



Article Evaluating the Influence of Criteria Revitalization Strategy Implementation for the Hospitality Industry in the Post-Pandemic Era

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Abstract: This study applies consistent fuzzy preference relations (CFPR) to evaluate the influential criteria of revitalization strategies (RS) for the hospitality industry in the post-pandemic (COVID-19) era in Taiwan. A real case applies CFPR in order to analyze the relationship between governmental implementation and industrial expectations in Taiwan. The results indicate that "market revitalization", such as the Taiwanese government's implementation of various stimulus vouchers and coupons to encourage market consumption and revitalize the overall economy, is considered the most essential/important criteria for RS. This study strengthens the government sector by evaluating the heterogeneity of revitalization strategies best used to formulate the actions to pilot industries as a global contribution to fight the COVID-19 pandemic within a global crisis.

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Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). **Keywords:** revitalization strategy; COVID-19 pandemic; hospitality; fuzzy preference relations; post-pandemic

1. Introduction

The unpredictability of crises is one of the external factors that can tremendously impact the hospitality industry [1,2]. A number of unpredicted crises have affected contemporary society globally, none of which have had such an arduous effect on the hospitality sector as the COVID-19 pandemic [3]. The COVID-19 outbreak has incurred the hospitality sector to experience significant financial pain due to the pandemic, which coalesced with a virtual shutdown of entire global economies [2]. The "hostile challenge" of the COVID-19 pandemic has involved many issues for governments to adopt the best applications in surmounting the diverse challenges that have impacted the hospitality sectors foremost. Some current research studies have pointed out millions of jobs in related hospitality industries immediately became at risk, and overall industries' incomes suffered losses of trillions of dollars worldwide while many restaurants and hotels became shuttered in the early phase of the COVID-19 outbreak. Consequently, efficient and effective government performance during the pandemic enhanced public confidence in economic agencies capable of revitalizing the economy. Considerable discussion in the literature has focused on relevant government measures such as infection prevention [4], distribution of personal protective equipment [5], tax relief [6], unemployment compensation [7] and industrial innovation [8]. Measures related to the digital environment and business intelligence [9,10] have also received considerable attention and development during the epidemic, while at the same time, the related application of sustainable supply-chain management has also been a focus of the literature [11,12].

However, several challenges will persistently remain after the pandemic has run its course, so the implementation of a revitalization strategy (RS) has swiftly converted into

an appropriate and practical alternative. In addition, it is advisable that the government develop accurate and effective RS to facilitate the necessary transformational acceleration and developmental stabilization during the post-pandemic phase [13]. As disease threats change, it is a concern whether government policy tools can meet the needs of industry; however, with multiple policy instruments, how to evaluate the priority of policy instruments is an important issue that needs to be addressed.

Initially, this study reviewed novel academic articles and publications from industrial journals and other relevant materials focused on COVID-19 issues in the hospitality dimension that broadened comprehension of governmental, industrial, and academic perceptions [14,15]. The study illustrated an empirical case study by conducting an interview survey of 16 hospitality experts in Taiwan; moreover, the study summarized eight influential criteria from two essential data: the first key data explores secondary data from an academic perspective while the other investigates primary data collected from 11 July~15 July 2020 by conducting interviews of experts and surveys.

Secondly, this study advocates a prediction model of analytical hierarchy reliant on CFPR to facilitate the hospitality sector to become more aware of COVID-19's unparalleled impact [16]; hence, the priority weights of influential criteria by conducting pairwise comparisons determine the rankings of outcomes amongst which the best decision-making model for governments may be adopted to make accurate revitalization strategies possible [17]. The proposed model should not only assist governments in realizing what criteria could determine successful and appropriate decision-making processes but contribute appropriate strategies and acts to pilot the hospitality industry implementing RS in the post-pandemic future as well.

Finally, we conduct discussions and conclusions directly related to formulating the priority of a decision-making model for governments to overcome the global crises in RS. The results indicate that "market revitalization" is considered the most essential/important criteria for RS under a zero-tolerance policy regarding the COVID-19 outbreak in Taiwan. The contribution of this paper lies in the use of expert interviews and the CFPR to explore the industry's preferential order for policy measures and to provide a reference for the government in the revitalization of hospitality.

This article is organized as follows. Section 2 presents the literature review. The COVID-19 outbreak real situation in Taiwan is introduced in Section 3. Section 4 introduces the research method, while the framework and influential criteria to implement a revitalization strategy for the hospitality industry in Taiwan are provided in Section 5. Empirical illustration and discussion are provided in Section 6, while Section 7 provides brief results. Section 8 concludes the paper, and Section 9 points out the limitations and future research directions.

2. Literature Review Related to the COVID-19 Crisis

2.1. Academic Perspective

Reviews of current journal articles and research on COVID-19 identify typologies and characteristics of crises in order to develop insight into phenomena and derive effective crisis management strategies. Sigala [18] mentions researchers and practitioners should not only implement and design crisis-recovery models and response strategies but also develop elastic capacity and knowledge to address further crises. At present, this capacity and knowledge are still deficient for measuring and predicting hospitality impacts and strategies during the pandemic but can be sourced from small-scale organizational issues to staff challenges and industrial misdeeds to large-scale external factors such as natural disasters. Initiative COVID-19 research has also concentrated on diverse governments' published material to determine stages of prescriptive models and assist government in comprehending strategic and proactive methodologies while also delineating the best actions and policies to be implemented in the future [14].

Further to this, Willis Towers Watson [19] illustrated the three phases of action for government and decision-maker alike, with the principles providing a road map of man-

agement framework in an ongoing response to the COVID-19 pandemic, with the findings from related studies being useful in informing decision-makers as to what strategies could be evaluated or implemented at the several phases of any crisis or disaster, and how to intervene, thereby alleviating, minimizing or simply blocking crises from moving forward.

Some studies investigate the COVID-19 impact on the effect of crisis response strategies, while some explore the role of government in affecting people's perceptions of crises [18]. Fong et al. [13] comment that crisis management should strengthen the relationship between industry and government in order to improve accuracy and relevancy. Enhancing comprehension of governmental action predominantly induces progressive understanding leading to the prevention of any crisis while managing a global pandemic.

2.2. Industry and Government Perspective

Awareness of the threat of hospitality crises and the potential to inflict harm is reflected in several academic publications, including special edition journals and articles devoted to this topic, as referred to in the earlier part of the report. Manuals and handbooks for practitioners and industry associations are also available; additionally, many official authorities and government bodies have been involved in the production of such publications where at the international level, UNWTO (United Nations World Tourism Organization) and PATA (Pacific Asia Travel Association) have both developed crisis management guidelines for hospitality businesses, operators and official agencies around the world to assist in dealing with crises and disasters. In essence, the difference between both guidelines is only in the form, not the content [20].

In terms of government policy, for example, Taiwan's Ministry of Economic Affairs has proposed eight major industrial rescue and revitalization measures, including financial aid, employment assistance, tax breaks, infrastructure facilities, utility discounts, innovation and transformation, market revitalization and COVID-19 prevention measures.

2.3. Comparison of Academic, Industry, and Government Perspectives 2.3.1. Differences

In terms of the COVID-19 outbreak in academic publications devoted to theoretical themes, many works are centered on case studies with an emphasis on extrinsic causes of crises rather than on intrinsic industrial weakness and destination perspectives. Such presented frameworks and models are very theoretical and not readily understood by hospitality industry practitioners and operators, so more appropriate models are difficult to implement as a crisis management plan; moreover, the academic literature is lacking in qualitative and quantitative research data about crisis management planning in the hospitality industry.

In contrast with academia, guidebooks and manuals developed by industry associations and governments are more practical, as most materials present step-by-step outlined procedures to follow in developing and designing effective crisis management strategies based on multidimensional resources for hospitality industries of all sizes. Most of the plans afford insight into the problems and provide crisis plan templates individually, which assist the industry in determining appropriate components best fitting the nature of the business and its needs.

2.3.2. Similarities

The study has found there is a consensus among academics, hospitality sectors, and governments that it is essential for both public and private hospitality industries to have a crisis management plan or contingency plan in place in order to provide more successful responses when a crisis occurs, thereby mitigating the severity of such crisis. Several similar issues are noted and addressed in both academic and industry or government publications, which are summarized below. This presents the aim of testing leadership, communications, and the role of government and industry plus others so concerned, including the ability of individual actors, while appraising the effectiveness of all such actions in a crisis. The actions and strategies should be followed by evaluation; each situation should be carefully assessed in order to improve the crisis management plan.

Crisis management leadership—the first step in developing a crisis management plan should be to implement group or individual leadership that can control challenges and impacts within a COVID-19 outbreak. Leaders should not only have the knowledge to evaluate problems and make accurate strategies but also the capacity to make appropriate decisions by utilizing popular computational methodology in leading the industry to overcome the pandemic. This is the key and most difficult part of crisis planning [21].

Importance of communication—a formal communication channel should be put in place to assist with the dissemination of information and the establishment of a unified response. It is important that perceptions of COVID-19 have an impact on predicting future hospitality demand and drafting appropriate recovery strategies. Government should develop transparent communication opportunities to improve the confidence of its audiences: employees, consumers, business partners, and local community politicians, and local, regional, national, and international authorities [22,23].

Role of government—the involvement of government is important in crisis planning as governments rely on prediction to provide stimulus packages and interventions for real demand from industry. COVID-19 has resulted in the enormous intervention of governments in the functions and operations of the hospitality industry [13,18,24].

3. The COVID-19 Outbreak Real Situation in Taiwan

Throughout the novel coronavirus (COVID-19) outbreak, the Taiwanese government has swiftly implemented disseminated prevention measures and systemic prophylaxis to the public in a timely fashion. Taiwan Centers for Disease Control (TCDC) successfully managed the COVID-19 outbreak from 12 April to 26 July 2020. In Taiwan, no positive domestic cases were reported for more than 100 consecutive days, with no incidences of local transmission occurring. The report of 19 July 2020 stated that the total of positive cases was capped at 458. Since the outbreak initially, 80,499 cases have had tests conducted, of which 79,555 were negative. Out of 458 total confirmed cases, 55 were domestic, 403 were imported, and 7 deaths occurred as a result of infection. According to the TCDC, prevention measures required citizens to utilize face masks, have their temperature checked, and undergo ethanol hand washes before entering public facilities, hospitals, schools, hotels, and restaurants during the pandemic threat [25]. COVID-19 prevention measures also included the implementation of social distancing that contributed significantly to the observed decline in infection rate [26]. Additional various factors have contributed to the lower frequency of pneumococcal disease and complex influenza in Taiwan. In 2020, Taiwanese people experienced a low intensity of disease transmission, lower occupancy of hospital beds and ICUs, and assumed proactive public-led responses for effective preventive measures [27].

As the COVID-19 pandemic in Taiwan began to spread, the government swiftly rolled out a three-pronged plan of prevention measure, relief for industries and stimulus steps for the economy. The initial step was disease prevention, as mentioned above. The second step involved direct industrial relief in those economic areas hardest hit by the pandemic, with this step being taken regardless of the industry. The third step of providing economic stimulus was made with the aim of equal benefit distributions, immediate result achievements, expansion of an affluent industrial foundation, and creation of sustainable public works projects [28]. According to Taiwan's Executive Yuan, a special act was promulgated to create a total relief package of NT\$1.05 trillion dollars tied directly to COVID-19 prevention, relief, and revitalization on 18 March 2020. The Taiwanese government authorized an initial relief package worth NT\$200 billion that included funds for household expenses, individual and business tax break subsidies, and industrial relief; moreover, the government amended the COVID-19 relief act to append a special budget of an additional NT\$150 billion and other budgets of NT\$700 billion in loans [28].

After these effective preventive acts and plans were applied, the domestic epidemic slowed down, people's lives gradually returned to normal, and after the 1 May Labor holiday and Mother's Day effects were added, the restaurant industry's revenue in May was NT\$100.86 billion, already a sharp increase of 15.95% from the previous month of April. When considering the largest monthly increase change rate in comparison with the same month of the previous year, there was still a decrease of 7.87% since the pandemic, as seen in Figure 1. After 7 June 2020, Taiwan reset its economy and market significantly by applying revitalization actions and plans, providing several factors capable of being utilized as accurate or appropriate strategies for industries to follow.



Figure 1. Statistics related to restaurant sales index and annual change rate from May 2019 to May 2020; Source: [29].

4. Research Method

The study applies the CFPR procedure to assess the criteria most effective in implementing a Taiwanese governmental revitalization strategy in the hospitality sector. Herera-Viedma et al. [30] conducted CFPR for designing pairwise comparison-preference decision matrices and utilizing the reciprocal additive transitivity property, where the CFPR methodology not only enables industrial experts to represent the level of preference taken from within a number of alternatives but it can also check the consistency in the process of decision-making [30–33]. In brief, descriptive propositions and definitions are presented, delineating how they are applied throughout this study.

4.1. Fuzzy Preference Relations

Definition 1. According to fuzzy preference relations *P* on a number of options *X* is represented by a positive preference relations matrix $P \subset X \times X$ advancing the function: $\alpha_p: X \times X \rightarrow [0, 1]$. Furthermore, $p_{ij} = \alpha(x_i, x_j)$ interprets the preference intensity of ratio of option x_i over x_j . When $p_{ij} = \sum_{i=1}^{n} p_{ij}$ intimates indifference between x_i and $x_j (x_i \sim x_j)$, $p_{ij} = 1$ denotes that x_i is absolutely The preference matrix *P* is supposed as an additive reciprocal [16]:

$$p_{ij} + p_{ji} = 1 \quad \forall i, j \in \{1, 2, \dots n\}$$
 (1)

Proposition 1. Consider some options, $X = \{x_i, ..., x_n\}$, is related to a reciprocal multiplicative preference relation $A = (a_{ij})$ with $a_{ij} \in [\frac{1}{9}, 9]$. In addition, the parallelism reciprocal additive fuzzy preference relation, $P = (p_{ij})$ with, $p_{ij} \in [0, 1]$, association of formula that A is stated as follows:

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

The study concentrates on the consistent decision model that relies on CFPR that is able to obtain the type of transformation function *g* relatable to the research issues.

4.2. Consistency of the Fuzzy Preference Relations

Proposition 2. Where $A = (a_{ij})$ can provide consistent multiplicative preference relations, the parallelism reciprocal additive fuzzy preference relation, P = g(A), proves the additive transitive property.

Proof. For being $A = (a_{ij})$ consistent which $a_{ij} \cdot a_{jk} = a_{ik} \forall i, j, k$, or equivalently $a_{ij} \cdot a_{jk} \cdot a_{ik} = 1 \forall i, j, k$. On both sides, by assuming logarithms that illustrate,

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

By dividing Equation (2) and adding Equation (3), equivalently

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

The fuzzy preference relation P = g(A), being $p_{ij} = \frac{1}{2}(1 + \log_9 a_{ij})$, affirms

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

Undoubtedly, summarizing P = g(A) proves the additive transitive property. \Box

In this study, the definition of consideration is as follows:

Definition 2. A reciprocal additive CFPR $P = (p_{ij})$ is consistent if

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

4.3. Additive Transitive Consistency of the Fuzzy Preference Relations

In the following, this study utilized additive consistency, referring to the consistency for fuzzy preference relations on the additive transitive property.

Proposition 3. For a reciprocal fuzzy preference relation $P = (p_{ij})$, the equivalent declaration *is stated*:

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

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \,\forall i < j < k.$$
(8)

Proposition 4. A fuzzy preference relation $P = (p_{ij})$ is consistent if and only if

$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2} \ \forall i \le j \le k.$$
 (9)

Proposition 5. For a reciprocal additive fuzzy preference relation $P = (p_{ij})$, given Equation (8) is hold, the equivalent declaration is stated:

$$p_{i(i+1)} + p_{(i+1)(i+2)} + \ldots + p_{(j-1)j} + p_{ji} = \frac{j-i+1}{2} \forall i < j.$$
(10)

5. Framework and Influential Criteria to Implement a Revitalization Strategy (RS) for the Hospitality Industry in Taiwan

5.1. The Framework and Evaluated Criteria in Case Study Model

A total of 16 questionnaires were conducted with nine managers, two owners, two scholars, two employees, and one councilor who have all been involved in the hospitality field for more than ten to forty years and all of whom possess a fundamental understanding of the real impact of the pandemic described. A practical decision-making model was proposed to demonstrate how to guide industries during this crisis to relevant government authorities. Evaluators identified criteria and attributions to be conducted as follows: C_1 financial aid; C_2 employment assistance; C_3 tax breaks; C_4 infrastructure facilities; C_5 utilities discount; C_6 innovation and transformation; C_7 market revitalization; and, C_8 COVID-19 prevention measures. An analytical hierarchy framework based upon eight influential criteria was illustrated, as shown in Figure 2 [16,28,33].

On 25 February 2020, the Taiwanese Executive Yuan announced a three-pronged plan of prevention measures, relief industry, and stimulus economy to meet the COVID-19 pandemic's significant impact on the global political, socio-cultural, and economic systems [18]. Influential criteria not only followed the government's policies and actions but were also derived from professional investigation and consultation along with the sixteen evaluators involved in this study's survey.

Eight key influential criteria were yielded, as provided below [28]:

- C_1 —*Financial aid.* The government provides financial assistance to industries and employees with a total relief package of NT\$1.05 trillion in stimulus loans and operational aid for small and medium-sized enterprises (SMEs). The authority not only allows generous interest subsidies, lenient processing of returned checks and reducing interest to SME, but also provides relief loans to workers [28].
- *C*₂—*Employment assistance*. Employees are furloughed and supplemental employee salaries and subsidies are available while also encouraging employees to undergo training during the pandemic. Moreover, the government not only provides usual unemployment payments for employees but also subsidizes compensation to companies for hiring the unemployed [13].
- C₃—*Tax breaks.* Small businesses are automatically exempted from tax payments from reported sales revenue. Tax deadlines and government-provided subsidies allow taxpayers and employers to postpone payment of taxes or to pay through installments [24].

- C₄—Infrastructure facilities. This includes the public markets and the basic projects subsidized by the government to help industry innovation and transformation. The government has expanded facilities for improvement and allowed project development to be advantaged in order to improve safe and sanitary conditions in public facilities. Business districts, public markets and regulated night markets have assisted with environmental disinfection, and have enhanced the usable space [15].
- C₅—Utilities discount. Companies have experienced a 15% reduction in revenue for two consecutive months, as compared with last year, with the water fee discount being 5% and the monthly limit reduced by NT\$5000. For electricity costs, users not only receive a 10% discount and the monthly limit is reduced by NT\$100,000 but contractual capacity and basic electricity fees charged within the past two years are reduced as well [2].
- C₆—Innovation and transformation. Public industry associations connect counties and municipal governments that integrate relevant government assistance resources to serve as a one-stage-service platform. Attention is given to simplify and improve the efficiency of administrative procedures for industry. Innovative subsidies related to industrial products, services, and technology to increase market occupancy and competitive have been the primary focus. In addition, diversified exhibitions have invited international purchasers to Taiwan to stimulate and increase consumption, and to assist industry revitalization, transformation and upgrading [13,34].
- C₇—Market revitalization. After the pandemic has stabilized, various promotional and stimulus measures are to be taken, such as triple stimulus vouchers subsided by the government for every citizen to stimulate consumption in domestic-demand industries, especially regarding retail department stores, hotels, restaurants, night markets, traditional markets, conventions and exhibitions, shopping malls, etc. [3,34].
- C_8 —*COVID-19 prevention measures.* Taiwan Centers for Disease announced COVID prevention measures to the public in requiring face masks, social distancing, temperature checking and ethanol hand washing before entering public facilities, hotels, restaurants and public transportation venues. COVID-19 prevention measures could contribute significantly to the observed decline in infection rates [26,27].

5.2. The Hierarchy Analytical Process for Evaluating the Influence of Criteria

5.2.1. Linguistic Variables

The study compares pairs of criteria by utilizing representation as follows: "Absolutely important (AB)", "Very strongly important (VS)", "Strongly important (ST)", "Moderately important (MO)", "Equally important (EQ)", and by applying a nine-level scale with numbers denoted by real scores (see Table 1).

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

Table 1. Influential criteria in linguistic terms for priority weights.



Figure 2. The analytical hierarchy framework of this study. Source: The authors' own drawing.

5.2.2. Reciprocal Additive Consistent Fuzzy Preference Relations for Weighting the Influential Criteria

Analytic Hierarchy Process (AHP) is a traditional decision-making method [35], and it is initially applied to resolve problems by the illustration of a hierarchical model. The AHP method requires a questionnaire model $C_2^n = \frac{n(n-1)}{2!}$ for each cluster of *n*-criteria pairwise comparison to be made in a preference matrix that contains many questions and comparisons. Due to analytic efficiency, this study utilizes the reciprocal additive CFPR that establishes computational simplicity by only requiring n - 1 comparisons for a number of *n* criteria. The procedures for establishing the reciprocal additive CFPR for prioritizing the evaluation criteria are given below [36].

The study established pairwise comparison matrices for *n* criteria (C_i , i = 1, 2, ..., n) in a dimension of a hierarchical system. Evaluators (C_k , k = 1, 2, ..., m) presented the essential data of each pair of criteria for a number of n - 1 preference values $(a_{12}, a_{23}, ..., a_{(n-1)n})$, as below:

$$A^{k} = \begin{bmatrix} c_{1} & c_{2} & \dots & c_{n-1} & c_{n} \\ c_{2} & & & & \\ c_{2} & & & & \\ c_{n-1} & & & \\ c_{n} & & & \\ c_{n} & & & \\ c_$$

where a_{ij}^k indicates the preference intensity regarding influential criteria *i* and *j* as compared by evaluator *k*, $a_{ij} = 1$ represents indifference of influential criteria *i* and *j*, $a_{ij} = 3, 5, 7, 9$ evidence that criteria *i* is comparatively essential to criteria *j*, and $a_{ij} = \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}$ denotes that influential criteria *i* is less essential than criteria *j*. The symbol "×" represents preserved a_{ij}^k , which has been denoted via opposite comparison [37]. 1. Conversion of preference value a_{ij}^k into p_{ij}^k utilizing an interval scale [0, 1] follows, resulting in the preserved p_{ij}^k relying on the reciprocal transitivity property gives:

$$A^{k} \stackrel{\frac{1}{2}(1+\log_{9}a_{ij})}{\Rightarrow} p^{k} = \begin{array}{c} c_{1} \\ c_{2} \\ \vdots \\ c_{n} \end{array} \begin{bmatrix} \begin{array}{c} 0.5 \\ 0.5 \\ 1-p_{12}^{k} \\ 0.5 \\ 1-p_{23}^{k} \\ \vdots \\ \times \end{array} \xrightarrow{k} \\ 0.5 \\ 0.$$

where $p_{ij} = 0.5$ presents indifference between criteria *i* and *j*, $p_{ij} = 1$ represents that criteria *i* is absolutely important to criteria *j*, and $p_{ij} = 0$ represents that the criteria is absolutely less important to criteria *j*. The remaining p_{ij}^k is calculated by applying Equations (1) and (10); also, within the interval [-a, 1 + a], a > 0, can be converted to obtain values with a converted function that preserves the reciprocity and additive consistency. The transformed function (x) is stated as follows [30]: $f : [-a, 1 + a] \rightarrow [0, 1]$, $f(x) = \frac{\chi + a}{1 + 2a}$ The transformation function is formulated as follows [38]:

$$\left(p_{ij}^{k}\right) = \frac{p_{ij}^{\kappa} + a}{1 + 2a}$$
 (13)

The absolute value of the maximum positive score or minimum negative score can be minus one in the preference decision matrix [39–41].

2. The evaluators' opinions can aggregate weights of influential criteria. Moreover, let p_{ij}^k indicate transforming the fuzzy preference score of evaluator *k* for evaluating criteria *i* and *j*. This study obtained integral values of *m* evaluators by applying the symbol of the average score [42], viz.:

$$p_{ij} = \frac{1}{m} \left(p_{ij}^1 + p_{ij}^2 + \ldots + p_{ij}^m \right)$$
(14)

3. The aggregated fuzzy preference relations matrices by normalizing q_{ij} is utilized to refer to the normalized fuzzy preference scores of every criterion, namely

$$q_{ij} = \frac{1}{n} \sum_{i=1}^{n} p_{ij}$$
(15)

Utilizing $\overline{\omega}_i$ represents the average priority weight of influential criteria, that *n* denotes the number of influential criteria, and the priority of each criterion can be defined, such as

$$\overline{\omega}_i = \frac{q_{ij}}{\sum_{i=1}^n q_{ij}} \tag{16}$$

6. Empirical Illustration and Discussion

6.1. Empirical Illustration

The study demonstrates the revitalization strategy used in Taiwan as an exemplification to illustrate the framework. Questionnaires reflecting linguistic variability, as seen in Table 1, were sent to 16 evaluators in order to investigate the actual situation affecting the hospitality sector during the COVID-19 outbreak. Eight influential criteria were synthesized via survey with the evaluation representatives indicated. The pairwise comparisons utilized computational analysis in obtaining priority weights to evaluate how the Taiwanese government applied accurate SR to assist the hospitality sector during the time of the global crisis. 1. According to the interviews with the 16 evaluators that indicated the essential eight influential criteria, Table 2 shows pairwise comparison matrices from a number of n - 1 adjacent criteria $\{a_{12}, a_{23}, \ldots, a_{78}\}$ into the parallelism scores [38].

As seen in Table 2, evaluators indicate values for a set of criteria, such as the value (a_{ij}) representing the preference level of the first criterion (C_i) when compared with a second criterion (C_j) . Suppose a_{ij} is the ratio scale with 1–9 scales of criteria, when $a_{ij} = 1$ indicates the equivalence between C_i and C_j , while $a_{ij} = 9$ indicates that C_i is absolutely preferred to C_j , whereas $a_{ij} = 1/9$ is a reciprocal value representing C_j as being absolutely preferred to C_i . For example, in Table 2, in terms of linguistic variables, $a_{12} = 1/7$ represents that C_2 is of very strong importance compared to C_1 [35].

Table 2. Preference relation matrix for pairwise comparison of the criteria.

	Evaluators																
C _i	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	C_j
C_1	1/7	1	1/3	1/3	1	1/9	7	1	1	1/5	1/7	1/4	1	5	7	1	C_2
C_2	1/5	1	5	1	1	9	3	1/7	3	1	1	7	1/5	1/5	7	4	C_3
C_3	9	7	1/5	1/3	5	7	1/3	7	5	3	1	1/3	1/6	3	3	1/3	C_4
C_4	1/9	1/8	1/5	3	1/5	1/7	1/7	1/5	1/3	3	7	4	1	1/5	1/3	3	C_5
C_5	8	1	1	1/3	1/3	1/7	7	1/9	1/3	1/7	1/8	1/7	8	1/3	1/7	1/5	C_6
C_6	1/2	1/2	1	1/5	1/7	1/5	1/9	1	1	5	1/6	2	1/8	1/7	1/5	1	C_7
<i>C</i> ₇	9	1	5	3	1/5	7	7	1	5	5	7	4	6	7	1/5	1	C_8

2. The appraisal of evaluator 1 (E1) can serve as an instance, see Table 3. The linguistic terms may be transformed into parallelism scores.

E1	C_1	<i>C</i> ₂	C_3	C_4	C_5	C_6	C_7	C_8
C_1	1.0000	0.1429	×	×	×	×	×	×
C_2	×	1.0000	0.2000	×	×	×	×	×
C_3	×	×	1.0000	9.0000	×	×	×	×
C_4	×	×	×	1.0000	0.1111	×	×	×
C_5	×	×	×	×	1.0000	8.0000	×	×
C_6	×	×	×	×	×	1.0000	0.5000	×
C_7	×	×	×	×	×	×	1.0000	9.0000
C_8	×	×	×	×	×	×	×	1.0000

Table 3. Interval pairwise comparisons of the criteria.

3. Transform the elements by applying Equation (2) (listed in Table 3) into an interval [0, 1], with the illustration providing the following:

$p_{12} = (1 + \log_9 0.1429)/2 = 0.0572,$	$p_{56} = (1 + \log_9 8.0000)/2 = 0.9732$
$p_{23} = (1 + \log_9 0.2000) / 2 = 0.1338,$	$p_{67} = (1 + log_9 0.5000)/2 = 0.3423$
$p_{34} = (1 + \log_9 9.0000) / 2 = 1.0000,$	$p_{78} = (1 + \log_9 9.0000)/2 = 1.0000$
$p_{45} = (1 + \log_9 0.1111)/2 = 0.0000$	

The evaluation score can be calculated by applying Equations (1) and (11) with p_{21} , p_{31} , p_{72} and p_{27} being utilized, for instance:

$$p_{21} = 1 - p_{12} = 1 - 0.0572 = 0.9428$$

$$p_{31} = \frac{3-1+1}{2} - p_{12} - p_{23} = 1.5 - 0.0572 - 0.1338 = 1.3091$$

$$p_{72} = \frac{7-2+1}{2} - p_{23} - p_{34} - p_{45} - p_{56} - p_{67}$$

$$= 3 - 0.1338 - 1.0000 - 0.0000 - 0.9732 - 0.3423 = 0.5508$$

$$p_{27} = 1 - p_{72} = 1 - 0.5508 = 0.4492$$

The CFPR matrix for the eight influential criteria as determined by evaluator 1 is shown in Table 4.

Table 4 lists p_{13} , p_{31} , p_{15} , p_{51} , p_{38} , p_{83} , p_{58} , p_{85} elements not found in the interval [0, 1]. Therefore, Equation (13) states a linear transformation applied to confirm the reciprocity and additive transitivity for the preference relations matrix (see Table 5).

Table 4. CFPR matrix of criteria E1.

E1	C_1	C_2	<i>C</i> ₃	C_4	C_5	C_6	C_7	C_8
<i>C</i> ₁	0.5000	0.0572	-0.3091	0.1909	-0.3091	0.1641	0.0064	0.5064
C_2	0.9428	0.5000	0.1338	0.6338	0.1338	0.6070	0.4492	0.9492
C_3	1.3091	0.8662	0.5000	1.0000	0.5000	0.9732	0.8155	1.3155
C_4	0.8091	0.3662	0.0000	0.5000	0.0000	0.4732	0.3155	0.8155
C_5	1.3091	0.8662	0.5000	1.0000	0.5000	0.9732	0.9732	1.3155
C_6	0.8359	0.3930	0.0268	0.5268	0.0268	0.5000	0.3423	0.8423
C_7	0.9936	0.5508	0.1845	0.6845	0.1845	0.6577	0.5000	1.0000
<i>C</i> ₈	0.4936	0.0508	-0.3155	0.1845	-0.3155	0.1577	0.0000	0.5000

Table 5. Linear solution for transformation matrix of criteria.

E1	<i>C</i> ₁	<i>C</i> ₂	<i>C</i> ₃	C_4	<i>C</i> ₅	<i>C</i> ₆	<i>C</i> ₇	<i>C</i> ₈
<i>C</i> ₁	0.5000	0.2285	0.0039	0.3105	0.0039	0.2941	0.1974	0.5039
C_2	0.7715	0.5000	0.2754	0.5820	0.2754	0.5656	0.4689	0.7754
C_3	0.9961	0.7246	0.5000	0.8066	0.5000	0.7901	0.6934	1.0000
C_4	0.6895	0.4180	0.1934	0.5000	0.1934	0.4836	0.3869	0.6934
C_5	0.9961	0.7246	0.5000	0.8066	0.5000	0.7901	0.7901	1.0000
C_6	0.7059	0.4344	0.2099	0.5164	0.2099	0.5000	0.4033	0.7099
C_7	0.8026	0.5311	0.3066	0.6131	0.3066	0.5967	0.5000	0.8066
C ₈	0.4961	0.2246	0.0000	0.3066	0.0000	0.2901	0.1934	0.5000

4. The calculated procedures illustrate the fuzzy preference relation matrices of another 15 evaluators; moreover, the aggregated pairwise comparison matrix of 16 evaluators is acquired by utilizing Equation (14), as listed in Table 6.

Е	C_1	<i>C</i> ₂	<i>C</i> ₃	C_4	C_5	C_6	C_7	C_8
<i>C</i> ₁	0.5000	0.4403	0.4920	0.5271	0.4588	0.3649	0.2625	0.4151
C_2	0.5597	0.5000	0.5518	0.5869	0.5186	0.4187	0.3222	0.4748
C_3	0.5080	0.4482	0.5000	0.5351	0.4668	0.3669	0.2705	0.4230
C_4	0.4729	0.4131	0.4649	0.5000	0.4317	0.3540	0.2575	0.3879
C_5	0.5412	0.4814	0.5332	0.5696	0.5000	0.4002	0.3464	0.4563
C_6	0.6351	0.5813	0.6331	0.6460	0.5764	0.5000	0.4035	0.5561
C_7	0.7375	0.6778	0.7295	0.7425	0.6729	0.5965	0.5000	0.6526
C_8	0.5849	0.5252	0.5770	0.6121	0.5437	0.4439	0.3474	0.5000
Total	4.5393	4.0673	4.4815	4.7194	4.1688	3.4451	2.7100	3.8657

Table 6. Aggregated pairwise comparison matrices of 16 evaluators.

Equation (15) is utilized to normalize the aggregated pairwise comparison matrix. Taking q_{12} as an example:

 $q_{12} = 0.4403 / (0.4403 + 0.5000 + 0.4482 + 0.4131 + 0.4814 + 0.5813 + 0.6778 + 0.5252) = 0.1082$

The priority weight and rank of every influential criterion by 16 evaluators are acquired by applying Equation (16), as indicated in Table 7.

The ranks of the influential criteria weights are substituted as:

 $C_7(0.1671) > C_6(0.1421) > C_8(0.1292) > C_2(0.1227) > C_5(0.1199) > C_3(0.1093) > C_1(0.1075) > C_4(0.1021).$

Ε	C_1	<i>C</i> ₂	<i>C</i> ₃	C_4	C_5	C_6	C_7	C_8	Total	Weight	Ranking
C_1	0.1101	0.1082	0.1098	0.1117	0.1101	0.1059	0.0969	0.1074	0.8601	0.1075	7
C_2	0.1233	0.1229	0.1231	0.1244	0.1244	0.1215	0.1189	0.1228	0.9814	0.1227	4
C_3	0.1119	0.1102	0.1116	0.1134	0.1120	0.1065	0.0998	0.1094	0.8748	0.1093	6
C_4	0.1042	0.1016	0.1037	0.1059	0.1035	0.1027	0.0950	0.1004	0.8171	0.1021	8
C_5	0.1192	0.1184	0.1190	0.1207	0.1199	0.1162	0.1278	0.1180	0.9592	0.1199	5
C_6	0.1399	0.1429	0.1413	0.1369	0.1383	0.1451	0.1489	0.1438	1.1371	0.1421	2
C_7	0.1625	0.1666	0.1628	0.1573	0.1614	0.1731	0.1845	0.1688	1.3371	0.1671	1
C_8	0.1289	0.1291	0.1287	0.1297	0.1304	0.1289	0.1282	0.1293	1.0333	0.1292	3
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.0000	1.0000	

Table 7. Normalized matrix of priority weight and rank of influential criteria.

6.2. Discussions

Using the CFPR model has far more advantages than using the traditional AHP method. Initially, the CFPR method can not only reduce the set of questions, but CFPR can effectively decrease pairwise comparison frequency. For example, utilizing the traditional AHP method requires preparing and answering $C_2^8 = \frac{8 \times 7}{1 \times 2} = 28$ questions where inconsistency is likely to occur through comparison while using CFPR requires only preparation, and the answer n - 1 for just seven questions. Secondly, computational simplicity is applied in order to provide a relative weight of each of the influential criteria by utilizing the CFPR method. Thirdly, as a consequence of the COVID-19 outbreak, governments, organizations, and industries should make appropriate strategic decisions objectively and rapidly while utilizing CFPR for decision matrices, thereby guaranteeing consistency in the decision-making procedure [17,42].

The results are shown in Figure 3. The primary four assessment attributes are as follows: market revitalization (0.1620), innovation and transformation (0.1416), COVID-19 prevention measure (0.1332), and employment assistance (0.1229). Meanwhile, the four least important attributes are as follows: utility discounts (0.1197), tax breaks (0.1192), financial aid (0.1082), and infrastructure facilities (0.1025).



Figure 3. Rank of priority weight and influential criteria of evaluators.

According to Figure 3. the ranking of the main criteria is $C_7 > C_6 > C_8 > C_2 > C_5 > C_3 >$ $C_1 > C_4$, which reveals the opinions of experts in the hospitality field. The results indicate that "market revitalization" (criterion C_7) is considered as the most essential/important criteria for RS. The market revitalization included some stimulus actions, such as the Taiwanese government's implementation of various stimulus vouchers and coupons to encourage market consumption and revitalize the overall economy in the form of triplestimulus vouchers. The second important criterion is "innovation and transformation" (criterion C_6) that involves the support of new technology, services, and marketing of innovative training opportunities subsidized by the government. The COVID-19 pandemic has intensified the role of innovation in the recovery, re-shaping, and re-imagining of hospitality. Innovational trends and the adoption of the latest technologies and services can benefit the economy and create a transformation in the hospitality industry [18]. Of tertiary importance is "COVID-19 prevention measure" (criterion C_8), which presents that effective government measures in the pandemic promote public confidence in economic agencies beneficial for the recovery of the economy [13]. Moreover, the fourth-place criterion is "employment assistance" (criterion C_2). Some current research on the impact of COVID-19 on the tourism and hospitality sector indicates that for unemployed staff from different restaurants or hotels, employees were asked for unpaid leave [14,21,43], necessitating the address of a range of small-scale organizational issues related to employee challenges [44]. "Utilities discount" (criterion C_5) and tax breaks (criterion C_3) involved in government subsidies were seen as less important criteria. The last criterion to be considered is "infrastructure facilities and environmental improvement" (criterion C₄. This study determined an interesting phenomenon in that "financial aid" (criterion C_1) is of second-to-last importance. Sigala [18] indicated the COVID-19 outbreak had an enormous international economic impact leading to the largest decline in the history of the modern

hospitality industry, and it became the epicenter of all international discussions [14,23,24,34]. Some evaluators who are in executive positions indicated that the application process to obtain financial aid procedures was too complex, leading many SMEs to give up on this course of action entirely. Financial aid for the hospitality industry will become a future research issue to be addressed from different dimensional characteristics of the hospitality industry, the strategy of implementation, and what the industry will require for eventual relief.

8. Conclusions

In Taiwan, the government has adopted a zero-tolerance policy regarding the COVID-19 outbreak. The results indicate that "market revitalization" is considered the most essential/important criteria for RS under a zero-tolerance policy regarding the COVID-19 outbreak. The contribution of this paper lies in the use of expert interviews and the CFPR technology to explore the industry's preference order for policy measures and to provide the government with a reference for the revitalization of hospitality.

This study presents the CFPR method to evaluate the influential criteria in an RS for the hospitality industry, including expert surveys and interviews. This selected method makes it simple to construct multi-criteria decision matrices and evaluate the essentialness of every criterion for government strategies or actions to take place [37]. The efficient strategies or actions can be directly evaluated by calculating expert scores into priority weights, with the procedure of computation becoming both practical and popular. The ranking results could provide significant analysis data to governments and decision-makers of organizations for purposes of RS in future implementation [17].

Furthermore, whether the hospitality industry will accept governmental assistance still depends on the revitalization strategies yet to be implemented, the relative convenience of procedures and services, and the nature of business encouragement policies. The government should premeditate several aspects for formulated actions or policies. The popularization and development of industry demand should show powerful and unequivocal support from the government. In this study, only 16 experts' opinions were collected to evaluate and confirm the concept model. In reality, real industrial perspectives and expectations are essential to enhance strategic effectiveness, and such preferences would be more accurate in estimating the model during the crisis [23,45]. Furthermore, the sample of evaluators should be enlarged in future works to acquire more instructive results. Promoting the success of the RS had some obvious implementations. According to Wang and Hsieh [44], several methods may be used to promote the governmental decision-making process, with the conclusion as follows [22]:

- Nurture an awareness of potential crises that may inflict economic harm;
- Establish a priority-setting process during a crisis;
- Identify influential factors from expert opinions that reflect real needs for different industries;
- Determine the accuracy, urgency, and relevance of revitalization strategy implementation policies;
- Supervise disaster control to make accurate decisions to pilot industry-recall of a product or the shutdown of a system;
- Mobilize and utilize resources or methods to deal with critical impact effectively and objectively;
- Promptly notify and then provide support for one-stage-services of critical industrial demand to deal with the coronavirus pandemic outbreak or similar events; and,
- Establish a governmental "hotline" for the public, industry, media, and private individuals to announce the transparency situation of the COVID-19 outbreak.

9. Limitations and Future Research

The study's findings and contributions, and limitations are demonstrated for further research. Initially, the study was illustrated in a continuous pandemic with the hospitality

sector being seriously impacted. In Taiwan, due to the COVID-19 epidemic, a large number of hospitals were closed under the government's zero-tolerance policy. However, the path taken by Europe and the United States is to coexist with the virus, but it has also caused more infections and deaths. Therefore, the government's attitude towards the epidemic may also affect the industry's assessment of the importance of policy implementation. In future research, we can explore the importance of relevant policies in the face of differences in government policies on disease control. Secondly, the study provides an overview of Taiwan's hospitality situation. Further research should focus on exploring the comparison of different sizes and types of industries or countries. Thirdly, regarding the prevention measures of social distancing, the study conducted a survey of 16 evaluators; subsequently, the sample could be enlarged to enhance the level of reliability and validity. Fourthly, the COVID-19 pandemic has continuously impacted several countries; nevertheless, uncertainty concerning surroundings and questions regarding RS implementation continue to prevail regarding the best RS m implementation strategy. The essentialness of RS as a mechanism is paramount for hospitality stakeholders to sustain or create competitive performance advantages in the future.

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