Feasibility Study of Intelligent Cafeteria Peak Efficiency Management

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Abstract. Based on a college cafeteria queue, the operational process of the cafeteria queue and its causes of inefficiency are analyzed. To address this problem, an actionable optimization scheme is proposed to build an intelligent Internet platform to cope with the slow pace of cafeteria dining during peak hours and the lack of effective communication methods between the two parties. The analytical ideas and solutions in this paper are operable and repeatable for the intelligent construction of university canteens.

Keywords: Cafeteria; Big data; intelligence; efficiency; process optimization

1   Introduction

Abstract Data type and amount in human society is growing in amazing speed which is caused by emerging new services such as cloud computing, internet of things and social network, the era of big data has come. Data has been fundamental resource from simple dealing object, and how to manage and utilize big data better has attracted much attention. [1] Intelligence is gradually integrating into our lives and changing the way we eat, dress and live. As students and teachers are the main consumers of college cafeterias, how to provide them with a safer, more convenient and more comfortable dining environment is increasingly becoming a hot topic today. The combination of intelligent technology and student canteens to improve dining efficiency and save unnecessary time wastage has become the voice of contemporary college students. [2] The expansion of college enrollment and the lack of supporting facilities and resources have led to various problems that limit the development of schools. School canteen is an important place to solve the "three meals a day" of school teachers and students. There are three management modes of traditional unit canteens, i.e., unit-run mode, catering company-run sole proprietorship mode, and "unit + catering enterprise" cooperation mode [3], all of which have certain limitations. The cafeteria management model affects not only the daily lives of the school's students and faculty, but also the daily operations of the school. During peak meal times, it is a common problem that too many people in the school cafeteria make students wait too long in line to eat. "The people take food for the sky, the nation takes food for security", The concept of "macro-nutrition" has been deeply rooted in people's hearts, how to solve the problem of efficient meals for

teachers and students, this paper gives the relevant improvement measures for reference.

2   Factors affecting the efficiency of student dining

Through research and study, it can be found that the root cause of long waiting time for students is that during the peak dining period, students gather to eat at some affordable and popular cafeteria windows, and at the same time, the number of people received at each window per unit of time is limited and there is an upper limit to the production rate of food in the kitchen. Increasing the number of window receptionists and improving labor efficiency are part of improving hardware conditions, which are demanding, difficult, and costly. This paper does not discuss research options for improving peak efficiency management in this area, but intends to improve management efficiency by improving software conditions

With regard to software factors that affect the efficiency of student meals, specific problems are reflected in two points:

(1) The windows are running at high capacity during peak hours, and students have low dining efficiency and long waiting times.

The time when students arrive at the cafeteria for dinner is typically randomly distributed [4], with a large number variable and a strong randomness at each window. The workload of the cafeteria staff increases dramatically when college students concentrate their meals between 11:30 a.m. and 12:30 p.m. Students of all grades concentrate their meals in the cafeteria after classes, with a large influx of students. During this period, it is common for students to queue for a long time and not be able to find a seat for their meals. This greatly increases the time it takes for students to eat. During peak meal times, students' queue for some popular dishes for even longer than the actual meal time.

(2) There are fewer information channels between students and teachers, and it is difficult for the cafeteria to understand the feedback needs of students and teachers in a timely and accurate manner.

At present, the channel of information interface between the cafeteria and students and teachers is mainly through the relevant student departments to regularly collect students' problems, organize statistics and then collect feedback.

The current student cafeteria problem feedback platform of our university is operated by the university rights and interests protection department, with a platform network attention of 1,470 people, active browsing awareness of about 300 people, and the construction of three student communities with a total of about 1,600 people.

The department focuses on collecting feedback from students in each college for about one month, during which time it includes meetings to discuss, screen, and plan for online and offline feedback. The frequency of communication meetings between the student department and the relevant person in charge of the cafeteria is once every two to three months, and the meeting with the school's logistics teachers is about once a semester. The efficiency of logistics service is low, and the organizational perfor-

mance is not high.[5] Student feedback issues have a limited rate of information dissemination and feedback, and the student platform has limited attention, making it difficult to cover a wide range of campus faculty and student groups. Each offline communication meeting is able to collect about ten suggestions from students and faculty due to time constraints.

The existing online platform has a single function and little possibility of development and optimization. It can only collect students' problems in the cafeteria, so participants often use the community platform only after they have encountered problems, and the daily reliance on it is extremely low, which also leads to the lack of attention of the community platform in the student community. **[Fig.1]**
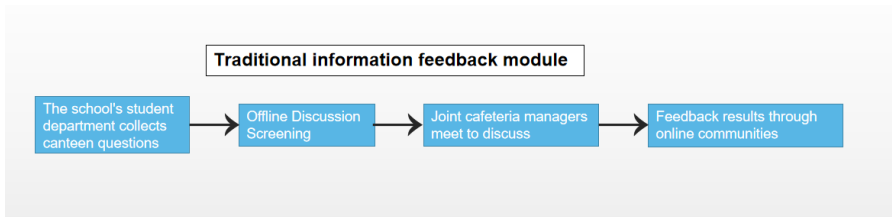

Fig. 1. Traditional canteen information feedback model diagram

This approach results in a long feedback period, a very limited amount of feedback, and is often hardly representative of public opinion. As a result, the cafeteria can only learn about student taste preferences through a relatively single approach, such as the sale of dishes. Students wait in long lines for some popular windows, while some windows are abandoned, wasting the few cafeteria windows available. Students' lack of knowledge about the taste of dishes also tends to lead to students' dissatisfaction with the taste of dishes and much waste.

3   Solution to inefficient dining

With respect to the issues described in the previous section, you can focus your efforts on optimization and improvement by building a big data platform.

3.1   The use of reservation ordering system solves the problem of long waiting time

We build an intelligent web platform through big data to enable online booking and ordering for students. Through location inquiries and timely active feedback of location information, we are committed to achieving accurate and on-time dining options. Greatly reduce students' waiting time.

Currently, the dining process in campus cafeterias generally involves students ordering food offline from the cafeteria → the cafeteria begins production → students pick up their meals. The disadvantages of this method are.

(1) The only way to order food from existing personnel in real time offline is through existing personnel, which is less efficient in information transfer per unit of time, and

coupled with the fact that each order is sent from the student to the back-of-house cashier, the multiple information transfer processes in between will increase the time from ordering to picking up the food. When the meal rush is on, the increased information transmission time will undoubtedly increase the waiting time for students significantly.

(2) In the actual ordering process, there are also cases where students do not understand the taste of the ingredients of the cafeteria dishes, which can lead to hesitation in ordering, delaying the whole meal time and possibly increasing unnecessary waste.

The advantages of using the Internet platform booking ordering system are as follows.

(1) Students order food online through the application platform. Platform ordering can break the traditional ordering time and distance restrictions. Meals can be booked in advance through the platform. After the cafeteria receives the student order, it can be formulated in advance according to the arrival time, and the target of dining within three minutes can be accomplished within three minutes through timely and proactive feedback of location information and meal time budget based on big data analysis. Having the meal ready before the meal can greatly reduce the problem of long meal times and low meal efficiency for students.

(2) Students order in advance, which also facilitates the window to make corresponding estimates in advance, improves the fault tolerance rate during peak hours, reduces the compliance of window operations, improves efficiency and saves related human resources dispatch.

3.2 Open the communication channel between teachers and students and canteens through big data statistics and exchange function

The intelligent Internet platform built by big data increases the feedback opportunities and audience reach of most students, optimizes the feedback delivery process, and provides a more efficient and direct understanding of students' dining needs. Discover the common laws of network big data, study the network big data qualitatively and quantitatively [6], which is beneficial to the canteen for the timely improvement of the problem, as well as the promotion and distribution of news within the cafeteria and increased information exchange between the cafeteria level and the student level.

The current model is to use the student union or other relevant departments as a sounding board between the cafeteria and the students and faculty, to regularly collect opinions and give feedback to the cafeteria, which then makes relevant improvements.
[Fig.2]
The disadvantages of this approach are.

(1) There is an "intermediate department" in the middle of information feedback, which is inefficient, with long feedback intervals and limited feedback information. This will take up additional time and labor costs. In the process of progressive information transfer, there will be information loss, and much information can not play its proper role.

(2) Limited audience relying on student departments alone. Student-related communities and spaces do not reach a wide enough audience of students, and there are also a large number of new students entering each year who need to continue to popularize

information about cafeteria dining and other related information, and there are still a significant number of students who are unable to find relevant feedback channels while repeating their work. Moreover, due to the large amount of information available in the student department on a daily basis, most students do not pay much attention to it on a daily basis and tend to turn to the relevant departments only when they need to, so in the process of feedback from the cafeteria to students, the information can be limited by a large audience, which is not conducive to effective information exchange between the cafeteria and students.

Through the construction of the Internet platform, the advantages in terms of information feedback and exchange are as follows:

(1) Student information can be fed back directly to the relevant departments of the cafeteria, and the online platform can break through the limitations of time and space to exchange information efficiently and even in real time. The cafeteria can also answer students' questions or feedback online in a timely manner, and can set up representative feedback in the platform square to address students with the same problem. For new students entering each year, you can also learn directly about the relevant cafeteria standards and how to give feedback on dining through previous question inquiries, etc., saving a lot of publicity and education efforts.

(2) Students use this platform to order catering and expand the audience of the platform. Students need to eat every day, and the platform is extremely used, so they can be informed about the relevant information on the platform in a timely manner. To a large extent, the efficiency of information exchange has been greatly improved. For the improvement of the cafeteria, the introduction of new dishes, and the possible related welfare activities and announcement publicity, good publicity can be achieved at a very low cost.
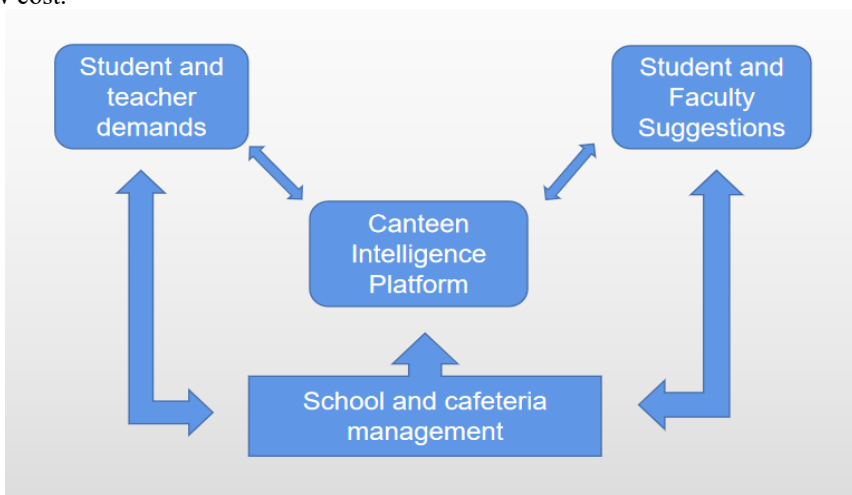

Fig. 2. Intelligent canteen platform information feedback mode diagram

4   Cafeteria order exchange platform function suggestion and discussion

4.1   Order function

Establish a database of student and faculty information and a school cafeteria database to enable data and information exchange. Canteen staff can enter the menu in advance according to the meal preparation of the day. Students can use a variety of ordering forms, such as online reservation ordering, offline QR code scanning code ordering, and quick entry by the ordering staff at the window, etc. The ordering system is connected to the payment system to make the ordering and payment integrated.

4.2   Data collection and analysis functions

Big data statistics can easily target the peak time and large number of dishes needed for each dish in each window. Through the backstage analysis of various dining data recorded by the system, it effectively assists the canteen to prepare meals more scientifically at regular intervals [7], thus making dish allocation, staffing, and meal time refinement more efficient and accurate, and facilitating regular meal data analysis. A canteen window incentive competition system can be further designed, where less than a certain number of meals per unit of time can be improved or shelved, and the corresponding window can be rectified. Through reasonable competition, the service quality and dish quality of the limited windows of the canteen can be improved.

4.3   Positioning function

On the basis of big data statistics, open the reservation system, add the information feedback docking function with an error of no more than one minute, and add the synchronous manual location acquisition function. Through the active location determination and timely information feedback function, the dining time is close to the actual dining time. Timely docking information allows users to grasp the progress of scheduled meals and specific meal times in real time, and canteens can obtain more accurate offline pick-up and drop-off times for diners to meet the basic requirement that meals can be picked up within three minutes after dining.

4.4   Menu functions

The cafeteria monitors ingredients and condiments to ensure that the food comes from a legal, clean and sanitary source. The dish introduction page explains the taste of the dish, the amount of ingredients (even for condiment brands and production dates) so that ordering students can quickly understand the taste and raw materials of different dishes, food safety related information is more open and transparent, consumers are more assured and easier to choose the food that suits their taste.

4.5   Promotion function

New dishes and canteen events can be promoted on the online platform and consumer feedback channels can be established. By promoting through the online platform, more people can learn about new dishes or new events faster, combining the above features with the possibility to learn about the taste and ingredients of new dishes. Appropriate welfare activities also help to increase the activity of the cafeteria and attract more students to try different dishes, etc. Consumer feedback channels are more convenient, with a wider audience and more efficient information flyers to keep abreast of students' views on the cafeteria and related needs raised.

4.6   Evaluation feedback function

Establish a user evaluation and exchange center to build a channel for timely feedback to teachers, students and users through the platform. Setting up a feedback and Q&A section where canteen-related staff can answer teachers' and students' questions online and screen out problems of general significance for display can better serve as long-term publicity and notification, allowing new users to also learn about solutions to related problems based on the platform display. This role also helps to increase communication between canteens and teachers and students, to keep abreast of their dietary needs, and to carry out relevant improvement activities.

5   Future research direction of intelligent canteen platform

Intelligent construction should take efficiency enhancement as a fundamental priority, making full use of the Internet and the advantages of intelligent platforms to improve the efficiency of information transmission and reduce the information gap in favor of development optimization. Only by applying modern cost control and management tools effectively in practice and constantly innovating can college cafeterias keep up with the changes of the times and provide better quality catering services.[8]

Cafeterias are common in primary and secondary schools and even workplaces around the world. As a necessary activity for human survival, intelligence can greatly save the efficiency of the service of eating and dining. Intelligent, process-oriented and even unified catering intelligent platform system has great potential to be explored in the future using demand. Mature food ordering operation mode can not only be applied in the canteen scene, but also has a huge development market in the increasingly prosperous food service industry market.

6   Conclusion

In summary, the peak efficiency management model based on smart canteens can be improved in two ways.

(1) By building an online sharing platform through big data, users can view the dining information of the school cafeteria on the APP anytime and anywhere, and then

arrange the order flexibly according to their own time, solving the problems of high operational load of windows, low dining efficiency of students and long dining time during peak periods.

(2) Create a two-way feedback system on the built platform to evaluate and exchange dining experiences and feelings, address information docking between students and canteens in real time, and understand students' feedback needs in a timely and accurate manner.

Acknowledgement

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