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Research Article

OTAs Selection for Hot Spring Hotels by a Hybrid MCDM Model

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Tourism has been identified as one of the sectors that will contribute to Taiwan's economic development. Online travel agencies' role in producing economic value in the hospitality industry continues to grow. The hotel industry is used in this study as the research context to help managers of hot spring hotels select the optimal online travel agencies (OTAs) using a hybrid multi-criteria decision-making (MCDM) model. The aim of this paper is threefold: first, to obtain selection criteria for OTAs based on the fuzzy Delphi method; second, to extract interdependencies between the perspectives using decision making trial and evaluation laboratory (DEMATEL); and third, according to interdependencies between the perspectives, to rank the alternatives by analytic network process (ANP). Based on the proposed model, a real-world company was conducted and demonstrated OTAs selection problem; the results demonstrated the proficiencies and effectiveness of this model.

1. Introduction

People can buy anything on the Internet. If they want to get around, tourism websites can be visited to find many scenic spots [1]. Without time and geographical limitations, electronic commerce (e-commerce) makes our life more convenient [2]. E-commerce's rapid growth has resulted in many enterprises constructing online marketing channels. More specifically, within the hotel industry, the majority of international hotel chains have built websites to assist guests with online services [3]. However, operating a host website is much more difficult for small or medium-sized hotels, as their visit amount is much lower [4]. Chang et al. [5] also noted that not all companies have the ability or resources to build viable online channels capable of retaining consumers' attention. Therefore, many such enterprises continue to depend on well-liked online agencies and booking sites to help them sell products. For example, hotels often maintain relationships with one or more OTAs to sell their rooms.

OTAs do not own or operate hotels; rather, they host websites that tourists can visit in order to gather information about hotels, do price comparisons, check to see if discounts are available, and review comments from people who have already visited [6]. OTAs reduce search costs by helping prospective customers rank hotels by price, location, or quality, thereby increasing the competition between hotels. As such, they are becoming critical players within the industry, and relationship with the major sites is becoming a competitive necessity for almost all types of hotels [7]. According to [8], the increasing dependence of customers on OTAs when they contemplate major purchasing decisions is due to the pervasiveness of the Internet in people's lives. OTAs have become popular communication and distribution channels for many types of customers when it comes to travel products or services. In fact, Inversini and Masiero [9] claimed that traditional travel agencies have been replaced by OTAs due to their ability to present customers with a large variety of booking services associated with their travel plans.

OTAs will continue to grow exponentially in countries where they can be accessed [10]. Moreover, OTAs dominate online information and reservation channels [11]. Even so, while OTAs and hotels collaborate with each other, they often simultaneously are competing with each other. They cooperate as they attempt to introduce and attract new customers to a given hotel but compete with each other when it comes to repeat customers [6]. Ling et al. [12] also indicated that many hotels have the challenge to develop applicable cooperative mechanisms with OTAs. As such, selecting the optimal OTAs to work with is a major issue for hotel executives. Moreover, this selection is made more difficult due to the fact that there are almost no standards or frameworks that hotels can follow [13].

This study is unique within the existent literature for a number of reasons. The fuzzy Delphi method can cause favorable selection criteria [14, 15]. As a result, we used the fuzzy Delphi method, which calls for the collection of expert opinions, with respect to modifying selection criteria and constructing a hierarchy to select the optimal OTAs. Second, when making decisions, it is vital to consider whether the relevant perspectives are dependent on each other. DEMATEL can lead to improved decision-making due to the fact that it can verify interdependencies between the various perspectives, and help to map out the relative relationships between them [16]. ANP is suitable to apply for both quantitative and qualitative data and also facilitates solutions for issues related to interdependence and feedback [17]. In this study, we also utilized DEMATEL to confirm the interdependencies between the perspectives; based on the results, ANP was used to rank the alternatives. Many studies have already highlighted the benefits of combining DEMATEL and ANP in this way [18–20].

We organized this study as follows. The literature pertaining to the selection or evaluation of OTAs is first briefly outlined. Next, the fuzzy Delphi method, DEMATEL, and ANP are discussed. Section 4 shows the integrated model to select the optimal OTAs for hot spring hotels in Taiwan. Conclusions and proposals for future research are offered in Section 5.

2. Literature Review: OTAs Selection or Evaluation

Several studies have examined issues pertaining to OTAs selection or evaluation. Kim et al. [21] investigated important OTAs choice attributes from online customers' viewpoints. Park et al. [22] measured OTAs website quality. Using a sample of 311 respondents, they examined the influence of perceived website quality on willingness to make use of OTAs. Ku and Fan [23] used analytic hierarchy process (AHP) to weight the criteria for OTAs' products based on 131 customers' viewpoints. Chiou et al. [24] evaluated online travel websites from the internal perspective of an organization. Within the context of OTAs, Bernardo et al. [25] clarified the scope of e-service quality; they further evaluated the effect of e-quality on perceived customer value and loyalty. Sun et al. [10] ranked attributes in order of importance to assist Chinese travel agencies to maximize benefits associated with website design, operational efficiency, and resource allocation. Dutta et al. [26] identified the factors affecting customer satisfaction for OTAs in India based on a survey of 384 customers. Lee et al. [13] collected data from 283 users and applied it to an investigation of the importance of website serviceability of OTAs. Lee et al. [27] explored factors impacting cross-strait consumers' selection of OTAs by AHP. Dash and Sharma [28] compared the competitiveness of Indian tourism aggregators via AHP. Niu and Lee [29] explored the relationship between repurchase intention of Chinese tourists and variables of OTAs websites. Yee et al. [30] evaluated third-party hotel booking website performance by AHP. Tandon et al. [31] combined intuitionistic fuzzy AHP (IFAHP) and intuitionistic fuzzy preference ranking organization method for enrichment evaluation (IFPROMETHEE) to rank OTAs websites.

Researchers have yet offered much in the way of useful guidance regarding the creation of a decision-making model pertaining to selecting the optimal OTAs for hotels. As to the MCDM methodologies, past studies suffer from some defects, including (1) not clearly describing how to screen the selection criteria, (2) not considering the interdependencies among perspectives or criteria in the hierarchy, and (3) not to specifically identify the interdependent relations between perspectives or criteria by any quantitative methods. Moreover, Chiou et al. [24] showed that user-based surveys should be regarded as an external evaluation method with respect to deciding whether an online travel website is "doing the thing right" in terms of meeting the expectations of their users. Evaluating whether an online travel website is "doing the right thing" with respect to meeting its web strategy requirements requires an initial internal evaluation by a team of experts; once completed, the external surveys can be performed. In response, we first utilized the fuzzy Delphi method based on external and internal evaluations to adjust the relevant selection criteria. Then, we applied DEMATEL so that the interdependencies among the perspectives could be identified. Finally, ANP was to rank the available alternatives.

3. Method

When multi-criteria group decision-making emerged in the early 2000s, it has been a quite vital field [32]. Researchers have tried to combine multiple MCDM approaches for constructing optimal decision schemes in recent years [33]. This study presented a hybrid model that blends the fuzzy Delphi method, DEMATEL, and ANP, such that the selection of the optimal OTAs becomes clear following the analysis. The steps and procedures involved are outlined below.

3.1. Fuzzy Delphi Method. In addition, using an MCDM approach, it is advised that information be collected through expert discussions as well as group decision making, for example, by following the Delphi method [34]. The Delphi method is essentially dependent on expert professional wisdom, intuitional experience, and value judgment. At the beginning, the Delphi method requires the formation of a group with 10 to 15 experts focused on a specific issue. The Delphi method is composed of an anonymous survey conducted over two or more rounds; it is not expected that participants will ever meet each other throughout the process. After each round, the results are provided from the previous round to allow participants to review their original assessments, and then choose to maintain or revise them. Rowe et al. [35] noted that there exists a common belief that this approach makes better use of group interaction. Wu et al. [36] also pointed out that the pros of the Delphi method include the following: (1) being reliable and practical, (2) reducing incorrect results through anonymity, and (3) reducing personal bias.

However, the Delphi method has been criticized for a number of issues including a low convergence, the length of the interrogation process, and the loss of pertinent information that could be gleaned from expert opinions [37]. To avoid the shortcomings of the Delphi method, various studies [14, 38, 39] improved it in a fuzzy environment.

Chao and Kao [40] claimed that the fuzzy Delphi method's primary advantage consisted of the amount of time saved due to the reduction in the number of surveys performed, in conjunction with the inclusion of expert opinions. To assess the selection criteria, the present study employed the fuzzy Delphi method as developed by Klir and Yuan [41]. We began by collecting expert opinions through questionnaires and then establishing the triangular fuzzy number T_i. Y_{ij} was deemed the evaluation value of expert j for criterion i. Following Hsu et al. [42], we derived the defuzzified value of each criterion S_i using the simple center of gravity method. Last, we screened out the selection criteria by setting a threshold, which was done through expert discussion.

$$T_i = (L_i, M_i, U_i) \tag{1}$$

$$L_i = \min_j \{Y_{ij}\} \tag{2}$$

$$U_i = \max_j \{Y_{ij}\} \tag{3}$$

$$M_i = \left(\prod_{j=1}^{n} Y_{ij}\right)^{1/n} \tag{4}$$

$$S_i = \frac{L_i + M_i + U_i}{3} \tag{5}$$

3.2. DEMATEL. As noted above, DEMATEL is applied to identify factor interdependent relationships. The steps involved in DEMATEL are as follows [33, 43–47].

Step 1. Establish the initial direct relation matrix A according to the scores.

Based on professional knowledge, the decision maker scores the mutual relationships between factors. Comparisons on a scale ranging from 0 (no impact) to 4 (very high impact) regarding the impact between factors must be made. Determining the degree of influence between two factors and filling in the value as defined above in the corresponding field, A can be created by consolidating the values filled in by the decision makers. The notation x_{ij} represents the degree to which the expert evaluation factor i influences factor j. For $i = j$, all diagonal elements values are 0. For each respondent, a $n \times n$ positive matrix can be developed as $X^k = [X_{ij}^k]$, where k is the number of experts with $1 \le k \le H$, and n is the number of perspectives. To integrate the opinions from H experts, the average matrix $A = [a_{ij}]$ is as follows:

$$a_{ij} = \frac{1}{H} \sum_{k=1}^{H} x_{ij}^k \tag{6}$$

Step 2. Compute the normalized initial direct relation matrix D.

D is generated from A. $D = A \times S$, where $S = 1/\max_{1\le i\le n} \sum_{j=1}^{n} a_{ij}$. Each element in D falls between 0 and 1.

Step 3. Attain the total relation matrix T.

T is defined as $T = D(I - D)^{-1}$, where I is the identity matrix. r and c are $n \times 1$ and $1 \times n$ vectors representing the sum of rows and sum of columns of T, respectively. Assume r_i to be the sum of the ith row in T; then r_i summarizes both the direct and indirect impacts given by factor i to the other factor. If c_j means the sum of the jth column in T, then c_j represents both the direct and indirect impacts by factor j from the other factor. When $j = i$, the sum $(r_i + c_j)$ expresses the total impacts given and received by factor i. As such, $(r_i + c_j)$ indicates the degree of significance that factor i plays in the system. Moreover, driving and outcome factors can be also detected. Driving factors have positive criterion $(r_i - c_j)$ values. By contrast, outcome factors are criteria with negative $(r_i - c_j)$ values [48–50].

Step 4. Identify a threshold value.

While T provides a structural relation between the factors, decision makers are still required to arrange a threshold value to eliminate the unsuitable effects. Hsu [51] and Tsai and Lin [52] suggested that the threshold value can be established via expert discussions.

3.3. ANP. ANP is derived from AHP. Using pairwise comparisons, AHP is able to approximate the relative importance of every node. Nodes are compared by Saaty's scale: a score of 1 suggests that both are equally important, while a score of 9 represents that one node is extremely more important as compared to the other. Saaty [53] proposed the consistency ratio (CR) for verifying the consistency of the pairwise comparison matrix. If the CR value is less than 0.1, the consistency of the pairwise comparison matrix is accepted.

AHP's major limitation is that the decision problem is modeled as a hierarchy. In contrast, ANP can handle decision problems modeled as a network. In such a way, interdependence can be considered [54]. ANP applied in diverse areas can be utilized to make decision problems that cannot be structured hierarchically and without the independent assumptions [55]. ANP handles interdependence very well due to the fact that it develops a supermatrix to later procure the relevant composite weights [56]. Wu et al. [57] summarized past studies and pointed out the advantages of ANP, including (1) capability of handling feedbacks and interdependencies, (2) being able to depict the dependence of factors involved in higher-level objective, and (3) specific software that can be used to make solving problems more convenient. In general, ANP can be described as follows:

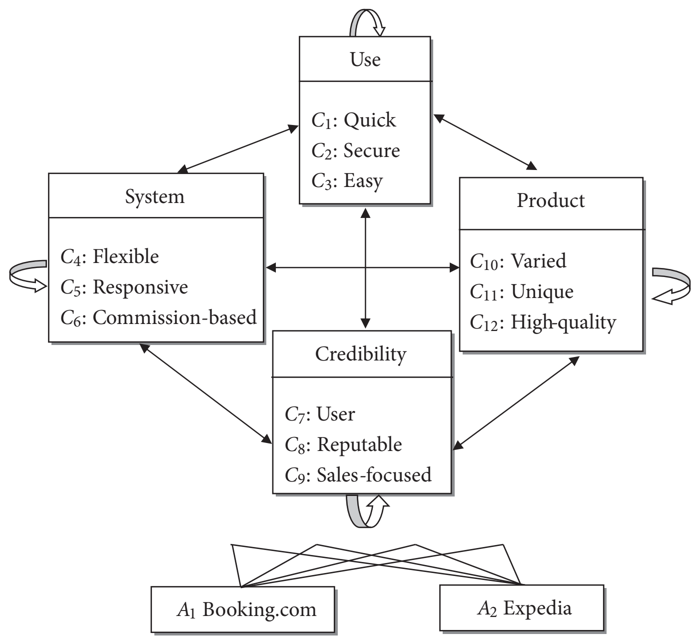

Figure 1: Hierarchy to select the optimal OTAs for hot spring hotels.

Step 1. Build the hierarchy and structure the problem.

Step 2. Perform pairwise comparison.

Step 3. Calculate the supermatrix.

Step 4. Select the optimal alternative.

4. Application

In this section, we utilized the fuzzy Delphi method, DEMATEL, and ANP to select the ideal OTAs for hot spring hotels in Taiwan via the following steps.

Step 1. Build the hierarchy and structure the problem.

The OTAs selection criteria were based on a review of other relevant studies, as well as discussions with hot spring hotel executives. Following a purposive sampling method, members of The Hot Spring Tourism Association Taiwan were contacted and asked to provide a list of names of professionals who could competently select the optimal OTAs. Employing the fuzzy Delphi method, the scale used to measure the selection criteria in the questionnaire ranged from 1 (least important) to 9 (most important). The semi-structured questionnaire also provided space for suggestions on additional criteria. We received completed questionnaires from 64 senior executives with a minimum of five years of practical experience evaluating OTAs, and these were used to develop the OTAs selection criteria. Via the fuzzy Delphi method, we screen the selection criteria for the purpose of ensuring content validity.

Based on the process outlined above, the top 12 criteria were obtained: Quick [21, 25], Secure [13, 21–25, 27], Easy [10, 21, 22, 24, 25, 27], Flexible [10, 21, 24, 25], Responsive [13, 22, 24], Commission-based (executive proposed), User (executive proposed), Reputable [24], Sales-focused (executive proposed), Varied [24, 27], Unique (executive proposed), and High-quality [23, 24]. Detailed explanations for the criteria are offered in Table 1.

Based on the studies by Kim et al. [21] and Chiou et al. [24] and discussions with senior executives, the hierarchy with an overall goal of selecting the optimal OTAs for hot spring hotels in Taiwan was constructed. Level 1 included four perspectives (Use, System, Credibility, and Product). Each perspective included three criteria from those identified earlier. Level 3 consisted of the two OTA alternatives in a case company. DEMATEL was then used to confirm the interrelationships between the perspectives. The decision-making committee included two senior managers of a hot spring hotel. Following DEMATEL procedures, the initial direct relation matrix and the total relation matrix of perspectives were assessed, as shown in Tables 2 and 3. Threshold values were 19 that were determined following discussions with the same two senior executives. Based on this process, a DEMATEL impact relation map was created, as shown in Figure 1.

Step 2. Perform pairwise comparison.

Based on the interdependencies of the perspectives, each perspective's and criterion's priority weight can be depicted. The pairwise comparison matrixes of perspectives are shown in Tables 4–7. About criteria, Table 8 as an example depicts a pairwise comparison within the System perspective with respect to Quick.

Step 3. Calculate the supermatrix.

Following Step 2, an unweighted supermatrix is formed in Table 9. Then, the unweighted supermatrix is converted into

Table 1: Definitions of the selection criteria.

Perspective	Criteria	Definition
Use	C_1: Quick	Can complete transactions quickly.
	C_2: Secure	Can complete transactions securely.
	C_3: Easy	Easy to use.
System	C_4: Flexible	Allows users to modify bookings.
	C_5: Responsive	Can respond to problems appropriately.
	C_6: Commission-based	Commission fee.
Credibility	C_7: User	Number of users.
	C_8: Reputable	Reputation.
	C_9: Sales-focused	Selling performance.
Product	C_{10}: Varied	Variety of products available.
	C_{11}: Unique	Uniqueness of products.
	C_{12}: High-quality	Quality of products.

Table 2: The initial direct relation matrix of perspectives.

Perspectives	Use	System	Credibility	Product
Use	0.000	3.500	3.500	3.500
System	4.000	0.000	3.500	3.500
Credibility	4.000	3.500	0.000	3.500
Product	4.000	3.500	3.500	0.000

Table 3: The total relation matrix of perspectives.

Perspectives	Use	System	Credibility	Product
Use	21.0000	19.2500	19.2500	19.2500
System	22.0000	19.6724	19.9138	19.9138
Credibility	22.0000	19.9138	19.6724	19.9138
Product	22.0000	19.9138	19.9138	19.6724

The threshold value is 19.0000.

Table 4: The interdependence matrix of the perspectives with respect to Use.

Use	Use	System	Credibility	Product	Priority weights
	λ_{max}=4.1084	CR=0.0365			
Use	1.0000	4.8990	1.8708	4.0000	0.5203
System	0.2041	1.0000	1.0000	1.7321	0.1630
Credibility	0.5345	1.0000	1.0000	1.4142	0.1972
Product	0.2500	0.5774	0.7071	1.0000	0.1195

Table 5: The interdependence matrix of the perspectives with respect to System.

System	Use	System	Credibility	Product	Priority weights
	λ_{max}=4.0124	CR=0.0042			
Use	1.0000	1.1547	1.0690	1.0690	0.2661
System	0.8660	1.0000	1.0000	0.7071	0.2196
Credibility	0.9354	1.0000	1.0000	0.7071	0.2239
Product	0.9354	1.4142	1.4142	1.0000	0.2904

a weighted supermatrix via multiplying the priority weights from the perspectives, as shown in Table 10. Finally, the weighted supermatrix can converge into a stable supermatrix, called the limiting supermatrix. The final priorities weight of the selection criteria is presented in the limiting supermatrix, as indicated in Table 11.

Step 4. Select the optimal alternative.

Based on the weight of each alternative with respect to the selection criteria, as well as the limiting supermatrix, we got the overall weight of each alternative showing in Table 12. On this basis, the preferred OTA could be selected: Alternative 1 (Booking.com) clearly outperformed Alternative 2 (Expedia).

Table 6: The interdependence matrix of the perspectives with respect to Credibility.

Credibility	Use	System	Credibility	Product	Priority weights
	λ_{max}=4.0006		CR=0.0002		
Use	1.0000	2.6458	2.8284	2.8284	0.4797
System	0.3780	1.0000	1.0000	1.0000	0.1754
Credibility	0.3536	1.0000	1.0000	1.0000	0.1725
Product	0.3536	1.0000	1.0000	1.0000	0.1725

Table 7: The interdependence matrix of the perspectives with respect to Product.

Product	Use	System	Credibility	Product	Priority weights
	λ_{max}=4.0819		CR=0.0276		
Use	1.0000	7.4833	6.4807	6.0000	0.6861
System	0.1336	1.0000	1.7321	1.4142	0.1257
Credibility	0.1543	0.5774	1.0000	1.4142	0.0990
Product	0.1667	0.7071	0.7071	1.0000	0.0893

Table 8: The interdependence matrix within the System perspective with respect to Quick.

Quick	Flexible	Responsive	Commission-based	Priority weights
	λ_{max}=3.0134		CR=0.0101	
Flexible	1.0000	1.0000	0.5774	0.2728
Responsive	1.0000	1.0000	0.8165	0.3062
Commission-based	1.7321	1.2247	1.0000	0.4210

Table 9: The unweighted supermatrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
C_1	0.3725	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.2956	0.3333	0.3333	0.3333
C_2	0.2956	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3725	0.3333	0.3333	0.3333
C_3	0.3319	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3319	0.3333	0.3333	0.3333
C_4	0.2728	0.3725	0.5262	0.3319	0.3042	0.2339	0.3333	0.2000	0.2679	0.2679	0.2679	0.3333
C_5	0.3062	0.3319	0.2641	0.3725	0.5167	0.2269	0.3333	0.4000	0.2679	0.2679	0.2679	0.3333
C_6	0.4210	0.2956	0.2097	0.2956	0.1791	0.5392	0.3333	0.4000	0.4641	0.4641	0.4641	0.3333
C_7	0.2420	0.4142	0.2726	0.3333	0.3333	0.1581	0.5279	0.3333	0.2220	0.3333	0.3333	0.3333
C_8	0.3662	0.2929	0.1605	0.3333	0.3333	0.3726	0.2361	0.3333	0.2797	0.3333	0.3333	0.3333
C_9	0.3918	0.2929	0.5670	0.3333	0.3333	0.4694	0.2361	0.3333	0.4983	0.3333	0.3333	0.3333
C_{10}	0.3561	0.3319	0.4000	0.2361	0.2361	0.2247	0.2247	0.3333	0.2500	0.4119	0.3333	0.3333
C_{11}	0.3328	0.2956	0.4000	0.2361	0.2361	0.2247	0.2247	0.3333	0.2500	0.3969	0.3333	0.3333
C_{12}	0.3111	0.3725	0.2000	0.5279	0.5279	0.5505	0.5505	0.3333	0.5000	0.1912	0.3333	0.3333

Table 10: The weighted supermatrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
C_1	0.1938	0.1734	0.1734	0.0887	0.0887	0.0887	0.1599	0.1599	0.1418	0.2287	0.2287	0.2287
C_2	0.1538	0.1734	0.1734	0.0887	0.0887	0.0887	0.1599	0.1599	0.1787	0.2287	0.2287	0.2287
C_3	0.1727	0.1734	0.1734	0.0887	0.0887	0.0887	0.1599	0.1599	0.1592	0.2287	0.2287	0.2287
C_4	0.0445	0.0607	0.0858	0.0729	0.0668	0.0514	0.0585	0.0351	0.0470	0.0337	0.0337	0.0419
C_5	0.0499	0.0541	0.0431	0.0818	0.1135	0.0498	0.0585	0.0701	0.0470	0.0337	0.0337	0.0419
C_6	0.0686	0.0482	0.0342	0.0649	0.0393	0.1184	0.0585	0.0701	0.0814	0.0583	0.0583	0.0419
C_7	0.0477	0.0817	0.0537	0.0746	0.0746	0.0354	0.0910	0.0575	0.0383	0.0330	0.0330	0.0330
C_8	0.0722	0.0577	0.0316	0.0746	0.0746	0.0834	0.0407	0.0575	0.0482	0.0330	0.0330	0.0330
C_9	0.0772	0.0577	0.1118	0.0746	0.0746	0.1051	0.0407	0.0575	0.0859	0.0330	0.0330	0.0330
C_{10}	0.0426	0.0397	0.0478	0.0685	0.0685	0.0653	0.0388	0.0575	0.0431	0.0368	0.0298	0.0298
C_{11}	0.0398	0.0353	0.0478	0.0685	0.0685	0.0653	0.0388	0.0575	0.0431	0.0354	0.0298	0.0298
C_{12}	0.0372	0.0445	0.0239	0.1533	0.1533	0.1598	0.0949	0.0575	0.0862	0.0171	0.0298	0.0298

Table 11: The limiting supermatrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
C_1	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672	0.1672
C_2	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632	0.1632
C_3	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649
C_4	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565
C_5	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541
C_6	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586
C_7	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565	0.0565
C_8	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538	0.0538
C_9	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718	0.0718
C_{10}	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461	0.0461
C_{11}	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449
C_{12}	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624	0.0624

Table 12: The overall weight of each alternative.

	Booking.com	Expedia
C_1	0.1115	0.0557
C_2	0.0956	0.0676
C_3	0.1046	0.0604
C_4	0.0358	0.0207
C_5	0.0317	0.0224
C_6	0.0371	0.0214
C_7	0.0331	0.0234
C_8	0.0341	0.0197
C_9	0.0479	0.0239
C_{10}	0.0293	0.0169
C_{11}	0.0285	0.0164
C_{12}	0.0395	0.0228
Overall weight	0.6286	0.3714

5. Conclusions

The best way to select an optimal OTA remains poorly understood. However, hotels that can make optimal decisions in this area stand to benefit. The purpose of this paper is to establish a comprehensive model for selecting OTAs. A hybrid MCDM model is utilized to achieve this purpose. In this study, the hybrid MCDM model for OTAs selection included three stages: first, we defined the research problem and constructed OTAs selection hierarchy for hot spring hotels in Taiwan; second, we identified the cause-effect relationships between perspectives; third, we evaluated the alternatives by using ANP.

In other words, the comprehensive selection model of OTAs is constructed to identify the optimal alternative. Then, the fuzzy Delphi method is to express the incomplete knowledge of experts and represent the uncertainties of information. DEMATEL is used to confirm interdependencies between the perspectives. Moreover, ANP is introduced to rank alternatives, so as to better take the relationships between the perspectives into consideration. A case is conducted to test the capabilities of the proposed model. The selection model developed in this study provides a theoretical analysis and operational insights, while the results should assist managers to make efficient and effective decisions. Theoretically, Use and System perspectives are vital parts of OTAs websites. The findings of this study fit in with those shown in the literature. Moreover, the effectiveness of the security system should be ensured that users can complete their transactions securely. The proposed model illustrated through an empirical case is useful in practice, as it integrated three validated approaches in an optimal manner. This outcome supports us to trust that this model is highly suitable as a decision-making tool for OTAs selection.

The contributions of this study are: first, the selection of the optimal OTAs is an MCDM problem with dependence and interaction factors. A literature review and fuzzy Delphi method were used to create four perspectives (Use, System, Credibility, and Product) and 12 criteria (Quick, Secure, Easy, Flexible, Responsive, Commission-based, User, Reputable, Sales-focused, Varied, Unique, and High-quality) to select OTAs for hot spring hotels in Taiwan. Two MCDM techniques (DEMATEL and ANP) were combined to design a hybrid OTAs selection model that prioritizes the weighting of perspectives and criteria and also finds the optimal OTAs for a case company. The proposed model not only handles the causal relationships between each perspective but also generates more valuable information for hot spring managers to make decisions.

Two issues should also be noted. First, all data were collected in Taiwan. Researchers are encouraged to broaden the collection area like conducting a cross-national analysis to determine whether the model remains consistent across various countries. Second, using a larger scale survey might better the generalizability of the findings and also result in the discovery of new criteria.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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