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OPTIMIZING CAMPUS CAFETERIA OPERATIONS: DEVELOPMENT AND USABILITY EVALUATION OF THE EATSY MOBILE FOOD ORDERING SYSTEM

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Abstract:

Technological advancement has changed the landscape of the food service industry. People nowadays place their food **orders** using food service applications. However, university students still need to queue up at the cafeteria to get their food. During peak hours, university students face long lines and significant delays, wasting their valuable time due to inefficient manual order management at the cafeteria. The problems affect students' satisfaction and cafeteria staff productivity. Therefore, this project aimed to address these challenges by designing a user-friendly Android mobile application food ordering system, Eatsy in the

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context of cafeteria at the University Teknologi MARA (UiTM) Machang Campus. The application has been developed using Rapid Application Development (RAD) methodology which involves Requirements Planning, User Design, Construction and Cutover phases to improve the dining service experience. Eatsy allows students to order food at cafeteria wherever they are, and they could track the status of their orders in real-time. This application also helps cafeteria staff managing order effectively. At the Cutover phase, a preliminary usability test with the System Usability Scale (SUS) was performed with a purposeful sample of users. The result of the evaluation showed an average of SUS score of 91.25 which is considered as very high user acceptance and system usability. Overall, the implementation of Eatsy proves to be a viable digital transformation strategy, aimed at minimizing operational delays, optimizing the service offering and enriching the dining experience at the Campus. Future research directions involve utilization of intelligent recommendation system and extension of architecture to support sustainable operation of multi-cafeteria systems.

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Keyword:

Campus Cafeteria, Mobile Food Ordering, Rapid Application Development, System Usability Scale, Usability Evaluation



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Introduction

The proper operation of food service systems is an important part of efficient daily operations, particularly at high-volume facilities such as universities. There are concerns regarding the ability to provide food services for large, diverse student bodies efficiently. The inefficiency in the dining part is primarily due to manual ordering process which results in long queues and failed order in the dining area as mentioned by Gurukar et al. (2024) and Suganthi et al. (2026). Such inefficiencies are not only a frustration for students, but they can also place an excessive burden on cafeteria staff and ultimately impact the dining experience. Mobile technology has taken hold and made its mark in all aspects of life, even food ordering and eating. Food-ordering mobile apps are popular, and offer convenience for users by letting them pre-order, track food orders in real-time and pay digitally. In a controlled setting such as a campus cafeteria, these systems have been able to cut down on the amount of time it takes to wait in line and increase customer satisfaction. Moreover, digital solutions have been found to be of great help to food service providers when it comes to improving their operational efficiency as it helps them to manage orders effectively and reduces errors. The efficiency improvement directly translates into an overall better dining experience, increasing customer satisfaction and the institutions' reputation, ultimately leading to customer loyalty (Serhan & Serhan, 2019). Furthermore, this digitized approach contributes to strengthening the security of the ordering process, thus offering additional benefits (Nizar et al., 2023).

The commercial applications have grown, but the use of this application in academic institutions is still restricted particularly in developing countries. Reports from industry show that only 33% of students are happy with the food service facilities in their school, highlighting the need for improvement (Dobрила, 2020). Hence, this project proposes a mobile application to be implemented at university cafeterias. The app Eatsy was first implemented at UiTM Machang Campus. Eatsy allows students to browse menus, place online orders and receive real-time updates on meal readiness. Students could save their valuable times instead of waiting in line. This app also helps cafeteria managing order, reduces errors and increases efficiency. Eventually, Eatsy connected campus community by improving dining experience and campus life. Hence, to make sure the app effectively resolved these operational challenges, three research questions were addressed:

RQ1: What are the operational challenges faced by UiTM Machang students and cafeteria staff in the traditional food ordering process?

RQ2: What functional features must be incorporated into a localized mobile platform to streamline cafeteria ordering and fulfillment?

RQ3: How usable and acceptable is the developed Eatsy food ordering system for students and cafeteria staff?

Literature Review

This section will elaborate on manual ordering system which still be used at cafeteria, digital transformation in food ordering system and online applications available for food ordering.

Service Operations and Challenges in Campus Cafeteria

The manual ordering system at the university cafeteria usually ends up with long queues during peak hours. Students usually skip breakfast and go to the cafeteria hungry. Finally, they get frustrated waiting a long time for their food. They just waste their valuable time (Tajuddin et al., 2024; Masurkar et al., 2022). The traditional ordering process usually requires the food ordering staff to fill out a paper form and submit it to the kitchen, which can be tiresome and ineffective (Jalaludin et al., 2023; Nikhil, 2022; Tajuddin et al., 2024). Noise levels can be quite high during busy hours, resulting in ineffective communication and possible misunderstandings and inaccurate interpretation of orders (Tajuddin et al., 2024). Furthermore, no visible guarantee of a successful order, and customers cannot be informed if their orders have been received successfully or not (Nikhil, 2022). Moreover, there are no automatic updates of an order, which means that the customer wastes time waiting to get an update on his meals. The preceding study emphasizes the ability of smart food court technology to solve these problems in real time, particularly through order monitoring in real time and provision of management dashboards to greatly reduce wait time and increase the efficiency of administrative work (Suganthi et al., 2026). Besides, the intelligent digital functions of the local campus system have proven helpful in responding to users' questions and enhancing the user experience (Jalaludin et al., 2023). The slow and gradual effect of the long lines and inaccurate orders indicated the inefficiency of manual procedures.

Digital Transformation through Mobile Food Ordering

One of the most groundbreaking developments to arise in the food service industry is the food ordering system that is run through the mobile phone. It is acknowledged as a strategic instrument for the digital transformation.

Mobile ordering apps are the apps that enable customers to order food straight from their mobile phone. The apps have acquired more purchase in the food service sector because they are now capable of creating enhanced customer experiences and streamlining operations. Customers can use mobile apps to view digital menus, order customizations, and make transactions without needing to wait for customer service support (McMahon, 2024). This ordering apps decreases wait time and human error in the ordering process, which leads to better order accuracy. Moreover, most of the mobile ordering applications offer other features, such as dietary filters, loyalty programs, and personalized recommendations based on previous orders, which cater to individual customer preferences (Binari, n.d.). With the ease of ordering food from anywhere, anytime, the way consumers have traditionally engaged with food services has been restructured, delivering more flexible and customized dining experiences. In addition, the applications can be connected to payment systems, so that customers can pay directly from the application and save time and improve customer satisfaction.

The commercial delivery platforms are the major ones in the food industry. However, their integration into the internal operation of the cafeteria is limited, and delivery surcharges are high in closed campus environments. So, there is a pressing need to develop a local campus-based ordering system. The dedicated apps improve the student self-service technology (SST) experience and allows cafeteria staff to have access to real-time data to manage inventory and staff workflow for a more sustainable and efficient service delivery model.

There are various mobile food ordering apps that have been developed, each offering different functionalities and features to cater for different customer preferences. We will discuss three well-known mobile apps used by customer in Malaysia: GrabFood, FoodPanda, and Shopee Food, and discuss their advantages and disadvantages.

Existing Food Ordering Mobile Applications

GrabFood is a food delivery service that is part of Grab's super app solution, which is widely used throughout Southeast Asia. It enables users to place orders from various types of restaurants and have their food delivered to them through a network of riders from Grab (Grab, 2024). GrabFood brings convenience to users as it is integrated with Grab's ecosystem, which includes ride hailing and e-wallet services. Everyone is aware of its ease of use and the fact that it enables users to connect with local and international cuisines makes it the order of the day for both urban and suburban users.

FoodPanda is a popular online food and grocery delivery service available across various regions such as Asia, Middle East and Europe. FoodPanda helps customers find a variety of restaurants and grocery stores and gives them a streamlined experience the same way they shop online for food and essentials (Elluminati, n.d.).

ShopeeFood is a food delivery system in Shopee, which allows users to order food and groceries from various restaurants and stores (Bomstart, 2022). The app users can now place orders directly from the Shopee app or the specially crafted ShopeeFood feature.

Table 1: Food Service Application Features Comparison

Features	GrabFood	FoodPanda	Shopee Food	Eatsy
Target Audience	General public, restaurants	General public, restaurants	General public, restaurants	Campus Student, Campus Staff, Cafeteria Staff
User Registration	Easy sign-up via email/social	Easy sign-up via email/social	Easy sign-up via email/social	Simple registration process
Restaurant Search	Extensive restaurant listings	Extensive restaurant listings	Local restaurants available but limited to specific regions in Malaysia	Focused on cafeteria options
Order Types	Food, drinks, groceries	Food, drinks, groceries	Food, drinks, groceries	Campus cafeteria meals
Customizable Menus	Limited customization	Limited customization	Limited customization	Customizable for cafeteria menus
Delivery Option	Delivery by riders, pickup	Delivery by riders, pickup	Delivery by riders, pickup	Self-pickup only
User Reviews and Ratings	Yes	Yes	Yes	Yes
User Interface	Simple, modern, vibrant	Clean, vibrant, intuitive	User-friendly, compact	Simple and user-friendly
Payment Options	Multiple options including e-wallets	Multiple options including cash and cards	Multiple options including e-wallets	Cashless payments preferred
Real-Time Order Tracking	Yes	Yes	Yes	Yes
Order Notification	Push notifications (order updates & promos)	Push notifications (order updates & promos)	Push notifications (order updates & promos)	In-app order updates only

The comparison provided by Table 1 shows an in-depth analysis of the features and characteristics of four popular food delivery apps—GrabFood, FoodPanda, ShopeeFood and Eatsy—and how each serves its audience. Unlike GrabFood, FoodPanda and ShopeeFood

which aim to serve a wide range of customers such as ordinary citizens and a number of restaurants, Eatsy is dedicated to serving the students and the staff of the University Technology of Machang (UiTM). Eatsy focuses on getting online orders only from university students, unlike other mobile apps that cover a very wide range of customers.

GrabFood, FoodPanda, and ShopeeFood all have user-friendly sign-up procedures, with users having the option to sign up using their email addresses or social media accounts. The other thing to consider is that Eatsy's registration is much simpler as the user base is much more targeted. It's just easier to use for students and the cafeteria staff, which is typical for a smaller, more niche customer. GrabFood, FoodPanda, and ShopeeFood are some order types that can be used to order food, drinks, and groceries, providing a diverse array of options for customers. Eatsy, however, is available only for campus cafeteria meals, thus limiting the service area, but offering a more niche service for students who must make a campus dining choice.

Another distinctive feature in Eatsy is customization options. GrabFood, FoodPanda, and ShopeeFood have a few menu options, mostly individual item preferences or add-ons. Using Eatsy cafeteria staff could modify the meals offered according to availability and students' demand. This flexibility is very convenient for the cafeteria that has a changing nature in terms of menus. Eatsy only offers pickup services as there is no delivery service offered in the campus. This limitation helps to reduce the complexity of the system operation and fits the campus environment where students can pick their meals up. Delivery services impose service fees on consumers. These supplementary charges can place a financial burden on some students. Regarding payment methods Eatsy uses a cashless system. Eatsy focuses on making payments simple for students. GrabFood, FoodPanda and ShopeeFood give a range of payment options, such as cash, cards and e-wallets. Those options might be a benefit for some customers. All four apps include real-time order tracking. GrabFood, FoodPanda and ShopeeFood send notifications to the users' smart phones. Eatsy sends updates inside the app. These updates are only seen when the user is actively using the app. Real-time order tracking and in-app notifications are especially useful for keeping communication smooth between students and cafeteria staff. These features also improve the user experience by avoiding confusion during peak hours. In general, GrabFood, FoodPanda and ShopeeFood have a wide range of functions for a wide demographic, while Eatsy focuses on the specific needs of UiTM Machang students and staff of the cafeteria. It has unique characteristics such as the customizable menu for the campus cafeteria and an easy-to-use self-pick-up system, which provide special benefits for the campus community.

Methodology

The system development phase is applied in this study using two phase methodology that consists of the Rapid Application Development (RAD) model, while in the evaluation phase there is system testing and System Usability Scale (SUS). RAD methodology was chosen because of its focus on rapid prototyping, incremental development, and flexibility in accommodating changing requirements, which are all more practical for limited resource projects.

The Eatsy application has gone through 4 main phases of RAD. In Requirements Planning phase, the user requirements were collected through the analysis of various studies and systems to determine the gaps in services, and a feasibility study was conducted and recorded in a System Requirements Specification (SRS) to lead the technical process. During the User

Design stage, the system architecture was designed using the Unified Modeling Language (UML) diagrams. The data architecture of the system is based upon five fundamental concepts: Student, CafeteriaStaff, MenuItem, Order, and Feedback. The 'Order' entity is the "hub" that connects a student's profile to an item chosen from the menu and logs the process until it is finished.

To demonstrate the working of the system, a detailed flow chart was drawn. Figure 1 shows the overall flow chart for the students and cafeteria staff. In terms of the workflow, the students will start with account registration or login. Then, they might proceed by browsing the menu, choosing items to order, and placing an order. Once an order is placed, students go on to simulate payment. After payment is made, students could monitor order progress in real time. When the order is ready, students will get a notification to pick up their meals. Later, they could drop their feedback regarding the cafeteria service. The cafeteria staff could log into the system to observe and handle incoming orders. They could also update the status of the preparation, mark the order as completed, and evaluate student feedback. This orderly flow helps to clearly define the roles of students and cafeteria staff to ensure the efficient execution of the system.

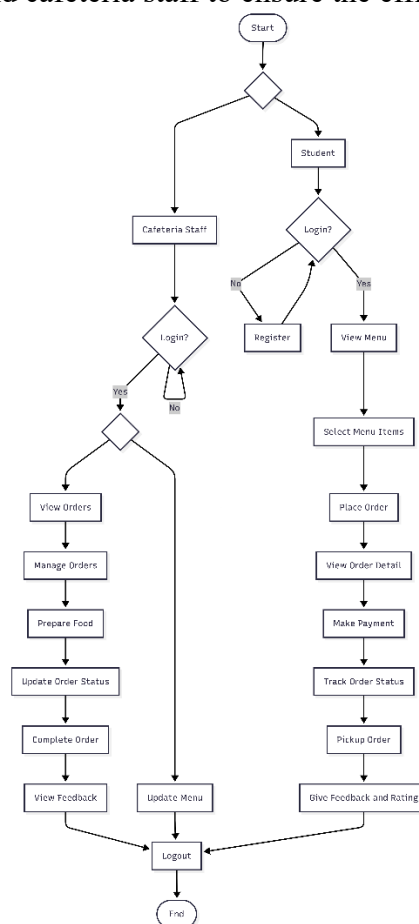


Figure 1: Overall System Flowchart

The Eatsy app was implemented primarily in Java, ensuring compatibility with a wide range of Android devices and taking advantage of the robust libraries and frameworks provided by the Android SDK. For the backend, Firebase Firestore was utilized as a cloud-based NoSQL database to manage and store real-time data such as 'users', 'orders', 'menu_items', 'payments', and 'feedback'. In this project, the flowchart shows the overall process of the entire functioning of the Eatsy. The flowchart for students starts with registering for new user or

logging into their accounts for existing user. Later, student could view the available menu, select the menu items and then place the order. Students can review their order details and, upon verification, proceed with the online payment process. Once the transaction is successful, users can monitor their order progress in real-time. The system will trigger a notification when the order is ready for pickup. Furthermore, the application includes a feature for students to provide their feedback. For the cafeteria staff, the workflow begins with logging into the application. Once logged in, the staff can view and manage all incoming orders. As the meals are prepared, the staff updates the order status accordingly. Finally, once the preparation is finished, the order is marked as completed. They also could view all the feedback from student regarding their services. Both student and cafeteria staff end their respective processes by logging out of the system. This flowchart shows the system processes in a very structured way, underlining the importance of decision points and critical actions. This will ensure that user roles and functionalities of the system are concisely defined for better understanding and, hence, better communication and alignment in the development of the system.

System testing was conducted to evaluate whether the Eatsy mobile food ordering system meets its functional requirements and operates as intended for both UiTM Machang students and cafeteria staff. During this test, 24 features of the application were verified to ensure its accuracy and reliability in different scenarios. Each of the major functions, including customer functions such as registering and logging in users, browsing the menu, ordering, checking out, and cafeteria staff functions such as adding and editing menu items, taking orders, and updating order statuses were covered in test cases. In the meantime, the System Usability Scale (SUS) is a useful tool for assessing the usability of the Eatsy mobile food ordering app. The Nielsen Norman Group rule "Five-User Heuristic" states that testing with five users identifies around 85% of the usability problems (Radek, 2023). This way, resources are used efficiently, and meaningful data is gathered on the usability of the system. This approach is a simple yet reliable means to collect user feedback by having them rate their experience on a 1-5 scale, with 1 being Strongly Disagree and 5 being Strongly Agree. In total, six respondents, including students of the UiTM in Machang and the food court staff were invited to participate in the evaluation and provide their feedback on the usability and the satisfaction of the system.

Results and Discussion

This chapter presents the results and findings of the Eatsy mobile food ordering apps, focusing on the user interface, functional system testing and system evaluation based on SUS.

The first research question (RQ1) which is about operational challenges encountered by the students of UiTM Machang and the cafeteria staff was successfully answered. The findings gained from the requirement-gathering phase is analysed and it explains how the findings were used to design solutions to meet the challenges of the students and the cafeteria staff in the UiTM Machang campus cafeteria. Based on the reviewed studies and literature, several problems were identified with the existing system, such as long lines at mealtimes, lack of visibility of the menu, and the inability of the school food service attendants to manage the orders. These issues may cause delays and errors. In fact, it could lead to a less than satisfactory mealtime and slowdown in the cafeteria service. Eatsy app was created to address these gaps with core functionalities that are centred around the campus cafeteria ecosystem. These important features are designed to optimize the ordering workflow, cut down on wait times, decrease order entry mistakes, and improve the general satisfaction of students and staff in the cafeteria. Eatsy's system design is based on the understanding of the literature in order

to give a solution that is in line with the operational requirements of the cafeteria at UiTM Machang.

Next research question (RQ2) was accomplished as the Eatsy mobile application was developed based on the requirements identified during the analysis phase. The system features an intuitive interface and essential functionalities designed to streamline the ordering and pickup process for UiTM Machang students while supporting efficient operations for cafeteria staff. Each component was carefully designed and implemented to optimize cafeteria workflows, reduce congestion during peak hours, and provide a seamless, user-centric experience for both students and cafeteria staff.

The Student Home and Track Order interfaces are shown in Figure 2. When student's login, they will be provided with a personalized dashboard to access popular meals and menu items by category. After an order is placed and simulated payment is made, the Track Order interface shows real-time updates of the order's status. The order status will change from 'Order Placed,' to 'Preparing,' and finally to 'Ready for Pickup. This order visibility reduces the uncertainty and waits that is often found in conventional cafeteria environments.

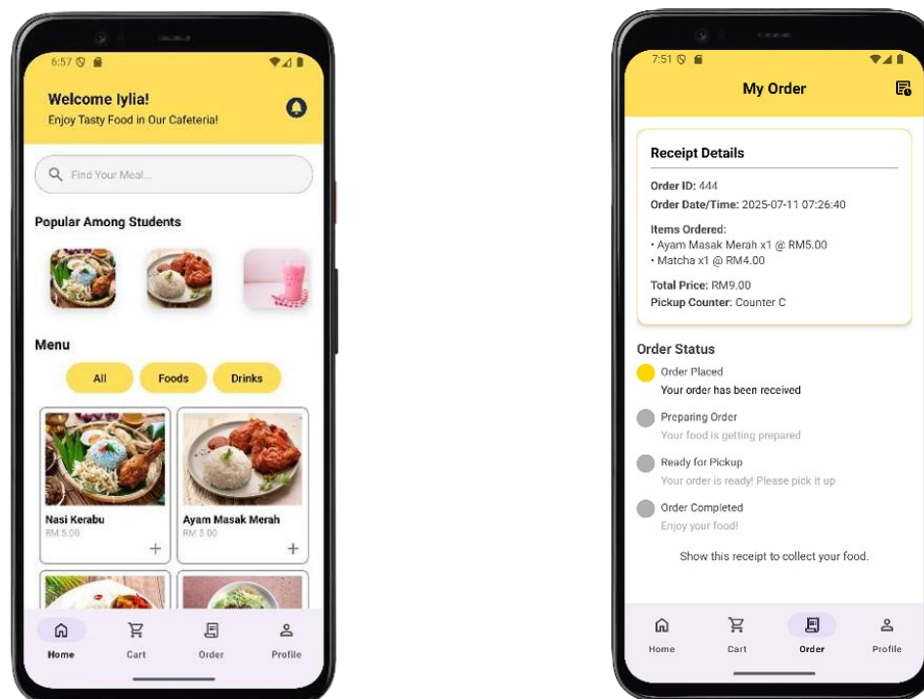


Figure 2: Student Home and Track Order Interfaces

For the cafeteria staff, the interface is designed to optimize order fulfillment and menu management. Figure 3 illustrates the Staff Orders dashboard, which systematically organizes transactions into 'New Orders,' 'Ongoing Orders,' and 'Past Orders'. This chronological arrangement enables staff to prioritize meal preparation effectively during peak hours. Staff can view detailed order specifications, accept incoming requests, and update statuses. This status will automatically trigger in-app notifications for the respective students. Furthermore, the system includes an analytics module and feedback management interface, allowing staff to monitor daily revenue, identify best-selling items, and respond to customer reviews directly.

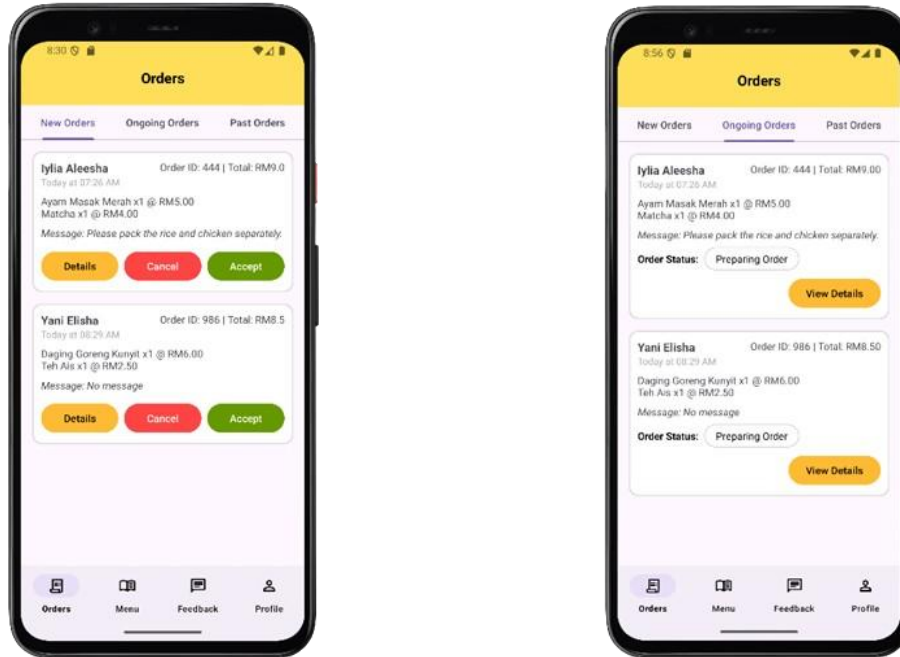


Figure 3: Cafeteria Staff Order Management Interface

The final research question (RQ3) focused on evaluating the application to determine overall user acceptance and usability. A comprehensive system testing phase comprising 24 specific test cases was conducted to evaluate the core functionality of the apps. The evaluation confirmed that all 24 test cases passed successfully without any technical inconsistencies, indicating that the application operates accurately and reliably under various functional conditions.

Six respondents were selected by purposive sampling to take the SUS assessment (students and cafeteria staff). The final average SUS score calculated to be 91.25, which is higher than the industry standard for acceptable usability. The detailed analysis of the SUS items showed very positive user perceptions about the application's design and functionality. The results are depicted in Figure 4, which showed that the intention to use the application was high, with 83.3% strongly agreeing to use the application regularly.

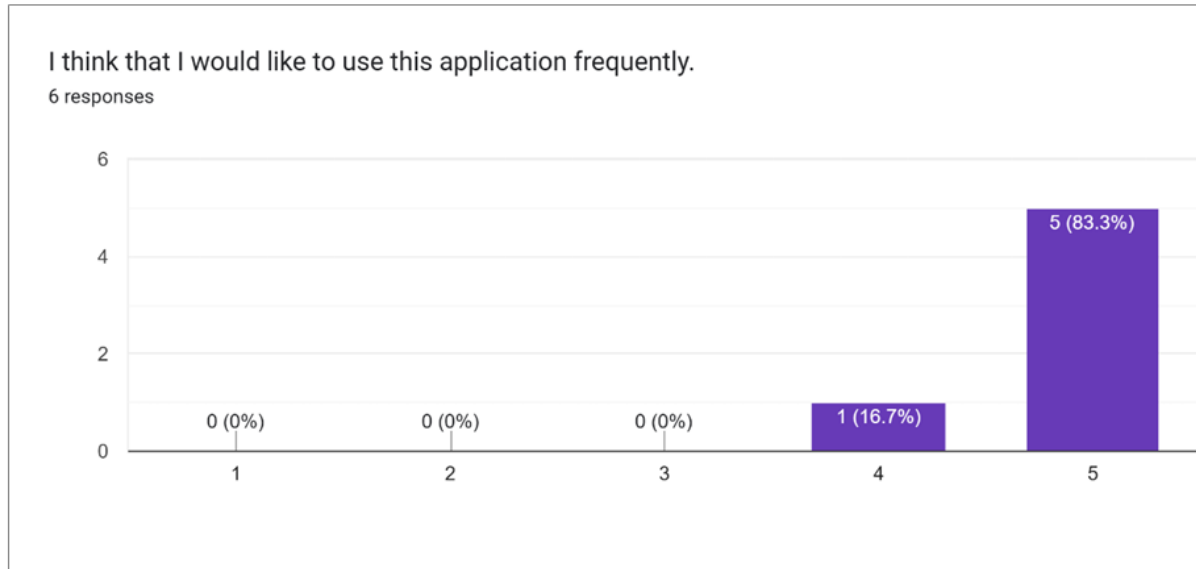


Figure 4: User Adoption Intent

As illustrated in Figure 5, 66.7% strongly agreed that the app was easy to navigate and 66.7% strongly disagreed that the app was unnecessarily complex. This finding indicates that Eatsy is user friendly. In addition, the application was very intuitive: 83.3% strongly agreed that most people would learn to use it very quickly and 50% strongly disagreed that they needed to learn a lot before using it.

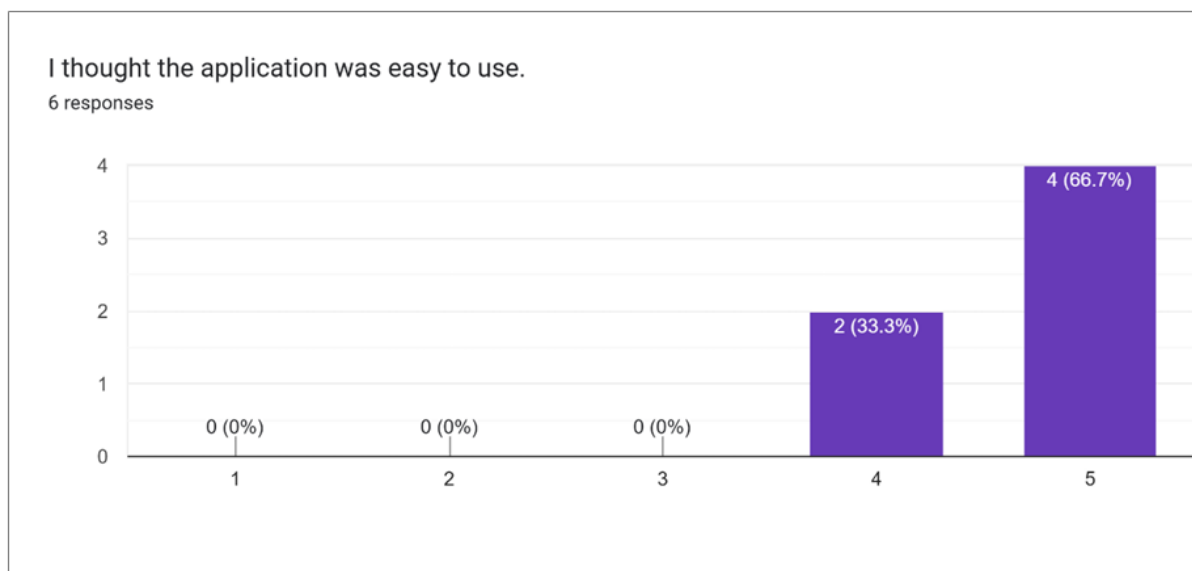


Figure 5: Ease of Use Evaluation

The functions of the system were also well integrated with 33.3% strongly agreeing and 66.7% agreeing. But 83.3% strongly disagreed that there was too much inconsistency within the app. Lastly, when it comes to user confidence, no one said that they require technical support to use the system, while all of the respondents indicate that they are confident with the use of the application. In summary, the results show that the Eatsy mobile ordering app can address the

difficulties of manual cafeteria operations. It offers a digital, intuitive, and dependable tool that adds value to students' dining experiences and helps the cafeteria staff to manage orders easily.

Conclusion and Future Work

The Eatsy mobile application has been developed successfully and tested as a feasible solution to enhance the food ordering system at the cafeteria at UiTM, Machang. The system helps to eliminate long physical queues, order mismanagement and delayed service delivery which are common problems in traditional manual workflows of food delivery services. The use of Rapid Application Development (RAD) methodology allowed the system to be developed efficiently, including essential features such as real-time tracking of orders, menu management, and a feedback section. The initial testing results were very positive, as the system passed all functional test cases and had a high score on the System Usability Scale (SUS), indicating that it was well received by users, very intuitive and easy to operate.

Eatsy apps is successful but has some shortcomings. It is not widely scalable at this stage and is only available in one cafeteria in the UiTM Machang campus. Further, the notification system is limited to in-app information, and the platform does not have a direct messaging system to send students specific requests to staff. The simulated online payment option also needs to be integrated with real banking gateways to process real financial transactions securely in the future.

The future work suggested is to improve the system architecture so that the system can be expanded to operate multiple cafeterias, making it scalable across various locations in the campus or even to external dining establishments. In the future, the project should also be expanded with external push notifications and direct communication with the staff to improve the communication between the users and the cafeteria staff. Furthermore, incorporating intelligent recommendation systems based on user preferences and implementing loyalty programs could significantly boost long-term user engagement and ensure the apps's sustainability.

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