Tourism Economics, 2013, 19 (6), 1249–1272 doi: 10.5367/te.2013.0247

Selecting resort locations

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This study examines a comprehensive and objective three-stage method for selecting resort location in Taiwan that maximize competitive advantage. The factors and criteria used in the evaluation model are obtained from an exhaustive literature review and interviews with 16 experts. In the first stage, for which the modified Delphi method is used to identify the evaluation criteria, a survey is performed to rank the relative importance of the 22 criteria identified in the interviews. In the second stage, 19 experts evaluate potential resort locations using a subjective multi-criteria model, the analytical hierarchy process (AHP). The analytical results yield rankings of resorts of the following types: casino resorts, seaside resorts, health/spa resorts and lakeside resorts. In the final stage, a sensitivity analysis is performed to clarify the strength of the various influences on resort selection. The analytical results are used to develop and examine a potential solution.

Keywords: resort hotel; location selection; analytical hierarchy process (AHP); sensitivity analysis

The Taiwan Tourism Bureau has recently attempted to integrate its global advertising and promotional strategies, and this associated marketing activity has raised the international profile of Taiwan. Understanding the relationship between tourism and competitiveness of the nation helps policymakers to communicate to taxpayers how tourism policy generates development opportunities in the tourism sector (Porter, 1990; Gooroochurn and Sugiyarto, 2005; Croes, 2010). The tourism development policy of the Taiwan government assumes significant tourism growth, as evidenced by the building of new hotels and a focus on increasing the international competitiveness of local tourism businesses.

Notably, the government of Taiwan has focused on developing international tourism through a plan to double the number of arriving tourists. In fact, the competitiveness of tourism businesses depends on environmental conditions because the environment is the main basis of tourism activity (Swann, 2010; Ribes *et al*, 2011). In the last few decades, resorts have become one of the preferred targets for investment in the leisure industry of Taiwan (Lee and Dzeng, 2009). Policymakers and business groups typically perform poorly when selecting hotel locations, reducing international competitiveness.

Resorts not only provide relaxation and recreation but also offer beautiful surroundings, high-quality food and facilities that support exercise and various healthy activities (Lee and Dzeng, 2009). Resort islands are very popular in Asia: examples include Phuket in Thailand, Bali in Indonesia, the Philippine islands, Malaysia and the Republic of Maldives. They typically offer water sports, land-based activities (including horse riding, racing, golf courses, zoos, botanical gardens, sports activities and others) and related facilities.

Taiwan has very few resort hotels, that are integrated health and leisure club establishments. However, resort hotels vary significantly in location, natural resources and nearby attractions (Table 1). In northern Taiwan there is a popular hot spring resort hotel in the Yang Ming Shan area. Howard Beach Resort Green Bay is a popular seaside resort hotel. The Howard Lake Resort on Shih Men Dam is a popular lakeside resort hotel. In southern Taiwan, Howard Beach Resort Ken-Ting and Uni-Resort are very popular (Chiu, 2010).

The prioritization of factors that affect location choice is part of a complex multi-criteria decision-making process. The analytical hierarchy process (AHP), a widely used multi-criteria, multi-objective decision-making process, is particularly suitable to application in situations in which most of the essential data are subjective (Ananda and Herath, 2002; Ivanov and Webster, 2007; Hsu *et al*, 2009; Ramanathan *et al*, 2010). It can be used in setting priorities and supports decision-making problems that involve multiple-criteria. AHP is unique in the sense that it recognizes bias and inconsistencies in subjective judgments. These inconsistencies can be tested and reduced, yielding a more consistent final ranking. For years AHP has been used in tourism planning (Moutinho and Curry, 1994), convention site selection (Chen, 2006) and choosing tourist destinations (Hsu *et al*, 2009). The AHP converts individual preferences into ratio-scale weightings; these weightings are utilized in ranking alternatives and assisting the decision maker in making choices or forecasting an outcome. The shortcoming of AHP is the need for making pair-wise comparisons, which is a tedious process several alternatives are to be evaluated. Hence, this study involves a sensitivity analysis to simulate the effect of criteria and alternatives to reduce the error in decision making.

However, a sensitivity analysis elucidates the relationships between the output and inputs of a modelling application. It elucidates how a variation in a model output (numerical or otherwise) can be apportioned, qualitatively or quantitatively, to various sources of variation, and how the model depends on its inputs (Saltelli *et al*, 2008; Chen *et al*, 2010). Sensitivity analysis is crucial in validating and calibrating numerical models, and can be utilized performed to check the robustness of final outcomes against slight changes in input data (Ticehurst *et al*, 2003; Chen *et al*, 2010). There are some well-established techniques for conducting sensitivity analyses, ranging from differential analysis to well-known Monte Carlo analysis, from measurements of importance to the

Table 1. Resort hotels in Taiwan.

Location	Hotel name	Number of rooms	Type of resort
Northern	Hotel Landis China - Yang Ming Shan	47	Hot spring resort
Taiwan	Howard Beach Resort Green Bay	241	Seaside resort
	South Garden Resort	111	Hot spring resort
	Howard Lake Resort of Shih Men Dam	94	Lakeside resort
	Hotel Royal Chiao His	198	Hot spring resort
	Evergreen resort Hotel	231	Hot spring resort
	Silks Place Hotel – Yi Lan	193	Hot spring resort
Central	The Lalu Sun Moon Lake	96	Lakesides resort
Taiwan	Fleur De Chine Hotel	211	Lakeside resort
	Wen Wan Hotel & resort	92	Lakeside resort
	The Hibiscus resort	201	Lakeside resort
	Nice Prince Hotel	245	Theme resort
Southern	Grand Hotel Kaohsiung	107	Lakeside resort
Taiwan	Caesar Park Hotel – Ken Ting	254	Seaside resort
	Uni-resort	185	Seaside resort
	Howard Beach resort – Ken Ting	405	Seaside resort
Eastern	Hotel Royal Chihpen Spa	182	Hot spring resort
Taiwan	Formosa Naruwan Hotel & resort	276	Hot spring resort
	Silks Place Hotel – Ta Ro Ko	160	Mountain resort
	Farglory Hotel, Hua Lien	391	Theme resort
	Parkview Hotel	343	Theme resort
	Promised Land resort Hotel	227	Theme resort

Source: Chiu (2010), Taiwan Tourism Bureau (2012).

use of sensitivity indices, and from regression or correlation methods to variance-based techniques (Chen *et al,* 2010).

Sensitivity analysis can reduce uncertainty in multiple criteria decision making (MCDM) and improve output stability by elucidating the effect of small changes in specific input parameters on outcomes (Archer *et al*, 1997; Chen *et al*, 2010). A detailed sensitivity analysis is performed by varying the weight of objective factor decision, and the weightings of the subjective factor and gain factor priority. Sensitivity analysis that is based on decomposition of the variance in the predictions of a model can effectively take into account possible interactions among parameters, but doing so requires more model runs (Morris, 1991; Wu *et al*, 2007; Confalonieri *et al*, 2010). The usefulness of sensitivity analysis is in its supporting decision making and making recommendations for decision makers, improving communication between modellers and decision makers, and increasing understanding or quantification of a system and the development of models. These procedures have been applied to various areas. In the field of tourism, Tsaur *et al* (2002) performed sensitivity analysis to forecast the loyalty of guests to international tourist hotels (Palmer *et al*, 2006).

To explore the implementation of the resort location assessment model, the method of Michael E. Porter (1990) is used herein to elucidate the relationship between the identification and assessment of resort locations to specific development objectives. The model criteria are obtained from a detailed literature review and by the use of the modified Delphi method. Following expert interviews, a hierarchy of evaluation criteria was established, and AHP was used to calculate the weight and relative importance of each criterion. Sensitivity analysis was performed for selecting and optimizing the locations of resorts in Taiwan, and to determine the effectiveness of the method. The proposed evaluation criteria are useful for the development of a method of resort assessment by resort administrators and academics for use in resort optimization.

Method

This section reviews related literature, including the Diamond model of Porter (1990), the AHP method and the related sensitivity analysis. The Diamond model, used for elucidating national competitive advantage, is used herein as part of an analytical framework for evaluating resorts. As well as a literature review and expert interviews, the modified Delphi method, AHP theory and sensitivity analysis are also used to design a new method for assessing resort location. Its effectiveness is tested. The theoretical approaches used herein are described below.

Diamond Model of Porter

The Diamond Model of Porter comprises six main elements and identifies pathways to success in an industry. It provides an organizational structure of regional development and can be a particular theory of competitive behaviour. This chosen theory can accommodate the development of Taiwanese resorts. This study thus assesses whether the application of the Porter Diamond Model (Porter, 1990) of competitive advantage, and the subsequent analysis by Porter (1998) of business cluster concepts, provides a suitable framework for resort development in Taiwan.

Based on the above, Diamond Model of Competitive Advantage involves interaction among four determinants and two outside forces, and the quality of these interactions determines national competitiveness. Porter theorized that these four forces can affect the competitive environment and, therefore, firm competitiveness (Porter, 1990). The four determinants and two forces in the theory of Porter are as follows.

1. Factor endowments: the production factors, including land, labour or infrastructure, that are required to compete in an industry.
2. Demand conditions: consumer demand is particularly important in motivating firms to increase their competitiveness.
3. Firm strategy, structure and rivalry: the conditions that govern firm creation, organization and management, as well as domestic competition.
4. Related and supporting industries: the presence or absence of internationally competitive suppliers and related industries, which may promote (or inhibit) the development of industry.
5. Government: government policy can significantly affect industrial success. For example, tourism policies affect resort development, and government greatly affects national competitiveness at the regional and national levels.
6. Chance: companies face many uncontrollable events, including new

> inventions and technological breakthroughs, natural disasters, wars, new trends inspired by television and movies, political developments, and major shifts in demand in foreign markets. Chance causes discontinuities that have an impact on competitiveness or even change the competition itself.

While not the first model to do so, the Porter Diamond Model successfully elucidates strategy at the enterprise level rather than the national level. Additionally, Porter recommended using strategic government policies rather than simply opening markets to foreign investment, emphasizing the importance of links between politics and business. The Porter Diamond Model helps to identify firm-specific linkages among the four determinants and two external forces, and can accurately forecast future trends.

AHP

The AHP is a systematic procedure for hierarchically ordering problem elements, and establishes a hierarchy and the consistency of data on judgments that are made by decision makers. In 1971, Saaty developed the AHP method (Saaty, 1980), which has become a popular method for selecting locations (Vaidya and Kumar, 2006). Lee (2001) then used AHP to select rural tourism sites. Tzeng *et al* (2002) used it to select the location of a restaurant in Taipei. Kajanus *et al* (2004) proposed using a combined AHP-SWOT method to study whether culture significantly affects the success of rural tourism.

AHP also offers supports group decision making (Dyer and Forman, 1992). It (1) permits the consideration of all values, including individual and/or group, tangible and/or intangible, in group decision processes, (2) encourages decisions that focus on goals rather than alternatives, (3) provides a discussion framework that incorporates all factors, and helps to present those factors systematically and coherently and (4) facilitates a discussion that continues until the group reaches consensus, with all members' opinions. In this study, four resorts are using 22 criteria, and the best of the four is selected. AHP incorporates the evaluations of all decision makers in a final decision, without clarifying the utility functions of those evaluations in relation to subjective and objective criteria, via pair-wise comparison of alternatives (Saaty, 1990). AHP herein applied to various problems using the following procedure.

Establishment of pair-wise comparison matrix A

Let $C_1, C_2, \ldots, C_n$ represent the set of elements, and a_{ij} denote a quantitative judgment about a pair of elements C_i, C_j. The relative importance of these two elements is specified on a Likert scale from 1 to 5, where 1 denotes 'equally important', 3 represents 'more important' and 5 is 'much more important'. This rating yields an n-by-n matrix A, as follows:

$$A = [a_{ij}] = \begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array} \left[\begin{array}{cccc} C_1 & C_2 & \ldots & C_n \\ 1 & a_{12} & \ldots & d_{1n} \\ 1/a_{12} & 1 & \ldots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \ldots & 1 \end{array} \right], \quad (1)$$

where $a_{ij} = 1$; $i = j$, $a_{ji} = 1/a_{ij}$, $i \neq j$, $i,j \neq 1,2,\ldots,n$. In matrix A, the problem becomes assigning to the n elements $C_1, C_2, \ldots, C_n$ a set of numerical weights $W_1, W_2, \ldots, W_n$ that reflect the recorded judgments. If A is a consistency matrix, then the relationships between weights W_i and judgments a_{ij} are given by $W_i/W_j = a_{ij}$, $i,j = 1,2,\ldots,n$ and:

$$A = \begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array} \begin{bmatrix} C_1 & C_2 & \cdots & C_n \\ w_1/w_1 & w_1/w_2 & \cdots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \cdots & w_2/w_n \\ \vdots & \vdots & \ddots & \vdots \\ w_n/w_1 & w_n/w_2 & \cdots & w_n/w_n \end{bmatrix}, \quad (2)$$

Saaty (1990) proposed that the largest eigenvalue λmax was:

$$\lambda_{max} = \sum_{j=1}^{n} a_{ij} \frac{W_j}{W_i} . \quad (3)$$

If A is a consistency matrix, eigenvector X can be calculated using:

$$(A - \lambda_{max} I)X = 0. \quad (4)$$

Saaty (1990) proposed using consistency index (CI) and consistency ratio (CR) to determine the consistency of the comparison matrix. Saaty defined CI and RI as follows.

$$CI = (\lambda_{max} - n)/(n - 1), \quad (5)$$

$$CR = CI/RI, \quad (6)$$

where RI represents the mean consistency index across many random entries of reciprocal matrices of the same order. If $CR \leq 0.1$, then the estimate is accepted; otherwise, a new comparison matrix is obtained until $CR \leq 0.1$.

Sensitivity analysis

The one-at-a-time (OAT) method (Chen and Rothschild, 2010), a common method in sensitivity analysis, involves monitoring the effect of changes in an individual input factor on output. One factor is changed at a time and all other factors remain fixed at their central or baseline values, enabling the outputs to be compared.

Sensitivity analysis elucidates the implicit relationship between a solution (to an optimization problem, for example) and input parameters. Given a solution to a problem with specific input parameters, first-order sensitivity analysis is performed to identify a roughly linear relationship between changes in input parameters and the solution (Clark and Watling, 2006). Three criteria are commonly used to analyse sensitivity: change in values of various factors, changes in the relative importance of factors, and changes in the weights of these factors. Sensitivity analysis can identify the most influential input variables that are related to the competitive advantage of a resort. Competitive advantage analysis elucidates the impact of input variables on resort selection. Sensitivity analysis involves the perturbation of an input by a particular percentage either positively or negatively, and the propagation of this change through a model. Sensitivity analysis also complements the obtaining of individual segment profiles by identifying many segmentation variables for consideration as market delineators (Bloom, 2005).

A detailed sensitivity analysis involves varying the decision weight of objective factor, and the priority weights of the subjective and gain factors (Chang *et al*, 2010; Tsai *et al*, 2010). Antunes and Climaco (1992) proposed a form of sensitivity analysis as part of their tri-criteria linear programming. However, their method has limited applicability, only being effective in situations with three or fewer attributes. Although the multi-attribute decision-making literature includes many studies of sensitivity analysis with an assumed value function, the form of the value function is assumed to be restrictive and applicable only to special cases (Maddulapalli *et al*, 2007). Triantaphyllou and Sanchez (1997) proposed a sensitivity analysis method and applied it to popular multi-attribute decision-making methods similar to weighted sum models, such as the weighted product model and AHP (Saaty, 1980).

Sensitivity analysis not only enables decision-makers to check the robustness of a decision, but also helps identify the critical steps and types of judgment in particular decision-making processes (Tavana *et al*, 1996). The lessons of sensitivity analysis are extremely useful to decision-makers at resorts who must implement group-decision support systems without a facilitator.

The range is defined as a bounded set of discrete percentage changes, or a range of percentage changes (RPC) in an original weighting of a factor that is set in a based run. Either a single range (such as plus or minus 20%) can be applied to all factors, or different ranges can be used for each factor, as required.

A series of evaluation runs can be performed in which each factor weight is adjusted in percentage increments (such as plus or minus 1%), expressed as increments of percentage change (IPC), throughout their feasible ranges (Equation (7)), and the weights of the other factors are adjusted proportionally to satisfy the additive constraint in Equation (1), which requires that all factor weights sum to unity (Equation (8)). The total number of simulation runs required for solving a given decision problem is given by:

$$Runs = \sum_{i=1}^{n} r_i, \tag{7}$$

where n is the total number of criteria, and r_i represents the number of *IPCs* in an *RPC* (default to ±20%) for factor i.

The sum of all the factor weights, given any percentage change (*PC*) in $W(pc)$, must always be one:

$$R(pc) = \sum_{i=1}^{n} W(C_i, pc) = 1, \; RPC_{min} \leq pc \leq RPC_{max}, \tag{8}$$

where $W(c_i, pc)$ is the weight of the ith factor C_i given a certain *PC* level; n represents the total number of factors, and RPC_{min} and RPC_{max} are the minimum and maximum values of *RPC*, respectively.

The weight of the most significant changing factor C_m, $W(C_m, pc)$ given a certain PC, can be calculated as:

$$W(C_m, pc) = W(Cm, 0) + W(Cm, 0) \times pc, \ 1 \le m \le n, \tag{9}$$

where $W(C_m, 0)$ denotes the weight of the primary changing factor Cm, in the base run.

To satisfy the conditions in Equation (8), the weights of the other factors $W(c_i, pc)$ are adjusted proportionally using $W(c_m, P)$ that are given by Equation (9):

$$W(C_m, pc) = (1 - W(Cm,pc)) \times W(Ci,0)/(1 - W(Cm,0)), \ i \ne m, \ 1 \le i \le n, \tag{10}$$

where $W(C_i,0)$ is the weight of the ith factor Ci at the base run.

When the weight of an important changing input is altered by an *IPC* within an *RPC*, a sequence of assessment maps is generated for each simulation run and a summary table is generated for each factor to quantify the changes in that input (factor) and output (results of evaluation).

Illustrative example

Most of the customers of resorts in Taiwan are international tourists. Accommodation at international tourist resorts is typically provided by international chain resort hotels, many of which are five-star hotels that offer golf courses, casinos and stage shows. Such hotels promote themselves professionally, may have significant government investment and may advertise to corporations. The development of tourism infrastructure focuses mostly on beach activities and water sports, specialist shopping precincts, duty-free shopping, convention centres and sometimes casinos.

This study studies a comprehensive and objective three-stage-method for resort selection, and uses it to establish a model of competitive advantage for resort/lodging markets. The first stage comprises three steps, and uses the modified Delphi method to identify the optimal evaluation criteria. The second stage comprises five steps, and applies AHP theory to calculate the weight of the factors used in evaluating the decision, the effectiveness of the proposed model. Finally, the third stage is sensitivity analysis. The three stages are detailed below.

First stage: Applying the modified Delphi method to evaluate the resort

Step 1: Specify the group of hospitality market experts. Twenty-four hospitality market experts were selected from industry, government and academia. During the first round of modified Delphi method, a list of potential panelists was drawn from an initial list of eight authors who had published at least one peer-reviewed paper on hospitality development in journals such as *The Annals of Tourism Research*, *Tourism Management*, the *Asia Pacific Journal of Tourism Research*, *The Journal of Outdoor Recreation Study* and *The International Journal of Hospitality*

Management. Next, snowball sampling of eight internationally recognized hospitality tourism scholars, eight Taiwan Tourism Bureau government officers and eight business representatives from the tourism and hospitality industry, identified by the Delphi board, (Juan and Lin, 2011) was performed.

Step 2: Identify the main factors in optimizing resort selection to ensure competitive advantage, based on a review of the literature. The domestic and foreign literature was reviewed to identify the main factors in optimizing the competitive advantage of resorts, and to develop criteria by the expert questionnaire survey. Five Likert-type scales were used to measure the weight of these. The levels of the individual factors are given below. Additionally, experts identified resort selection and competitive advantage criteria using key evaluation factors.

Porter (1998) proposed the Diamond model of national industrial competitiveness. The Diamond model identifies the following four determinants and two external forces as affecting competitive advantage (i) Factor endowments: production factors that are necessary for industrial competitiveness, including land, labour and infrastructure; (ii) demand conditions: domestic consumer demand that motivates companies to increase their competitiveness; (iii) firm strategy, structure and rivalry: including domestic rivalry that affect company creation, organization and management; (iv) related and supporting industries: the international competitiveness of supplier and related industries; (v) government: including government policy, that affect nation tourism strategy; (vi) chance: events beyond control of the firm, including inventions, technological breakthroughs, disasters, wars, trends initiated by particular television programs and movies, external political developments and demand shifts (Aguilo *et al*, 2005; Jacob *et al*, 2010).

Factor endowments (C_1) include the following four factors: (i) Labour resources (SC_1): resort personnel, including those engaged in accounting, human resources, purchasing, security, and public relations, as well as specialized hospitability staff; (ii) natural resources (SC_2): physical, chemical and biological environments (including land, water and air), ecological systems (including terrestrial and aquatic species, flora, fauna, and fragile life forms) and visual environments (landscapes and townscapes); (iii) capital (SC_3): capital cost of resort development; (iv) infrastructure (SC_4): required resort utilities, including water, energy and transportation, communication services, and others.

Demand conditions (C_2) include the following three factors: (i) key market segments (SC_5): such as families and mature travel markets, and changes in the business travel market; (ii) market scope (SC_6): new customers and customers that have been attracted from competitors owing to superior location, facilities, standards and prices, as well as through catering to additional markets (such as conventions and banqueting) and (iii) attitudes of local residents (SC_7): toward tourism and their effect on decision making in the community. Resident attitudes contribute greatly to the attractiveness of tourist environments, and directly affect the experiences of tourists.

Firm strategy, structure and rivalry (C_3) includes assessments of the following four factors: (i) business strategies (SC_8): competitive strategies such as branding and hotel chain globalization; (ii) attitudes of policymakers (SC_9): attitudes of board of directors (administrators), consultants (including management and financial personnel) and other relevant professionals, and particularly their attitudes toward managing tourism operations and improving offerings to tourists; (iii) entrepreneurial vision (SC_{10}): organizational objectives and focus; (iv) corporate social responsibility (SC_{11}): legally mandated actions with social value beyond the interests of the firm.

Related and supporting industries (C_4) includes assessments of the following three factors: (i) local natural resources (SC_{12}): natural attractions such as scenic areas; (ii) local human resources (SC_{13}): recreational attractions such as biking, hiking, fishing, sightseeing, sailing, bird watching, and golf, and cultural heritage such as castles, temples, cultural festivals, museums, manor houses, and aboriginal cultural villages; (iii) emergency facilities (SC_{14}): hospitals and police stations.

Government (SC_5) includes assessments of the following three factors: (i) legal requirements (SC_{15}): the availability and legal status of development land; (ii) stable and clear government policy (SC_{16}): political stability and government policy supportive of tourism development; (iii) political environment (SC_{17}): planning regulations, infrastructure, regulations concerning joint ventures and other partnerships, and financial incentives.

Chance (SC_6) includes assessments of the following five factors: (i) natural disasters (SC_{18}): the risk of earthquakes, tsunamis, floods, droughts, cyclones, political disturbances, epidemics and others; (ii) technological innovation (SC_{19}): technological advances by firm that improve the experiences of tourists, and their effect on the marketing of resorts (Fernandez *et al*, 2011); (iii) popularity of television and movies (SC_{20}): the effect of TV programs on, in particular, particular locations and their impact on tourism marketing (Kim *et al*, 2009); (iv) changes in market demand (SC_{21}): variations in demand from local tourists (Teresa, 2009); (v) bilingualism (SC_{22}): bilingual signage and brochures.

Step 3: Establish a model of optimal resort selection to ensure competitive advantage. The group of experts identifies the factors and resort types that must be considered in a model of comparative advantage of resorts with a view to optimizing their selection. Resorts in Taiwan can be variously classified. Sen (1996) distinguished among them by location or characterized them as mountain resorts, lakeside resorts, seaside resorts and hot spring resorts. Yau (1997) distinguished them by location and as spa resorts, marine resorts and casino and entertainment resorts. In 2012, Taiwan has seven hot spring resorts, six lakeside resorts, four seaside resorts, one mountain resort and four theme resorts. Seven resorts are located in northern Taiwan; five resorts are in central Taiwan, four resorts are in southern Taiwan and six resorts are in eastern Taiwan (Taiwan Tourism Bureau, 2012). Examples of seaside resorts include Ken-ting Beach in southern Taiwan, and Green Bay in northern Taiwan. Examples of lakeside resorts are those at Shih-men Dam in northern Taiwan and Sun Moon Lake in central Taiwan.

Casino resorts allow legal gaming, such as lotteries, casinos, pari-mutuel betting, bingo, electronic poker, card rooms and charity gambling (Sun, 2011). Health/spa resorts provide visitors the therapeutic benefits of mineral springs and related treatments (Sen, 1996). The experts identified four type of resort in Taiwan – seaside resorts, lakeside resorts, casino resorts and health/spa resorts. The results of the survey elucidated 22 factors and four alternatives for in the selection of a resort hotel.

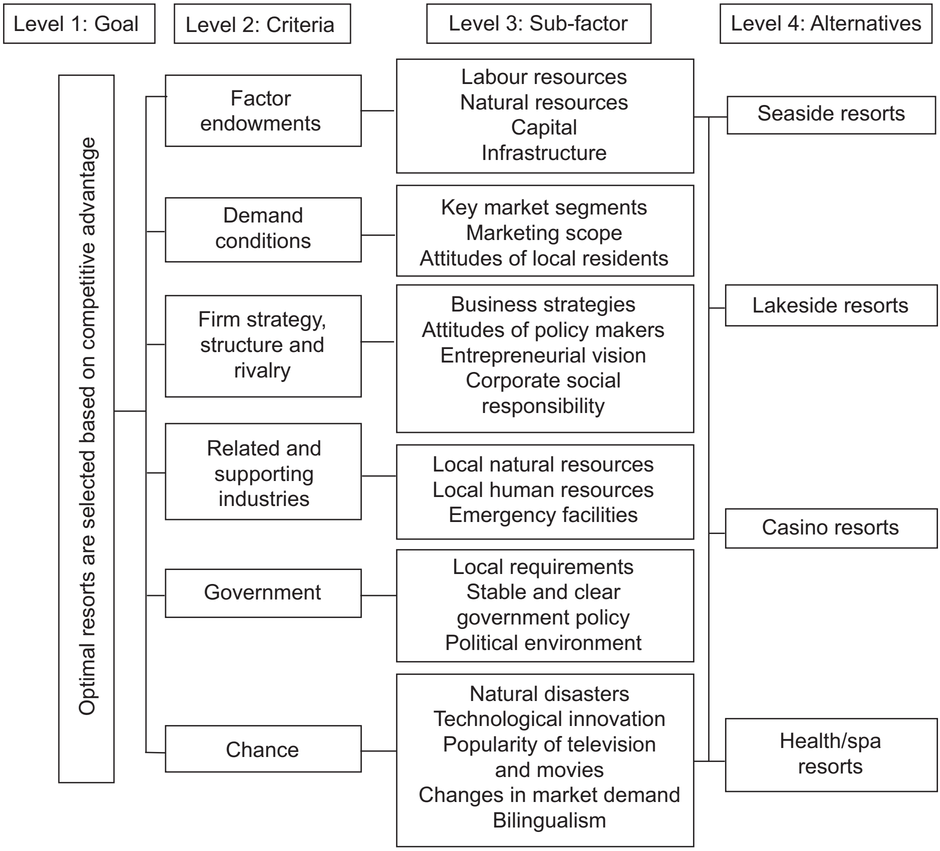

Figure 1. Hierarchical structure for selecting and evaluating optimal resorts based on competitive advantage.

Second stage: Determining weight of each factor in resort selection model using AHP to ensure competitive advantage

Step 1: Establish a hierarchy structure. Each evaluation factor in the model for selecting resort location to maximize competitive advantage has many levels.

Step 2: Establish each factor in pair-wise comparison matrix. Nineteen experts performed a pair-wise comparison of the level of factors. For example, as presented in Figure 1.

Step 3: Calculate eigenvalue and eigenvector. Formulae (1) and (2) yield the aggregate pair-wise comparison matrix. Levels 2–4 are made for a sample group of 22 individuals, with each respondent's of the decision elements and assigning relative scores to them. Formulae (3) and (4) are used to calculate the eigenvectors of the comparison matrix in Table 2. Table 3 shows the eigenvector by the six criteria and 22 sub-factors.

Table 2. Goal aggregate pair-wise comparison matrix and eigenvectors for level 2.

Goal	Factor endowments	Demand conditions	Firm strategy, structure and rivalry	Related and supporting industries	Government	Chance	Eigenvectors (weightings)
Factor endowments	1.000	0.963	1.636	2.456	1.977	2.849	0.255
Demand conditions	1.039	1.000	1.699	2.551	2.053	2.959	0.265
Firm strategy, structure and rivalry	0.611	0.589	1.000	1.501	1.208	1.742	0.156
Related and supporting industries	0.407	0.392	0.666	1.000	0.805	1.160	0.104
Government	0.506	0.487	0.828	1.242	1.000	1.441	0.129
Chance	0.351	0.338	0.574	0.862	0.694	1.000	0.090

Note: λ_{max} = 6.0001; CI = 0.0000; CR = 0.0000.

Table 3. Eigenvectors and weightings for selecting four resort locations using 22 sub-factors.

Criteria	Sub-factor	Weightings for sub-factors	Seaside resorts	Lakeside resorts	Casino resorts	Health/spa resorts
Factor endowments	Labour resources	0.155	0.156	0.121	0.388	0.336
	Natural resources	0.314	0.418	0.317	0.179	0.085
	Capital	0.246	0.186	0.138	0.401	0.274
	Infrastructure	0.285	0.248	0.184	0.325	0.243
Demand conditions	Key market segments	0.329	0.180	0.174	0.312	0.334
	Marketing scope	0.474	0.230	0.266	0.202	0.302
	Attitudes of local residents	0.197	0.361	0.261	0.157	0.222
Firm strategy, structure and rivalry	Business strategies	0.227	0.127	0.087	0.448	0.338
	Attitudes of policymakers	0.252	0.128	0.141	0.366	0.365
	Entrepreneurial visions	0.372	0.153	0.117	0.449	0.281
	Corporate social responsibility	0.150	0.306	0.242	0.262	0.190
Related and supporting industries	Local natural resources	0.434	0.394	0.360	0.159	0.087
	Local human resources	0.389	0.346	0.316	0.237	0.101
	Emergency facilities	0.177	0.181	0.113	0.388	0.318
Government	Legal requirements	0.401	0.370	0.275	0.178	0.178
	Stable and clear government policy	0.406	0.486	0.280	0.145	0.089
	Political environment	0.193	0.353	0.274	0.237	0.136
Chance	Natural disasters	0.177	0.463	0.308	0.147	0.082
	Technological innovation	0.245	0.142	0.094	0.351	0.413
	Popularity of television and movies	0.143	0.315	0.257	0.251	0.177
	Changes in market demand	0.290	0.275	0.243	0.245	0.237
	Bilingualism	0.146	0.216	0.148	0.366	0.270

Table 4. Eigenvectors and weightings for selecting four resort locations.

Criteria	Weightings	Seaside resorts	Lakeside resorts	Casino resorts	Health/spa resorts
Factor endowments	0.255	0.272	0.205	0.308	0.215
Demand conditions	0.265	0.239	0.235	0.229	0.297
Firm strategy, structure and rivalry	0.156	0.164	0.135	0.400	0.302
Related and supporting industries	0.104	0.338	0.299	0.230	0.133
Government	0.129	0.414	0.277	0.176	0.134
Chance	0.090	0.273	0.206	0.272	0.249
Synthesis value		0.272	0.221	0.273	0.234
Rank		2	4	1	3

Step 4: Perform consistency testing. The results of the consistency test and the *CR* of the comparison matrix are ≤ 0.1 for all 19 experts, indicating consistency. Additionally, the *CR* of the aggregate matrix is also ≤ 0.1, again indicating consistency.

Step 5: Calculate the relative weights of elements by each level. Table 4 reveals that the weights of level 3. The four sub-factors of factor endowments are ranked as natural resources (0.314) > infrastructure (0.285) > capital (0.246) > labour resources (0.155). The weights for the three sub-factors of demand conditions are ranked as market scope (0.474) > key market segments (0.329) > attitudes of local residents (0.197).

Additionally, the weightings of the four sub-factors of firm strategy, structure and rivalry are ranked as entrepreneurial vision (0.372) > attitudes of policymakers (0.252) > business strategies (0.227) > corporate social responsibility (0.150). The weightings of the three sub-factors of related and supporting industries are ranked as local natural resources (0.434) > local human resources (0.389) > emergency facilities (0.177). The weightings for the three sub-factors of government are ranked as stable and clear government policy (0.406) > legal requirements (0.401) > political environment (0.193). Finally, the weightings of the five s sub-factors of chance are ordered as changes in market demand (0.290) > technological innovation (0.245) > natural disasters (0.177) > bilingualism (0.146) > popularity of television and movies (0.143).

The weights of factor endowments decrease in the order casino resorts, seaside resorts, health/spa resorts and lakeside resorts. The weights of demand conditions decrease in the order health/spa resorts, seaside resorts, lakeside resorts and casino resorts. Additionally, the weights for firm strategy, structure and rivalry decrease in the order casino resorts, health/spa resorts, seaside resorts and lakeside resorts. Meanwhile, the weightings of related and supporting industries decrease in the order seaside resorts, lakeside resorts, casino resorts and health/spa resorts. The weightings of government decrease in the order seaside resorts, lakeside resorts, casino resorts and health/spa resorts. Finally, the weightings of chance decrease in the order seaside resorts, casino resorts, health/spa resorts and lakeside resorts (Table 4).

Equation (11) lists:

$$\begin{bmatrix} 1.70 \\ 1.36 \\ 1.62 \\ 1.22 \end{bmatrix}. \tag{11}$$

Identical results are obtained for seaside resorts as for the type of resort selected here. The four types of resort are ranked as casino resorts (0.273) > seaside resorts (0.272) > health/spa resorts (0.234) > lakeside resorts (0.221).

Third stage: Perform sensitivity analysis

The weightings of selected subjective factors are varied in Expert Choice 2000 2nd Edition Software. In the case considered herein, the four types that were used in this study was based on modified Delphi method. Sensitivity analyses are required because changing the importance of the factors requires varying the factor endowments, demand conditions, firm strategy, structure and rivalry, related and supporting industries, government and chance in relation to developing a process for selecting an optimal resort location that ensures competitive advantage, where FE = factor endowments, DC = demand conditions, FSR = firm strategy, structure and rivalry, RSI = related and supporting industries, G = government, C = chance, SR = seaside resorts, LR = lakeside resorts, CR = casino resorts, HR = health/spa resorts.

In this study a PRC of +20% and an IPC of +1% was a complete set of six factors. The sensitivity analysis comprises 200 evaluation runs over the range –20.0% (1st simulation run) to +20% (40th simulation run) of each of the six factors in the base run (the 21st run). Table 5 presents an example of DC, listing ranks of the cells of which represent weight and changes in numerical weightings among four alternative resorts.

Results were obtained from 246 simulation runs, and present in Table 5. No factors relative to its original in the base run. The output is most sensitive to DC and FE among all criteria, and least sensitive to RSI and C. The ranks of most cells in these four suitable resorts remained constant, or changed slightly. FE and FST drive DC.

DC is the most important factor and resort suitability is greatly affected when its weighting is changed by more than 1%. LR are relatively unaffected by variation in the weights of factor endowments, firm strategy, structure and rivalry, related and supporting industries, government and chance. These two suitable levels remained unchanged, or changed only slightly. The fact that a perturbation in decision weights, particularly of G and C, only minimally affected the ranks of most cells in LR and SR reveals that the domination of these factors is almost independent of the decision weights of these selected factors. Most occurred with changes of +1% in HR. DC had a higher weighting than the other factors, strongly influencing the evaluation results.

FE had the greatest weight and so strongly influenced the evaluation results. DC and FSR drive FE. Therefore, FE is the factor to which outcomes are most sensitive, as is expected. Relative to the high spatial variability of the above four criteria, G and C are relatively uniform in space. C was assigned the lowest

Table 5. Example of the summary table generated from the 41 SA runs for criterion DC showing the 40 SA simulation runs plus the base run (bold).

Change, %	FE	DC	FSR	RSI	G	C	SR	LR	CR	HR	Variation			
											SR	LR	CR	HR
–20	0.274	0.212	0.167	0.111	0.138	0.096	0.274	0.220	0.276	0.230	0.002	0.001	0.003	0.004
–19	0.273	0.215	0.167	0.111	0.138	0.096	0.274	0.220	0.276	0.230	0.002	0.001	0.003	0.004
–18	0.272	0.217	0.166	0.111	0.138	0.096	0.274	0.220	0.276	0.230	0.002	0.001	0.003	0.004
–17	0.271	0.220	0.166	0.110	0.137	0.095	0.273	0.220	0.275	0.231	0.001	0.001	0.002	0.003
–16	0.270	0.223	0.165	0.110	0.137	0.095	0.273	0.220	0.275	0.231	0.001	0.001	0.002	0.003
–15	0.269	0.225	0.165	0.110	0.136	0.094	0.273	0.220	0.275	0.231	0.001	0.001	0.002	0.003
–14	0.268	0.228	0.164	0.109	0.135	0.094	0.273	0.220	0.275	0.231	0.001	0.001	0.002	0.003
–13	0.267	0.231	0.163	0.109	0.135	0.094	0.273	0.220	0.275	0.231	0.001	0.001	0.002	0.003
–12	0.266	0.233	0.163	0.108	0.134	0.093	0.273	0.220	0.275	0.232	0.001	0.001	0.002	0.002
–11	0.266	0.236	0.163	0.108	0.134	0.093	0.273	0.220	0.275	0.232	0.001	0.001	0.002	0.002
–10	0.265	0.239	0.162	0.107	0.133	0.093	0.272	0.221	0.275	0.232	0	0	0.002	0.002
–9	0.264	0.241	0.161	0.107	0.133	0.092	0.272	0.221	0.275	0.232	0	0	0.002	0.002
–8	0.263	0.244	0.161	0.107	0.133	0.092	0.272	0.221	0.275	0.232	0	0	0.002	0.002
–7	0.262	0.246	0.160	0.106	0.132	0.092	0.272	0.221	0.274	0.233	0	0	0.001	0.001
–6	0.261	0.249	0.160	0.106	0.132	0.092	0.272	0.221	0.274	0.233	0	0	0.001	0.001
–5	0.261	0.252	0.159	0.106	0.131	0.091	0.272	0.221	0.274	0.233	0	0	0.001	0.001
–4	0.259	0.254	0.159	0.106	0.131	0.091	0.272	0.221	0.274	0.233	0	0	0.001	0.001
–3	0.258	0.257	0.158	0.106	0.130	0.091	0.272	0.221	0.274	0.233	0	0	0.001	0.001
–2	0.257	0.260	0.157	0.105	0.130	0.091	0.272	0.221	0.273	0.233	0	0	0	0.001
–1	0.256	0.262	0.156	0.104	0.130	0.091	0.272	0.221	0.273	0.233	0	0	0	0.001
0	**0.255**	**0.265**	**0.156**	**0.104**	**0.129**	**0.090**	**0.272**	**0.221**	**0.273**	**0.234**	**0**	**0**	**0**	**0**

1	0.254	0.268	0.156	0.103	0.129	0.089	0.272	0.221	0.273	0.234	0	0	0	0
2	0.253	0.270	0.155	0.103	0.128	0.089	0.271	0.221	0.273	0.235	0.001	0	0	0.001
3	0.252	0.273	0.155	0.103	0.128	0.089	0.271	0.221	0.273	0.235	0.001	0	0	0.001
4	0.252	0.276	0.154	0.102	0.127	0.088	0.271	0.221	0.272	0.235	0.001	0	0.001	0.001
5	0.251	0.278	0.154	0.102	0.127	0.088	0.271	0.221	0.272	0.235	0.001	0	0.001	0.001
6	0.250	0.281	0.153	0.102	0.126	0.088	0.271	0.221	0.272	0.236	0.001	0	0.001	0.002
7	0.249	0.284	0.153	0.101	0.126	0.087	0.271	0.221	0.272	0.236	0.001	0	0.001	0.002
8	0.248	0.286	0.152	0.101	0.126	0.087	0.271	0.221	0.272	0.236	0.001	0	0.001	0.002
9	0.247	0.289	0.151	0.101	0.125	0.087	0.271	0.221	0.272	0.236	0.001	0	0.001	0.002
10	0.247	0.292	0.151	0.100	0.124	0.086	0.270	0.222	0.271	0.237	0.002	0.001	0.002	0.003
11	0.246	0.294	0.150	0.100	0.124	0.086	0.270	0.222	0.271	0.237	0.002	0.001	0.002	0.003
12	0.245	0.297	0.149	0.099	0.124	0.086	0.270	0.222	0.271	0.237	0.002	0.001	0.002	0.003
13	0.244	0.299	0.149	0.099	0.123	0.086	0.270	0.222	0.271	0.237	0.002	0.001	0.002	0.003
14	0.243	0.302	0.148	0.099	0.123	0.085	0.270	0.222	0.270	0.238	0.002	0.001	0.003	0.004
15	0.242	0.305	0.148	0.098	0.122	0.085	0.270	0.222	0.270	0.238	0.002	0.001	0.003	0.004
16	0.241	0.307	0.147	0.098	0.122	0.085	0.270	0.222	0.270	0.238	0.002	0.001	0.003	0.004
17	0.240	0.310	0.147	0.098	0.121	0.084	0.270	0.222	0.270	0.238	0.002	0.001	0.003	0.004
18	0.239	0.313	0.146	0.097	0.121	0.084	0.270	0.222	0.270	0.238	0.002	0.001	0.003	0.004
19	0.238	0.315	0.146	0.097	0.120	0.084	0.269	0.222	0.270	0.239	0.003	0.001	0.003	0.005
20	0.237	0.318	0.145	0.097	0.120	0.083	0.269	0.222	0.270	0.239	0.003	0.001	0.003	0.005

Note: SA = sensitivity analysis; FE = factor endowments; DC = demand conditions; FSR = firm strategy, structure and rivalry; RSI = related and supporting industries; G = government; C = chance; SR = seaside resorts; LR = lakeside resorts; CR = casino resorts; HR = health/spa resorts.

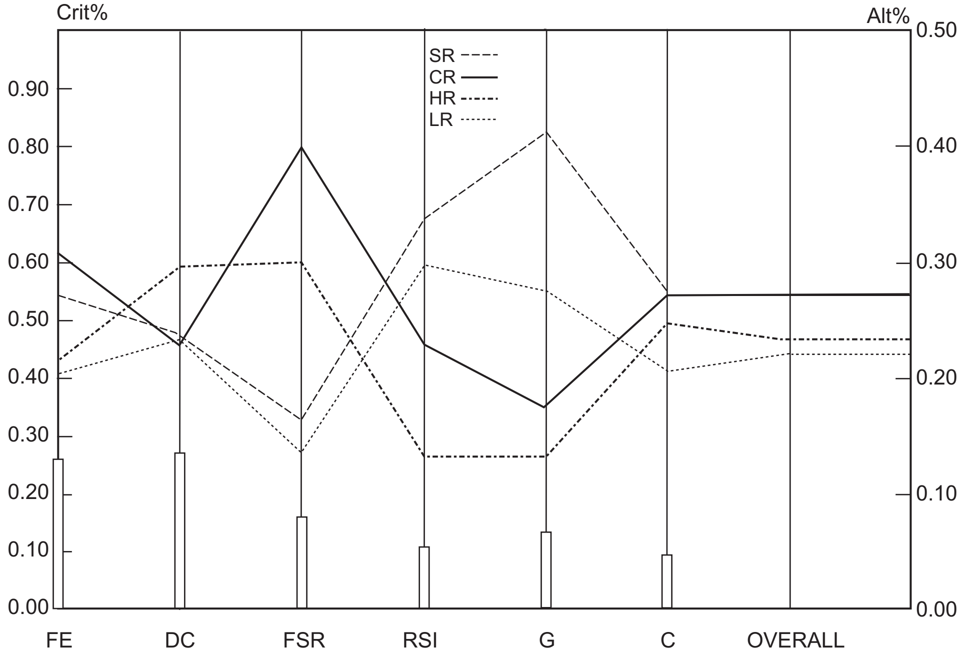

Figure 2. Performance sensitivity of the alternatives.

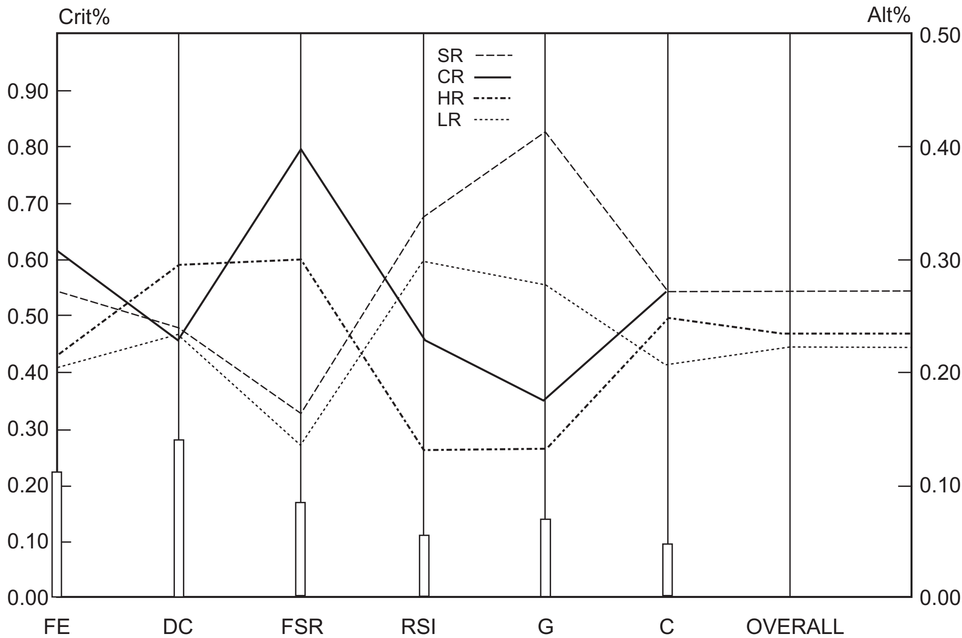

Figure 3. Performance sensitivity of the alternatives when FE is decreased by 22%.

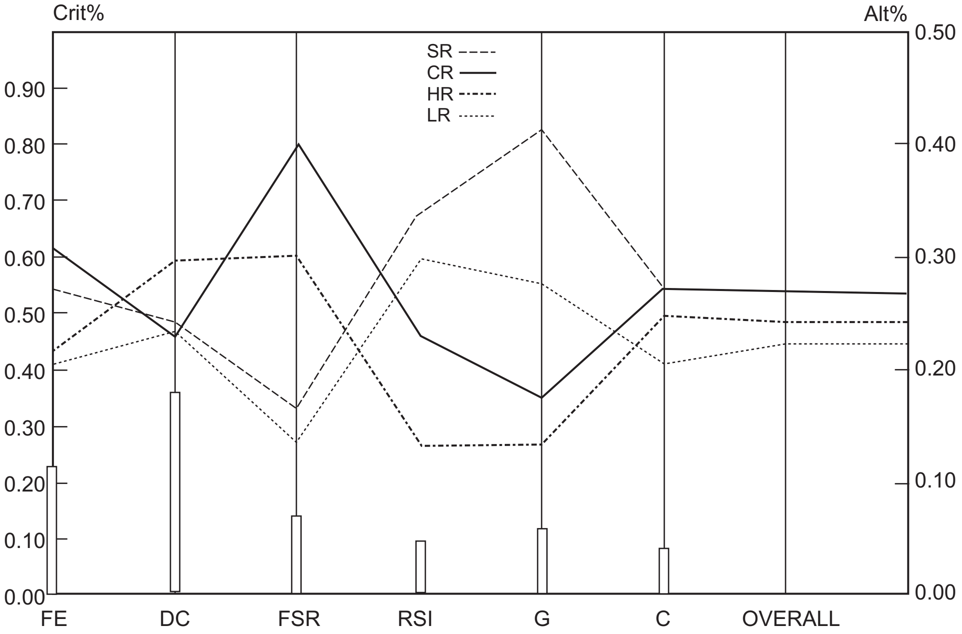

Figure 4. Performance sensitivity of the alternatives when DC is increased by 35.6%.

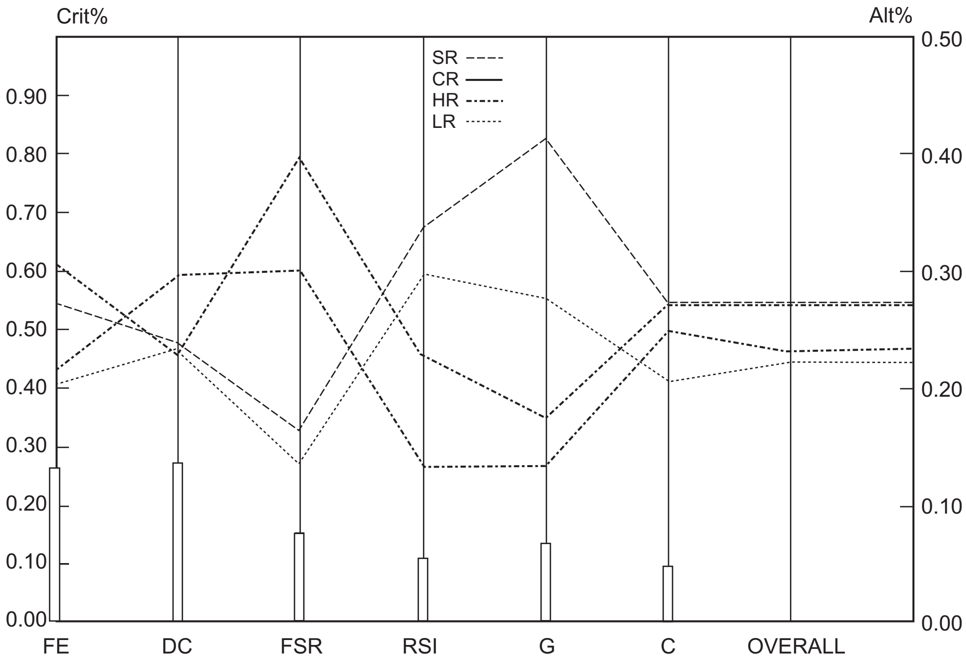

Figure 5. Performance sensitivity of the alternatives when FSR is decreased by 14.7%.

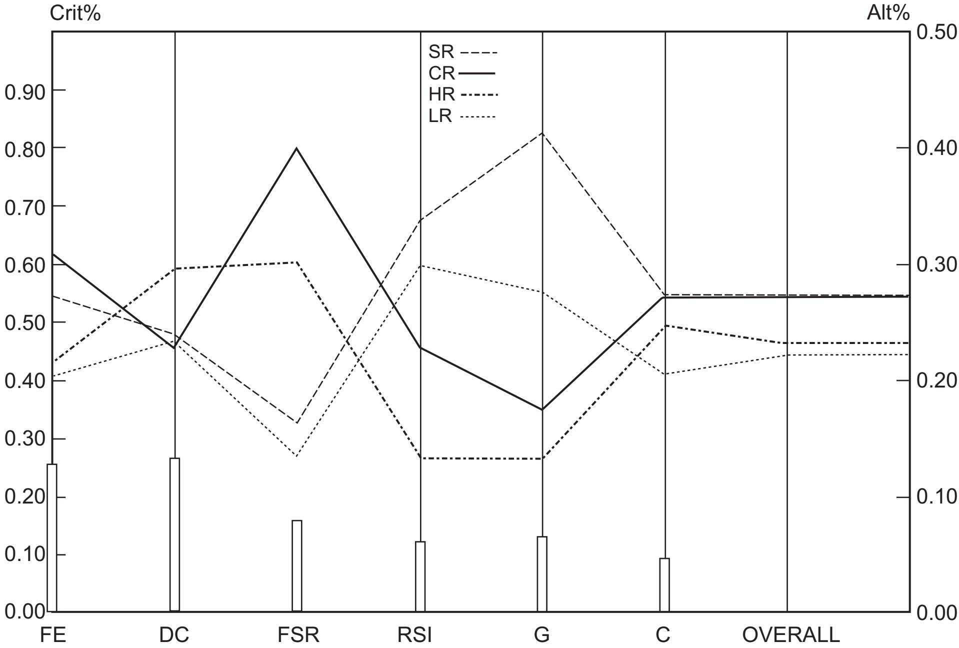

Figure 6. Performance sensitivity of the alternatives when RSI is increased by 11.8%.

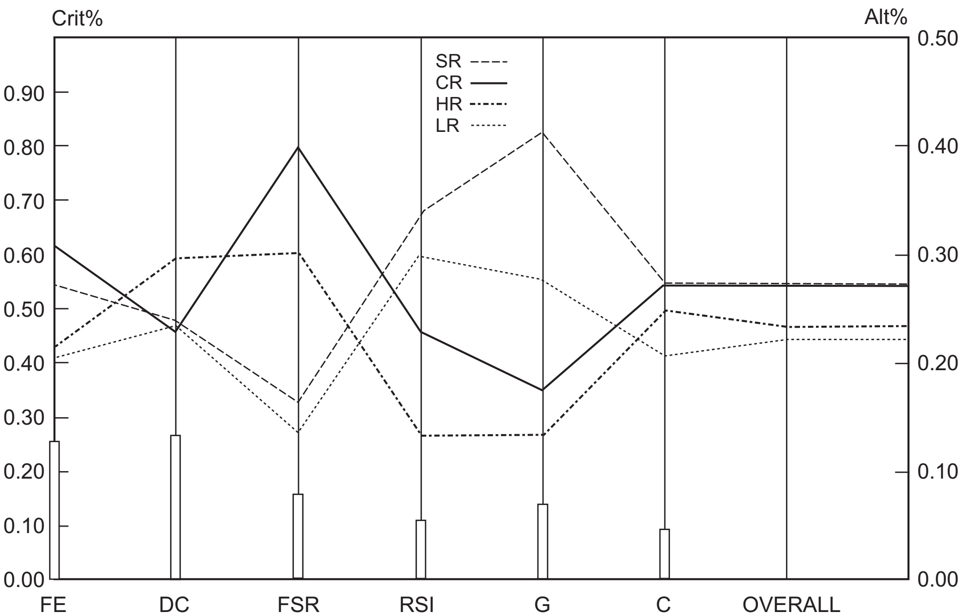

Figure 7. Performance sensitivity of the alternatives when G is increased by 13.6%.

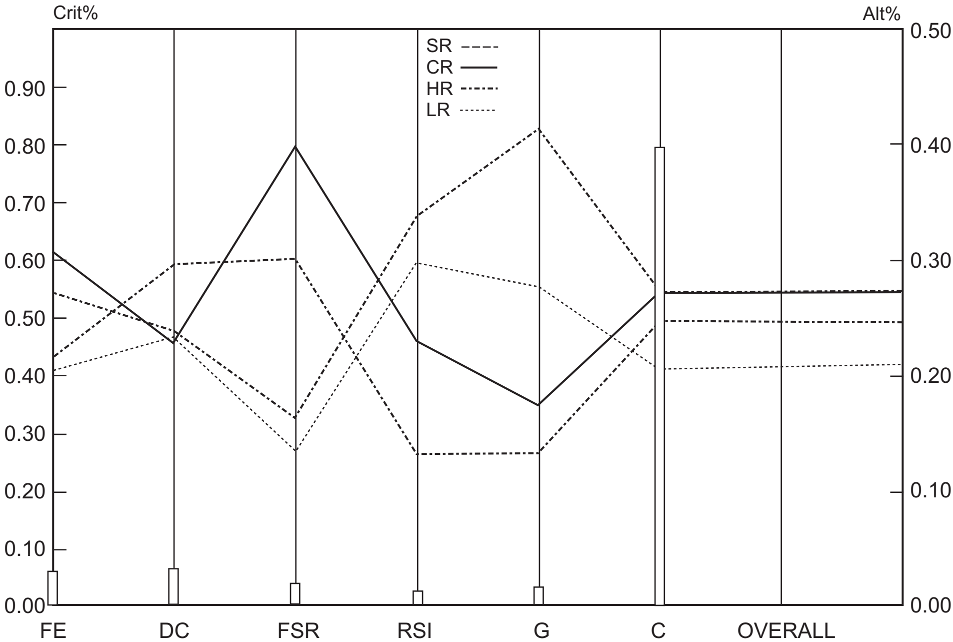

Figure 8. Performance sensitivity of the alternatives when C is increased by 79.1%.

weight because it was almost uniform over the study area. Therefore, both G and C are assumed to have only a minimal impact on the evaluation results.

After the initial solution was obtained using the given criteria weightings, sensitivity analyses were performed to explore the response of the overall ranking of alternatives to changes in the relative of each factor (Figure 2). When FE decreases from 25.5% to 22% (Figure 3), DC increases from 26.5% to 35.6% (Figure 4), FSR decreases from 15.6% to 14.7% (Figure 5), RSI increases from 10.4% to 11.8% (Figure 6), G increases from 12.9% to 13.6% (Figure 7) and C increases from 9% to 79.1% (Figure 8), the global weighting of the casino resort as the optimal choice also increases.

Government is the most important criterion, significantly modifying from 12.9% to 13.6%. Other changes in conditions are also carefully analysed, and the associated scenarios are studied. The generated result is the casino resort. Again, a decision should not be made based solely on the above measures because the analysis also uses objective factor measurements.

Conclusion

Using the famous Diamond Model, which seeks to clarify the intricate relationships among various types of competitive advantage, this study develops an evaluation criterion for optimizing the selection of new Taiwanese resorts locations. The proposed evaluation criterion provides policymakers and academics with a basis for making recommendations regarding future resort development. The objective factor is implemented in various alternative scenarios based on the best global indicators. Additionally, the subjective factor is measured using AHP. The analysis identifies various factors and sub-factors while considering the optimization of resort selection to maximize competitive advantage. The selection of a location is a complex problem. For example, the Ta Shee Resort was located in northern Taiwan, but ceased operations in 2008 because of poor management. Therefore, this occurrence reflects the fact that the highly competitive market makes optimizing resort location critical (Bernini and Guizzardi, 2010; Swann, 2010; Assaf and Agbola, 2011). This study uses AHP and sensitivity analysis to reduce errors in decision making.

Sensitivity analysis yields the weight of each factor and determines its effect on a hierarchy of alternatives. This study also surveys the effect of the weights of the criteria and sub-factor on the four types of resort. Based on dynamic sensitivity, the hierarchy of alternatives is ranked as casino resorts, seaside resorts, health/spa resorts and lakeside resorts. Sensitivity analysis was performed to identify variation in behaviour. Such an analysis enables decision makers to follow a comprehensive yet easy-to-use procedure to study the sensitivity to the weight of 22 factors. The tool can consolidate output from each simulation run into an easy-to-interpret tabulated summary to examine the results of the sensitivity analysis.

Sensitivity analysis should be part of the evaluation of MCDM: consideration of the degree of variation in model output when parameters or associated weightings are systematically varied over a range of interests. Sensitivity analysis is critical to understanding the heterogeneity; making the assessment and comparison of the different resorts difficult.

The AHP and sensitivity analysis tool studied here is simple and flexible. The tool provides immediate feedback to evaluators or modellers, is easy for non-experts to understand, and provides a mechanism for solving decision problems revealing how changes in weightings of factors spatially and quantitatively affect evaluation outcomes.

After the initial solution is obtained using the given criteria weightings, sensitivity analyses were performed to study the response of an overall ranking of alternative to changes of each criterion. Sensitivity analyses are required because changes in the importance of factors require levels of FE, DC, FSR, RSI, G and C associated with resort development to be changed.

Tourism administrators or decision makers should prioritize hotels in seaside resorts for cooperation or investment. The Legislative Yuan of the Republic of China, Taiwan, passed an amendment to the Off-Shore Island Development Act No 10–2, in January 2009, allowing off-shore islands to build casinos as a part of international tourist resorts. The facilities of off-shore island resorts should include international tourist hotels, amusement facilities, international convention and exhibition centres, shopping malls and other tourism-related services. Special permission is given to those who operate and engage in tourist casinos to ignore the otherwise relevant provisions of the Penal Code (Chang, 2011). Finally, this study recommends that tourism administrators or decision makers use the proposed model to evaluate the business dynamics of resorts.

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