

## ORIGINAL ARTICLE

# User Requirements and Usability Testing on a Mobile Application for Food Ordering Canteens

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## ABSTRACT

**Introduction:** In today's competitive world, people are rushing for meals between work. A long-time queuing to wait for orders is not a good option. Furthermore, the pandemic situation has forced people to avoid crowds or close physical contact, resulting in the demand for food ordering applications. Existing applications, however, lack customization to specific consumer demands, such as the unique requirements for school students during a pandemic. Furthermore, there is currently little to no evidence-based information accessible about their quality. Thus, this study was conducted to identify requirements to cater for the supply and demand for food and beverages during school hours. **Methods:** In order to assess quality, a usability assessment was conducted using 15 usability test questions with school students and canteen operators (n=50). The testing protocol comprised pre/post-test surveys, a structured interview and task-performance (n=9) observation. **Results:** The Efficiency test shows most tasks were more than 90% of the time completed successfully with minimal errors. With a threshold of 78%, eight out of nine tasks were considered effective. Also, a score of more than 85% dominates the satisfaction tests, with an average mean of 4.54. An average score of 91% on the usability scale demonstrated excellent perception of the application's usability. The result also provides several recommendations for improvement. **Conclusion:** The ultimate design of the application is targeted to receive good acceptance and meet the users' demand. This will promote an efficient supply and demand system and improve the quality of life for consumers and canteen operators.

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## INTRODUCTION

In the competitive world nowadays, people have less to no luxury of time to wait in a queue for their lunch order to be taken by the canteen operators. Many people visit the canteen during their lunch break, so they only have a short time to place an order, eat, and then return to their respective offices or companies (1). Gowthami et al. (2) supported this argument that people usually go to the canteen to place their orders, and they must wait a long period to receive their orders.

The problem similarly happens in the school environment. Besides that, during the recent Covid-19 pandemic, students had limited access to the school canteen, and any close physical contact must be avoided. More and more evidence has emerged of clusters of outbreaks caused by virus transmission from person to

person (3), indicating that the more people gather, the more likely people are to become infected. Furthermore, students with critical diseases or who are at a higher risk of becoming ill should avoid crowds as much as possible. This suggests students must avoid gatherings, such as waiting in line for lunch at the canteen.

Today, several food ordering applications are available for quick access to foods and beverages. However, there was a lack of customization to specific consumer demands, such as the unique requirements for school students during a pandemic. Furthermore, there is currently little to no evidence-based information accessible about their quality. Thus, this study is aimed to provide a solution by understanding user requirements and quality expectations for food ordering applications in a school context. The objective of this study was to develop a mobile application to cater to the supply and demand for food and beverages during school hours in terms of both functional and non-functional requirements. In order to assess the quality, a usability evaluation was conducted to measure its efficiency, effectiveness, and satisfaction. This study

is hoped to reveal a clue to producing a good quality canteen food ordering mobile application, which could promote a positive user experience, and benefit both the users and canteen operators alike. Most importantly, the application is designed to meet the needs of its users. This will result in a more efficient supply and demand system, which will improve the quality of life for the consumers and canteen operators alike.

Using application to purchase food online has become valuable and profitable in every industry. Because of the high demand in the sector and the expanding usage of the Internet, an online food ordering system is essential. Buyers may quickly select their menu and place their orders using an online ordering tool. Buyers can pay for their food more easily via cashless payment. Food operators, on the other hand, will be able to add or update food items and prices, as well as get consumer comments.

The meal ordering app's feedback features could help operators think on how to improve consumer pleasure and loyalty. Because pleasure acts as a mediator between contentment and loyalty, client satisfaction and happiness can contribute to a sense of loyalty (4). Customers could order cuisine based on their preferences, and payments could be done in cash or online. It will eliminate the need to wait for the worker to accept orders and make payments (5).

It is also commonly understood that people have diverse tastes and preferences when it comes to food. A recommendation system could be created based on previous purchasing patterns, demographics, and customer ratings (6). In a food ordering application, a recommendation system is critical for providing customers with meal combinations, as well as persuading users to purchase through promotions and increasing customer satisfaction (4).

In addition, QR codes are a popular way to quickly store and exchange information. Buyers and sellers have regularly used it to share information and make payments. Each is designed to make the users' work easier (7). As a result, including a QR code in a meal ordering canteen app may make it easier for purchasers to pay suppliers.

People usually go to a canteen and order meals, and they have to wait a long time to acquire their orders (2). Customers must wait in a long line to place an order, and once the order is placed, they must wait until the order is ready (2). Similar problem occurs with school students who order food from the canteen using a manual system. Getting their food during school breaks was a major issue for them. Students usually rush to grab food in a short amount of time. These students, on the other hand, must wait in line for a lengthy period to purchase meals. Their break time is primarily squandered waiting in lines, and

it's even worse when they don't get to eat their food on time. Because of the increased congestion, the canteen workers are often unable to fulfil orders on time. In their analysis, Fegade et al. (8) discovered that it is sometimes dragged until recess time is finished, causing students to skip class, practicals, or be late for their classes. They may go without food at times due to a lack of supplies (9). Students were also subjected to conflicting commands on occasion. Due to the imbalanced size of the canteen and the number of clients, there is also congestion at the counter (10). Furthermore, in a crowded and noisy environment, miscommunication is common, and the chances of receiving a mistaken order are higher (11).

This necessitates the development of a system that allows school students to acquire their food on time during recess using a mobile application. This application will assist students in purchasing food during their breaks without having to wait in long lines or waste time. Because recess is short, it is critical that students receive their meals on time. Students may go straight to the canteen to pick up their pre-ordered meal without having to wait or risk receiving the wrong order. Students will be able to buy meals on time, making it easier for cafeteria workers to prepare food and deliver it in timely manner.

## MATERIALS AND METHODS

Fig. 1 illustrates the research methods. A survey was conducted using questionnaires built based on 14 related features and issues identified from the past literature, and the review to existing related food ordering application. They are as follows: food and drink list, add to cart, submit order, food recommendation, view order, track order, order notification, cashless (QR pay), feedback, timesaving, ease of use, agreeability, tailored for pandemic situation, tailored for school recess situation. The survey was done online with n=52 respondents involving secondary school students who have experience with online purchasing. The features resulting from the survey were used as functional and non-functional requirements for the intended food ordering canteen mobile application.

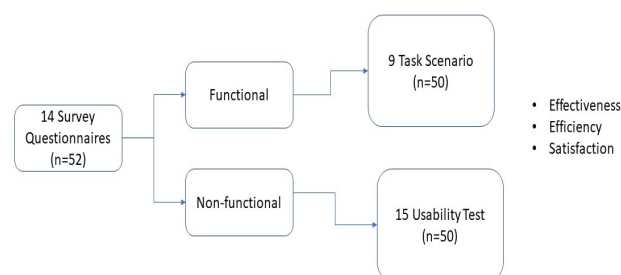


FIG 1: The Research Methods

The developed application was then tested to obtain user feedback and assess its usability. Quantification of usability can be done using several usability metrics. Usability comprises the aspects effectiveness, efficiency, and satisfaction (12). Effectiveness is a term that relates to the accuracy and completeness with which users accomplish defined goals. While efficiency refers to the resources used in relation to the accuracy and completeness with which users accomplish goals. Satisfaction, on the other hand, relates to the ease and acceptability of use.

This study gathers user feedback and evaluates the usability metrics in the form of efficiency, effectiveness, satisfaction of the food ordering canteen mobile application. A 15-session usability test with school students and staff (n = 50) was conducted to collect data on user satisfaction and experience with the application's contents and mobile interface. The protocol for usability testing included pre- and post-test surveys, a structured interview, and task performance observation on the mobile platform. A pre-testing questionnaire was utilised to collect demographic information, and a 15-question post-testing questionnaire was employed to determine participants' degree of satisfaction.

The participants were randomly selected among students and staffs. Prior to beginning the evaluation work, a demographic background was surveyed. Participants were chosen based on the following criteria: a secondary school student with prior experience ordering food, a member of the school personnel, and a member of the canteen staff. The evaluation was conducted using tasks by different scenarios. The respondents were given a total of nine task scenarios in which they were requested to experience the application on their mobile phone. Each work scenario required five minutes to complete. Table I demonstrates the tasks and scenarios.

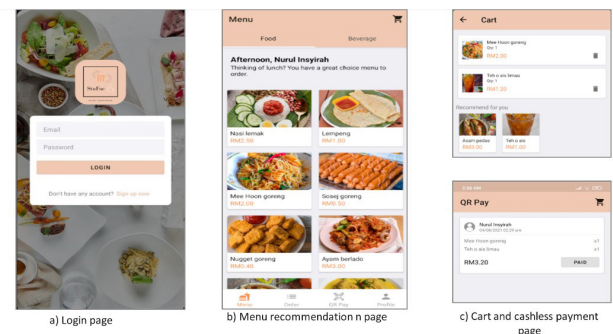
**Table I: The User Task Scenario**

Task	Scenario
Recommended menu	The user clicks search button for recommended menu.
QR code	The user clicks QR code button, scan the displayed QR code to view the menu name and price.
Add to cart	The user clicks Add button to add the menu into the cart, go to the cart page, and check the menu list.
Track order	The user clicks Track Order button to check status whether completed or still in progress.
Receive order	The user clicks Order button to view the ordered menu and click Ready to Pick-up button.
Payment	The user clicks Payment button to view payment history and make payment.
Feedback	The user clicks Rate button, write feedback, and give star rating and click submit button.
View feedback	The user clicks the Feedback button to view all feedbacks and star rating.
CRUD menu	The user clicks Menu button, create, read, update, and delete (CRUD) information on food and beverage.

A usability test questionnaire, adopted from (13), were the given to the respondents. The questionnaire comprising 15 usability tests is used to determine the participants' level of satisfaction. Descriptive analysis was then conducted to analyze the gathered data from the questionnaire, and qualitative analysis to the interview result, to determine efficiency, effectiveness, and level of satisfaction, as well as provide relevant recommendations.

## RESULTS

A canteen food ordering mobile application was developed based on the result from the survey conducted to target users. It has features for recommending menus, QR pay, adding to cart, tracking orders, receiving orders, payment, feedback, and admin features to create, read, update, and delete menus. Fig. 2 shows instances of the application.



**FIG 2: The Instances of the Application**

### Test of Efficiency and effectiveness

The study conducted user tasks scenario and answer the 15 usability test questions involving 50 participants. The composition of respondents adds insights to the background of the respondents. They comprise of 20% lower (13-15 years old) and 60% upper (16-18 years old) secondary school students, and 20% staff including the canteen staff with equal distribution of gender for all.

**Table II: The Test Result**

No.	Task completion	Errors	Average Time taken
1	45	5	3.00 min
2	50	0	1.02 min
3	50	0	2.05 min
4	42	8	1.30 min
5	50	0	1.00 min
6	15	35	6.5 min
7	47	3	2.08 min
8	50	0	1.04 min
9	46	4	4.03 min

Table II shows the test result for task completion, errors, and average time taken to complete each user task scenario (refer Table I) given to the 50 respondents.

These results were analysed to determine the application's efficiency via task completion and time taken, and effectiveness via success rate. Majority of respondents were able to complete all tasks, except Task 6, which was about payment feature.

An interview was also conducted based on the ISO 9124-11 usability attributes, i.e., efficiency, effectiveness, and satisfaction, with the respondents to obtain further information on their experience after the application walkthrough.

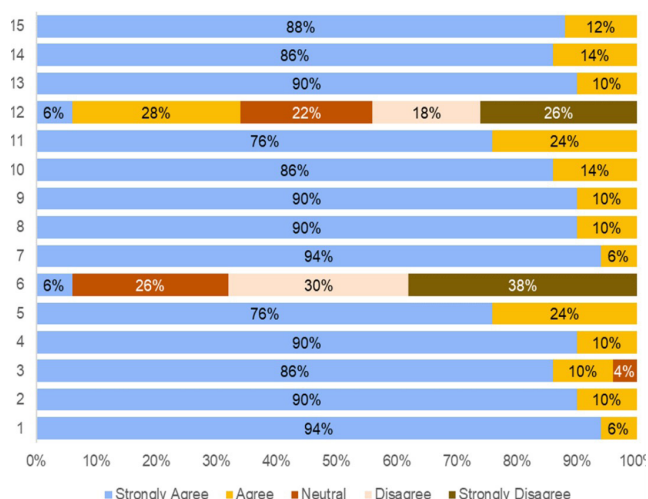
The synthesized respondents' feedback and recommendation is shown in Table III. This result will be useful to enhance the efficiency and effectiveness of the application.

**Table III: The Interview Result**

Attribute	Comments/Errors	Suggestions/recommendation
Efficiency	Task 1 (Recommended menu)	Task 1 (Recommended menu)
	- It was easy for me to find the recommended menu.	- Add more menu for recommendation
Effectiveness	Task 3 (Add to cart)	Task 3 (Add to Cart)
	- There was no problem for me to add the menu into the cart and submit the order via the cart page.	- Add payment method before submitting the order
Satisfaction	Task 7 (Feedback)	
	- The interface on the feedback page is excellent.	
	Task 4 (Track Order)	Task 4 (Track Order)
	- I'm very satisfied with this function, but I feel additional features should be added.	- Add time calculation and display feature to indicate waiting duration / time-frame.
	Task 6 (Payment)	Task 6 (Payment)
	- It is difficult for me to get to making the real payment.	- Include payment gateway and add payment options so that it will be easy to make payment.

## Test of Satisfaction

A questionnaire comprising of 15 usability test was used to assess level of satisfaction. The questionnaire was set to rate five-point Likert scale, from strongly disagree to strongly agree. Fig. 3 shows the evaluation results. The result shows that more than 75% of users agreed that they were satisfied using the application on both platforms. Highest satisfaction score (94%) was on the ease of use and simple steps to execute task. Five tests received 90% satisfaction score, which are easy to find information, pleasant fonts used, clear and descriptive information, easy navigation, and intention to use.



**FIG 3: The Satisfaction Feedback**

## DISCUSSION

### Test of Efficiency

As can be seen from the table, 100% of users were able to complete Task 2 (QR code), Task 3 (Add to cart), Task 5 (Receive order), Task 8 (View feedback) in about one minute. More than 90% of users successfully completed Task 1 (Recommended menu) with five errors, Task 7 (Feedback) with three errors, and Task 9 (CRUD menu) with four errors, with average time taken three minutes, 2.08 minutes, and 4.03 minutes respectively. Task 4 (Track order) was completed by 84% of users with 8 errors. All these tasks have successfully completed within the given time. However, Task 6 (Payment) has received only 30% successful completion rate with 35 errors and was not successfully completed within the given time. Thus Task 6 is lacking efficiency. This reflects the perceived complexity in payment related page by the users.

### Test of Effectiveness

Success rate of task completion is used as a measure of effectiveness of the application. As demonstrated in Table II, only tasks 4 tasks, Task 2, Task 3, Task 5 and Task 8, have achieved 100% completion rate while the rest showed 94% and below completion rate. The data shows only 42-47 users were able to complete the tasks, apart from Task 6 which scored lowest with 30% success rate.

Based to a benchmark of 78% as the threshold for average successful completion rate, the result indicates that eight out of nine tasks are considered effective. The study observed the resulting ineffectiveness of Task 6 was due to the major proportion of the respondents were school students, and they were not familiar with the option of online payment, as they usually use cash to make purchase at school canteen.

### Test of Satisfaction

More than 85% strongly agree that the application has pleasant interface, and no broken link/menu/page, and they indicated that they are satisfied with the overall application and would recommend it to other users. However, 30% low score was received for test 6, which indicates disagreement by users to the test for error message display with information on how to solve the problem. This provides clue for future improvement to the application to add error message with information to assist users to solve the problem. It is also interesting to see that for test 12, 44% vs 34% of the users did not agree for the application to be improved, while 22% have neutral opinion. Additional mean analysis as shown in Fig. 4 indicates that most of the participants were satisfied with the application, with an average mean of 4.54.

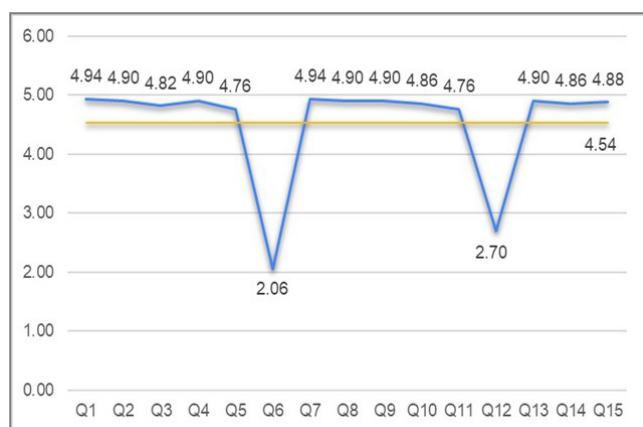


FIG 4: The Overall Mean Analysis

Although the satisfaction test shows encouraging results, it also shows that there is a room for improvement. This is in tandem with test of effectiveness and efficiency, which indicates similar results. For future improvement, recommendations provided in Table III could be referred.

### CONCLUSION

This study has analysed the effectiveness, efficiency, and satisfaction in order to examine the usability of the food ordering canteen mobile application. The data was obtained from 50 respondents among school's staffs and students. Analysis of the success rate of task completion was used to assess effectiveness, task completion time and errors were used to assess efficiency, and based on nine user task scenarios, 15 usability tests were

administered to assess level of user satisfaction.

The analysis results showed that the mobile application is considerably effective, efficient, and scored high on user satisfaction. Nevertheless, there was indication for further improvements, and several suggestions were obtained from the result of interview session. The result provides empirical evidence that the food ordering canteen mobile application is successful and receive good usability assessment. The ultimate used of the app will benefit school students and canteen operators to easily get/deliver the right food at the right time in timely manner.

Although the application is deemed successful, it was developed under some limitations, for instance the application was developed based on Android OS, thus it cannot be used on other OS such as iOS. Another limitation is it was tested using secondary school students and staffs as respondents. These limitations provide opportunities for further research on other platforms as well as wider scope and population. Additionally, further improvement can be done based on the user's feedback, for instance the application can be enhanced to include payment gateway to complement the feature where users can have options and easily make online payments.

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