

# Enhancing customer dining experience through biophilic design: a case study analysis of restaurants

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**Abstract.** Biophilic design (BD) is the integration of nature into built environments to best improve human well-being. This paper aims to investigate how biophilic elements affect the dining experience in particular Klang Valley, Malaysia, restaurants. The study applies quantitative as well as qualitative approaches. This research examined the BD elements present in many restaurant settings using qualitative observation. In line with accepted BD theory, the findings were documented and investigated utilising site images. Apart from the qualitative studies, a quantitative survey was carried out among customers of the restaurants to assess their dining experiences with particular reference to the integration of BD elements. This research aimed to explore the effect of BD implementation on dining experiences of restaurant occupants and maybe identify the preferred BD of the restaurant by means of a purposive sample technique. The survey findings imply that the dining experience is much improved by include BD components, particularly those that provide a visual connection to nature. This research provides important new perspectives on the usage of BD in Malaysian restaurants, therefore guiding designers and architects in selecting and implementing effective biophilic approaches to possibly improve customers satisfaction.

## 1 Introduction

The dining experience is a complicated concept with psychological, social, and emotional components in addition to the basic food-related ones. Several studies have shown how important the dining surroundings are for affecting customer impressions and satisfaction [1, 2]. By building a harmonic atmosphere that combines physical space, service, and mood, the aesthetic quality of a restaurant greatly improves the dining experience. According to Horng and Hsu [3], a well-designed visual environment may improve emotional reactions, hence fostering client contentment. This is consistent with BD ideas, which underline the need of

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including natural surroundings and aesthetically appealing design to enhance the whole dining experience. Because of growing interest in sustainable and holistic design techniques, BD has evolved into a major paradigm for enhancing dining environments. Based on the inherent human impulse to establish a connection with the environment [4], BD is a concept that combines natural elements into built environments. Based on past research and looking at its relationship to BD ideas, this introduction presents a brief analysis of the dining experience.

## **1.1 Dining Experience in Relationship with the Environment**

### *1.1.1 Environmental Impact*

The surroundings greatly affects the dining experience as they combine many psychological and physical elements that mould consumer impressions and contentment. Environment influences consumer experience and behavioural intentions by incorporating psychological and physical components [5]. A well-designed dining environment could help to make the experience more enjoyable and memorable. The BD implementation at the chosen restaurants will be discussed using a known BD theory, which will be further expanded in the parameter section including lighting, temperature, air quality, and acoustics which influence the dining experience. Proper lighting may create a warm, inviting environment, while natural light can boost mood and decrease stress [6]. Biophilic architecture with wide windows, skylights, and light shelving maximises natural light, making meals more comfortable. Natural light makes diners feel more calm and comfortable, according to research [7]. Proper ventilation and indoor plants increase air quality and provide a healthier dining atmosphere [8]. A well-planned layout may improve mobility, privacy, and closeness or openness. The plan may use BD features including natural materials, organic forms, and patterns to connect with nature. Wood, stone, and natural fabrics produce a warm, earthy vibe, while water elements and green walls bring calm and freshness [9]. BD patterns like prospect and refuge [10] may provide diners clear views of the surroundings (prospect) and a safe, contained environment (refuge) [6]. Sights, sounds, and fragrances affect dining experiences. Natural components may improve sensory perception. Environments with plants, water features, and natural landscapes may be relaxing [11]. Water, singing, and rustling leaves help cover noise and relax you [12]. The dining experience also depends on aromas. The scent of fresh flowers, herbs, or wood may improve the room. Strategic plant placement, natural materials, and water features may combine these components into BD [8].

### *1.1.2 Emotional and Psychological Impact*

The emotional and psychological influence of the dining space shapes the experience. Positive and stress-free environments boost satisfaction and promote return visits [1]. Biophilic architecture connects people to nature to improve mental health [4]. Besides, it was known that incorporation of nature can even induce therapeutic enhancement towards children with special needs [13]. Natural components may alleviate stress, increase mood, and boost cognition [14]. The meal experience might be more joyful and rejuvenating. Diners who feel comfortable and pleased in a nature-inspired atmosphere are more satisfied with the cuisine and service [15].

Social contact and community are also affected by the dining setting. Dining in communal spaces that foster belonging may improve the experience. BD creates welcoming, pleasant public areas that encourage socialisation [6]. For instance, community tables or cosy corners

may make meals more convivial. Green walls and indoor gardens may develop a feeling of community and connection to nature [9].

### 1.1.3 Relating Dining Experience Aspects to BD

By use of BD, these dining experience might be investigated to better grasp how inherent elements enhance the surroundings. Using BD theories such as Browning et al.'s 14 Patterns of BD, we may create helpful, well-being, and pleasurable dining environments. A location may be calm and peaceful depending on natural light (Pattern 1: Visual Connection with Nature) and water features (Pattern 5: Presence of Water). The region may get warmth and comfort from natural materials and organic shapes (Pattern 7: Material Connection with Nature) [16]. The dining experience and environment are related, various elements influence the pleasure of the diners. BD might make meals more enjoyable by enhancing their social, emotional, and sensory components as well as their taste. By integrating natural elements into restaurant settings, BD provides a useful foundation for appreciating and improving the dining experience. The dining experience is multi-faceted, with social, emotional, and sensory aspects all of which BD ideas may help to shape. Using BD in restaurants helps to create environments that not only look great but also support visitors' comfort, well-being, and happiness.

## 1.2 BD Parameters

To support health and well-being, BD includes nature into constructed spaces. Developed by Browning, Ryan, and Clancy [16], the 14 Patterns of BD provide a comprehensive methodical methodology for adding biophilic aspects into various settings. Three separate groupings comprise this collection of patterns which are Nature in the Space, Natural Analogues, and Nature of the Space. Table 1 lists the parameter BD patterns which can be found in the study.

**Table 1.** BD patterns outlined by Browning (2014) used as study parameter.

Element	Patterns	
Nature in the Space	1. Visual Connection with Nature	5. Presence of Water
	2. Non - Visual Connection with Nature	6. Dynamic and Diffuse Light
	3. Non – Rhythmic Sensory Stimuli	7. Connection with Natural Systems
	4. Thermal and Airflow Variability	
Natural Analogues	8. Biomorphic forms and patterns	10. Complexity and Order
	9. Material connection with Nature	
Nature of the Space	11. Prospect	13. Mystery
	12. Refuge	14. Risk / Peril

Browning's 14 Patterns of BD's choice for this research is validated by their thorough and pragmatic approach to include biophilic features. Browning et al.'s patterns provide a thorough and practical manual fit for many situations, including eating venues, unlike those of other frameworks. While useful, other frameworks—such as those put forward by Kellert [6] or Beatley [17], are more general and less prescriptive, which makes Browning's patterns more appropriate for concentrated research on particular environments like restaurants.

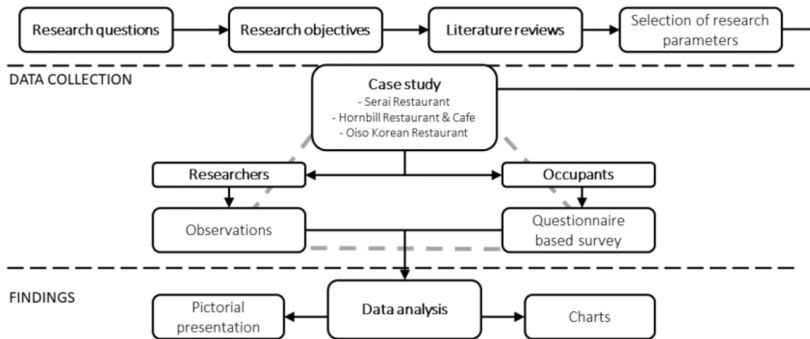
## 2 Methodology

This research used a mixed-method methodology to investigate the influence of branding diversity (BD) on dining experiences in selected restaurants. The technique consists of two

distinct phases: qualitative and quantitative. During the first stage, comprehensive observations and photographs are used for qualitative analysis. Three restaurants were chosen for its elaborate implementation of BD in the space. The author will observe biophilic patterns based on the parameter established by Browning on-site to study on the BD implementation in the restaurant space. Comprehensive site pictures will record these components and be analysed using BD parameter from the literature research.

The second step uses quantitative surveys and questionnaires through a purposive sampling technique. Customers' dining experiences in the chosen restaurants will be assessed using a thorough questionnaire. Survey was distributed to 40 customers for each of the restaurant using a purposeful sample method, therefore guaranteeing participation' genuine status as customers. Ambiance, comfort, aesthetics, and biophilic element emotions will be surveyed. To guarantee a varied sample, questionnaires will be delivered in-person and online. To find relationships between BD and consumer perceptions, descriptive and inferential statistics will be used.

The last step combines qualitative and quantitative results. Compare observational data with survey findings to find similarities and differences. These integrated data will be analysed to determine how biophilic architecture improves dining experiences. A detailed research will identify biophilic components that greatly improve dining experiences and give restaurant design suggestions. This mixed-method research seeks to assess BD's ability to enhance dining experiences and well-being.



**Fig. 1.** Shows flowchart of the study's general process methodology.



### 3 Results & Discussions

#### 3.1 BD Analysis of the Selected Restaurants



All of the selected restaurants were analysed for its BD implementation in the spaces and how the spaces were designed to cater for the different context of the site in Malaysia. Selected restaurants are located around Klang Valley. The analysis of the BD implementation found in the spaces of the restaurants were tabulated as the table 2, Table 3 and Table 4 below with photos of spaces in the restaurants and descriptive analysis based on the established parameter by Browning.

**Table 2.** Analysis of Serai Restaurant, at Paradigm Mall.

Indoor dining area	<b>1. Visual Connection with Nature</b> – The space is decorated with lush trees scattered around the space.
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	<p><b>6. Dynamic and Diffuse Light</b> - The play of interior space with glazing connecting towards daylighting from the skylight of the mall create that interplay of nature's lighting.</p> <p><b>8. Biomorphic Forms &amp; Patterns</b> – The design of curved bamboo fixture portray the look of wrapping trees with the use of bamboo to capture the nature's envelope.</p> <p><b>9. Material connection with Nature</b> – Use of material from wood and bamboo as the finish and furniture.</p> <p><b>12. Refuge</b> – The curved bamboo fixture that connect the wall to the ceiling create that feels of enclosure into the space.</p>
<p>Outdoor dining area</p> 	<p><b>1. Visual Connection with Nature</b> – The space is decorated with luscious hanging potted plants around the space.</p> <p><b>6. Dynamic and Diffuse Light</b> –Massive skylight of the mall that welcome daylighting into the space</p> <p><b>9. Material connection with Nature</b> – Use of material from wood and bamboo as the overall interior finish and furniture</p>
<p>Application of BD patterns in the restaurant : <b>1, 6, 8, 9, 12</b></p>	

**Table 3.** Analysis of BD Patterns in Hornbill Restaurant & Cafe, at KL Bird Park.

<p>Indoor dining area</p> 	<p><b>1. Visual Connection with Nature</b> – The space overlooking opened door greeted with luscious trees in the outdoor dining space.</p> <p><b>4. Thermal and Airflow Variability</b> – Cross ventilation promoted through the opened door.</p> <p><b>6. Dynamic and Diffuse Light</b> – The play of interior space with fairly dimmed light contrasting with the outdoor daylighting.</p> <p><b>9. Material connection with Nature</b> – Use of material from wood as the overall interior finish and furniture</p> <p><b>12. Refuge</b> – The vantage point of the space with opened door creates a framed vista of the outdoor makes the indoor space feels like in an enclosure and sense of protectiveness from the outside dining area.</p>
<p>Outdoor dining area</p> 	<p><b>1. Visual Connection with Nature</b> – The outdoor dining surrounded with massive views of surrounding wrapped with luscious plants and trees.</p> <p><b>2. Non-visual Connection with Nature</b> – auditory perception of animals such as bird and insect sounds, accompanied with the aroma of flowers and tree leaves in the encompassing environment.</p> <p><b>3. Non – Rhythmic Sensory Stimuli</b> – The expansive views of the nature induced surrounding with unpredictable occurrence of birds coming by and go.</p> <p><b>4. Thermal and Airflow Variability</b> – Cross ventilation in the open space.</p> <p><b>6. Dynamic and Diffuse Light</b> – The daylight connection in the space with interplay of the tree branches creating shadow and light diffusion.</p> <p><b>7. Connection with Natural Systems</b> – The sighting of various different birds with possible interaction with it.</p> <p><b>9. Material connection with Nature</b> – Use of material from wood as the overall interior finish and furniture.</p> <p><b>11. Prospect</b> – The vast view towards the KL Bird Park can be seen from the dining area.</p> <p><b>12. Refuge</b> – The lower ceiling height design in this outdoor space creates feeling of enclosure and intimate in the space.</p>
<p>Application of BD patterns in the restaurant : <b>1, 2, 3, 4, 6, 7, 9, 11, 12</b></p>	

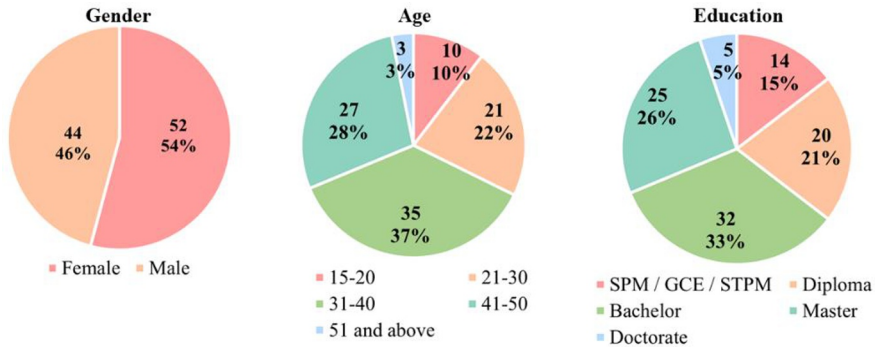
**Table 4.** Analysis of BD Patterns in Oiso Korean Restaurant, Bangsar South.

<p style="text-align: center;">Indoor dining area</p> 	<p><b>1. Visual Connection with Nature</b> – The interior space is decorated with artificial tree at the centre and few hanging plants.</p> <p><b>5. Presence of Water</b> – The mini water fountain fixture connects the space with the sighting and sounds of the water fountain.</p> <p><b>6. Dynamic and Diffuse Light</b> - The play of interior space with abundance of pendant lights create dynamic lighting with connection of daylighting from the fully glazed entrance side.</p> <p><b>8. Biomorphic Forms &amp; Patterns</b> – The design of the interior was scattered, and greeted with flowy curved water fountain fixture at the entrance side.</p> <p><b>9. Material connection with Nature</b> – Use of material from wood and bamboo as the finish and furniture.</p> <p><b>10. Complexity and order</b> – The wall of the interior are decorated with different texture of material such as pebbles, bricks and roof tiles with irregular design.</p> <p><b>12. Refuge</b> – The curved bamboo fixture that connect the wall to the ceiling create that feels of enclosure into the space.</p>
<p style="text-align: center;">Outdoor dining area</p> 	<p><b>1. Visual Connection with Nature</b> – The outdoor space is surrounded with creeper plants and expansive view of luscious trees of the adjacent landscape area.</p> <p><b>2. Non-visual Connection with Nature</b> – auditory perception of animals such as bird and insect sounds from the surrounding</p> <p><b>3. Non – Rhythmic Sensory Stimuli</b> – The landscape nearby promotes natural occurrence such as birds sightings and change of weather.</p> <p><b>4. Thermal and Airflow Variability</b> – Cross ventilation in the open space.</p> <p><b>5. Presence of Water</b> – The mini water fountain fixture also available in the outdoor area connects the space with the sighting and sounds of the water fountain.</p> <p><b>6. Dynamic and Diffuse Light</b> - The space greeted with direct access towards sunlight and play of creepers create dynamic lighting composition.</p> <p><b>7. Connection with Natural Systems</b> – The sighting of birds, animals, plants and flowers in the adjacent landscape area.</p> <p><b>11. Prospect</b> – The vast view of the open landscape area can be seen from the space.</p>
<p>Application of BD Patterns in the Restaurant : <b>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12</b></p>	

### 3.2 Perception of Occupants on the Dining Experience

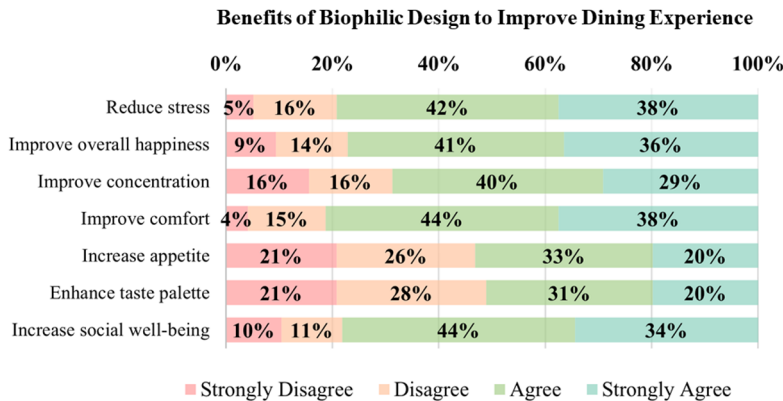
The perceptions of the occupants will also be examined in this research to help to better grasp how BD installation affects their dining experience. Therefore, it was imperative to conduct a research based on questionnaires targeting individuals who had visited these eateries. This study asked customers of the three selected restaurants for their experience via a survey. The survey was distributed both online and physically, and after meticulous screening, only 96 replies were judged legitimate. This approach guaranteed that the data used for the study was accurate and faithfully reflecting the actual client experience. The discarded replies included inconsistent responses or incomplete questionnaires, therefore compromising the results. The survey investigates the impact of BD on the dining experience in the restaurant, as well as

the significance of different biophilic patterns seen in the restaurant spaces of the case study. Pie Chart 1 given below shows the participants' demographic traits.



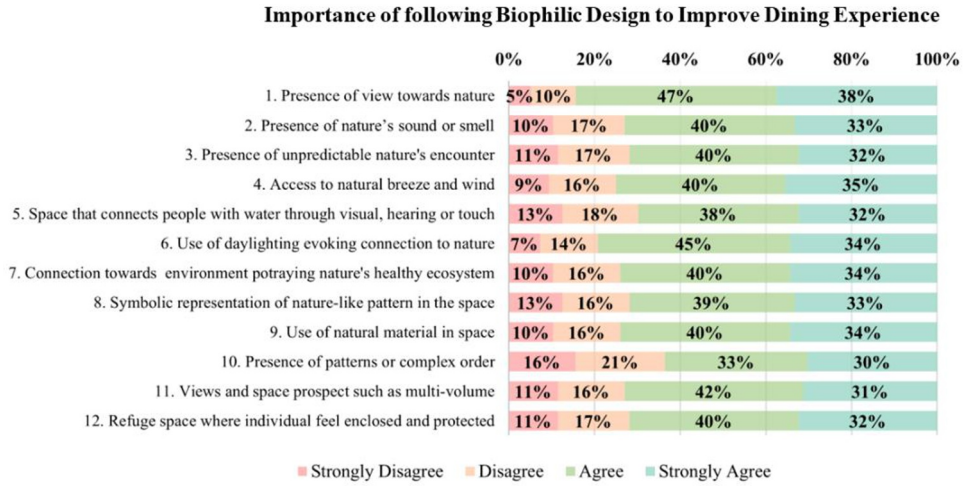
**Chart 1.** Shows the respondents' gender, age and education demographics.

Implementing BD in a space may provide several advantages to the people using the area. Will the use of BD in restaurant dining environments also provide major benefits to the restaurant diners? According to Chart 2, most participants expressed strong agreement or agreement about the many advantages of BD, as determined by the characteristics outlined in the literature research. The aspect that received the highest level of agreement was the enhancement of comfort.



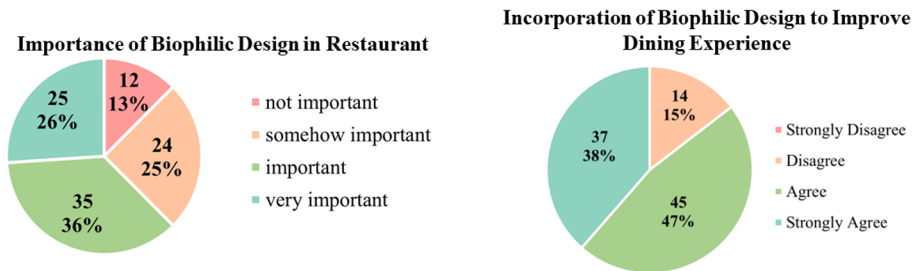
**Chart 2.** Benefits of following BD to improve dining experience in the restaurant.

Chart 3 shows that most survey participants agreed with the relevance of the many BD elements and features of the selected restaurant case studies. The most widely accepted BD pattern of utmost significance is 1. Visual Connection with Nature, and the next is 6. Dynamic and Diffuse Light with the rest of the patterns to be closely tied for its importance. However, 10. Complexity and Order is considered the least essential among the other features which is still considered important with agreement of 63% of the respondents.



**Chart 3.** Importance of following BD to improve dining experience in the restaurant.

According to chart 4, most of the respondents expressed agreement that BD enhances their dining experience in the restaurant. Hence, it can be anticipated that almost all of the participants recognise the significance of BD in the creation of restaurant dining space.



**Chart 4.** Importance of BD in restaurant and perception of incorporation of BD to improve dining experience in the restaurant.

## 4 Discussion

The findings from the research highlight the significant impact of BD on enhancing the dining experience in selected restaurants in Malaysia. All three restaurants demonstrated a strong visual connection with nature, featuring elements such as indoor plants, views of outdoor greenery, and natural decor. This pattern was highly appreciated by customers, as indicated by the survey results, which highlighted it as the most significant BD element. The presence of natural views and greenery creates a calming and aesthetically pleasing environment, enhancing the overall dining experience [6]. Similarly to previous researches, it was found in Malaysia, that Visual Connection with Nature is the most preferred pattern by the occupants in communal space of workplace [18, 19] and libraries [20]. Few of the chosen restaurants with design implementation of skylight, windows and apertures, clearly used natural lighting and the interaction of light and shadow which aligned with the BD implementation. Customers gave this design great ratings as well, which reflects its significance in creating a friendly environment. Studies have shown that natural light improves mood and well-being, which influences eating experiences more favourably [21]. Every restaurant revealed the great usage of natural materials like bamboo and wood. This relationship with nature

enhances not only the visual attractiveness but also the comfort and warmth by means of material connection.. The survey results supported this, indicating a strong preference for natural materials in dining spaces. Oiso Korean Restaurant incorporated water elements, such as a mini water fountain, which contributed to the sensory experience of the dining environment. The sound and sight of water can have a soothing effect, further enhancing the dining experience.

The survey results indicated that the enhancement of comfort was the most agreed-upon benefit of BD. Natural elements such as greenery, natural light, and water features contribute to creating a comfortable and relaxing environment. This finding is in line with the body of current research stressing the need of comfort in consumer pleasure and whole dining experience [1]. Strong agreement on the relevance of different BD patterns was shown by participants; visual connection with nature and dynamic and diffuse light is the most crucial. These elements are crucial in creating an engaging and pleasant dining environment. The least essential pattern, complexity and order, still received significant agreement, indicating that even less prominent biophilic elements are valued by customers. The majority of respondents agreed that BD enhances their dining experience. This underscores the importance of integrating natural elements into restaurant design to meet customer expectations and improve satisfaction. The positive perception of BD elements aligns with previous studies that demonstrate the benefits of nature-inspired design in promoting well-being and satisfaction [22].

## 5 Conclusions

The practical consequences of the study's findings and results extend to the field of restaurant interior design. Integrating BD elements can significantly enhance the dining experience, leading to increased customer satisfaction and loyalty. In order to create a more welcoming and pleasant atmosphere, restaurant owners and designers should contemplate the integration of natural elements, such as vegetation, natural illumination, and water features, into their premises. Additionally, understanding the specific BD patterns that customers value most can guide targeted design interventions.

The integration of BD patterns such as introduction of plants, view towards nature, natural lighting, sound of nature, water element and more, in restaurant environments significantly enhances the dining experience, as evidenced by both the qualitative analysis of selected restaurants and the quantitative survey of occupants' perceptions. Visual connection with nature, dynamic and diffuse light, and material connection with nature were identified as the most impactful biophilic patterns. These results emphasise the need of integrating natural motifs into restaurant architecture to provide welcoming, cosy, and gratifying dining environment. By leveraging BD principles, restaurant owners and designers can improve customer satisfaction, promote well-being, and ultimately contribute to the success of their establishments.

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