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Comparison of Distance-Based Fuzzy MCDM Techniques to Evaluate Marketing Strategies for Tourism-Pilgrimage Hotels During a Pandemic

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ABSTRACT

In the last two years (2020 and 2021), many businesses, especially in the tourism and pilgrimage sectors, suffered severe recession during the COVID-19 pandemic. The closure of many hotels in the world's religious cities has posed a major threat to religious tourism. Meanwhile, Mashhad hotels in Iran, which are demanded by many tourists and pilgrims from neighboring countries of Iran, were the most affected by this pandemic. Therefore, attracting tourists by observing health protocols for prosperity Industry is very important. Given the complexity of the issue, creativity and the use of decision-making techniques to prioritize marketing strategies are particularly important. This study aims to prioritize marketing strategies using the FMCDM techniques and compare their results together for hotels in the world's second-largest religious metropolis during the COVID-19 pandemic. Therefore, two approaches were applied using the combination of the FAHP technique with distance-based FMCDM methods. Distance-based techniques including FTOPSIS and FVIKOR were used. Based on the FTOPSIS, a strategy with an emphasis on focused differentiation was selected as the most appropriate marketing strategy. By applying the FVIKOR method, three strategies were selected as the best strategies. Two of these three strategies emphasize focused differentiation and the other emphasizes differentiation.

1. Introduction

In December 2019, the world faced a new crisis called the COVID-19 pandemic. The pandemic first started in China's Hubei Province and the city of Wuhan and spread around the world rapidly. In addition to human health, this disaster has severely affected the world economy and poses a serious threat to the viability of businesses around the world [52]. The world health organization's (WHO) recommendation to quarantine has

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caused many financial damages to people and businesses. The COVID-19 pandemic has forced many businesses to close, leading to severe trade disruption in various industries. The hotel industry in the COVID-19 era experienced a rapid and sharp decline in demand [11]. Accommodation centers, especially hotels, have been severely affected by this crisis. The expansion of COVID-19 has disrupted the performance and durability of hotels around the world [27]. Such crises can face businesses to many challenges, problems, and threats. During the COVID-19 pandemic, hotels are a good case for study in the field of business management, and significant studies have been conducted in this area [7, 31, 16, 19, 54]. Statistics show that in the United States, during the COVID-19 pandemic, 80% of hotel rooms were empty, and airlines reduced a high percentage of their workforce [11]. In Egypt, five-star hotels were forced to offer competitive prices and 50% discounts at the start of the COVID-19 pandemic [44]. Hotels in religious cities have not been spared from this damage. So that, in the middle of 2021, about 27% of hotels in Mashhad city have closed their businesses and more than 85% of the capacity of active hotels is empty. Mashhad is the world's second-largest religious metropolis, the second-largest city in Iran, and the most prominent tourist destination in this country. The hotels of this city have a tourism-pilgrimage nature. Throughout the history of tourism and pilgrimage, one of the most important factors in the prosperity of businesses in special environmental conditions is choosing a specific marketing strategy to introduce tourist and pilgrimages attractions. This study deals with prioritizing tourism-pilgrimage hotels marketing strategies during the COVID-19 pandemic for the first time.

One of the prerequisites for businesses to achieve a good position in a competitive environment and management optimization is to have a good marketing strategy. An appropriate marketing strategy can increase business resilience in the face of the crisis. Hooley, Lynch, & Jobber introduced five generic marketing strategies (GMS) that businesses may use in a competitive environment [23]. These strategies are known by the acronym GMS1 to GMS5. In this paper, these strategies are the basis for defining marketing strategies for hotels. Prioritizing and choosing a marketing strategy to increase sales revenue is a fundamental issue, and many companies face difficulties choosing the best marketing strategy for products and services because a marketing plan includes many factors that affect sales revenue [2]. Many organizations have to make strategic decisions on various issues. Due to the limited resources of the organization, strategists should decide which strategy has more advantages for the business. The growth, development, and failure of a business are influenced by the decisions it makes by management.

High costs and complex conditions force senior business managers to use appropriate decision-making techniques [12]. Decision-making is the main approach that helps experts to make the best possible decision by prioritizing different alternatives based on specific criteria [15]. A decision to prioritize or select marketing strategies might be supposed as a multi-criteria decision-making (MCDM) issue. To evaluate and select marketing strategies, a number of important criteria need to be considered [53]. On the other hand, when a decision needs to be made according to several criteria, the use of MCDM methods is one of the useful options in this regard. The MCDM methods have been used in various fields [47]. An MCDM problem is an issue where the decision-maker must choose an alternative from several alternatives based on a set of criteria. MCDM methods are analytical tools for prioritizing strategies and a suitable alternative to subjective, qualitative, costly, and long-standing methods [50].

If MCDM is based on fuzzy set theory, it can create more confident results. The fuzzy set theory was first proposed by Zadeh [55]. Applying the fuzzy set theory is useful to manage the ambiguity of expert comments [49]. Fuzzy logic, which is very similar to human thinking, is added to decision-making methods to express uncertainty in these techniques [3]. In the decision-making process, experts often express their opinions in linguistic terms, and the use of fuzzy logic in resolving the ambiguities in their opinions is of particular importance [33]. Fuzzy logic was first used by Bellman & Zadeh in decision-making [4]. In recent years, fuzzy logic has received much attention in decision-making [28, 14]. Many MCDM techniques can be used in fuzzy environments for better decision-making. In this work, to evaluate the strategies, two different approaches were used based on the combination of the fuzzy analytic hierarchy process (FAHP) technique with distance-based fuzzy multi-criteria decision-making (FMCDM) methods. One approach involves combining the FAHP method

with fuzzy Technique for Order of Preference by Similarity to Ideal Solution (FTOPSIS), and the other approach involves combining FAHP and fuzzy VIseKriterijumska Optimizacija I Kompromisno Resenje (FVIKOR) techniques.

Distinctive points of this research in comparison with other similar researches are choosing hotels in the second-largest religious metropolis in the world as a case study, comparing the results of distance-based FMCDM methods in prioritizing hotel marketing strategies, and conducting research during the COVID-19 pandemic to improve hotel performance in such crises. This article is arranged as follows. Section 2 reviews the most important works of literature. The methods used in data analysis are presented in Section 3. Section 4 presents results and data analysis. Finally, Section 5 summarizes the results of the research.

2. Literature Review

Marketing strategy is performance-based and is supported by resources and capabilities [13]. If companies combine different resources and capabilities more creatively, they will be more successful in bringing new products and services to market. This increases value creation for the customer [36]. During a pandemic, many managers have to make strategic decisions, and businesses are asked to change their products, goals, target customers, and channels [21].

2.1 Marketing Strategies

Suitable allocation and harmony of marketing processes and resources to gain the company's utilizable objectives from the perspective of a specific product market can be considered a definition of marketing strategy [51]. Marketing strategy can be considered as a tool for the business to respond to competitive situations, and the existing framework in this field will facilitate the adequate performance of the organization by helping to create a relationship between strategic organizational departments and external factors [18]. Based on different approaches, several strategies have been introduced under the heading of generic marketing strategy (GMS). Miles et al. introduced four approaches including defenders, Prospectors, Analyzers, and Reactors [34]. Porter proposed generic strategies including differentiation, focused differentiation, cost leadership, and focused cost leadership [42]. In another category, four strategies of market follower, market challenger, market niche, and market leader are introduced [30]. Price leadership, product specialization, and aggressive marketing are the other three strategies presented by Slater & Olson [48].

Five marketing strategies in the form of GMSs of Hooley, Lynch, & Jobber have been considered in this research [23]. Every business in a crisis may choose one of these strategies to survive or compete with other competitors. However, the important thing is which of these strategies can be the most optimal strategy for the business. GMS1 approach is to target the entire market and includes the providing of high-quality products and same prices. This generic marketing strategy is similar to Porter's differentiation marketing strategy. GMS2 approach is to target specific segments of the market through higher quality products and higher prices. This generic marketing strategy is similar to Porter's focused differentiation marketing strategy. GMS3 involves marketing products of medium quality and average price or similar to competitors. It can be said that it does not create any competitive advantage through distinction in quality or cost. In GMS4, specific segments of the market are targeted through higher quality products and lower prices. This strategy, like the GMS2, is similar to Porter's focused differentiation marketing strategy, except that low-prices are considered in the GMS4. GMS5 approach is to reduce costs and improve productivity and target a specific segment of customers. This generic strategy is like Porter's focused cost leadership marketing strategy [9].

Following five GMSs introduced, we proposed five alternatives or marketing strategies under the headings MS1 to MS5, given in Table 1. In other words, these five alternatives are a translation of five GMSs for a better understanding of hotel industry experts. The basis of this study is the prioritization of these alternatives or strategies.

Table 1. Proposed general marketing strategies for hotels

Strategy	Strategy description
MS1	Providing high quality hotel services and if it possible at a low price (providing different services to competitors and purpose: the whole market)
MS2	Provide high quality and high price hotel services (focus on customers who looking for high quality, even if the price increases)
MS3	Providing hotel services with the same quality and price (average quality and price, quality and price almost similar to competitors)
MS4	Providing hotel services with the highest possible quality and low price (focus on customers looking for high quality and low price)
MS5	Reduce costs related to providing hotel services and improve productivity with the aim of reducing prices compared to competitors and focusing on a specific segment of customers.

2.2 Marketing Strategies and COVID-19 Pandemic

From early 2020 until now, the need to pay attention to marketing strategies in the COVID-19 era has led to extensive research in this area. Hoekstra & Leeflang discussed the effect of the COVID-19 pandemic on consumer behavior and explained the consequences of this crisis on marketing strategies. They explained that the pandemic shows similarities with changes in consumer behavior and marketing practices during a recession. The crisis also shows features such as a rapid shift from offline to online behavior [21]. Another study describes how Chinese companies are developing marketing strategies using dimensions of motivation for innovation and the level of collaborative innovation [52]. A study has been performed to evaluate the impact of the COVID-19 pandemic on the industry of meetings, incentives, conferences, and exhibitions (MICE) worldwide and the United Arab Emirates (UAE) [1]. The results identified a 5p marketing strategy and an outsourcing approach as two suitable solutions for the viability of MICE businesses. Ding & Li have explored marketing innovation strategies that companies must adopt to survive and thrive during the COVID-19 pandemic. They presented the strategic solutions of using marketing innovation strategies during and after the epidemic crisis [10].

2.3 Criteria for Marketing Strategy Prioritization

The most attractive criteria for prioritizing and selecting a marketing strategy are presented by Hooley et al. [22]. These criteria have been used in this study to prioritize marketing strategies during the COVID-19 pandemic and are listed in Table 2. These criteria are based on marketing resources (MR) and consider both marketing support resources and market-based resources. Four criteria of Customer-linking capabilities, market innovation capabilities, human resource assets, and Reputational assets fall into the category of market-based resources and managerial capabilities fall into the category of marketing support resources.

Table 2. Criteria for prioritizing marketing strategies [22]

Criteria	Criteria description
MR1: Managerial capabilities	Refers to financial management, human resource management, hotel service management and operations management technology.
MR2: Customer-linking capabilities	It includes the level of hotel customer service, communication with key customers, understanding customer needs, maintaining and improving linking with existing customers, and building relationships with new customers.
MR3: Market innovation capabilities	Innovation in providing hotel services in a way that are not be imitated and copied by competitors simply. It is measured through the hotel's ability to provide new services.
MR4: Human resource assets	Refers to the job satisfaction of hotel staff, retention and the ability and talent of hotel staff to gain customer satisfaction and achieve the goals of the hotel. Having human resources can include such things as having a large number of human resources to provide more and better services, customizing services for different customers, having skilled, educated, well-mannered human resources, and so on.
MR5: Reputational assets	Determines the brand of the hotel and its value and credibility in the customer's imagination. It refers to the possibility of developing and nurturing the reputation and brand of the hotel in order to create added value for customers and to help create the suitable competitive positions for the hotel.

2.4 FMCDM Techniques and Marketing Strategies

FMCDM hybrid approaches have produced good results in strategy decision-making, especially when the FAHP technique is combined with one of the distance-based FMCDM methods such as FTOPSIS or FVIKOR [29, 45]. In the last two decades, the use of FMCDM methods in prioritizing and selecting the optimal marketing strategy has been considered by researchers. In 2009, the fuzzy analytic network process (FANP) technique was used as a valuable way to prioritize marketing strategies in Taiwan's private hotels [32]. According to the study, differentiation strategy is the most appropriate strategy in creating a competitive advantage for the hotels under study. Mohaghar et al. conducted a research to determine the optimal marketing strategy of Yazd Baft Company. For this purpose, they used a combination of FAHP and VIKOR techniques and found that the best marketing strategy for the company under study is the segmentation strategy [35]. A study has been conducted to evaluate Porter's generic strategies in Bank Melli Iran [46]. FTOPSIS technique was used to prioritize strategies and the results showed that differentiation, focus, and cost leadership strategies are in the first to third priorities, respectively. Jain et al. conducted a study to select the appropriate green marketing strategy to promote new green products and used the FAHP technique to determine the importance of criteria and the FTOPSIS method to prioritize strategies. They found that the green defense strategy was the best strategy for the company [26]. In another study using the FANP approach, manufacturing cost reduction was selected as the most appropriate marketing strategy for a multinational furniture retailer in Istanbul [20]. Among the various MCDM methods, we used AHP, TOPSIS, and VIKOR techniques in the fuzzy environment to analyze the data.

3. Methodology

In this study, an attempt has been made to prioritize marketing strategies for tourism-pilgrimage hotels by providing two hybrid decision models during the COVID-19 pandemic. For this purpose, two questionnaires were designed. The first questionnaire is related to the pairwise comparison of criteria, which was completed by all senior hotel managers. In March 2021, 158 hotels were identified in Mashhad, of which only 115 were active, and the rest of the hotels were closed due to the COVID-19 pandemic. Comments were received from 92 experts regarding pairwise comparisons between criteria. Table 3 presents linguistic terms and triangular fuzzy numbers (TFNs) used for fuzzy pairwise comparisons. The fuzzy integrated pairwise comparison matrix is obtained using the geometric mean of the responders' pairwise comparisons. After creating the fuzzy integrated pairwise comparison matrix, the weight of the criteria is determined by the FAHP technique. The second questionnaire is related to determining the status of strategies in terms of each criterion, which was completed by 13 experts in the hotel industry. The fuzzy decision matrix was created through the second questionnaire. Table 4 provides the linguistic terms used in the second questionnaire and the TFNs to create the fuzzy decision matrix. The geometric means of arrays in the decision matrices of the responders are used to aggregate the experts' comments and create the integrated fuzzy decision matrix.

Table 3. Linguistic terms and TFNs for fuzzy pairwise comparisons [8]

Scale	Linguistic Term	TFN
$\tilde{1}$	Equal preference	(1,1,1)
$\tilde{2}$	Low to medium preference	(1,2,3)
$\tilde{3}$	Medium preference	(2,3,4)
$\tilde{4}$	Medium to high preference	(3,4,5)
$\tilde{5}$	High preference	(4,5,6)
$\tilde{6}$	High preference to very high	(5,6,7)
$\tilde{7}$	Too much preference	(6,7,8)
$\tilde{8}$	Preference is very high to quite high	(7,8,9)
$\tilde{9}$	Quite a lot of preference	(8,9,10)

Table 4. Linguistic terms and TFNs to create a fuzzy decision matrix [41]

Scale	Linguistic Term	TFN
$\tilde{1}$	Very weak	(1,1,3)
$\tilde{2}$	Weak	(1,3,5)
$\tilde{3}$	Medium	(3,5,7)
$\tilde{4}$	Well	(5,7,9)
$\tilde{5}$	Very Well	(7,9,11)

Finally, according to the weights of the criteria and the integrated fuzzy decision matrix, marketing strategies were prioritized, and the best alternatives were selected using two distance-based FMCDM methods, including FTOPSIS and FVIKOR techniques. All calculations related to different steps of techniques are performed by Microsoft Excel 2019 software. Figure 1 shows the research framework.

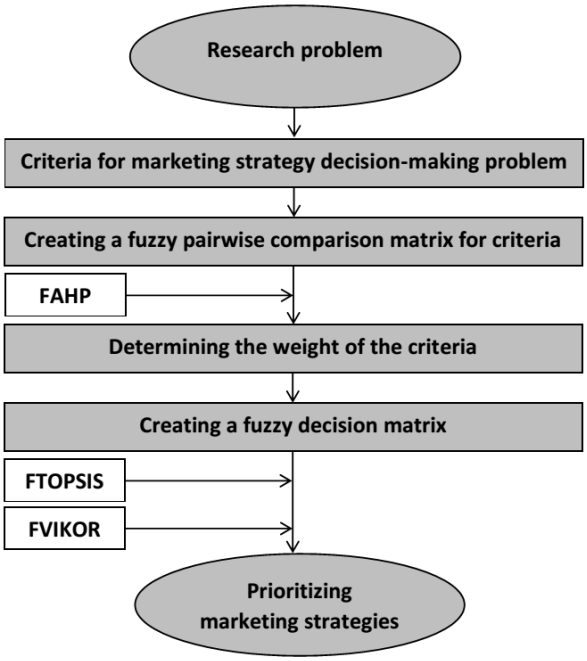

Figure 1. Research framework

3.1 FAHP Technique

An efficient technique in decision-making is AHP, first proposed by Saaty [43]. This technique is based on pairwise comparisons and allows managers to evaluate different scenarios. In this method, the study system is designed based on a hierarchical structure, and pairwise comparisons are performed for each row of this structure. In other words, in the AHP technique, an intricate problem is divided into some simple issues [17]. The fuzzy version of AHP contains situations that are ambiguous or not well defined. The FAHP technique has been proposed in different ways by different persons. In this research, the criteria weight is calculated using the technique proposed by Buckley [5]. Five steps are performed to determine the criteria weights and prioritize them through the FAHP technique.

Step1: Creating the fuzzy pairwise comparisons matrix ($\tilde{A}$). Suppose $\tilde{P}_{ij}$ is a set of decision makers' preferences for one criterion over another. $\tilde{A}$ is formed as follows:

$$\tilde{A} = [\tilde{p}_{ij}]_{n\times n} = \begin{bmatrix} 1 & \tilde{P}_{12} & \tilde{P}_{1n} \\ \tilde{P}_{21} & 1 & \tilde{P}_{2n} \\ \tilde{P}_{n1} & \tilde{P}_{n2} & 1 \end{bmatrix} \qquad i = 1,2,\dots,n;\ \ j = 1,2,\dots,n \tag{1}$$

where n is the number of related elements in each row.

Step2: Calculating the geometric mean values ($\tilde{r}_j$). The geometric mean value of the fuzzy comparisons of criterion j to each criterion is obtained from equation (2) [24].

$$\tilde{r}_j = \left(\prod_{i=1}^{n} \tilde{P}_{ij}\right)^{1/n} \qquad j = 1,2,3,\dots,n \tag{2}$$

Step3: Calculating the fuzzy weights ($\widetilde{w}_j$). In this step, the fuzzy weight of jth criterion is represented by a TFN calculated by equation (3).

$$\widetilde{w}_j = \tilde{r}_j \otimes (\tilde{r}_1 \oplus \tilde{r}_2 \oplus \dots \oplus \tilde{r}_n)^{-1} \tag{3}$$

Step4: Calculating the crisp weights (w_{crisp}). After calculating the $\widetilde{w}_j$, we calculate w_{crisp} of the criteria through equation (4) and then normalize them. For normalization, each w_{crisp} must be divided by the sum of the crisp weights.

$$w_{crisp} = \frac{lw_i + 2mw_i + uw_i}{4} \tag{4}$$

where lw_i, mw_i and uw_i are lower, middle and upper values of the fuzzy weight of the jth criterion, respectively.

Step5: Prioritizing the criteria. Finally, according to the normal weights obtained for the criteria, their priority is determined. The fuzzy weight of the criteria is used as input for FTOPSIS and FVIKOR techniques.

3.2 FTOPSIS Technique

Hwang & Yoon introduced the TOPSIS technique [25]. In this method, several alternatives are evaluated by several criteria, and the result is the prioritization of alternatives. According to this technique, the most appropriate alternative is to have the most distance from the negative ideal solution and the closest distance to the positive ideal solution. One of the approaches related to this method is the FTOPSIS technique, which was first presented by Chen & Hwang [6]. In this research, the developed method by Patil & Kant [41] has been used. Therefore, to implement this technique, several steps must be taken.

Step1: Creating the fuzzy decision matrix ($\widetilde{D}$). Assume that $\widetilde{D}$ defines expert opinions as follows:

$$\widetilde{D} = \left[\tilde{x}_{ij}\right]_{m\times n} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn} \end{bmatrix} \qquad i = 1,2,\dots,m;\ \ j = 1,2,\dots,n \tag{5}$$

Each column represents a criterion and each row represents an alternative. In $\widetilde{D}$, $\tilde{x}_{ij}$ represents the quantity of the ith alternative in the jth criterion. Depending on the effect on alternatives, criteria may be negative or positive.

Step2: Creating the normalized fuzzy decision matrix ($\tilde{R}$). At this step, $\widetilde{D}$ must be converted to a scaleless fuzzy decision matrix. $\tilde{R}$, which is normalized $\widetilde{D}$, defined as equation (6). To obtain $\tilde{R}$, $\widetilde{D}$ must be normalized based on equation (7) and equation (8).

$$\tilde{R} = [\tilde{r}_{ij}]_{m\times n} = \begin{bmatrix} \tilde{r}_{11} & \tilde{r}_{12} & \cdots & \tilde{r}_{1n} \\ \tilde{r}_{21} & \tilde{r}_{22} & \cdots & \tilde{r}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{r}_{m1} & \tilde{r}_{m2} & \cdots & \tilde{r}_{mn} \end{bmatrix} \qquad i = 1,2,\dots,m;\ \ j = 1,2,\dots,n \tag{6}$$

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^+}, \frac{b_{ij}}{c_j^+}, \frac{c_{ij}}{c_j^+}\right) \ \ and\ c_j^+ = \max_i c_{ij} \quad \text{(for positive criteria)} \tag{7}$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}}\right) \ and\ a_j^- = \min_i a_{ij} \quad \text{(for negative criteria)} \tag{8}$$

Step3: Creating the weighted normalized fuzzy decision matrix ($\tilde{V}$). $\tilde{V}$ is defined as equation (9). To obtain $\tilde{V}$, the fuzzy weight of the criteria ($\tilde{w}_j$) is multiplied by $\tilde{r}_{ij}$. Where $\tilde{w}_j$ is fuzzy weight of *j*th criterion and is calculated by FAHP technique.

$$\tilde{V} = [\tilde{v}_{ij}]_{m\times n} = \begin{bmatrix} \tilde{v}_{11} & \tilde{v}_{12} & \cdots & \tilde{v}_{1n} \\ \tilde{v}_{21} & \tilde{v}_{22} & \cdots & \tilde{v}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{v}_{m1} & \tilde{v}_{m2} & \cdots & \tilde{v}_{mn} \end{bmatrix} \qquad i = 1,2,\dots,m;\ \ j = 1,2,\dots,n \tag{9}$$

Where: $\tilde{v}_{ij} = \tilde{r}_{ij}.\tilde{w}_j$

Step4: Specifying the fuzzy positive ideal solution (A^+) and the fuzzy negative ideal solution (A^-). A^+ and A^- of the alternatives are determined by equation (10) and equation (11), respectively.

$$A^+ = (\tilde{v}_1^+, \tilde{v}_2^+, \dots, \tilde{v}_n^+) \ \ where\ \tilde{v}_j^+ = \begin{cases} \max\limits_i \{\tilde{v}_{ij}\} & \text{for positive criteria} \\ \min\limits_i \{\tilde{v}_{ij}\} & \text{for negative criteria} \end{cases} \quad i = 1,2,\dots,m;\ \ j = 1,2,\dots,n \tag{10}$$

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-) \ \ where\ \tilde{v}_j^- = \begin{cases} \min\limits_i \{\tilde{v}_{ij}\} & \text{for positive criteria} \\ \max\limits_i \{\tilde{v}_{ij}\} & \text{for negative criteria} \end{cases} \quad i = 1,2,\dots,m;\ \ j = 1,2,\dots,n \tag{11}$$

Step5: Calculating the distance of each alternative from A^+ and A^-. The distance of each alternative from A^+ and A^-, shows by d_i^+ and d_i^-, which obtained through equation (12) and equation (13), respectively.

$$d_i^+ = \sum_{j=1}^n d\left(\tilde{v}_{ij} - \tilde{v}_j^+\right) \qquad i = 1,2,\dots,m \tag{12}$$

$$d_i^- = \sum_{j=1}^n d\left(\tilde{v}_{ij} - \tilde{v}_j^-\right) \qquad i = 1,2,\dots,m \tag{13}$$

Step6: Obtaining closeness coefficient (CC_i) for each alternative. CC_i for each alternative is calculated by equation (14).

$$CC_i = \frac{d_i^-}{d_i^+ + d_i^-} \qquad i = 1,2,\dots,m \tag{14}$$

Step7: Prioritizing the alternatives. In the last step, the alternatives are prioritized based on the descending order of CC_i.

3.3 FVIKOR Technique

VIKOR method was proposed by Opricovic for the first time [38]. This technique was developed using fuzzy inputs by Opricovic & Tzeng [39]. Next, a fuzzy development of VIKOR was presented to find a fuzzy compromise solution [37]. The FVIKOR technique solves the multi-criteria decision-making problem in a fuzzy environment. In this way, criteria weights are fuzzy sets, and TFNs are used to work with ambiguous and inaccurate numerical values. In this study, the FVIKOR technique developed by Opricovic has been used [40]. The steps to perform this technique are as follows.

Step1: Creating the fuzzy decision matrix ($\widetilde{D}$). In the first step, like the FTOPSIS technique, matrix $\widetilde{D}$ must be created.

Step2: Creating the normalized fuzzy decision matrix ($\widetilde{N}$). In this step, $\widetilde{D}$ must be converted to $\widetilde{N}$. To determine $\widetilde{N}$, the following steps must be performed:

(1) Determining the positive ideal and the negative ideal for each criterion: The best and worst of each of the values in each criterion are called $\tilde{f}_j^+$ and $\tilde{f}_j^-$, respectively. If the *j*th criterion represents profit, $\tilde{f}_j^+$ and $\tilde{f}_j^-$ are obtained from the equation (15) and equation (16), respectively. But if the *j*th criterion represents the cost, $\tilde{f}_j^+$ and $\tilde{f}_j^-$ are determined from the equation (17) and equation (18), respectively.

$$\tilde{f}_j^+ = \max_i \tilde{f}_{ij} \qquad i = 1,2,\dots,m \tag{15}$$

$$\tilde{f}_j^- = \min_i \tilde{f}_{ij} \qquad i = 1,2,\dots,m \tag{16}$$

$$\tilde{f}_j^+ = min_i \tilde{f}_{ij} \qquad i = 1,2,\dots,m \tag{17}$$

$$\tilde{f}_j^- = \max_i \tilde{f}_{ij} \qquad i = 1,2,\dots,m \tag{18}$$

(2) Obtaining normalized fuzzy difference: According to $\tilde{f}_j^+ = (l_j^+, m_j^+, u_j^+)$ and $\tilde{f}_j^- = (l_j^-, m_j^-, u_j^-)$,the normalized fuzzy difference is calculated through the equation (19) and equation (20).

$$\tilde{d}_{ij} = \frac{\tilde{f}_j^+ \ominus \tilde{f}_{ij}}{u_j^+ - l_j^-} \qquad \text{(for positive criteria)} \tag{19}$$

$$\tilde{d}_{ij} = \frac{\tilde{f}_{ij} \ominus \tilde{f}_j^+}{u_j^- - l_j^+} \qquad \text{(for negative criteria)} \tag{20}$$

Step3: Calculating utility ($\tilde{S}_i$) and regret ($\tilde{R}_i$) values of the alternatives. $\tilde{S}_i$ indicates the relative distance of alternative i from the ideal point and $\tilde{R}_i$ indicates the maximum inconvenience of alternative i from distance of the ideal point and are obtained by equations (21) and (22), respectively.

$$\tilde{S}_i = \sum_{j=1}^{n} \left(\tilde{w}_j \otimes \tilde{d}_{ij}\right) \tag{21}$$

$$\tilde{R}_i = \max_j \left(\tilde{w}_j \otimes \tilde{d}_{ij}\right) \tag{22}$$

Step4: Calculating the FVIKOR index ($\tilde{Q}_i$). $\tilde{Q}_i$ is calculated by equation (23).

$$\tilde{Q}_i = v\frac{(\tilde{S}_i \ominus \tilde{S}^+)}{S^{-r}-S^{+l}} \oplus (1-v)\frac{(\tilde{R}_i \ominus \tilde{R}^+)}{R^{-r}-R^{+l}} \quad (23)$$

Where: $\tilde{S}^+ = \min_i \tilde{S}_i$, $S^{-r} = \max_i S_i^r$, $\tilde{R}^+ = \min_i \tilde{R}_i$, $R^{-r} = \max_i R_i^r$, and the value of v is between 0 and 1 and is selected according to the agreement of the decision-making group. If the agreement is too high, v > 0.5, the agreement is by majority vote, v = 0.5, and if the agreement is small, then it will be v <0.5. In other words, the larger v, then the more value is given to group comments, and the smaller v, the more value is given to individual comments. In this study, the value of v is considered 0.5.

Step5: Calculating crisp values for S_i, R_i and Q_i. In this step, the crisp values for S_i, R_i, and Q_i are calculated using equation (24) and are known as S_i^{crisp}, R_i^{crisp}, and Q_i^{crisp}, respectively.

$$Crisp\ value = \frac{l_i+2m_i+u_i}{4} \quad (24)$$

Where: l_i, m_i and u_i are lower, middle and upper values of $\tilde{S}_i$, $\tilde{R}_i$ and $\tilde{Q}_i$.

Step6: Prioritizing the alternatives and selecting the best alternatives. If the following two conditions are satisfied, the best alternative is to have the lowest value of Q_i^{crisp} and the other alternatives are prioritized based on Q_i^{crisp} values.

Condition 1: *If, based on the values of Q_i^{crisp}, alternatives A_1, A_2, and A_m are the first, second, and last alternatives, respectively, and m represents the number of alternatives, the equation (25) must be established.*

$$\frac{\left[Q_{A_2}^{crisp}-Q_{A_1}^{crisp}\right]}{\left[Q_{A_m}^{crisp}-Q_{A_1}^{crisp}\right]} \geq \frac{1}{m-1} \quad (25)$$

Condition 2: *The alternative A_1 must also be the best ranked in terms of values $S_{A_1}^{crisp}$ or/and $R_{A_1}^{crisp}$.*

If condition 1 is not satisfied, alternatives A_1, A_2, ..., A_i are selected as the best alternatives. The maximum value of *i* is determined according to equation (26).

$$Q_{A_i}^{crisp} < \frac{1}{m-1} + Q_{A_1}^{crisp} \quad (26)$$

If condition 1 is satisfied but condition 2 is not satisfied, the two alternatives A_1 and A_2 are selected as the best alternatives.

4. Results

The hierarchical structure for performing the decision-making process is shown in Figure 2. At the highest level, this structure represents the goal, and at other levels, it includes five criteria and five alternatives. The weight and importance of the criteria at level two of this structure are determined by FAHP Technique. The third level of the structure includes five alternatives that are prioritized by FTOPSIS and FVIKOR techniques.

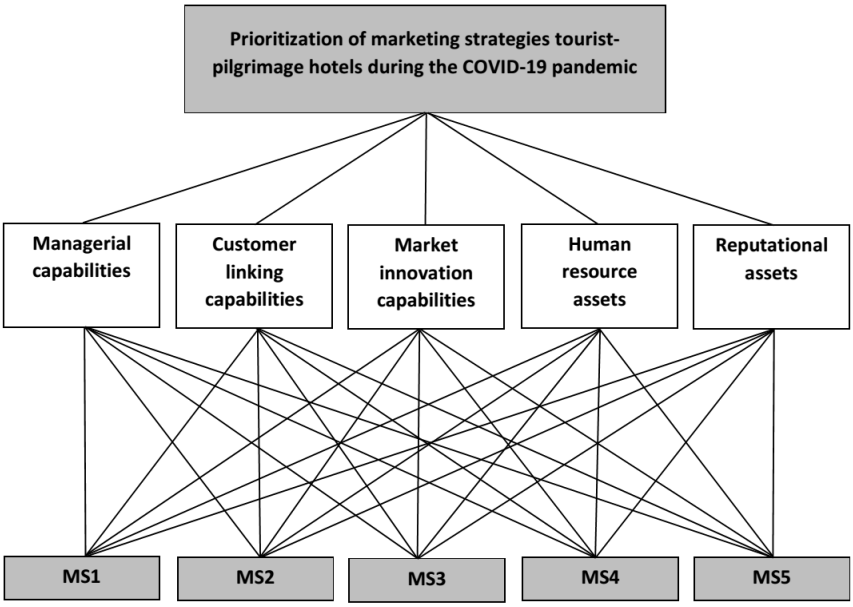

Figure 2. Hierarchical structure

4.1 Calculating the Criteria Weights Using the FAHP Technique

The weight of effective criteria in prioritizing marketing strategies was determined by fuzzy hierarchical analysis process, and the priority of each criterion was determined during the COVID-19 pandemic. Paired comparisons of criteria were done through a pairwise comparison questionnaire by senior hotel managers. The integrated fuzzy pairwise comparison matrix was obtained based on the geometric mean of the respondents' opinions and is given in Table 5. Then, after forming the integrated fuzzy pairwise comparison matrix, criteria weights were calculated by performing the steps of the FAHP technique. The calculated weights include TFNs. These weights were then used to prioritize marketing strategies in FTOPSIS and FVIKOR techniques. Table 6 shows the fuzzy and normal weights, and the priority of the criteria.

Table 5. Integrated fuzzy pairwise comparison matrix for criteria

	MR1	MR2	MR3	MR4	MR5
MR1	(1.000,1.000,1.000)	(0.720,0.903,1.134)	(0.418,0.518,0.663)	(0.608,0.770,1.012)	(0.521,0.674,0.894)
MR2	(0.882,1.108,1.388)	(1.000,1.000,1.000)	(0.442,0.591,0.816)	(0.706,0.900,1.209)	(0.612,0.806,1.089)
MR3	(1.508,1.932,2.394)	(1.225,1.692,2.263)	(1.000,1.000,1.000)	(1.063,1.448,1.914)	(0.909,1.343,1.914)
MR4	(0.988,1.298,1.645)	(0.827,1.111,1.416)	(0.522,0.691,0.941)	(1.000,1.000,1.000)	(0.661,0.818,1.052)
MR5	(1.119,1.484,1.919)	(0.919,1.241,1.634)	(0.522,0.745,1.100)	(0.951,1.223,1.514)	(1.000,1.000,1.000)

Table 6. Weight and rank of each criterion

Criteria	Fuzzy weight	Normal weight	Rank
MR1	(0.098,0.147,0.226)	0.147	5
MR2	(0.109,0.168,0.264)	0.169	4
MR3	(0.175,0.282,0.444)	0.282	1
MR4	(0.121,0.187,0.288)	0.187	3
MR5	(0.137,0.216,0.340)	0.216	2

The results show that the criterion of market innovation capabilities has the most effect, and the criterion of managerial capabilities has the least effect on the choice of marketing strategies of hotels during the COVID-19 pandemic. Criteria of reputational assets, human resource assets, and customer-linking capabilities are also ranked second to fourth, respectively.

4.2 The Weights of the Alternatives in Terms of Criteria

Based on the information received from the second questionnaire, the integrated fuzzy decision matrix was created. The integrated fuzzy decision matrix is the result of merging the comments of all experts. This matrix is given in Table 7. Through this matrix, the weight and rank of the alternatives were determined in terms of each criterion and are presented in Table 8.

Table 7. Integrated fuzzy decision matrix

	MR1	**MR2**	**MR3**	**MR4**	**MR5**
MS1	(5.615,7.660,9.684)	(3.946,6.031,8.076)	(4.500,6.560,8.591)	(4.160,6.229,8.266)	(5.121,7.226,9.281)
MS2	(5.261,7.321,9.353)	(6.068,8.117,10.143)	(5.195,7.228,9.246)	(4.739,6.819,8.861)	(6.821,8.828,10.832)
MS3	(1.184,2.982,5.063)	(1.184,2.314,4.500)	(1.088,1.340,3.464)	(1.088,2.635,4.743)	(1.587,2.908,5.157)
MS4	(6.821,8.828,10.832)	(5.993,8.014,10.027)	(6.821,8.828,10.832)	(6.477,8.493,10.502)	(5.126,7.181,9.210)
MS5	(4.743,6.777,8.793)	(5.472,7.513,9.536)	(1.184,2.127,4.326)	(6.647,8.659,10.666)	(1.088,1.340,3.464)

Table 8. Weight and rank of the alternatives in terms of each criterion

Criteria	**Alternatives**	**Weight**	**Rank**
MR1	MS1	0.228	2
	MS2	0.217	3
	MS3	0.091	5
	MS4	0.262	1
	MS5	0.201	4
MR2	MS1	0.186	4
	MS2	0.251	1
	MS3	0.083	5
	MS4	0.248	2
	MS5	0.232	3
MR3	MS1	0.242	3
	MS2	0.266	2
	MS3	0.072	5
	MS4	0.326	1
	MS5	0.094	4
MR4	MS1	0.188	4
	MS2	0.206	3
	MS3	0.086	5
	MS4	0.257	2
	MS5	0.262	1
MR5	MS1	0.254	2
	MS2	0.311	1
	MS3	0.113	4
	MS4	0.253	3
	MS5	0.069	5

4.3 Prioritizing the Alternatives Using the FTOPSIS Technique

According to Table 7 and performing the various steps of the FTOPSIS technique, the required parameters were calculated in order to prioritize the hotel marketing strategies. So that, d_i^+, d_i^-, CC_i, and NCC_i were calculated for each alternative, and the alternatives were ranked accordingly. Table 9 presents the values of d_i^+, d_i^-, CC_i, NCC_i and the rank of the alternatives. Prioritization of alternatives through the FTOPSIS technique showed that alternative MS4 has the highest value of CC_i. Therefore, based on the FTOPSIS method, providing hotel services with the highest possible quality and low price and focusing on customers looking for high quality and low price is the most optimal marketing strategy for hotels during the COVID-19 pandemic. This strategy emphasizes focused differentiation.

Table 9. d_i^+ and d_i^-, CC_i, NCC_i and rank of alternatives based on FTOPSIS technique

Alternative	d_i^+	d_i^-	CC_i	NCC_i	Rank
MS1	0.892	0.762	0.461	0.219	3
MS2	0.826	0.858	0.510	0.242	2
MS3	1.229	0.343	0.218	0.104	5
MS4	0.783	0.922	0.541	0.257	1
MS5	1.018	0.610	0.374	0.178	4

4.4 Prioritizing the Alternatives Using the FVIKOR Technique

In the FVIKOR technique, by considering Table 7 and the weight of criteria as inputs and going through different steps of this technique, the required data to prioritize and select superior marketing strategies were determined. Therefore, the fuzzy values for $\tilde{S}_i$, $\tilde{R}_i$, and $\tilde{Q}_i$ were determined and are provided in Table 10. The rank of the alternatives is specified using the values of S_i^{crisp}, R_i^{crisp}, and Q_i^{crisp} and is shown in Table 11. For prioritizing alternatives by Q_i^{crisp} values, the first condition is not met. Thus, based on equation 26, alternatives MS4, MS2 and MS1 were selected as the best strategies in the FVIKOR technique. All three selected alternatives emphasize differentiation, with the exception that strategies MS4 and MS2 emphasize focused differentiation.

Table 10. $\tilde{S}_i$, $\tilde{R}_i$ and $\tilde{Q}_i$ in FVIKOR technique

Alternative	$\tilde{S}_i$			$\tilde{R}_i$			$\tilde{Q}_i$		
	S_i^l	S_i^m	S_i^r	R_i^l	R_i^m	R_i^r	Q_i^l	Q_i^m	Q_i^r
MS1	-0.146	0.204	0.960	-0.022	0.057	0.248	-0.482	0.076	0.684
MS2	-0.210	0.105	0.803	-0.030	0.040	0.220	-0.510	0.028	0.606
MS3	0.146	0.659	1.502	0.055	0.189	0.381	-0.306	0.366	1.000
MS4	-0.253	0.039	0.701	-0.031	0.033	0.177	-0.524	0.000	0.524
MS5	-0.043	0.369	1.113	0.044	0.169	0.377	-0.372	0.259	0.885

Table 11. S_i^{crisp}, R_i^{crisp}, Q_i^{crisp}, S_i^{rank}, R_i^{rank} *and* Q_i^{rank} in FVIKOR technique

Alternative	S_i^{crisp}	R_i^{crisp}	Q_i^{crisp}	S_i^{rank}	R_i^{rank}	Q_i^{rank}
MS1	0.306	0.085	0.089	3	3	3
MS2	0.201	0.068	0.038	2	2	2
MS3	0.741	0.204	0.356	5	5	5
MS4	0.131	0.053	0.000	1	1	1
MS5	0.452	0.190	0.258	4	4	4

5. Conclusions

In this research, we have tried to prioritize marketing strategies for hotels in the second-largest religious metropolis in the world based on distance-based FMCDM methods and select the optimum strategy. The importance of the criteria was specified by conducting pairwise comparisons between the criteria and using the FAHP method. Market innovation capabilities were determined as the most important criterion during the COVID-19 pandemic. Then, reputational assets, human resources assets, customer-linking capabilities, and managerial capabilities were the following priorities, respectively. Criteria prioritization indicates that in critical situations, hotel managers must enhance market innovation capabilities. Improving market innovation capabilities is made possible by providing new services, which are not easily imitated by competitors. Innovation capabilities in the hotel industry can create a significant difference between competitors and are effectively attract more customers in a pandemic crisis. In determining the weight of each strategy in terms of each criterion, it was determined that in terms of managerial capabilities and market innovation capabilities, alternative MS4 has the most weight and in terms of customer-linking capabilities and reputational assets, alternative MS2 has the highest score. Also, in terms of human resource assets, alternative MS5 has gained the most weight.

Alternatives were ranked as MS4, MS2, MS1, MS5, and MS3 during the COVID-19 pandemic using the FTOPSIS technique. Therefore, providing hotel services with the highest possible quality and low price and focusing on customers looking for high quality and low price was selected as the optimum strategy by the FTOPSIS technique. However, according to the FVIKOR method, alternatives MS4, MS2 and MS1 were selected as the best alternatives. A noteworthy point is that according to the FVIKOR technique, strategies that do not emphasize differentiation will not have a place among the prioritization of strategies and have been eliminated. Thus, the superiority of FVIKOR method over FTOPSIS method is that it eliminates strategies that may not play a role in improving the performance of hotels during the COVID-19 pandemic. However, according to the FTOPSIS technique, the same strategies eliminated in FVIKOR method are in the last ranks of prioritization. By prioritizing the FTOPSIS method and selecting three alternatives as best strategies through the FVIKOR method, it is possible to realize the importance of differentiation, especially focused differentiation during the COVID-19 pandemic. Therefore, to maintain or create a competitive advantage during the COVID-19 pandemic, tourism-pilgrimage hotels should focus on differentiating their services by offering new services and adding new features to their services, and on the other hand, focusing on a specific segment of customers. In addition to strategies prioritization and selection, another critical issue is strategy implementation. In this regard, hotels should take appropriate measures to implement the best strategy and pay more attention to resources and capabilities. One of the limitations of this research is that its results may not be generalizable to other business sectors. Because the covid-19 pandemic has different effects on various business sectors and businesses should choose a different marketing strategy in such a crisis. Another limitation of this study was that the distribution of questionnaires was a time-consuming process. This study was performed for the COVID-19 pandemic era. it is suggested that the discussion of marketing strategies prioritization for the post-COVID-19 era also be considered. It is recommended that researchers consider selecting the appropriate marketing strategy for hotels in other major religious tourism destinations during the COVID-19 and post-COVID-19 era.

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