Applying DANP to Explore the Critical Factors for Building Taiwan Restaurant Industry's Customer Loyalty

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Abstract
The restaurant industry in Taiwan embeds a characteristic of easy entrance and lower imitation barriers that results in a fierce competition in nature. How to build customer loyalty for encouraging customers to visit repeatedly is an essential challenge for every restaurant manager. This article employs the DANP method to explore the criteria and their priority for building restaurant customer loyalty. The thirteen evaluation criteria are firstly extracted from past literature and are categorized into four clusters; then consult with ten scholars/experts who are excellent in restaurant industry; finally, interview with another fourteen senior restaurant managers to collect their practical opinions. The research results reveal that Differentiation Cluster is the "main cause-factor" while Brand Image Cluster is the "main effect-factor" among the clusters. Customer Experience Cluster has the significant relationship with other clusters and locates at the central role among the four clusters. This article also distinguishes the restaurants into two groups: national-wide chain restaurants and the well-known local independent restaurants. For the national-wide chain restaurants, the top three important criteria are Trust, Product Quality, and Product Innovation; the last three criteria are Customer Satisfaction, Price Effectiveness, and Atmosphere. While the top three important criteria for the well-known local independent restaurants are Reputation, Trust, and Product Quality; the last three criteria are Product Innovation, Social Media Marketing, and Atmosphere. This article also finds that the focuses of the national-wide chain restaurant managers are pursuing the consistent service for all branch restaurants while the well-known local independent restaurant managers insist in maintaining traditional uniqueness.

Keywords: MCDM (Multi-Criteria Decision Making), DEMATEL, ANP, DANP, Customer Loyalty, Restaurant Industry

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1. Introduction

Restaurant industry occupies an important place in national economy. Accompany with the people's growing income and lifestyle transforming of the consumption pattern, the customers have many choices in selecting their favorite restaurant. The restaurant industry in Taiwan embeds a property of easy entrance and lower imitation barriers, the incumbent restaurants always face fierce competition. How to build customer loyalty to encourage customers to visit repeatedly and can be distinguished out of competitors is an essential challenge for every restaurant manager.

Most of the past literature on customer loyalty concentrated on the customers' perspective. They focused on how customers are passively perceived the products, services, or environments provided by restaurants and then engender the sensation of loyalty, i.e., the data for analysis is directly collected from customers by questionnaires (Mohammad et al., 2012; Al-Tit, 2015; Pratminingsih, 2018; Satti, Babar, & Parveen, 2022; Ahmed et al., 2023). Instead, this article stands from the viewpoints of restaurant managers and investigates how they can actively strive for customer loyalty by providing tasty products, excellent services, or comfortable environments.

This article separates the concerned restaurants into two groups: the national-wide chain restaurants and the well-known local independent restaurants[1] to engage in exploring the criteria that can help restaurant manages to build customer loyalty. This article employs the DANP methodology proposed by Ou Yang et al. (2008), which originally combined the models of DEMATEL and ANP model, to investigate the criteria and their priority of building customer loyalty for restaurant managers. We found that the restaurants managers will pay more attention on Differentiation Cluster and do not take serious on Brand Image Cluster. The focuses of the national-wide chain restaurant managers are pursuing the consistent service for all branch restaurants while the well-known local independent restaurant managers insist in maintaining traditional uniqueness. The results of this article will provide suggestions to the potential restaurant managers when they plan to enter into restaurant industry. Also, the different criteria priority for chain restaurants and independent restaurants will provide an opportunity for independent restaurants who prepare to expand their operation into chain restaurants.

The research structure of this article is organized as follows: Section 2 briefly reviews the past literature concerning about the important determinants of building customer loyalty; Section 3 expresses the employed research methodology and research procedure; The research results and discussion are shown in Section 4; Section 5 states the conclusion of this article.

2. Literature Review

This article aims at exploring the major determinants for restaurant industry to effectively build customer loyalty. Firstly, establish research framework and identifies four clusters, i.e. Brand Image Cluster, Customer Experience Cluster, Differentiator Cluster, and Customer Relationship Management (CRM) Cluster. Then, further develops thirteen criteria by extracting from past literature under the above clusters.

[1] This article defines national-wide chain restaurant as the restaurants which has a head quarter and two or more branch restaurants located in different areas in Taiwan; the well-known local independent restaurant is a famous individual restaurant that operates at a specific area in Taiwan.

2.1 Brand Image Cluster

Brand image denotes the overall perception of a brand shaped by consumers' impressions and experiences (Budiman, 2015) and plays a critical role in helping customers to decide whether or not to buy the brand and further influencing their repurchase behavior (Bian & Moutinho, 2011; Azmi et al., 2022). Gómez-Rico et al. (2022) stated that advertising promotion, corporate social responsibility, and social media can helpfully building a strong brand image. Fraihat et al (2023) found that CSR activities can positively influence on reputation and brand image. Brand Image Cluster includes Corporate Social Responsibility (CSR) Criterion, Reputation Criterion, and Social Media Marketing Criterion.

1. CSR Criterion: The restaurant company will participate CSR activities (e.g., charity activities, social care, and ecological conservation) to enhance customers' positive attitude (Han, Yu, & Kim, 2019) and create good image of the restaurant (Park, 2019).

2. Reputation Criterion: The reputation assessment of a restaurant focuses mostly on meals quality, meals feature, service quality, and dinning environment, etc. (Richard & Zhang, 2012). The restaurant company have to pay more attention to the reaction of the experienced customers for their consumption satisfaction and the effect of their word of mouth (Harahap et al., 2018; Williams, Buttle, & Biggemann, 2012).

3. Social Media Marketing Criterion: The restaurant company can apply social media such as some App in internet to create, share, and communicate its product or service information. Through social media, restaurant company can easily interact with customers (Yaakop, Anuar, & Omar, 2013; Nguyen & Khoa, 2019; Grover, Kar, & Janssen, 2019; Hsu, 2012; Seo & Park, 2018) to shape brand image on target market (Barreda et al., 2015).

2.2 Customer Experience Cluster

Creating a unique experience is an increasing trend to improvement company's confidence and loyalty (Klaus, 2014). Most companies use customer satisfaction to assess their customers' experiences (Klaus & Maklan, 2013; Kim & Kim, 2022). Customer Experience Cluster includes Consumer Satisfaction Criterion, Product Quality Criterion, Service Quality Criterion, and Atmosphere Criterion.

1. Consumer Satisfaction Criterion: To increase customer satisfaction, the restaurant company must enhance food quality (taste, freshness of meals, and amount of food), hygiene (clean dining area and clean staff), responsiveness (prompt service) and menu (display, variety, and knowledge of items) (Almohaimmeed, 2007).

2. Product Quality Criterion: For increasing the customers' dinning satisfaction, the restaurant company has to maintain a high level of its product quality (Peri, 2006). To raise the product quality, the restaurant has to emphasize the characteristics of meals, such as: taste, freshness, appearance, temperature (Kabir, 2016), food appearance, aesthetics (Kristiawan, Hartoyo, & Suharjo, 2021), special features, reliability (Garvin, 1984), and some of the combination of these dimensions.

3. Service Quality Criterion: To satisfy customer, the restaurant company has to raise service quality by compressing the disparity between the expected and actual services (Cronin &

Taylor, 1992), such as service process, service environment, service staff, and service experience.

4. Atmosphere Criterion: The restaurant company will provide customers a good experience in perceiving the quality of surrounding space (Liu & Jang, 2009), including decor, noise level, temperature, cleanliness, smell, lighting, color, and music (Sulek & Hensley, 2004; Pecotić, Bazdan, & Samardžija, 2014).

2.3 Differentiation Cluster

Differentiation offers a superior, different, and unique products or services to the customers (Porter, 1980) and distinguishes the company' and competitors' offerings (Kotler & Amstrong, 2010). Differentiation strategy included company's performing innovation (Kaliappen & Hilman, 2014), design, physical attributes, features (Gyampah & Acquaah, 2008). Differentiator Cluster includes Price Effectiveness Criterion, Product Innovation Criterion, and Product Attribute Criterion.

1. Price Effectiveness Criterion: The restaurant company can provide the meals with excellent value and reasonable price to its customers (Campbell, 2020; Goldsmith, Flynn, & Kim, 2010).

2. Product Innovation Criterion: The restaurant company can frequently introduce new taste and new flavor of food and beverages (Tüzünkan & Albayrak, 2015), or significantly improve meals in its characteristics or original appearance to satisfy customer (Atalay, Anafarta, & Sarvan, 2013).

3. Product Attribute Criterion: The restaurant company has to enhance product attributes include food safety, cleanliness, food quality, speed of service, perceived value of the food and drink items, quality of service, staff friendliness, price, variety of menu, close travel distance, and parking facility (Harrington, Ottenbacher, & Way, 2013; Upadhyay, Singh, & Thomas, 2007; Ponnam & Balaji, 2014) to increase customers' satisfaction and loyalty.

2.4 CRM Cluster

CRM seeks to establish long-term relationships with the customers on committed, trusting, and cooperative relationships (Jain, Jain, & Dhar, 2002). Chen & Ching (2007) concluded that CRM includes service and customization, loyalty programs, cross selling. Therefore, CRM Cluster comprises of Trust Criterion, Loyalty Program Criterion, and Customization Criterion.

1. Trust Criterion: The restaurant company has to build customers' confidence (Suhartanto, 2019; Morgan & Hunt, 1994) in food safety, food taste, service, and dinning atmosphere (Afzal et al., 2010; Song et al., 2022) to affects customer's repurchase intention and behaviors (Atkinson & Rosenthal, 2014).

2. Loyalty Program Criterion: The restaurant company provides bonus points redeemable for prizes or discounts (Sharp & Sharp, 1997; Furinto, Pawitra, & Balqiah, 2009), special treatment rewards designed to deliver comfort and peace of mind (Furinto, Pawitra, & Balqiah, 2009) or free gifts (Gu et al., 2022), to improve the relationship between business and customer (Ou et al., 2011).

3. Customization Criterion: The restaurant company builds a one-on-one interaction process with customer and designs tailored products or services for individual customer's preference or needs (Fels, Falk, & Schmitt, 2017; Wu, 2004), to generate value and enhance customer relationships to create customer satisfaction and loyalty (Franke & Piller, 2003).

3. Research Methodology

This article adopts the DANP method proposed by Ou Yang et al. (2008), which combines DEMATEL and ANP procedures, to investigate the MCDM problems of how the restaurant managers engage in building customer loyalty. The ANP is employed to evaluate the priority of criteria for evaluates the priority of building customer loyalty. Then, the DEMATEL procedure is used to investigate interdependences between clusters and weights the even-weighted clusters in ANP.

3.1 Research Procedure

For more precise, this article consults ten scholars/experts in the related fields to modify and complement the original edition of evaluation criteria. The final version of "The Criteria Description of Customer Loyalty" is shown as Table 3.1.

3.2 Data Processing Steps

The data processing steps adopt the model proposed by Ou Yang et al. (2008) and the revised procedure by Lee (2021). Fig.3.2 shows the more detail flowchart of DANP steps rearranged by this article.

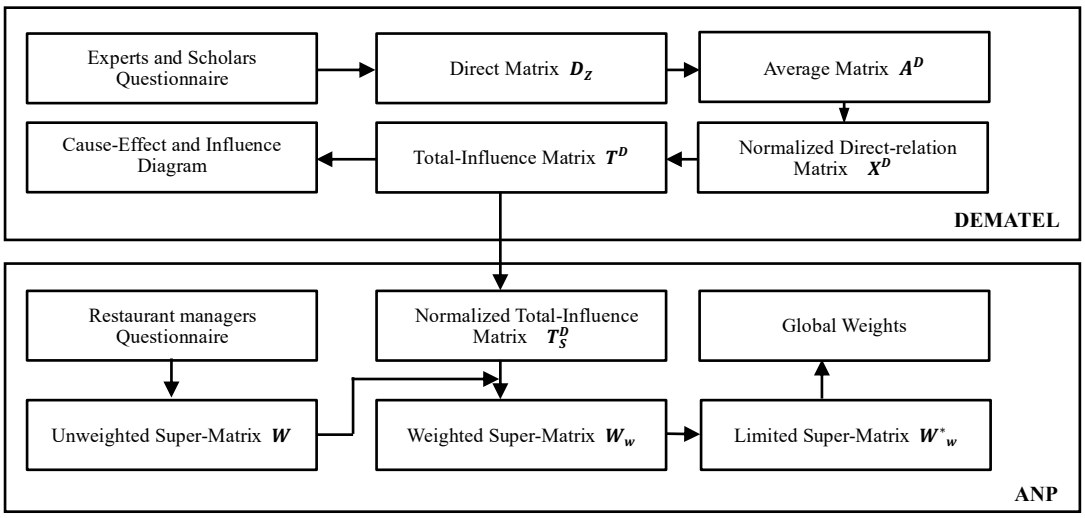

Fig. 3.1: The Flowchart of DANP Steps (Source: Rearranged by This Article)

Table 3.1: The Criteria Description of Customer Loyalty

Clusters	Criteria	Description	Sources
(B) Brand Image	(B1) Corporate Social Responsibility (CSR)	The restaurant company will participate CSR activities (e.g., charity activities, social care, product services, and ecological conservation) to enhance customer positive attitude and create good image and reputation of the restaurant.	Han et al., 2019 Park, 2019
	(B2) Reputation	The reputation assessment of a restaurant focuses mostly on meals quality, meals feature, service quality, and dinning environment, etc. The restaurant company have to pay more attention to the reaction of the experienced customers for their consumption satisfaction and the effect of their word of mouth.	Richard & Zhang, 2012 Harahap et al., 2018
	(B3) Social Media Marketing	The restaurant company can apply social media such as some App in internet to create, share, and communicate its product or service information. Through social media, restaurant company can easily interact with customers to shape brand image on target market.	Nguyen & Khoa, 2019 Grover, 2019 Seo & Park, 2018 Barreda et al., 2015
(E) Customer Experience	(E1) Customer Satisfaction	To increase customer satisfaction, the restaurant company will enhance food quality (taste, freshness of meals and amount of food), hygiene (clean dining area and clean staff), responsiveness (prompt service) and menu (display, variety, and knowledge of items).	Almohaimmeed, 2017
	(E2) Product Quality	For increasing the customers' dinning satisfaction, the restaurant company has to maintain a high level of its product quality. To raise the product quality, the restaurant has to emphasize the characteristics, such as: taste, freshness, appearance, temperature, food appearance, aesthetics, special features, reliability, and some of the combination of these dimensions.	Peri, 2006 Kabir, 2016 Kristiawan, Hartoyo, & Suharjo, 2021
	(E3) Service Quality	To satisfy customer, the restaurant company has to raise service quality by compressing the disparity between the expected and actual services, such as service process, service environment, service staff, and service experience.	Cronin & Taylor, 1992
	(E4) Atmosphere	The restaurant company will provide customers have a good experience in perceiving the quality of surrounding space, including decor, noise level, temperature, cleanliness, smell, lighting, color, and music.	Liu & Jang, 2009 Pecotić, Bazdan, & Samardžija, 2014
(D)Differentiation	(D1) Price Effectiveness	The restaurant company can provide the meals with excellent value and reasonable price to its customers.	Campbell, 2020 Goldsmith, Flynn, & Kim, 2010
	(D2) Product Innovation	The restaurant company can frequently introduce new taste and flavor of food and beverages or significantly improve meals in its characteristics or original appearance to satisfy customer.	Tüzünkan & Albayrak, 2015 Atalay et al., 2013

Table 3.1 The Criteria Description of Customer Loyalty (Con't)

Clusters	Criteria	Description	Sources
(D)Differentiation	(D3) Product Attribute	The restaurant company has to enhance product attributes include food safety, cleanliness, food quality, speed of service, perceived value of the food and drink items, quality of service, staff friendliness, price, variety of menu, close travel distance, and parking facility to increase customers' satisfaction and loyalty.	Upadhyay, Singh, & Thomas, 2007 Ponnam & Balaji, 2014
(M) Customer Relationship Management (CRM)	(M1) Trust	The restaurant company have to build customers' confidence in food safety, food taste, service, and dinning atmosphere to affects customers' repurchase intention and behaviors.	Morgan & Hunt, 1994 Suhartanto, 2019 Afzal et al., 2010 Song et al., 2022 Atkinson & Rosenthal, 2014
	(M2) Loyalty Program	The restaurant company provides bonus points redeemable for prizes or discounts, special treatment rewards designed to deliver comfort and peace of mind or free gifts, to improve the relationship between business and customer.	Sharp & Sharp, 1997 Furinto, Pawitra, & Balqiah, 2009 Gu et al., 2022 Ou et al., 2011
	(M3) Customization	The restaurant company builds a one-on-one interaction process with customer and designs tailored products or services for individual customer's preference or needs, to generate value and enhance customer relationships to create customer satisfaction and loyalty.	Fels, Falk, & Schmitt, 2017 Wu, 2004 Franke & Piller, 2003

3.2.1 Apply DEMATEL for Network Relationship

Step D1: Calculate the direct relation matrix $\boldsymbol{D_z}$

Each questionnaire received from respondent will produce a direct matrix $\boldsymbol{D_z}$, Where z = 1, 2,⋯, n, where n represents the number of respondents. Each element of $\boldsymbol{D_z}$, denoted by d_{ij}^z shows the initial direct effects that each cluster i exerts on and receives from other cluster j, Then, i is the ith row and j is the jth column. $\boldsymbol{D_z}$ is expressed as Eq. (1).

$$\boldsymbol{D_z} = \begin{bmatrix} d_{11}^z & \cdots & d_{1j}^z & \cdots & d_{1n}^z \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ d_{i1}^z & \cdots & d_{ij}^z & \cdots & d_{in}^z \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ d_{n1}^z & \cdots & d_{nj}^z & \cdots & d_{nn}^z \end{bmatrix} \tag{1}$$

Step D2: Averaging the direct-relation matrix $\boldsymbol{A^D}$

The average matrix $\boldsymbol{A^D}$ is calculated by the mean of the same elements in the various direct matrices of the respondents. Each element of matrix $\boldsymbol{A^D}$, represented as a_{ij}^D, is calculated by Eq. (2).

$$a_{ij}^D = \frac{\sum_{z=1}^{n} d_{ij}^z}{n} \tag{2}$$

Step D3: Normalizing the direct-relation matrix $\boldsymbol{X^D}$

The normalized direct-relation matrix $\boldsymbol{X^D}$ can be obtained by normalizing the $\boldsymbol{A^D}$ through Eqs. (3) and (4), in which all the diagonal elements equal to zero.

$$\boldsymbol{S^D} = min\left[\frac{1}{max\sum_{j=1}^{n}\left|a_{ij}^{d}\right|}, \frac{1}{max\sum_{i=1}^{n}\left|a_{ij}^{d}\right|}\right] \tag{3}$$

$$\boldsymbol{X^D} = \boldsymbol{S^D} \times \boldsymbol{A^D} \tag{4}$$

Step D4: Deriving the total influence matrix $\boldsymbol{T^D}$

$\boldsymbol{T^D}$ is the direct/indirect matrix which can be acquired through Eq. (5), in which $\boldsymbol{I}$ is identity matrix. The elements t_{ij}^{D} of $\boldsymbol{T^D}$ is direct and indirect influence from cluster *i* to cluster *j* and when $\lim_{k\to\infty} \boldsymbol{X}^k = [\boldsymbol{0}]_{n\times n}$, the total-influence matrix is listed as follows:

$$\boldsymbol{T^D} = \lim_{k\to\infty}\left(\boldsymbol{X^D} + \boldsymbol{X^{D^2}} + \boldsymbol{X^{D^3}} + \cdots + \boldsymbol{X^{D^k}}\right) = \lim_{k\to\infty} \boldsymbol{X^D}\,(\boldsymbol{I} - \boldsymbol{X^D})^{-1} \tag{5}$$

Vector *r* and vector *c* respectively represent the sum of rows and sum of columns of the total relation matrix $\boldsymbol{T^D}$, which defined by Eq. (6) and Eq. (7), respectively.

$$r = (r_i)_{n\times 1} = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} \tag{6}$$

$$c = \left(c_j\right)_{1\times n} = \left(c_j\right)'_{1\times n} = \left[\sum_{i=1}^{n} t_{ij}\right]'_{1\times n} \tag{7}$$

In Eq. (6), r_i is the sum of the *i*th row of $\boldsymbol{T^D}$ which represents the sum of direct and indirect influences of cluster *i* affecting on the other clusters; In Eq. (7), c_j is the sum of the *j*th column of $\boldsymbol{T^D}$ and represents the sum of direct and indirect influences cluster *j* received from the other clusters. In the case of *i* = *j*, the sum (r_i+ c_i) shows the aggregate of the row sum and column sum of cluster *i* which is called "prominence" that indicate the total influence given and received by cluster *i*. If the value of (r_i+ c_j) is high, it means that cluster *i* plays a central role and has a stronger linkage with the other clusters. In addition, the difference $(r_i - c_i)$ shows the prioritization of cluster *i* which is called "relation". If $(r_i - c_i) > 0$, it represents that cluster *i* influences other clusters. $(r_i - c_i) < 0$ means cluster *i* is influenced by other clusters.

Step D5: Setting an α-cut as a threshold to obtain the cause-effect diagram and influence diagram

Each element t_{ij} in $\boldsymbol{T^D}$ provides the information of how much influence of cluster *i* can impose on cluster *j*. To filter out the minor influence clusters in $\boldsymbol{T^D}$, Ou Yang et al. (2008) proposed to set a threshold α. In $\boldsymbol{T^D}$, if the original value of each element is smaller than α and the element value will be replaced by 0. But many authors (e.g., Chiu et al., 2013; Shen et al., 2014; Hsu et al., 2013) suggested that eliminating the less influence elements by α-cut may eliminate some key clusters in DEMATEL, and therefore result in information distortion in ANP. Furthermore, if the element values in any row or column in $\boldsymbol{T_{\alpha}^{D}}$ are all 0, the calculation in ANP can never be convergent. This article adopts the revised version of α-cut. For example, if the elements t_{11}^{D}, t_{21}^{D}, t_{31}^{D}, t_{23}^{D} are smaller than α, those elements will just be signed an asterisk "*" symbol instead of replaced by 0. The dash and solid line in influence diagram respectively denote minor and significant influence, shown as Fig. 3.2.

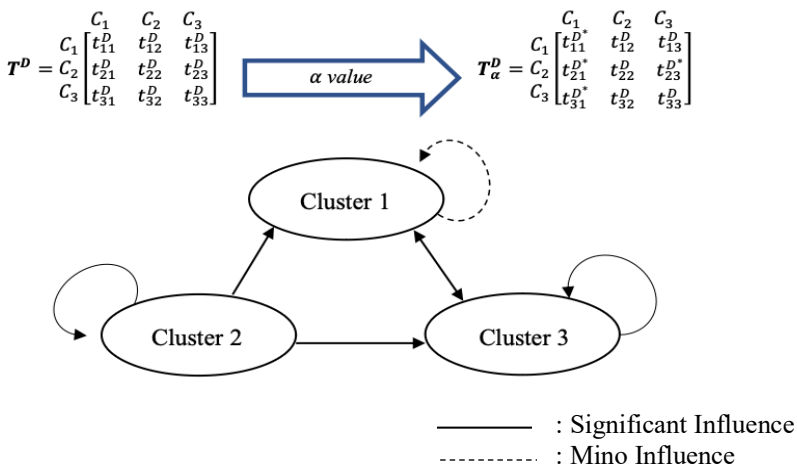

Fig. 3.2 The Revised Edition of $\boldsymbol{T_\alpha^D}$ and Influence Diagram for This Article
(Source: Revised by This Article)

3.2.2 Apply ANP for Weighted Measurements

Step A1: Building the direct super matrix $\boldsymbol{A_z}$

The direct matrix $\boldsymbol{A_z}$, z = 1, 2, ⋯, n, expressed as Eq. (8), is received from respondent's questionnaire, where n represents the total number of respondents. Each element in $\boldsymbol{A_z}$, denoted by a_{ij}^z shows the initial direct effect that the criterion exerts on and received from the other criteria, $\boldsymbol{A_z}$ is expressed as Eq. (8). In $\boldsymbol{A_z}$, c_n denotes the *n*th cluster, e_{nm} denotes the *m*th element in *n*th cluster, and $\boldsymbol{A_{ij}}$ is the principal eigenvector of the influence of the elements compared in the *j*th cluster to the *i*th cluster.

$$\boldsymbol{A_z} = \begin{array}{c} \\ \boldsymbol{C_1} \\ \\ \boldsymbol{C_2} \\ \\ \vdots \\ \\ \boldsymbol{C_n} \\ \\ \end{array} \begin{array}{c} \begin{array}{ccc} \boldsymbol{C_1} & \boldsymbol{C_2} & \boldsymbol{C_n} \\ e_{11} \cdots e_{1m_1} & e_{21} \cdots e_{2m_2} \cdots\cdots & e_{n1} \cdots e_{nm_n} \end{array} \\ \begin{array}{c} e_{11} \\ e_{12} \\ \vdots \\ e_{1m_1} \\ e_{21} \\ e_{22} \\ \vdots \\ e_{2m_2} \\ \vdots \\ e_{n1} \\ e_{n2} \\ \vdots \\ e_{nm_n} \end{array} \begin{bmatrix} a_{11}^z & a_{12}^z & \cdots & a_{1n}^z \\ a_{21}^z & a_{22}^z & \cdots & a_{2n}^z \\ \vdots & \vdots & \vdots\vdots\vdots & \vdots \\ a_{n1}^z & a_{n2}^z & \cdots & a_{nn}^z \end{bmatrix} \end{array} \tag{8}$$

Step A2: Averaging the direct super matrix

The average matrix $\boldsymbol{A^A}$ is calculated by the mean of the same elements in the various direct matrices of the respondents. In the $\boldsymbol{A^A}$, each element a_{ij}^A, is calculated by Eq. (9).

$$a_{ij}^A = \frac{\sum_{z=1}^{n} a_{ij}^z}{n} \tag{9}$$

Step A3: calculating the initial direct-relation matrix $\boldsymbol{X^A}$

The normalized direct-relation matrix $\boldsymbol{X^A}$ is produced by normalizing the $\boldsymbol{A^D}$ through Eqs. (10) and (11). In the $\boldsymbol{X^A}$, all diagonal elements are equal to zero.

$$\boldsymbol{S^A} = \min\left[\frac{1}{max\sum_{j=1}^{n}\left|a_{ij}^{A}\right|}, \frac{1}{max\sum_{i=1}^{n}\left|a_{ij}^{A}\right|}\right] \tag{10}$$

$$\boldsymbol{X^A} = \boldsymbol{S^A} \times \boldsymbol{A^A} \tag{11}$$

Step A4: Deriving the total influence matrix $\boldsymbol{T^A}$

$\boldsymbol{T^A}$ is the direct/indirect matrix which can be derived from Eq. (12), in which $\boldsymbol{I}$ is an identity matrix. The elements t_{ij}^{A} in $\boldsymbol{T^A}$ is direct and indirect influence from cluster *i* to cluster *j* and when $\lim_{k\to\infty} \boldsymbol{X^k} = [\boldsymbol{0}]_{n\times n}$.

$$\boldsymbol{T^A} = \lim_{\boldsymbol{k}\to\infty}\left(\boldsymbol{X^A} + \boldsymbol{X^{A^2}} + \boldsymbol{X^{A^3}} + \cdots + \boldsymbol{X^{A^k}}\right) = \lim_{\boldsymbol{k}\to\infty} \boldsymbol{X^A}\,(\boldsymbol{I} - \boldsymbol{X^A})^{-1} \tag{12}$$

Step A5: Normalizing the total influence matrix $\boldsymbol{T_N^A}$

The normalized total influence matrix $\boldsymbol{T_N^A}$ is presented as Eq. (13).

$$\boldsymbol{T_N^A} = \begin{array}{cc} & \begin{array}{cccc} \boldsymbol{C_1} & \boldsymbol{C_2} & & \boldsymbol{C_n} \\ e_{11}\cdots e_{1m_1} & e_{21}\cdots e_{2m_2} & \cdots\cdots & e_{n1}\cdots e_{nm_n} \end{array} \\ \begin{array}{cc} & e_{11} \\ \boldsymbol{C_1} & e_{12} \\ & \vdots \\ & e_{1m_1} \\ \boldsymbol{C_2} & e_{21} \\ & e_{22} \\ \vdots & \vdots \\ & e_{2m_2} \\ & \vdots \\ & e_{n1} \\ \boldsymbol{C_n} & e_{n2} \\ & \vdots \\ & e_{nm_n} \end{array} & \begin{bmatrix} T_N^{A^{11}} & T_N^{A^{12}} & \cdots & T_N^{A^{1n}} \\ T_N^{A^{21}} & T_N^{A^{22}} & \cdots & T_N^{A^{2n}} \\ \vdots & \vdots & \vdots\vdots\vdots & \vdots \\ T_N^{A^{n1}} & T_N^{A^{n2}} & \cdots & T_N^{A^{nn}} \end{bmatrix} \end{array} \tag{13}$$

For deriving $\boldsymbol{T_N^A}$, calculates the sum of all the elements in each cluster in $\boldsymbol{T^A}$, then divide every element by the summation. Demonstrate $\boldsymbol{T_N^{A^{11}}}$ by Eqs. (14) and (15).

$$s_{ei}^{11} = \sum_{j=1}^{m1} t_{eij}^{A^{11}}, i = 1,2,\cdots,m_1 \tag{14}$$

$$\boldsymbol{T_N^{A^{11}}} = \begin{bmatrix} t_{11}^{A^{11}}/\ s_{e1}^{11} & \cdots & t_{12}^{A^{11}}/\ s_{e1}^{11} & \cdots & t_{1m_1}^{A^{11}}/\ s_{e1}^{11} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{21}^{A^{11}}/\ s_{e2}^{11} & \cdots & t_{12}^{A^{11}}/\ s_{e1}^{11} & \cdots & t_{2m_1}^{A^{11}}/\ s_{e2}^{11} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{m_11}^{A^{11}}/\ s_{em_1}^{11} & \cdots & t_{m_11}^{A^{11}}/\ s_{em_1}^{11} & \cdots & t_{m_1m_1}^{A^{11}}/\ s_{em_1}^{11} \end{bmatrix}$$

$$= \begin{bmatrix} t_{N11}^{A^{11}} & \cdots & t_{N12}^{A^{11}} & \cdots & t_{N1m_1}^{A^{11}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{N21}^{A^{11}} & \cdots & t_{N22}^{A^{11}} & \cdots & t_{N1m_1}^{A^{11}} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{Nm_11}^{A^{11}} & \cdots & t_{Nm_12}^{A^{11}} & \cdots & t_{Nm_1m_1}^{A^{11}} \end{bmatrix} \tag{15}$$

Step A6: Acquiring the unweighted super-matrix $\boldsymbol{W}$

Transpose $\boldsymbol{T_N^A}$, gains the unweighted super-matrix $\boldsymbol{W}$ as Eq. (16) for preparation of calculating the weighted super-matrix $\boldsymbol{W_W}$.

$$\boldsymbol{W} = \begin{array}{c|c} & \begin{matrix} \boldsymbol{C_1} & & \boldsymbol{C_2} & & \boldsymbol{C_n} \\ e_{11} \cdots e_{1m_1} & & e_{21} \cdots e_{2m_2} & \cdots\cdots & e_{n1} \cdots e_{nm_n} \end{matrix} \\ \begin{matrix} \boldsymbol{C_1} \\ \\ \boldsymbol{C_2} \\ \vdots \\ \boldsymbol{C_n} \end{matrix} & \begin{matrix} e_{11} \\ e_{12} \\ \vdots \\ e_{1m_1} \\ e_{21} \\ e_{22} \\ \vdots \\ e_{2m_2} \\ \vdots \\ e_{n1} \\ e_{n2} \\ \vdots \\ e_{nm_n} \end{matrix} \begin{bmatrix} W_{11} & W_{12} & \cdots & W_{1n} \\ W_{21} & W_{22} & \cdots & W_{2n} \\ \vdots & \vdots & \vdots\vdots\vdots & \vdots \\ W_{n1} & W_{n2} & \cdots & W_{nn} \end{bmatrix} \end{array} \tag{16}$$

Step A7: Acquiring the normalized total-influence matrix $\boldsymbol{T_N^D}$

Applying the different cluster weights established in DEMATEL and normalizes the total-influence matrix $\boldsymbol{T^D}$, the normalized total-influence matrix $\boldsymbol{T_N^D}$ is produced by Eqs. (17) and (18).

$$\boldsymbol{T^D} = \begin{bmatrix} t_{11}^D & \cdots & t_{1j}^D & \cdots & t_{1n}^D \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{i1}^D & \cdots & t_{ij}^D & \cdots & t_{in}^D \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{n1}^D & \cdots & t_{nj}^D & \cdots & t_{nn}^D \end{bmatrix} \quad , \ d_i = \sum_{j=1}^{n} t_{ij}^D \tag{17}$$

$$\boldsymbol{T_N^D} = \begin{bmatrix} t_{11}^D/d_1 & \cdots & t_{1j}^D/\ d_1 & \cdots & t_{1n}^D/\ d_1 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{i1}^D/d_i & \cdots & t_{ij}^D/\ d_1 & \cdots & t_{in}^D/\ d_i \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{n1}^D/d_n & \cdots & t_{nj}^D/\ d_1 & \cdots & t_{nn}^D/\ d_n \end{bmatrix} = \begin{bmatrix} t_{N_{11}}^D & \cdots & t_{N_{1j}}^D & \cdots & t_{N_{1n}}^D \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{N_{i1}}^D & \cdots & t_{N_{ij}}^D & \cdots & t_{N_{in}}^D \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{N_{n1}}^D & \cdots & t_{N_{nj}}^D & \cdots & t_{N_{nn}}^D \end{bmatrix} \tag{18}$$

Step A8: Acquiring the weighted super-matrix $\boldsymbol{W_W}$

Multiplies the transposed normalized total-influence matrix $\boldsymbol{T_N^{D'}}$ by unweighted super-matrix $\boldsymbol{W}$. Then, the weighted super-matrix $\boldsymbol{W_W} = \boldsymbol{T_N^{D'}} \times \boldsymbol{W}$ is produced as Eq. (19).

$$\boldsymbol{W_W} = \begin{bmatrix} t_{N_{11}}^D \times W_{11} & \cdots & t_{N_{1j}}^D \times W_{1j} & \cdots & t_{N_{1n}}^D \times W_{1n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{N_{i1}}^D \times W_{i1} & \cdots & t_{N_{ij}}^D \times W_{ij} & \cdots & t_{N_{in}}^D \times W_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ t_{N_{n1}}^D \times W_{n1} & \cdots & t_{N_{nj}}^D \times W_{nj} & \cdots & t_{N_{nn}}^D \times W_{nn} \end{bmatrix} \tag{19}$$

Step A9: Acquiring the limited super-matrix $\boldsymbol{W^*}_{\boldsymbol{W}}$

Limit the weighted super-matrix $\boldsymbol{W_W}$ by raising to a adequately large power, until it converged and become to a long-term stable limited super-matrix $\boldsymbol{W^*}_{\boldsymbol{W}}$ as Eq. (20). It obtains a global priority vector also is called DANP influential weights (Chiu, Tzeng, & Li, 2013).

$$\lim_{k \to \infty} \boldsymbol{W_W}^k \tag{20}$$

Step A10: Ranking the global weights

The global weights are ranked base on the global priority vector by the limited super-matrix $\boldsymbol{W^*}_{\boldsymbol{W}}$.

4. Research Results and Discussion

This article collects data which from the ten scholars/experts and ten senior managers of restaurant. Then, this article follows the data processing steps explain in section 3.2 to research the influence relationships among clusters and rank the priority of criteria when restaurant managers building customer loyalty.

4.1 The Relationships among Clusters

Ten direct matrixes are collected from ten scholars/ experts questionnaires. By Eq. (2), the average matrix $\boldsymbol{A^D}$ is shown as Table 4.1.

Table 4.1 The Average Matrix $\boldsymbol{A^D}$ (n=10)

Cluster	B	E	D	M
B	0	2.4	2.3	3.2
E	3.3	0	2.7	3.4
D	2.7	3.1	0	2.7
M	3.4	2.7	2	0

The normalized direct-relation matrix $\boldsymbol{X^D}$ is obtained by normalizing the $\boldsymbol{A^D}$ by Eqs. (3) and (4) as Table 4.2.

Table 4.2 The Direct-Influence Matrix $\boldsymbol{X^D}$

Cluster	B	E	D	M
B	0	0.25532	0.24468	0.34034
E	0.35106	0	0.28723	0.36710
D	0.28723	0.32979	0	0.28723
M	0.36170	0.28404	0.21277	0

By Eq. (5), the total influence matrix $\boldsymbol{T^D}$ is given as Table 4.3.

Table 4.3 The Total Influence Matrix $\boldsymbol{T^D}$

Cluster	B	E	D	M
B	2.09526	2.06000	1.84450	2.32862
E	2.65855	2.12494	2.11009	2.64142
D	2.45429	2.22736	1.7580	2.43334
M	2.39689	2.10663	1.8533	2.11027

Employ Eqs. (6) and (7), the values of $r_i + c_i$ and $r_i - c_i$ are calculated to gain the gives and received influences of the four clusters as Table 4.4. Based on Table 4.4, the cause-effect diagram of total relationship is shown as Fig. 4.1.

Table 4.4 The Gives and Received Influences of the four Clusters

Cluster	r_i	c_i	$r_i + c_i$	$r_i - c_i$
B	8.3284	10	17.9334	−1.2766
E	9.53500	8.51892	18.0539	1.0161
D	8.87302	7.56594	16.4390	1.3071
M	8.46712	9.51366	17.9808	−1.0465

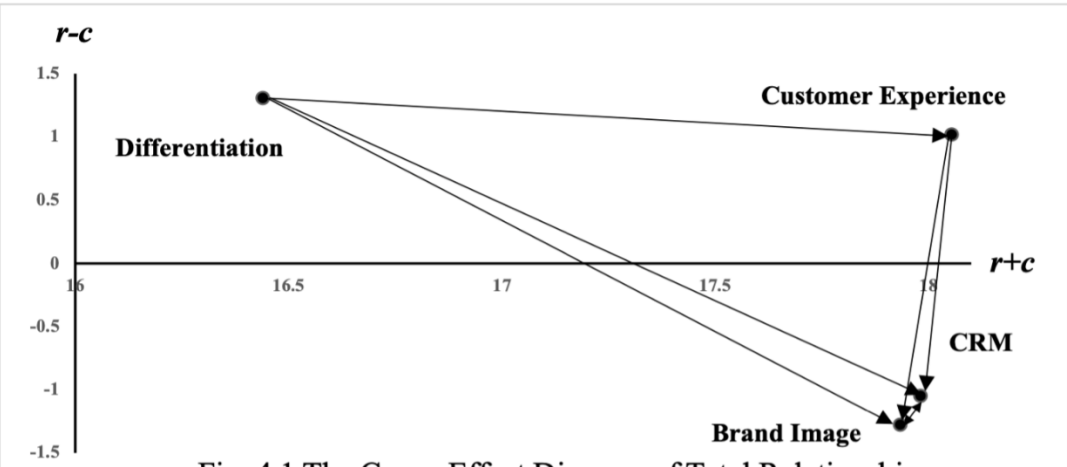

Fig. 4.1 The Cause-Effect Diagram of Total Relationship

Fig. 4.1 reveals that Differentiation Cluster has the positive and largest $r_i - c_i$ value. It represents that Differentiation Cluster has the most influence on the other clusters and can be called "main cause-factor" among the clusters. At the same time, Differentiation Cluster also has the least $r_i + c_i$ value, it implies that restaurant managers should firstly consider Differentiation Cluster when they choose the other clusters to evaluate customer loyalty. On

the contrary, Brand Image Cluster has the lowest negative $r_i - c_i$ value, it means that Brand Image Cluster receives the most influence from the other clusters and can be seen as the "main effect-factor" among the clusters. Yet, the Brand Image Cluster has near the highest $r_i + c_i$ value. It shows that restaurant managers must pay more attention on the criteria in Brand Image Cluster. Customer Experience Cluster is an extreme. Custom Experience Cluster has the highest $r_i + c_i$ value and almost highest positive $r_i - c_i$ value. It states that Custom Experience Cluster is located in the central role among the four clusters and has the significant relationship with other clusters. It exposes that restaurant managers should frequently consider Customer Experience Cluster with the other clusters. For distinguishing the minor and significant influencer, the threshold value $\alpha = \sum t_{ij}/16 = 2.20022$. If original value of element in $\boldsymbol{T^D}$ is smaller than α, put an asterisk sign "*" on the upper right of that element value as Table 4.5. Based on $\boldsymbol{T^D}$, this article draws the influence diagram of the four clusters as Fig. 4.2.

Table 4.5 The Total Influence Matrix $\boldsymbol{T^D}$

Cluster	B	E	D	M
B	2.09526*	2.06000*	1.84450*	2.32862
E	2.65855	2.12494*	2.11009*	2.64142
D	2.45429	2.22736	1.75800*	2.43334
M	2.39689	2.10663*	1.85333*	2.11027*

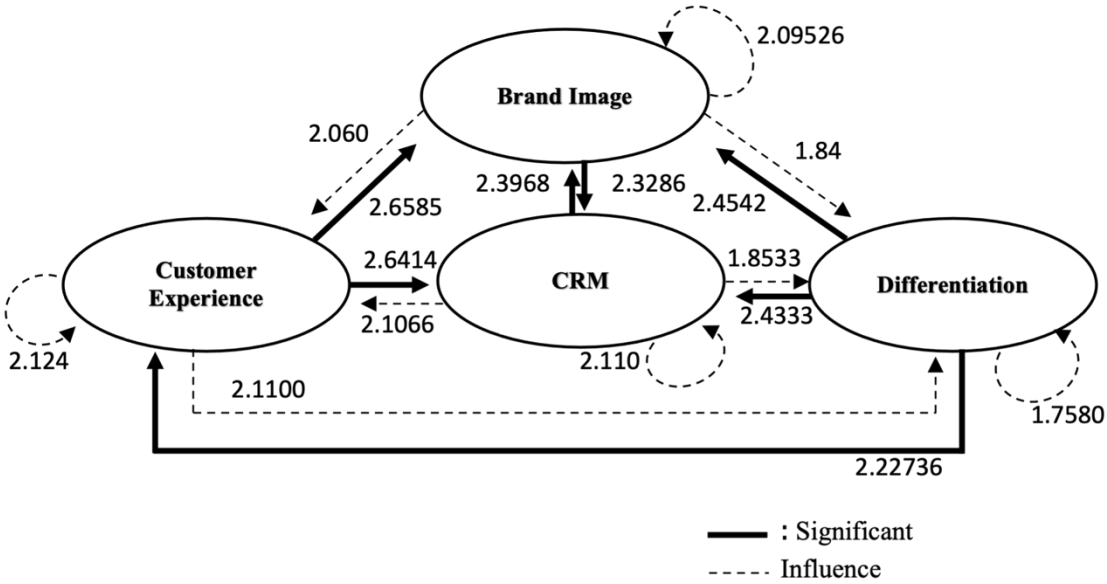

Fig. 4.2 Influence Diagram of the Four

In Fig. 4.2, Differentiation Cluster is the most significant influencer in the four clusters, it means that restaurant managers will firstly consider Differentiation Cluster when building customer loyalty. On the other hand, Brand Image Cluster is most significant influenced by the other clusters, it denotes that when restaurant managers building customer loyalty, the last consideration is Brand Image Cluster.

4.2 Measuring the Priority of Criteria by ANP

For contrasting the priority difference between national-wide chain restaurants and well-known local independent restaurants, in ANP procrdure, the data is collected from seven national-wide chain restaurants and seven well-known local independent restaurants to create fourteen direct super matrixes $\boldsymbol{A_z}$, z =1, 2, …, 14 by interviewing the incumbency restaurant managers to evaluate the important criteria for customer loyalty. In the fourteen direct super matrixes $\boldsymbol{A_z}$, z =1, 2, ..., 7 represent seven national-wide chain restaurants and z =8, 9, ..., 14 denote the other well-known local independent restaurants, respectively.

The average direct super matrix $\boldsymbol{A^A}$ of national-wide chain restaurants and well-known local independent restaurants are calculated by Eq. (9), shown as Table 4.6.1 and Table 4.6.2.

Table 4.6.1 The Average Direct Super Matrix of Chain Restaurants A^A (n=7)

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	1.000	1.374	2.806	7.000	8.000	6.857	3.857	3.589	5.143	4.714	6.286	4.571	3.429
B2	4.071	1.000	**0.409**	3.302	5.857	3.429	1.214	2.071	8.286	4.286	4.857	3.714	2.714
B3	2.556	5.000	1.000	4.286	6.429	6.429	2.429	3.857	3.171	2.371	6.857	4.857	4.857
E1	0.145	1.780	0.621	1.000	4.143	3.857	2.071	1.238	3.429	1.286	1.000	0.873	0.873
E2	0.126	0.369	0.300	0.623	1.000	0.378	0.268	0.272	0.426	0.408	2.505	1.233	0.537
E3	0.254	0.568	0.278	0.628	5.857	1.000	0.510	0.521	1.700	0.581	4.449	5.457	3.369
E4	0.524	1.750	0.778	0.914	6.143	4.429	1.000	2.119	5.000	3.857	6.714	6.571	4.429
D1	1.532	1.628	0.628	1.750	5.571	4.143	2.333	1.000	5.857	3.429	5.143	2.857	2.143
D2	0.396	0.123	1.216	0.548	5.429	2.873	0.311	0.184	1.000	1.512	3.857	2.179	0.768
D3	0.506	0.419	2.473	0.905	5.143	2.714	0.438	0.464	3.163	1.000	4.643	1.679	0.893
M1	0.372	0.434	0.253	1.000	4.607	1.493	0.274	0.398	0.628	0.648	1.000	1.448	0.917
M2	0.509	0.630	0.411	2.143	5.878	1.082	0.261	0.661	2.768	3.018	4.446	1.000	0.530
M3	0.643	0.667	0.405	2.143	4.143	1.475	0.421	0.735	3.929	2.929	3.762	4.286	1.000

Table 4.6.2 The Average Direct Super Matrix of Local Restaurants A^A (n=7)

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	1.000	3.857	3.149	5.429	8.714	7.000	4.571	4.449	1.842	5.071	5.306	2.391	3.954
B2	0.636	1.000	1.645	3.873	7.444	4.608	3.214	2.788	1.582	1.703	4.873	1.891	2.104
B3	2.776	4.873	1.000	5.730	8.714	7.036	7.286	5.143	5.429	6.571	6.857	7.714	6.286
E1	0.335	1.679	1.522	1.000	2.714	2.036	0.804	1.929	1.593	0.749	0.770	0.628	0.574
E2	0.115	1.385	0.115	0.759	1.000	0.367	0.126	1.251	0.135	0.137	0.497	0.275	0.294
E3	0.255	2.507	0.678	1.200	6.571	1.000	0.938	2.493	1.434	1.275	1.200	2.220	1.419
E4	0.412	0.788	0.141	2.786	8.286	4.464	1.000	2.631	1.821	2.476	4.286	1.306	3.000
D1	1.366	3.034	0.397	3.208	7.161	3.324	1.895	1.000	3.893	3.732	3.592	4.020	2.878
D2	2.304	4.159	0.307	4.159	7.714	5.730	2.302	2.524	1.000	6.143	6.571	6.000	5.029
D3	0.537	3.444	0.262	4.048	7.571	5.875	1.044	1.628	0.282	1.000	4.857	2.587	1.735
M1	1.351	1.643	0.253	3.786	5.286	3.743	1.205	1.427	0.261	0.316	1.000	0.239	0.675
M2	3.468	2.925	0.134	3.857	6.286	4.470	1.750	2.246	0.960	1.763	5.429	1.000	1.171
M3	2.239	3.909	0.271	3.429	6.000	4.589	1.187	1.608	1.780	1.521	3.429	1.476	1.000

The initial direct-influence matrix $\boldsymbol{X^A}$ of chain restaurants and local restaurants are calculated by Eqs. (10) and (11), shown as Table 4.7.1 and Table 4.7.2.

Table 4.7.1 The Direct-Influence Matrix $\boldsymbol{X^A}$ of Chain Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.015	0.020	0.041	0.103	0.117	0.101	0.057	0.053	0.075	0.069	0.092	0.067	0.050
B2	0.060	0.015	0.006	0.048	0.086	0.050	0.018	0.030	0.121	0.063	0.071	0.054	0.040
B3	0.037	0.073	0.015	0.063	**0.094**	0.094	0.036	0.057	0.047	0.035	0.101	0.071	0.071
E1	0.002	0.026	0.009	0.015	0.061	0.057	0.030	0.018	0.050	0.019	0.015	0.013	0.013
E2	0.002	0.005	0.004	0.009	0.015	0.006	0.004	0.004	0.006	0.006	0.037	0.018	0.008
E3	0.004	0.008	0.004	0.009	0.086	0.015	0.007	0.008	0.025	0.009	0.065	0.080	0.049
E4	0.008	0.026	0.011	0.013	0.090	0.065	0.015	0.031	0.073	0.057	0.098	0.096	0.065
D1	0.022	0.024	0.009	0.026	0.082	0.061	0.034	0.015	0.086	0.050	0.075	0.042	0.031
D2	0.006	0.002	0.018	0.008	0.080	0.042	0.005	0.003	0.015	0.022	0.057	0.032	0.011
D3	0.007	0.006	0.036	0.013	0.075	0.040	0.006	0.007	0.046	0.015	0.068	0.025	0.013
M1	0.005	0.006	0.004	0.015	0.068	0.022	0.004	0.006	0.009	0.010	0.015	0.021	0.013
M2	0.007	0.009	0.006	0.031	0.086	0.016	0.004	0.010	0.041	0.044	0.065	0.015	0.008
M3	0.009	0.010	0.006	0.031	0.061	0.022	0.006	0.011	0.058	0.043	0.055	0.063	0.015

Table 4.7.2 The Direct-Influence Matrix X^A of Local Independent Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.012	0.046	0.038	0.065	0.104	0.084	0.055	0.053	0.022	0.061	0.064	0.029	0.047
B2	0.008	0.012	0.020	0.046	0.089	0.055	0.039	0.033	0.019	0.020	0.058	0.023	0.025
B3	0.033	0.058	0.012	0.069	0.104	0.084	0.087	0.062	0.065	0.079	0.082	0.092	0.075
E1	0.004	0.020	0.018	0.012	0.033	0.024	0.010	0.023	0.019	0.009	0.009	0.008	0.007
E2	0.001	0.017	0.001	0.009	0.012	0.004	0.002	0.015	0.002	0.002	0.006	0.003	0.004
E3	0.003	0.030	0.008	0.014	0.079	0.012	0.011	0.030	0.017	0.015	0.014	0.027	0.017
E4	0.005	0.009	0.002	0.033	0.099	0.053	0.012	0.032	0.022	0.030	0.051	0.016	0.036
D1	0.016	0.036	0.005	0.038	0.086	0.040	0.023	0.012	0.047	0.045	0.043	0.048	0.034
D2	0.028	0.050	0.004	0.050	0.092	0.069	0.028	0.030	0.012	0.074	0.079	0.072	0.060
D3	0.006	0.041	0.003	0.048	0.091	0.070	0.013	0.020	0.003	0.012	0.058	0.031	0.021
M1	0.016	0.020	0.003	0.045	0.063	0.045	0.014	0.017	0.003	0.004	0.012	0.003	0.008
M2	0.042	0.035	0.002	0.046	0.075	0.054	0.021	0.027	0.012	0.021	0.065	0.012	0.014
M3	0.027	0.047	0.003	0.041	0.072	0.055	0.014	0.019	0.021	0.018	0.041	0.018	0.012

The direct/indirect matrix T^A can be derived from Eq. (12). By Eqs. (13) to (15), the normalized total influence matrix T_N^A is calculated. Then transpose T_N^A as Eq. (16) to gain the unweighted super-matrix W as Table 4.8.1 and 4.8.2.

Table 4.8.1 The Unweighted Super-Matrix W of Chain Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.223	0.601	0.307	0.137	0.207	0.263	0.224	0.366	0.242	0.185	0.327	0.303	0.332
B2	0.319	0.230	0.530	0.597	0.442	0.453	0.487	0.405	0.182	0.201	0.404	0.388	0.375
B3	0.459	0.168	0.163	0.265	0.351	0.283	0.289	0.230	0.575	0.614	0.268	0.309	0.293
E1	0.233	0.207	0.199	0.106	0.228	0.112	0.108	0.137	0.089	0.120	0.144	0.205	0.221
E2	0.374	0.455	0.394	0.417	0.474	0.665	0.509	0.445	0.574	0.541	0.598	0.593	0.513
E3	0.263	0.250	0.296	0.320	0.196	0.157	0.305	0.281	0.290	0.279	0.210	0.157	0.204
E4	0.131	0.088	0.111	0.157	0.102	0.066	0.077	0.137	0.046	0.060	0.049	0.045	0.062
D1	0.235	0.149	0.304	0.194	0.212	0.169	0.181	0.117	0.115	0.134	0.207	0.119	0.113
D2	0.420	0.544	0.407	0.553	0.429	0.546	0.467	0.546	0.412	0.608	0.425	0.446	0.510
D3	0.344	0.308	0.289	0.253	0.359	0.285	0.353	0.337	0.473	0.258	0.368	0.435	0.377
M1	0.449	0.451	0.431	0.420	0.560	0.370	0.409	0.492	0.535	0.577	0.366	0.654	0.442
M2	0.327	0.330	0.311	0.333	0.298	0.394	0.360	0.304	0.324	0.269	0.393	0.223	0.426
M3	0.224	0.220	0.259	0.248	0.142	0.236	0.231	0.205	0.140	0.154	0.241	0.124	0.132

Table 4.8.2 The Unweighted Super-Matrix W of Local Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.168	0.222	0.301	0.139	0.111	0.138	0.271	0.278	0.312	0.167	0.354	0.448	0.319
B2	0.521	0.432	0.572	0.506	0.792	0.683	0.604	0.615	0.603	0.733	0.530	0.483	0.601
B3	0.312	0.346	0.127	0.354	0.097	0.179	0.125	0.107	0.085	0.099	0.116	0.068	0.081
E1	0.210	0.204	0.203	0.174	0.285	0.155	0.181	0.208	0.211	0.216	0.254	0.227	0.220
E2	0.369	0.400	0.351	0.415	0.434	0.585	0.481	0.443	0.401	0.416	0.391	0.397	0.404
E3	0.265	0.244	0.250	0.286	0.197	0.156	0.264	0.231	0.276	0.297	0.261	0.266	0.284
E4	0.156	0.151	0.196	0.125	0.084	0.104	0.073	0.117	0.113	0.072	0.094	0.110	0.092
D1	0.392	0.437	0.328	0.426	0.688	0.454	0.388	0.203	0.313	0.500	0.570	0.438	0.360
D2	0.197	0.262	0.297	0.341	0.149	0.271	0.261	0.388	0.151	0.177	0.197	0.215	0.319
D3	0.411	0.300	0.374	0.234	0.163	0.275	0.350	0.410	0.536	0.323	0.233	0.347	0.320
M1	0.450	0.514	0.371	0.408	0.459	0.323	0.484	0.381	0.400	0.511	0.475	0.627	0.531
M2	0.237	0.238	0.340	0.312	0.271	0.396	0.191	0.350	0.323	0.281	0.210	0.179	0.262
M3	0.313	0.248	0.289	0.280	0.270	0.281	0.325	0.269	0.277	0.207	0.315	0.194	0.207

By Eqs. (17) and (18), employ the cluster weights established in DEMATEL to normalize the total-influence matrix T^D, the normalized total-influence matrix T_N^D is produced as Table 4.9.

Table 4.9 The Normalized Total Influence Matrix T_N^D

Cluster	B	E	D	M
B	0.252	0.247	0.221	0.280
E	0.279	0.223	0.221	0.277
D	0.277	0.251	0.198	0.274
M	0.283	0.249	0.219	0.249

By Eq. (19) The weighted super-matrix W_w of chain restaurants and local restaurants are received, then follows Eq. (20), the limited super-matrix $W^*{}_w$ of chain restaurants and local restaurants are shown as Table 4.10.1 and Table 4.10.2.

Table 4.10.1 The Limited Super-Matrix $W^*{}_w$ of Chain Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
B2	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
B3	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092
E1	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
E2	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123
E3	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
E4	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
D1	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
D2	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
D3	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
M1	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
M2	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088
M3	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052

Table 4.10.2 The Limited Super-Matrix $W^*{}_w$ of Local Restaurants

	B1	B2	B3	E1	E2	E3	E4	D1	D2	D3	M1	M2	M3
B1	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
B2	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158	0.158
B3	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
E1	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053
E2	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101
E3	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
E4	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
D1	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
D2	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053
D3	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
M1	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
M2	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
M3	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071

4.3 Rank the Criteria

Based on the global priority vector by the limited super-matrix $W^*{}_w$, the global weights are ranked. The local weights are the sum of the global weights in the cluster and divided by a criterion in that cluster, which is represent as a criterion relative importance in that cluster. The weights and ranks of the evaluation criteria for chain restaurants and independent restaurants are shown as Table 4.11.1 and Table 4.11.2.

Table 4.11.1 The Weights and Ranks of the Evaluation Criteria of Chain Restaurants

Cluster	Criterion	Local weights	Global weights	Rank
Brand Image	(B1) Corporate Social Responsibility	0.293954	0.079979	7
	(B2) Reputation	0.368351	0.100221	4
	(B3) Social Media Marketing	0.337694	0.091879	5
	The sum of the Global weights		**0.272080**	
Customer Experience	(E1) Customer Satisfaction	0.170206	0.041291	11
	(E2) Product Quality	0.508838	0.123437	2
	(E3) Service Quality	0.239499	0.058100	9
	(E4) Atmosphere	0.081457	0.019761	13
	The sum of the Global weights		**0.242591**	
Differentiation	(D1) Price Effectiveness	0.180072	0.038841	12
	(D2) Product Innovation	0.471216	0.101640	3
	(D3) Product Attribute	0.348712	0.075217	8
	The sum of the Global weights		**0.215698**	
Customer Relationship Management	(M1) Trust	0.481286	0.129770	1
	(M2) Loyalty Program	0.325620	0.087797	6
	(M3) Customization	0.193094	0.052064	10
	The sum of the Global weights		**0.269631**	

Table 4.11.2 The Weights and Ranks of the Evaluation Criteria of Local Restaurants

Cluster	Criterion	Local weights	Global weights	Rank
Brand Image	(B1) Corporate Social Responsibility	0.250157	0.068063	7
	(B2) Reputation	0.582061	0.158367	1
	(B3) Social Media Marketing	0.167782	0.045650	12
	The sum of the Global weights		**0.272080**	
Customer Experience	(E1) Customer Satisfaction	0.218125	0.052915	10
	(E2) Product Quality	0.416214	0.100970	3
	(E3) Service Quality	0.249871	0.060617	9
	(E4) Atmosphere	0.115790	0.028090	13
	The sum of the Global weights		**0.242591**	
Differentiation	(D1) Price Effectiveness	0.442606	0.095469	4
	(D2) Product Innovation	0.245018	0.052850	11
	(D3) Product Attribute	0.312377	0.067379	8
	The sum of the Global weights		**0.215698**	
Customer Relationship Management	(M1) Trust	0.463472	0.124966	2
	(M2) Loyalty Program	0.271450	0.073191	5
	(M3) Customization	0.265077	0.071473	6
	The sum of the Global weights		**0.269631**	

Observe Table 4.11.1, the criteria priority of global weights for chain restaurants is ranked as: Trust > Product Quality > Product Innovation > Reputation > Social Media Marketing > Loyalty Program > Corporate Social Responsibility > Product Attribute > Service Quality > Customization > Customer Satisfaction > Price Effectiveness > Atmosphere. The national-wide chain restaurant managers rank the most important criterion in each cluster from the local weight is: Reputation Criterion in Brand Image Cluster, Product Quality Criterion in Customer Experience Cluster, Product Innovation Criterion in Differentiation Cluster, and Trust Criterion in Customer Relationship Management Cluster. In Table 4.11.2, the criteria priority of global weights for local independent restaurants is ranked as: Reputation > Trust > Product Quality > Price Effectiveness > Loyalty Program > Customization > Corporate Social Responsibility > Product Attribute > Service Quality > Customer Satisfaction > Product Innovation > Social Media Marketing > Atmosphere. The well-known local independent restaurant managers rank the most important criterion in each cluster from the local weight is Reputation Criterion in

Brand Image Cluster, Product Quality Criterion in Customer Experience Criterion, Price Effectiveness Criterion in Differentiation Cluster, and Trust Criterion in Customer Relationship Management Cluster.

According to Table 4.11.1 and 4.11.2, the top three factors for national-wide chain restaurants and well-known local independent restaurants both include "Trust Criterion" and "Product Quality Criterion". Research results show that both types of restaurant managers emphasize building trust and maintaining good product quality as important factors when establishing of customer loyalty. On the contrary, "Atmosphere Criterion" was ranked the last criterion for both national-wide chain restaurants and well-known local independent restaurants in terms of building customer loyalty. Atmosphere is considered relatively less important compared to other criteria, and restaurant managers believe that most customers are still more concerned about the experience of the products themselves. Therefore, Atmosphere was placed at the bottom of the list of considerations. Table 4.11.1 shows that "Product Innovation Criterion" is the third important factor, whereas in Table 4.11.2, it is ranked in eleventh. National-wide chain restaurant managers believe that product innovation is quite important for them because they are spread out across the country and need to respond to changes in market demand, serve a variety of customers with different and changing preference, and compete with other competitors. Therefore, national-wide chain restaurants must continuously offer diversified products and launch new products to attract more customers, increase sales, enhance brand awareness to differentiate themselves from competing peers for improving customer loyalty. On the other hand, the well-known local independent restaurants typically sell a single or limited item and mainly focus on serving local customers. Well-known local independent restaurant managers believe that most of their customers are searching for recalling the memory of “the traditional old sweet flavor”, in such case, the local independent restaurants do not want to introduce new products and place greater emphasis on maintaining the original taste and consistent quality.

5. Conclusion

The low entrance threshold and imitation barriers of restaurant industry attracts many businesses being fervent to join this arena. As the increasing choices for customers arise fierce competition in Taiwan restaurant industry. For maintaining even increasing restaurant performance, the issue of how to build customer loyalty for encouraging customers to visit their restaurants repeatedly is therefore an essential challenge for every restaurant manager.

According to the research results, this article suggests that the restaurants managers have to pay more attention on the Differentiation Cluster and do not distracted by Brand Image Cluster. Furthermore, the national-wide chain restaurant (well-known local independent restaurant) managers must focus heavily on the Trust, Product Quality, and Product Innovation Criteria (Reputation, Trust, and Product Quality Criteria). As for Customer Satisfaction, Price Effectiveness, and Atmosphere criteria (Product Innovation, Social Media Marketing, and Atmosphere criteria), those are just located at the middle place for national-wide chain restaurant managers and well-known local independent restaurant managers respectively while building customer loyalty. The research results of this article can provide suggestions to the potential restaurant managers when they plan to enter into restaurant industry. In addition, understanding the different focuses for the national-wide chain restaurant managers who are pursuing the service consistence for all their branch restaurants while the well-known local independent restaurant managers who are insisting in maintaining traditional uniqueness, the founding of this article may provide a guideline for the well-known local independent

restaurants who are preparing to expand their operation scale to national-wide chain restaurants. Past scholars have proposed many studies on customer loyalty in restaurant industry, with a focus on understanding the factors that influence customer loyalty from the perspective of customers. This article evaluates the importance ranking of criteria for building customer loyalty in the restaurant industry from the perspective of industry managers, and provides a reference for industry managers to establish customer loyalty. It identifies the criteria that are relatively important for building customer loyalty, and provides guidance for aspiring entrepreneurs in the restaurant industry on how to run a restaurant and enhance customer loyalty.

Considering the variety forms of restaurants, from street vendors, road-side stalls, to luxurious high-end restaurants, the criteria and priority of building customer loyalty must be differentiated. This article simply separates the different types of operation models into national-wide chain restaurants and well-known local independent restaurants and does distinguish the diversity modes of operation. Yet, the results of this article may provide as a start point for future research in this field.

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