

Exploration of constructing the catering quality indices of university canteens in China from the viewpoint of food safety

Importance of
the catering
quality indices

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Abstract

Purpose – This study used the literature review and the modified Delphi method to evaluate the importance of the catering quality indices of university canteens in China. In order to compile the catering quality indices of university canteens in China as reference for the subsequent improvement of Chinese canteens.

Design/methodology/approach – This study first analysed literature data to establish the preliminary quality indices and used the modified Delphi method for measurement. After three rounds of Delphi analysis by 35 experts, the results of the catering quality indices of university canteens in China are summarised.

Findings – The research results show that university canteen catering quality issues are divided into six dimensions, including catering safety management, employee hygiene management, catering service, food quality, environmental atmosphere and corporate social responsibility. Catering safety management is the most important index, followed by employee hygiene management.

Originality/value – The research results can be used as suggestions for follow-up improvements in the quality of university canteens in China and a basis of reference for amendments to relevant national or local laws and regulations. The food prices, food quality and whether food hygiene and safety standards are met by university canteens are all related to the health and vital interests of the teachers and students, as well as the stability of the university. Therefore, the government should increase supervision in these aspects to avoid decline in the quality of meals due to low profits and enforce strict requirements for food safety.

Keywords Modified delphi method, Food safety, University canteens, Catering, Food quality

Paper type Research paper

1. Introduction

According to the food quality indices, as prescribed by the International Organisation for Standardisation, food quality can be interpreted as the sum of the characteristics and features of food that satisfy customers, as well as the expected and unexpected impacts on relevant parties (ISO, 2018). Food quality is one of the most important considerations for consumers when choosing food, and maintaining good food quality is the only way to succeed in restaurant operations. Currently, more and more people are paying increased attention to food quality under the premise of ensuring food safety; for example, as they believe in higher



food safety, many Chinese are willing to pay a higher price to buy organic foods (Guo *et al.*, 2019).

In recent years, food safety incidents have occurred frequently all over the world. In 2010, the World Health Organisation reported that there were approximately 600 million food borne cases and 420,000 people died from food poisoning (World Health Organisation, 2015). In view of China's large and highly concentrated population, food quality and safety issues have been attracting continuous public attention.

Students at school, employees at workplaces and patients in hospitals demand ready to eat meals. Therefore, food catering companies are responsible for supplying meals to schools, hospitals and private companies, which are not capable of producing and providing meal on their own (Tufano *et al.*, 2020). The catering industry is a labour- and technology-intensive industry, especially in universities. To provide cost-effective, safe and tasty meals, these two issues have to be carefully managed through advanced decision-support systems and planning techniques (Tufano *et al.*, 2019). In China, there are a large number of faculty, employees and students in universities with a high volume of catering production, diverse consumer groups and extensive social impacts. One study showed that, although college students were concerned about food safety issues (95.1%), their food safety knowledge score was only about 60%, and 77.1% of students would buy unsafe food (Luo *et al.*, 2019). However, food safety, food quality, service and ambience are all commonly agreed upon attributes of catering quality. When the quality of a restaurant's attribute (i.e. food quality) increases, there is a corresponding positive increase in customer behavioural intention (Bujisic *et al.*, 2014).

If university canteens can be required to attach greater importance to food safety and catering quality, they will also pay more attention to the health of college students. To improve school canteen conditions, the basis for considering the quality of school canteens has shifted from the previous research on food safety to consumer willingness for catering operations. Thus, it can be observed that catering quality considerations have become more diverse. Therefore, in order to define the considerations for the catering quality indices of university canteens in China, this study considered the viewpoints of food safety to discuss the important items of catering quality in university canteens. This study first analysed literature data to establish the preliminary quality indices and used the modified Delphi method for measurement. The catering quality of university canteens were discussed from the perspectives of industry veterans, education experts and government officials to develop the importance assessment of the catering quality indices of university canteens in China and to compile the catering quality indices of university canteens in China as reference for the subsequent improvement of Chinese canteens.

2. Literature review

2.1 Food safety

Food safety refers to the need to ensure consumers' health in all stages of production, preparation, transportation and sales of food ingredients while simultaneously considering the environment at the time of consumption and the nutritional information of the food ingredients (Baert *et al.*, 2011). In addition, when considering food safety, most consumers consider food-related chemical substances, preservatives and additives. Food safety is currently one of the most globally important factors of health concerns. In the latest revision of "Food Safety Law of the People's Republic of China", food safety is defined as: food shall be non-toxic, harmless and conform to nutritional requirements and shall not cause any acute, subacute or chronic harm to human health (China Legal Publishing House, 2019).

The Chinese Government has realised the seriousness of the current food safety issues, successively introduced a series of laws and regulations and established a complex food

control management, monitoring and inspection system (Jia and Jukes, 2013). While the ministry of health is responsible for overall coordination, part of the responsibility is shared by the ministry of agriculture (edible agricultural products), the general administration of quality supervision, inspection and quarantine (food production/manufacturing), the ministry of industry and commerce (distribution and retail), and the state food and drug administration (catering industry), and can be divided into three parts: the basic laws, laws and regulations formulated by various ministries and ministerial committees in accordance with the basic laws and orders of the state council and various regulations promulgated by provincial governments (Guo *et al.*, 2019).

China's food safety regulatory agencies assume regulatory obligations to food production companies, and such companies are primarily responsible for food safety. However, due to insufficient coordination between regulatory agencies, inadequate law enforcement and ineffective government supervision, weak links still exist, especially in terms of implementation. Despite all efforts, some foods still fail to meet the established quality, safety and compliance standards; thus, the food safety legal system in China is far from complete (Huang and Yang, 2017).

It is not enough to rely solely on government supervision or market regulation for food safety supervision in catering services, instead, government supervision, market regulation, social supervision and industry self-discipline must be combined. The state is paying more and more attention to food safety governance, and since the 18th national congress of the communist party of China, food safety governance has been raised to a new level, and strict regulatory requirements have been put forward. In May 2015, General secretary Xi Jinping proposed the "four most stringent" food safety systems, which emphasise the use of "the most stringent standards, the strictest supervision, the most severe penalties, and the most serious accountability" to ensure food safety (He *et al.*, 2020).

2.2 Factors affecting catering quality

There are many factors that affect catering quality. Röhr *et al.* (2005) suggested that food hygiene and safety are closely related to consumers' trust in products. By strengthening inspections to confirm food safety and hygiene, consumers are willing to pay high prices to buy food that has passed inspections to ensure food safety. The most important catering quality is the food itself, including microbiological and sensory aspects, such as smell, taste and visual appeal; while the texture, appearance and flavour of food are the three main performance factors (Seo and Shanklin, 2005). Sulek and Hensley (2004) pointed out that the three main characteristics that determine food quality are food safety, food attractiveness and food acceptance, including taste, appearance, texture, colour, temperature and serving size. Freshness is also an important indicator (Peneau *et al.*, 2006). From Pettijohn *et al.* (1997) studied the quick service restaurant customers graded food quality considerably higher than the four attributes of cleanliness, value, price and convenience. Namkung and Jang (2007) recognised the six dimensions of presentation, variety, healthy options, taste, freshness and temperature.

Parasuraman *et al.* (1988) defined service quality as the comparison between the customer's personal experience after receiving the service and the customer's expectation of the service. Service quality as the overall evaluation of or attitude towards service superiority, and the difference is the actual service performance is higher than expected. Seo and Shanklin (2005) pointed out that, in addition to the characteristics of the food itself, environmental factors will also affect customers' perceptions of the quality of food, such as the types of food selected, the decoration of the restaurant, the presentation of background music and dining etiquette in line with the restaurant's environment. Corporate social responsibility (CSR) has become an increasing concern of business managers as companies

are evaluated not only on safety, ethical and financial considerations but also on social performance. From the perspective of CSR, food companies frequently focus to broaden interests, and there is an increasing need for them to respond to the challenges and responsibilities posed by sustainability (Forsman-Hugg *et al.*, 2013). Restaurant firms have also implemented environment friendly and energy-saving business practices, such as the use of energy efficient fuel (Elan, 2008). Forsman-Hugg *et al.* (2013) identified seven key dimensions of food chain CSR: environment, product safety, corporate nutritional responsibility, occupational welfare, animal health and welfare, local market presence and economic responsibility.

This study is divided into the following aspects: catering safety management (including overall management, production process and environmental management of the catering factory), employee hygiene management (including health and hygiene management of employees), catering service (including catering services and consumer response), food quality (including nutrition and appearance and taste of food), environmental atmosphere (including atmosphere and cleanliness of the dining environment) and CSR (including compliance with the laws and regulations, food adulteration, green environmental protection and sustainability).

2.3 Current status of catering quality in canteens in China

Wang *et al.* (2019) pointed out that the public's confidence in the food made in China has been severely challenged because of the food safety scandal that China has experienced in the past few years. Food safety has also become one of the most challenging social issues in China that must be addressed. With the increasing number of food safety incidents exposed by the mass media, society and the public have paid more attention to these issues, and these events have had a serious impact on China and the world; thus, more and more people have begun to pay attention to food safety issues (Liu *et al.*, 2020). With the popularisation of higher education in China, the number of enrolments in colleges and universities has been increasing year by year. According to statistics from the Ministry of Education, as of August 2019, there were a total of 2,940 colleges and universities across the country, and the total number of students in higher education in the country had reached 45.74 million people (Ministry of Education of the People's Republic of China, 2020).

There are many factors that affect university canteens' dietary safety. The research of Hu and Zhang (2008) considered that food safety factors lie in the design of the canteen, the procurement and storage of the main and secondary raw materials of the canteen, the food processing processes, the cleaning of tableware and the quality of the employees and the dining environment. Lu (2009) suggested that the most important thing for the health and safety of university canteens is to ensure the source of raw material procurement, and second is to follow the requirements of relevant laws, regulations, standards and norms and have clear stipulations on the processing and operational procedures of university canteens, including hygiene management, employee management, restaurant service, complaint handling, safety and conservation, and other related content. Huang and Li (2013) found that there are also numerous food safety hazards in the environments surrounding universities, which increases the concern regarding food safety in universities.

How to ensure food hygiene and the safety of teachers and students in colleges and universities, and prevent and eliminate the recurrence of food poisoning and food-borne diseases for teachers and students? Therefore, the certification system has become popular in China, and the prevalent standards and management models for food safety in Chinese universities include the quality management system, HACCP (Eyck *et al.*, 2006; ISO, 2018), quantitative and hierarchical management of catering industry hygiene supervision, "5S" and "6T" (Fang, 2005).

3. Research method

3.1 Research framework and design

This study explored how to construct catering quality indices for university canteens in China. The preliminary catering quality indices for the university canteens in China were constructed with the literature analysis method, and the modified Delphi method was adopted. This study conducted three rounds of questionnaire surveys to gather the opinions of experts and scholars, in order to reach a consensus and develop the catering quality indices for university canteens in China.

3.2 Research tools

This study adopted the modified Delphi method, as proposed by [Murry and Hammons \(1995\)](#), and implemented a total of three rounds of Delphi questionnaire survey. The researcher constructed the preliminary indices of catering quality for university canteens in China through literature analysis and developed six dimensions, which were sent via the questionnaires to the invited experts and scholars. After the questionnaires were recovered, the items were consolidated and analysed, and the indices were modified, deleted or added into the next round of questionnaires. After several rounds of questionnaires, the opinions of the experts and scholars gradually became unanimous.

The experts and scholars invited for this study are experienced, authoritative and highly willing to cooperate; regarding their backgrounds, they are either experts with more than ten years of work experience in catering and culinary arts, or scholars with in-depth knowledge of catering and culinary personnel. A total of 35 experts and scholars from the industry, government and academia were invited, including seven government officials for catering health supervision or disease prevention and control, 17 food (catering) course college teachers and 11 restaurant chefs or foremen (either from the hotel industry or university canteens).

3.3 Data analysis

The statistical analysis of this study was performed with SPSS version 25.0 software.

3.3.1 Modified Delphi questionnaire. The Delphi method expert opinions were recovered for consistency verification, and the average mean, stability, interquartile and other methods were adopted as evaluation criteria. This study referred to the average to analyse the importance of expert opinions for evaluation; if the average is ≥ 3.5 , it means the item index is considered to be an important factor by the Delphi expert group ([Murry and Hammons, 1995](#)); thus, the index can be retained, then the average mean can be used to rank the various factor indices in order of importance. Items were judged for consistency by referring to the interquartile range, and one-tenth of the questionnaire evaluation level was used as the basis for judgement ([Fahety, 1979](#)). This study used a five-point Likert type scale; thus, the judgement value of the interquartile range is 0.5, that is, the interquartile range is less than or equal to 0.5. According to the above, it can be determined that the views of Delphi expert group have a high degree of consistency regarding this factor.

3.3.2 Delphi questionnaire judgement criteria. Judgement criteria for importance: items with an average value above 4.00 were taken as items that met the criteria; if the average value did not reach 4.00, it was regarded as an item that did not meet the criteria.

Judgement criteria for consistency: items with an interquartile difference less than 1 were regarded as the items that met the criteria; if the interquartile difference was more than 1, the item was regarded as not meeting the criteria.

Judgement criteria for stability: in this study, three rounds of modified Delphi questionnaires were issued, and the same expert group was invited as the respondents. Therefore, in order to test questionnaire stability, [Holden and Wedman \(1993\)](#) suggested that

if more than 85% of the question items have reached a moderate consensus or above, it can be regarded as reaching the stability standard and the investigation can stop.

Judgement criteria for deletion: in the first and second rounds of the questionnaires of this study, the question items that both met the average mean of less than 4.00 and the interquartile range greater than or equal to 1 were deleted, and the question items were also modified and adjusted based on expert opinions.

4. Result and discussion

4.1 Analysis of three rounds of Delphi questionnaire survey

By reviewing the related factors of food quality in literature, this study further summarised, categorised and developed the six dimensions and 88 indices of the first questionnaire round of “catering quality indices of university canteens in China”. There were 24 items on catering safety management, 10 items on employee hygiene management, 15 items on catering service, 10 items on food quality, 13 items on environmental atmosphere and 16 items on CSR. The first round of the questionnaire was scored by scholars and experts. A total of nine question items that did not meet the requirements were deleted in this round of questionnaires, one question item was merged and five question items were added. The scholars and experts modified and improved most of the indices to form the questionnaire for the second round.

There were 83 indices in the second round of the questionnaire: 26 items about catering safety management, 10 items about employee hygiene management, 10 items about catering services, 10 items about food quality, 13 items about environmental atmosphere and 14 items about CSR. In this round of the questionnaire, 13 items that did not meet the requirements were deleted, and the scholars and experts further modified and improved the indices to form the questionnaire for the third round.

There were 70 indices in the third round of the questionnaire: 23 items on catering safety management, 10 items on employee hygiene management, eight items on catering services, eight items on food quality, 11 items on environmental atmosphere and 10 items on CSR. It can be seen that the average mean of all indices in the third round of the questionnaire survey were greater than 4.00; in addition, the interquartile ranges of all indices were less than or equal to 1, which did not meet the criteria for deleting items, and stability was over 85%; thus, all indices were retained.

On the whole, the average score of the expert members on the index suitability questionnaire survey was higher than that of the second round, and the interquartile range was also reduced. This shows that when this study conducted the third round of the modified Delphi questionnaire, the suitability of the indices were improved and the expert opinions tended to be consistent; thus, the distribution of the Delphi questionnaire was stopped.

Table 1 shows the results of the third round of the questionnaire. The mean values of the main dimensions: A. catering safety management (mean 5.00), B. employee hygiene management (mean 4.94), C. catering service (mean 4.60), D. food quality (mean 4.83), E. environmental atmosphere (mean 4.46) and F. CSR (mean 4.51) were all above 4.00, of which the importance of catering safety management was the highest, followed by employee hygiene management.

4.2 Results and discussion of the indices of the Delphi method

Among the main indices, as shown in Table 1, the average means of the six main indices are all above 4.00. Among them, the highest average score of the catering safety management index reached a full score of 5.00, while the lowest average score of the environmental atmosphere index also reached 4.46, which shows that experts believe that the six main

Table 1.
Analysis of the results
of the main indices

Dimension	Average mean	Mode	Interquartile difference	Stability	Priority order of importance
A. Catering safety management	5.00	5	0	100.0	1
B. Employee hygiene management	4.94	5	1	100.0	2
C. Catering service	4.60	5	0	100.0	4
D. Food quality	4.83	5	1	100.0	3
E. Environmental atmosphere	4.46	4	1	100.0	6
F. Corporate social responsibility	4.51	5	0	97.1	5

indices all play important roles in the catering quality indices of university canteens in China. These results also fully reflect the high attention paid to food safety and catering quality. [Ukwueze \(2019\)](#) found that, in order to provide consumers with adequate protection, food safety and the highest level of food quality must be ensured from production and throughout the entire supply chain, and unsafe and low-quality foods will have serious negative impact on the economy and public welfare. This is consistent with the results of this study.

4.2.1 The indices of catering safety management. As shown in [Table 2](#), among the 23 catering safety management indices, 10 received an average score higher than 4.90. Among these 10 items, the items with the highest average score were A2. Food material inspection and quarantine certificate, A3. Compliance with relevant specifications for storage hygiene management (classification, storage in separate shelves and registration of materials) and A10. Reservation of samples of all food (or catering) samples or regular random inspections (such as microbiological analysis), followed by A1. Traceability of sources of food materials, A6. Hygiene and safety management during food (or catering) preparation, A17. Proper use and control of detergents and disinfectants and A18. Periodic elimination of pests and rodents in kitchens. While A7. Smooth kitchen flow planning (including flow of people, air, material and water) received the lowest average score of all indices, it also far exceeded 4.00, which shows that every index of catering safety management is indispensable.

A2. Food material inspection and quarantine certificate and A1. Traceability of sources of food materials ranked first and fourth in importance, respectively. As lax control will cause serious food safety incidents, these two indices were in the first round of the management of university canteens. In their case study of the Thai fresh food market, [Chaiyaphan and Ransikarbum \(2020\)](#) also emphasised that the source of food production must be safe and should not contain contaminants that are toxic or harmful to health; otherwise, the risks for consumers becoming ill may be very high. More and more food industries around the world recognise that the source of food must be safe in the production, processing and distribution stages. Japan, Australia and many European countries have begun to install food traceability systems, which are considered an important tool to prevent food safety incidents ([Berti and Sempredon, 2018](#)). It is reported that many domestic university canteens currently lack food (or catering) samples or regular random inspection procedures. Experts believe that A10. Reservation of samples of all food (or catering) samples or regular random inspections (such as microbiological analysis) is very important, which indicates that it is necessary to establish a microbiological testing method for catering services as testing has great significance in

Item	Average mean	Catering safety management indices			Priority order of importance
		Mode	Interquartile difference	Stability	
A1. Traceability of the sources of food materials	4.94	5	0	100.0	4
A2. Food material inspection and quarantine certificate	4.97	5	0	100.0	1
A3. Compliance with the relevant regulations of storage hygiene management (classification, storage in separate shelves, registration of materials, etc.)	4.97	5	1	100.0	1
A4. Time and temperature control during food storage	4.74	5	1	100.0	16
A5. Food material management follows the first-in first-out warehousing principle	4.71	5	0	100.0	18
A6. Hygiene and safety management during the food (or catering) preparation process	4.94	5	1	100.0	4
A7. Smooth kitchen flow planning (including flow of people, air, materials and water)	4.43	4	1	100.0	23
A8. Periodic self-inspection or inspection of test and measurement tools by relevant departments	4.46	4	0	97.1	22
A9. Clean and hygienic environment in the kitchen	4.91	5	0	100.0	8
A10. Reservation of samples of all food (or catering) samples or regular random inspections (such as microbiological analysis, etc.)	4.97	5	0	100.0	1
A11. Food transportation system in compliance with hygiene management	4.86	5	1	100.0	12
A12. Proper handling of overnight meals according to standards	4.71	5	0	97.1	18
A13. Cautious attention to possible cross-contamination in the food environment (such as contamination of raw and cooked foods, peeling of wall coverings, etc.)	4.77	5	0	100.0	15
A14. Periodic safety inspection of drinking water and ice cube hygiene	4.91	5	1	100.0	8
A15. Location and distance between kitchen and toilet meet relevant requirements	4.74	5	0	100.0	16
A16. Cleaning and disinfection of equipment and utensils	4.89	5	0	100.0	10
A17. Proper use and control of detergents and disinfectants	4.94	5	0	100.0	4
A18. Periodic elimination of pests and rodents in kitchens	4.94	5	0	100.0	4
A19. Correct use and management of food additives	4.86	5	0	100.0	12

Table 2. Analysis of results of catering safety management indices

(continued)

Table 2.

Item	Average mean	Catering safety management indices			Priority order of importance
		Mode	Interquartile difference	Stability	
A20. Waste (e.g. food waste and expired products) treatment and removal methods	4.80	5	1	100.0	14
A21. Covering trash bins and sorting of garbage	4.54	5	1	100.0	21
A22. Air quality in the kitchen	4.60	5	0	100.0	20
A23. Cleanliness of catering and serving areas	4.89	5	0	100.0	10

determining the source of contamination and establishing an appropriate hygiene and sanitation plan (Yoon *et al.*, 2008).

Regarding A4. Time and temperature control during food storage, A12. Proper handling of overnight meals in accordance with standards and A13. Cautious attention to possible cross-contamination in the food environment (such as contamination of raw and cooked food, and peeling of wall coverings), although the importance of such indices ranked relatively low, these indices are still indispensable in catering safety management. Human health is adversely affected by biological, chemical and physical hazards, and the main cause of such hazards is the time-temperature abuse during the food storage process, cross-contamination in the food environment, improper food handling and storage, improper cleaning of food processing equipment, inadequate hygiene and sanitation plans, and poor food transportation and distribution facilities systems (Ruelas and Edeza, 2020). Morrison and Young (2019) found that nearly half of tested household kitchens are contaminated by at least one foodborne pathogen, and the degree of contamination in the kitchen may be higher than that in the bathroom. In addition, pathogens can survive in undercooked meat and reproduce during storage, which illustrates the importance of the proper handling of leftover food.

The employee hygiene standards of university canteens play an important role in ensuring the safety of processed food, and food handlers should clean their hands, especially before handling food, after meals and after touching contaminated materials (Al-Shabib *et al.*, 2016). Lack of food safety knowledge and non-compliance with hygienic habits during food processing by food handlers are the main causes of food contamination (Suryani *et al.*, 2019). Food processors found to be carriers of pathogens have also been reported as related risk factors (Todd *et al.*, 2008). Some studies have emphasised that the education and training of food professionals is an indispensable part of their proficiency in producing harmless food and minimising food safety risks (Omar and Shahril, 2019).

4.2.2 *The indices of employee hygiene management.* According to Table 3, 10 indices of employee hygiene management had an average score between 4.46 and 5.00. Among them, the indices of the top three scores were B8. Employee health check management (who should have a health certificate), B6. Employee admission regulations (washing hands and disinfecting, clothing and appearance, wearing masks and gloves, talking as little as possible, etc.) and B5. Employees are familiar with food (or catering) safety and hygiene standards and operating practices. While B9. Employees understand correct cooking procedures or standards received the lowest average score of all the indices. The results of this study show that university canteens should attach greater importance to employee health and hygiene management, regularly organise employee education and training, provide regular physical examinations, standardise job requirements and familiarise employees with food safety and hygiene standards, in order to avoid food safety incidents caused by humans.

Item	Average mean	Employee hygiene management indices			
		Mode	Interquartile difference	Stability	Priority order of importance
B1. Employees' awareness of food (or catering) safety and hygiene	4.83	5	1	100.0	4
B2. Employees' awareness of food (or catering) contamination prevention methods	4.74	5	1	100.0	5
B3. Employees' awareness of food (or catering) risks and hazards	4.51	5	1	97.1	8
B4. Food (or catering) safety training plan is required	4.63	5	0	100.0	6
B5. Employees are familiar with food (or catering) safety and sanitation operating specifications	4.86	5	0	100.0	3
B6. Employee admission rules (washing hands and disinfection, clothing and appearance, wearing masks and gloves, talking as little as possible . . .)	4.94	5	1	100.0	2
B7. Mandatory employees' independent hygiene management	4.49	5	0	91.4	9
B8. Employee health check management (should have a health certificate)	5.00	5	1	100.0	1
B9. Employees understand the correct cooking procedures or standards	4.46	4	1	97.1	10
B10. Chefs and kitchen helpers have basic knowledge of cooking nutrition	4.54	5	1	97.1	7

Table 3.
Analysis of results of
employee hygiene
management Indices

4.2.3 The indices of catering service. There are eight catering service indices with an average score of 4.29–4.89 (Table 4). The indices with the top three scores are: C6. Service attitude (such as civilised language, kind attitude and courteous treatment), C5. Pays attention to appearance and clothing (e.g. work clothes and hats are neatly worn, clean and hygienic, and the ID badge is displayed as per the standard), C7. Response and handling of complaints from consumers (including students) and C1. Attach importance to communicating with consumers (including students) and listening to opinions.

4.2.4 The indices of food quality. It can be seen from Table 5 that the average scores of the eight indices of food quality were between 4.46 and 4.77. The indices of the top three scores are: D5. Nutritional combination of food, D7. Reasonable price of food (or catering), D3. Taste of food (or catering) (e.g. chewiness and crispness) and D4. Food (or catering) is delicious. The quality of the dishes is the most important factor that determines customer satisfaction and future behaviour intentions. When consumers go to the cafeteria to eat, satiety, nutritional value, visual appeal, smell, colour, freshness, price, promotion, variety and innovation, and other factors will affect their food satisfaction and future consumption intention (Trafialek *et al.*, 2020). According to the results of this study, experts believe that food nutrition, price, taste and deliciousness are the priority factors considered when people are choosing dishes.

4.2.5 The indices of environmental atmosphere. The average scores of the 11 environmental atmosphere indices were between 4.49 and 4.97 (Table 6). The indices of the top three scores were E5. Dining environment is clean and hygienic, E7. Washroom cleaning and disinfection and E6. Table and tableware cleaning and disinfection. Studies have shown

Table 4. Analysis of the results of catering service indices

Question	Average mean	Mode	Catering service indices		Priority order of importance
			Interquartile difference	Stability	
C1. Attach importance to communicating with consumers (including students) and listening to opinions	4.69	5	1	100.0	3
C2. Understand catering expertise	4.29	4	1	91.4	8
C3. Fast service (such as fast settlement, short waiting time, etc.)	4.63	5	1	100.0	5
C4. Correctness of the service (e.g. serving size, accurate settlement, guaranteed meal time, etc.)	4.63	5	0	100.0	5
C5. Pay attention to appearance and clothing (e.g. work clothes and hats are neatly worn, clean and hygienic, and the ID badge is displayed as per the standard)	4.80	5	0	100.0	2
C6. Service attitude (e.g. civilised language, kind attitude and polite to others)	4.89	5	1	100.0	1
C7. Responding to and handling of complaints from consumers (including students)	4.69	5	1	100.0	3
C8. Respect the privacy of consumers (including students)	4.31	4	1	91.4	7

Table 5. Analysis of the results of food quality indices

Item	Average mean	Mode	Food quality indices		Priority order of importance
			Interquartile difference	Stability	
D1. Food (or catering) appearance and colour	4.60	5	1	100.0	6
D2. Aroma of food (or catering)	4.63	5	1	100.0	5
D3. Taste of food (or catering) (e.g. chewiness and crispness)	4.71	5	1	100.0	3
D4. Food (or catering) is delicious	4.71	5	0	100.0	3
D5. Nutritional combination of food	4.77	5	1	100.0	1
D6. Temperature of food (or catering) served	4.46	4	0	100.0	8
D7. Reasonable price of food (or catering)	4.77	5	1	97.1	1
D8. The dishes are innovative and rich in variety	4.49	5	1	94.3	7

that the physical environment is important for improving customer satisfaction and influencing customers' choices in restaurants; for example, food display, seating space arrangement, charming interior design, pleasant background music and atmosphere, and lighting effects (Trafialek *et al.*, 2020). As seen from the results of this study, experts pay more attention to the environmental hygiene and disinfection of dining rooms, which is a deviation

Question	Average mean	Environmental atmosphere indices			Priority order of importance
		Mode	Interquartile difference	Stability	
E1. Daylighting and lighting of dining places	4.69	5	1	100.0	7
E2. Space planning and design of dining places	4.49	4	1	100.0	11
E3. Seating comfort in dining places	4.57	5	0	100.0	9
E4. Air quality of dining places	4.83	5	0	100.0	4
E5. Dining environment is clean and hygienic	4.97	5	0	100.0	1
E6. Table and tableware cleaning and disinfection	4.89	5	0	100.0	3
E7. Washroom cleaning and disinfection	4.94	5	1	100.0	2
E8. Regular inspection of firefighting equipment	4.74	5	1	100.0	5
E9. Clear identification of escape maps and exit signs	4.74	5	1	100.0	5
E10. The dining place is equipped with ample sinks and taps	4.60	5	1	100.0	8
E11. Suitable temperature of dining places	4.57	5	1	100.0	9

Table 6.
Analysis of the results of the environmental atmosphere indices

from the above research, but not contradictory. For consumers, a clean and hygienic dining environment is the most basic requirement. University canteens should create a dining environment with first-class decor, bright lighting, comfortable seats, suitable temperature and fresh air to attract more consumers to eat there.

Maignan and Ralston (2002) divided the scope of social responsibility into five categories, creditor status, social contribution, employees, consumers and suppliers. Maloni and Brown (2006) pointed out that the contents of social responsibility include the six aspects of environmental protection, social contribution, technological innovation, nutrition and safety, employee rights and procurement control. In addition, it is very important to build a good corporate reputation through CSR initiatives, such as charitable donations, saving water or energy, fair employment practices and using environmentally friendly products, which contribute to the overall operations and gain customer trust, thereby retaining and winning customers (Tong *et al.*, 2019).

4.2.6 The indices of corporate social responsibility. The average scores of the 10 CSR indices were between 4.31 and 4.97 (Table 7). The indices with the top three scores were F8. Prohibit the use of fake and inferior food, F3. Ensure food (or catering) safety and hygiene and F2. Recognition of national food (or catering) safety policies. In addition, F8. Prohibit the use of counterfeit and inferior food ranked first in importance, which shows that experts believe that, at this stage, some food companies are not strict enough in implementing food safety standards, leading to the repeated occurrence of fake and inferior foods. This requires the government to strictly supervise enterprises to ensure that fake and inferior foods no longer appear (Xia, 2019). The index of F3. Ensure food (or catering) safety and hygiene shows that food safety and hygiene are the common responsibilities of enterprises, which means that consumers, farmers, manufacturers and food practitioners all have the responsibility to ensure food safety and play an important role in preventing foodborne diseases (Auaad *et al.*, 2019). As found from experts' ranking of F2. Recognition of national food (or catering)

Item	Average mean	Corporate social responsibility indices			Priority order of importance
		Mode	Interquartile difference	Stability	
F1. Improve employee performance and rewards	4.31	4	0	100.0	10
F2. Recognition of national food (or catering) safety policies	4.86	5	0	100.0	3
F3. Ensure food (or catering) safety and hygiene	4.94	5	1	100.0	2
F4. Saving water and other energy resources	4.63	5	1	100.0	8
F5. Use environmentally friendly products	4.69	5	1	100.0	7
F6. Let employees identify with corporate culture	4.43	5	1	94.3	9
F7. It is obligated to accept government supervision	4.74	5	0	100.0	5
F8. Prohibit the use of fake and inferior food	4.97	5	0	100.0	1
F9. Formulate complete sanitation management methods and responsible person management system	4.83	5	1	97.1	4
F10. Respect the cultural differences, beliefs and values of employees and consumers (including students)	4.71	5	0	100.0	6

Table 7. Analysis of the results of the corporate social responsibility indices

safety policies, university canteens should start from the inside and use training, education and incentive measures to motivate employees to comply with food safety and sanitation regulations; however, appropriate external rewards may be more important for motivating employees to comply with food safety rules (Harris *et al.*, 2019).

5. Conclusion and suggestion

5.1 Conclusion

This study used the modified Delphi method to modify three rounds of expert questionnaires to establish six dimensions, including 23 items for catering safety management, 10 items for employee hygiene management, eight items for catering service, eight items for food quality, 11 items for environmental atmosphere and 10 items for corporate social responsibility. Moreover, these six elements can be ranked in the following order of importance: catering safety management, employee hygiene management, food quality, catering service, CSR and environment atmosphere. This result illustrates that in terms of food hygiene, attention should be paid to hygiene and food factors. Moreover, the findings also reveal the topics that must be prioritised.

The analysis of the importance of catering safety management indices found that the experts considered A2. Food material inspection and quarantine certificate, A3. Compliance with the relevant regulations of storage hygiene management and A10. Reservation of samples of all food (or catering) samples or regular random inspections as the most important factors. The importance of employee hygiene management indices showed that experts considered B8. Employee health check management, B6. Employee admission rules and B5. Employees are familiar with food (or catering) safety and hygiene standards and operating practices as the most important factors. Whether it focuses on hygiene or personnel auditing

management, a major project has to be carried out in complying with the laws and regulations.

The importance of catering service indices considered C6. Service attitude, C5. Pay attention to the appearance and clothing, C7. Response and handling of complaints from consumers (including students) and C1. Attach importance to communicating with consumers (including students) and listening to opinions as the most important factors. The importance of food quality shown D7. Reasonable price of food (or catering), "D5. Nutritional combination of food, D4. Food (or catering) is delicious and D3. Taste of food (or catering) as the most important factors. E5. Dining environment is clean and hygienic, E7. Washroom cleaning and disinfection and E6. Dining table and tableware cleaning and disinfection as the most important factors for environmental atmosphere indices. A good service attitude, positive communication, delicious food and a clean dining environment are the major items for school catering.

Analysis of importance of corporate social responsibility indices found that experts considered F8. Prohibit the use of fake and inferior food, F3. Ensure food (or catering) safety and hygiene and F2. Recognition of national food (or catering) safety policies as the most important factors. In terms of catering companies' social responsibilities, food products should be ensured to be certified and compliant with the national laws and regulations on food safety to prevent adulteration.

5.2 Suggestion

5.2.1 Suggestions to university canteens. The quality of university canteens is related to the vital interests of students, and affects the harmony and stability of the campus. This study suggests that university canteens should attach great importance to the safety and hygiene of catering and employees, improve the dining environment, strengthen the cleanliness of the kitchen and pay attention to personal hygiene. To improve students' satisfaction with the canteen, they should start with the details and needs of students and continuously improve the chef's cooking skills and the quality of the food. University canteens should establish clear standard operating procedures for food procurement, packaging, storage, picking, washing, cutting, cooking and food waste, strictly control each link and provide supervision and training.

University canteens are part of public welfare, and the companies that operate canteens should only earn meagre profits after covering their costs. Therefore, in order to prevent operators from making huge profits, socialised canteen management should absorb competitive enterprises, carry out strict control and screening of canteen operators, implement public bidding for canteen contractors, comprehensively review the various indicators of the bidders and prevent the occurrence of various food hygiene and safety incidents. These are the important measures to improve the overall quality of university canteens.

5.2.2 Suggestions to government. This study showed that F7. It is obligated to accept government supervision requires further enforcement. At present, there are still weak links in law enforcement among government regulatory agencies; thus, in order to ensure the standardisation and stabilisation of university canteens, the government should take measures to pre-regulate. This study suggests the governmental regulation of college canteens should be focused, and the macro-control activities should be scientific, predictable and effective.

The catering service market for college students is a relatively special market, and both the location and the object of operations are special. The government's market supervision and public service functions should be exerted for the macro-control of university canteens. The food prices, food quality and whether food hygiene and safety standards are met by

university canteens are all related to the health and vital interests of the teachers and students, as well as the stability of the university. Therefore, the government should increase supervision in these aspects to avoid decline in the quality of meals due to low profits and enforce strict requirements for food safety.

5.3 Implications and future research

This study found that experts have emphasised the importance of supervision at the catering management and employee levels. In terms of the safety and quality of catering, practitioners should follow relevant laws and regulations to maintain good food quality. From the perspective of the government and schools – in addition to strengthening supervision and auditing – it is vital to establish relevant regulations and standards. Education and training can be adopted to achieve a qualitative leap in the five elements of catering safety management, employee hygiene management, food quality, catering service and environment atmosphere. Moreover, people and norms are significant in food safety. In addition, the catering quality can be improved by understanding dining consumers. Hence, it is necessary to give questionnaires regularly to consumers on food quality, catering quality and environment atmosphere. Furthermore, catering companies cooperating with schools may promote student hygiene and related green environmental protection. The university dining venue is an ideal place to promote corporate social responsibilities as the university society is the epitome of the real society.

The research results showed that in catering service, environment atmosphere and CSR are less prioritised. However, only when we pay more attention to intangible consumer feelings on the basis that food and beverage quality can be improved and the condition of basic food safety and hygiene is achieved, we can obtain more support from students and faculty. In future research, the dimensions of the consumers' feelings should be analysed, and the importance of each element should be evaluated for different types of catering canteens and different sizes of schools, which will provide clearer indicators and directions to canteen practitioners.

Formulate complete sanitation management methods and responsible person management system

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