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Full Length Research Paper

Assessing the performance of Taiwanese tour guides

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This study combines analytic network process (ANP) with technique for order preference by similarity to ideal solution (TOPSIS) to assess the performance of Taiwanese tour guides. Interviews of practitioners and reviewing of studies are used to collect assessment criteria. Questionnaires based on 9 point Likert scale are sent to 48 senior tour guides to obtain their opinions about the importance of criteria. After discussions with 3 experts, the top 12 criteria, Communication, Interpretation, Emergency, Polite, Friendliness, Neat, Atmosphere, Help, Money, Caution, Conscientiousness and Honest are sorted into 3 perspectives: Ability, Customer and Firm, to structure the hierarchy for assessing the performance of Taiwanese tour guides. Considering the interdependence among criteria, ANP is used to obtain their weights, while TOPSIS is used to rank the tour guides. By integrating ANP and TOPSIS, this study can make better assessments of the performance of Taiwanese tour guides. Moreover, to illustrate how ANP and TOPSIS may be applied to real-world performance assessment, a case study of assessment is conducted.

Key words: Analytic network process, technique for order preference by similarity to ideal solution, tour guide.

INTRODUCTION

A tour guide is a person who guides groups or individual visitors around the sites and landscapes of a city or region and also interprets using the language of visitor's choice (Black and Ham, 2005). Tour guides are the interface between the host destination and its visitors. They are responsible for the impression and satisfaction with the tour service proposed by a destination (Ap and Wong, 2001). Geva and Goldman (1991) point out that the performance of the tour guide is a vital factor in the success of the tour. The success of the tourism industry largely depends on the performance of tour guides (Zhang and Chow, 2004).

In this paper, we explore the following issues: (1) what are the important criteria in assessing the performance of tour guides in Taiwan and (2) how to make better decisions in the assessment of the performance of Taiwanese tour guides.

CONCEPTUAL FRAMEWORK

This study combines ANP with TOPSIS to assess the performance of Taiwanese tour guides. Following Zhang and Chow (2004), and through interviews of practitioners, we collect criteria for assessing the performance of Taiwanese tour guides. Questionnaires are sent to senior tour guides to obtain their opinions about the importance of criteria. Based on geometric mean values, we retain important criteria. Discussion with senior executives, criteria are taken into perspectives to structure the hierarchy for assessing the performance of Taiwanese tour guides. In the conceptual framework, the top level is the goal of this study. The second level is the performance assessment criteria for Taiwanese tour guides. The third level is the tour guides in the case study company as alternatives.

TOUR GUIDES PERFORMANCE

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Ap and Wong (2001) measure the existing level of professional service standards of tour guiding in Hong Kong. Moreover, issues and challenges facing the profession in the 21st century are also identified. Zhang and Chow (2004) assess the performance of Hong Kong's tour guides from the viewpoint of mainland Chinese outbound visitors using the important-performance analysis (IPA) model. Black and Ham (2005) develop tour guide certification programs to improve and maintain tour guide standards. Though assessing the performance of Taiwanese tour guide is crucial to the development of Taiwan's burgeoning tourism industry, the issue remains underexplored in the literature.

ANALYTIC NETWORK PROCESS (ANP)

ANP (Saaty, 1996) is a comprehensive decision-making technique that captures the outcome of dependency between factors. Analytic hierarchy process (AHP) serves as a starting point for ANP. Priorities are established in the same way that they are in AHP using pairwise comparisons. The weight assigned to each perspective and criterion may be estimated from the data or determined subjectively by decision makers. It is desirable to measure the consistency of the decision makers' judgment. Through the consistency ratio (CR), AHP provides a measure that indicates the reliability of the model. A CR exceeding 0.1 indicates inconsistent judgment (Saaty, 1980). ANP comprises 4 major steps (Saaty, 1996).

Step 1: Construct the hierarchy and structure problem

The problem should be clearly stated in constructing the hierarchy structure. The hierarchy can be determined by decision makers' opinion via brainstorming or other appropriate methods, such as literatures review.

Step 2: Determine the perspectives and criteria weights

In this step, the decision-making committee makes a series of pairwise comparisons to establish the relative importance of perspectives and criteria. In these comparisons, a 1-9 scale is applied to compare 2 perspectives or criteria based on their interdependence. The eigenvector of the observable pairwise comparison matrix provides the perspectives and criteria weights at this level, which will be used in the supermatrix.

Step 3: Construct and solve the supermatrix

The perspectives and criteria weights derived from Step 2 are used to obtain the column of the supermatrix. Finally, the supermatrix will be stabilized by multiplying the supermatrix by itself until the supermatrix's row values converge to the same value for each column of the matrix. The resultant matrix is known as the limiting matrix.

Step 4: Select the best alternative

According to the limiting matrix and weights of alternatives with respect to criteria, we can aggregate the total weight of each alternative. We rank the alternatives according to their respective priority weights. In the previous studies on the application of ANP, Agarwal et al. (2006) note that ANP is a powerful decision-making technique for compounding the factors governing supply chain performance.

Güngör (2006) uses ANP to evaluate the connection types from a design for disassembly (DFD) point of view. Leung et al. (2006) use AHP and ANP to facilitate the implementation of balanced scorecard (BSC). They observe that these 2 approaches can be tailored to specific situations and can be used to overcome the traditional problems of BSC implementation, such as the dependent relationship. Mu (2006) creates a model to predict the relative number of attendees to the 2009 Latin American Studies Association (LASA) conference. Additionally, a benefit-cost-risk (BCR) model is designed to select the most optimal Latin American city as the conference site.

Shyur (2006) combines ANP with modified TOPSIS for commercial-off-the-self (COTS) product evaluation. Chang et al. (2007) compare AHP with ANP results to identify the most appropriate digital video recorder system. They conclude that ANP is more effective in providing a right solution. Chang (2007) uses ANP for selecting the hosts of Taiwanese TV-shopping channels.

Cheng and Li (2007) compare the weights of the critical factors generated by AHP with ANP for strategic partnering, to ensure the utility of ANP. They indicate that ANP is more appropriate. Gencer and Gürpinar (2007) apply ANP in an electronics firm for supplier selection. They also suggest that the user-friendly software would help managers apply ANP more easily in decision making.

Jharkharia and Shankar (2007) employ ANP for logistics service provider selection. They also indicate that ANP not only gives the decision makers a better understanding of the complex relationships among factors, but also improves the reliability of the decision. Simunich (2007) uses ANP to determine the best course of action for the United States in dealing with Iraq, finding that working with the United Nations to ensure weapons inspections is the best choice.

Wu and Lee (2007) point out that ANP is a new method which is capable of handling the dependencies. They use ANP for knowledge management strategy selection. Yüksel and Dağdeviren (2007) apply ANP for SWOT analysis. That is because AHP is not appropriate to take into account the dependency among factors. Chen et al. (2008) employ ANP for new product development (NPD) development (NPD) mix selection. They argue that AHP cannot deal with the interrelationships among factors when resolving NPD managerial problems. Demirtas and Üstün (2008) integrate ANP and multi-objective mixed integer linear programming (MOMILP) to select suppliers and determine their shipment allocations. Hsieh et al. (2008) explore customer expectations of service quality in Taiwanese hot spring hotels. ANP is applied to find the weights among the criteria, emphasizing interdependent relationships to increase accuracy of their paper. Lin et al. (2008) use ANP to find the most optimal dispatching method. They argue that the application of ANP would improve the limitations of AHP, which assumes factors must be mutually independent. Ustun and Demirtas (2008a) integrate ANP and achievement scalarizing functions to select the best suppliers and also define the suitable quantities among them.

Ustun and Demirtas (2008b) integrate ANP and MOMILP to select optimal suppliers and determine the suitable quantities among selected suppliers to maximize the total value of purchasing (TVP), and to minimize the total cost and total defect rate. Chang et al. (2009) use fuzzy Delphi, ANP and zero one goal programming (ZOGP) to select revitalization strategies for the historic Alishan forest railway. Chen et al. (2009) use ANP and BSC for measuring knowledge management performance. Guneri et al. (2009) apply fuzzy ANP to select an appropriate location for a shipyard.

Hsu and Hu (2009) use ANP to select suppliers, adding the concept of hazardous substance management. Lee et al. (2009) establish an investment decision model based on the Gordon model. ANP is used to generate the weight of the criteria because of the interrelations and self-feed-back relationships among the criteria. Liao and Chang (2009a) apply ANP to choose public relations personnel for Taiwanese hospitals. Liao and Chang (2009b) apply ANP to select televised sportscasters for Olympic Games. Liao and Chang (2009c) combine ANP with BSC to identify the key capabilities of Taiwanese TV-shopping companies.

Liao and Chang (2009d) use ANP to measure the performance of hospitals. Lin (2009) combines ANP with fuzzy preference programming (FPP) to select suppliers and then allocate orders among the selected suppliers by multi-objective linear programming (MOLP). Oh et al. (2009) apply ANP and BSC to evaluate the feasibility of a new telecom service. They point out that ANP can obtain more realistic results. Wu et al. (2009) combine ANP with conjoint analysis (CA) to simplify ANP for hospital policymakers making appropriate management policies. Wu et al. (2009) apply ANP to select strategic alliance partners for the LCD industry.

Chen and Chen (2010) apply decision-making trial and evaluation laboratory (DEMATEL), fuzzy ANP and TOPSIS to develop a new innovation support system. Liao and Chang (2010) combine ANP with BSC for measuring the managerial performance of TV companies. Lin and Tsai (2010) integrate ANP and TOPSIS to select locations for foreign direct investments in new hospitals in China. Tseng (2010) uses ANP, DEMATEL and fuzzy set theory to obtain the weight of BSC factors for a university performance measurement. Yüksel and Dağdeviren (2010) integrate fuzzy ANP and BSC to measure the performance of a manufacturing firm in Turkey.

As the foregoing literature review shows, ANP, which widely applied in decision making, is more accurate and feasible under interdependent situations. However, after discussions with senior tour guides, we find that the criteria for assessing the performance of tour guides are interrelated. ANP, which captures the interdependence among criteria, appears to be one of the more feasible and accurate solutions to the problem of generating the weights of assessment criteria.

TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SOLUTION (TOPSIS)

TOPSIS, first proposed by Hwang and Yoon (1981), enables decision makers to determine the positive ideal solution (A^*) and the negative ideal solution (A^-). On the basis of TOPSIS, the chosen alternative should have the shortest distance from the positive ideal solution, and the farthest distance from the negative ideal solution. The computing process is presented as follows:

Step 1: Construct the standardized appraisal matrix

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \qquad (1)$$

where i indicates the alternatives, j denotes the assessment criteria and x_{ij} means the i alternative under the j criterion to be assessed.

Step 2: Construct the weighted standardized appraisal matrix.

Weights of the assessment criteria, $w = (w_1, w_2, , w_n)$, multiplied by the standardized appraisal matrix, can be expressed as

$$v = \begin{bmatrix} v_{11} & v_{12} & & v_{1n} \\ v_{21} & v_{22} & & v_{2n} \\ & & & \\ v_{m1} & v_{m2} & & v_{nm} \end{bmatrix} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & & w_n r_{2n} \\ & & & \\ w_1 r_{m1} & w_2 r_{m2} & & w_n r_{mn} \end{bmatrix} \qquad (2)$$

Step 3: Identify the positive ideal solution and negative ideal solution

$$A^* = \{v_1^*, v_2^*, ..., v_j^*, ..., v_n^*\} = \{(\max_i v_{ij} | j \in J) | i = 1, ..., m\}, \quad (3)$$

$$A^- = \{v_1^-, v_2^-, ..., v_j^-, ..., v_n^-\} = \{(\min_i v_{ij} | j \in J) | i = 1, ..., m\}.$$

Step 4: Calculate the Euclidean distance between the positive ideal solution (S_i^*) and the negative ideal solution (S_i^-) for each alternative

$$S_i^* = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_i^*)^2}, \ i = 1, ..., m,$$
$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_i^-)^2}, \ i = 1, ..., m. \quad (4)$$

Step 5: Calculate the relative closeness to the positive ideal solution for each alternative

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-} \quad (5)$$

An alternative A_i is closer to A^* and farther from A^- as C_i^* approaches 1.

Step 6: Rank the preference order by C_i^*

According to C_i^*, larger index values indicate better performance of the alternatives. The TOPSIS literature is also extensive. Shyur (2006) combines ANP with modified TOPSIS for COTS product evaluation. Wang and Chang (2007) use fuzzy TOPSIS to measure aircraft performance and rank aircraft. Hsu and Hsu (2008) combine entropy with TOPSIS for clinics to measure the quality of information technology (IT) suppliers. Lin et al. (2008) combine AHP with TOPSIS into the customer-driven product design process. Dağdeviren et al. (2009) use AHP and fuzzy TOPSIS to select weapons.

Gumus (2009) employs fuzzy AHP and TOPSIS to evaluate the hazardous transportation firms. Saremi et al. (2009) apply fuzzy TOPSIS to select external total quality management (TQM) consultant. Sun and Lin (2009) use fuzzy TOPSIS to generate the weight of each criterion and rank 4 shopping websites. Wang et al. (2009) develop a fuzzy hierarchical TOPSIS that builds on Chen (2000) to select a lithium-ion battery protection IC (LIBPIC) supplier. Chen and Chen (2010) apply DEMATEL, fuzzy ANP and TOPSIS to develop a new innovation support system for Taiwanese higher education. Kelemenis and Askounis (2010) propose a new approach on the basis of fuzzy TOPSIS to select IT professionals. Lin and Tsai (2010) integrate ANP and TOPSIS to select locations for foreign direct investments in new hospitals in China.

Although TOPSIS is easily understood and the computation is uncomplicated, the inherent hardship of assigning reliable subjective preferences to criteria is an issue (Shyur, 2006). After discussions with senior tour guides, we find that the criteria for assessing the performance of tour guides are interrelated. Due to the interdependence of the criteria, ANP is used in this paper to generate the weights of the assessment criteria. TOPSIS is used to rank the alternatives. By combining ANP with TOPSIS, this study can make better decisions in Taiwanese tour guide performance assessment.

APPLICATION

We employ ANP and TOPSIS in a case study of a company to assess the performance of tour guides. The decision committee includes a chairman and a manager. There are 3 tour guides as alternatives. We depict the assessment process thus:

Step 1: Construct the hierarchy and structure problem

Based on Zhang and Chow (2004) and interviews of the practitioners, we collect criteria for assessing the performance of Taiwanese tour guides. The questionnaires, using a 9 point Likert scale, with 1 as most unimportant and 9 as most important, are sent to 48 senior tour guides to obtain their opinions about the importance of the criteria.

$$L_G = (L_1 \times L_2 \times \cdots \times L_n)^{1/n} \quad (6)$$

where L_n = importance rating of the criteria by n^{th} experts, while L_G = geometric mean value.

According to the geometric mean values, we retained the top 12 criteria as shown in Table 1. After discussion with 3 senior executives, including a chairman and a vice president from different travel agencies, and the honorary chairman of the association of national tour escorts, 12 criteria are sorted into 3 perspectives, namely Ability, Customer and Firm, to structure the hierarchy for assessing the performance of Taiwanese tour guides.

Step 2: Determine the perspectives and criteria weights

In this step, the decision-making committee makes a series of pairwise comparisons to establish the relative importance of perspectives. In these comparisons, a 1-9 scale is applied to compare the 2 perspectives. The pairwise

Table 1. Descriptions of the assessment criteria.

Criteria	Definition	Contributors
Communication	Be familiar with different languages.	Zhang and Chow (2004).
Interpretation	The ability to interpret.	Zhang and Chow (2004).
Emergency	The ability to handle emergency.	Practitioners propose.
Polite	Be polite.	Zhang and Chow (2004).
Friendliness	Be friendly.	Zhang and Chow (2004).
Neat	Appear neat.	Zhang and Chow (2004).
Atmosphere	The ability to generate friendly atmosphere.	Zhang and Chow (2004).
Help	Be available for help.	Zhang and Chow (2004).
Money	The purchasing amount of visitors.	Practitioners propose.
Caution	Be cautious.	Practitioners propose.
Conscientiousness	Conscientious toward work.	Practitioners propose.
Honest	Be honest.	Zhang and Chow (2004).

Table 2. The pairwise comparisons of perspectives.

	Ability	Customer	Firm	Priority weights
Ability	1.0000	1.7321	1.7321	0.4630
Customer	0.5774	1.0000	0.7559	0.2435
Firm	0.5774	1.3229	1.0000	0.2935

λ_{max}=3.0087 CR=0.0066.

Table 3. The pairwise comparisons within ability perspective with respect to communication.

	Interpretation	Emergency	Polite	Priority weights
Interpretation	1.0000	3.1623	1.2910	0.4967
Emergency	0.3162	1.0000	0.8165	0.1979
Polite	0.7746	1.2247	1.0000	0.3054

$\lambda_{\max}$ =3.0538 CR= 0.0407

comparison matrix and the development of each perspective priority weight are shown in Table 2. Based on the interdependence of the criteria, we apply pairwise comparisons again to establish the criteria relationships within each perspective. The eigenvector of the observable pairwise comparison matrix provides the criteria weights at this level, which will be used in the supermatrix. With respect to Communication, for example, a pairwise comparison within the Ability perspective is shown in Table 3. In this way, we can derive each criterion weight to obtain the supermatrix.

Step 3: Construct and solve the supermatrix

The criteria weights derived from Step 2 are used to obtain the column of the supermatrix as shown in Table 4. Finally, the system solution is derived by multiplying the supermatrix of model variables by itself, which accounts for variable interaction, until the system's row values converge to the same value for each column of the matrix, as shown in Table 5. According to Tables 2 and 5, we can aggregate the total weight of each criterion as shown in Table 6.

Step 4: Construct the standardized and weighted standardized appraisal matrix

The decision-making committee is asked to establish the appraisal matrix by comparing the 3 alternatives with respect to each criterion. After the appraisal matrix is generated, equation (1) is used to obtain the standardized appraisal matrix, shown in Table 7. The criteria weights derived from ANP shown in Table 6 are then multiplied by the standardized appraisal matrix to obtain the weighted standardized appraisal matrix.

Step 5: Identify the positive ideal solution and negative ideal solution

The positive ideal solution and negative ideal solution are defined according to Equation (3) as:

Table 4. The supermatrix before convergence.

	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	0.0000	0.6494	0.4967	0.3989								
C_2	0.4967	0.0000	0.1979	0.3179								
C_3	0.1979	0.2054	0.0000	0.2832								
C_4	0.3054	0.1452	0.3054	0.0000								
C_5					0.0000	0.4226	0.2128	0.4967				
C_6					0.1996	0.0000	0.2556	0.1979				
C_7					0.2515	0.2113	0.0000	0.3054				
C_8					0.5489	0.3660	0.5316	0.0000				
C_9									0.0000	0.4839	0.2414	0.6175
C_{10}									0.4967	0.0000	0.6154	0.2758
C_{11}									0.1979	0.1387	0.0000	0.1067
C_{12}									0.3054	0.3774	0.1432	0.0000

Table 5. The supermatrix after convergence.

	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	0.3465	0.3465	0.3465	0.3465								
C_2	0.2717	0.2717	0.2717	0.2717								
C_3	0.1812	0.1812	0.1812	0.1812								
C_4	0.2006	0.2006	0.2006	0.2006								
C_5					0.2834	0.2834	0.2834	0.2834				
C_6					0.1757	0.1757	0.1757	0.1757				
C_7					0.2096	0.2096	0.2096	0.2096				
C_8					0.3313	0.3313	0.3313	0.3313				
C_9									0.3256	0.3256	0.3256	0.3256
C_{10}									0.3077	0.3077	0.3077	0.3077
C_{11}									0.1322	0.1322	0.1322	0.1322
C_{12}									0.2345	0.2345	0.2345	0.2345

A^* = (0.1167, 0.0909, 0.0620, 0.0544, 0.0428, 0.0292, 0.0351, 0.0491, 0.0643, 0.0553, 0.0249, 0.0419),
A^- = (0.0674, 0.0615, 0.0358, 0.0533, 0.0332, 0.0202, 0.0187, 0.0410, 0.0371, 0.0461, 0.0188, 0.0354).

Step 6: Calculate the Euclidean distance between the positive ideal solution and the negative ideal solution for each alternative

The Euclidean distance between the positive ideal solution and the negative ideal solution for each alternative can be measured by Equation (4).

Step 7: Calculate the relative closeness to the positive ideal solution for each alternative

C_i^* value of each alternative can be obtained by Equation (5).

Step 8: Rank of alternative

According to Table 8, Alternative 1 has the best performance and Alternative 3 has the worst performance.

RESEARCH DESIGN

Based on Zhang and Chow (2004) and interviews of practitioners, we collect criteria for assessing the performance of Taiwanese tour guides. Questionnaires using a 9 point Likert scale, with 1 as most unimportant and 9 as most important, are sent to 48 senior tour guides to obtain their opinions about the importance of criteria. According to geometric mean values, we retain the top 12 criteria. After discussion with 3 senior executives, including a chairman and a vice president from different travel agencies, and the honorary chairman of an association of national tour escorts, 12 criteria are sorted into 3 perspectives to structure the hierarchy for assessing the performance of Taiwanese tour guides. In the case company, ANP and TOPSIS are employed to assess the performance of tour guides. The decision committee includes a chairman and a manager. There are 3 tour guides as alternatives (Figure 1).

Table 6. The total weight of each criterion.

	Weights from perspectives	Weights from supermatrix after convergence	Total weights
C_1	0.4630	0.3465	0.1604
C_2	0.4630	0.2717	0.1258
C_3	0.4630	0.1812	0.0839
C_4	0.4630	0.2006	0.0929
C_5	0.2435	0.2834	0.0690
C_6	0.2435	0.1757	0.0428
C_7	0.2435	0.2096	0.0510
C_8	0.2435	0.3313	0.0807
C_9	0.2935	0.3256	0.0956
C_{10}	0.2935	0.3077	0.0903
C_{11}	0.2935	0.1322	0.0388
C_{12}	0.2935	0.2345	0.0688

Table 7. Standardized appraisal matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
A_1	0.7276	0.7228	0.7385	0.5734	0.4804	0.4714	0.3672	0.5077	0.3885	0.5103	0.4851	0.6030
A_2	0.5423	0.4887	0.5222	0.5734	0.6202	0.6831	0.6870	0.6092	0.6295	0.6124	0.6417	0.5149
A_3	0.4201	0.4887	0.4264	0.5852	0.6202	0.5578	0.6271	0.6092	0.6729	0.6038	0.5941	0.6093

Table 8. Results of TOPSIS.

	S_i^*	S_i^-	C_i^*	Rank
A_1	0.0370	0.0634	0.6315	1
A_2	0.0463	0.0401	0.4644	2
A_3	0.0635	0.0349	0.3550	3

CONCLUSION

The tour guide is an important factor in the success of the tour. The success of the tourism industry largely depends on the performance of tour guides. This study presents an effective framework applying ANP and TOPSIS to assess the performance of Taiwanese tour guides. By interviewing practitioners and reviewing studies, we collect criteria for assessing the performance of tour guides. Questionnaires using a 9 point Likert scale are sent to 48 senior tour guides to obtain their opinions about the importance of criteria. After discussion with the 3 experts, the top 12 criteria including Communication, Interpretation, Emergency, Polite, Friendliness, Neat, Atmosphere, Help, Money, Caution, Conscientiousness and Honest are sorted into 3 perspectives, namely Ability, Customer and Firm to structure the hierarchy for assessing the performance of Taiwanese tour guides.

To solve the interdependency problem in the assessing criteria, ANP is used to obtain their weights. TOPSIS is used to rank the tour guides. By combining ANP with TOPSIS, this study can make better decisions in the assessment of Taiwanese tour guide performance. In this paper, the CR of each pairwise comparison is less than 0.1, which means that the reliability of data is acceptable. ANP requires more calculations and additional pairwise comparisons. The computational process would be too complex if there are too many criteria. As the result, we only retain 12 important criteria to structure the hierarchy for assessing the performance of Taiwanese tour guides. We suggest that future research studies incorporate more criteria in order to generate more accurate estimates. Additionally, ANP ignores the fuzziness of executives' judgment during the decision-making process. We

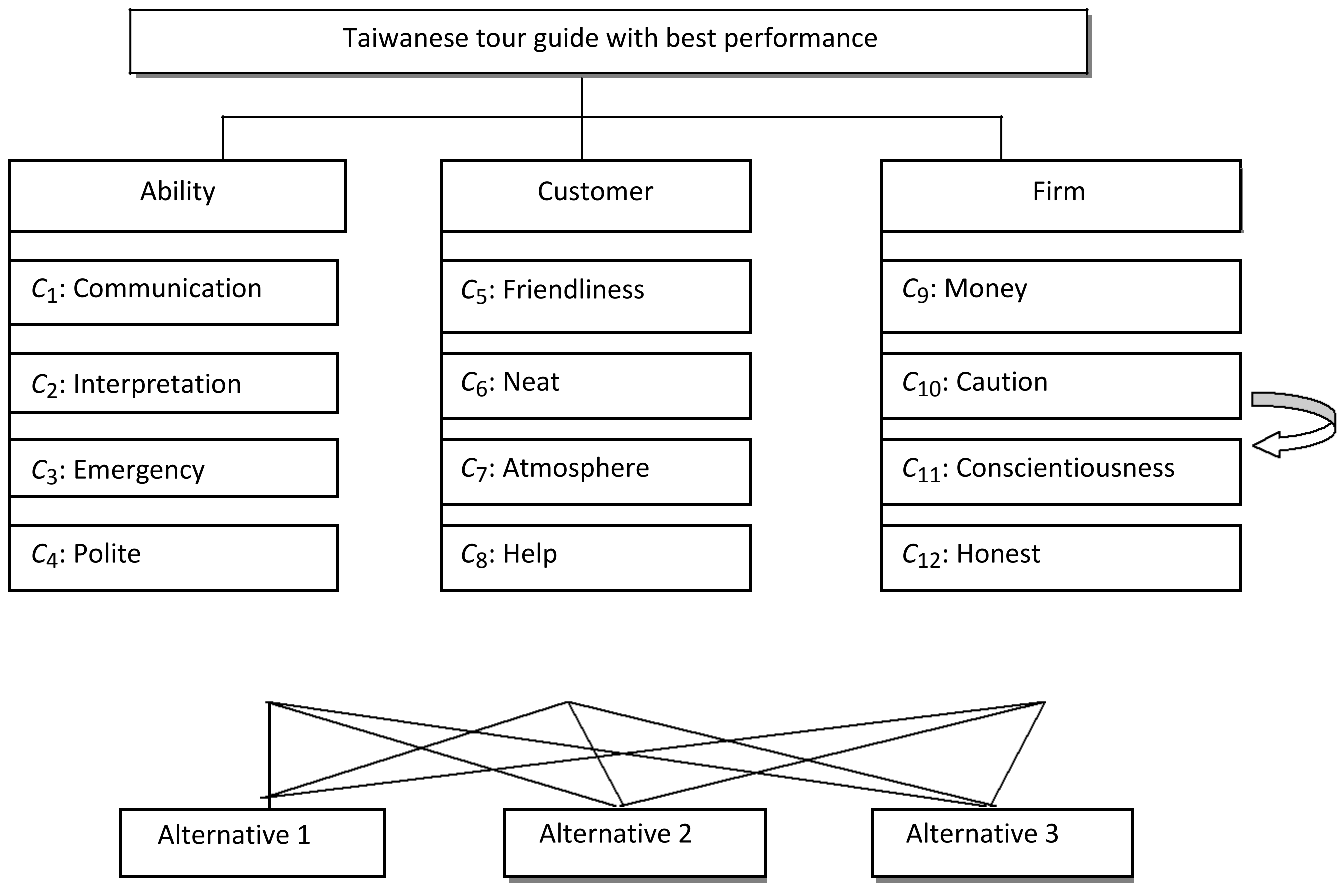

Figure 1. Hierarchy to assess the performance of Taiwanese tour guides.

suggest that follow-up researchers analyze this topic using fuzzy sets.

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