0.018
A3-FACEBOOK	0.044	0.023	0.016	0.061	0.006	0.010	0.014	0.009	0.018	0.014	0.010	0.063	0.043	0.018	0.038	0.033	0.022	0.013
A4-BLOGS	0.023	0.011	0.006	0.022	0.007	0.012	0.012	0.005	0.013	0.010	0.007	0.051	0.029	0.017	0.015	0.027	0.022	0.011
A5-WEBSITES	0.040	0.021	0.014	0.050	0.008	0.012	0.017	0.011	0.023	0.013	0.009	0.081	0.047	0.021	0.039	0.041	0.026	0.016
A6-GOOGLE COMMENTS	0.039	0.017	0.010	0.038	0.004	0.005	0.012	0.008	0.015	0.013	0.008	0.063	0.037	0.015	0.029	0.034	0.025	0.018

In the next step, A^+ (positive) ideal solution values and A^- (negative) ideal solution values are revealed with the help of a weighted decision matrix. An examination of the column values in the weighted decision matrix reveals that the maximum values are expressed as A^+ and the minimum values are determined as A^- (Wang et al.; 2020). Thus, the positive ideal solution and negative ideal solution sets of the alternatives were created (Table 9).

Table 9
Positive and Negative Ideal Solution Set

A+	0.044	0.023	0.016	0.061	0.008	0.012	0.017	0.011	0.023	0.014	0.010	0.081	0.047	0.021	0.039	0.041	0.026	0.018
A-	0.023	0.011	0.006	0.022	0.004	0.005	0.010	0.005	0.013	0.008	0.007	0.040	0.029	0.011	0.015	0.027	0.014	0.011

After obtaining the positive and negative ideal solution sets, the distances to these solution points were determined. The matrices for the distance to the positive ideal solution () and the distance to the negative ideal solution () are shown in Tables 10 and 11.

Table 10
Distance to Positive Ideal Solution (s_i^+)

	IO1	**IO2**	**IO3**	**IO4**	**WD1**	**WD2**	**SAT1**	**SAT2**	**SAT3**
A1-TWITTER	0.000352	0.000132	0.000044	0.000581	0.000007	0.000021	0.000050	0.000034	0.000103
A2-INSTAGRAM	0.000000	0.000000	0.000000	0.000012	0.000001	0.000010	0.000017	0.000005	0.000033
A3-FACEBOOK	0.000000	0.000000	0.000000	0.000000	0.000003	0.000004	0.000009	0.000005	0.000027
A4-BLOGS	0.000461	0.000147	0.000098	0.001485	0.000001	0.000000	0.000025	0.000034	0.000103
A5-WEBSITES	0.000018	0.000004	0.000004	0.000119	0.000000	0.000000	0.000000	0.000000	0.000000
A6-GOOGLE COMMENTS	0.000033	0.000031	0.000027	0.000502	0.000014	0.000058	0.000025	0.000010	0.000058
	ACC1	**ACC2**	**CQ1**	**CQ2**	**CQ3**	**CQ4**	**USA1**	**USA2**	**USA3**
A1-TWITTER	0.000029	0.000010	0.001635	0.000313	0.000093	0.000194	0.000182	0.000136	0.000045
A2-INSTAGRAM	0.000000	0.000001	0.000236	0.000108	0.000000	0.000028	0.000000	0.000003	0.000000
A3-FACEBOOK	0.000000	0.000000	0.000318	0.000020	0.000008	0.000002	0.000065	0.000020	0.000020
A4-BLOGLAR	0.000014	0.000010	0.000920	0.000313	0.000017	0.000581	0.000182	0.000020	0.000045
A5-WEBSITES	0.000000	0.000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000003
A6-GOOGLE COMMENTS	0.000000	0.000004	0.000318	0.000108	0.000032	0.000104	0.000046	0.000001	0.000000

Table 11
Distance To Negative Ideal Solution (s_i^-)

	IO1	**IO2**	**IO3**	**IO4**	**WD1**	**WD2**	**SAT1**	**SAT2**	**SAT3**
A1-TWITTER	0.000007	0.000000	0.000011	0.000208	0.000001	0.000009	0.000000	0.000000	0.000000
A2-INSTAGRAM	0.000461	0.000133	0.000097	0.001229	0.000007	0.000020	0.000009	0.000013	0.000019
A3-FACEBOOK	0.000461	0.000147	0.000098	0.001485	0.000004	0.000033	0.000016	0.000013	0.000025
A4-BLOGS	0.000000	0.000000	0.000000	0.000000	0.000009	0.000058	0.000004	0.000000	0.000000
A5-WEBSITES	0.000297	0.000104	0.000064	0.000764	0.000014	0.000052	0.000050	0.000034	0.000103
A6-GOOGLE COMMENTS	0.000247	0.000043	0.000022	0.000260	0.000000	0.000000	0.000004	0.000007	0.000006
	ACC1	**ACC2**	**CQ1**	**CQ2**	**CQ3**	**CQ4**	**USA1**	**USA2**	**USA3**
A1-TWITTER	0.000000	0.000000	0.000000	0.000000	0.000000	0.000103	0.000000	0.000000	0.000000
A2-INSTAGRAM	0.000025	0.000006	0.000629	0.000053	0.000093	0.000354	0.000176	0.000097	0.000045
A3-FACEBOOK	0.000029	0.000010	0.000511	0.000174	0.000047	0.000520	0.000029	0.000052	0.000005
A4-BLOGS	0.000003	0.000000	0.000102	0.000000	0.000031	0.000000	0.000000	0.000052	0.000000
A5-WEBSITES	0.000025	0.000006	0.001635	0.000313	0.000093	0.000581	0.000182	0.000136	0.000025
A6-GOOGLE COMMENTS	0.000025	0.000001	0.000511	0.000053	0.000016	0.000193	0.000045	0.000117	0.000045

The final () and () values of each alternative in the decision stage of the TOPSIS method were determined by equations (4) and (5) on TOPSIS. Finally, with the help of the values obtained for the alternatives, the value of was reached by using equation (6) (Table 12). Thus, with the help of the value, the relative closeness of the alternatives to the ideal solution was determined. In this way, the final ranking of the alternatives is also revealed.

Table 12
Closeness Of Alternatives to The Ideal Solution and Final Ranking

	s_i^+	s_i^-	C_i^*	Ranking
A1-TWITTER	0.062946	0.018450	0.226674	5
A2-INSTAGRAM	0.021318	0.058888	0.734204	2
A3-FACEBOOK	0.022358	0.060501	0.730166	3
A4-BLOGS	0.066750	0.016092	0.194254	6
A5-WEBSITES	0.012161	0.066914	0.846205	1
A6-GOOGLE COMMENTS	0.037049	0.039947	0.518822	4

6. DISCUSSION AND CONCLUSION

In today's world, where online shopping trends are at a very high level, internet users aim to carry out their shopping requirements in the best possible way. One of the areas where online transactions are widely used is travel planning. Many users use online platforms to carry out their travel planning or holiday transactions. Of course, knowing which platform is more convenient than others is also important. In addition, users want to benefit from the features offered by the online platforms they use for their travel planning. In this sense, the expectations of users from the platforms they use can also affect the quality of shopping. For some customers, accessibility is more important, while for others, factors such as speed or content quality are a priority. Thus, the aim of this study was to conduct research into which platform is effective in online travel planning and, accordingly, which criteria are prioritized on alternative platforms.

In this study, platforms that can perform online travel planning processes and the quality criteria of these platforms were evaluated. The AHP and TOPSIS methods, which are multi-criteria decision-making methods, were chosen for the study, and the data obtained from users were evaluated. Accordingly, the main criteria which formed the basis of this study were usability, satisfaction, interaction possibility, content quality, accessibility and web design criteria. Sub-criteria were listed using the AHP method. As a result of the evaluation, content quality was seen to be the most important criterion with 36.3%, and this criterion was followed by the possibility of interaction with 27.9%. The usefulness criterion had a priority of 17.5% and the satisfaction criteria had a priority value of 9.3%. While system accessibility had a priority of 5.1%, the web design criterion took last place with a rate of 3.9%. Our evaluation of the sub-criteria showed that the easy-to-understand content criterion, which is the content quality sub-criterion (CQ1), took first place with 41.7%. An examination of the sub-criteria of the interaction possibility criterion revealed that the instant communication feature took first place with 40.5% (IO4).

In the study, the best alternatives meeting the criteria were determined. Alternatives were listed using the TOPSIS method in order to determine the best platform for performing travel planning processes. Our results showed that websites have become the most preferred alternative in travel planning. Instagram and Facebook applications followed this alternative with very close values, respectively. The Google comments alternative took 4th place, with the Twitter application following it in 5th place. In this study, the blogs alternative took the last place.

An evaluation of the result of the study shows that the criterion of quality of content was found to be the most important criterion in the digital platforms preferred for online travel planning. In previous studies content quality is also called information quality (Delone & Mclean, 2003). Accordingly, in order for the information of any web application to be of high quality, it is expected that it should be presented in an easy, understandable, complete, appropriate, and up-to-date way, while also meeting the needs of customers (Delone & Mclean, 2003; Sirsat & Sirsat, 2016; Rai et al.; 2002). When the literature is examined, information quality plays an important role in determining the success of information systems (Lee et al.; 2002; Petter et al.; 2008). Thus, the fact that the content quality criterion is a priority feature in the current study supports the literature within the framework of information systems. The quality of the information obtained from any information system also positively affects the satisfaction obtained from the system and the success of the system (Mardiana et al.; 2015; Petter et al.; 2008; Zviran & Erlich, 2003). If there is sufficient and satisfactory content in information systems, users prefer to use that system (Alshibly, 2014; Delone & Mclean, 1992; Urbach & Müller, 2012). The current study also shows that content quality is the most important factor in increasing the quality of a digital platform used in tourism or travel transactions.

When studies conducted with multi-criteria decision-making methods are evaluated, it is clear that the quality of information has priority in the research. Accordingly, Lin (2010) reported that content quality is the most important criterion in the learning system in his study on web-based learning systems using fuzzy AHP method. Arora and Gupta (2017) examined the features of the system in their study on e-government systems with the AHP method. According to this study, content quality was found to be the most important criterion among other system features. Baki (2020) evaluated hotel websites in terms of quality with fuzzy AHP and fuzzy TOPSIS methods. The results showed that, when the criteria of trust, information quality, customer relations, design and price are taken into consideration, the criterion of trust takes the first place, while quality of information takes the second place. Tseng et al. (2021) developed a model for the selection of 3rd party travel reservation systems in their study. The study determined which criteria were important in the selection of the best tourism website with the AHP method. As a result of the research, while the security criterion among the five main criteria took the first place, the information quality criterion took the second place. The current study also shows that quality of the content is an important criterion for travel planning. In this respect, the result of the present study largely supports previous studies. According to the results of this research, it can be said that digital platforms with quality content will create more satisfaction on users. This is because the content that is sufficient and meets expectations affects platform users. Thus, the quality of the content created by the content providers gains importance in terms of guiding the customers. In this direction, the aim of content providers should be to provide better service to users by improving the content offered by the platforms in order for customers to plan travel transactions. In particular, if the content is up-to-date, comprehensible, meeting expectations and reliable customers will be affected positively. In this way, customer loyalty will be achieved as the expectations and needs of the customers are met. As a result of the study, the factors affecting the quality of digital platforms for travel planning were revealed. To this end, a solution model was developed for the problem of appropriate platform selection.

There are certain limitations within the scope of this study. The opinions of 16 experts in the field were evaluated. This number could be increased in future studies. In addition, different results may be obtained if this study were tested on generation Z or other age groups. This is because the use of social networks varies according to various age groups (Thuy and Duy, 2021). Different results may emerge in studies on the younger population, for example (Mamula-Nikolić et al.; 2022). In addition, the participants in the current study were determined from among academicians. This study could be repeated on different business groups or people with different incomes. However, more definitive results could be obtained if these and similar studies were also performed using new techniques such as fuzzy AHP, fuzzy TOPSIS, ANP, PIPRECIA and fuzzy MARCOS (Stević et al.; 2021; Sun, 2010; Chowdhury & Paul, 2020). In this study, the preferred platforms are limited to only six. In future studies, more social media platforms or digital content providers could be tested. In this study, six criteria were used to determine the quality of online tourism tools. In future studies, these criteria could be changed according to different dimensions or perspectives. Influencers or advertisements could also be considered as effective criteria in determining travel planning. As a result of the study, although the websites were chosen as the best platform, it should be taken into account that Instagram and Facebook platforms also receive very close values. Accordingly, managers in the sales and marketing sector are likely to turn to social media platforms in order to gain customers. In addition, in this study, the criteria of content quality and interaction possibility were shown to be the most important criteria in travel planning. Thus, improving the content on the platforms will create satisfaction on the users. Since information sharing is very popular in today's world, it will be important for users to have an interactive structure on digital platforms.

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