Article
Priority Weights for Predicting the Success of Hotel Sustainable Business Models

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Abstract: This study proposes the use of consistent fuzzy preference relations to evaluate the structure of hotel sustainable business model (HSBM) dimensions and the corresponding hierarchy of evaluation indicators, and predict the overall probability of success. As fuzzy preference relations require, a group of hotel professionals in Taiwan was asked to process pairwise comparisons using linguistic variables to determine the weights of dimensions and indicators. According to the results, finances were found to be the most important dimension, followed by human capital. The number of local cultural events in the hotel was identified as the most important indicator. The predictive values revealed the possibility for successful HSBM implementation, shedding light on the vision of sustainability for the hotel industry. The results of the present study contribute to the literature on sustainability by determining the importance and weights of dimensions and indicators for hotel business models, providing an example of the use of this strategic tool in generating and modifying sustainable business models for the hotel industry.

Keywords: sustainable business model; consistent fuzzy preference relations; hotel industry; sustainability

1. Introduction

Sustainability issues have become increasingly critical due to the global focus on the impact of businesses on resources, the environment and society [1]. The hotel industry is having an increasing effect on the global economy, underscoring that hotel-related businesses generate substantial economic and financial outcomes. This influence has prompted customers to expect hotel companies to commit business leadership efforts to sustainable development (SD) and other forms of social responsibility [2], Franco, et al. [3] found that customers were more willing to book rooms in hotels that were committed to SD practices than to those that were not. The hotel industry is globally recognized as a major contributor to the tourism industry [4], dos Santos, et al. [5] stated that hotel businesses are exceptional for their diversity of leisure, entertainment, and conference and meeting facilities, creating a production system that stimulates local economies. Sustainability initiatives in the hotel industry can have a substantial positive impact on society; the close relationship between the industry and social, economic, and environmental systems at all levels of the global–local relationship perfectly position it to make a significant contribution to SD on a global scale, while also connecting with specific communities and (tourist) destinations [6].

Sustainability is one of the key factors affecting future competitiveness and business survival [7,8]. A growing number of hotels have publicly stressed and demonstrated their commitment to SD in order to increase their competitive advantage in the market. Thus, in order to meet customers’ growing eco-friendly needs, issues related to sustainability have become a top priority [8], Mihalić, et al. [9] argued that the topic of sustainability should be incorporated into hotels’ business models. Nosratabadi, et al. [10] considered that sustainable business models (SBMs) require proactive multi-stakeholder management,
innovation, and a long-term view if they are to achieve SD goals. Although sustainability in the hotel industry has attracted significant attention, research on sustainable hotel management remains scarce [11,12].

Even though hotel managers are aware of the importance of environmental and social performance goals, they are reluctant to implement sustainable practices [13,14] and fully commit to achieving economic goals because they are under pressure to achieve a high level of financial performance [9]. Few studies have examined the factors leading to hotel sustainable business model (HSBM) success, especially in Taiwan. Due to the booming hospitality market, hospitality management programs are some of the fastest growing academic programs in Taiwan [15,16]. However, Horng, Liu, Chou, Tsai and Chung [15] argued that there are gaps between the academic world and actual industry. Research on environmental management has mainly focused on manufacturing, because such companies are more exposed to ecological issues in the form of inputs and outputs. This type of exploration needs to be extended to green issues in the service sector, an area often described as silently destroying the environment. Alberton, et al. [17] argued that when organizational actions can only meet one or another pillar of sustainability, they cannot be considered sustainable. Sustainability is reflected in the management of an organization, which prompts questions regarding the capabilities required for its development.

Based on a sample of Slovenian hotels, Mihalič, Žabkar and Cvelbar [9] developed an HSBM that combined the elements of the World Tourism Organization’s sustainability model (2005) and the triple bottom line (TBL) sustainability model. The latter, developed by Elkington [18], was the first sustainability framework and clearly incorporates customer perspectives into the economic aspects of sustainability [8]. Based on the HSBM, Cvelbar and Dwyer [19] argued that the economic performance of the hotel industry can be measured by the overall success and specific dimensions of the hotel company. Environmental performance can be evaluated in terms of actions related to resource use and the raising of environmental awareness. In terms of the social aspect, a company measures its performance based on its relationships with customers, local communities, and employees.

During the COVID-19 global health crisis, the global economy approached a nearly zero growth rate [20]. Stay-at-home orders and travel restrictions issued by local and national governments led to a sharp drop in hotel revenue and occupancy rates. The hotel industry is now fighting for survival [21] as a result, and many hotels have been permanently or temporarily closed [22]. Polukhina, Sheresheva, Efremova, Suranova, Agalakova and Antonov-Ovseenko [21] confirmed that both in the pre-pandemic period and today, the challenges resulting from the COVID-19 pandemic mean that the three pillars of sustainability are even more critical to the development of tourism. The HSBM covers the following three pillars: economic, social-cultural, and environmental sustainability, which together serve as the basis of sustainability for the tourism industry and are the most frequently evaluated in research [23].

Hence, using the concept of the HSBM developed by Mihalič, Žabkar and Cvelbar [9] as a framework, the present research draws upon previous studies [24,25] applying consistent fuzzy preference relations and expert opinions in order to identify the leading dimensions and indicators affecting SD in the hotel industry and forecast the chances of successful HSBM initiatives. If offered a weighted HSBM, managers could better understand and more effectively use it as a strategic tool to generate and modify successful business models for sustainability, enhancing the satisfaction and commitment of employees, customers, investors, and stakeholders and improving relationships with the municipality, local communities, and other related organizations. The main research questions are: what are the most important dimensions and indicators for the implementation of a hotel sustainable business model (HSBM)? What is the probability of success or failure for implementing a HSBM in Taiwan? The relevant evaluation dimensions and indicators are presented in Figure 1.
The remaining sections of this paper are structured as follows. Section 2 illustrates dimensions of HSBM with respect to the three pillars of sustainability. The methodology and calculation of the dimensions’ weights are discussed in Section 3. The analysis and results are given in Section 4. The final portion of this study describes conclusions, the managerial implications of our findings, limitations, and suggestions for future research.

2. Literature Review

2.1. Economic Business Category

Mihalič, Žabkar and Cvelbar [9] argued that in the services sector, and especially in the hotel industry, customer satisfaction, long-term relationships, and customer-perceived service quality should be prioritized as service-related indicators, rather than more traditional performance and financial indicators. Therefore, the HSBM combines financial and marketing satisfaction indicators into the economic indicator group.

2.1.1. Financial Dimension

Financial performance indicates a company’s state or financial situation, which has a significant impact on its ability to engage in sustainable business [26]. Bodhanwala and Bodhanwala [27] found that there is a positive and significant relationship between a company’s profitability, such as its return on investment (ROA) and return on invested capital (ROIA), and its sustainability. Profitability measurements for the hotel industry not only calculate gross operating profit and net operating income [28], but also profit margin (PM), average room rate (ARR), and average occupancy rate (AOR) [29]. Jurigová, et al. [30] suggested that tourism managers and authorities should focus on the economic value added (EVA), which is one of the most important and useful financial indicators used to determine the value of a company [31]. A positive EVA means that the company has successfully created value for capital owners because it can generate returns that exceed the level of capital [32]. Planinc, et al. [33] suggested including total revenue per employee (TRPE) as a financial indicator related to the performance of the hotel industry.

2.1.2. Marketing Dimension

Understanding the concept of satisfaction is important for ensuring the success of any company in the service industry [22]. In order to facilitate SD in the hotel industry, it is important to first understand what can satisfy customers in terms of sustainability [34]. Customer satisfaction is the result of the customer’s perception of the value obtained in the transaction or relationship, where value is equal to the perceived service quality relative to price and customer acquisition cost. Service quality, customer satisfaction, and price are important criteria in customer selection and key factors that determine post-purchase behavior such as word-of-mouth recommendations and intent to return [35,36]. Karipidou [37] explained that satisfied customers tend to revisit a hotel and recommend it to others. Customers revisiting a hotel more than twice are considered to maintain a high level of customer loyalty. Customer satisfaction and loyalty enhance a hotel’s goodwill, reputation, and financial returns, ultimately enabling survival and success.

2.2. Environmental Business Category

Through the education of employees and managers, sustainability information, increased awareness, and ethics can all be part of changing the level of sustainability on the supply side. Hence, education and awareness regarding the three environmental pillars were added to the HSBM to emphasize the responsibility companies have in this regard [9]. Pleissner [38] stated that the hotel industry must meet the expectations of eco-conscious tourists, who prefer hotels that engage in activities that protect natural resources and prevent waste accumulation. However, other researchers [39,40] have argued that when focusing on ecotourism business models, a trade-off between environmental sustainability and financial success is worth noting.
2.2.1. Resources

One of the most important aspects of the environment and its interaction with the hotel industry involves the resources provided to the business. The hotel industry relies on environmental resources such as energy and water, but it may also destroy the resources upon which it depends [41]. Waste management and energy saving have always been key issues in hotel environmental management [41,42]. In the tourism industry, hotels are the main energy consumers [43] and hotel buildings consume more energy than do other commercial buildings [44]. Lai, et al. [45] found that the estimated carbon emissions from the use of energy by the hotel industry are very significant. Bhochhibhoya, Pizzol, Marinello and Cavalli [46] noted that an effective SD strategy would focus on reducing energy consumption and heat loss, and shifting to the use of renewable energy.

Fresh water is also widely used throughout the hotel industry, especially in areas such as guest rooms, food service/preparation spaces, conference and banquet halls, special facilities, laundries, gardens, and swimming pools. All of this water is wasted after use. If wastewater could be harnessed and reused, significant economic and environmental benefits would be obtained [47]. Another environmental management activity includes waste management. Hotels reduce their impact on the environment by reducing waste and resource requirements. Doing so may attract ecologically conscious tourists, thereby reducing waste management expenditure [38]. Despite the potential economic benefits of solid waste management, it has received little attention [48].

2.2.2. Biodiversity

Chung and Parker [49] found that hotels impact various animal and plant species and ecosystems, destroying forest areas, creating environmental pollution, and using natural resources. A hotel should meet the expectations of customers and bear the pressure of protecting biodiversity. For example, in internationally operated hotels with a high degree of market diversification, the impact of hotel brands on the scope of biodiversity is expected to be greater, because ignoring public reporting may threaten the reputation of high-asset brands [50]. Hotels can choose plants that are suitable for the area, reduce the use of pesticides, and offer organic products to protect biodiversity [51]. Mihalič, Žabkar and Cvelbar [9] proposed planting vegetation suitable for a specific environment as a good business practice that is easy to implement, though it is not a main mode of action. It can be expected that biodiversity issues will become more important with the improvement of environmental awareness and education.

2.2.3. Environmental Education

Chan, et al. [52] suggested that the environmental knowledge of hotel employees contributes to their ecological behavior through the development of environmental awareness and subsequent attention to the environment. The more hotel employees know regarding the environment, the more appropriate and environmentally friendly they behave Mensah [53] argued that the success of a hotel’s environmental program depends on the environmentally responsible behavior of customers, especially in terms of resource depletion and waste generation. Customers play a key role in achieving environmental goals. Investing in environmental education for guests may generate even more dividends than educating employees because of the high rate of motivation that employees may have after receiving training.

2.3. Social Business Category

According to Mihalič, Žabkar and Cvelbar [9], the social business category can be divided into three business sub-categories: human capital (i.e., employees), cultural capital (i.e., local culture), and the power of change/participation (i.e., relationships with local residents, organizations, and communities, which help build consensus on and partnerships for achieving SD). The role of human capital is one of the key considerations in providing sustainable competitiveness [54]. In the hotel industry, it is considered a special resource
due to the direct interaction between employees and customers [55]. Culture is an economic resource because it can be commoditized as a tourism product. Since the economic value of culture can be used as a source of income, even if some aspects of the culture are not tangible, it can be regarded as capital [56].

2.3.1. Human Capital

Human capital is one of the core dimensions of intellectual capital and the most important company asset because it is the source of all strategic renewal, creativity, and innovation, and therefore a company’s ability to maintain a competitive advantage. Employees’ talents and skills provide uniqueness to a company, allowing it to develop products that add value and achieve stakeholder loyalty [57]. In a hotel, tourists and employees are asked to cooperate in the realization of services. Whether or not the two groups’ interaction is successful depends largely on the ability, knowledge, and skills of employees. Since employees’ knowledge and skills are an intangible asset of any service organization, employee satisfaction is one of the most important issues [58].

Jaworski, et al. [59] noted that training and development is vital to hotel organizations because of the high cost associated with employee turnover. There are many benefits that stem from proper training, such as consistency in job performance, higher job satisfaction, improved guest satisfaction, and reduced business costs.

2.3.2. Cultural Capital

The hotel industry is becoming increasingly aware that culture has the potential to generate income and thus substantially impact today’s global tourism market. Therefore, cultural resources should be understood as capital that tourist destinations can use to gain an economic advantage. This type of capital must be properly managed and maintained with regard to its potential for SD [56]. Freitas and Correia [60] suggested that cultural events were one of the most important components in hospitality attractiveness. Their purpose is to attract a large number of tourists, and therefore hotels that organize such events benefit in a variety of ways, such as through image recognition, strengthening of brand positioning, and simply attracting customers.

Bondzi-Simpson and Ayeh [61] opined that in the hotel and tourism industry, authenticity is an important trait and main motivation for tourists. It allows companies and destinations to gain a competitive advantage. The production, consumption, and sale of local dishes not only contribute to the promotion of food safety, health, and nutrition and the development of the local economy, but also play an important role in determining the authenticity of the destination. The impact of local dishes on tourists’ destination experience and satisfaction highlights the need for hotels to reassess organizational culture and reposition local dishes as an important part of their marketing strategy [62].

2.3.3. Power and Participation

Effective planning and implementation of sustainable tourism depends on the cooperation of many participants [63]. Cvelbar and Dwyer [19] suggested that cooperating with municipalities, local residents, and non-governmental environmental organizations helped local residents remain satisfied with the development of the tourism industry. The manner in which a company handles its relationships with important participants in its network is decisive for the development of its competitive advantage [19]. Yasarata, Altinay, Burns and Okumus [63] argued that the formulation and implementation of sustainable tourism policies and plans are impeded by power struggles and political manipulations within the government, private sector, political parties, local authorities, and major participants in the community. Mihalič, Žabkar and Cvelbar [9] found that political power and support make it possible to implement SD strategies. Roberts and Tribe [64] stated that cooperation with local NGOs was essential to promoting and enhancing appreciation of cultural and historical heritage. Figueroa and Rotarou [65] opined that the sustainability of tourism is closely related to the acceptance of residents and relies heavily on the community’s support.
for the tourism industry and their experiences with tourists. The collective actions and behaviors of residents are key factors in ensuring the success of SD in the tourism industry. Kapera [66] suggested that SD for hotels requires cooperation with the local community.

Psomas, et al. [67] noted that in the global economy and market, service companies must establish and implement well-designed internal management systems based on internationally recognized management standards (such as ISO). For instance, environmental management in the ISO 14000 series of standards helps organizations minimize the negative impact of their operations on the environment and ensures compliance with actual regulations and other environmental requirements. Considering the importance of sustainability in the current economic context and the strong development of the tourism industry, ISO (e.g., ISO 9001, ISO 14001, OHSAS 18001) can be used as a tool for SD in the hotel industry [68].

3. Research Methodology

The goals of this study are: (1) to prioritize dimensions and indicators of HSBM by applying consistent fuzzy preference relations, (2) to build pairwise comparison preference decision matrices that apply the reciprocal additive transitivity property [69], and (3) to predict the successful probability of HSBM implementation [24,25]. A consistent fuzzy preference relations approach is a useful tool for modeling the decision-making process, especially when seeking to aggregate the preferences of experts into groups. Throughout the decision-making process, experts propose their own preferences for a set of criteria. Then, specific preference relations are constructed to generate priority weights. This method not only allows experts/decision-makers to express their preferences for a set of attributes or alternatives, it avoids the need to check for inconsistencies [24,69].

The predicted chance of successful implementation can be used to promote HSBM implementation. According to Wang and Chang [24] and Hsieh, Nguyen, Wang and Lee [25], by multiplying the weight of an influential factor by the level of the possible outcome, a predicted success/failure value can be obtained [24,25]. An analytic hierarchy framework (see Figure 1) was established to illustrate the prediction of HSBM implementation.

![Figure 1. Analytical hierarchy framework for predicting HSBM implementation.](image-url)

3.1. Fuzzy Preference Relations

Fuzzy preference relations suppose that for a set of alternatives, \( P \) is the fuzzy set for the product of \( X \times X \) with the membership function \( \mu_{\alpha} : X \times X \to [0,1] \). Preference relations are represented by an \( n \times n \) matrix.

\[
P = (p_{ij}), \text{ where } p_{ij} = \mu_{\alpha}(x_i, x_j), \forall i, j \in \{1, \ldots, n\}, p_{ij} \text{ is the intensity of the preference for alternative } x_i \text{ over } x_j. \]

\[
p_{ij} = \frac{1}{2} \text{ represents indifference between } x_i \text{ and } x_j (x_i \sim x_j); p_{ij} = 1
\]
shows that $x_i$ is absolutely preferred to $x_j$, and $p_{ij} = 0$ shows that $x_i$ is absolutely preferred to $x_j$, and $p_{ij} > \frac{1}{2}$ shows that $x_j$ is preferred to $x_i$ ($x_i \succ x_j$). In this case, the preference matrix $P$ is the supposed additive reciprocal \[25,69\]:

$$p_{ij} + p_{ji} = 1 \quad \forall i, j \in \{1, \ldots, n\} \quad (1)$$

**Proposition 1.** Assume that there is a set of alternatives $X = (x_1, \ldots, x_n)$ that is related to a reciprocal multiplicative preference relation $A = (a_{ij})$ with $a_{ij} \in [1/9, 9]$. Then, the corresponding reciprocal additive fuzzy preference relation $P = (p_{ij})$ with $p_{ij} \in [0, 1]$ to $A = (a_{ij})$ is given as follows:

$$p_{ij} = g(a_{ij}) = \frac{1}{2} \cdot (1 + \log_9 a_{ij}) \quad (2)$$

### 3.2. Consistent Fuzzy Preference Relations

The propositions of consistent fuzzy preference relations are as follows \[25,69\]:

**Proposition 2.** Consider $A = (a_{ij})$ to be a consistent multiplicative preference relation. A corresponding reciprocal fuzzy preference relation $P = g(A)$ verifies the property of additive transitivity.

**Proof.** To keep $A = (a_{ij})$ consistent, whereby $a_{ij} \cdot a_{jk} = a_{ik} \quad \forall i, j, k$ or, equivalently, $a_{ij} \cdot a_{jk} = 1 \quad \forall i, j, k$, the logarithms of both sides are assumed.

$$\log_9 a_{ij} + \log_9 a_{jk} + \log_9 a_{ki} = 0 \quad \forall i, j, k. \quad (3)$$

Add 3 and then divide by 2 on both sides:

$$\frac{1}{2} \cdot (1 + \log_9 a_{ij}) + \frac{1}{2} \cdot (1 + \log_9 a_{jk}) + \frac{1}{2} \cdot (1 + \log_9 a_{ki}) = \frac{3}{2} \quad \forall i, j, k. \quad (4)$$

The fuzzy preference relation $P = g(A)$, where $p_{ij} = \frac{1}{2} \cdot (1 + \log_9 a_{ij})$, verifies:

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i, j, k \quad (5)$$

It can be concluded that $P = g(A)$ verifies additive transitivity. In this way, the definition of consistent fuzzy preference relations is presented below. □

**Definition 1.** The reciprocal additive fuzzy preference relation is consistent if:

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i, j, k = 1, \ldots, n \quad (6)$$

The term “additive consistency” is used to refer to the consistency of the fuzzy preference relations based on the additive transitive property, as follows:

**Proposition 3.** For the reciprocal fuzzy preference relation $P = (p_{ij})$, the statements are equivalent, as follows:

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i, j, k \quad (7)$$

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i < j < k \quad (8)$$
Proposition 4. The fuzzy preference relation $P = (p_{ij})$ is consistent if:

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i \leq j \leq k$$  \hspace{1cm} (9)

Proposition 5. For the reciprocal additive fuzzy preference relation $P = (p_{ij})$, the statements are equivalent, as follows:

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \quad \forall i, j, k$$  \hspace{1cm} (10)

$$p_{i(i+1)} + p_{(i+1)(i+2)} + \ldots + p_{(j-1)j} + p_{ji} = \frac{j - i + 1}{2}, \quad \forall i < j.$$  \hspace{1cm} (11)

Proposition 5 is very important because it can be used to construct consistent fuzzy preference relations from a set of values. This can help experts express consistent preferences throughout the decision-making process. It should be noted that if any value in the decision matrix is not in the interval $[0, 1]$ but rather in the interval $[-a, 1+a]$, a linear solution is necessary to preserve the reciprocity and additive transitivity. Therefore, using a transformation function to retain reciprocity and additive consistency gives the following function:

$$f : [-a, 1+a] \rightarrow [0, 1], \quad f(x) = \frac{x + a}{1 + 2a}$$  \hspace{1cm} (12)

3.3. Analytical Process for Weighting the HSBM

In line with Wang and Chang [24] and Hsieh, Nguyen, Wang and Lee [25], the following is the process for the reciprocal additive consistent fuzzy preference relations that was used to prioritize the evaluation dimensions (i.e., phase one) and indicators (i.e., phase two). This research included interviews with 15 hotel professionals (hereafter referred to as the experts) (see Table 1), who were asked to process pairwise comparisons for the main HSBM dimensions and indicators in 2021. All invited experts were either very experienced or held senior positions in hotels in Taiwan (five five-star, three four-star and two non-starred hotels) [70,71]. The experts were denoted as $E_e$, where $e = 1, 2, \ldots, 15$. The evaluation dimensions were denoted as $C_r$, where $r = 1, 2, \ldots, 8$, and the alternatives were finance ($C_1$), marketing ($C_2$), resources ($C_3$), biodiversity ($C_4$), environmental education ($C_5$), human capital ($C_6$), cultural capital ($C_7$), and power and participation ($C_8$).

Table 1. Experts’ backgrounds.

| Expert No. | Position         | Tenure |
|------------|------------------|--------|
| $E_1$      | Chief Secretary  | 13 years|
| $E_2$      | Manager          | 26 years|
| $E_3$      | Manager          | 11 years|
| $E_4$      | Assistant Manager| 15 years|
| $E_5$      | Vice President   | 32 years|
| $E_6$      | Assistant Manager| 20 years|
| $E_7$      | Assistant Manager| 25 years|
| $E_8$      | Manager          | 10 years|
| $E_9$      | Manager          | 20 years|
| $E_{10}$   | Manager          | 15 years|
| $E_{11}$   | Vice President   | 24 years|
| $E_{12}$   | Manager          | 11 years|
| $E_{13}$   | Manager          | 23 years|
| $E_{14}$   | Manager          | 10 years|
| $E_{15}$   | Vice President   | 24 years|
| $E_{15}$   | President        | 6 years |
Step 1. A nine-point scale (see Table 2) was used to express the importance of the pairwise comparisons of the criteria. The importance levels of the HSBM dimensions/indicators were all different. Therefore, this study provided the experts with simple linguistic terms quantified on a scale of \([1, 9]\) to express the degree of importance. The linguistic terms were “equally important (EQ)”, “moderately more important (MO)”, “strongly more important (ST)”, “very strongly more important (VS)”, “absolutely more important (AB)”, and intermediate values.

Table 2. Linguistic scale for priority weights of evaluation criteria.

| Definition                   | Intensity of Importance |
|------------------------------|-------------------------|
| Equally important (EQ)       | 1                       |
| Moderately more important (MO)| 3                       |
| Strongly more important (ST)  | 5                       |
| Very strongly more important (VS)| 7                       |
| Absolutely more important (AB)| 9                       |
| Intermediate values          | 2, 4, 6, 8              |

In addition, the linguistic variables “very high (VH)”, “high (H)”, “fair (F)”, and intermediate values were simultaneously used to assess the predictions of success or failure within each dimension (see Table 3).

Table 3. Linguistic scale for priority evaluation of possible outcomes.

| Definition | Intensity of Importance |
|------------|-------------------------|
| Fair (F)   | 1                       |
| High (H)   | 3                       |
| Very high (VH) | 5                 |
| Intermediate values | 2, 4     |

Step 2. A pairwise comparison matrix of \(n\) dimensions was constructed and shown as follows. \(C_i (i = 1, 2, \ldots, n)\) are the dimensions of the hierarchy. The experts \((E_k, k = 1, 2, \ldots, m)\) provided a set of preference values \(a_{12}, a_{23}, \ldots, a_{(n-1)n}\) for each pair of dimensions, based on intensity of importance:

\[
A^k = \begin{bmatrix}
C_2 & C_2 & \cdots & C_n \\
1 & a_{12}^k & \times & \times \\
C_2 & \times & 1 & a_{23}^k \times \\
\vdots & \vdots & \vdots & \vdots \\
C_n & \times & \times & \cdots & 1
\end{bmatrix}
\]

where \(a_{ij}^k\) represents the preference intensity of the evaluation criteria \(i\) and \(j\) evaluated by expert \(k\), \(a_{ij}^k = 1\) denotes that there was no difference between the evaluation criteria \(i\) and \(j\), \(a_{ij}^k = 3, 5, 7, 9\) indicates that the criterion \(i\) was relatively more important than \(j\), \(a_{ij}^k = 1, 2, 3, 4, 5\) indicates that the evaluation criterion \(i\) was not as important as criterion \(j\), and \(\times\) represents the remaining \(a_{ij}^k\), which was completed by inverse comparison.
Step 3. The preference values \( a_{ij}^k \) to \( P_{ij}^k \) were converted to fall within the interval scale \([0, 1]\). Then, the remaining \( P_{ij}^k \) could be derived based on the reciprocal transitivity property. The matrix is shown below:

\[
P^k = \frac{1}{2} (1 + \log_9 A^k) = \begin{bmatrix}
C_1 & C_2 & \cdots & C_n \\
0.5 & P_{12}^k & \times & \times \\
\times & 0.5 & P_{23}^k & \times \\
\vdots & \vdots & \vdots & \vdots \\
\times & \times & \cdots & 0.5 
\end{bmatrix}
\]

where \( P_{ij}^k = 0.5 \) indicates that there was no difference between evaluation criteria \( i \) and \( j \), \( P_{ij}^k = 1 \) means that evaluation criterion \( i \) was absolutely more important to criterion \( j \), and \( P_{ij}^k = 0 \) shows that criterion \( i \) was absolutely less important than criterion \( j \). The remaining \( P_{ij}^k \) could then be calculated based on Equations (5)–(11). If the values for \( P_{ij}^k \) were not in the interval \([0, 1]\) but were in the interval \([-a, 1 + a]\), \( a > 0 \). In such cases, the values needed to be transformed using the transformation function (function \( f : [-a, 1 + a] \rightarrow [0, 1] \)) in order to preserve reciprocity and additive consistency.

\[
f(P_{ij}^k) = \frac{p_{ij}^k + a}{1 + 2a}
\]

Step 4. The opinions of the experts were integrated to obtain the total weight for the criteria. Let \( P_{ij}^k \) represent the converted fuzzy preference values of the experts \( k \) for evaluating the criteria \( i \) and \( j \). This study applied the average value to represent the judgement values of \( m \) experts, namely:

\[
p_{ij}^k = (p_{ij}^1 + p_{ij}^2 + \ldots + p_{ij}^m) / m
\]

Step 5. The fuzzy preference relations matrices were then normalized. Let \( r_{ij} \) represent the normalized fuzzy preference value of each considered criterion, as follows.

\[
r_{ij} = \frac{p_{ij}}{\sum_{n=1}^{n} p_{ij}}
\]

Step 6. Let \( \omega_i \) indicate the priority weight of evaluation criterion \( i \), where \( n \) indicates the number of evaluation criteria. The priority of each criterion was obtained:

\[
\omega_i = \frac{\sum_{j=1}^{n} r_{ij}}{\sum_{j=1}^{n} \sum_{i=1}^{n} r_{ij}}
\]

Step 7. The same steps were followed to address the weights of the indicators corresponding to each dimension. In order to understand the final ranking of the indicators, the global weight of each indicator was obtained by multiplying the weights of its corresponding dimensions [72]. The overall results of the dimensions’ weights and indicators’ global weights are shown in Figure 2.
3.4. Determination of the Priority Ratings for Possible Outcomes Regarding Each Dimension

Step 1. The experts were asked to express their subjective judgments regarding preference ratings for possible outcomes $A_u (u = 1, 2, \ldots, t)$ associated with each dimension, according to the linguistic terms shown in Table 3. They chose the best of two possible outcomes for a set of $t - 1$ preference data $\{b_{12}, b_{23}, \ldots, b_{(t-1)t}\}$ for each dimension. For instance, the matrix could be constructed as follows:

$$B = \begin{bmatrix}
A_1 & A_2 & A_3 & \cdots & A_t \\
1 & b_{12}^k & \times & \times & \times \\
\times & 1 & b_{23}^k & \times & \times \\
\times & \times & 1 & b_{34}^k & \times \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
\times & \times & \times & \times & 1 
\end{bmatrix}$$

where $b_{uv}^k$ indicates the performance value assessed by expert $k$ for the possible outcomes $A_u$ and $A_v$, according to dimension $i$. 

Figure 2. Weights of dimensions and global weights of indicators.
Step 2. The preference value $b_{uv}^k$ was converted to fall within the range $[\frac{1}{5}, 5]$ to $i_q^k_{uv}$ in the interval $[0, 1]$. Then, the remaining $i_q^k_{uv}$ could be obtained, based on the reciprocal transitivity property:

$$i_B^{\frac{1}{2}(1+\log_5 b_{uv})} \rightarrow iQ = A_1 \begin{bmatrix} A_1 & A_2 & A_3 & \cdots & A_t \\ 0.5 & i_q^{k_{12}} & \times & \times & \times \\ 1 - i_q^{k_{12}} & 0.5 & i_q^{k_{23}} & \times & \times \\ \times & 1 - i_q^{k_{23}} & 0.5 & i_q^{k_{34}} & \times \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \times & \times & \times & \times & 0.5 \end{bmatrix}$$

Step 3. The evaluations of the experts were pulled to obtain the transformed synthetic rating of the possible outcomes for each dimension. Let $i_q^k_{uv}$ represent the converted fuzzy preference value by expert $k$ for assessing possible outcomes $A_u$ and $A_v$, according to dimension $i$. The judgment values of $m$ experts were then integrated using the average values.

$$i_q^k_{uv} = \frac{1}{m}(i_q^{1_{uv}} + i_q^{2_{uv}} + \cdots + i_q^{k_{uv}})$$ (17)

where $m$ represents the number of experts.

Step 4. The synthetic fuzzy preference rating of each possible outcome was normalized for each dimension. Let $i_\lambda^k_{uv}$ represent the normalized ratings of possible outcomes $A_u$ and $A_v$, according to dimension $i$.

$$i_\lambda^k_{uv} = i_q^k_{uv} \sum_{u=1}^t i_q^i_{uv}, \ u, v = 1, 2, \ldots, t$$ (18)

Step 5. Let $i_\bar{\phi}^k_u$ represent the average rating of possible outcome $A_u$ according to dimension $i$. The expected rating of each possible outcome could then be obtained for each dimension:

$$i_\bar{\phi}^k_u = \frac{1}{t} \sum_{v=1}^t i_\lambda^k_{uv}$$ (19)

where $t$ denotes the number of possible outcomes.

Step 6. The priority weight of each dimension was multiplied by the rating of the possible outcome to obtain the predicted value $Z_u$ for the chance of successful/failed implementation:

$$Z_u = \sum_{i=1}^n i_\bar{\phi}^k_u \bar{w}_i$$ (20)

where $\bar{w}_i$ indicates the aggregated weight of dimension $i$ and $i_\bar{\phi}^k_u$ is the rating of possible outcome $A_u$ according to dimension $i$. The prediction weight 0.5 represents that the probability of success or failure of the HSBM implementation was approximately fifty-fifty.

4. Analysis and Results

4.1. Weights and Ranks of Evaluation Dimensions (Phase One)

In light of the analysis procedures outlined in [24,25], a number of pairwise comparison matrices were constructed based on 15 experts’ opinions. The weight calculations for the eight dimensions with respect to the goal is outlined below. The evaluation of the first expert ($E_1$) is used as an example to illustrate the calculation process for obtaining the priority weights, using reciprocal additive consistent preference relations. The experts indicated values for a number of criteria (see Table 1), such as the score $a_{12}$ representing the preference level for the first criterion ($C_1$) as compared to the second criterion ($C_2$). For example, assume $a_{12}$ is the ratio scale of 1 to 9 for a criterion, where $a_{12} = 1$ indicates equivalence between $C_1$ and $C_2$, $a_{12} = 5$ means that $C_1$ is absolutely preferred to $C_2$. Conversely,
\[ a_{12} = 3 \] indicates that \( C_1 \) is moderately preferred to \( C_2 \). Using the evaluation of \( E_1 \), the linguistic terms were converted into corresponding numbers, as shown in Table 4.

**Table 4. Linguistic terms converted to parallel scores.**

|   | \( E_1 \) | \( C_1 \) | \( C_2 \) | \( C_3 \) | \( C_4 \) | \( C_5 \) | \( C_6 \) | \( C_7 \) | \( C_8 \) |
|---|---|---|---|---|---|---|---|---|---|
| \( C_1 \) | 1.0000 | 5.0000 | x | x | x | x | x | x |
| \( C_2 \) | x | 1.0000 | 5.0000 | x | x | x | x | x |
| \( C_3 \) | x | x | 1.0000 | 0.2000 | x | x | x | x |
| \( C_4 \) | x | x | x | 1.0000 | 1.0000 | x | x |
| \( C_5 \) | x | x | x | x | 1.0000 | 5.0000 | x | x |
| \( C_6 \) | x | x | x | x | x | 1.0000 | 0.2000 | x |
| \( C_7 \) | x | x | x | x | x | 1.0000 | 0.3333 |
| \( C_8 \) | x | x | x | x | x | x | x | 1.0000 |

Note: x represents unknown values that could be calculated using Equations (1) through (11).

Using Equation (3) to convert the elements (see Table 5) into intervals, the following values were obtained:

\[
p_{11} = \frac{(1 + \log_9 1.0000)}{2} = 0.5000, \quad p_{12} = \frac{(1 + \log_9 5.0000)}{2} = 0.8662
\]

\[
p_{23} = \frac{(1 + \log_9 5.0000)}{2} = 0.8662, \quad p_{34} = \frac{(1 + \log_9 0.2000)}{2} = 0.1338
\]

\[
p_{45} = \frac{(1 + \log_9 1.0000)}{2} = 0.5000, \quad p_{56} = \frac{(1 + \log_9 5.0000)}{2} = 0.8662
\]

\[
p_{67} = \frac{(1 + \log_9 0.2000)}{2} = 0.1338, \quad p_{78} = \frac{(1 + \log_9 0.3333)}{2} = 0.2500
\]

**Table 5. Consistent fuzzy preference relations matrix for the dimensions assessed by \( E_1 \).**

|   | \( E_1 \) | \( C_1 \) | \( C_2 \) | \( C_3 \) | \( C_4 \) | \( C_5 \) | \( C_6 \) | \( C_7 \) | \( C_8 \) |
|---|---|---|---|---|---|---|---|---|---|
| \( C_1 \) | 0.5000 | 0.8662 | 1.2325 | 0.8662 | 0.8662 | 1.2325 | 0.8662 | 0.6162 |
| \( C_2 \) | 0.1338 | 0.5000 | 0.8662 | 0.5000 | 0.5000 | 0.8662 | 0.5000 | 0.2500 |
| \( C_3 \) | -0.2325 | 0.1338 | 0.5000 | 0.1338 | 0.1338 | 0.5000 | 0.1338 | -0.1162 |
| \( C_4 \) | 0.1338 | 0.5000 | 0.8662 | 0.5000 | 0.5000 | 0.8662 | 0.5000 | 0.2500 |
| \( C_5 \) | 0.1338 | 0.5000 | 0.8662 | 0.5000 | 0.5000 | 0.8662 | 0.5000 | 0.2500 |
| \( C_6 \) | -0.2325 | 0.1338 | 0.5000 | 0.1338 | 0.1338 | 0.5000 | 0.1338 | -0.1162 |
| \( C_7 \) | 0.1338 | 0.5000 | 0.8662 | 0.5000 | 0.5000 | 0.8662 | 0.5000 | 0.2500 |
| \( C_8 \) | 0.3838 | 0.7500 | 1.1162 | 0.7500 | 0.7500 | 1.1162 | 0.7500 | 0.5000 |

Then, Equations (1)–(11) were used to calculate the remaining values with \( p_{21}, p_{31}, p_{52}, \) and \( p_{71} \) serving as examples:

\[
p_{21} = 1 - p_{12} = 0.1338,
\]

\[
p_{31} = \frac{3 - 1 + 1}{2} - p_{12} - p_{23} = 1.5 - 0.8662 - 0.8662 = -0.2325,
\]

\[
p_{52} = \frac{5 - 2 + 1}{2} - p_{23} - p_{34} - p_{45} = 2 - 0.8662 - 0.1338 - 0.5000 = 0.5000,
\]

\[
p_{71} = \frac{7-1+1}{2} - p_{12} - p_{23} - p_{34} - p_{45} - p_{56} - p_{67} = 3.5 - 0.8662 - 0.8662 - 0.1338 - 0.5000 - 0.8662 - 0.1338 = 0.1338
\]

The consistent fuzzy preference relations matrix for the eight evaluation dimensions provided by \( E_1 \) is shown in Table 5.

The elements listed in Table 6 were not found within the interval \([0, 1]\); therefore, the linear transformation described in Equation (13) was applied to ensure the reciprocity and additivity of the preference relations matrix shown in Table 7.
Table 6. Linear solution of the dimensions’ transformation matrix.

| $E_1$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | $C_7$ | $C_8$ |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| $C_1$ | 0.5000 | 0.7500 | 1.0000 | 0.7500 | 0.7500 | 1.0000 | 0.7500 | 0.5793 |
| $C_2$ | 0.2500 | 0.5000 | 0.7500 | 0.5000 | 0.5000 | 0.7500 | 0.5000 | 0.3293 |
| $C_3$ | 0.0000 | 0.2500 | 0.5000 | 0.2500 | 0.2500 | 0.5000 | 0.2500 | 0.0793 |
| $C_4$ | 0.2500 | 0.5000 | 0.7500 | 0.5000 | 0.5000 | 0.7500 | 0.5000 | 0.3293 |
| $C_5$ | 0.2500 | 0.5000 | 0.7500 | 0.5000 | 0.5000 | 0.7500 | 0.5000 | 0.3293 |
| $C_6$ | 0.0000 | 0.2500 | 0.5000 | 0.2500 | 0.2500 | 0.5000 | 0.2500 | 0.0793 |
| $C_7$ | 0.2500 | 0.5000 | 0.7500 | 0.5000 | 0.5000 | 0.7500 | 0.5000 | 0.3293 |
| $C_8$ | 0.4207 | 0.6707 | 0.9207 | 0.6707 | 0.6707 | 0.9207 | 0.6707 | 0.5000 |

Table 7. Aggregated pairwise comparison matrices of the dimensions for the 15 experts.

| $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | $C_7$ | $C_8$ |
|-------|--------|--------|--------|--------|--------|--------|--------|
| $C_1$ | 0.5000 | 0.6515 | 0.6835 | 0.7706 | 0.6951 | 0.6110 | 0.6809 | 0.6606 |
| $C_2$ | 0.3485 | 0.5000 | 0.5319 | 0.6191 | 0.5435 | 0.4595 | 0.5294 | 0.5090 |
| $C_3$ | 0.3165 | 0.4681 | 0.5000 | 0.5872 | 0.5116 | 0.4276 | 0.4975 | 0.4771 |
| $C_4$ | 0.2294 | 0.3809 | 0.4128 | 0.5000 | 0.4244 | 0.3404 | 0.4103 | 0.3899 |
| $C_5$ | 0.3049 | 0.4565 | 0.4884 | 0.5756 | 0.5000 | 0.4160 | 0.4859 | 0.4655 |
| $C_6$ | 0.3890 | 0.5405 | 0.5724 | 0.6596 | 0.5840 | 0.5000 | 0.5699 | 0.5495 |
| $C_7$ | 0.3191 | 0.4706 | 0.5025 | 0.5897 | 0.5141 | 0.4301 | 0.5000 | 0.4796 |
| $C_8$ | 0.3394 | 0.4910 | 0.5229 | 0.6101 | 0.5345 | 0.4505 | 0.5204 | 0.5000 |
| Total | 2.7468 | 3.9590 | 4.2145 | 4.9117 | 4.3073 | 3.6351 | 4.1942 | 4.0313 |

Similarly, the above calculation process was used to compute the fuzzy preference relations matrices for the other 14 experts; the aggregated pair comparison matrix for the 15 experts was then obtained, as shown in Table 7.

Equation (15) was applied to normalize the total pairwise comparison matrix. Using $r_{12}$ as an example:

$$r_{12} = \frac{0.6515}{(0.6515 + 0.5000 + 0.4681 + 0.3809 + 0.4565 + 0.5405 + 0.4706 + 0.4910)} = 0.1646$$

The priority weights and ranks for each evaluation dimension were obtained using Equation (16), as shown as Table 8. According to the results, finance (0.1652) was the most important dimension, followed by human capital (0.1367) and marketing (0.1263). The order of the other dimensions was: power and participation (0.1240), cultural capital (0.1188), resources (0.1188), environmental education (0.1152), and biodiversity (0.0958).

Table 8. Normalized matrix of weights and ranks of dimensions.

| $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | $C_7$ | $C_8$ | Weight | Rank |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| $C_1$ | 0.1820 | 0.1646 | 0.1622 | 0.1569 | 0.1614 | 0.1681 | 0.1623 | 0.1639 | 0.1652 | 1     |
| $C_2$ | 0.1269 | 0.1263 | 0.1262 | 0.1260 | 0.1262 | 0.1264 | 0.1262 | 0.1263 | 0.1263 | 3     |
| $C_3$ | 0.1152 | 0.1182 | 0.1186 | 0.1195 | 0.1188 | 0.1176 | 0.1186 | 0.1183 | 0.1181 | 6     |
| $C_4$ | 0.0835 | 0.0962 | 0.0980 | 0.1018 | 0.0985 | 0.0936 | 0.0978 | 0.0967 | 0.0958 | 8     |
| $C_5$ | 0.1110 | 0.1153 | 0.1159 | 0.1172 | 0.1161 | 0.1144 | 0.1158 | 0.1155 | 0.1152 | 7     |
| $C_6$ | 0.1416 | 0.1365 | 0.1358 | 0.1343 | 0.1356 | 0.1375 | 0.1359 | 0.1363 | 0.1367 | 2     |
| $C_7$ | 0.1162 | 0.1189 | 0.1192 | 0.1201 | 0.1194 | 0.1183 | 0.1192 | 0.1190 | 0.1188 | 5     |
| $C_8$ | 0.1236 | 0.1240 | 0.1241 | 0.1242 | 0.1241 | 0.1239 | 0.1241 | 0.1240 | 0.1240 | 4     |

4.2. Weights and Ranks of Indicators (Phase Two)

The same procedure was applied to calculate the indicators’ weights. In the second phase, the rankings of the indicators used global weights, which were the weight of each indicator multiplied by the weight of its corresponding dimension. In order to clearly judge the rankings, the decimal of each global weight was extended to five places. The final rankings of the indicators (see Table 9) revealed that the number of local cultural events at the hotel enterprise
had the highest score (0.06831). The next top four rankings were: environmental activities for employees (0.06606), choosing plants adapted to the specific environment (0.05719), proportion of local dishes served (0.05046), and employees’ salaries (0.04935). The overall results for the weights of the dimensions and indicators can be found in Figure 2.

Table 9. Ranks of indicators.

| Dimension              | Indicator                                         | Global Weight | Rank |
|------------------------|---------------------------------------------------|---------------|------|
| Cultural capital       | Number of local cultural events held in the hotel enterprise | 0.06831       | 1    |
| Environmental education| Environmental activities for employees             | 0.06606       | 2    |
| Biodiversity           | Choosing plants adapted to the specific environment | 0.05675       | 3    |
| Cultural capital       | Proportion of local dishes served                  | 0.05046       | 4    |
| Human capital          | Employees’ salaries                                | 0.04964       | 5    |
| Environmental education| Environmental protection activities for customers    | 0.04910       | 6    |
| Human capital          | Employee satisfaction                              | 0.04478       | 7    |
| Human capital          | Employee training                                  | 0.04228       | 8    |
| Biodiversity           | Planting at least one tree per year                | 0.03903       | 9    |
| Marketing              | Customers recommending the hotel to friends and acquaintances | 0.02824       | 10   |

4.3. Calculation of Weights for Possible Outcomes Regarding the Dimensions

If an influential dimension has a strong presence in an HSBM, then the implementation is more likely to be successful [24,25]. The experts’ linguistic preference intensities for the chance of success or failure related to each influential dimension were translated into corresponding numbers, as defined in Table 3. Then, the formula $t_{uv}^{q} = \frac{1}{2} \cdot (1 + \log_{5} b_{uv})$ was used to transform the values to fall within the scale of $[\frac{1}{5}, 5]$ in the interval $[0, 1]$. The preference data are shown in Table 10.

Table 10. Transformed preference weights of possible successful outcomes.

| $E_1$ | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ | $E_9$ | $E_{10}$ | $E_{11}$ | $E_{12}$ | $E_{13}$ | $E_{14}$ | $E_{15}$ | $q_{ST}$ |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|----------|----------|----------|----------|----------|--------|
| F     | F     | F     | F     | F     | F     | F     | F     | F     | F        | F        | F        | F        | F        | F        |        |
| $C_1$ | S     | 0.9307| 1.0000| 1.0000| 0.5000| 0.5000| 0.7153| 0.7153| 0.5000| 0.9307   | 0.5000   | 0.7153   | 1.0000   | 0.5000   | 0.7153   | 10.5074 | 0.7005 |
| $C_2$ | S     | 0.9307| 0.9307| 1.0000| 0.5000| 0.5000| 1.0000| 0.8413| 0.9307| 0.9307   | 0.7153   | 0.7153   | 0.1587   | 0.8413   | 0.5000   | 0.7153   | 11.2100 | 0.7473 |
| $C_3$ | S     | 0.5000| 0.9307| 1.0000| 0.5000| 0.5000| 0.5000| 0.7153| 0.7153| 0.5000   | 0.7153   | 0.5000   | 0.7153   | 0.5000   | 0.7153   | 0.7153   | 0.7227  | 0.6482 |
| $C_4$ | S     | 0.8413| 0.8413| 0.5000| 0.7153| 0.5000| 0.5000| 0.2847| 0.5000| 0.5000   | 0.2847   | 0.1587   | 0.5000   | 0.7153   | 0.7153   | 0.7153   | 11.587  | 0.7544 |
| $C_5$ | S     | 0.8413| 0.8413| 0.5000| 0.7153| 0.5000| 0.7153| 0.8413| 0.5000| 0.8413   | 0.2847   | 0.2847   | 0.5000   | 0.7153   | 0.2847   | 0.2847   | 9.0806  | 0.6054 |
| $C_6$ | S     | 0.5000| 0.9307| 0.8413| 0.5000| 0.5000| 0.5000| 0.5000| 0.9307| 0.5000   | 0.0693   | 0.7153   | 0.8413   | 1.0000   | 0.5000   | 0.7153   | 9.5440  | 0.6363 |
| $C_7$ | S     | 0.8413| 0.9307| 0.1587| 0.2847| 0.5000| 0.7153| 0.8413| 0.5000| 0.5000   | 0.2847   | 0.7153   | 0.7153   | 0.5000   | 0.7153   | 0.8413   | 8.9180  | 0.5945 |
| $C_8$ | S     | 0.8413| 0.9307| 0.9307| 0.2847| 0.5000| 0.5000| 0.9307| 0.5000| 0.5000   | 0.1587   | 0.2847   | 0.8413   | 0.5000   | 0.8413   | 0.2847   | 8.8286  | 0.5886 |

Note: S and F indicate abbreviations for success and failure, respectively.

Table 11 lists the inverse comparisons of failure and success using the reciprocal additive transitivity property. The synthetic ratings of the possible outcomes were obtained based on Equation (17), as listed in Table 12. Equations (18) and (19) were used to normalize and synthesize the fuzzy preference ratings of two possible outcomes with respect to the
eight influential dimensions. The normalized values and priority weights are listed in Table 12. Calculations using $\lambda_{SS}$, $\lambda_{SF}$, $\lambda_{FS}$, and $\lambda_{FF}$ as examples are shown below.

$$
\lambda_{SS} = \frac{q_{SS}}{q_{SS} + q_{FS}} = \frac{0.5}{0.5 + 0.2995} = 0.6254
$$

$$
\lambda_{SF} = \frac{q_{SF}}{q_{SF} + q_{FF}} = \frac{0.7005}{0.7005 + 0.5} = 0.5835
$$

$$
\lambda_{SS} = \frac{q_{FS}}{q_{FS} + q_{SS}} = \frac{0.2995}{0.2995 + 0.5} = 0.3746
$$

$$
\lambda_{FF} = \frac{q_{FF}}{q_{FF} + q_{SF}} = \frac{0.5}{0.5 + 0.7005} = 0.4165
$$

Table 11. Inverse comparison matrix for possible failed outcomes.

|       | $E_1$ | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ | $E_9$ | $E_{10}$ | $E_{11}$ | $E_{12}$ | $E_{13}$ | $E_{14}$ | $E_{15}$ | $q_{SS}$ |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|---------|
| $C_1$ | S     | S     | S     | S     | S     | S     | S     | S     | S     | S       | S       | S       | S       | S       | S       | 4.4926  |
| $C_2$ | F     | 0.0693| 0.0000| 0.0000| 0.5000| 0.5000| 0.2847| 0.2847| 0.5000| 0.5000  | 0.0693 | 0.5000  | 0.2847 | 0.5000  | 0.5000  | 0.2847  |
| $C_3$ | F     | 0.0693| 0.0693| 0.0000| 0.5000| 0.5000| 0.0693| 0.2847| 0.2847| 0.5000  | 0.5000  | 0.0693  | 0.2847 | 0.5000  | 0.5000  | 0.2847  |
| $C_4$ | F     | 0.1587| 0.1587| 0.5000| 0.2847| 0.5000| 0.5000| 0.7153| 0.7153| 0.5000  | 0.5000  | 0.7153  | 0.5000 | 0.5000  | 0.5000  | 0.5000  |
| $C_5$ | F     | 0.1587| 0.1587| 0.5000| 0.2847| 0.5000| 0.5000| 0.7153| 0.7153| 0.5000  | 0.5000  | 0.7153  | 0.5000 | 0.5000  | 0.5000  | 0.5000  |
| $C_6$ | F     | 0.5000| 0.0693| 0.1587| 0.5000| 0.5000| 0.5000| 0.5000| 0.5000| 0.0693  | 0.5000  | 0.9307  | 0.1587 | 0.0000  | 0.5000  | 0.2847  |
| $C_7$ | F     | 0.1587| 0.0693| 0.8413| 0.7153| 0.5000| 0.2847| 0.5000| 0.5000| 0.7153  | 0.5000  | 0.5000  | 0.5000 | 0.2847  | 0.5000  | 0.2847  |
| $C_8$ | F     | 0.1587| 0.0693| 0.0693| 0.7153| 0.5000| 0.5000| 0.5000| 0.5000| 0.0693  | 0.5000  | 0.8413  | 0.7153 | 0.1587  | 0.5000  | 0.1587  |

Table 12. Normalized priority weights for possible outcomes based on the eight dimensions.

|       | Success | Failure | Total | Priority Weight |
|-------|---------|---------|-------|-----------------|
| $C_1$ | 0.6254  | 0.5835  | 1.2089| 0.6044          |
| $C_2$ | 0.3746  | 0.4165  | 0.7911| 0.3956          |
| $C_3$ | 0.6643  | 0.5991  | 1.2635| 0.6317          |
| $C_4$ | 0.3357  | 0.4009  | 0.7365| 0.3683          |
| $C_5$ | 0.5870  | 0.5645  | 1.1515| 0.5758          |
| $C_6$ | 0.4130  | 0.4355  | 0.8485| 0.4242          |
| $C_7$ | 0.5073  | 0.5071  | 1.0144| 0.5072          |
| $C_8$ | 0.4927  | 0.4929  | 0.9856| 0.4928          |

Based on Equation (20), the priority weights of the eight influential dimensions were multiplied by the priority levels of the two possible outcomes to determine the prediction weights for the success and failure possibilities of HSBM implementation, as shown in Table 13. The results indicate that the values for success for the eight influential dimensions were as follows: $C_2$ marketing (0.6317), $C_1$ finance (0.6044), $C_3$ resources (0.5758), $C_6$ human capital (0.5758), $C_5$ environmental education (0.5533), $C_7$ cultural capital (0.5477), $C_8$ power and participation (0.5446), and $C_4$ biodiversity (0.5072). The predictive value of the probability of successful HSBM implementation was 0.5703 and for failure was 0.4297. Calculation examples of the prediction weights for success and failure are as follows:
$Z_{success} = (0.6044 \times 0.1652) + (0.6317 \times 0.1263) + (0.5758 \times 0.001181) + (0.5072 \times 0.0958) + (0.5533 \times 0.1152) + (0.5694 \times 0.1367) + (0.5477 \times 0.1188) + (0.5464 \times 0.1240) = 0.5703$

$Z_{failure} = (0.3956 \times 0.1652) + (0.3683 \times 0.1263) + (0.4242 \times 0.001181) + (0.4928 \times 0.0958) + (0.4467 \times 0.1152) + (0.4306 \times 0.1367) + (0.4523 \times 0.1188) + (0.4554 \times 0.1240) = 0.4297$

Table 13. Predicted probabilities of success and failure.

| Dimension weight | C1     | C2     | C3     | C4     | C5     | C6     | C7     | C8     | Probability |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| Success          | 0.1652 | 0.1263 | 0.1181 | 0.0958 | 0.1152 | 0.1367 | 0.1188 | 0.1240 | 0.5703      |
| Failure          | 0.2956 | 0.3683 | 0.4242 | 0.4928 | 0.4467 | 0.4306 | 0.4523 | 0.4554 | 0.4297      |

5. Conclusions and Managerial Implications

According to observations, tourism research on sustainable business models has tended to address economic rather than social and environmental sustainability, ignoring the concept of environmental value propositions [39]. Supported by fuzzy preference relations, the significant contribution of this study is the identification and ranking of HSBM elements for hotels, incorporating finance, human capital, marketing, cultural capital, environmental education, and biodiversity as the most important considerations of SD for hotel businesses. Together, these cover the relevant economic, social, and environmental aspects. The predictive values indicated that the possibility of successful HSBM implementation was 0.5703, shedding light on the vision of sustainability in the hotel industry.

According to the results, finance (0.1652), human capital (0.1367) and marketing (0.1263) were the most important dimensions. This aligns with the findings of Alola, Avci and Ozturen [4], who determined that human capital played a major role in the sustainability of organizations in the hotel industry. Profit orientation is of course very important and should be one of the main goals of a company. Without financial gains, a company’s operations cannot be sustainable [19]. However, sustaining human capital enhances productivity [4]. The hotel industry is labor-intensive and highly dependent on human resources. Human resource management is indispensable [73]. Sardo, Serrasqueiro and Alves [57] empirically confirmed that human capital has a positive impact on the financial performance of a hotel. It is a key factor in a hotel’s success and the foundation of the industry’s service quality, notions that support the result of marketing dimensions being ranked third in the present research. Furthermore, Wikhamn [74] found that sustainable human resource practices enhanced a hotel’s ability to be innovative and satisfy customers. This implies the need to create innovative policies that pursue employee satisfaction, so that, through these policies, customers will receive high-quality services related to the treatment they expect [22].

In the second phase, the rankings of the global weights of the indicators revealed that the number of local cultural events in a hotel was first (0.06831). This finding is consistent with the results of Cvelbar and Dwyer [19], who found that cultural heritage issues should be better addressed in the long-term strategic planning of hotel businesses. The most important benefits of cultural events are the ability to attract customers’ attention and act as incentives, thereby offsetting the problem of seasonality faced by the hotel industry. When guests participate in these activities and doing so meets their expectations, this helps to improve the overall positive satisfaction they have with the hotel [60].

Environmental protection activities for employees was ranked as the second indicator (0.06606), which aligns with the findings of Naiman and Mlozi [75] that training employees in the implementation of hotel environmental management practices is critical to achieving business sustainability. Ahmed, et al. [76] believed that hotels should deploy green human
resource practices to improve employees’ perception of environmental protection initiatives, thus enhancing their motivation and the organization’s environmental goals. Doing so will increase participation in ecofriendly behavior and successfully improve employees’ environmental performance.

In the second phase, choosing plants adapted to the specific environment ranked third (0.05675), which is consistent with the findings of Trang, et al. [77] who determined that green landscaping and architectural designs in hotels (e.g., physical environments with plants and green decorations) is a factor affecting customers’ willingness to stay in green hotels and a necessary condition for long-term green development. According to a set of in-depth interviews conducted by Han and Chan [78] that examined the views of tourist’ perceptions of hotels’ environmental protection practices, one of the attributes of a green hotel was a physical environment with plants or green decorations. However, in contrast to the finding of Kim, et al. [79], these researchers argued that “using plants locally adapted” was an inappropriate item for pro-environmental programs in hotels because customers could not identify or evaluate it when using hotel services [77].

5.1. Managerial Implications

5.1.1. Sustainable Human Resource Practices

The results of this study offer several implications for management and practice. The current findings suggest that human capital is a priority for hotel managers seeking to implement sustainable business development practices (excluding finance). Alola, Avci and Ozturcn [4] found that a high level of human capital has a positive impact on organizational sustainability, while employees with high levels of efficacy can mobilize, motivate, exhibit energy, accept challenges, and make more of an effort to achieve goals. It is expected that the hotel industry needs to motivate employees if it is to achieve organizational sustainability. It is recommended that in order to encourage employees to contribute to organizational growth, human resource management should involve employees in decision-making, which will increase their overall ability and level of commitment. In addition, loyal employees are useful assets for organizational innovativeness, which translates to sustainability. Atan, et al. [80] argued that employee turnover has always been a key management issue in the hotel industry. From this perspective, a sustainable workforce must put forth practices that improve employee motivation, resulting in significantly more happiness in the workplace. Wikhamn [74] proposed that sustainable human resource practices affect customer satisfaction. The human resource management practices that are implemented shape the interaction between employees and customers, especially in service areas where employees have direct contact with customers. For hotel managers, investing in employees and their wellbeing is essential to innovation and customer satisfaction.

5.1.2. Open Innovation through Customer Satisfaction

When tourism activities return to pre-pandemic levels, the hotel industry will have to regain the trust of customers and strengthen its brand. At the same time, innovation is an essential tool in achieving differentiation [22]. Customers are the key source of innovation in the hotel industry [22] and play a significant role in the innovation process as co-creators [81]. In this sense, marketing being ranked after human capital seems reasonable, because it is economic in nature and one of its key performance indicators is customer satisfaction. Sustainable profitability can be created through intangible resources, such as response to customer needs and preferences, innovation, quality, and image [9]. Ji and Goo [82] affirmed that the service sector is likely to be misunderstood as being isolated from the technological environment. In fact, this area can innovate by adopting external technologies. Díaz and Duque [22] proposed that open innovation enables the hotel industry to create platforms and channels for cooperation with customers, allowing for a better understanding of their tastes and needs. In terms of open innovation, service innovation is a key strategy for corporate development, increasing corporate value and improving customer commitment. Therefore, to formulate a sustainable and effective
growth strategy, service innovation must become the core of the organization’s management process [83].

5.1.3. Cultural Events Held by Hotels

As event venues, hotels can generate revenue by organizing events for tourists and combining them with marketing strategies. Creating enjoyable experiences such as cultural events can increase the probability of customers recommending and returning to the hotel [84]. Freitas and Correia [60] found that cultural events occupied an important position in the hotel industry because they offer a satisfaction factor that may significantly affect customer satisfaction. Boo and Park [85] argued that hotel events are more suitable for targeting local residents, because local residents believe that hotels are important community facilities for holding such events. Therefore, it is likely that if hotels provide more special events, they will attract not only tourists but also locals to their facilities. It is notable that hotel managers may have to consider the benefits of opening events to the public and carefully adjust the balance between private and public events. Exclusivity may help to improve customer satisfaction, because if cultural events can only be attended by guests, their unmet expectations are lower than if the local community can also participate [60].

5.1.4. Green Human Resource Management

Malik, et al. [86] proposed that green human resource management (GHRM) promotes environmental sustainability by combining human resource management activities such as performance management, training, recruitment, and compensation with company goals. Therefore, the authors suggest that GHRM activities are essential to ensuring that employees participate in environmentally sustainable work practices. Especially important is that GHRM improves the green creativity of employees [86,87]. Ahmed, Guo, Qureshi, Raza, Khan and Salam [76,86,87] suggested that hotels should develop GHRM practices to instill green motivation in employees. Once employees begin to realize the importance of green practices, they will eventually become highly active in green strategies. Secondly, hotels should compensate employees according to their approaches to environmental protection. Thirdly, human resource managers and practitioners have a responsibility to provide employees with environmental education and awareness through appropriate training plans, workshops, and seminars designed to facilitate the successful implementation of green human resource practices. Human resource managers should also formulate recruitment and selection policies by prioritizing environmentally conscious applicants who align with the company’s environmental protection values.

5.1.5. Green Practices

Trang, Lee and Han [77] found that green practices are an important environmental factor for hotels. Since adopting green practices can offer a competitive advantage over other accommodation services, they suggested using local native and adaptable plants and other green projects to landscape the hotel in order to develop green elements. Moreover, they recommended building a variety of eco-friendly bungalows to create unique buildings that exist in harmony with nature, and integrating special orchards into the model. Hotel operators should also grow organic gardens to cater to their customers, who will respond well to being served fresh, locally grown organic food and the creation of an eco-friendly atmosphere.

In the last two decades, the Taiwanese government launched the “Green Mark” (2008) and “Green Hotel” (2011) demarcations for the hotel industry, in response to the global demand for environmental protection and SD. However, there were few applicants. As hotel operators in Taiwan are generally reserved concerning the notion of green hotels, they tend to worry about investing in green facilities and the quality of service they will be able to provide, and do not know how best to market their efforts. One recommendation is that the government should provide subsidies and tax incentives for acts of environmental protection, and directly encourage hotel operators to implement green elements [88].
6. Limitations and Suggestions for Future Research

Despite its various practical contributions, this research faced certain limitations. The HSBM referred to in this study is limited. Future research should add other items in response to the dynamic environment (such as in the context of a pandemic) to form a broader picture. In addition, this study used a group of 15 experts, which may have resulted in sample selection bias. It is recommended that future research conduct interviews with a larger sample comprised of an international expert group to foster explanatory power and a better evaluation analysis.

Future researchers are also encouraged to explore dimensions and indicators based on the hotel’s size, category, and location as well as the performance of the various hotel business elements identified in this research [72].

Finally, this research was conducted in Taiwan, where the cultural, socio-economic, and political conditions of the market may have affected the results. Therefore, in order to solve issues of generalizability, it is recommended that the research be replicated in other countries with different market characteristics to explore the specific business models adopted by the hotel industry.

Author Contributions: Conceptualization, T.-C.W., S.-L.H. and J.-Y.L.; Data curation, C.-Y.H. and S.-L.H.; Formal analysis, C.-Y.H. and S.-L.H.; Investigation, C.-Y.H. and S.-L.H.; Methodology, T.-C.W., S.-L.H. and J.-Y.L.; Project administration, T.-C.W. and J.-Y.L.; Resources, S.-L.H.; Software, T.-C.W. and J.-Y.L.; Supervision, T.-C.W. and J.-Y.L.; Validation, T.-C.W., S.-L.H. and J.-Y.L.; Writing—original draft, S.-L.H.; Writing—review & editing, T.-C.W., S.-L.H. and J.-Y.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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