

En Route to Fast and Efficient Service: A Proposed Automated Ordering System in Counter-Style Foodservice Establishments

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Abstract

Foodservice establishments have turned out to be a huge business market in the recent times. With the advancement in the foodservice industry, restaurateurs are responsive to cater to the consumer needs. This industry has undergone a constant change in adapting to the technological drift. With fierce competition, foodservice businesses are striving hard to answer to the consumer needs of quick ordering and fast service through the development and incorporation of ICTs. This paper proposes the automation of the food ordering through self-service system in counter style food establishments to maximize the number of customers served during peak hours. It also intends to minimize queue length; waiting time to give in their order; queue length at the pickup counter; and the number of lost customers. Moreover, the proposed system will eliminate errors during order taking and communicate inventory status.

Keywords: *foodservice business, self-ordering, counter style, automated food ordering system*

1. Introduction

In this fast paced busy world when every individual is toiling day in and day out in their own walk of life, busy citizens need quick meal options. This is where the Quick Service Restaurants (QSR) or fast food restaurants make their presence felt. As the word “quick service” suggests, speed of service is one of the key considerations in this paper.

Quick service restaurants are foodservice establishments where the food and drink are paid for before being served. The critical points for this type of restaurant are to have service staff who are readily available to take or receive orders and food quickly prepared and then immediately served to the maximum number of customers in the least amount of time. The main characteristics of quick service restaurants are speedy service, inexpensive food items, limited menu normally displayed on a wall, and convenience [1]. These types of restaurants use counter style service where customers are queued or lined up to speak with counter staff to give their order, pay and wait until ordered food is ready. These foodservice establishments may also provide drive-thru, delivery, and take-out services [1].

There are several challenges restaurant managers running a counter-style service confront. The lack of speed in processing the orders and delivering service. Another is the delay in the relay of ordered items in the kitchen. Also inaccuracy in tracking the ingredient utilization and the overall inventory. Another challenge is repricing menu on display when doing seasonal promotions. Then, there is the issue of manually working on the financial accounting of the business operation which is time consuming. The most important issue that a restaurant manager should confront is the customer service long queue and wait time

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during peak hours. Several research that were published have mentioned that long queue and long wait time are the dissatisfiers in relation to customer satisfaction. As such researchers have analyzed the efficiency of restaurant services. Hummel and Murphy (2011) mapped out an entire service system to depict the impact of efficiency management on a restaurant and its industry. This technique was termed service blueprinting. One of their findings was that optimizing the time to serve the customers paying their bills would earn the restaurant three additional dining tables in a peak hour [1]. Another study is a survey conducted by [2] about customer satisfaction. A primary and the most critical issue in quick service restaurant is the queuing and waiting time. The survey result mentioned that the speed of service was an important item for the consumers who ate meals away from home.

This study would like to propose a solution to the long queue and waiting time in the counter style foodservice establishment to speed up the service. It also aims to reduce labor cost by introducing an automated self-ordering system that will be available for use anytime especially during peak hours. The proposed system will directly communicate order to the kitchen thereby eliminating errors when communicating orders. Moreso, the proposed system will facilitate efficient foodservice operation by making item repricing, inventory and accounting part of the system capabilities.

2. Literature Review

2.1. Overview of Quick Service Restaurant

Quick Service Restaurant (QSR) is a specific type of restaurant within the food industry that serves different cuisines and has minimal table service. The establishment offers a limited menu, cook in bulk in advance and keep hot, finished and packaged to order and is usually available ready to take away, even though seating may be provided. These restaurants are typically part of a restaurant chain or franchise operation that provisions standardized ingredients and/or partially prepared foods and supplies to each restaurant through controlled supply channels [3].

2.2. Rise of Quick Service Restaurants

The increase in single parents and dual earner families have affected the amount of time families have to plan, purchase and prepare meals at home. A customer on a constrained time budget will likely favor the use of technology to reduce transaction time, and patronize businesses that make life easier. Dual income families usually have more discretionary income to spend on food, less time and energy to prepare food at home, and a strong desire and a need to spend time together as a family unit [4].

Consumers value time and convenience in when buying products or availing services. They are used to getting what they want and getting it immediately. American families are experiencing a time-famine, more families are eating out. One thing that will continue to contribute to the growth and success of restaurants is the evolving patterns and needs of consumers. Conflicting schedules, busy lifestyles, varied food preferences, a robust economy and a low unemployment rate are some of the reasons for the increase in dining out [5].

2.3. Conventional Food Ordering

An existing method commonly used in quick service restaurant is customers queue on line and give their orders at the service counter personnel. Menu boards, tents and posters are placed in all conspicuous places within the venue. One has to decide while standing and looking at the advertising material and has to fix their options prior to their ordering. An alternative option adopted during peak time is to assign an order taker during a long queue.

[6]. These methods aside from consuming time are completely annoying. Once the customer has placed and paid the order a number will be given. One has to constantly and vigilantly to wait for his order to be assembled and his number be called to pick up the order. This situation reduces customer experience.

2.4. Language Barrier/Communication Gap

Problems may occur when people from different cultural backgrounds misunderstand each other, which results not only from language barriers but is also due to cultural differences [7]. In South Korea, most of the restaurants are owned and operated by the family members. Koreans who take orders and served food barely speak English and other languages [8]. In another study about language barrier in intercultural service encounter, interviewees mentioned that they encounter difficulties in expressing themselves or understanding what the servers were saying [9]. Furthermore, miscommunication and the difficulties in obtaining accurate information on the menu items are the main sensing problems that Korean ESL customers encounter. This, in turn, affects their purchase decisions because they are not well-informed about the products and procedures [9].

2.5. Conventional Inventory Method

The key decision in foodservice business is how much inventory to keep on hand. The success of the business depends on how well the store manager's ability to maintain adequate quantities of items for sale. Records provided by an inventory method call the attention to the need to produce or reorder when called for. Traditional daily inventory is supervised by this method. Actual counting is a method used to control and supervise inventory. It is used to actually count inventory item-by-item. This is an exhausting task and not all businesses do it. Ingredients or menu items gone during the daily foodservice operation will result to loss of sales opportunity. On the other hand, customers get disappointed when items that they will order or have ordered are not available [14].

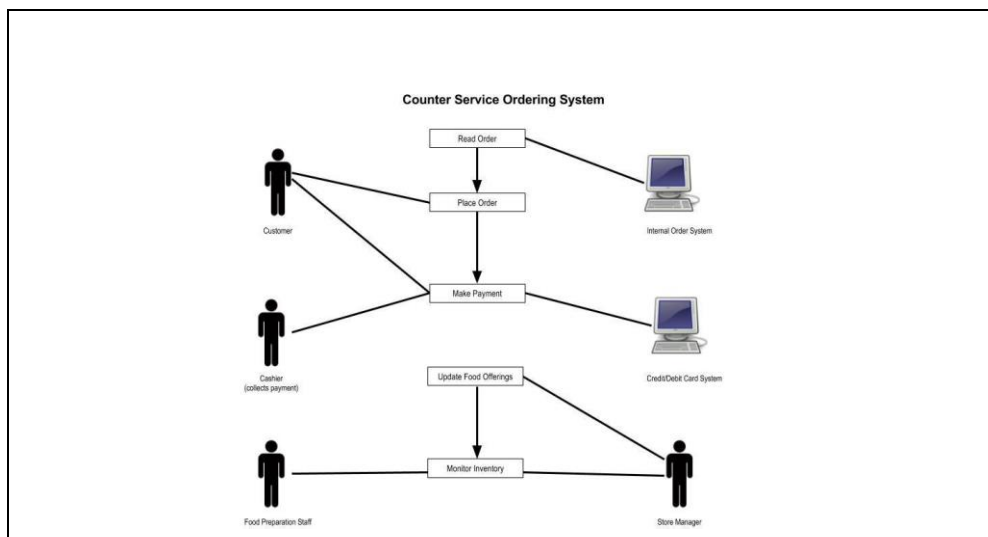


Figure 1. Counter Service Ordering Method and Conventional Inventory Method adopted from Vimal Mayank & Deep Saraf (2003) Project Fast Food Automated System

2.6. Information and Communication Technology

Information and communications technology (ICT) refers to the range of technologies that allow the gathering, exchange, retrieval, processing, analysis and transmission of information. The rise of ICT as a tool for general interaction is evident from the wide

acceptance of the Internet as a platform for communication and knowledge sharing, and from the pervasive adoption of mobile communications all around the world [10].

These process frameworks are the basis for applying the technologies needed in self-service ordering system. To streamline the whole system, actors must optimize both internal and interconnecting processes. Information technology supports this interconnectivity by providing the foundation for implementing the self-service ordering system. In this context, ICTs are deployed in two dimensions:

The information systems that are used to link and support the self-service food ordering. The goals for ICT are to ensure that essential processes and information are integrated through solutions and applications. In self-service ordering, these applications range from those supporting the ordering, payment collection, update food offerings and inventory control.

Technologies are also used to provide platforms and tools through which knowledge can be shared; collaboration and communication can occur among various foodservice personnel involved in the process. The goals for ICT include providing voice communication services for personnel in the areas of operation or supporting information sharing.

The ICT challenge has always been to ensure that there is adequate application support to allow the automation of critical transactional processes, and that appropriate technology is in place to encourage the desired collaborative and knowledge sharing behaviors to support these processes [10].

To make their operation more efficient, some counter style foodservice establishments use Information Communication Technologies (ICTs). Some of the existing ICT's typically used by these establishments are digital on-screen monitor for menus, order taking while the customer is still on the queue and online food ordering[11] [12].

3. Challenges and Limitations

The counter service style foodservice businesses are not realizing efficiencies that would result from better applications of technology in their daily operations. Every fast food has a food counter where you can place your order and then make the payment. So every fast food establishment needs an employee for taking the order and processing the payment. However, one of the areas in the business that present a major challenge relates to human resource. The human resource has several issues including labor shortages that has a high turnover and adequate training problems. Also, there is a need for more qualified employees, which leads to increased labor costs. Lastly, diversity issues in the workforce that include an increase in generational differences in the workforce and employees whose first language is not English, that results in training challenges and cultural sensitivity issues [13].

To overcome the challenges and limitations in the present service operational system, this paper proposes the automation of the food ordering in counter style food establishments to maximize the number of customers served during peak hours. Moreso, it also aims to minimize queue length, waiting time to give their order, queue length at the pickup counter and number of lost customers.

4. Application as a Solution

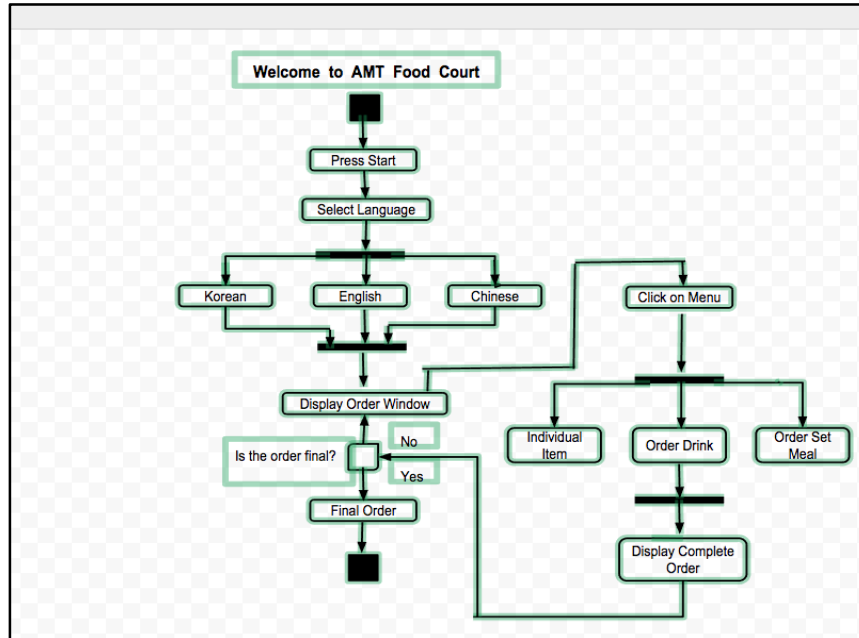
This paper proposes an improved version of the electronic menu and ordering system by Torres [8]. The system application that was recently published provides a quick ordering feature that can be installed on mobile devices such as smartphone and tablets. It also allows the customer to choose the language to use. Moreover, a detailed description of the dish, price, serving size, nutritional contents, main ingredients, the degree of spiciness, possible food allergens etc. Visual features like photos of dishes and videos with suggested way on how to enjoy eating Korean traditional food are included [8].

The self-ordering automated system will be equipped with a user-friendly touch screen, a credit/debit card reader, and software for completing the process at the backend. For this system there will be system administrator. The administrator will have the access to the computerized system to enter the menu with their current prevailing prices. The system administrator can enter anytime in the system by a secured system password to change the menu contents by adding or deleting an item or changing its price.

Now when the customer enters the establishment to order, the order can be encoded through the help of the touch screen using the intuitive graphical user interface, right from the selection of language until the payment confirmation. Single or multiple food choices can be selected from the displayed options. Once the selection has been finalized, the total amount to be paid will be displayed. Options of paying the bill by cash, debit card or credit card is also part of the system. Upon clicking the payment option, the customer when using cash have to insert the bill and/or coin on the slot provided. If using debit or credit card, customer will have to slide his card and the system will check for the validity of the card and then payment will be made. A receipt will be printed containing the detailed order/s and an order number for claiming. Likewise, the order will be sent to the kitchen for production, cooking and assembly.

4.1. Operational Benefits

There are numerous operational benefits for this proposed system. First, it will minimize the number of employees at the front and back of the counter. This can result to a reduction of the cost of labor. Second, the system will be less probable to make a mistake, since it has less labor to commit human error. Third, the customer's long queues at the counter will disappear due to the speed of execution. Multiple screens can accommodate more customers to do self-ordering. Finally, the ordering system can be available 24 hours a day without shutting down.



**Figure 2. Diagram of the Self-Ordering System
adopted from Vimal Mayank & Deep Saraf (2003) Project Fast Food
Automated System**

4.2. Automated Food Ordering System Proposed Features

The system will have a user-friendly user interface. Part of the system's feature is that the particular user will have no difficulty in reading the text on the display because the system is navigable through intuition. The menu choices are presented in form of buttons, which contain text as well as little pictures illustrating the choice for better understanding. The system will support multi lingual capabilities since it was anticipated that customer is not a native speaker of the common spoken language in the country. The system will cater to English (universally accepted language for communication) and other languages such as Korean and Chinese, which are commonly spoken in the country where it will be operative. The system will take order from the customer as per choice. The customer can select an item or multiple items or set meal (e.g. a combination of main food, drink and side dish). The system will calculate and display the final bill based on the placed order. It will calculate final bill based on the quantity of the items multiplied by their unit price topped up by the applicable taxes if any. The customer will be given the option to either pay for the order or revise the order. The system will handle the payment for the customer-defined order. If the customer decides to pay cash, the system will request user to enter cash in the slot. The system will verify the cash amount and will give change if any after deducting the amount. The customer will decide to pay through credit/debit card. The system will inform the user to swipe card through card reader. It will verify the card and will charge the amount of the bill to the card. It will prompt the customer to sign the bill on the signing pad. The system will print out receipt containing an order number, details of the order, bill and the payment method with a terminal message (Enjoy your meal!). The system will communicate the order to the kitchen through the internal ordering system. The system will readily be programmable should the manager choose to change menu items available for the day or during promotional season. The system will be resistant to active/rigorous handling. It was anticipated that some security threats may occur and so the system will be programmed to provide security for these areas.

4.3. System Performance Characteristics

There are several performance characteristics expected from the automated self-ordering system. First is the maximization of the following: (1) The number of customers (throughput), which can be handled by the system in a given shift. This relates to the number of employees and the number of operating touch screen. (2) The operator utilization. The system generates revenues when in used and at the same time incurred an expense. The system is expected to efficiently managed the food service operation by minimizing the following : (1) Queue length. This is a direct measure of the customer satisfaction with the system and may cause loss of revenue if a customer decides it is not worth waiting for the system to be free and will leave. (2) Cost of operation. The system will minimize the cost of operating the system (per day/per shift). This directly relates to the salary of the employees and the other variable cost like operating cost of the touch screen. (3) Time spent by the customer in the system. This might be a bottleneck consideration while designing the system. A customer will not come back again if a lot of time has been spent to get his order completed. Also this is an important characteristic in time critical setting (for e.g. at during lunch time in a cafeteria where people have limited break time). (4) Waiting time. This is more or less directly relates to the queue length minimization problem. However, it is important to consider the time it takes for an average customer to complete the order on the touch screen. So queue moves quickly. So this in turn relates to designing a user interface, which causes a user to navigate smoothly across the screens without fumbling for the things being looked for. (5) Queue length at the pickup counter. It is not simply enough to state that minimizing the queue on the touch screens or average waiting time on the touch screens will do the job. We also have to consider employing enough food ordered assemblers so that they deliver the prepared order quickly

and efficiently. (6) Number of lost customers. This directly relates to the requirement on the percentage of customer who will be served by the system. Obviously a lost customer is lost revenue and as this number increases so is the increasing dissatisfaction with the restaurant operation.

4.4. Identified Actors

The actor is anybody or anything that interfaces with the system externally and participates in systems modeling. In the proposed self-service ordering system, the actors would be: The Customer, the principal user who will order food and make the payment. The Store Manager, who will hold the rights to change the menu offerings and enter the system to make any changes. Another is the Internal Order System. This actor will read the order given by the customer and pass it to the food preparation person. Next is the Bank System. This actor serve as a backbone for doing the credit / debit card transaction. There is also the Cashier who will accept the cash from the customer and gives back the change. Lastly, the Food Preparation Staff who receives the order placed by the customer through internal order system.

5. Conclusion

Restaurants are focusing more on efficiency, whether that means the use of new technology or better employee scheduling, to move customers through the line quicker and churn out more sales during their busiest hours. Some foodservice establishments are speeding up lines by using hand-held ordering systems and mobile-phone payments, while others are trying to do a better job of training and scheduling employees. While others are scheduling more workers during busy times. In the highly labor intensive industry, some establishments are hesitant when it comes to technology because they don't want to sacrifice their personal touch. However, in today's foodservice demand and high volume of customer that needs to be served at the shortest possible time, technology improves productivity. The speed of service using automated system is much faster and should be continued to facilitate fast and efficient food service. Since payment tends to be an impersonal, the process can be speed up by mechanizing it without taking from the human experience. Technology is a big driver for satisfying the customer's needs to avoid long queues and be served immediately hence valuing their time.

References

- [1] M. Dharmawirya, H. Oktadiana and E. Adi, "Analysis of Expected and Actual Waiting Time in Fast Food Restaurants", *Industrial Engineering Letters*, vol. 2, no. 5, pp. 8-18.
- [2] A. K. Y. Law, Y. V. Hui and X. Zhao, "Modeling Repurchase Frequency and Customer Satisfaction for Fast Food Outlets", *International Journal of Quality and Reliability Management*, vol. 21, no. 5, pp. 545-563.
- [3] Wikipedia. Quick Service Restaurants. Retrieved from https://en.wikipedia.org/wiki/Fast_food_restaurant
- [4] R. Allen, "Demographics changing, shaping industry", *National Restaurant News*, vol. 25, no. 42, (1991).
- [5] G. Vila, "Consumers shape future", *Food and Service News*, vol. 1, no. 5, (1999), pp. 14-15.
- [6] S. Barker and C. E. J. Härtel, "Intercultural service encounters: An exploratory study of customer experiences", *Cross Cultural Management*, vol. 11, no. 1, (2004), pp. 3-14. <https://doi.org/10.1108/13527600410797710>.
- [7] A. Grobelna, "Intercultural Challenges Facing the Hospitality Industry. Implications for Education and Hospitality Management", *Journal of Intercultural Management*, vol. 7, no. 3, pp. 101-117. <https://doi.org/10.1515/joim-2015-0023>, (2015).
- [8] A. M. Torres, "Electronic Menu and Ordering Application System: A Strategic Tool for Customer Satisfaction and Profit Enhancement", *International Journal Science and Technology*, <https://doi.org/10.14257/ijunesst.2016.9.4.39>, vol. 9, no. 4, (2016), pp. 401-410.
- [9] E. E. K. Kim and A. S. Mattila, "The Impact of Language Barrier & Cultural Differences on Restaurant Experiences: A Grounded Theory Approach", *The Limits of Our Language*, (2011), pp. 1-8.
- [10] E. Yu, "Technology in Food Assistance".
- [11] D. Jarvis, N. Stoeckl and H.-B. Liu, "The impact of economic, social and environmental factors on trip

- satisfaction and the likelihood of visitors returning”, *Tourism Management*, vol. 52, pp. 1-18. <https://doi.org/10.1016/j.tourman.2015.06.003>.
- [12] G. R. Gilbert, C. Veloutsou, M. M. H. Goode and L. Moutinho, “Measuring customer satisfaction in the fast food industry: a cross-national approach”, *Journal of Services Marketing*, <https://doi.org/10.1108/08876040410548294>, vol. 18, no. 5, (2004), pp. 371-383.
- [13] J. Sneed, “A Guide to Centralized Foodservice System”, *Funding NFSMI (Vol. 1)*. National Food Service Management Institute Through a Cooperative Agreement with USDA, Food and Nutrition Science. <https://doi.org/10.1017/CBO9781107415324.004>, (2002).
- [14] R. W. Hilton, “Inventory management”, In *Managerial Accounting*. Mc Graw-Hill Inc., (1994).