

# Study on Satisfaction Degree of University Canteen based on AHP-FCE

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## Abstract

**This paper cites the hierarchical analysis method, looks for the factors related to the canteen satisfaction and establishes the index system affecting the satisfaction of the university canteen on the basis of the satisfaction survey of a university canteen; Conduct consistency test and determine the weight and ranking of each index through 1~9 scale method to build the judgment matrix. According to the maximum membership principle, quote the fuzzy comprehensive evaluation method to score each index, multiply the index weight and the index evaluation score, finally get the important index of the university canteen satisfaction and find solutions; in order to provide help to improve the living conditions of college students.**

## Keywords

**College Canteen Satisfaction; Hierarchical Analysis Method; Fuzzy Comprehensive Evaluation Method.**

## 1. Introduction

The Management Notice about Further Strengthening the Rural Compulsory Education Students Nutrition Improvement Plan mentioned that some school canteen does not reach the designated position of policy understanding, implementation, the money usage, the safety food management, the health education and nutrition health monitoring evaluation is not timely. So it is difficult to improve the satisfaction of the university canteen. Therefore, it is necessary to evaluate the satisfaction of the university canteen and choose the appropriate evaluation method to find out the countermeasures suitable for the development of the university canteen according to the evaluation results.

## 2. Satisfaction Evaluation Index of University Canteen based on Hierarchical Analysis Method

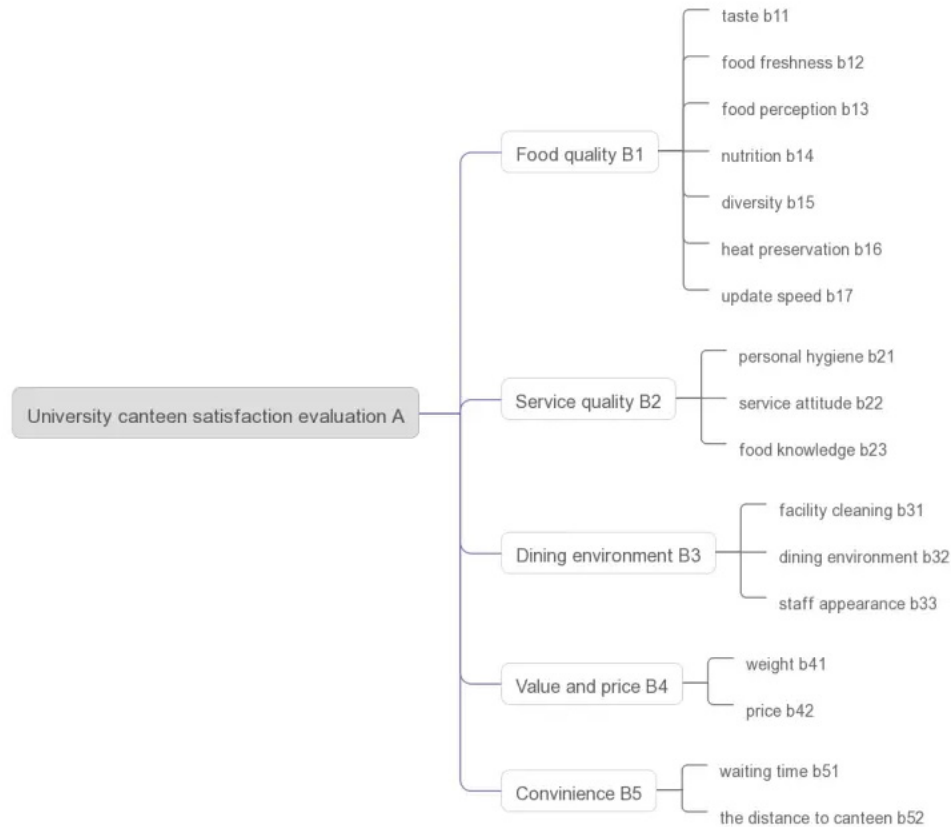
### 2.1. The Concept of the Hierarchical Analysis Method

Hierarchical analysis method is to determine the weight value of the importance order of an element of this level and the upper level. Hierarchical analysis method decomposes the elements related to the decision into goals, criteria, schemes and other levels. Based on it, we have qualitative and quantitative analysis. This paper mainly studies the weight of factors affecting canteen satisfaction through hierarchical analysis method.

### 2.2. Affect the Establishment of the Canteen Satisfaction Index System

In this paper, the relevant evaluation indicators involving university canteens are designed into questionnaires and distributed randomly to the respondents to complete the questionnaires independently. The surveyed students are both boys and girls, from different ages[1].

University canteen satisfaction evaluation index system should be able to comprehensively reflect the operation of the canteen and affect the important link about the students' feelings, considering the important factors affecting canteen satisfaction; The hierarchy analysis establishes hierarchy model from food quality, service quality, dining environment, price and convenience these five aspects and classify the factors which will affect the university canteen satisfaction , as shown in Figure 1.



**Figure 1.** College canteen satisfaction index system

Based on the 9-degree scaling method, we can construct the pairwise comparison judgment matrix. In the judgment matrix, the weight of the criterion layer to the target layer and the weight of each factor of the scheme layer to the target layer are determined and the judgment matrix is constructed through questionnaire survey; Using the data in the judgment matrix to qualitatively and quantitatively analysis the influence of food quality, service quality, dining environment, value and convenience on the satisfaction of college canteen[2]. The hierarchical single ranking refers to the ranking of the importance of the factors at this level for the previous level[3]. The specific process of calculating the feature root and eigenvectors is that the matrix B meets  $BW = \lambda_{max}W$ ,  $\lambda_{max}$  is the maximum feature root of B, and W is the normalized eigenvector corresponding to  $\lambda_{max}$ , and the component  $\omega_i$  of W is the importance weight of each factor at the present level for a certain factor in the previous layer. Use the "cloud operator" to calculate the maximum feature root of the matrix, and find the CI according to the formula .According to the  $CI = \frac{\lambda_{max} - n}{n - 1}$  (n is the order) ,we can get the CI. RI is a random consistency index, and the CR is available through  $CR = \frac{CI}{RI}$ , so we can check that it can pass the consistency test.

### 2.3. Determination and Ranking of the Weight of University Canteen Satisfaction Indicators

After calculating the relative importance of all levels of elements, we can find out the comprehensive importance of all levels of elements to the whole from top to bottom, as shown in Table 1.

**Table 1.** Secondary indicators and weights of satisfaction in university canteen

metric	weight	total ranking weight	metric	weight	total ranking weight
taste	0.163	0.0438	quality of service	0.29	0.0264
fresh	0.355	0.0955	Employee food knowledge	0.25	0.0227
sense of view	0.045	0.0121	facility cleanliness	0.56	0.0336
nutrition	0.243	0.0654	dining environment	0.32	0.0192
diversity	0.102	0.0274	Staff appearance	0.12	0.0072
keep warm	0.062	0.0167	component product	0.75	0.117
refresh rate	0.03	0.0081	price	0.25	0.039
personal hygiene of employees	0.46	0.0419	service waiting time	0.75	0.3195
			distance to canteen	0.25	0.1065

According to the calculation results, the length of the queuing time is the most important factor affecting the satisfaction of the university canteen, and then the amount of the dishes is also a more important factor. Therefore, we should start to improve work efficiency, establish a number of cooking Windows and reduce the waiting time of students. Secondly, according to the situation of students, we can add the appropriate amount for students. We should not waste it, but also ensure that the students are satisfied. Since the pairwise comparison between indicators is subjective and the weight changes with the emphasis of students. We use the fuzzy comprehensive evaluation method to make the conclusions more objective and scientific.

## 3. Research on Fuzzy Comprehensive Evaluation of College Canteen Satisfaction

### 3.1. Fuzzy Comprehensive Evaluation Method

In real life, it is necessary to evaluate the satisfaction of a university canteen. People are used to using qualitative methods to evaluate the university canteen, and it is even not practical when selecting the influencing factors[4]. In order to have a more scientific and comprehensive understanding of the current situation of the university canteen, this paper adopts the fuzzy comprehensive evaluation method, combining qualitative analysis and quantitative analysis to draw conclusions and countermeasures.

### 3.2. Determine the Evaluation Indicators and Evaluation Grades

The comprehensive evaluation index set of a university satisfaction  $U =$  (food quality, service quality, dining environment, value and price, convenience), and have 5 sub-index sets:  $U_1$  (food quality),  $U_2$  (service quality),  $U_3$  (dining environment),  $U_4$  (value and price),  $U_5$  (convenience); and decompose each primary index into secondary indicators, such as  $U_1$  (food quality) can be decomposed into  $U_{11}$  (taste),  $U_{12}$  (food freshness) and  $U_{13}$  (food perception), etc.

### 3.3. Determination of Single Membership

Determine the comment rating  $V = \{good, better, general, worse, bad\}$ . We use the ratio method, which is the ratio of the number of each level to the total number of all evaluation items of the index is the membership of the evaluation index. This paper asks the students from a university to score the indicators of the university canteen through the questionnaire survey [5]. Quantify the basis of the scoring. The evaluation results are shown in Table 2.

**Table 2.** Comprehensive evaluation index of the satisfaction of the university canteen

level 1 indicators	weight	secondary indicators	order of evaluation				
			good	preferably	same as	range	difference
food quality	0.269	taste	0.08	0.38	0.38	0.13	0.03
		fresh	0.07	0.44	0.36	0.11	0.02
		sense of view	0.08	0.37	0.39	0.13	0.03
		nutrition	0.1	0.34	0.43	0.1	0.03
		diversity	0.1	0.27	0.46	0.15	0.02
		keep warm	0.09	0.34	0.37	0.14	0.06
		refresh rate	0.08	0.21	0.39	0.21	0.11
quality of service	0.091	personal hygiene of employees	0.08	0.34	0.41	0.13	0.04
		attitude towards customers	0.1	0.43	0.37	0.07	0.03
		employee food knowledge	0.08	0.32	0.39	0.18	0.03
dining environment	0.06	facility cleanliness	0.09	0.47	0.35	0.07	0.02
		dining environment	0.1	0.37	0.41	0.1	0.02
		staff appearance	0.1	0.43	0.35	0.11	0.01
Value and price	0.156	component product	0.06	0.35	0.39	0.15	0.05
		price	0.04	0.32	0.42	0.17	0.05
convenience	0.426	service waiting time	0.08	0.2	0.41	0.23	0.08
		distance to canteen	0.14	0.36	0.36	0.1	0.04

### 3.4. Fuzzy Comprehensive Evaluation

The fuzzy comprehensive evaluation matrix of each level is obtained from the questionnaire. They are  $R_1, R_2, R_3, R_4, R_5$ , which corresponds to food quality, service quality, dining environment, value and price. And the first level index  $A_1$  (food quality) under the second level of the index weight.

take for example  $A_1 = [0.163 \ 0.355 \ 0.045 \ 0.243 \ 0.102 \ 0.062 \ 0.03]$  and so on. Calculation steps are that the firstly determine the evaluation of the object factors set and evaluation set, then build pairwise comparison judgment matrix calculation vector, determine the weight of each factor and their membership vector, obtain fuzzy evaluation matrix. Finally the fuzzy evaluation matrix and factor weight vectors should have the fuzzy synthesis and normalization to get the fuzzy evaluation comprehensive results [6].

According to the weight of each index and the single membership can get the comprehensive evaluation of each index ( $B_1, B_2, B_3, B_4, B_5$ ), take the example of the canteen quality.  $B_1 = A_1 * R_1 = [0.101 \ 0.338 \ 0.397 \ 0.131 \ 0.017]$

$$R = \begin{matrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \end{matrix} \begin{bmatrix} 0.101 & 0.338 & 0.397 & 0.131 & 0.017 \\ 0.090 & 0.402 & 0.347 & 0.144 & 0.004 \\ 0.005 & 0.026 & 0.022 & 0.005 & 0.001 \\ 0.078 & 0.359 & 0.385 & 0.122 & 0.052 \\ 0.092 & 0.254 & 0.363 & 0.232 & 0.057 \end{bmatrix}$$

The comprehensive membership of the university canteen satisfaction is  $B = A * R = [0.087 \ 0.2933 \ 0.3544 \ 0.1665 \ 0.0374]$ .

According to the principle of maximum membership, the satisfaction rate of the university canteen is general.

## 4. Conclusion

First of all, this paper comprehensively selects the index with great influence on the canteen satisfaction, and establishes the interrelated index system. Secondly, the hierarchical analysis method is adopted to establish the judgment matrix through the relative importance of each index, and calculate the weight so that the corresponding judgment matrix meets the basis of the consistency test. The following conclusion is obtained through the fuzzy comprehensive evaluation method that the satisfaction rate of the school canteen is general. We put forward the supply side reform strategy of the university canteen with the problem of student waiting time, food size and the distance to the canteen.

### 4.1. Improve the Supply-side Reform System

After improving the supervision system and the socialization reform of the university canteen, although the operation mechanism of the student canteen has been reformed, the rights and obligations of the colleges as party A have not changed. Therefore, colleges and universities have the responsibility to supervise the canteen.

Improve the university canteen operation access system and management system, restrain the experience with the most strict standards, require the canteen management staffs to have relevant management experience, qualification and reputation; so as to improve the operation efficiency of the university canteen and shorten the waiting time of students in the canteen.

### 4.2. Optimize the Supply Structure of University Canteen

Colleges and universities should adhere to the principle of public welfare in the canteen, and fully meet the dining needs of some students by appropriately increasing the scale of cheap dishes. The school can actively integrate the empty window resources inside the canteen, appropriately reduce the window price to attract contractors, increase the number of Windows and reduce the phenomenon of most students staying in some fixed Windows. In addition, staff training in the canteen can improve the skills of chefs to distract students' attention to some fixed Windows. The development of Internet + has also brought a great impact to the university canteen operators. In his speech presiding over the 24th meeting of the Central Leading Group for Comprehensively Deepening Reform, General Secretary Xi stressed we should recognize that reform has pain, but not reform is a lasting pain. For college canteens, only reform can survive, grow and provide better serve to teachers and students. Therefore, university canteens can learn from the takeout mode of the catering industry and launch a selling food platform, takeout is not only convenient for students, but also can provide part-time income for some poor college students.

It is hoped that the above methods will help to improve the management of the university canteen, improve the service quality, meet the dining needs of the students in the extent and improve the quality of life of the college students.

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