



A Development of Online Food Ordering System for Restaurant Beiji

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Abstract: Currently, Beiji Restaurant still runs their business, processing orders through paper-based work and being handled manually by employees. It is inefficient and faces a lot of human error, resulting in the worst customer experience to order from their restaurant. Therefore, this study developed an Online Food Ordering system to help Beiji Restaurant provide better online food ordering services to customers. The project is developed as a mobile application system using a throwaway prototype method and a mobile -based language. By using this system, restaurants can receive and process orders easily. In addition, customers can also view and place orders from online easily. In addition, all users can also update the status of the order, thus customers can easily track the status of their order at any time in real time. In addition, the system emphasizes point-of-sale technology, in which administrators can view observations and report analysis of restaurant sales.

Keywords: Food Ordering, point-of-sale, restaurant

1. Introduction

Restaurant means a place where meals are prepared and served to customers in Cambridge Dictionary. Usually, people visit to the restaurant to solve hungry and starving, people can choose either to dine-in or takeaway. But no matter which method people choose to have the food, people are facing a same problem which is food ordering process.

Typically, a food ordering process involves several steps. Customers need to visit to the restaurant, choosing food from a paper-based menu, place the order and wait for the meals to be prepared [1]. Inevitable, customers will feeling dissatisfied about the ordering services because it is inefficiency. In this era of technology, people seek for efficiency, productive and convenience. The time wasted at waiting food, the mis-order happen due to the traditional ordering process have to be resolved. Just think about it, customer already wait for an hour after you placed the order, it comes out a mis-order food. If worse, the restaurant missed the order and still waiting for it. This situation not only brings a worst experience to the customers, it also effects the reputation of the restaurant. Humans make mistakes sometimes, that's why people need the help of technology to overcome the problems.

Besides, during this pandemic of Covid-19, most of the time customers are not allowed to dine in the restaurant. Even when the government has loosened the SOP, most of the people still choosing to take away instead of dine-in because of the pandemic concerns. Besides, there is also high risk to do the dine-in business, because they might face several problems. For example, restaurant is fined if one of the customers not following the SOP, restaurant is forced to close when one of the customers is positive in Covid-19 test. This will bring inconvenience for both customers and restaurant. Hence, the restaurant must shift main business to the takeaway and delivery method to survive.

Due to the rapid growth of the Internet and technologies associated with it, all the problems stated at above can be solved by using a web based Online Food Ordering System. So many businesses and company are now undertaking their business comfort on the Internet. Due to the situation nowadays, most of the restaurant target for quick preparation and speedy delivery process to attract the customers and maintain their business, rather than focus on the rich experience when dine-in [2].

With the present of Online Food Ordering System, it can increase the productivity and efficiency significantly. It not only provides an excellent services and experience to the customers, but it also transforms and expands the traditional business mode of a restaurant.

The article is organized into five sections. The first part is an introduction describing the context of the project. The second section describes the analysis of the related work. In the third section, the methodology is explained. The implementation and testing of this system are described in the fourth section. In the last section, a conclusion with some instructions for future employment is given.

2. Related Work

Typically, a food ordering process involves several steps. Customers need to visit to the restaurant, choosing food from a paper-based menu, place the order and wait for the meals to be prepare [1]. Inevitable, customers will feeling dissatisfied about the ordering services because it is inefficiency. In this era of technology, people seek for efficiency, productive and convenience. The time wasted at waiting food, the mis-order happen due to the traditional ordering process have to be resolved. Just think about it, you already wait for an hour after you placed the order, it comes out a mis-order food. If worse, the restaurant missed your order and you still waiting for it. This situation not only brings a worst experience to the customers, it also effects the reputation of the restaurant. Humans make mistakes sometimes, that's why we need the help of technology to overcome the problems.

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A point-of-sale system, POS, is the process which the customer makes a payment for products or services at the store. Simply put, when a customer makes a purchase, they are completing a point of sales transaction. The explanation above is only refer to the traditional version of POS system (TPOS), the latest point of sales system goes beyond for further feature in processing, accountability and accurate data documentation for effective management of the business. Point of sales information system is a growing system information and a lot of people is interested in using it especially in the business areas [4]. Several industries implement point of sales system (POS) technology with the intention of making their services better, especially for Food & Beverage (F&B) aspect.

F&B industry needs to collect and process data in order to improve the sales, customer service and to make the operations more efficient. This is why the POS technology is one of the most important

aspects that restaurant have been forced to integrate [5]. Point of sales system works as the central component for a business, it is the hub where everything like product management, order processing, payment processing, sales reporting and customer management merged together.

All the information collected is called POS data. The data are collected from the volumetric information on every transaction made, i.e., the quantity sold, both in numbers and value, the price at which the transaction was made, and any added information [6]. All the data are process in POS system to help administrator to identify not only daily or monthly POS performance, it helps to accelerate the product and order management. POS data can also be used to predict what is the hot sales item or the seasonal sales more accurately. The POS system is a device to automatically collect and combinesales data, which can then be used to generate various sales reports [7]. The analysis generated using POS data that can directly aid restaurant administrator or manager in their strategic and tactical decision-making.

The currently ordering process apply by Restaurant Beiji is still in the traditional way. The customers need to visit to the restaurant and search for parking. The menu still in paper-based, sometimes new menu was not able to update for the customer, causes the customer can only know the new menu from the waiters. Once the waiters forgot to recommend the new menu, it will not able to be known and bought by the customers. Since the restaurant has no digital menu or online order, customers need to queue for the order service. Sometimes when the restaurant is crowded, customer need to wait for the waiters to serve them and even more times for their ordered food. Besides, human error often happened during the crowding period, especially for waiters and chef. Miscommunication during the order cause the waiter to pass a wrong order to kitchen, confuse the order sequence led to dissatisfying of customers, and because the orders are all in hand-written, misunderstanding happened in the kitchen.

Because of the pandemic of Covid-19, Restaurant Beiji had start online business by taking order through WhatsApp message or phone call. The owner of the restaurant had created a Facebook page, Instagram and post the restaurant’s menu on the social media. So, they leave their phone number on the social media page as the only contact way for online ordering. If customer feel interest after viewing the restaurant’s post on the social media, they will call or message to the restaurant, and place their order. After that, the owner of restaurant will drop down the order and pass it to the kitchen. When the meals are prepared, the delivery man will call the customer to inform he/she that the food is on the way and confirm again customer’s address. When the delivery man arrived at the customers’ house, he will pass the meals to customers and receive the payment by cash or Touch ’n Go. Figure 1 summarized the existing process through As-Is Model.

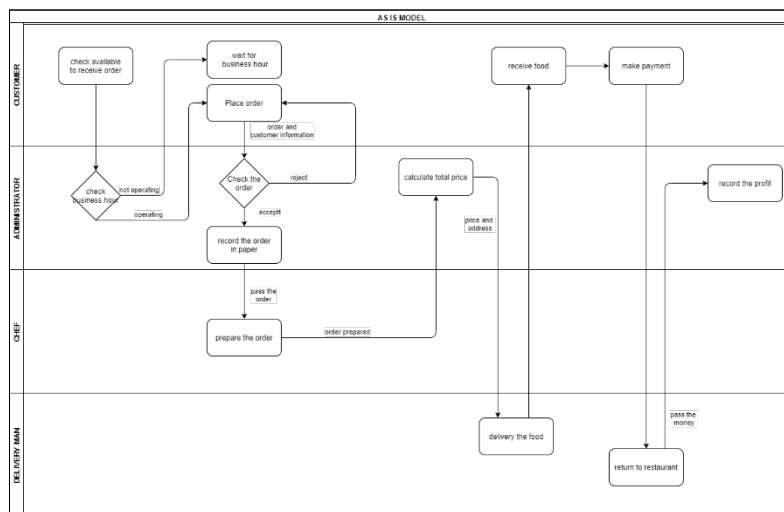


Figure 1: As-Is Model

The whole order procedure either in online or offline will waste many times and highly manpower consuming. Besides, the current system is difficult to keeping the records of sales in order to do the business sales analysis. According to Kimes, (2008) [3], the technology in the restaurant can speed service by reducing the order-taking time advancing food production, tighten service time, shortening the payment time, and cutting turnaround time. So, there is significant evidence to support that technology and computerized system are required to improve the work efficiency and service quality.

The current system applied in Restaurant Beiji is not good enough to provide an efficient and quality service for customer. Most of the process are done manually, and it cost a lot of time and manpower. Besides, they didn't have a systematic management on their daily order and complete documentation of order information. All the order are still written in paper-based form or by word from mouth. By applying the POS technology in the proposed system, it will accelerate the ordering process in order to provide a better service to customer. Moreover, the POS system will help to manage each of the order. Hence, the miscommunication or mis-order could be reduced or avoid. Furthermore, the system will collect data from all aspect i.e., order, customer, food and etc. to generate an analytic report. The admin not only can view their daily, weekly or monthly sales insight, but also make strategic decision to boost restaurant's business based on the report.

Three existing system is examined and compared with the proposed system. All features compared are listed in Table 1.

Table 1: System's Comparison

Modules	Kyte	UpMenu	Foodpanda	Online Food Ordering System Restaurant Beiji
System type	Mobile application	Web-based system and mobile application	Web-based system and mobile application	Mobile application
Register	Using personal details	Using personal details	Using personal details, shop license, bank account detail and etc.	Using personal details, employee registration can only be done by Admin
Login	User ID and password	User ID and password	User ID and password	User ID and password
Online Order	Available	Available	Available	Available
Food Delivery	Available	Not supported	Available	Available for certain area only
Manage product catalog	Administrator and employee	Administrator only	Administrator only	Administrator only
Review	Not available	Available	Available	Not available
Order status	Not support	Not support	Updated real-time	Updated real-time
Generate report	Administrator only	Administrator only	Generate monthly only	Administrator only

3. Methodology

3.1 Software Development

The methodology used for developing this system is Throwaway Prototyping. Throwaway Prototyping model is especially useful and suitable when the requirement of the system is vaguely,

blurry and poorly laid out. By using throwaway prototyping, the feedback can gather rapidly from the end-users. Hence, the system's requirements and functionalities will be more clearly defined and developed. Table 2 summarizes the software development activities.

Table 2: Software development activities and their task

Phase	Task	Output
Planning	Proposed the project Determine the project schedule, activities and output	<ul style="list-style-type: none"> • Project proposal • Gantt chart
Analysis	Define requirements Define stakeholders Identify Software for development	<ul style="list-style-type: none"> • System's requirement • UML Diagram • Class Diagram • RTM • Swimlane diagram
Prototyping	Design prototype Implement prototype User testing	<ul style="list-style-type: none"> • User feedback • Requirements validation
Design	Design GUI Design software architecture Design database	<ul style="list-style-type: none"> • Design specification • System architecture • Database design • User interface design
Implementation	Implement the system	<ul style="list-style-type: none"> • Completed system
Testing	Unit testing Functional testing System testing Acceptance testing	<ul style="list-style-type: none"> • Test case specification • Test plan • Test cases

3.2 Requirement Analysis

System requirement analysis is a structured, or organized, methodology for identifying an appropriate set of resources to satisfy a system need and the requirements [8]. Requirement analysis is the process of determine requirements that developed system needs to fulfill, or user expectation outcome from the proposed system. System requirements include functional and non-functional requirements, user requirements and system requirements. Table 3 shows the system functional module.

Table 3: System functional module

No.	Module	Function	User
1.	Registration and Login Module	Allow customer, chef, delivery man and administrator to register and login to the system	Administrator, chef, delivery man and customer
2.	Product Management module	Manage and update the information of the product	Administrator

Table 3: (cont)

No.	Module	Function	User
3.	Order module	Allow the customer to view menu, place order, choose payment method and make payment	Customer
4.	Order Status module	Update and track the status of an order	Administrator, chef, delivery man and customer
6.	Report module	To generate report for business need analysis	Administrator

Functional requirements capture the intended behavior of the system. This behavior may be expressed as services, task or functions the system is required to perform [9]. Non-functional requirement address to a software requirement that describes not what the software will do, but how the software will do it [10]. Table 4 shows the functional requirements of the proposed system while Table 5 shows the non-functional requirements of the system. Table 6 describe the user requirements of the system.

Table 4: Functional requirements

No	Module	Description
1.	Registration and Login Module	<ul style="list-style-type: none"> The system should allow user to register an account with username and password. The system should allow user to login into the system using registered username and password. The system should only allow a user to log in as a user with a valid username and password. The system should allow admin to register chef, deliver man and another admin to the system The system should alert the user for any invalid input. The system should redirect user to that respective main menu upon successful login.
2.	Product Management module	<ul style="list-style-type: none"> The system should allow admin to add product to the menu. The system should allow admin to upload image to the menu. The system should allow admin to delete products from the menu. The system should allow admin to update any changes to the product menu.
3.	Order module	<ul style="list-style-type: none"> The system should allow customer to access and view the menu. The system should allow customer to add food to the cart. The system should allow customer to place an order. The system should provide a checkout list to the customer before an order is placed. The system should allow customer to choose payment method.
4.	Order Status module	<ul style="list-style-type: none"> The system should allow customer to track order status. The system should allow admin, chef and delivery man to update the order status real-time. The system should allow customer to complete the order after receive the meals.
6.	Report module	<ul style="list-style-type: none"> The system should generate report for admin to view.

Table 5: Non-functional requirements of the developed system

No	Requirements	Description
1.	Performance	The loading time required for a page is no more than 1 minute
2.	Operational	The system should be available for 24 hours / 7 days
3.	Usability	The system should be user friendly
4.	Cultural and political	The system should be able to work on any web browser
5.	Capacity	The system should allow more than 20 users to access at a same time
6.	Security	The system should prevent unauthorized access to the admin page

Table 6: User requirements of the developed system

No.	User Requirements
1.	All users must be able to enter a valid id and password to enter the system
2.	Administrators should be able to manage the product catalog menu
3.	The system only allowed to accept order during business hour
4.	Customer should be able to view the product catalog menu
5.	Customer should be able to place the order online
6.	Customer should be able to make the payment online
7.	Users should be able to view and edit their own profiles.
8.	Customers should be able to track their order status
9.	Administrators, chef and delivery man should be able to update the order status
10.	Administrators, chef and delivery man should be able to view the order status
11.	Administrators should be able to view report generated by the system
12.	Administrators should be able to register chef, delivery man and admin
13.	Administrators should be able to view and edit each chef, delivery man and administrator profiles
14.	The system should allow the customer to complete an order after receive the order
15.	Administrators should be able to remove the registered chef, delivery man and administrators

Table 7 and Table 8 show the hardware and software requirements for the system development.

Table 7: Hardware requirements

Specification of Hardware	
Processor	3.7 GHz or higher
Memory	8 GB RAM or higher
Internet Connection	100MBps
Storage	256 GB or higher

Table 8: Software requirements

Type of Software	Specification of Software
Android Studio	To create interface for the system and function of the entire system
XAMPP Control Panel	To create and manage database
Mobile App Simulator and Google Chrome	To test run the system

3.3 System Analysis

Figure 2 shows the use case diagram that represents the overall activity of the Online Food Ordering System Restaurant Beiji. There are four users for the proposed system who are the admin, customer, chef and delivery man.

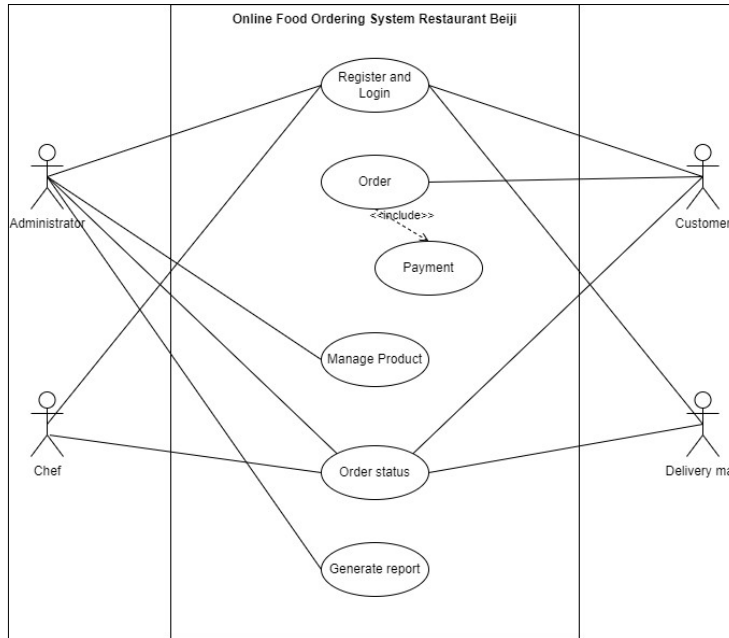


Figure 2: Use Case diagram of proposed system

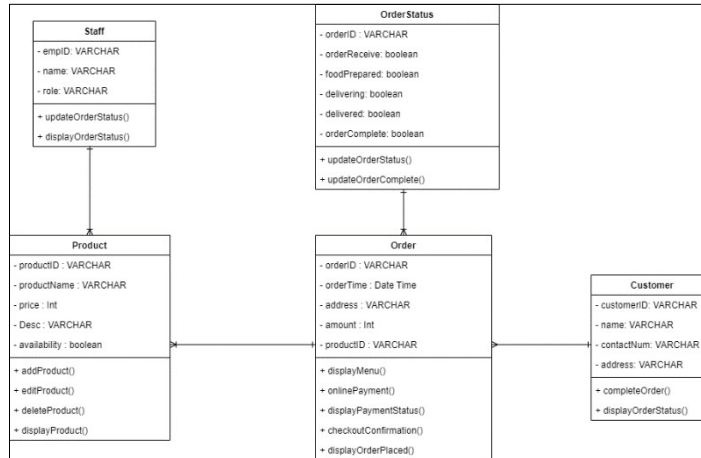


Figure 3: Class diagram of proposed system

A class diagram is the illustration of relationships among classes in Unified Modelling Language (UML) which demonstrate the structure and overview of the whole system Figure 3 describe the relationships between classes of proposed system in UML class diagram.

In the to-be model, the interaction between the users and system will be increased in order to provide a more quality and efficiency service to the customer. Figure 4 show the to-be model of the Online Food Ordering System Restaurant Beiji.

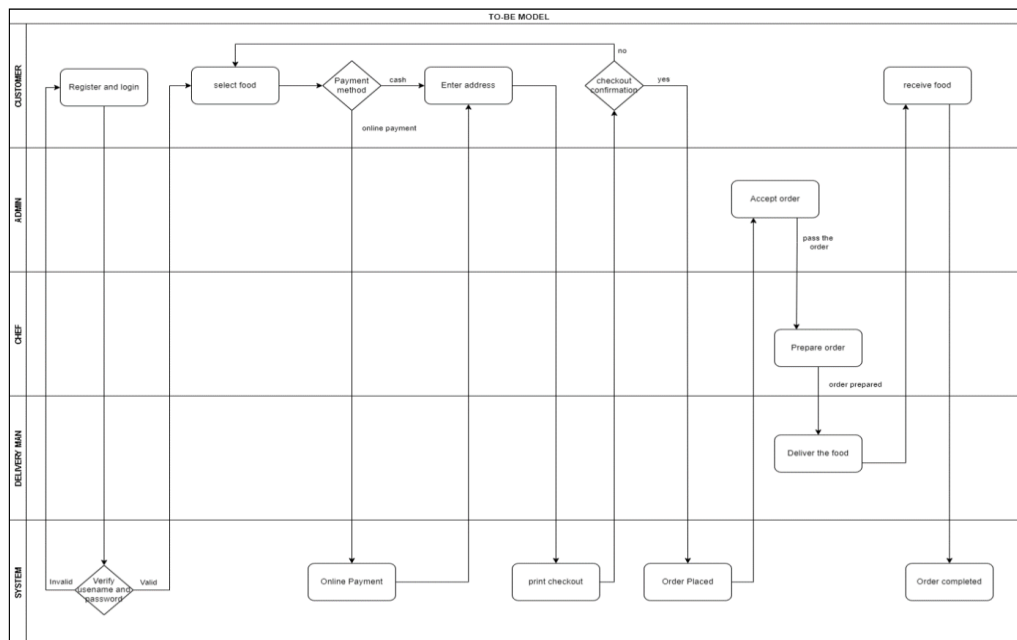


Figure 4: To-be Model of proposed system

3.4 System Design

The system architecture is the three-tier client-server architecture. This architecture organizes applications into three logical and physical computing tiers, which are the presentation tier, the application tier and the data tier. Figure 5 demonstrate the simple flow of three-tier client server architecture.

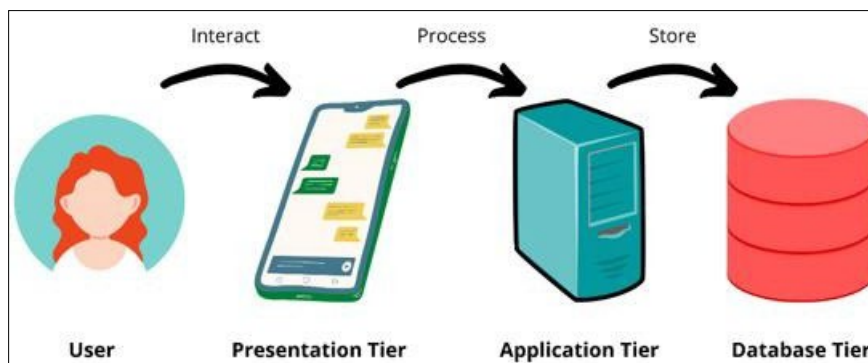


Figure 5: System Architecture

3.5 Database Design

The database schema describes the entities that hold the different data in the database. The database schema is as follow:

- i. Admin (adminID, username, password)
- ii. Customer (customerID, username, password, contactNum, address)
- iii. Chef (empID, username, password)
- iv. DeliveryMan (empID, username, password)
- v. Product (productID, productName, price, Desc, availability)
- vi. Order (orderID, orderTime, address, selectedFood)

- vii. OrderStatus (orderID, orderReceive, foodPrepared, delivering, delivered, orderComplete)

3.6 User Interface Design

Figure 6, Figure 7, Figure 8 and Figure 9 show some of the interface design of the system.

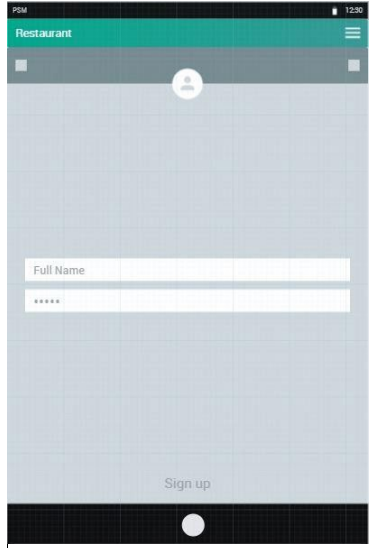


Figure 6: Login Page

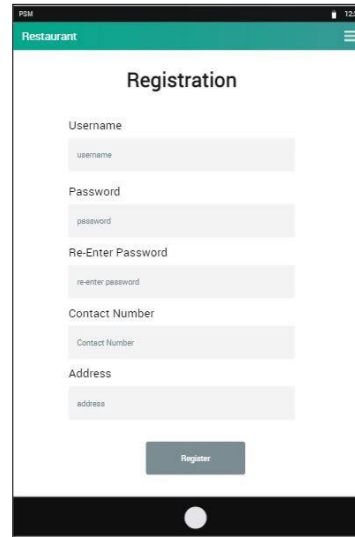


Figure 7: Registration Page (Customer)

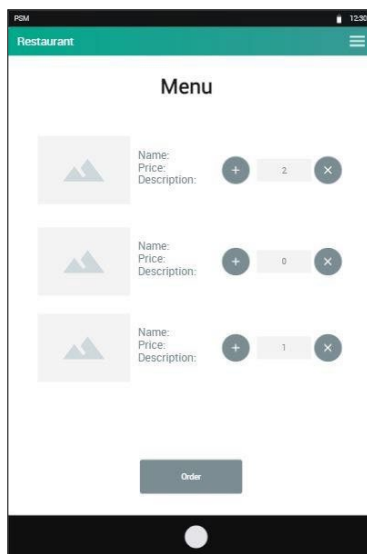


Figure 8: Menu Page

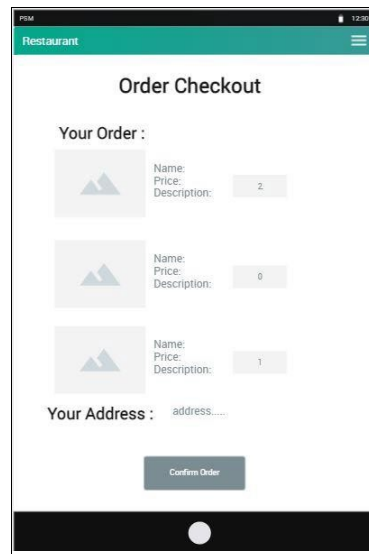


Figure 9: Order Checkout Page

4. Results and Discussion

The Online Food Ordering System for Restaurant Beiji had been develop in expected time given. The development of the system is by using Java as the coding language and “Android Studio” as the

tools while “Firebase” as the database. The system application with a total of five main modules is successfully developed.

4.1 Registration and Login Module

Registration and Login module allow the user to register and login by using valid username and password. The registration of the staff can only be done by the administrator.

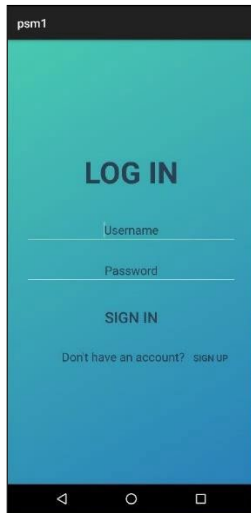


Figure 10: Customer Login Page

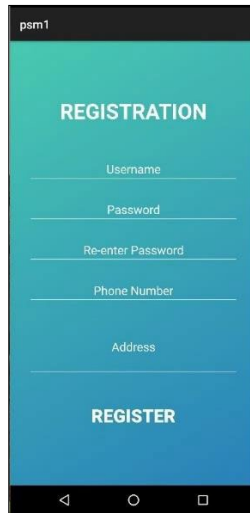


Figure 11: Customer Register Page

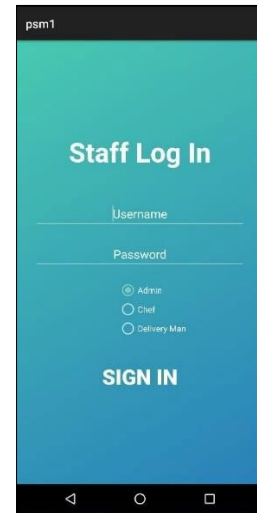


Figure 12: Staff login Page

4.2 Product Management Module

Product management module is only accessible by administrator. Administrator can add, edit and update the information of food sold in the restaurant.



Figure 13: Food Management Page

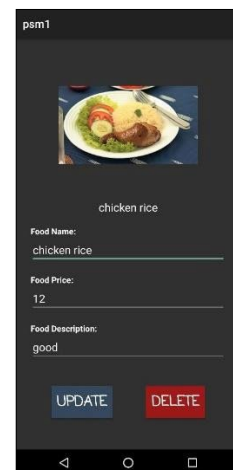


Figure 14: Edit Food Page

4.3 Order Module

Customer can view menu, add food to cart and place order in this module.

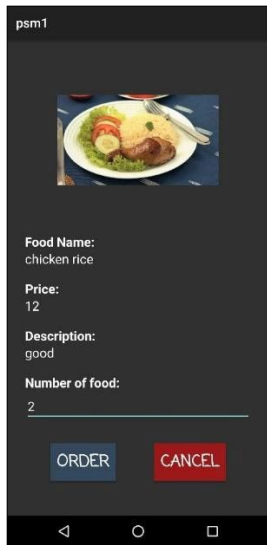


Figure 15: Add Order Page

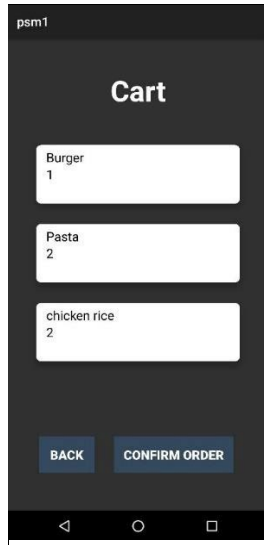


Figure 16: Cart Page

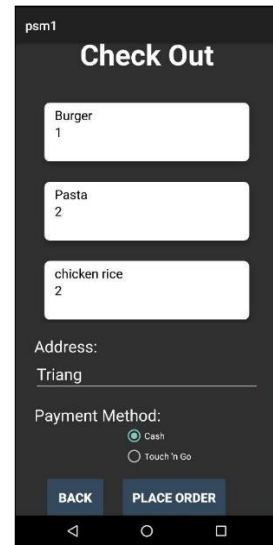


Figure 17: Checkout Page

4.4 Order Status Module

In this module, customers can track their order status and complete the order after receiving the food. The staff and administrator can track and update all the order status of customers.

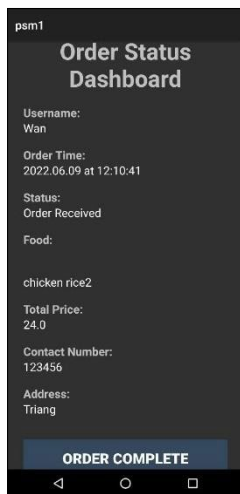


Figure 18: Customer Order Status Page

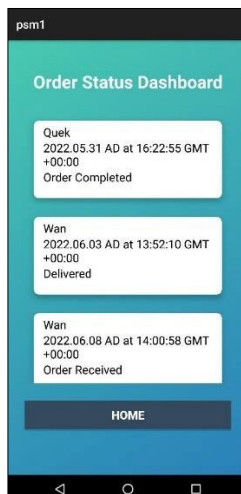


Figure 19: Staff Order Status Page

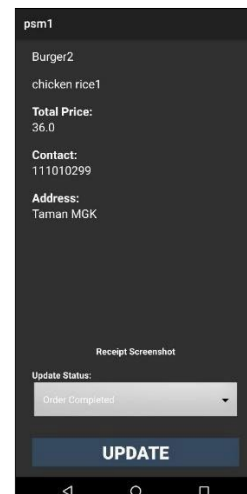


Figure 20: Update Order Status Page

4.5 Report Module

This module is only accessible by administrator. Administrator can select date period and generate a report within the period.

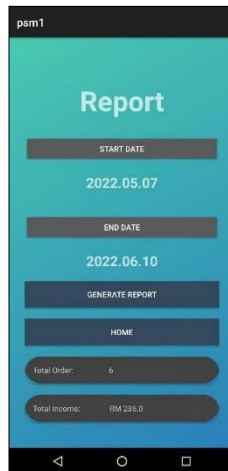


Figure 21: Report Page

4.6 Functional Testing

The functional testing is carried out to test the system’s functionalities. The system should perform functions that meet the functional requirements. The test cases are derived based on the functional requirements defined in Table 4. Table 9 shows the test case summarization which assists in testing to trace the requirements to make sure that all requirements are being tested.

Table 9: Test Case Summarization

Software Requirement Specification	Test Case ID	Test Case Description	Test Result (Pass / Fail)
SRS_REQ_100	TEST_100	Registration and Login	
SRS_REQ_101	TEST_100_001	The user is able to enter login page	Pass
SRS_REQ_102	TEST_100_002	The user can log in with valid username and password, then the system directs the user to main page	Pass
SRS_REQ_103	TEST_100_003	The system display error message if the username and password are invalid	Pass
SRS_REQ_104 SRS_REQ_108	TEST_100_004	Customer can register an account with valid information	Pass
SRS_REQ_105 SRS_REQ_106 SRS_REQ_108	TEST_100_005	Admin can register another admin and staff with valid information	Pass

Table 9: (cont)

SRS_REQ_107	TEST_100_006	System display error message when registration is failed	Pass
SRS_REQ_200	TEST_200	Product Management	
SRS_REQ_201	TEST_200_001	Only admin can access this module	Pass
SRS_REQ_202 SRS_REQ_205	TEST_200_002	Admin can add a product and the system will display message	Pass
SRS_REQ_203 SRS_REQ_206	TEST_200_003	Admin can edit a product and the system will display message	Pass
SRS_REQ_204 SRS_REQ_207	TEST_200_004	Admin can delete a product and the system will display message	Pass
SRS_REQ_300	TEST_300	Order	
SRS_REQ_301	TEST_300_001	The system display menu after user clicks the 'Menu' button	Pass
SRS_REQ_302 SRS_REQ_303	TEST_300_002	User can choose and select the food	Pass
SRS_REQ_305 SRS_REQ_306	TEST_300_003	The user is able to choose the registered address or enter a new address	Pass
SRS_REQ_304 SRS_REQ_307	TEST_300_004	User can choose payment method at the checkout page	Pass
SRS_REQ_400	TEST_400	Order Status	
SRS_REQ_401 SRS_REQ_403	TEST_400_001	The customer can view order status and complete the order after received the food	Pass
SRS_REQ_401 SRS_REQ_402	TEST_400_002	The staff can view order status and update the status	Pass
SRS_REQ_500	TEST_500	Report	
SRS_REQ_501	TEST_500_001	Only admin can access this module	Pass
SRS_REQ_502 SRS_REQ_503 SRS_REQ_504	TEST_500_002	Admin insert the time period and system generate a basic report	Pass

4.7 Overall Test Result

There are total of 18 test cases were carried out for testing the functionality of five modules of the system. The overall test case results are show in the Table 10 below. Besides, the result is analyzed in a pie chart as shown in Figure 10 to clarify the percentage of pass for the test cases.

Table 10: Overall Test Case Result

Test Case ID	Total Test Cases	Total Passed
TEST_100	6	6
TEST_200	4	4
TEST_300	4	4
TEST_400	2	2
TEST_500	2	2
TOTAL	18	18

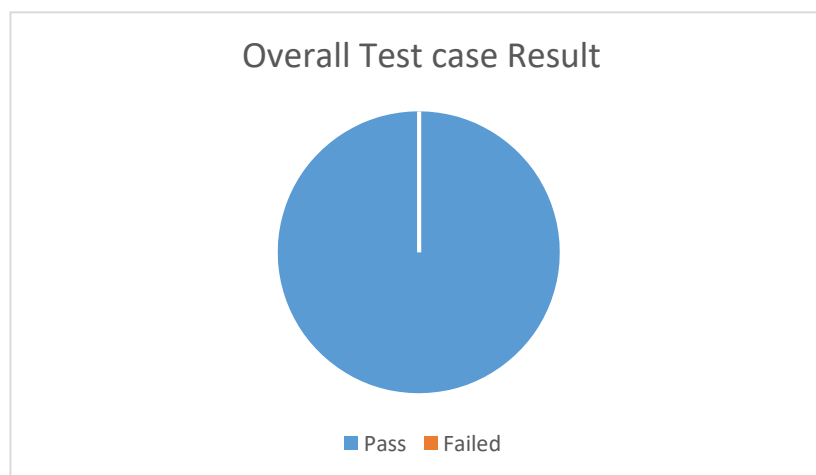


Figure 10: Overall Test case Result

4.8 User Acceptance Test

User acceptance testing is done with three expected user which are the administrator, staff and customer. The users are invited to test the functionality, usability and interface design of the system with a scale from 1 to 5, which represent from very unsatisfied to very satisfied. Figure 11 below show the bar graph of the user satisfaction testing result of the system.

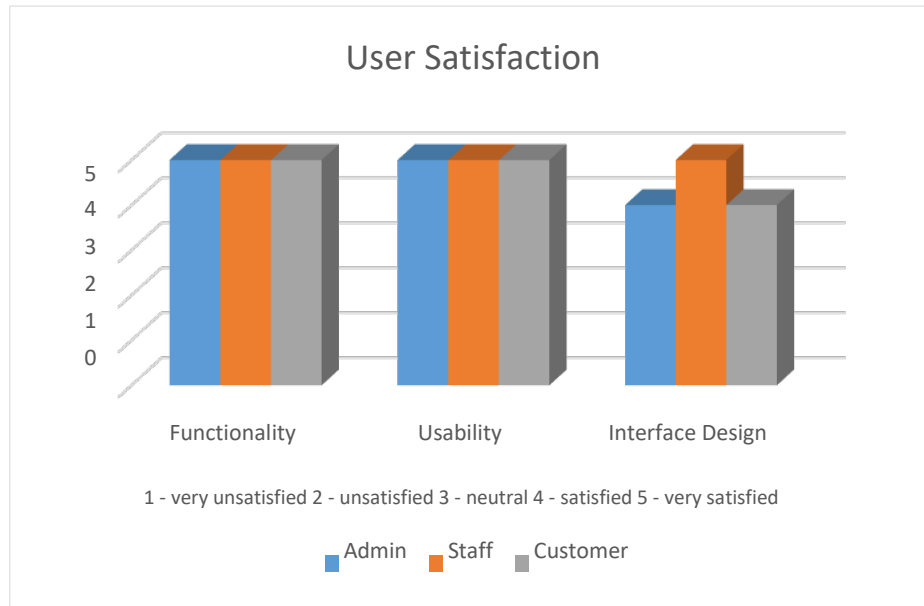


Figure 11: User Satisfaction Testing Result

5. Conclusion

The Online Food Ordering System for Restaurant Beiji had been successfully planned, designed and developed. The system is aimed to improve the efficiency of the ordering process and the customers' satisfaction while placing an order to the restaurant. The overall conclusion of the system including the advantages, disadvantages and future suggestion will be discussed to improve the system in future.

5.1 Advantages of the System

There are a few advantages that had been identified in Online Food Ordering System for Restaurant Beiji. The advantages are as following:

- i. The system helps to reduce the staff's workload as the whole ordering system can be done by system online in order to improve efficiency.
- ii. The system helps reduce the human mistakes and errors in order to improve the customers' experiences and satisfaction.
- iii. The system is easily to be understand by user and user friendly.
- iv. The system provided a better documentation of sales of the restaurant.

5.2 Disadvantages of the System

There are a few disadvantages that had been identified in Online Food Ordering System for Restaurant Beiji. The disadvantages are as following:

- i. The system did not generate notification to the restaurant when a new order is received.
- ii. The order is unable to be changed after it is placed.
- iii. The user cannot change its username after registration.
- iv. The system did not show estimated waiting time for the order.

5.3 Recommendations

The suggestions below can help improving the quality and performance of the system. The suggestions are as following:

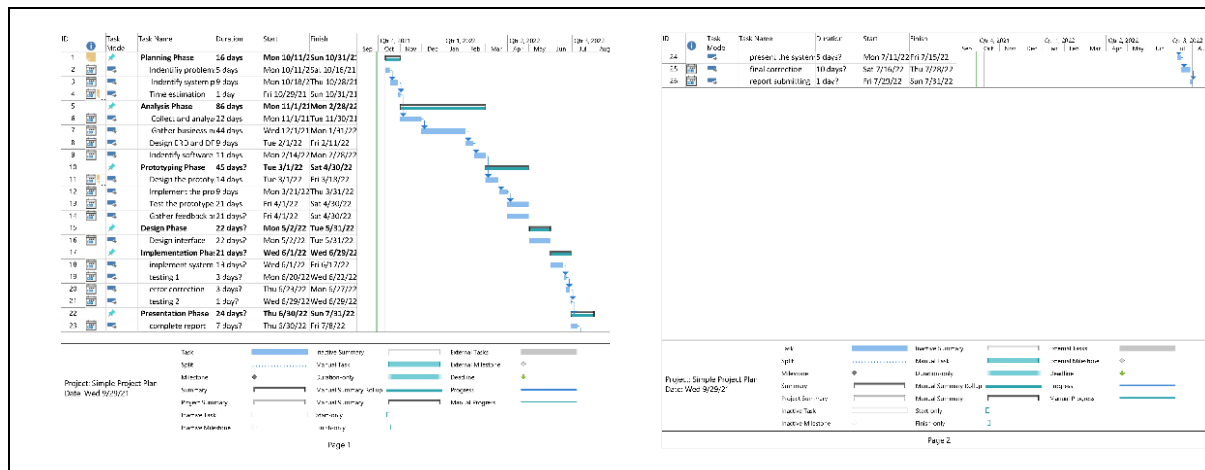
- i. A notification will be generated and send to the admin or staff once the order is received.

- ii. Provide order cancellation or change function to the system which the order can be cancel or change by the customer with appropriate reason.
- iii. Provide food recommendation based on the best sales of the restaurant.
- iv. Provide an average estimated waiting time for the order.

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Appendix A



Gantt Chart

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