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Research on the Construction of Intelligent Platform of University Canteens

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Abstract

Under the influence of the COVID-19, the health awareness of residents has been continuously enhanced, people pay more attention to personal dietary hygiene and physical health issues, and the greening of food health has become the focus of attention. In recent years, with the continuous promotion of college enrollment expansion policy, college canteens have developed rapidly. As an important part of university logistics, college canteen is the key to improve college students' unhealthy diet. Firstly, this paper uses CiteSpace software to visually analyze the relevant literature of smart canteen collected by CNKI in recent 20 years. Secondly, taking university students as the survey object, this paper investigates the construction of smart platform of university canteen through online questionnaire, and analyzes and studies the survey results. Finally, according to the analysis results, this paper constructs the business model of smart platform of university canteen from student end and merchant end.

Keywords

University Canteen; Intelligent Platform; Citespace; Questionnaire Investigation.

1. Introduction

General Secretary Xi put forward the Healthy China Strategy in his report to the 19th National Congress of the Communist Party of China. With the continuous progress of the Healthy China strategy, the people’s health and living standards have been constantly improved. As an important part of promoting social development, college students have unhealthy lifestyles such as chaotic work and rest, lack of exercise, unreasonable diet and so on. At this stage, there are a series of problems in the university canteen, such as chaotic queuing order, unreasonable food collocation, unbalanced supply and demand of dishes, etc, resulting in low dining efficiency, unbalanced nutrition intake of students and waste of dishes in the canteen. Therefore, it is inevitable to build an efficient, green and economical college canteen. According to the 48th statistical report on the development of China's Internet, by June 2021, the number of Internet users in China had reached 1.011 billion, an increase of 21.75 million over December 2020, and the Internet penetration rate had reached 71.6%. Meanwhile, the number of online takeout users reached 469 million, an increase of 49.76 million compared with December 2020, accounting for 46.4% of the total number of Internet users. With the gradual development and maturity of Internet technology and the rise of online takeout platform, it is inevitable for college canteens to change the traditional operation mode and meet the development of the times. Therefore, the construction of intelligent platform for college canteens has become the general trend.

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2. Visual Analysis based on CiteSpace

2.1. High Frequency Keyword Analysis

Based on CNKI, advanced retrieval was conducted with the theme of smart canteen and university canteen, and the literature about smart canteen in recent 20 years was screened, and 159 literatures were finally obtained. Using CiteSpace to conduct keyword co-occurrence analysis on the data, the keyword co-occurrence map of smart canteen is obtained. The map has 185 nodes and 244 connections. The author sorted out the top 10 keywords in the selected literature. From the analysis of keyword frequency, smart campus, college canteen, big data, Internet of things and other keywords have a high frequency, which is basically in line with the current research status of smart canteen in China. From the analysis of the centrality of the research, the keywords with more than 0.01 centrality include smart campus, Internet of things, university canteen, queuing theory, smart kitchen, artificial intelligence, big data, risk prevention and control, visualization, data mining, raw materials, smart canteen, smart Park, logistics service, Internet behavior, consumption behavior, Internet, intelligence, application and canteen management, which shows that the research of smart canteen focuses on the above aspects.

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Table 1. Ranking of top 10 keywords of smart canteen literature in China

the serial number	keywords	frequency	centricity	the serial number	keyword	frequency	centricity
1	wisdom campus	25	0.30	6	wisdom canteen	5	0.05
2	vollege canteen	10	0.19	7	data mining	4	0.07
3	big data	7	0.10	8	aritificial intelligence	4	0.12
4	the Internet of things	6	0.23	9	logistics service	3	0.03
5	the school canteen	6	0.00	10	wisdom logistics	3	0.00

2.2. Keywords Cluster Analysis

Based on the co-occurrence map of keywords, the cluster analysis of keywords is carried out, and the research hot topic of smart canteen in China is obtained. CiteSpace operation results q = 0.8849 (> 0.3), s = 0.9608 (> 0.5). Therefore, the keyword clustering effect is good, which can reasonably reflect the research status of smart canteens in China. This keyword clustering generates seven core clusters, namely Internet of things, university canteen, smart campus, smart canteen, raw materials, data mining and artificial intelligence. Most of the keyword clustering maps are divided into two main parts: smart clustering and smart clustering. The first part is the development status of smart canteen, which explores the development of smart canteen as a whole, such as smart campus, smart canteen, public canteen and other keywords in the atlas. The other part is the application of smart canteen, including technological innovation, core features, operation management and other aspects of smart canteen, such as data mining, artificial intelligence, Internet of things, security traceability, big data, smart logistics and other keywords in the atlas [1].

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3. Feasibility Analysis of Smart Platform Construction

3.1. Survey in the Early Stage of Smart Platform Construction

The questionnaire takes college students as the survey object, designs several questions from the aspects of dining situation in the canteen, factors affecting dining in the canteen and attitude towards smart canteen, and sends the questionnaire by the platform of Questionnaire Star. A total of 210 questionnaires were distributed, 205 valid questionnaires were recovered, and the effective rate of the questionnaire was 98%. In terms of gender, there are 98 boys, accounting for 47.8%; There are 107 girls, accounting for 52.2%. In terms of grade, there are 52 freshmen, accounting for 25.4%; 48 sophomores, accounting for 23.4%; 56 junior students, accounting for 27.3%; 49 senior students, accounting for 23.9%.

From the survey results of dining in the canteen, the frequency of college students dining in the canteen is low. The dining efficiency of 75 people in the school canteen is 6-10 times a week, 59 people in the school canteen are 11-15 times a week, 40 people in the canteen are more than 15 times a week, and 31 people in the canteen are less than 6 times a week. It can be seen that college students have a negative attitude towards dining in the canteen.

From the survey results of the factors affecting the dining in the canteen, college students are dissatisfied with the food price, dining environment, dishes, cooking efficiency, dining order, food insulation and food freshness in the canteen. 132 people think that the food price in the canteen is on the high side. 152 people were generally satisfied with the dining environment of the canteen. 140 people were generally satisfied with the dishes in the canteen. The satisfaction of 120 people with the dining efficiency of the canteen was average. 189 people believed that the dining order in the canteen was chaotic. 162 people think that the food insulation in the canteen is very poor. It can be seen that there are a lot of negative factors affecting college students to eat in the canteen.

From the survey results of the attitude towards smart canteen, the students' attitude towards the construction of smart canteen is positive, and 182 people are very interested in the construction of smart canteen. 163 people will book canteen meals directly online on this platform. It can be seen that the construction of smart canteen platform is widely popular among students.

3.2. Problems of Canteen Itself

3.2.1. The Order of Ordering and Taking Food is Chaotic

During the period when a large number of students eat after class, due to the influx of students, the canteen staff can not maintain the order of ordering and taking meals for the time being, resulting in the phenomenon of casually jumping in the queue. In addition, the number of students is too large, and the dining speed of the canteen cannot be met. Students need to waste a lot of time ordering meals, so students reduce the dining frequency of the canteen.

3.2.2. Unbalanced Supply and Demand of Dishes

Due to the lack of communication platform between the canteen and students, and the canteen is unable to collect students' eating hobbies and rules, so it is unable to grasp the specific sales volume of dishes, resulting in insufficient or excessive procurement, resulting in a waste of cost.

3.2.3. Unreasonable Food Mix

Due to the lack of professional nutrition experts in the canteen, the unreasonable combination of dishes and set meals, and the lack of innovation in dishes, some students gradually give up eating in the canteen.

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3.3. Student Needs

3.3.1. Healthy and Reasonable Nutrition Package

The awareness rate of students' health knowledge is low, their work and rest are irregular and lack of exercise. In addition, unhealthy lifestyles such as dieting and unreasonable diet are common, and the health problems of college students are becoming increasingly prominent. Students urgently need healthy and reasonable nutrition packages to cultivate good eating habits and improve their physical health, so as to manage their body healthily and reasonably.

3.3.2. Efficient and Orderly Ordering Mechanism

Students' peak dining results in crowded ordering and taking meals in the canteen, and there is no obvious queue jumping phenomenon, resulting in disorder of ordering and taking meals. Students need to waste a lot of time on ordering meals in the queue, improve the ordering efficiency of the canteen, shorten the queuing time, alleviate the queuing congestion, and establish an efficient and orderly ordering mechanism, which has become an urgent service for students.

4. Platform Business Model Construction

Based on the questionnaire data, aiming at the problems existing in the current canteen and the needs of students, this paper explores the construction of the business model of the intelligent platform of university canteen. The platform consists of two parts: student side and merchant side.

4.1. Student Client

The student side includes five core modules: appointment management, meal taking management, nutrition experts, and activity and evaluation center.

4.1.1. Reservation Management

Reservation management is the core part of the platform, and other parts serve this part. Mainly through the background data analysis, students can know in advance the number of diners on each floor of the canteen and the number of people who have ordered at each window, as well as the expected waiting time for taking meals at each window after ordering at different time periods. Students can decide the dining place and time, so as to skip peak meals, avoid wasting time in a long queue and improve dining efficiency. In addition, students can receive corresponding coupons on this interface to reduce the purchase price.

Students can make an appointment to order meals through mobile app and wechat applet. On the home page, they can choose the shop and dishes they want to buy according to the dishes recommended by nutrition experts. After determining the dishes, they can choose hall food, self-help and takeout according to their own situation. When paying, you can choose the coupon you receive. After payment, you will receive the corresponding meal code. Students can receive the purchased meals with this code.

4.1.2. Meal Taking Management

This section has a variety of meal taking methods to choose from. Students can choose the best meal taking method according to their own situation and the current situation of students. So as to achieve the effect of dispersing the students and avoiding the disorder of meal taking order, greatly reduce the students' meal taking time and improve the dining efficiency.

After receiving the order, the merchant completes the food preparation according to the students' needs, and places the meal in the designated place according to the students' choice. For example, if students choose to take meals from the canteen, the merchant will put the food in the designated intelligent meal taking cabinet, and the students will take meals by virtue of the meal taking code [2]. Students who eat or take meals in the canteen can understand their

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order status through the small electronic screen set up in front of the purchased window, or through the large electronic screen set up in the center of the canteen. The large and small screens are linked to update the order status of each window synchronously, sit and wait for meals without queuing, so as to improve the efficiency of dining in the canteen. Students who choose takeout can take their meals by self-service at the designated pick-up point according to the meal code, which saves the time for takeout staff to wait for students to take their meals, improves the delivery efficiency of takeout, and improves the dining efficiency of students.

4.1.3. Nutrition Specialist

This section is to provide intelligent recommendation services for students' meals, and provide students with the most suitable and nutritious food packages. In order to solve the problems of unreasonable diet and unhealthy diet of college students, improve the diet of college students and ensure the healthy growth of college students.

The intelligent platform of university canteen provides students with special intelligent nutrition experts. The experts provide students with suggestions on nutritional diet matching and recommend personalized nutritional packages according to the students' ordering record data and physical fitness sorted out in the background. In this section, the platform will display the personalized suggestions provided by nutrition experts, so that students can order meals and reasonably match meat and vegetable dishes to form healthy and green eating habits and reasonably manage their body [3].

4.1.4. Activities and Evaluation Center

This section is to provide students with a path to understand canteen activities and information feedback. Students can understand the recent activities of the canteen and sign up for participation. They can also reflect their dining feelings and opinions and suggestions on canteen management to the canteen, so as to solve the problem of two-way information asymmetry between University canteens and students.

After eating in the canteen, students can leave a message in the comment area, or feed back relevant opinions to merchants in the form of private letter or questionnaire. Through students' opinions and suggestions on the food, service and activity feeling of the canteen in the evaluation center, merchants can generate word cloud through data collection in the background, so as to improve students' evaluation more quickly and accurately. Businesses can release information on the platform and deliver the latest news to students, such as the latest healthy dishes, store limited activities, canteen Festival welfare activities, etc., so that students can timely understand the preferential activities and dish updates of the canteen and improve the timeliness of information transmission.

4.2. Merchant Client

The merchant side includes four core modules: nutritional menu management, dish inventory management, dish purchase management and data visualization.

4.2.1. Nutrition Menu Management

This section is the core part of the merchant side of the platform. It mainly uses web database technology and big data analysis technology to collect and analyze students' ordering information, and formulate corresponding material statistics for businesses. Businesses can prepare meals accordingly, which can avoid the waste of exceeding and insufficient meals. In addition, the nutrition menu matching function of the nutrition expert plate connected to the student side is also available in this plate, providing students with a special personalized menu. This plate can solve the problems of unbalanced supply and demand of canteen dishes and unhealthy diet of students.

The nutritional menu management system automatically obtains the required amount of ingredients according to the students' ordering information through wed database technology,

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and formulates accurate material consumption statistics. Merchants can accurately prepare meals according to the material consumption statistics, purchase scientifically and reasonably, and reduce the waste caused by the imbalance between supply and demand. The system can also analyze students' eating habits by using big data technology according to the ordering records. Nutrition experts can match nutrition accordingly, reasonably match meat and vegetable dishes, and provide personalized menus for students. So as to help the canteen realize fine management and improve the management efficiency and operating efficiency of the canteen.

4.2.2. Dish Inventory Management

This section is mainly used to manage the in and out of the warehouse of the dishes purchased by the canteen, so that the merchants can understand the inventory of the materials used for the dishes in detail. This section is combined with the nutrition menu management section and the dish purchase management section, so that the dishes purchased by the canteen can be fully used, avoid the waste of food materials and reduce the operating cost of the canteen.

The dish inventory management system includes the functions of inventory counting, inventory transfer, inventory checking, return stock out, return stock in, picking stock out, etc. this section of the platform can help businesses grasp the whole process of goods from purchase to stock out in real time, making the canteen inventory management more simple and efficient. Merchants can also manage the dishes in stock in time through this system to ensure the freshness and health of daily dishes. This section also provides the basis for the purchase of dishes, so that merchants can achieve accurate purchase, reduce waste and save costs.

4.2.3. Purchase Management of Dishes

This section mainly tracks and manages the whole process of food material procurement in the canteen, so as to improve the freshness and quantity accuracy of food materials. This section collects and analyzes the ordering records of teachers and students, and completes the purchase of food materials in time according to the inventory of food materials in the canteen. It also tracks the purchase of food materials and the process of entering the warehouse, and evaluates the freshness of food materials by school teachers and students, so as to ensure the green and healthy of food materials.

The dish purchase management system includes the functions of purchase pricing, purchase application, generation of purchase order, purchase warehousing, generation of settlement document and so on. It works with the inventory management system to help merchants update their inventory in real time, ensure that the warehouse can provide the quantity of dishes required for the day in time, and avoid waste caused by excessive purchase of food materials. In addition, the platform can track the whole process from the purchase of food materials to the warehousing project, and whether the dishes evaluated by students are fresh, select more reliable suppliers for procurement, and complete the pricing, ordering, warehousing and settlement document generation of required food materials in this section.

4.2.4. Data Visualization

This section is mainly to provide data basis for the later management of businesses. Businesses can timely adjust the dish style, dish supply and later sales activities according to the management data provided by the platform, so as to provide better services for school teachers and students, improve the sense of dining experience of school teachers and students and their satisfaction with the canteen.

The operation data visualization system includes purchase statistics, cost accounting, report statistics and other functions. The platform uses web database technology to timely generate graphic results about purchase, cost and sales volume, which can enable businesses to timely and clearly understand the purchase and sales of dishes. Businesses can analyze and adjust dish supply, later sales activities and dish purchase in time according to this situation.

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References

[1] Wanchun Liu, Qing Wu. Literature Review of Logistics Industry Research Based on CiteSpace [J]. Logistics Engineering and Management, 2021,43 (7): 23-26.

[2] Shujuan Li, Weiqiang Zhou, Yong Mi. Exploration and Practice of Intelligent Ordering System in Colleges and Universities [J]. Journal of Central China Normal University (Natural Science Edition), 2017 (S1): 59-62.

[3] Suihui Liu, Xiaoming Ma. Study on the Current situation and Countermeasures of Catering Waste in College Students' Canteens -- Taking Qinghai University for Nationalities as an Example [J]. University, 2021 (29): 98-100.