

UTHM Foodie: Cafe Food Ordering System

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Abstract

UTHM Foodie: Cafe Food Ordering System streamlines the food ordering experience at Secangkir Cafe in Universiti Tun Hussein Onn Malaysia. The app aims to address issues related to long queues, enhancing customer satisfaction. It offers an online platform where customers can monitor their order status and receive notifications when their food is ready. The app features a digital menu for easy browsing, allowing customers to access detailed information about the restaurant's offerings. Staff can manage the menu, and a sign-up/login feature prioritizes user privacy. The chosen prototyping model, which comprises six phases like requirement gathering, quick design, prototype development, user evaluation, prototype refinement and final product phase. Ultimately, the application improves efficiency, benefiting both Secangkir Cafe staff and customers, potentially attracting more regular customers and boosting sales. In future, it is advised to develop an iOS version, integrate multiple payment options such as Apple Pay and digital wallets, include estimated preparation times, and support multiple languages to appeal to a wider and more diverse audience.

1. Introduction

A food ordering system application connects students with nearby eateries through a digital platform, enabling them to customize, and securely order a variety of food products. This technology-driven solution enhances convenience for students, offering features like real-time order tracking, payment choices, and user evaluations [1].

Historically, ordering involved visiting a restaurant, verbally communicating with waitstaff, and waiting for the kitchen to prepare the meal. This process had drawbacks such as order mistakes, long wait times, and face-to-face interactions which makes customers be in hassle. Conventional meal ordering methods, like in-person dining or phone calls causes long queues and inefficient ordering processes, contributing to customer dissatisfaction and operational difficulties. Another problem with conventional methods is the lack of detailed menu information, which can be a hurdle for informed decision-making, especially for those with dietary preferences or restrictions. The proposed system resolves this by offering a detailed digital menu that can be regularly updated by the restaurant, providing customers with the necessary information. Additionally, the systems streamline the ordering process by offering digital receipts, allowing customers to review and modify orders, and ensuring accurate billing. The goal is to enhance the dining experience for both customers and stakeholders [2].

The project focusses on designing a food ordering system using object-oriented approach which is accessible via mobile application and validating the developed system using functional testing. Students can create profiles, log in, and start ordering seamlessly. They can also track the order status once placed. The

system ensures that restaurant staff receive orders promptly, minimizing delays in preparing customer food. In addition, students can choose a payment method after checking out their cart, making payments straightforward. This process ensures that restaurant staff receive payments accurately and without misunderstandings.

The study domain for this system is the food and beverages industry. The case study location for this system is based in Universiti Tun Hussein Onn Malaysia because a café styled restaurant owned in university's Secangkir Café is chosen as the project stakeholder. The system would be accessible to restaurant staff and students. The staff will update the menu, order details, payment details, food information and availability, and manage orders from students. The staff will have access to view the order details, customers details, manage discounts, payments, and carts. The students who are customers are the secondary users of the system. The students will be able to order food by adding the food in cart and proceed to payment. Once the payment is settled, the staff will immediately start to prepare the food and will make it available to the students.

This article consists of five sections comprising of project overview, literature review, methodology, research findings and discussion on system analysis and design as well as the project implementation part. Finally, the final section summarizes the project.

2. Related Work

This section examines the literature on online food ordering applications for the project which consists of conventional food ordering system digitalization, exploring technologies applied, existing ordering systems and a comparative analysis between the existing systems and the project's proposed system.

2.1 Case Study: Conventional Food Ordering Method

Conventional food ordering involves customers physically visiting a restaurant to enjoy its culinary offerings, creating a tangible and face-to-face dining experience deeply rooted in cultural customs [3]. This project's case study focuses on Secangkir Cafe at UTHM in Parit Raja, Johor, catering mainly to the main campus of UTHM. Known for offering freshly brewed coffee-based drinks, Western foods, and local recipes at reasonable prices, the cafe provides a unique dining experience. Fig. 1 illustrates the case study's location on Google Maps.

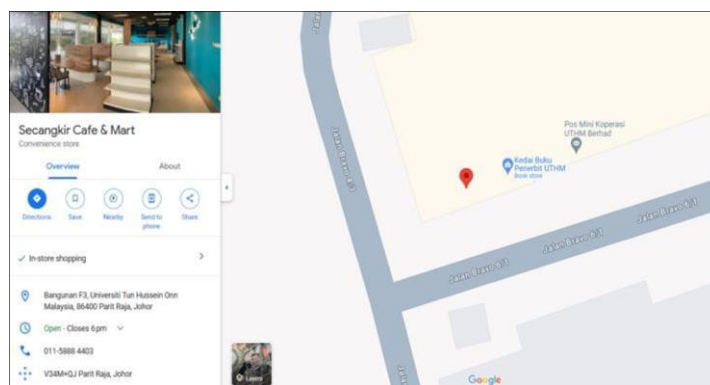


Fig 1 Secangkir Café [9]

The cafe currently follows a conventional food ordering process via device signals and manual ordering method. The current food ordering method has drawbacks, including long queues causing customer dissatisfaction and impacting the restaurant's business [4]. Moreover, the lack of detailed menu information poses difficulties for informed decision-making, particularly for those with dietary preferences or health restrictions. To address these challenges, a proposed solution involves creating a user-friendly, dynamic menu through an application. Customers can easily add items to their cart, review order details, and receive confirmations. Orders are promptly entered into the database, allowing restaurant staff quick access for review and processing. The intuitive interface prioritizes ease of use, efficiency, and accessibility, minimizing the inconvenience associated with conventional printed menus. The aim is to establish a successful meal ordering system that emphasizes user experience, effectiveness, and accessibility.

2.2 Mobile Application

Present-day mobile application developers now have more opportunities as well as limitations because of this altered environment. Developers must therefore evaluate their options and determine how to capitalize on these emerging trends. There are many types of applications in the current trend such as mobile applications, web applications, and desktop applications. Hence, in this proposed system a mobile application is selected which

can be easily accessed via any android mobiles and provides an online food ordering platform to improve the user experience of the Secangkir Café and enhance their business overall.

The application allows customers to add items to their cart, review order information, and receive confirmation details. Orders are entered into the database and accessed instantly, allowing restaurant staff to review and handle them quickly. reports. Customer can view the order status. By viewing their order status, customers and staff can confirm the order properly. It will provide updates such as preparing, cooking, or order sent. This solution can also notify the customers once the food they ordered is ready for pickup.

In summary, mobile applications empower restaurant owners with tools to optimize various aspects of their businesses. From operational efficiency to customer engagement and strategic decision-making, these applications play a crucial role in the success and sustainability of modern restaurants. Mobile applications play a pivotal role in enhancing the food ordering process for customers by providing convenience, customization options, real-time updates, and a range of features that contribute to a more enjoyable and efficient dining experience, thereby leading to the achievement of the project's objectives.

2.3 Study of Existing Related Systems

The study reviews existing applications, such as Bubblebee [10], Gong Cha [11], and Koi Malaysia [12], offers useful information to avoid errors and enhance the development of the proposed system.

2.3.1 Comparison of Existing Systems

Table 1 provides a clear comparison between the UTHM Foodie and similar ones. The functions and features of these applications will guide the development of our project. This table compares the proposed application with equivalent ones. The suggested application stands out with more features and modules compared to the reviewed systems. The common feature across all applications is login and registration, but each uses a different method: BubbleBee Mobile uses OTP login, Gong Cha uses phone number and password, and KOI Thé uses email and password. Adding and removing items in the cart is a shared feature in all three applications and the proposed one. The UTHM Foodie Café Food Ordering System includes an order tracking feature, absent in the compared applications. In the observation, Gong Cha showed the fewest differences from the proposed application. This comparison provides useful information for developing the current application.

Table 1 Comparison between existing systems and the developed system

Features/System	BubbleBee	Gong Cha	KOI The	UTHM Foodie: Cafe Food Ordering System
Login and Registration	√ OTP only	√ Phone Number and Password	√ Email and Password	√
Browse Menu	X	√	√	√
Add and Remove Items	√	√	√	√
Customize Order	X	√	√	√
Menu Description	X	√	X	√
Cart and Checkout	√	√	√	√
Payment	√ Multi mode	√ E-wallet only	√ Multi mode	√
Order Tracking	X	X	X	√
Notification	X	X	√	√
Schedule Pickup	√	√	X	√

3. Methodology

Prototyping modelling is designed to develop UTHM Foodie: Café Food Ordering System and it's well described in this methodology section which is accessible in software development [6]. This comprises six phases like requirement gathering, quick design, prototype development, user evaluation, prototype refinement and final product phase. Each phase description is presented in Table 2 below.

Phase	Task	Output
Requirement Gathering	Proposed the project	Project proposal
	Determine the project schedule, activities and output	Develop Gantt chart
	Gather, analyze, and validate the information Gather Requirements	Objectives and Scope
Quick Design	Design the initial user interface of the prototype	Class diagrams, Use Case Diagrams
	Design initial database	Architectural workflow of the prototype
	Determine the project schedule, activities and output	User interface designs
Prototype Development	Implement the preliminary designs into source code through coding Specifications are turned into executable prototype model	Functionable initial prototype of the application
User Evaluation	Prototype will be unit tested, integrated, and retested.	Test results and overview
	Make improvement and refinements to the prototype	Final prototype
Prototype Refinement	Prototype will be unit tested, integrated, and retested.	Test results and overview
	Make improvement and refinements to the prototype	Final prototype
Final Product	Deploy the final prototype to production Provide training for the end users	Application Documentation User manual
	Continue maintenance and support for the application is needed	
	Create user manual	

3.1 System Requirements

System requirements analysis examines the product's needs from various perspectives, roles, duties, and goals [7]. It includes user needs, functional and non-functional aspects, and system requirements for a thorough analysis [8].

Table 2 *Software development activities and their task*

Type of System Requirement	Module	Description
Functional Requirement	Login and Registration Module	<ul style="list-style-type: none"> • Allow the new users to register a new account before login. • Allow the existing users to login with the id and password. • Redirect the valid users to dashboard when successful login. • Allow the staff to login with admin privilege. • Redirect the staff to admin dashboard when successfully login.
	Browse and Search Module	<ul style="list-style-type: none"> • Allow users to browse restaurant menus. • Allow users to search for specific dishes. • Allow users to view information about foods. • Allow staff to add, edit, update, and delete food menus.
	Cart and Ordering Module	<ul style="list-style-type: none"> • Allow users to add and remove items from the cart. • Allow users to customize the order. • Allow users to specify pick up and dine-in preference.
	Payment Module	<ul style="list-style-type: none"> • The users can choose the payment method. • Allow users to pay using various methods. • Allow administrators to manage payment processes and details.
	Order Status Module	<ul style="list-style-type: none"> • The users can view the status of order. • The staff can update the status of the order
Non-functional Requirement	Performance	<ul style="list-style-type: none"> • The system should always be usable. • The system should be able to function on any android phone. • The system should be able to handle peak hours and many orders at a time without any issues.
	Operational	<ul style="list-style-type: none"> • The loading time required for a website is no more than 1 minute. • The system should be available 24/7, allowing customers to place orders at any time. • The system should be provided with easy-to-understand user interfaces for staff and users. • The system should minimize the occurrence of critical failures.
	Security	<ul style="list-style-type: none"> • The system should be able to store the user details secure in cloud. • The system should have robust authentication mechanisms, requiring users to verify their identity through secure means.
	Cultural and Political	<ul style="list-style-type: none"> • The system should be designed with cultural sensitivity. • The system should adhere to ethical standards and principles.

3.2 System Analysis

This section details the system design of the proposed system, employing an object-oriented approach to create Unified Modeling Language (UML) diagrams, including Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagrams.

3.2.1 Use Case Diagram

The use case diagram illustrates key actors, staff, and customers where customers can browse the menu, place orders, and track order progress. Staff can manage the menu, orders, and payments. Arrows depict interactions; for instance, a customer places an order via the "Place Order" function, and the system forwards it to the kitchen. The customer can track order progress using the "Track Order" function as shown in Fig 2.

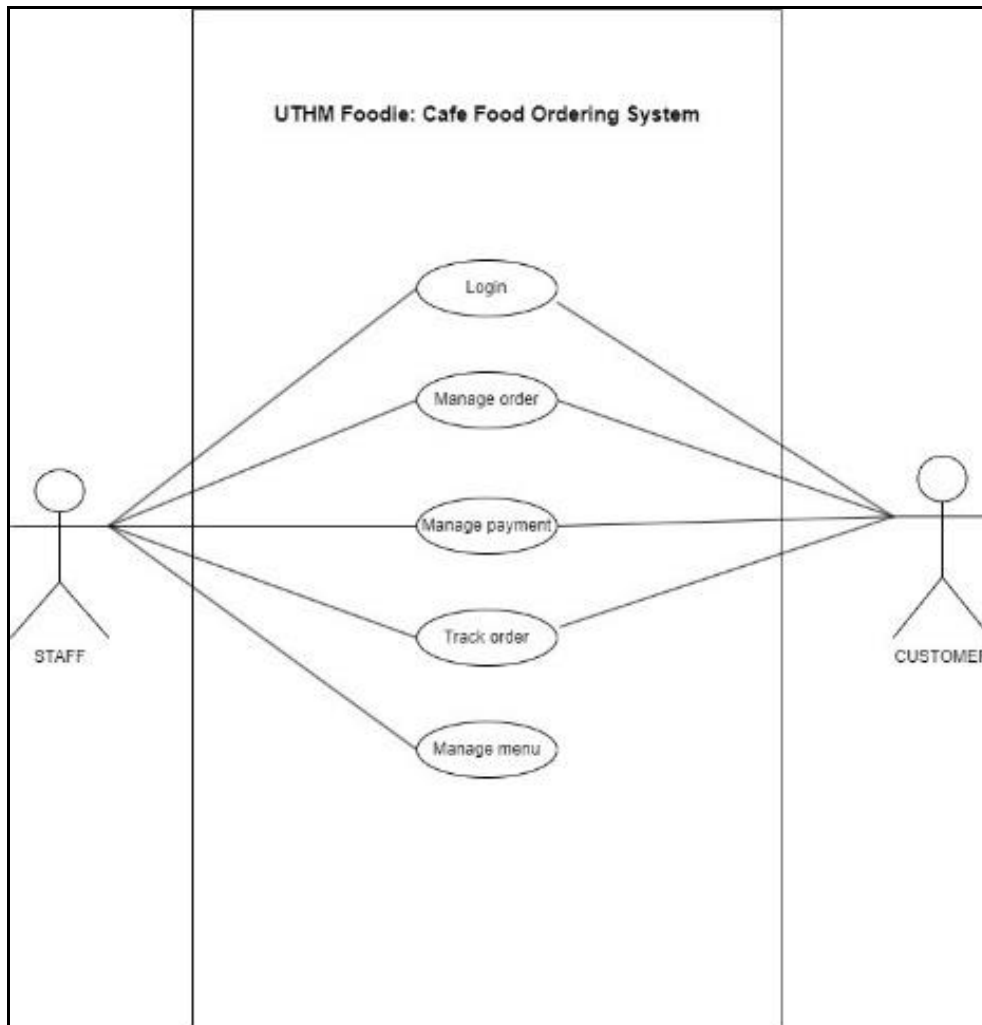


Fig 2 Use case diagram

3.2.2 Flowchart

Flowchart outlines the sequence of steps and decision points in a process and illustrates the logic and activity flow, offering a clear overview for developers, stakeholders, and project participants. Flowcharts use standardized symbols like rectangles for steps, diamonds for decisions, and arrows for flow direction. Starting with a "start" symbol, the flowchart connects symbols to represent actions, conditions, or events, concluding with an "end" symbol for process completion.

Fig 3 outlines the staff's process in the UTHM Foodie system. Staff begins by logging in. After a successful login, they can access the menu page. On this page, staff can create, update, and delete menu items. If changes are successful, they return to the menu page; otherwise, they redirect to the edit menu page. When a customer places an order, staff receives a notification. Staff reviews and confirms the order, ensuring payment confirmation before preparation. Once ready, a notification is sent to customers. After customers collect their order, staff confirms the payment. The system generates the order history when all processes are completed.

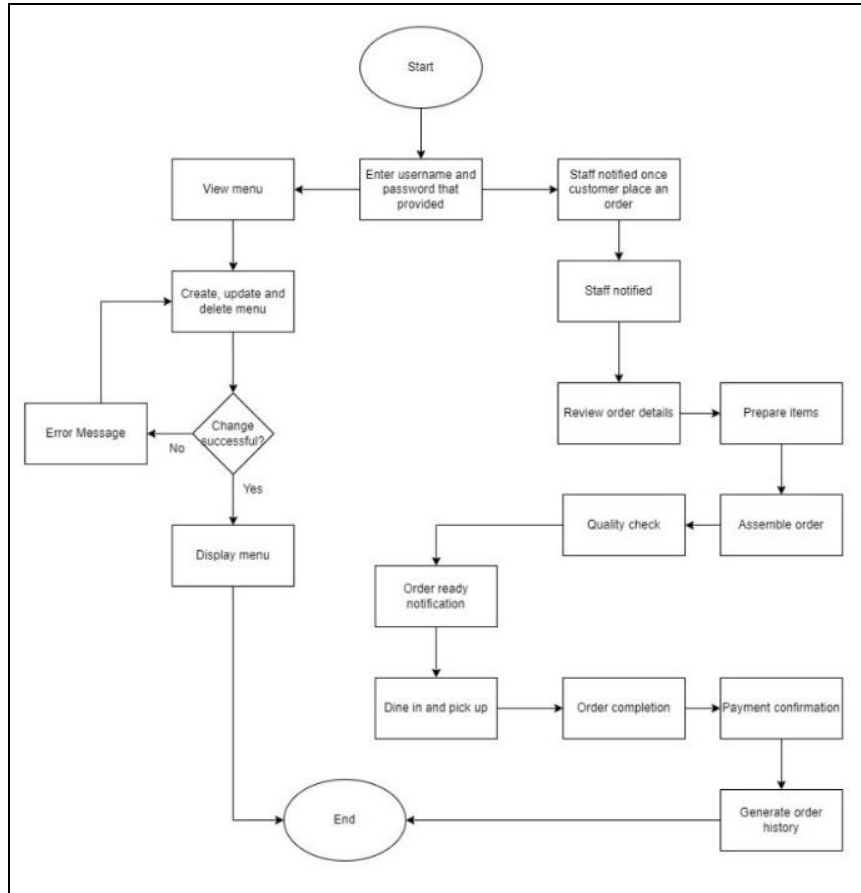


Fig 3 Flowchart of staff

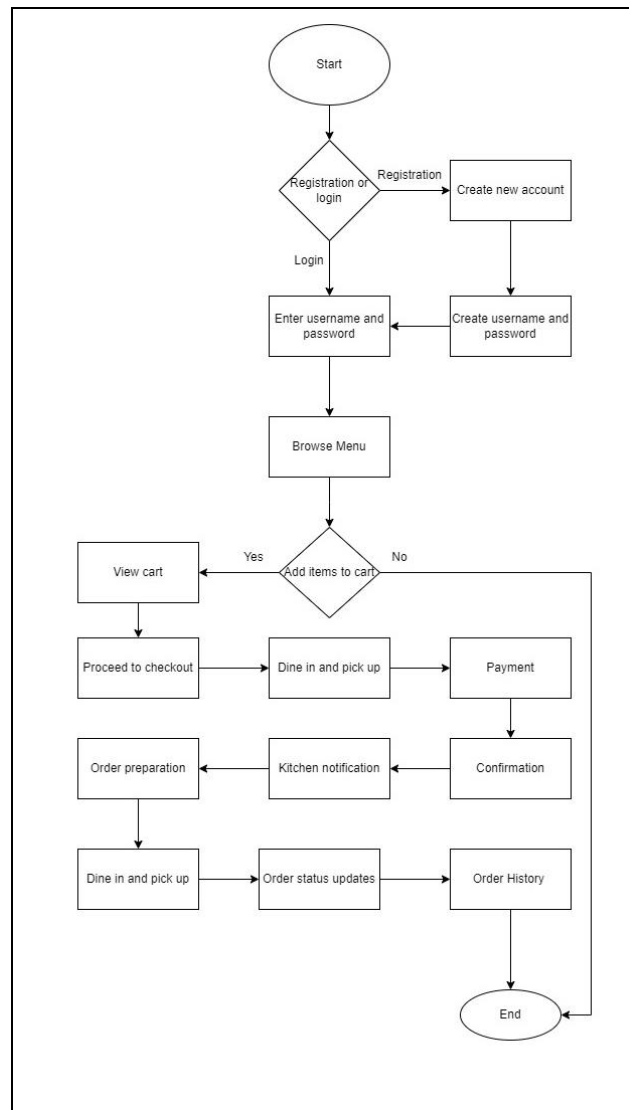


Fig 4 Flowchart of customer

Fig 4 illustrates the process of a customer using the proposed system to order food. The journey starts with the user landing on the platform's homepage. They can either register as a new user or log in. Registration involves creating a new account with a username and password. After logging in, the user explores available restaurants and menus, selects items, and adds them to their virtual cart. At checkout, the user decides whether to dine in or pick up their order. Payment is made through the platform's secure gateway. Staff confirms the order with the restaurant and notifies the user. The restaurant receives and prepares the order, providing progress updates to the system. The user, in real time, tracks the order status. For dining in, the user waits for the prepared order at the restaurant. For pickup, the user is notified when the order is ready. The platform allows users to review their order history, including past orders and statuses

3.2.3 Class Diagram

Class diagram in UML visually represents the static structure of a system, highlighting classes, their attributes, methods, and relationships. Each class serves as a template for creating objects, encapsulating data and behavior. Associations depict connections between classes, specifying relationship nature, and inheritance relationships showcase class inheritance. Interfaces may define common behaviors across classes. Fig 5 displays the class diagram of UTHM Foodie: cafe food ordering system.

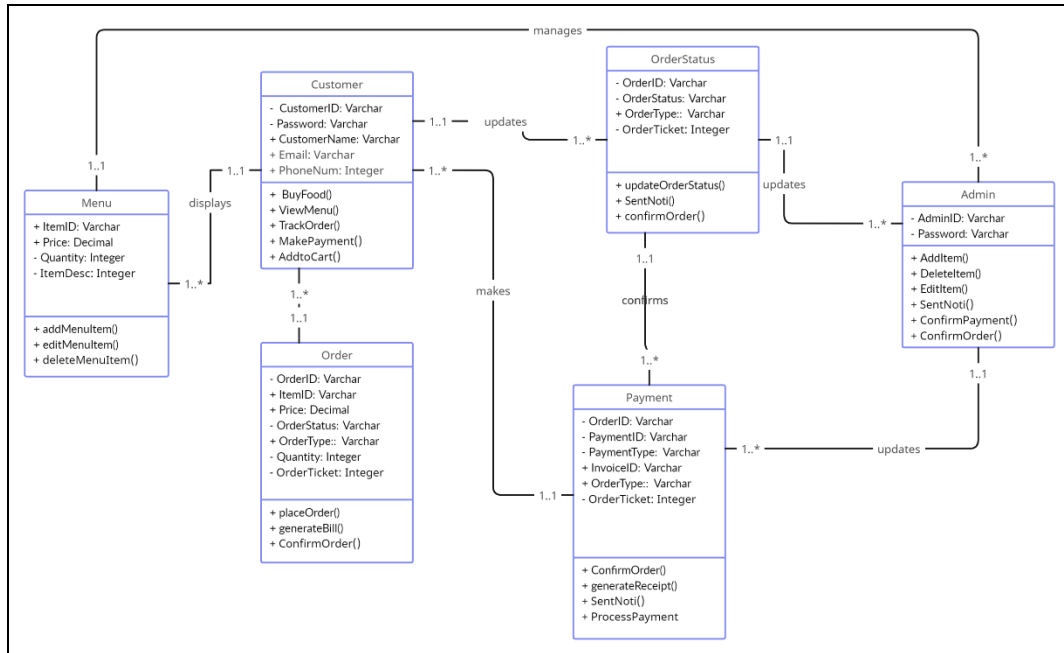


Fig 5 Class Diagram

3.3 System Design

Fig 6 illustrates the system architecture of UTHM Foodie. The streamlined set-server design enhances interactions for both customers and staff. Customers can place orders, make payments, and receive order status updates. The central server manages order receipt, payment billing, and connects with the kitchen interface. Staff efficiently review, evaluate, and accept orders for prioritized processing. A central database stores information about customers, menu items, orders, and order status. Customers benefit from order tracking, enhancing their experience.

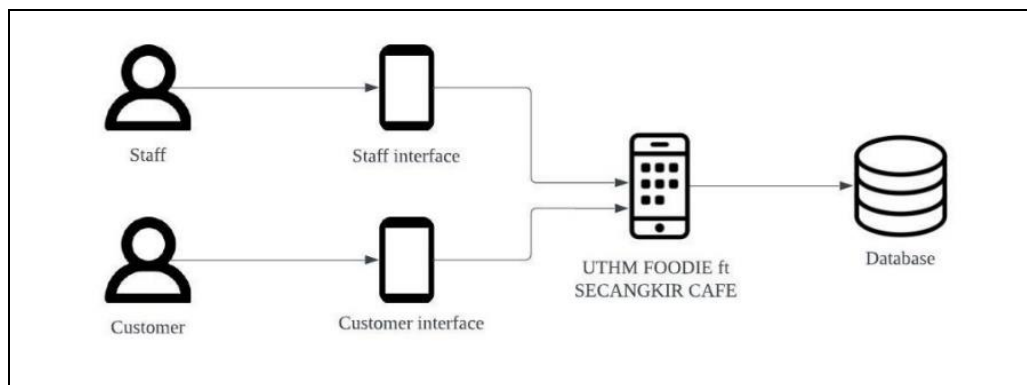


Fig 6 System Architecture

3.4 Interface Design

Appendix A illustrates a visual representation of interface design for the proposed study. The developed application interface must meet basic criteria: it should be easy to understand, user-friendly, and aligned with specified functions. The interface design aims to facilitate interaction between the application system and users. It is important to use background colours that are suitable for users and clearly indicated. The detailed interface design for UTHM Foodie is attached in Appendix A.

4. Results and Discussion

UTHM Foodie: Cafe Food Ordering System was developed using an IDE (Integrated Development Environment) which is Android Studio. Dart language is primarily used to develop this proposed application. Flutter framework was used to develop the user interface and layouts for each module. Firebase is chosen to connect and manage the database obtained from the frontend of the proposed application.

4.1 Login and Registration Module

Fig 7(a) illustrates the registration interface for the application. Users must enter their email, password, and confirm the password to create an account. An internet connection is essential for the application to function correctly and access the cloud Firebase. Fig 7(b) shows the application's login interface. Users enter their email and password to log in. New users can create an account via a redirect link, and there is also a "forgot password" option



Fig 7 Interface of (a) Create account; (b) User login

Fig 8 (a) shows the forgotten password interface of users of the proposed application. Users need to enter email and they will receive the link to reset the password. Fig 8 (b) shows the login interface of staff of the proposed application. Staff need to enter email and password to successfully login into the application.



Fig 8 Interface of (a) Forgot password; (b) Staff login

4.2 Browse and Search Menu

Once successfully logged into the application, users can browse and search the menus available. Fig 9(a) shows the browse and search menu interface of users. Fig 9(b) shows the interface of menu for staff where the staff can add, delete, and edit each menu. In this module, the staff can also add, delete, and edit descriptions for each menu they add.

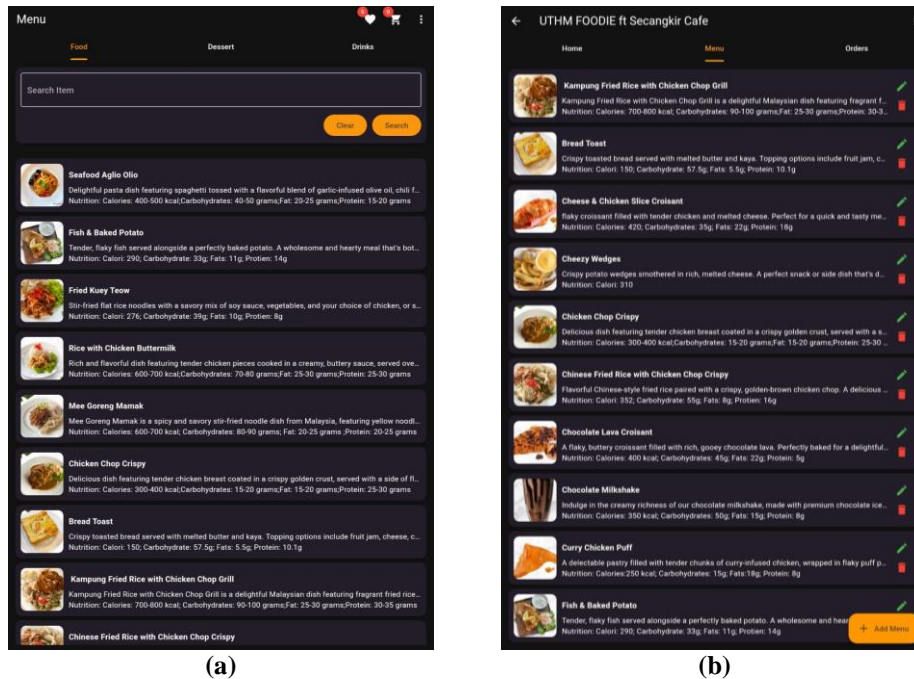


Fig 9 Interface of (a) User menu; (b) Staff menu

4.3 Cart and Ordering Module

This module includes the interface of the cart and food ordering page where users can add their fav menu in the cart and proceed to check out. There is also a new feature added which is a promo code feature. Users can enter a promo code available to get the discount when purchasing the food. Fig 10 shows the interface of cart and ordering module.

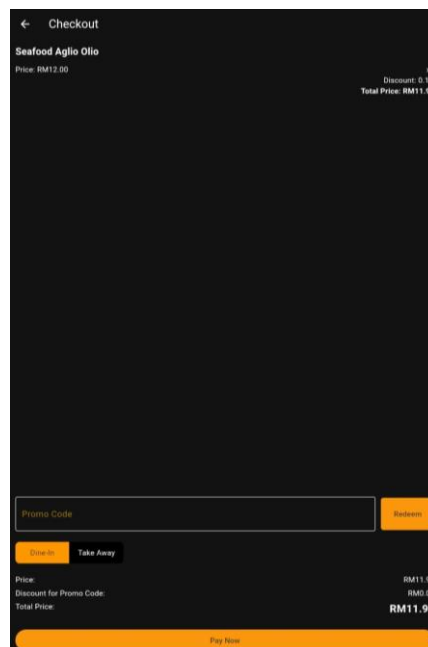


Fig 10 Interface of cart and checkout

4.4 Payment Module

The payment module in an application facilitates secure transactions, allowing users to make payments directly through the application. PayPal payment module is integrated into this application allowing users to make payments. The backend code manages the integration with PayPal's API to handle payment processing, ensuring secure and efficient transactions. Fig 11 shows the interface of payment module.

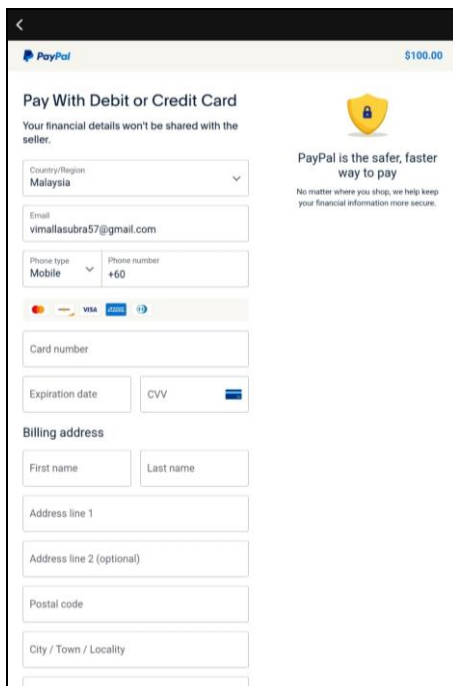


Fig 11 Interface of payment

4.5 Order Status Module

The order status module in a food ordering app allows users to track the progress of their food orders in real-time. The backend code updates the status based on inputs from the staff, ensuring users are kept informed throughout the process. Fig 12 shows the interface of status of order page.

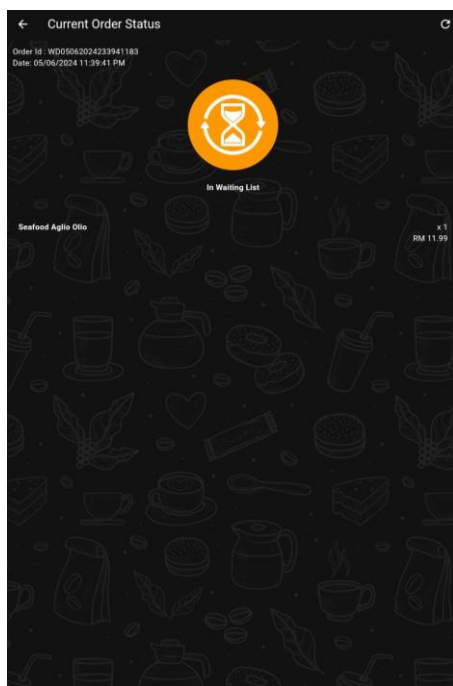


Fig 12 Interface of order status

4.6 Test Cases

Test plan is carried out after the proposed application is implemented. It can be used to check the application whether it meets the project requirements. The test plan for all the features in UTHM Foodie: Café Food Ordering System is shown in Table 3.

Table 3 *Test cases and descriptions*

No.	Module	Description
TEST_100		
1.	TEST_100_001	Create an account as the new users.
2.	TEST_100_002	Login to the application with correct email and password.
3.	TEST_100_003	Login to the application with wrong email.
4.	TEST_100_004	Login to the application with wrong password.
5.	TEST_100_005	Receive the password reset link after clicking forgot password.
6.	TEST_100_006	Login to the application when no internet access.
TEST_200		
1.	TEST_200_001	After logging in successfully, the application redirects to the homepage.
2.	TEST_200_002	Application redirects to homepage even if the login is not successful.
3.	TEST_200_003	After redirected to homepage, user exits the application and opens it again.
TEST_300		
1.	TEST_300_001	Browse the menu in the application.
2.	TEST_300_002	Search the menu in the application.
3.	TEST_300_003	Add a new menu and its description in the application.
4.	TEST_300_004	Delete the existing menu in the application.
5.	TEST_300_005	Edit the existing menu in the application.
TEST_400		
1.	TEST_400_001	Add the menu to the cart.
2.	TEST_400_002	Add multiple menu items to the cart.
3.	TEST_400_003	Update the item quantity.
4.	TEST_400_004	Remove items from the cart.
5.	TEST_400_005	Place the order by clicking 'Pay Now' option.
TEST_500		
1.	TEST_500_001	After clicking 'Pay Now', application redirect to payment page.
2.	TEST_500_002	Initiate the payment process with items in the cart.
3.	TEST_500_003	Check integration with PayPal payment gateway.
4.	TEST_500_004	Verify that the user receives payment confirmation.
TEST_600		
1.	TEST_600_001	Check if the order status is displayed correctly.
2.	TEST_600_002	Check the order status updates in user profile.
3.	TEST_600_003	Check the order details.
4.	TEST_600_004	Check each status is displayed correctly.
5.	TEST_600_005	Verify that users receive notifications for each status change.

The comprehensive testing of the food ordering application's various modules has been successfully completed, with all test cases passing. In the User Account Management module, new users were able to create accounts, log in with correct credentials, receive appropriate error messages for incorrect credentials, obtain password reset links, and handle login attempts without internet access effectively. The Post-Login Navigation module ensured that users were redirected to the homepage after successful login, did not redirect if the login was unsuccessful, and maintained the login state when the application was reopened. In the Menu Management module, users could browse, search, add, delete, and edit menu items seamlessly. The Cart Management module allowed users to add single and multiple items to the cart, update item quantities, remove items, and place orders successfully.

The Payment Processing module validated that users were redirected to the payment page upon clicking 'Pay Now,' could initiate the payment process, successfully integrate with the PayPal payment gateway, and receive payment confirmations. Finally, the Order Status Tracking module confirmed that order statuses were displayed and updated correctly in real-time, order details were accurate, and users received notifications for each status change. Overall, the application functions as expected, providing a seamless and robust user experience, and is ready for deployment.

4.7 User Acceptance Testing

This section discusses the results of the QUIS method conducted with two selected users and two selected staff. There are total of 5 parts for this user test case, which are Overall Reaction, Screen, Terminology and System Information, Learning, and System Capabilities. The purpose of this user testing is to verify whether the selected users can access the system, use the system, and evaluate the system according to their satisfaction. Fig 13 shows the result of the user testing for the Overall Reaction part. Both users and staff agree that the background and use of colors on the system display are appropriate. Most respondents find the content easily viewable, with the majority strongly agreeing and one generally agreeing. Users predominantly strongly agree that the buttons work well, and the text size is appropriate. The system is considered user-friendly and easy to understand, with strong agreement on its ease of use for management purposes.

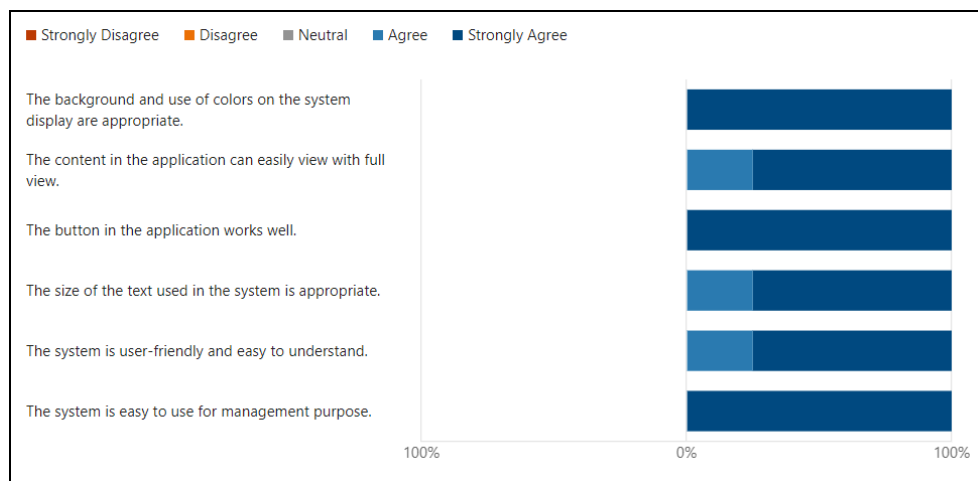


Fig 13 Result of User Testing for Overall Reaction

The rest of the results of each test cases are shown in Appendix B. the proposed application is well accepted by the target users and fulfills completely the objectives of the project.

5. Conclusion

In conclusion, the UTHM Foodie: Cafe Food Ordering System successfully met all project objectives, including designing an object-oriented application and developing a functional food ordering app. The application includes several advantages, such as menu descriptions that help users understand ingredient nutrients, order tracking with live updates and notifications, the ability to schedule order pickups, and the option to use promo codes for discounts. However, there are some disadvantages: it is currently only available for Android users, limiting its accessibility for iOS users, and it only supports PayPal for payments, which can be inconvenient for those without PayPal accounts. The order tracking feature lacks estimated preparation times, and the menu descriptions are limited to a single text box. To improve the application, it is recommended to develop an iOS

version, integrate multiple payment options like Apple Pay and digital wallets, include estimated preparation times, and support multiple languages to cater to a broader and more diverse user base.

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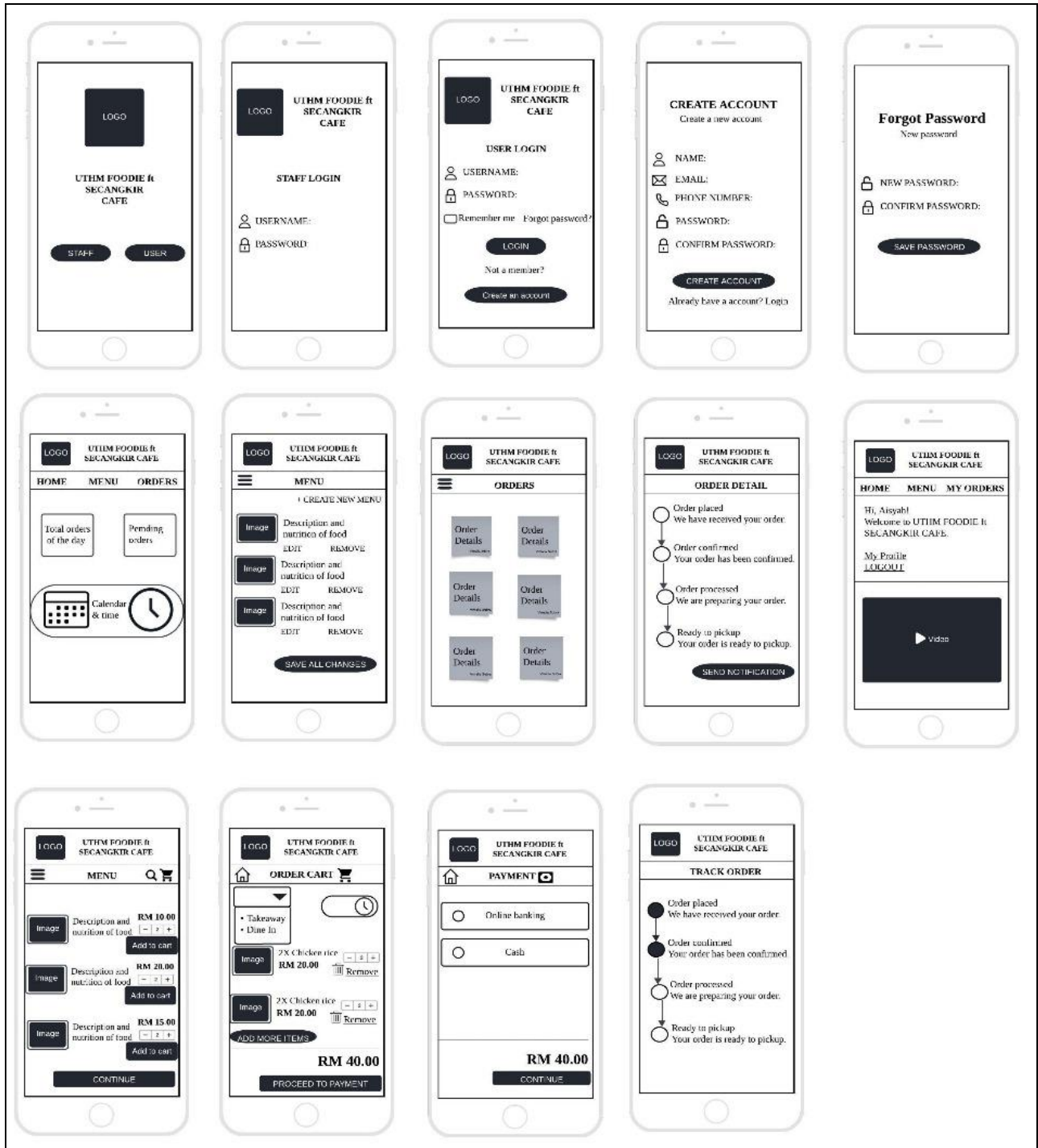
Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Appendix A: Interface Design of UTHM Foodie: Cafe Food Ordering System



Appendix B: Results of Each Test Case in User Acceptance Testing



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