

The Development of A Mobile-Based Application for TDI Café's Food Ordering and Management using an Object-Oriented Approach

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Abstract: TDI Café: Mobile-Based Application for Food Ordering and Management is a mobile-based application that improves the quality of existing system in TDI Café by using a more advanced food ordering application. Since TDI Café still uses the traditional food order method as the ordering process. Therefore, the proposed application is specially developed for TDI Café owner, café worker and customers. Furthermore, the TDI Cafe application can be run more systematically, save time, update order details and meet customer satisfaction. The application is designed using object-oriented approach and the model used is the prototype model to develop the application. In addition, the application is developed using Android Studio and Firebase. Finally, it is expected that TDI Café Application can be used and benefit the users. In addition, the application can increase efficiency in making the food ordering processes effectively using mobile devices.

Keywords: Food Ordering application, Mobile Application, Prototype Model.

1. Introduction

Nowadays, students and staffs of Universiti Tun Hussein Onn Malaysia (UTHM) are facing difficulties in looking for their preferred food in cafeteria. At this moment, a lot of problems arise at the cafeteria which are still using traditional food order method as their food order process. As a result, a food ordering application is proposed to address the issues that occur and increase the efficiency of the current ordering procedure. The objectives of this application are to design TDI Café: mobile-based application for food ordering and management based on object-oriented approach, develop TDI Café application using mobile technology and evaluate TDI Café application using alpha and beta testing. The initial users of the TDI Café application are the cafeteria owner as administrator, cafeteria worker as staffs and customers are UTHM students and lecturers. The application will consist of 5 modules which are registration module, login module, menu module, order module, payment module and report generation module. The article is organized into four sections. The first part is an introduction describing the context of the project. The second section describes the literature review of the related work and existing system. In the third section, the methodology used to develop the application including the

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analysis and design is explained. Finally, the last section concludes the current work and highlights the future work to be performed in Final Year Project 2.

2. Literature Review

2.1 Online Food Ordering and Management Application

The online food ordering app is a smartphone app that allow users to place food orders from wherever they are. It allows customers to select and pay for food before informing the kitchen that an order has been placed. The application system simplifies food ordering and management, reduces large manpower consumption, and saves time. The management system is very important to organize and run a business because it provides facilities that practice the management system as the main platform in business. Therefore, with the availability of an efficient TDI Café application it facilitates the ordering process.

2.2 Mobile-Based Application

A mobile application or Mobile Apps is a program loaded into a simple device which is portable and can be used anytime and anywhere. Apps are usually available through application distribution platforms, which are usually operated by the owner of the mobile operating system. A mobile application is an Internet application that runs on smartphones and other mobile devices. Food ordering system through android application is one of the fastest food restaurant latest services in the era of modern technology. Android applications are part of the software made by a computer company to perform certain tasks.

2.3 Comparison of Equivalent Systems

Three existing systems were analysed and researched to pick up more details to develop TDI Café: Mobile-Based Application for Food Ordering and Management. The three systems are namely VizDine, FineDine and MyMenu App. The comparison between the existing systems and the proposed system can be summarized in Table 1.

Table 1: Comparison Analysis Among Similar Systems

Features / System	VizDine	FineDine	MyMenu App	TDI Café: Mobile-based application for food ordering and management system
Login Module	phone number or username and password/login as guest	QR code	QR code	email and password
Registration Module	phone number or username and password	Username and phone number	Username and phone number	Username, email, password and phone number
Forgot password	Unable to reset password	Unable to reset password	Unable to reset password	Verify using email to reset password
Menu Module	Food name and price	Image, food name and price	Image, food name and price	Image, food name and price
Track Order	Unable to track order	Unable to track order	Unable to track order	Able to track order whether in progress or completed
Able to notify customer about the status of the food	Unable to notify status to customers	Unable to notify customers	Unable to notify customers	Able to notify the status whether in progress or completed

customer able to perform extra/special request	Able to add special requests	Able to add special requests	Able to add special requests	Able to add special requests
Payment module	online or Card or cash	online or card or cash	Online or card or cash	Card or cash
Order type module	Dine-in or Take Away	Unable to choose order type	Unable to choose order type	Dine-in or Take Away

Based on Table 1, among the four systems mentioned, VizDine and FineDine lack features such as order tracking, notification of food status, message notification, and report generation. However, VizDine allows customers to make extra or special requests while FineDine enables customers to provide ratings and feedback. MyMenu App offers basic functionalities like login, registration, menu viewing, and payment, but lacks features such as order tracking, notification, special requests, and feedback. On the other hand, TDI Café: mobile-based application, provides comprehensive features including login, registration, menu viewing, order tracking, notification of food status, message notification, extra/special requests and payment.

3. Methodology

The development of this system uses the Prototype model. This model consists of requirement phase, quick design phase, build prototype phase, user evaluation phase, refining prototype phase and implement and maintain phase to ensure that the system meets the user's needs.

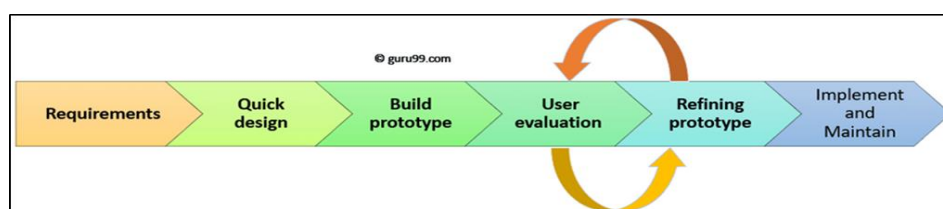


Figure 1: Prototype Model

3.1 Prototype Model

Table 2 shows the list of tasks performed at each phase in the Prototype model for TDI Café: Mobile-Based Application for Food Ordering and Management.

Table 2: List of tasks for each phase in the Prototype Model

Phase	Task
Requirements Gathering	<ol style="list-style-type: none"> 1. Analyze the existing system 2. Create a TDI Café: Mobile-Based Application for Food Ordering and Management requirement and analysis. <ol style="list-style-type: none"> i. An interview on the client’s expectations for the project will be conducted. ii. Review the requirement specification given. 3. Analyze the software aspects for TDI Café: Mobile-Based Application for Food Ordering and Management <ol style="list-style-type: none"> i. Analyze software output expected to be used. ii. Identify the software development model to be used.

Quick Design	<ol style="list-style-type: none"> 1. Creating a design for TDI Café: Mobile-Based Application for Food Ordering and Management. <ol style="list-style-type: none"> i. Design the flowchart of the TDI Café: Mobile-Based Application for Food Ordering and Management. ii. Design the Use Case Diagram to specify the expected behavior and application requirements. iii. Design the UML class Diagram that describes the application's structure and the application's classes, their attributes, operations and the relationships among objects. iv. Design the user interface of the TDI Café: Mobile-Based Application for Food Ordering and Management. v. Design the TDI Café: Mobile-Based Application for Food Ordering and Management algorithm. vi. Develop a database.
Build Prototype	Developing the prototype of the TDI Café: Mobile-Based Application for Food Ordering and Management based on design and specification.
User Evaluation	Perform user evaluation to observe one user at a time and quickly evaluate how they can navigate the system while performing a task.
Refining Prototype	Refining the prototype of the TDI Café: Mobile-Based Application for Food Ordering and Management based on user evaluation.
Implementation and Maintenance	<ol style="list-style-type: none"> 1. Perform application testing on the TDI Café: Mobile-Based Application for Food Ordering and Management after integration. <ol style="list-style-type: none"> i. Functional testing is conducted to evaluate the compliance of the application or component with specified functional requirements. 2. Launch TDI Café: Mobile-Based Application for Food Ordering and Management. 3. Monitor the application and keep the application up to date.

3.2 Requirement Analysis

Requirement analysis is the process to determine requirements that developed application which include functional and non-functional requirements, user requirements and system requirements. Table 3 shows the functional requirements of the proposed application while Table 4 shows the non-functional requirements of the application.

Table 3: Functional Requirement of the Application

No.	Modules	Functions
1.	Login Module	<ul style="list-style-type: none"> • Help users to login into the application using username and password. • A user who has the valid username and password can only login to their respective accounts. • Authentication of the user who enters the application.
2.	Registration Module	<ul style="list-style-type: none"> • Register the new user of the application fragmented into two parts which are each part has their own interface and information required to get registered in the system.
3.	Menu Module	<ul style="list-style-type: none"> • Can add, remove and update food items to the menu.
4.	Order Module	<ul style="list-style-type: none"> • Staff can accept or cancel the order. • Customer can place order.
5.	Order Type Module	<ul style="list-style-type: none"> • Staff can view the order type. • Customer can choose the order type based on their preferences.
6.	Payment Module	<ul style="list-style-type: none"> • The administrator, staff can view the payment details. • Customer can choose payment method and make payment.

Table 4: Non-Functional Requirement of the Application

No	Requirements	Description
1.	Performance	<ul style="list-style-type: none"> • The application should have smooth and fast functions
2.	Operational	<ul style="list-style-type: none"> • The application should be updated and maintained well. • The application should be user friendly.
3.	Security	<ul style="list-style-type: none"> • There will be no unauthorized users logging into the application.
4.	Reliability	<ul style="list-style-type: none"> • The application should work well even if the site is used extensively
5.	Usability	<ul style="list-style-type: none"> • The application will not have a difficulty while being used to operate certain functions

3.3 System Analysis

System analysis is performed to provide information on the user's application, the organization and the current system. The use case diagram was developed as part of the analysis to show the overall function and component of the application. A use case diagram is a visual representation that depicts the

interactions between actors and a system under consideration. Figure 2 shows the use case diagram that represents the overall activity of the TDI Café application. There are three users for the proposed application who are the admin, customer and staff. A sequence diagram is a visual representation of the interactions between objects or components in this application. The TDI Café Application's sequence diagram is shown in Figure 3.

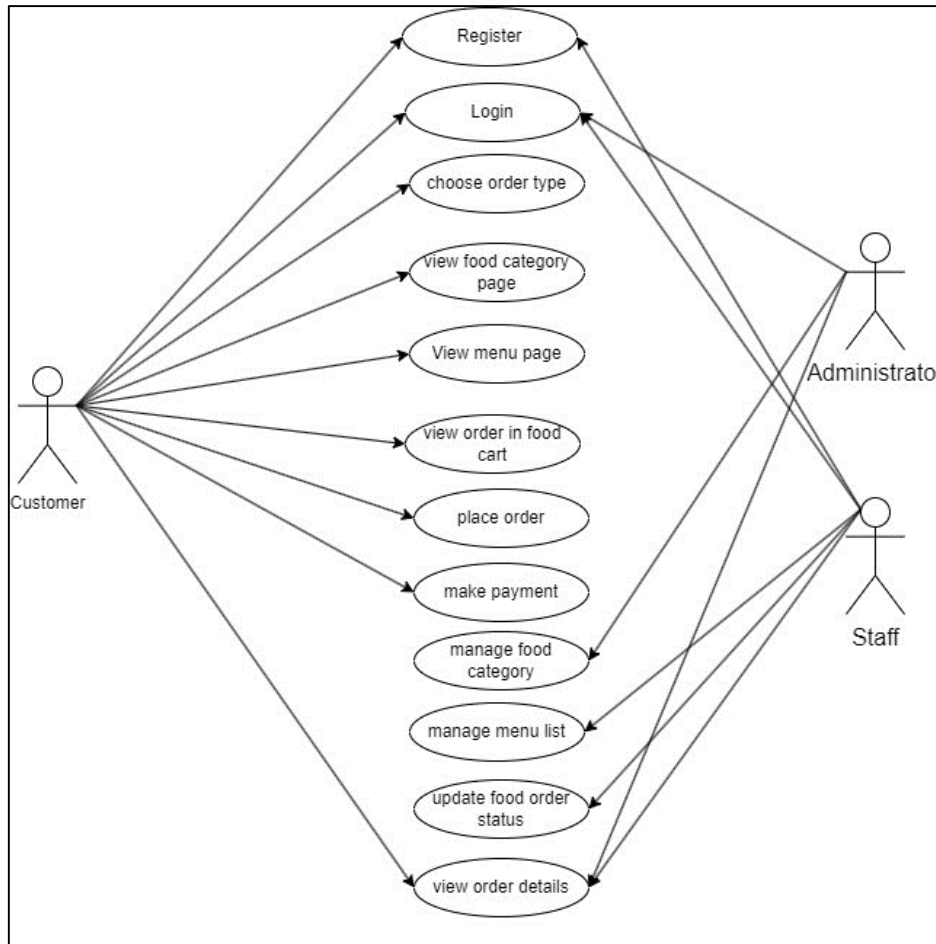


Figure 2: Use Case Diagram

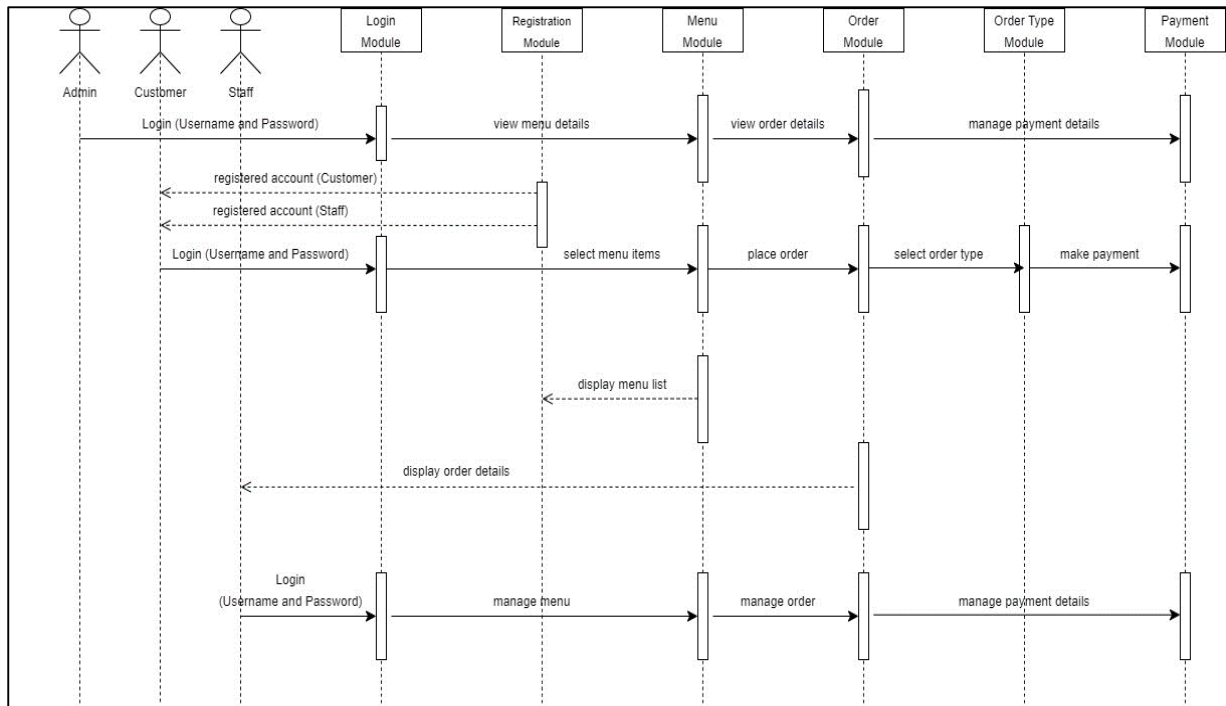


Figure 3: Sequence Diagram

An activity diagram is a visual representation of the flow of activities, actions, and decision points within a system or process. It illustrates the sequence of activities and the transitions between them, showcasing the overall behavior and workflow the application. Figure 4 shows the activity diagram of the TDI Café application. A class diagram is a visual representation of the structure, relationships, and behavior of classes and their interactions within a system. Figure 5 shows the class diagram for the TDI Café Application.

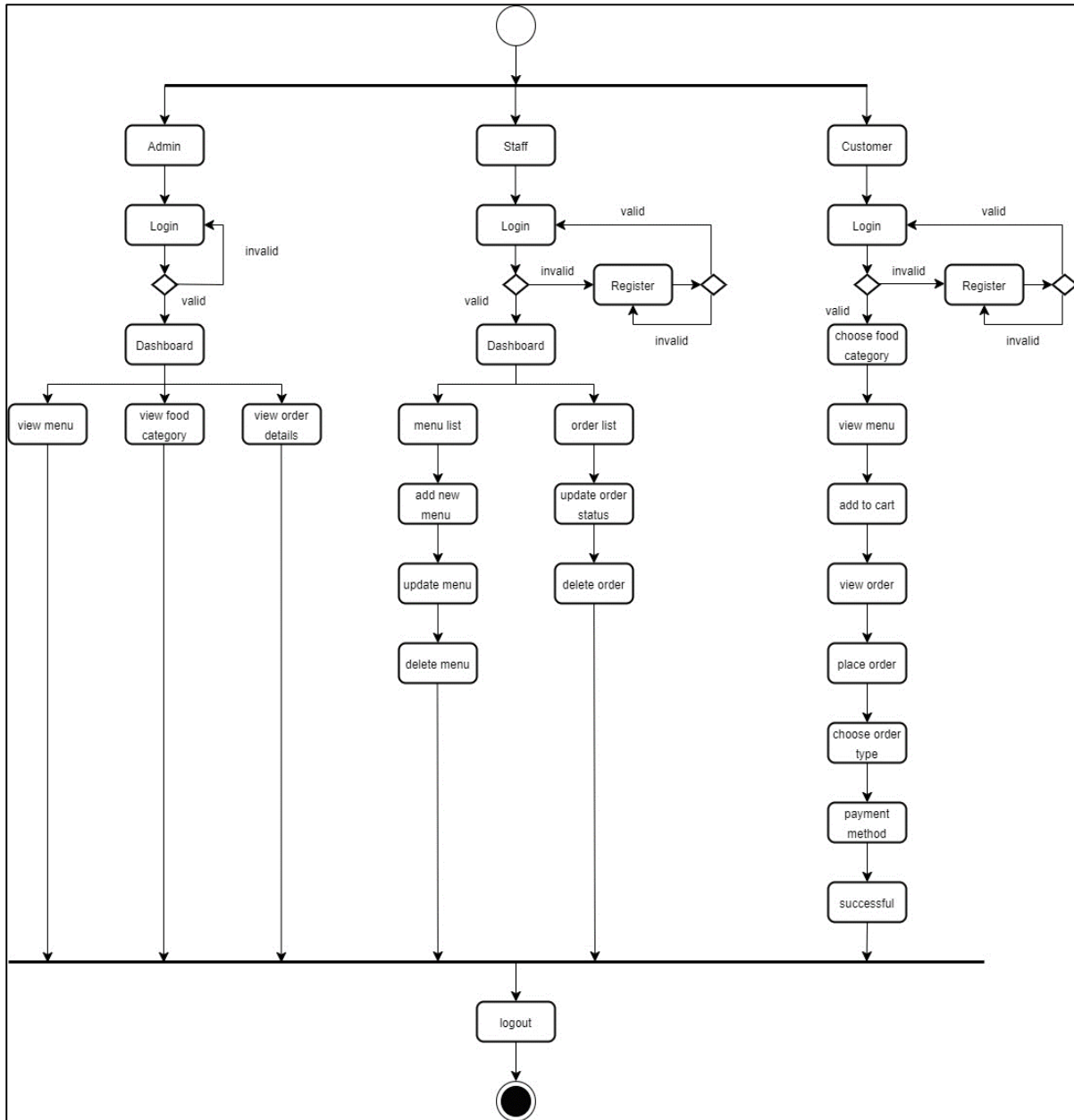


Figure 4: Activity Diagram

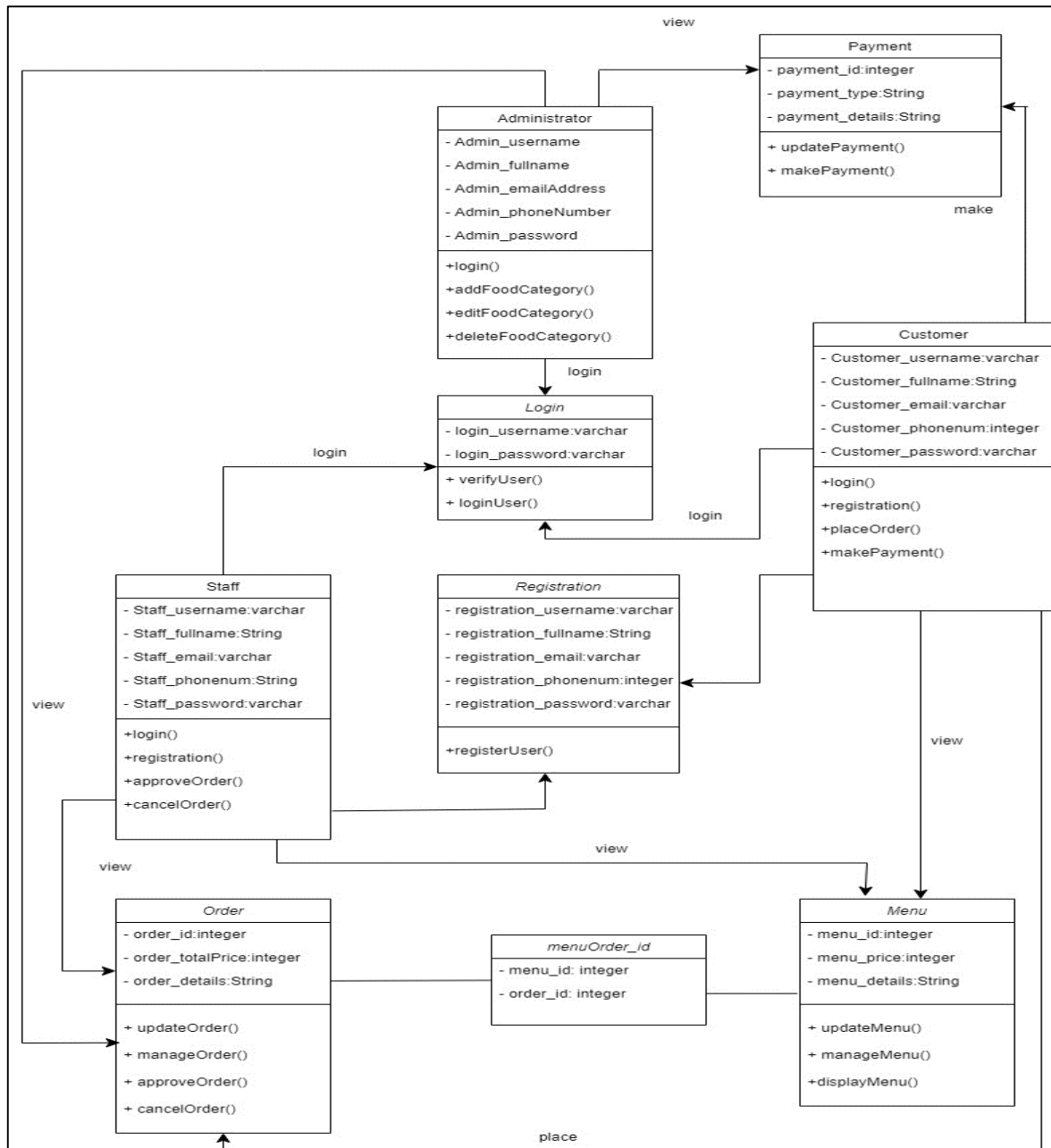


Figure 5: Class Diagram

3.4 System Design

This system architecture diagram is used to show how each component of module in a system related to one another. Figure 6 shows the system architecture diagram of TDI Caf : Mobile-based Application for Food Ordering and Management.

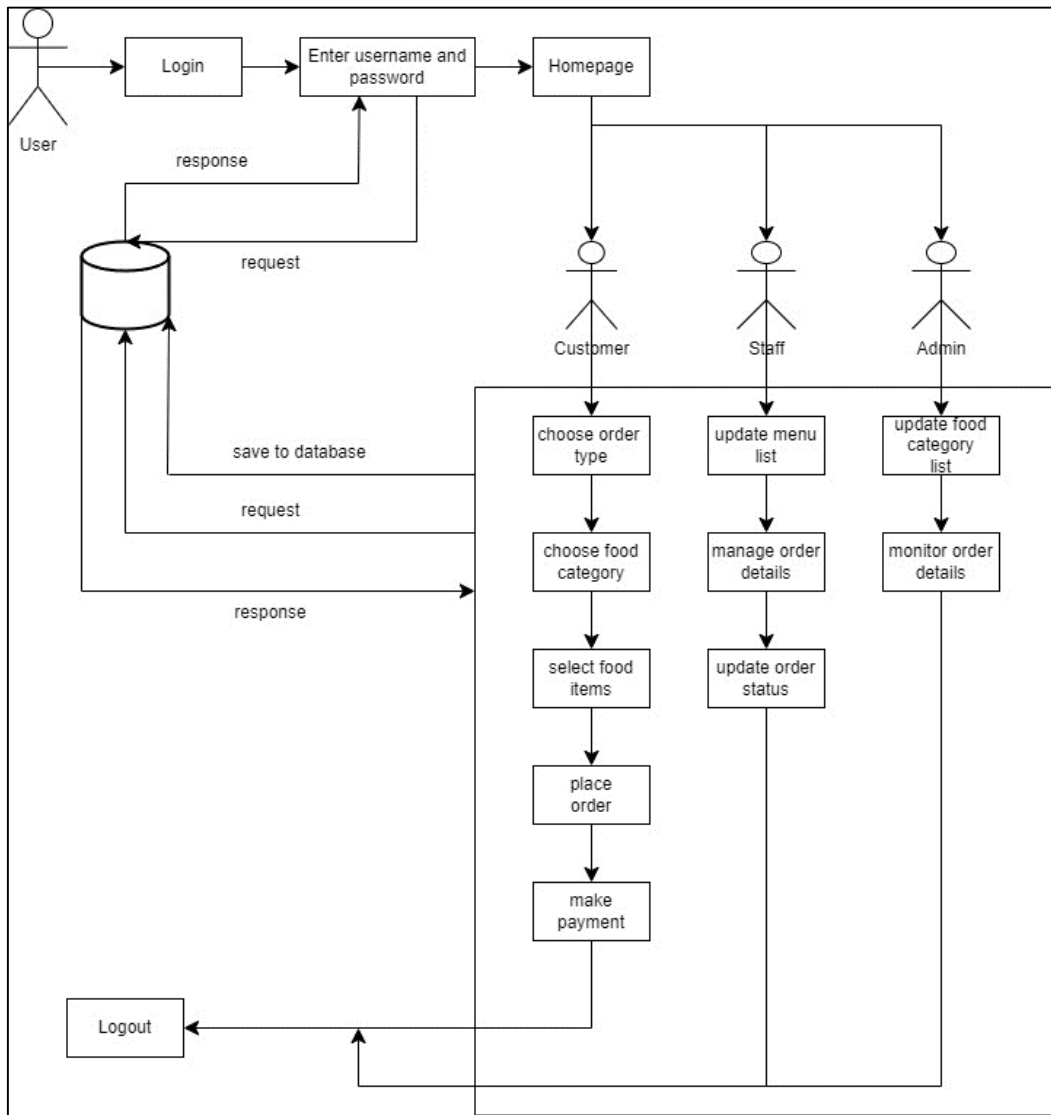


Figure 6: System Architecture Design

3.5 Interface Design

The process of designing the layout of the user interface for the system's components is known as user interface design. The interfaces have been created based on the requirements. The user interface was designed using Figma.

3.5.1 Login Module

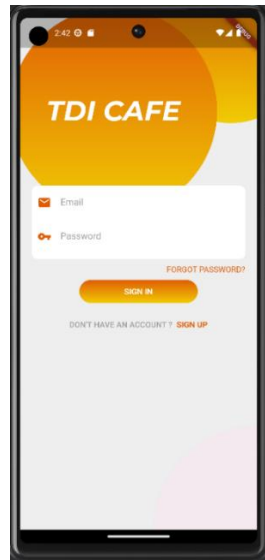


Figure 7: Login Module

Figure 7 shows the login interface which allows the customer to access the application. The customer is required to enter their registered email and password to login to the application. If the email or password are incorrect, an alert message will be prompted and let the users re-enter again. If the email and password are correct, the application will redirect to the homepage.

3.5.2 Registration Module

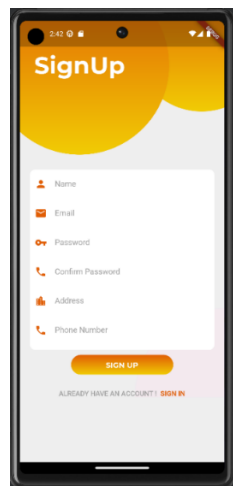


Figure 8: Registration Module

Figure 8 shows the interface of the registration module of the application. The module enables the customers to register as new user of the application. The users will be prompted to provide essential information such as username, email address, phone number and password. If any of the provided information is invalid or incomplete, the registration interface will display error messages. On the other hand, if the provided information is valid the registration interface will display successful message.

3.5.3 Menu Module



Figure 9: Menu Module

Figure 9 shows the food menu interface which presents a delightful and enticing selection of food items available within the application. This makes it easy for customers to explore the variety of food options.

3.5.4 Order Module

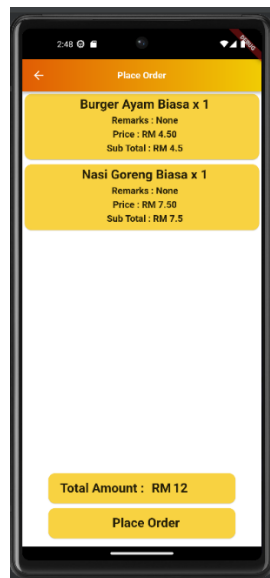


Figure 10: Order Module

Figure 10 shows the order interface which enables customers to place their food orders within the application. The order interface features a cart interface that displays the selected items, along with quantities, prices, and subtotal.

3.5.5 Order Type Module



Figure 11: Order Type Module

Figure 11 shows the order type interface which allows users to specify their preferred method of receiving their order within the application. It provides a convenient and customizable platform for users to select their desired order type based on their preferences.

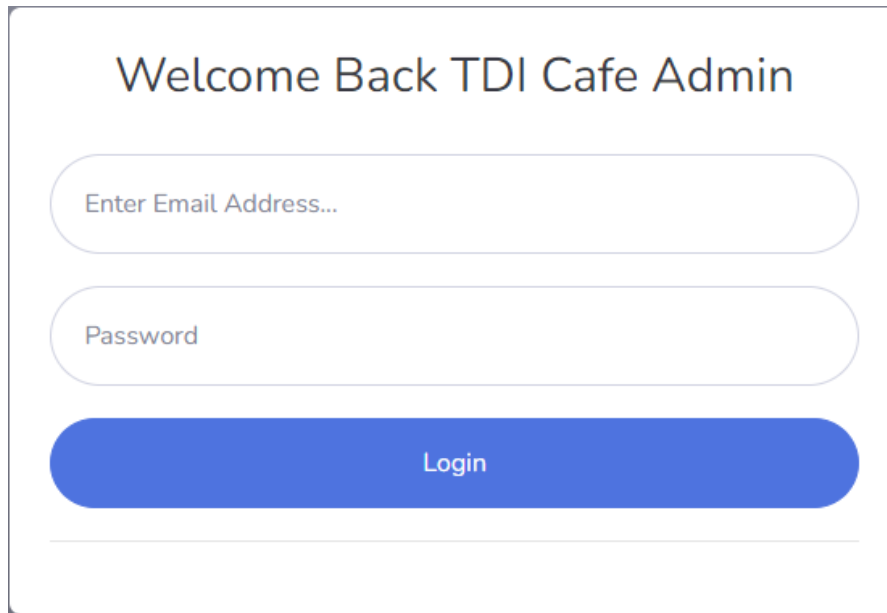
3.5.6 Payment Module



Figure 12: Payment Page

Figure 12 shows the payment interface which prompt users to choose from various payment methods, such as debit cards or cash. The interface will display the accepted payment methods.

3.5.7 Login Module for Admin



Welcome Back TDI Cafe Admin

Enter Email Address...

Password

Login

Figure 13: Login Page for Admin

Figure 13 shows the login module for admin to access the system. The admin is required to enter their registered email and password to login to the system. If the email or password are incorrect, an alert message will be prompted and let the admin re-enter again. If the email and password are correct, the application will redirect to the dashboard.

3.5.8 Food Category Module






Food Category		
ID	Name	Image
1	Fried Mee Hoon	
2	Burger	
3	Kuey Teow	
4	Nasi Goreng	
5	Mee Goreng	

Figure 14: Food Category Module

Figure 14 shows the food category interface for admin which is a dedicated section that allows administrators to manage and organize the different food categories within an application or system.

3.5.9 Add Menu Module

Figure 15: Add Menu Module

Figure 15 shows the add menu interface for admin is a section that enables administrators to create and manage the menu items within the application. It enables the administrators to add, modify, and remove menu items, ensuring that the menu remains up-to-date.

3.6.0 Update Order Status Module

Name	Items	Remark	Total	Date	Time	Status	Update	Delete
elen@gmail.com	Milo Panas X 1 , Burger Ayam Special X 1 ,	Milo Panas = None , Burger Ayam Special = None ,	RM 8.5	2023-06-17	05:11:06 PM	Ready To Deliver ▾	Update	Delete
elen@gmail.com	Nasi Goreng Biasa X 1 ,	Nasi Goreng Biasa = - ,	RM 7.5	2023-06-18	02:17:37 PM	Place Order ▾	Update	Delete

Figure 16: Update Order Status Module

Figure 16 shows the update order status interface for admin which allows administrators to manage and monitor incoming orders within an application. The interface provides administrators with a real-time overview of the incoming orders, allowing them to stay up-to-date.

4. Results and Discussion

4.1 Test Plan Result

The test reports for the functional testing done on each module in this system are presented in the subsections below. Following the implementation of the proposed application, the test plan is carried out.

Table 5 illustrates the test plan for the registration module of the application. This module is able to register the customers to login to the application. Table 6 shows the test plan for the login module. In this page, the registered email and password will be verified and customers are able to login to the homepage of the application. The test plan for the menu module is shown in Table 7. The customers are able to view the available food items in the module. The test plan for the placing order module is shown in Table 8. Customers can choose the food category, view the item list page, and select the item to order in this module. After that, it will successfully be added to the cart page. Table 9 shows the test plan for the order type module. Customers can choose their order type in the module before placing their order. Table 10 shows the test plan for the payment module. In this module, the customers need to choose the payment method before the order is successful.

Table 5: Test Plan for the Registration Module

Description	Expected Result	Actual Result
1. Register	i) A new user account is created.	Pass
i. Enter required personal information.	ii) Error message will be displayed if there is a field that has no input.	Pass
ii. Click the signup button.	iii) Alert message if the account already exists in the database.	Pass

Table 6: Test Plan for the Login Module

Description	Expected Result	Actual Result
2. Login	i) Login successfully and enter the home page.	Pass
i. Enter required personal information.	ii) Error message will be displayed if there is a field that has no input	Pass
ii. Click the sign in button.	iii) Alert message if the account does not exist, or the wrong password.	Pass

Table 7: Test Plan for the Menu Module

Description	Expected Result	Actual Result
1. Menu Module	i) Display the food category list and menu list correctly	Pass
i) Select food category	ii) All the available food category and menu options are displayed correctly	Pass
ii) Select menu		
iii) View food details		

Table 8: Test Plan of the Order Module

Description	Expected Result	Actual Result
2. Order Module	i) All the food added will be displayed in the add to cart page.	Pass
i) Click Add to Cart button		
ii) Click place order button	ii) A message will be displayed if the order has been placed successfully.	Pass

Table 9: Test Plan for the Order Type Module

Description	Expected Result	Actual Result
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3.Order Type Module i)Select the order type	i)Display the available order type option correctly.	Pass
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Table 10: Test Plan for the Payment Module

Description	Expected Result	Actual Result
4.Payment Module i)Select the payment method	i)Display the available payment method correctly.	Pass

4.2 User Acceptance Testing

User acceptance testing is performed on the users to test how much further their satisfaction with the proposed TDI Café application is, before the application is shifted to the production process. User acceptance testing is conducted through the Google Form to provide users an opportunity to use the application and measure their acceptance level towards the application.

Table 11 and Figure 13 show the outcomes of the testing form's function assessment after they've used the application for customer part. All the respondents are satisfied and highly satisfied with the register, login, and menu function. Some of the respondents feel good on the order module, order type module and payment module function. Overall, the functions offered in the proposed application is accepted by the respondents. Table 12 and Figure 14 show the outcome of the testing form for user interface part for customers, all the respondents are satisfied and highly satisfied, and only 1 respondent feels good on the easy to navigate. Thus, the main functions of the application should be improved in the future.

Table 11: User acceptance testing result on application function for Customers

Function	Highly Unsatisfied	Unsatisfied	Good	Satisfied	Highly Satisfied
Login Module	0	0	0	2	8
Registration Module	0	0	0	2	8
Menu Module	0	0	0	1	9
Order Module	0	0	3	4	3
Order Type Module	0	0	1	4	5
Payment Module	0	0	3	3	4

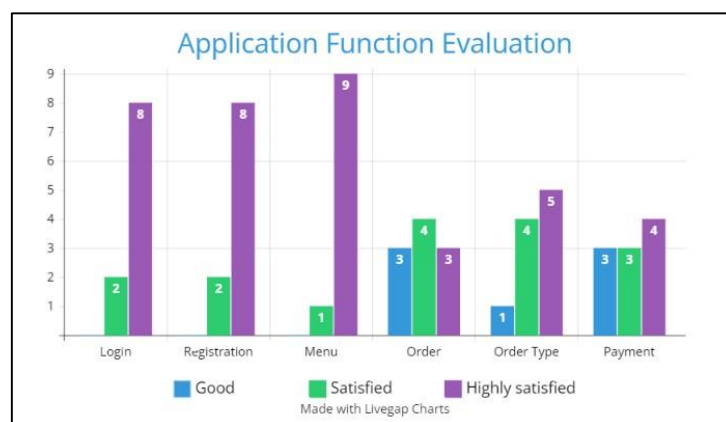
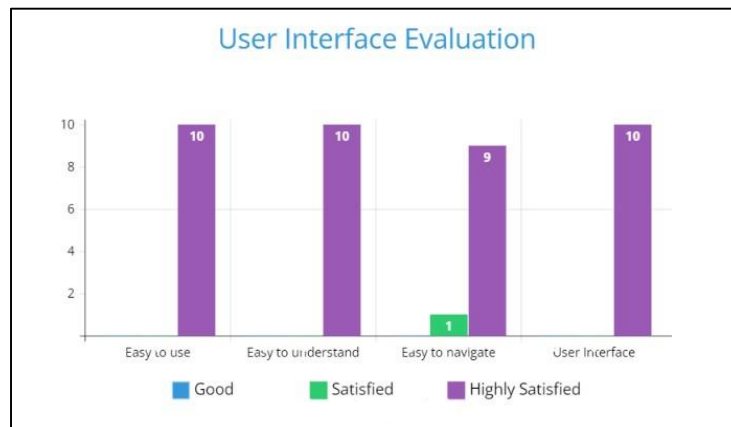


Figure 13: User acceptance testing result on application function for customers

Table 12: User acceptance testing result on user interface for Customers

Modules	Highly Unsatisfied	Unsatisfied	Good	Satisfied	Highly Satisfied
Easy to use	0	0	0	0	10
Easy to understand	0	0	0	0	10
Easy to navigate	0	0	0	1	9
User Interface	0	0	0	0	10

**Figure 14: User acceptance testing result on user interface for customers**

5. Conclusion

The TDI café application has been successfully developed to facilitate customer orders and order management by the admin. It includes registration and login modules for users to create accounts and log in and out of the application. The menu module allows customers to view and order from a list of food items, while staff can modify the menu. The order module displays the order list to customers, and staff can update or delete orders. Payments can be made through the payment module, which the admin monitors along with order details. The application aims to be user-friendly and efficient, enabling staff to process orders quickly and minimize confusion.

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