UNIVERSITI POLY-TECH MALAYSIA

AI-ORDERS: SMART ONLINE ORDERING WEB APPS FOR AI-CHA ICE CREAM & TEA

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Abstract

Ai-CHA Ice Cream & Tea is an emerging food and beverage (F&B) company in Malaysia with a various number of ice creams and beverages. Today, Ai-CHA uses third party websites to make online orders, and this makes the customer interaction to be little and operational costs higher. The purpose of this project is to create a mobile ordering app (Ai-Order) that would be devoted to Ai-CHA, it will make ordering convenient, will increase brand loyalty, and will ease the management process.

There will be two parts of the proposed system: a customer web application and an Admin Dashboard that will be available to the Ai-CHA staff. The web application will enable a user to look through the menu, design of beverages, secure payments, monitoring order status, and attend a loyalty scheme. Using the Admin Dashboard, the staff of the outlets can update the menu items and can keep track of incoming orders in real time and have access to basic sales analytics. The system can also be integrated with point of sale (POS) system to process orders efficiently at Ai-CHA store.

Its methodology is Waterfall, and the project will be carried out in the following stages: requirements analysis, design, implementation, testing and deployment. The feature requirements were validated with the help of user surveys to determine the user expectations and collect data. Testing involves both functionality and usability as well as Personal Data Protection Act 2010 (Act 709) compliances.

This will result in the whole mobile method of buying that increases customer experience, improves loyalty, and decreases the load on Ai-CHA personnel to handle manual activities. The solution also enables Ai-CHA to have meaningful customer insights and operational effectiveness, which will help it achieve the vision of its digital transformation.

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1 INTRODUCTION

1.1 Introduction

This chapter will present the information of the Ai-Orders project, namely, the background of the project, the statement of the problem, objectives, scope and target users of the project, which gives a clear picture of the solution, and its anticipated benefits on business operations of Ai-CHA.

1.2 Project Background

Ai-CHA Ice Cream & Tea is a young brand based in Malaysia consisting of a wide assortment of ice creams, drinks, and snacks that it sells to increasingly large numbers of customers. There has been a tremendous growth in the food and beverage industry especially in Malaysia over the course of the past few years because of shifting consumer preferences of convenient, high-quality and innovative food products. However, with this growth, Ai-CHA still depends on third-party food delivery services like GrabFood and ShopeeFood to process its online orders. Even though these platforms are convenient, they have some serious disadvantages, which is their commission fee is high, ranging between 20% and 35% per order, and this can lower the profit margins in the company (Ling et al., 2021). In addition, these third-party services restrain the chance of Ai-CHA gather transportation customer data, and develop direct relations with its customers, which is segregated to developing long-term business, its customer loyalty (Ling et al., 2021).

Although Ai-CHA has managed to satisfy customers using these platforms, the company has been experiencing a high rate of rivalry with leading food and beverage (F&B) brands such as Starbucks, Tealive and ZUS Coffee, which later adopted proprietary online ordering platform to serve their customers better. Such applications present a great variety of features, including loyalty programs, ordering in advance, integrated payment systems and custom promotions, which contribute to improving customer experience and making the relations with the brand stronger (Lakshman & Faiz, 2021). Nevertheless, Ai-CHA has not introduced its online ordering platform yet, which means that the company does not explore the possibility to directly communicate with customers and automate its business operations, not to mention stand out in the competitive business environment. Moreover, the existing manual order processing in-store works employees more, and it exposes them to more mistakes during the peak season, affecting customer satisfaction negatively (Lakshman & Faiz, 2021).

Since such obstacles are present, the offered project will establish and introduce Ai-Orders, an online ordering system that will be designed specifically for Ai-CHA Ice Cream & Tea. The Ai-Orders system will be encompassing a customer facing mobile application and Admin Dashboard that is combined with the current Point-of-Sale (POS) system that is being used by Ai-CHA. Customers will be able to view the menu, make customized orders, pay through their mobile devices and get loyalty points to make it an interesting and enjoyable flow. The Admin Dashboard will give the staff of Ai-CHA real time order management capability as they will be able to update the menu, sales data, and even order efficiently. The implemented mobile ordering system will allow Ai-CHA to enhance customer engagement and build loyalty, streamline its processes, and emerge as a sustainable and competitive firm in the fast-developing food and beverage industry (Mponela et al., 2024).

1.3 Problem Statement

A problem statement provides a brief description of the problem the project aims to solve. This project targets the following specific problems:

1.3.1 Absence of a Branded Online Ordering Web Platform

Ai-CHA currently does not offer its own official web ordering platform. For now, customers can use GrabFood and ShopeeFood to order from their favourite places. The need for new partners makes it harder for the company to maintain a branded user experience and separates the brand from its customers. Using third-party platforms means paying a commission that can be between 20% and 35% which straight away reduces the profit from each product sold (Ling et al., 2021). Also, Ai-CHA finds it difficult to modify the presentation of goods, talk about promotions or gather valuable information on orders, preferences and customer feedback. Because going digital is now crucial for food and beverage companies, Ai-CHA misses important advantages due to not supplying a direct online ordering platform. Having a bespoke app for online ordering will allows Ai-CHA to control every part of its digital ecosystem and helps build customer loyalty through the company’s regular branding (Ling et al., 2021).

1.3.2 Lack of Loyalty and Engagement Features

F&B businesses find that a loyalty program helps them keep their customers coming back. Brands like Starbucks, Tealive and ZUS Coffee have already established in-app loyalty systems that reward customers with points, vouchers, and member-only promotions (Lakshman & Faiz, 2021). On the other hand, Ai-CHA lacks a digital loyalty service which could help customers stay loyal for a long time. Because of this, businesses lose the chance to strengthen how customers feel about the brand and encourage them to come again. It was found by studies that businesses offering digital loyalty programs enjoy 25% better customer retention and customers who buy products more often (Lakshman & Faiz, 2021). Furthermore, a lack of personalized engagement such as birthday rewards, promo notifications or purchase-based suggestions can cause customers to switch to more digitally engaging alternatives. Adding these features into Ai-CHA's web application can significantly improve user satisfaction, make them value the brand and encourage them to visit repeatedly (Lakshman & Faiz, 2021).

1.3.3 Overload due to Lack of Order Automation

Without a web ordering platform to handle ordering and payment, Ai-CHA outlets must rely on traditional in-store processes that are time-consuming and prone to human error. During peak periods, staff must manually take orders, process payments, manage queues and verify customizations like sugar level and toppings. This situation makes service run more slowly and causes more mistakes in orders, mainly when several employees are busy with different tasks (Mponela et al., 2024). Wrong toppings or confusion over orders leads to unhappy customers and more wasted food. Besides, since there is no system for tracking orders at all outlets, the head office cannot easily see how things are going as soon as they happen (Mponela et al., 2024). An automated online ordering app eliminates some manual tasks and lets management know about orders, what customers like and their behaviour in real time (Mponela et al., 2024).

1.4 Project Objectives

The Ai-Order project aims to solve key challenges in Ai-CHA's current ordering process and improve both customer experience and operational efficiency. The project's specific objectives are as follows:

1.4.1 To Develop an Online Ordering Web Platform for Ai-CHA

The objective is to create a dedicated web application for ordering services with Ai-CHA trademark following the image and business model to the maximum. The web app will enable the customers to browse the menu, customize the drinks, place an order, and pay online, all within a user-friendly interface (Ling et al., 2021). Through this own platform, Ai-CHA can cut down its reliance on third-party apps and be both in complete control of customer experiences, design, promotions, and customer data. This also will ensure that the business does not incur commission fees brought about by third parties delivery platforms that are usually high (Ling et al., 2021).

1.4.2 To Increase customer retention through loyalty features.

The objective is to introduce a digital reward system into the web application enabling customers to receive loyalty points every time they make a purchase and spend them on unique offers and promotions. It will motivate customers to make a repeat purchase and generate more close emotional bonding with Ai-CHA brand (Lakshman & Faiz, 2021). This will in turn aid in customer loyalty, enhancement of the value of customer lifetime and the engagement of the Ai-CHA application as a critical consumer applications tool in the highly competitive food and beverage market (Lakshman & Faiz, 2021).

1.4.3 To Automate the Order Handling Process

The objective is to automate the web app to simplify the whole process involved in ordering, including making orders, paying and tracking the orders. The system will automate order handling, customization and payment. It will also give real time updates to the customers (Mponela et al., 2024). The orders will appear on the Admin Dashboard that is coupled with the POS system of Ai-CHA; therefore, the outlet staff will be able to handle the orders more easily. This shall eliminate human errors, reduce waiting time, and decrease the number of workloads prepared manually by the staff hence they can concentrate more on cooking food and serving their customers with excellent customer service (Mponela et al., 2024).

1.5 Scope and Target User

The following sections will detail two distinct scopes, outlining the specific objectives and deliverables associated with each element, as well as identifying the target users involved.

1.5.1 Project Scope

The Ai-Orders project is a web-based system aimed at developing a prototype that includes a web application for customers and an Admin Dashboard for Ai-CHA outlet staff and management. The web app will allow customers to browse the full menu, customize drink options, place orders, securely pay online, track the status of their orders, and participate in a loyalty program based on points. The app is designed to streamline the ordering process and enhance the likelihood of repeat purchases, offering a seamless and engaging user experience (Lakshman & Faiz, 2021).

The Admin Dashboard will enable real-time order management at all Ai-CHA's outlet in Malaysia, where staff will be able to view incoming orders, modify menu items (such as prices and availability), and track daily sales data. The dashboard will integrate with Ai-CHA's current Point-of-Sale (POS) system, ensuring that there is no disruption in both in-store and takeaway orders. This integration allows for the efficient entry of orders, reducing the need for manual data entry, minimizing errors, and improving overall operational efficiency (Mponela et al., 2024).

The project aims to deliver a working prototype to demonstrate how the system can improve operational efficiency, streamline order management, and enhance customer experience. This prototype will undergo testing to assess performance, usability, and its alignment with Ai-CHA's business requirements. Future potential additions to the system include handling online delivery orders and further expanding the functionality of the loyalty program (Lakshman & Faiz, 2021). Additionally, the system will incorporate security features, including secure payment processing, data encryption, and user authentication, ensuring the safety and confidentiality of customer information and transactions (Mponela et al., 2024).

1.5.2 Product Scope

The Ai-Orders system is geared toward the enhancement of customer interaction, operational efficiency, and automation of the ordering process to Ai-CHA Ice Cream & Tea. The main components of this system will be the following ones:

- **Web Ordering Platform**:
  - The web app will enable customers to make, pay and customize orders. It gives the options to users to order the drinks per menu, add sugar and ice contents, add toppings, and pay with different methods such as cash and e-wallet.
  - The customers will also be able to monitor the status of the order and accumulate loyalty points (Lakshman & Faiz, 2021).
- **Admin Dashboard:**
  - The dashboard will enable Ai-CHA staff control incoming orders, change menu items and monitor sales.
  - This will help the personnel to process orders more efficiently because the orders will be updated at real-time and eliminate human error (Mponela et al., 2024).

1.5.3 Target Users

- **Ai-CHA Customers**
  - The most frequent users of web apps are the customers.
  - The app will enable them to view the menu, create a drink according to their specifications such as ice level, setting the amount of sugar and toppings, order online to pick up or take away, make payments using several options without any cash, and get loyalty points on every purchase.
  - The application will deliver easy and interactive ordering issues which will motivate customers to stick with the company.

- **Ai-CHA Outlet Staff**
  - Admin Dashboard will be used by staff in the outlets to oversee the daily activities of order handling.
  - This dashboard will show real-time information on incoming customer orders, and the staff will be able to prepare orders more efficiently and there will be a decrease in service time.
  - Menu items, like prices, availability and promotional offers will also be updated by staff through the dashboard interface.
  - To integrate with the POS system will mean that the process of order will be the same across the efforts of sales.

- **Ai-CHA Management**
    - The reporting and analytics functions in Admin Dashboard will help our management track the performance of sales, the trends that customers place orders and the data on loyalty programs.
    - This knowledge will facilitate the use of statistics to make decisions that would be used in marketing campaigns, menu change, and general business strategy.
    - The system will offer useful management information to increase customer interaction and business operations to the highest level.

1.6 Overview of This Report

This report explains how the Ai-Orders system is developed fully and how it supports the main issues that Ai-CHA has during its present ordering and operation processes. The report has been presented in the following chapters:

1.6.1 Chapter 1: Introduction

In this chapter, a description of the project is given through background, problem statement, project objectives, scope, and target users. The reason behind introducing mobile ordering app is the necessity to promote the further development of the Ai-CHA business and customer experience by using the opportunities of a loyalty program and POS integration.

1.6.2 Chapter 2: Literature Review

This chapter outlines the trends and best practice related to web ordering applications, implementation of loyalty programs and POS System integration within the food and beverage (F&B) sector. It equally looks at the available solutions that are applied by major players including Tealive and Starbucks. Such review finds the gaps and opportunities that Ai-Orders intends to fill in to give Ai-CHA a competitive edge.

1.6.3 Chapter 3: Methodology

In this chapter, the author reveals the methodology of the Ai-Orders system planning and development. It outlines the various staging of the Waterfall development model which entails requirements gathering, system design, implementation, testing and deployment. The chapter also supports the valid reason as to why it is that the Waterfall model is applicable to this project at hand.

1.6.4 Chapter 4: Requirements

This chapter presents the functional requirements and the non-functional systems of the system. It also identifies the hardware and software requirements required to make systems development and deployment. The chapter shall also explain some important security considerations such as compliance with the Personal Data Protection Act 2010 (Act 709) to protect the user data.

1.6.5 Chapter 5: Analysis

The data presented in this questionnaire that was given to the users is analyzed in this chapter and it can provide some information on what the customers expect and confirm the necessity of having certain features in the system. The analysis assists in creating the mobile application and Admin Dashboard with the matching of needs and requirements of users and a business.

1.6.6 Chapter 6: Design

Perspective design of the proposed system, overall systems, architecture, use case diagrams, flow diagrams, user interface (UI) design of the web app and Admin Dashboard, and database structure is provided in this chapter. The design makes all the system components compatible.

1.6.7 Chapter 7: Implementation

The implementation aspects of the system components are found in this chapter. It involves the development of the customer web app, the creation of the Admin Dashboard and adding it to the existing POS system of Ai-CHA. There are screenshots and code samples to show main implementation steps.

1.6.8 Chapter 8: Testing

In this chapter, the plan of tests to prove the performance of the system and its quality is described. It discusses the effectiveness of unit testing, integration testing and user acceptance testing (UAT) so that each package of the system is tested to perform according to its expectation.

1.6.9 Chapter 9: Project Management

This chapter explains development activities of project management undertaken. It incorporates scheduling of the project, allocation of resources, risk analysis and project tracking. Major tools which are applied in the monitoring of project milestones and ensuring that a project is completed on time include Work Breakdown Structure (WBS) and Gantt Chart.

1.6.10 Chapter 10: Conclusion

In this chapter, the results of the project are summarized and the problem considered whether the stated project goals were achieved or not. It also mentions the difficulties encountered in the process of the project and some areas of improvement which can be done in the future along with the potential extensions of the project like integrating delivery modules or using advanced analytics.

2 LITERATURE REVIEW

2.1 Introduction

This chapter entails the review of relevant studies, technologies, and systems of online ordering, loyalty programs as well as the integration of POS systems in the food and beverage (F&B) industry. It also focuses on the application of web app development as a customer engagement and efficiency tool to reveal its application in renowned and reputable F&B brands including Starbucks, Tealive and ZUS Coffee. The section analyses the advantages and weaknesses of these available technologies and their contribution to the development of Ai-Orders system as well as a source of impulse. This review will describe the gap in existing solutions through which Ai-Orders intends to solve the identified needs of Ai-CHA Ice Cream & Tea in such a way that it enhances customer experience, operations, and loyalty accumulation (Leung et al., 2022; Tiwari & Bansal, 2021).

2.2 Investigation

Investigation is important to the success of any project because it gives them the needed insights as well as understanding the problem involved. In the case of this project, several investigations were used to evaluate the current position of the online ordering process of Ai-CHA, as well as the areas where the company faced difficulty in their current systems. It is important to understand the shortcomings and counter productiveness of the existing ways to create a proper solution that would meet the requirements of the business and the customers (Tiwari & Bansal, 2021). Investigation enables us to examine the points at which the current systems are weak including, interaction with customers, order accuracy, minimal interconnection between internet and store-based activities (Khan & Sulaiman, 2023).

The investigation phase helps to ensure that all relevant data and stakeholder feedback are considered in the design and development of the solution. This involves the analysis of the business processes, understanding customers' pain points, and the trend in the industry (Leung et al., 2022). Through research on the established solutions by other successful brands, including Starbucks, Tealive, and ZUS Coffee, the study forms the basis on which Ai-Orders will be built. It will also bring into the fore technical capabilities and innovations that can be borrowed from such systems which include mobile ordering, real time tracking and POS integration whose implementation is crucial to achieving objectives of efficient operations and improved customer satisfaction and customer loyalty (Farris et al., 2022).

2.2.1 About Ai-CHA

Figure 2.2.1 a : Ai-CHA Logo (Ai-CHA, 2024)

Figure 2.2.1 (a) above shows the Ai-CHA Logo, which represents the brand's identity. The logo is a key part of the marketing of Ai-CHA and strengthens the image of the brand in the market. The Ai-CHA logo is actually a visual reminder of how the company is committed towards quality products and satisfaction to its customers (Ai-CHA, 2024).

Ai-CHA Ice Cream & Tea is one of the most successful dessert and beverage-based companies in Malaysia, which also proposes a variety of customized drinks, ice creams, and snacks (Ai-CHA, 2024). Reputably in terms of the quality of its products and the use of fresh ingredients, Ai-CHA company formed a large customer base due to its dedication to customer service and pleasurable experience of using a product (Lee, 2025). The brand deals in milk teas, fruit teas, smoothies and gourmet ice creams, all of which are customized according to the different customer desires (Lee, 2025).

There are several outlets of Ai-CHA in Malaysia, and every branch has its team of trained baristas and support employees who are skilled to brew the drink fast (Ai-CHA, 2024). Nevertheless, the manual order system at its peak may cause a lot of delays and errors when it comes to customer order fulfillment. Ai-CHA will achieve operational efficiency by execution of the Ai-Orders web app that will simplify the process of ordering, minimize the issue of human error and provide its customers with an easier-going experience.

The Ai-Orders web app will enable the customers to view the entire menu, customize their orders, pay online safely and check the status of their order at any time. Further, the app would also make use of the Point-of-Sale (POS) system of Ai-CHA, which means that anyone could update on the real-time sales, availability of inventory, easily process the orders and thus the order would be perfect. Ai-CHA intends to boost repeat business and general customer satisfaction, with the provision of an added benefit of a loyalty program (Lee, 2025).

2.2.2 Online Ordering System

To create an online ordering system of Ai-CHA, various kinds of mobile ordering systems and technology behind them necessarily need to be understood. Online ordering systems may, in general be classified into one of three categories which are Fixed-Flow, Actuated and Adaptive systems (Mponela et al., 2024), as is indicated below:

- **Fixed-Flow Online Ordering Systems**

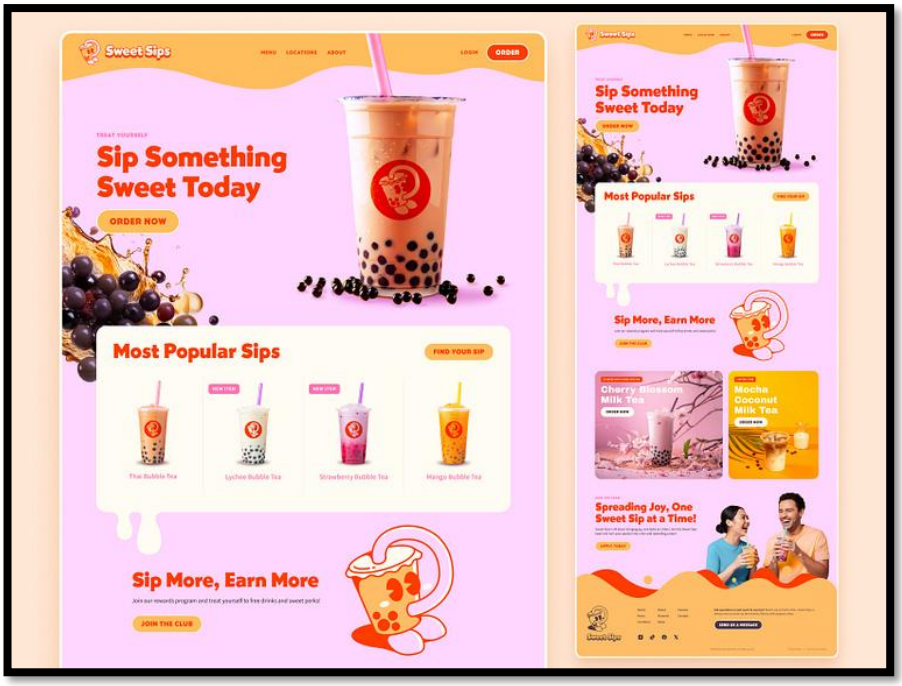


Figure 2.2.2 a : Basic Online Ordering Systems (Dribbble, n.d.)

Figure 2.2.2 (a) above shows an example of basic online ordering system. Fixed-flow systems such as the basic online ordering infrastructure have a predetermined process in which the menu is not dynamic and changes according to customer activity or order load. As an example, customers can only order through a fixed menu with limited customizability and without checking on the availability of the possible stock (Apptunix, 2023). Even though they are easy to adapt to and affordable, these systems are not flexible, especially in active environments where the needs of customers change frequently (Mponela et al., 2024). When such systems experience peak time, delays may occur because of not being able to keep with higher orders volumes, and when off-peak, customers may have to limit themselves to only some menu. Fixed-flow systems may find it difficult to accommodate the various needs of contemporary customers, hence curtailing on their experience in general (Mponela et al., 2024).

- **Actuated Online Ordering Systems**

Figure 2.2.2 b: Self-service kiosks (NCR, n.d.).

Figure 2.2.2 (b) above shows an example of self-service kiosks. Actuated systems, like self-service kiosks, allow real-time decision-making based on user actions. In an online ordering system, this implies the ability of the clients to be able to make dynamic decisions about their beverage, by altering the proportion of sugar, ice or adding other toppings, and the system automatically plays out (Mponela et al., 2024). In contrast with the fixed-flow systems, the actuated renders more individualized interaction, responding to the tastes of the customers and functions as a flexible system, where the orders are processed quite effectively (Apptunix, 2023). Ai-Orders will integrate this system where customers will be able to customize their orders at the same time order processing is made smooth (Mponela et al., 2024),

Although actuated systems are flexible compared to the fixed-flow systems, they are complex to integrate. To work efficiently, they need extra functionality such as real-time monitoring of the orders and live updating of the menu (Mponela et al., 2024). Such systems put a single customer input on emphasis but are narrow in the sense that they only customize interactions. An example can be given of busy times when the system cannot prioritize the orders because of waiting time or demand because it does not consider the overall requirements of the restaurants (Mponela et al., 2024).

- **Adaptive Online Ordering Systems**

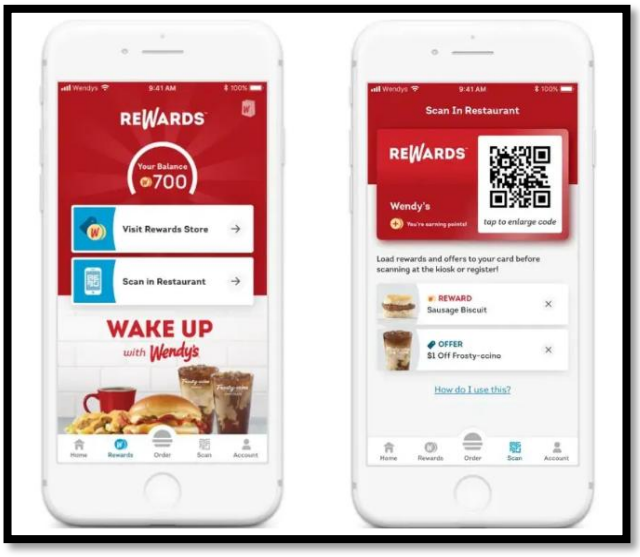


Figure 2.2.2 c: AI-driven online ordering platforms (Tada, 2023).

Figure 2.2.2 (c) above shows an example of AI-driven online ordering platform. The most sophisticated online ordering solutions are what is referred to as adaptive systems; these solutions will automatically adapt the ordering process depending on real time data, and that includes volume of orders, demand by the users, availability of capacity at a store as well as stocks. In the case of Ai-Orders, the systems will operate based on user interactions, stores traffic patterns and inventory systems to optimize the menu and prioritize orders. As an example, when there is not much of a certain beverage, the app will switch to a different menu or present substitutes to the customers. The system will also be able to hold up new orders at peak hours to foster the unloading of workloads and making the services prompt. (Mponela et al., 2024).

Based on the three online ordering systems above, the adaptive system is very much beneficial than the fixed and the actuated systems since the ordering process is optimized within the Ai-CHA outlets and various sites. Such systems scavenge on data such as customer choices and inventory levels in a constant manner to alter the streamlining of orders and the forecast of peaks. With the combination of machine learning, Ai-Orders will offer dynamic pricing, current inventory, and recommendation system. This style will increase interactions with the customer and make the business more efficient in operation such that the customer demands can comfortably be delivered and reduce the business processes (Apptunix, 2023).

2.2.3 Loyalty Programs in Mobile Apps

Figure 2.2.3 (a) below shows some examples of loyalty programs in mobile apps. Loyalty program is an effective tool employed by most business owners particularly those in the food and beverage industry to attract customers towards repeat purchase and foster long-term customer relationship. However, in the case of mobile apps, loyalty programs imply a process where rewards are earned by customers who make purchases in the app directly. Such prizes are usually presented as points, discounts, or even special offers, and they could be used in exchange to receive free goods or special offers (Adjust, 2023). With such incentives, companies such as Ai-CHA will be able to encourage customers to come back and connect more often to the company.

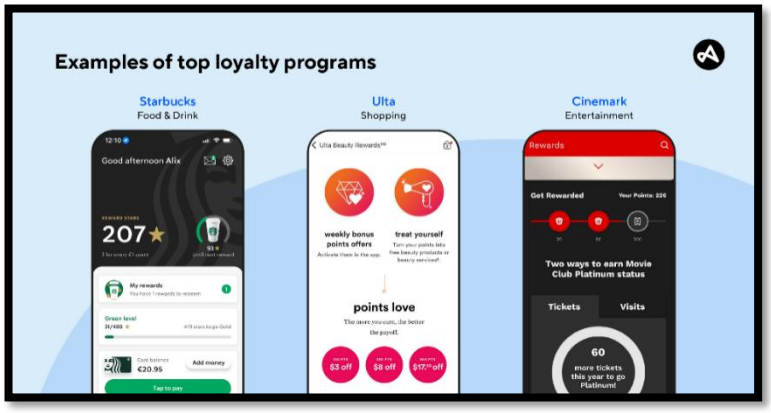


Figure 2.2.3 a: Loyalty Programs in Mobile Apps (Adjust, 2023).

- **Encourage Customer Retention**

  The mobile loyalty programs will enable the organization to monitor the customer behavior and build special deals which will ensure that there is a very strong bond between the customer and the brand. Researchers have found that electronic loyalty programs may increase the retention rate among customers by 25 percent and promote regular buying (Lakshman & Faiz, 2021). Using the Ai-Orders app, customers will receive some loyalty points upon purchase which they will redeem later to get goods as rewards. The rewards may be in the form of a discount on their next purchase, free items, and therefore boost the level of engagement of the app and the subsequent business.

- **Customer Data and Personalized Offers**

  Besides the resultant effect of customer loyalty programs in promoting the retention of customers, Loyalty programs also offer business good customer data. To take an example, Ai-CHA will be able to monitor customer preferences, the amount of purchases, and the popularity of products. They can use this information to deliver customized offers or any new food that the customer has shown interest in previously. Incorporation of loyalty program into Ai-Orders app will enable Ai-CHA to increase customer satisfaction, and stand out of the competition, which will eventually make the company sell extensive quantities and customer lifetime value (Adjust, 2023).

2.2.4 POS System Integration

Another actionable characteristic of new ordering systems in the mobile environment is the Point-of-Sale (POS) system connection. Figure 2.2.4 (a) below shows an example for POS System Integration. The integration of online ordering app and the already existing POS system in the store can streamline the flow of data between the orders given by customers and the backend processes of the business. Such integration enables the synchronization of orders, payments and inventory management in real time, thereby increasing efficiency, eliminating the human factor, and upgrading the experience of the potential consumers (Trevipay, 2023).

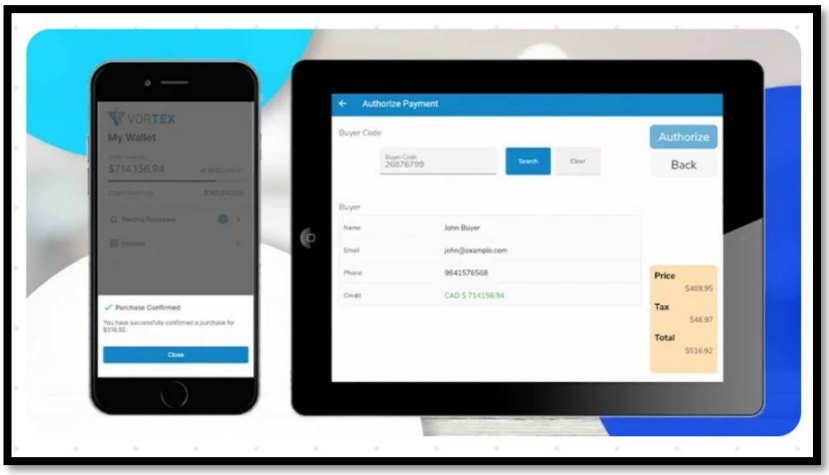


Figure 2.2.4 a : POS System Integration (Trevipay, 2023).

- **Streamline Order Process**

  In the case of Ai-Orders, the integration of POS system will enable the fact that the orders which are made via the web app will be recorded in seconds into the POS system of the store. This will automate the order and simplify the payments processing, keep the inventory in real-time and synchronize the data of the sales with all sales channels (Farris et al., 2022). With the integration, manual input of order data will not be required, and this will help minimize errors like wrong processing of order and order mismatches.

- **Real-Time Data and Insights**

  The fact that the web app will be synced with the POS system in real-time will also give Ai-CHA important information regarding customer behavior and the trends in sales. To give an example, popular products can be followed, the average costs spent by each customer, and general sales. The data can be utilized to better the menu offerings, prices and advertising. Also, the integration with POS system will assist Ai-CHA to monitor the range of stock in hand, the menu will be updated automatically either when the products are sold off or replenished, and this will further safe-guard the efficiency in its operations (Lakshman & Faiz, 2021).

- **Operational Efficiency**

  The business of Ai-CHA relies heavily on POS integration since a customer might want to buy the product on different platforms, whether on mobile applications, inside the store, or by using third-party apps. Having one central place in which all the information will flow gives you more control over inventory, pricing, and customer information and will enable smoother running of the operation and less possibility of items being miscommunicated on different channels (Lakshman & Faiz, 2021).

2.3 Related Existing Project

This section undergoes the review of the current mobile ordering application of the most popular brands Starbucks, Tealive, and ZUS Coffee to collect experience that can be used to implement the Ai-Orders project. These case studies suggest that loyalty programs, real-time analysis of the information, and integration of the POS systems may help improve the process of online ordering and relationship to the customers (Tiwari & Bansal, 2021). Understanding the strengths and weaknesses of these systems will help in designing Ai-Orders according to the needs of Ai-CHA.

2.3.1 Starbucks Mobile Apps

In 2011, Starbucks introduced a mobile application to make customers more convenient by simplifying the ordering process, shortening queues and providing mobile payments and reward system. This was done to boost the retention of customers and enable Starbucks to keep up with the rising food and beverage industry (Tiwari & Bansal, 2021; Leung, Liang, & Ng, 2022). The application enables clients to place orders, customize their beverage and make their payments safely and earn rewards including loyalty points via Starbucks Rewards. It is also integrated with the POS system, which makes order processing happen in real time and track inventory correctly, as well as aiding Starbucks in gaining essential customer data that could be used to create personalized experiences and increase loyalty (Tiwari & Bansal, 2021; Leung, Liang, & Ng, 2022).

Figure 2.3.1 a: Starbucks Malaysia Mobile Apps Logo (Starbucks, 2024)

Figure 2.3.1 (a) above shows the logo of Starbucks Malaysia Mobile Apps. It is a simple green and white design with the emphasis on the famous siren to ensure the notion of brand identity, lack of complexity, and class. This simple and familiar visual design helps improve the visibility of mobile apps and brand recognition (Starbucks, 2024). In the case of the Ai-Orders logo, this design will be one of the references under which an embodiment of simple, modern, and easily recognizable app icon reflects the corporate identity of Ai-CHA and attracts digital-savvy users.

➢ **Starbuck's Home Page Analysis**

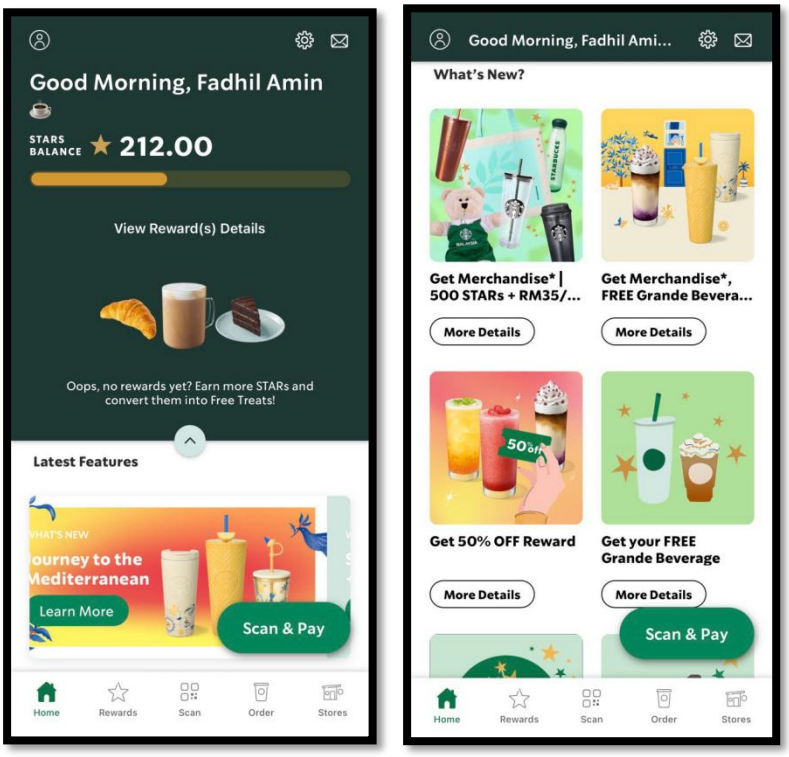


Figure 2.3.1 b: Starbucks Home Page (Starbucks, 2024)

Figure 2.3.1(b) above shows the main interface of the Starbucks app, which makes use of customer engagement by putting the number of "Stars" that a customer has into the screen. This is one of the loyalty programs whereby the customer is rewarded after making certain purchases with gifts such as free drinks and other discounts. The massive show of the Star balance encourages customers to buy further since it generates a feeling of success (Tiwari & Bansal, 2021). The ability to monitor the route toward the rewards makes a user feel appreciated and makes them feel more attached to the brand (Leung et al., 2022). Nevertheless, the app might not be appealing to the customers in some cases who do not collect Stars. The reward or discounts after the first few days might enhance user engagement and a rise in new users (Leung et al., 2022).

The second image of Figure 2.3.1(b) above shows the promotional section of the Starbucks app, where time-bound options are associated with the system of rewards. This method encourages interaction through granting special incentives such as a discounted rate or an item, which makes it based on time and needs to keep visiting. Special promotions such as "Get Merchandise* | 500 STARS + RM35" prompt consumers to buy more to redeem potential rewards they may use. Although this strategy uses psychological prompts such as scarcity and exclusivity, it may play out and burn the user by putting them under pressure to get rewards too often. One of the possible ways to stay engaged is through implementing tiered reward systems or providing customers with personalized offers depending on their interests (Tiwari & Bansal, 2021).

- **Starbuck's Reward Page Analysis**

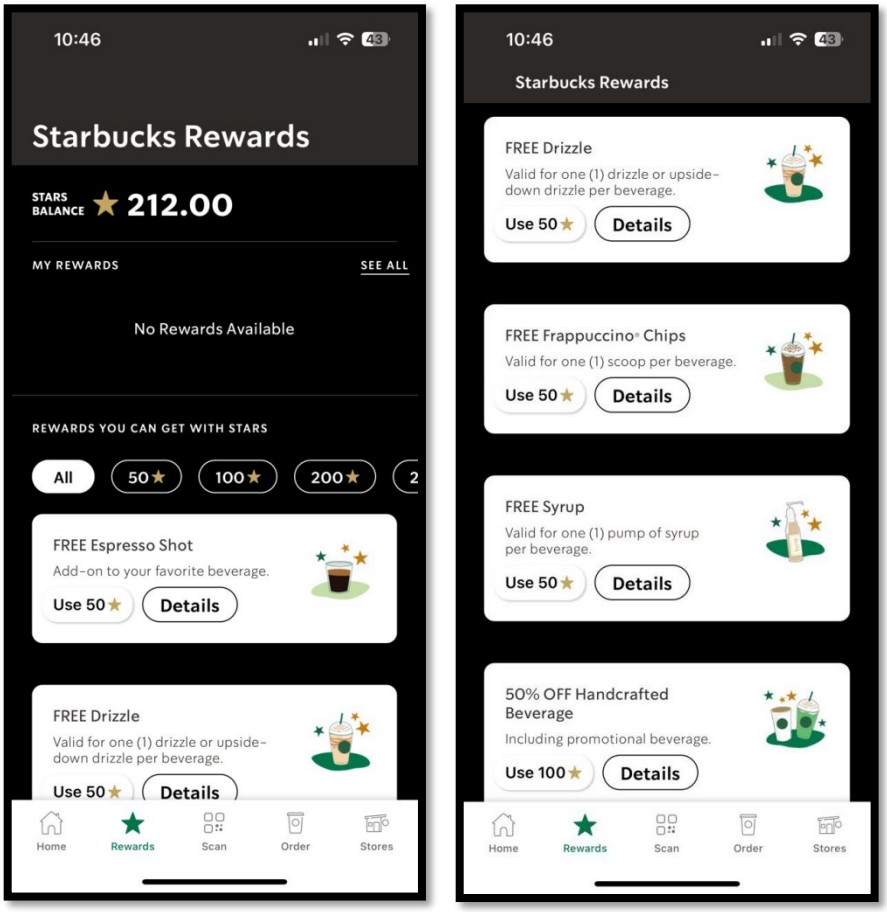


Figure 2.3.1 c: Starbucks Reward Page (Starbucks, 2024)

Figure 2.3.1(c) above shows the Reward Section of the Starbucks app in which the Stars Balance is displayed on the top of the screen. This loyalty program makes the customer accumulate Stars after every purchase to have an incentive to come back. Starbucks appeals to the customers in the form of a measuring project by experiencing exclusivity and a sense of accomplishment and gives a reward to the customer in the form of a tangible object (Starbucks, 2024). The visible Stars balance keeps the users constantly reminded that they are building the rewards, improving long-term customer loyalty levels (Tiwari & Bansal, 2021).

The second image of Figure 2.3.1(c) above shows how customers can get their rewards as calculated by their Stars earned. The app provides benefits such as free beverages and customizations, and coupons, where the user can receive minor rewards in the early stages of use (free drizzle after 50 Stars) and great rewards after some time (free drinks after 200 Stars) (Starbucks, 2024). This step system has aided in ensuring that customers do not get bored since they have a source of quick wins. Nevertheless, it can also lose interest to new users because they have no Stars at all. Starbucks might also provide some rewards or discounts so that first time users might get attracted by using it (Tiwari & Bansal, 2021).

- **Starbuck's Scan Page Analysis**

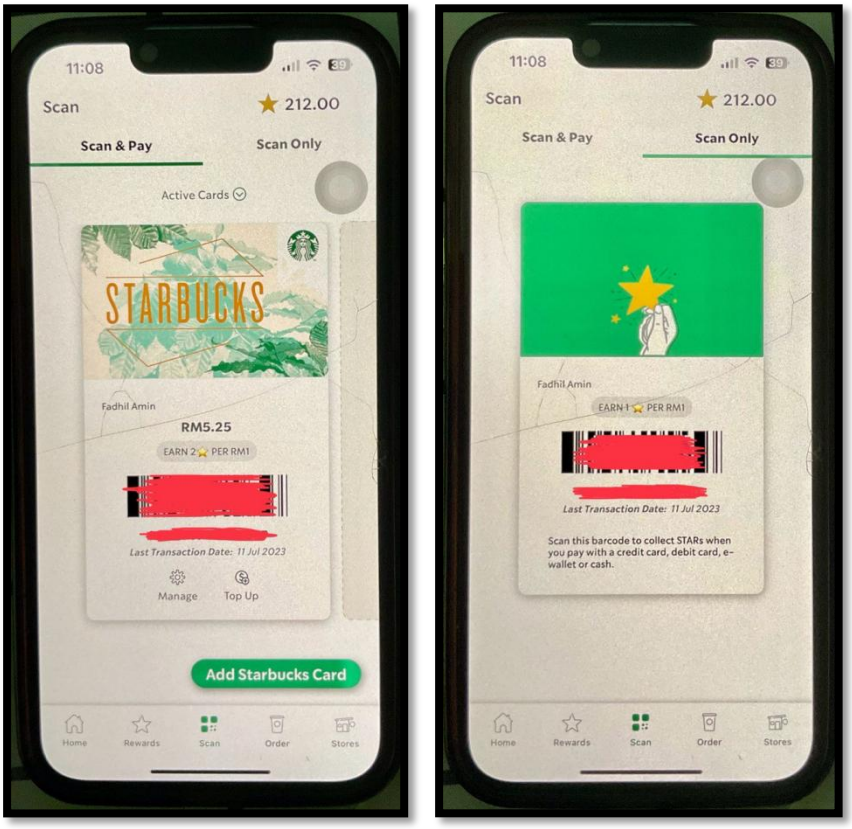


Figure 2.3.1 d: Starbucks Scan Page (Starbucks, 2024)

Figure 2.3.1(d) above shows the "Scan & Pay" page from the Starbucks app, that contains the active Starbucks card of the user. This functionality enables payment without any delay by scanning a barcode or any digital card, which makes the transaction process easy. The loyalty and balance in these offers are updated instantly upon a purchase thus it becomes convenient for the customer to make and redeem the rewards, like Stars, as the part of the Starbucks Rewarding program. The given opportunity contributes to the greater convenience, involvement, and satisfaction of the customers (Starbucks, 2024; Tiwari & Bansal, 2021).

The second image of Figure 2.3.1(d) displays the "Scan Only" feature, where one can earn Stars by purchasing through using different modes of payment such as credit card, debit card, e-wallet and even cash. This promotes high traffic in the business and the use of the app, because when customers scan the barcode, they are assured of a reward after making a purchase. Providing inclusive payment opportunities based on the loyalty system, Starbucks encourages the use of its app and customer loyalty, which in the end promotes increased sales (Starbucks, 2024; Tiwari & Bansal, 2021).

- **Starbuck's Order Page Analysis**

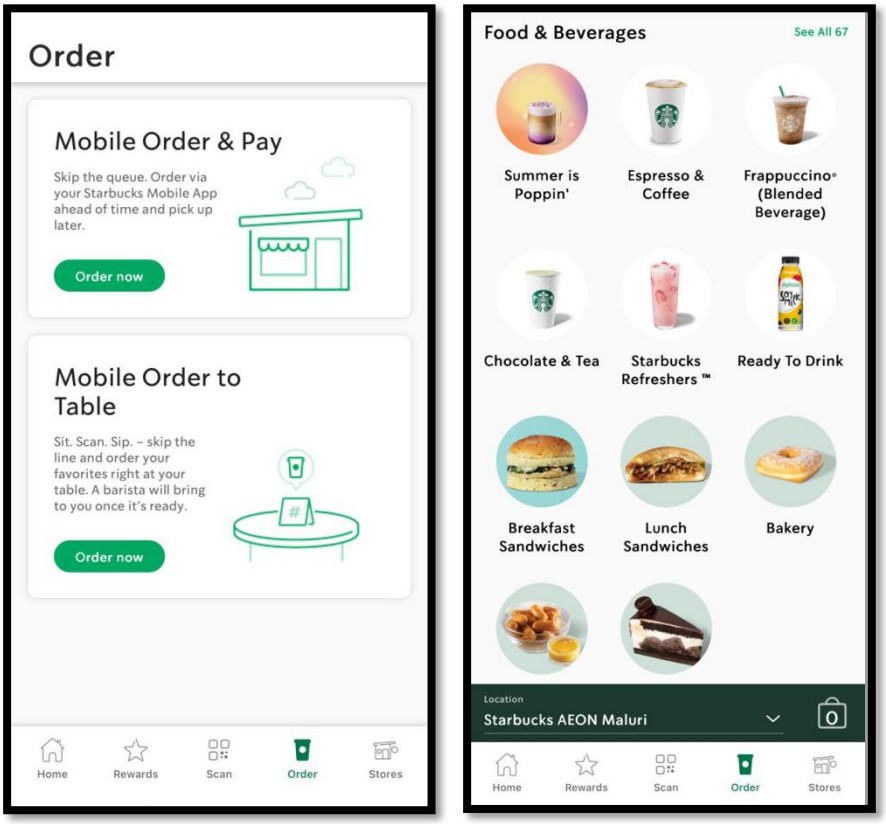


Figure 2.3.1 e: Starbucks Order Page (Starbucks, 2024)

Figure 2.3.1 (e) above is the order page of Starbucks mobile app and has two useful options for the customers. The feature of the mobile order and pay enables its users to order and pay in advance skipping the queue, coming to the establishment and receiving their drinks at their own time. The system is also joined with the POS system, providing precise and immediate order processing, still, it can require optimization to manage rushes (Starbucks, 2024). The second alternative, the so-called Mobile Order to Table, allows customers to order something from a table and a barista will bring a drink when it is ready. This aspect can improve the on-site experience, but its outcomes can be different due to store design and workforce availability (Tiwari & Bansal, 2021; Leung et al., 2022).

The second image on Figure 2.3.1(e) depicts the food and beverages section of the app, where the customers have effortless access to the categories regarding both drinks and foods, like "Summer is Poppin'" and "Frappuccino (Blended Beverage)." The design is user-friendly and arranged by categories where one can easily go through the menu and the images of the products help in captivating the user to explore the various products/options (Starbucks, 2024). Although the visual outlook of the user experience is promising, the app may be further enhanced with such features as filters based on dietary preferences or even by machine learning and allowing the app to become more streamlined to a specific customer (Tiwari & Bansal, 2021; Leung et al., 2022).

- **Starbuck's Stores Page Analysis**

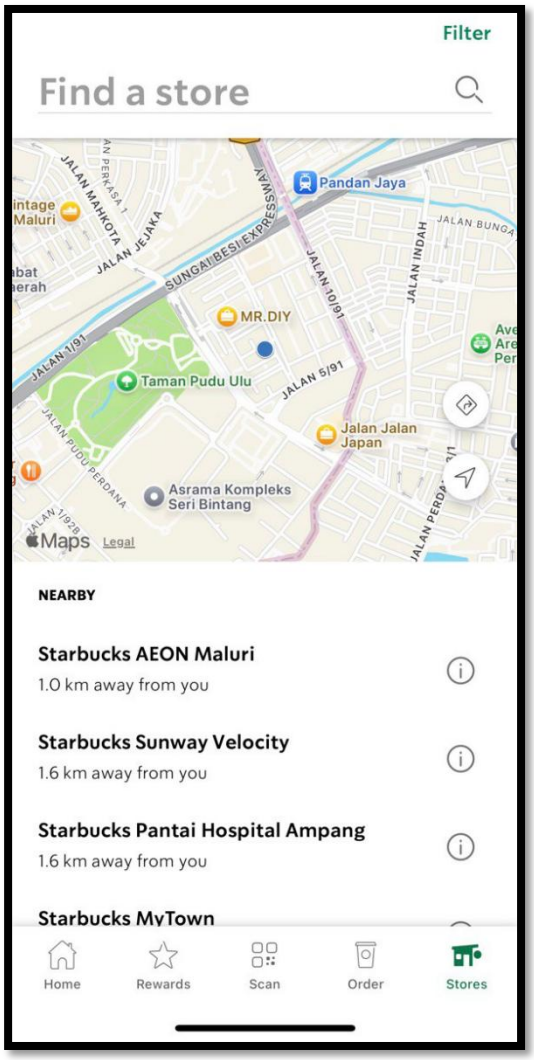


Figure 2.3.1 f: Starbucks Store Page (Starbucks, 2024)

Figure 2.3.1(f) above shows the presence of the Stores page in the Starbucks app, which gives users the opportunity to find out the location of the nearest Starbucks branch depending on their current location area. The app offers an interactable map and a list of the stores, containing information such as distance and the name of the stores (Starbucks, 2024). The latter increases the convenience of customers because the user can find Starbucks store easily and get directions to the physical store easily to drive foot traffic to the store. The feature is basic and easy to use, but may be enhanced with filters, like store amenities (such as Wi-Fi, or drive-thru). Overall, this aspect boosts the store visits, which may grow the in-store-sales and brand adherence (Tiwari & Bansal, 2021).

- **Starbuck's Point-of-Sale (POS) System Analysis**

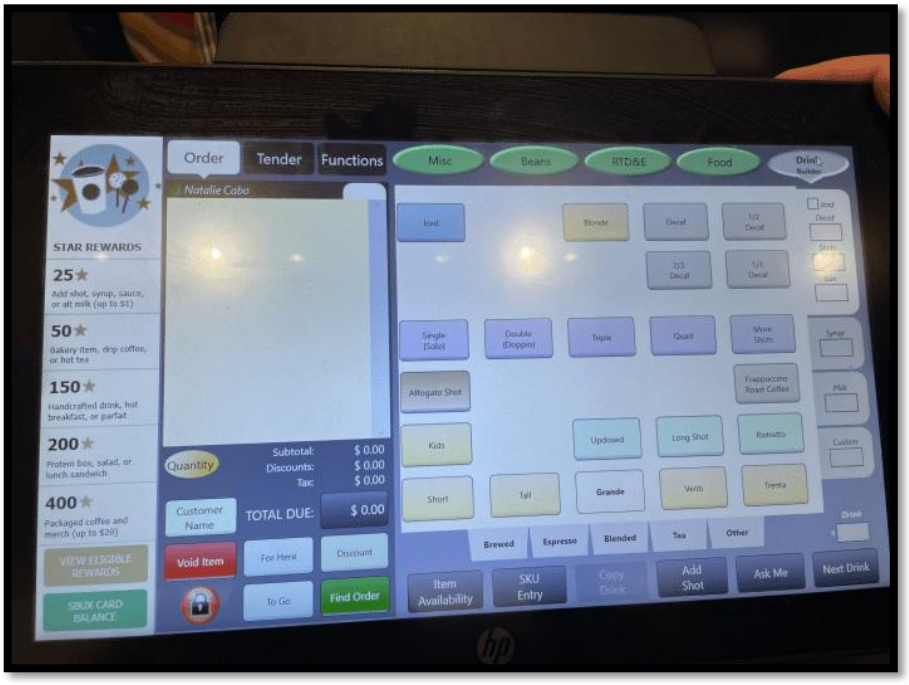


Figure 2.3.1 g: Starbucks POS System (Dayak Daily, 2023).

Figure 2.3.1(g) shows the Starbucks Point-of-Sale (POS) system interface, which is directly linked to the Starbucks Mobile App. The POS system plays a vital role in the simplification of the ordering and payment procedure of in-store and mobile app purchases (Dayak Daily, 2023). This will save time as all the orders done through the mobile app will be automatically synchronized with the backend shop and even employees will be able to see the orders or the customer as soon as the order is segregated through the mobile app (Dayak Daily, 2023). It also makes the reward points of the customer instantly available so that baristas can redeem rewards, offers and discounts on the spot. In addition, it will enable the staff to monitor the loyalty of the customer to automatically give him or her special benefits or discounts whenever customers are using the app to make their purchases (Dayak Daily, 2023).

With the help of this POS system, Starbucks can increase efficiency in managing a great number of orders and especially the peak time, in addition to improving the customer experience of smooth transactions. Inventory is also managed with the help of the app and POS system integration since it functions in real-time and it is not possible to sell the products that are out of stock, so the reflection of the menu items is proper (Starbucks, 2024). Also, the order personalization options offered by the POS system make the customers personalize their drinks the same way they can in the store, guaranteeing similar and individual experience wherever they may be shopping (Tiwari & Bansal, 2021).

The general setup of the Starbucks POS system contributes greatly to the sustainability of operation efficiency in the company, the accuracy of the orders being made and the satisfaction of the customers due to the streamlined operations performed with automation (Tiwari & Bansal, 2021).

- **Advantage and Disadvantage**

Starbucks Mobile App is an excellent way to demonstrate that customization and loyalty programs can considerably improve the involvement of customers and brand loyalty (Starbucks, 2024). The success of the app in promoting repeat purchases since its features allow individual customization of the drinks requested by the customers, earning them Stars and the complementary use of the POS to process orders quickly has enhanced customer retention. According to Leung et al. (2022), such characteristics can contribute to the development of brand loyalty due to the provision of a more personalized experience to a user. Another thing is that Starbucks rewards customers in exchange if they have free drink or a discount and established a high reward to use the app again.

Nevertheless, the strategy of the app also has its weaknesses. The major con is that it is not versatile because the application is specifically aimed at the Starbucks menu and brand image. It makes it difficult to implement in other businesses in the food and beverage sector and this hampers the ease of embracing or modifying the system to fit other brands (Tiwari & Bansal, 2021). Furthermore, though the app possesses a comprehensive loyalty program, it does not contain comprehensive analytics and recommendations through higher levels compared to the rewards. This implies that it fails to maximize customer data to provide further interaction or better tailored offers, which would enhance customer satisfaction and business productivity. These weaknesses indicate that even higher-level data analytics could provide finer granularity to overall customer experience by being even more personalized (Tiwari & Bansal, 2021).

2.3.2 Tealive Mobile Apps

Tealive is one of the renowned brands that deal with bubble tea in Malaysia, and among its apps, the mobile application was designed to improve the customer experience and make operations easier in a digital era. The app was released to enable an improved order procedure where customers can make orders and pay them beforehand so that they do not have to join the waiting lines in the shop. Tealive has appreciated the power of digital platforms in terms of enhanced customer interaction and optical performance of its operations, and the brand maintains its position in the expanding food and beverage market (Tealive, 2024).

The Tealive Mobile App enables customers to design their beverage and order beforehand as well as be part of the Tealive Rewards Program which motivates them to visit the outlet regularly with points and rewards. The application is also connected to Tealive POS system that makes an order, monitors worldwide stock and takes care of customer loyalty points in real-time, is correct in handling the order. Such integration also gives insights into the customer preferences and buying behavior, with the help of which Tealive can create custom shopping experiences and enhance its products (Tan, 2022; Tealive, 2024).

Figure 2.3.2 a : Tealive Malaysia Mobile Apps Logo (Tealive, 2024)

Figure 2.3.2 (a) above shows the logo of Tealive Malaysia Mobile Apps. It has a bright purple theme, childish fonts, and an adorable mascot, which makes its brand very attractive and youthful. Such characters and colors used will attract a younger audience and strengthen brand personality (Tealive, 2024). The above logo may also serve as the reference to create an Ai-Orders logo as it provides the appeal to create a fun and approachable design, which would be emotionally appealing to the users and oriented to the brand values of Ai-CHA.

➢ **Tealive's Home Page Analysis**

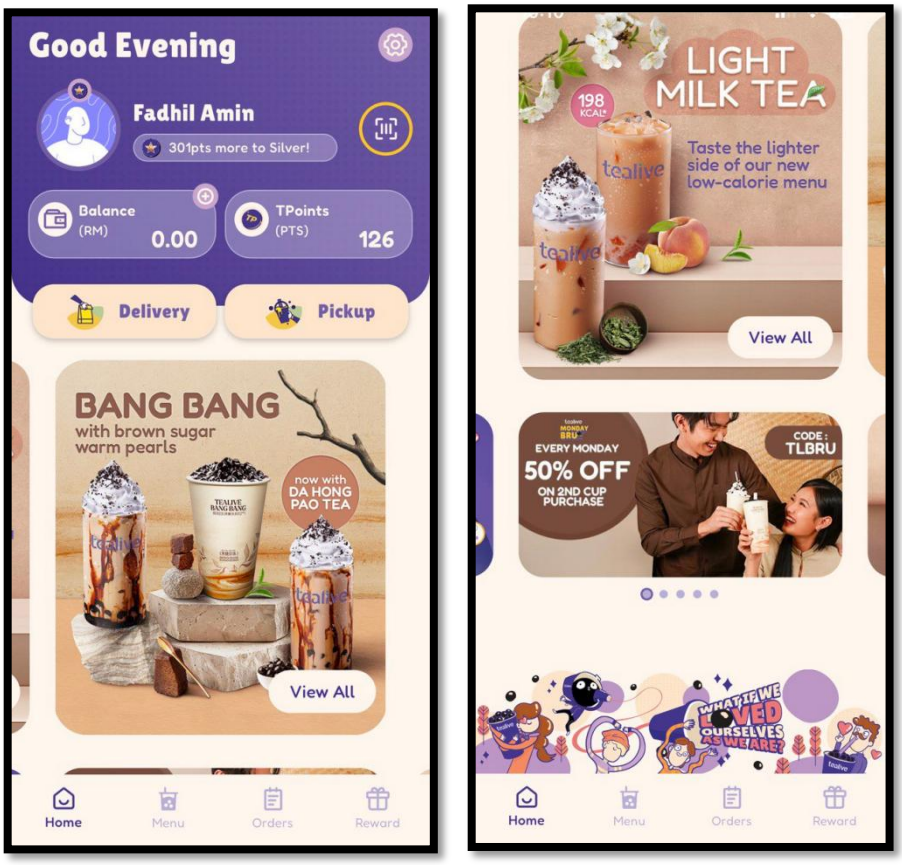


Figure 2.3.2 b: Tealive Home Page (Tealive, 2024)

Figure 2.3.2 (b) presents the homepage of the Tealive mobile app, showing the main characteristics of user engagement and loyalty to the mobile application. As an aspect of the Tealive Rewards Program, the balance of the user has his or her "TPoints", which encourage further purchases as the user strives to achieve the next level of reward. Also, the app includes suggestions of promotional ads, like the new beverage product "BANG BANG" with brown sugar warm pearls that intends to increase the sale of time-limited products. This conjunction between the tracking rewards and the products promoted makes the system much more involving to the end user and to promote new users to the market Tealive might consider offering newcomers rewards such as welcome bonuses or discounts. The application might also be a good idea to provide it with personal recommendations, where user experience would be improved with suggested special offers following previous purchases (Tealive, 2024; Tan, 2022).

The second image of Figure 2.3.2 (b) presents the Food and Beverages section of the app in which beverages are grouped in manageable categories like Light Milk Tea and offers on next purchases like "50% Off" on next purchase of a beverage. The design is such that people get to oversee many possibilities of the offerings and the experience could be smooth and beautiful to the eye. Images are of quality, and they help to improve the appearance of

an app and market products discreetly. Limited offers such as coupons or price reductions make people use the application more often as they stimulate a sense of an emergency. Nevertheless, the application may also be enhanced by the presence of sophisticated personalization tools, including suggestions based on the individual preferences of the user or his previous purchases, to increase customer interest and satisfaction (Tiwari & Bansal, 2021).

- **Tealive's Order Option Page Analysis**

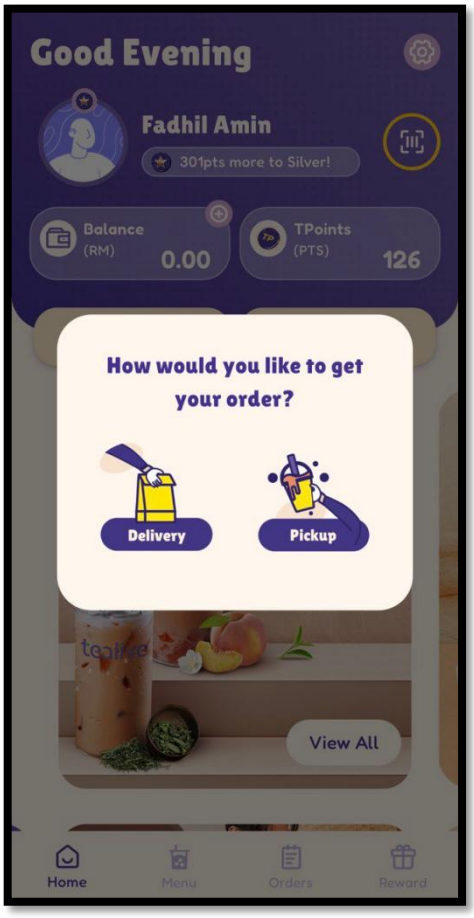


Figure 2.3.2 c: Tealive Order Option Pop Up (Tealive, 2024)

Figure 2.3.2 (c) shows the Order option pop up in the Tealive mobile app, in which customers are provided with the options Delivery or Pickup to enter (Tealive, 2024). This aspect is appealing to diverse customer tastes as it is flexible and fits better to ease things. The possibility to choose the favorite option enables the app to keep pace with the increasing need in individual approaches within the food and beverage sector. The combination with the POS system of Tealive will provide customers with smooth and correct order completion, resulting in customer satisfaction and an increment in loyalty (Tan, 2022).

- **Tealive's Delivery Option Page Analysis**

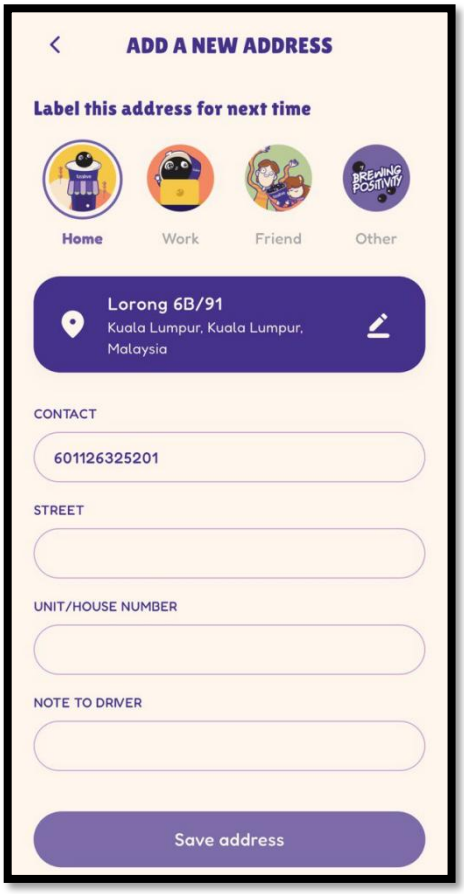


Figure 2.3.2 d: Tealive Delivery Option Page (Tealive, 2024)

Figure 2.3.2 (d) above shows the "Delivery Page" from the Tealive mobile app, where users are given the opportunity of adding or updating their delivery address (Tealive, 2024). This gives the customers an opportunity to save some addresses that could be easily referred to at the time of checkout and gives options of giving such addresses labels to show whether they are at home, work, or friend on the other. The nature of the details entered by a user can also be further refined in a way that the user can enter contact numbers, street, and unit/house numbers, which makes the process involved in delivering that much better. The possibility to provide special instructions to the driver is one more personal detail of the service (Tealive, 2024).

Although this service makes the process of ordering better, it would be enhanced to include an option of delivery time tracking since customers want the ability to track the order and eliminate anxiety about when they are supposed to receive deliveries (Tan, 2022). Also, the app can make it even more convenient to locate the user automatically based on location or previous location and save time by recommending the use of previous addresses, which enhances user experience and efficiency (Tan, 2022).

- **Tealive's Pickup Option Page Analysis**

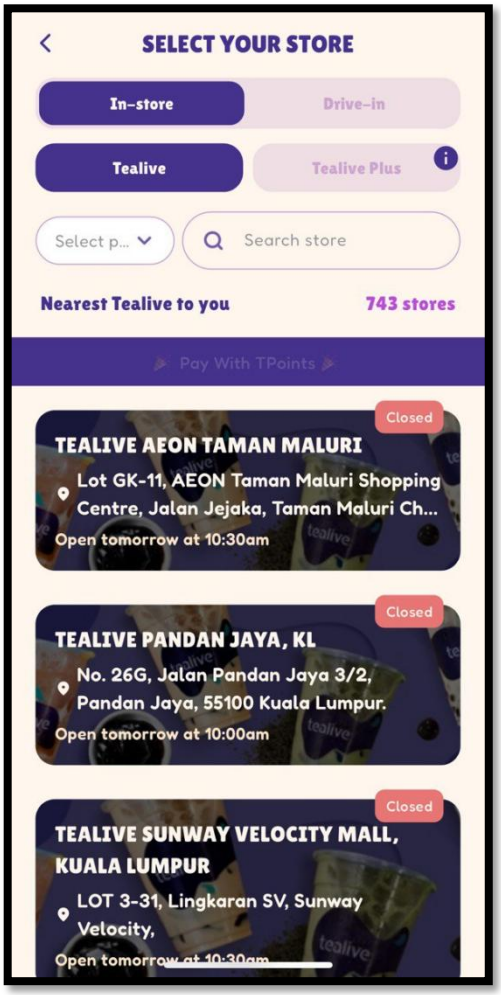


Figure 2.3.2 e: Tealive Pickup Option Page (Tealive, 2024)

Figure 2.3.2 (e) shows the "Select Your Store" page from the Tealive app, where customers are offered to select one of the pick-up options: In-store, Drive-in, Tealive or Tealive plus. The app shows the nearest stores depending on the location of the user, which includes the name of the store, the address and when the store is open or closed. To make it convenient, it is also possible to see the store's locations or just search for a specific one (Tealive, 2024).

This aspect enhances customer convenience as there are various ways of how the customers collect their item through their choice either inside the store or in their vehicle. The app also allows customers to pay using the loyalty points called "TPoints," Tealive rewards program to entice the customers into using their rewards program. One of these issues, however, is that it may be overly crowded at the most sought-after places at the peak hours of, which will have to be managed so that someone may visit these places more comfortably. Customer satisfaction also could be improved further by real-time updates about the status of the store, such as the waiting time (Tan, 2022).

- **Tealive's Menu Page Analysis**

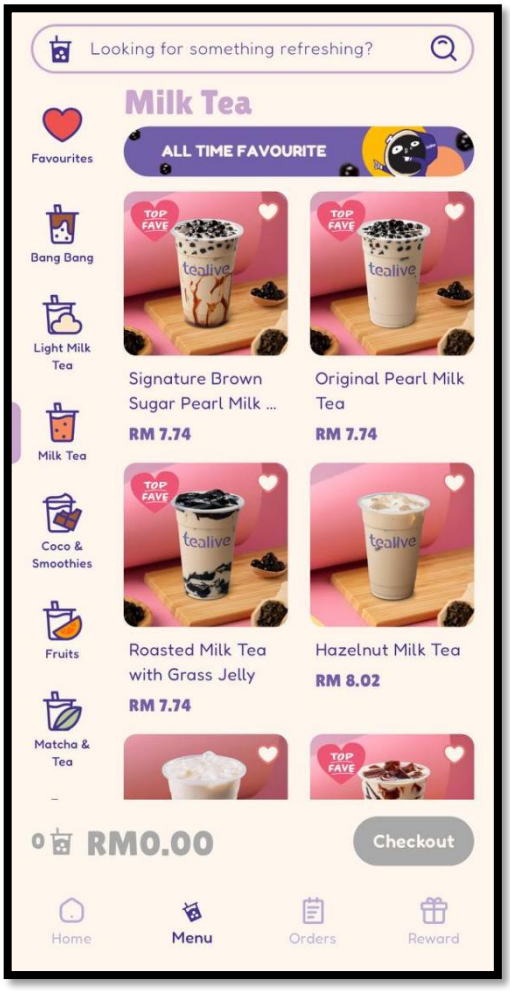


Figure 2.3.2 f: Tealive Menu Page (Tealive, 2024)

Figure 2.3.2 (f) shows the Menu page of Tealive app which is created in a simple way of browsing and choosing the drink. There is a search bar on the top which stimulates the user to search for their preferred drinks in a matter of a few seconds. There are cool and popular drinks with attractive pictures and prices such as: "Signature Brown Sugar Pearl Milk Tea" and "Original Pearl Milk Tea". The most popular ones are marked with the tag "Top Fave" so that it will be simpler to choose (Tealive, 2024).

The app has a simple way of organizing drinks into groups such as Favourites, Coco & Smoothies and Fruits, etc. The price with the possibility of adding it to the cart and a heart sign to add favorites is available on each listing of the drinks. This customized aspect imparts simplicity in the user to see and recall his or her favorite drinks. Well-organized and handsome images with distinct categories make browsing more enjoyable, and hence enhance customer satisfaction and sales (Tan, 2022). Nevertheless, the app can be enhanced by including the filters related to diet preferences, which allow users to search and filter the options rapidly.

- **Tealive's Order History Page Analysis**

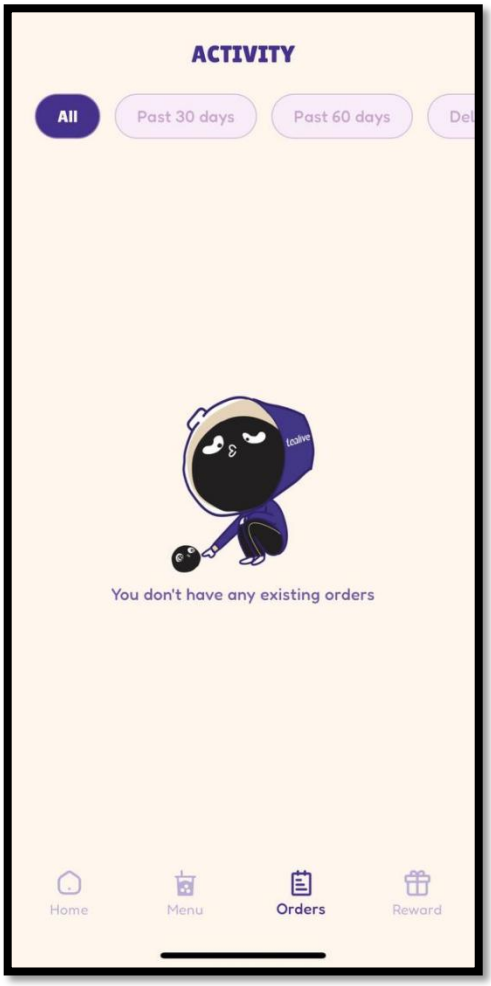


Figure 2.3.2 g: Tealive Order History Page (Tealive, 2024)

The Figure 2.3.2 (g) above shows the "Order History" page of the Tealive mobile app. The page would show the history of past orders made by the user and there would be different filters like All, past 30 days, past 60 days that can be used by the customers to view their past orders easily and it will be restricted to the specific time (Tealive, 2024). This aspect enables the customers to remember their past purchases, which may be convenient to reorder products they love.

An illustration of a playful character is in the center of the screen, which has the message, no existing orders, which means that no past orders are available to be shown by the user now. The section acts as a subtle notification of how the user would be able to make a first order or access his order history after the purchase. There is a design of the app that tries to get the user engaged with their previous purchases, which may lead to loyalty and recurring business (Tan, 2022). Moreover, it is also possible to extend the functions with this feature such as order tracking or even checking the status of the old orders (Tan, 2022).

- **Tealive's Reward Page Analysis**

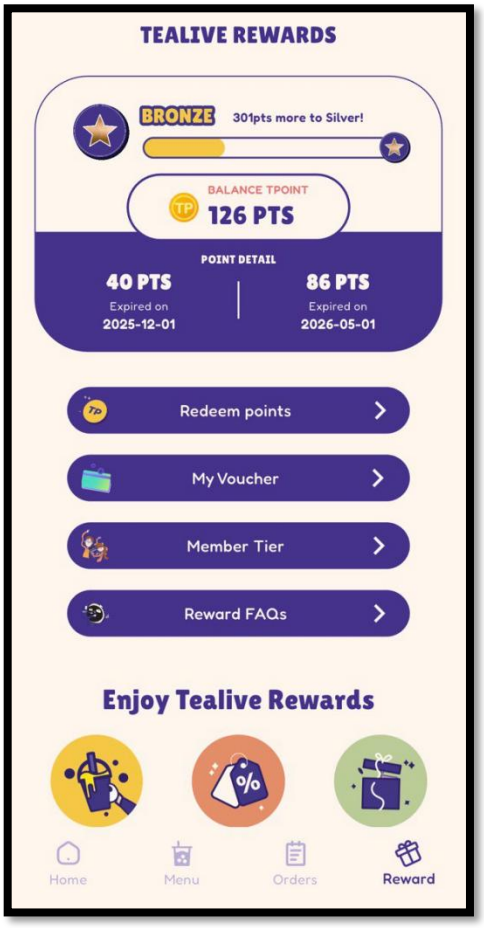


Figure 2.3.2 h: Tealive Reward Page (Tealive, 2024)

Figure 2.3.2 (h) shows the "Tealive Rewards" page, where users can track their progress in the loyalty program. The app also indicates the current tier that the user is currently in such as Bronze and how much he or she needs to accumulate in terms of points to move up to the next tier such as Silver (Tealive, 2024). Such system makes the users enjoy and feel welcome to the app since it makes the rewards treated as a game and thus, they gain more points through which they can activate more privileges.

On the top, the user can view their balance of TPoints, and information regarding expiring and valid points. This assists the users to manage their points within. Below the balance, one can find places to redeem the points towards the rewards, get the option of discounts using the page labeled as My Voucher and check the progress in the loyalty program. All these characteristics contribute to the continuous interaction, so users continue spending money to earn and redeem points (Tan, 2022). One of the potential opportunities is the personalization of rewards or suggestions depending on the customer preferences and past orders to increase customer satisfaction and loyalty (Tan, 2022).

- **Tealive's Voucher Page Analysis**

Figure 2.3.2 i: Tealive Voucher Page (Tealive, 2024)

Figure 2.3.2 (i) shows the "Voucher Shop" page of the Tealive app, where users stand a chance to redeem their TPoints to get rewards. In the top the app shows which level the user is currently in rewards such as Bronze and the amount of points currently available (126 TPoints). This makes a user feel its progress and gets interested in continuing to use the app to achieve the next level (Tealive, 2024). Depending on the number of points a user has, the page rewards its customers with free drinks, toppings, or a free Tealive Popcorn Chicken (Tealive, 2024).

The tiered rewards system adds a gamification element, making the process of earning and redeeming rewards more engaging. However, users with fewer points might feel frustrated when they are not able to gain some great awards. To increase engagement and retention levels, Tealive can configure lower-point rewards or provide some bonuses to new users, which motivates keeping using the application and participating in an incentives program (Tan, 2022).

➢ **Tealive's Tiered Membership Page Analysis**

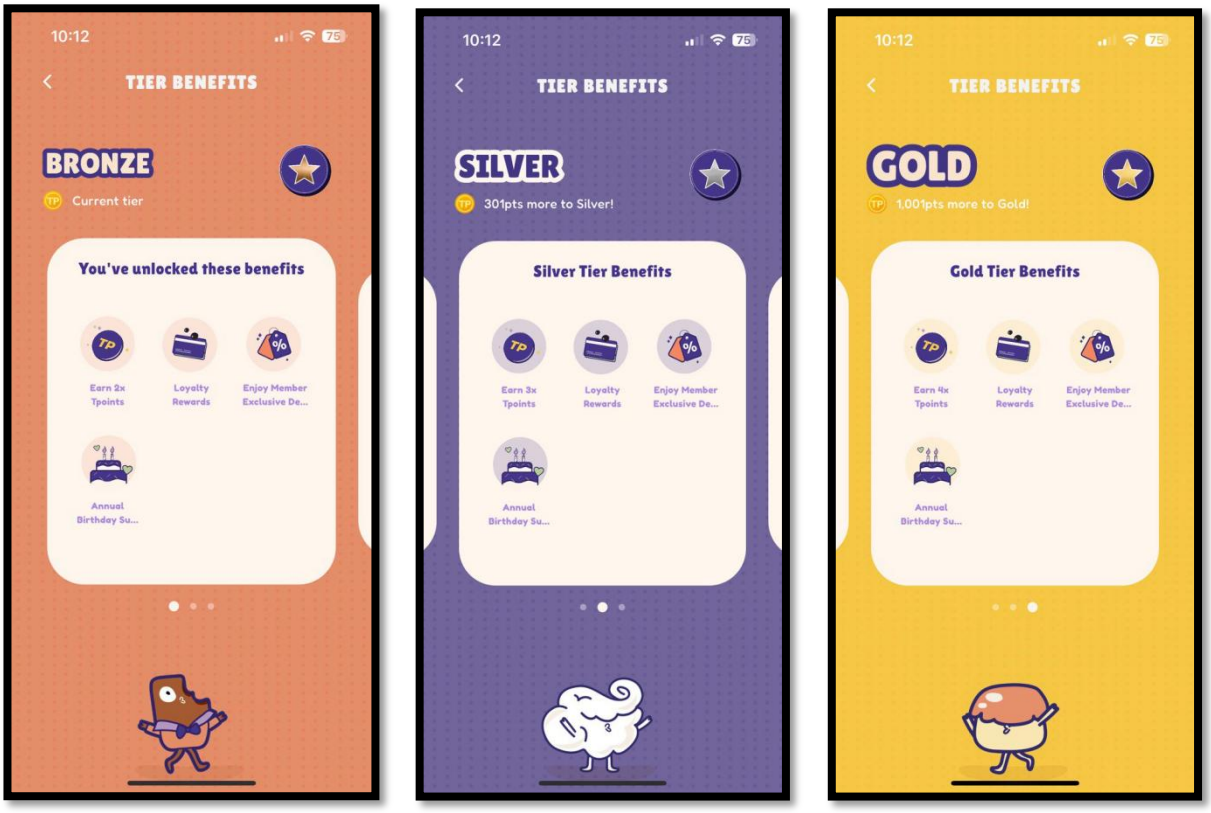


Figure 2.3.2 j: Tealive Tiered Membership Page (Tealive, 2024)

The Figure 2.3.2 (j) above shows the Tiered Membership Page in Tealive Rewards Program, including the aspects of explaining how a user can also get rewards as he or she advances in the levels.

The first figure in Figure 2.3.2 (j) displays the "Bronze" tier, which is the starting level of the program. It indicates level and Tpoints balance of the user. Among these rewards, 2x points, loyalty rewards, member deals, and birthday surprises, when getting the reward annually, may be mentioned. The visual design is the brown color scheme with cute illustrations of characters to ensure that the given experience becomes entertaining. The rewards presented in the Bronze level encourage consumers to climb the levels and get more rewards with additional purposes (Tealive, 2024).

The second figure in Figure 2.3.2 (j) introduces the "Silver" tier, which is one level above the "Bronze" tier. Members that will advance to the next level called the “Silver” will receive 3x points and receive the same benefits of the Bronze level except with more rewarding levels. The design is like the one of the Bronze tier, except there is a silver badge, which shows its higher status. This level provides the same combination of rewards such as loyalty tokens, limited-time sales, and birthday presents, though there is a bonus feature of gaining more points when you make a purchase (Tealive, 2024).

The third figure in Figure 2.3.2 (j) highlights the "Gold" tier, which is the highest tier in the Tealive Rewards Program. At this level, users can get 4x points, and this is the most rewarding value in the system. The members that hold the “Gold” level of membership have all the privileges of the lower-level members such as the birthday surprise and the loyalty point rewards coupled with the extra benefit as they earn maximum points per purchase. The premium status of this tier is reflected in the bright yellow color of the design and the gold badge that only stimulates customers to purchase further and attain such a level of membership, and sustain it (Tealive, 2024).

The tiered membership system offers customers more advantages as they move, which guarantees more activity and stimulates them to be loyal by promising attractive gifts. In such an organization of the program, Tealive promotes higher customer retention and engagement, so that customers want to buy the store more to receive higher rewards (Tan, 2022).

- **Advantage and Disadvantage**

Tealive Mobile App is aimed at enhancing customer experience using such opportunities as drinks customization, the possibility of integration with the Tealive Reward Program, and mobile payments. Customers will be able to make orders beforehand, pay via application, and pick up a service, either an offer of delivery or pick-up, minimising waiting time and making the process more convenient. The application is also fully integrated with the Point-of-Sale (POS) system at Tealive, which enables smooth order flow, up-to-date inventory and more precise loyalty points (Tealive, 2024).

The common feature or advantages of the Tealive app is that it has a very convenient interface with an intelligent menu, individual offers, or a ladder of rewards to increase customer loyalty (Tealive, 2024). The feature of the app that allows pickup and delivery makes it even more convenient and fits the needs of different customers (Tan, 2022). The disadvantages are the fact that probably the app will not be so popular among new users, as the rave program is mostly to the advantage of returning customers (Tan, 2022). Also, although there is some personalization, the app does not have more advanced opportunities, such as recommendations in line with individual histories of purchases.

Overall, Tealive Mobile App increases efficiency in its operation, customer loyalty, and ordering. Nevertheless, new user acquisition and customer data to enhance personalization are areas of opportunity, which might take the user experience of the app to a new level (Tan, 2022).

2.3.3 ZUS Coffee Mobile App

ZUS Coffee is a Malaysian coffee franchise with an aggressive expansion strategy established in 2019 by Venon Tian and Ian Chua whose mission statement states their aim to provide the best quality speciality coffee at low cost. ZUS Coffee introduced its mobile app to stay on the digital trend and to satisfy the customer's needs, including the one of convenience. Not only does the application spread customer experience but it also increases the competitive niche of the brand in the market, where convenience and customer experience are the main determinants of the brand (Vulcan Post, 2021). The ZUS Coffee Mobile App also offers a full package of customers being able to order, personalize the drinks and monitor the orders in real time. It is connected to the Point-of-Sale (POS) system of ZUS Coffee, which guarantee correct handling of the order and quick delivery of it. Customers can modify items, quantities, and even pay, such as credit card payment or electronic wallets, and it will be much quicker and more conveniently possible (FIUU, 2023).

One of the most prominent features of the application is that it is part of the ZUS Coffee Rewards Program that enables customers to get points with the purchases they take and utilize them as the discounts or free beverages. The app is also integrated with ShopeePay which provides cashback of transactions. This rewarding mechanism combined with the convenient interface of the application stimulates customer loyalty and increased multi-personalization with the help of individual offers. This has enhanced customer engagement and operation efficiency that is seamlessly integrated into the app, POS system, and reward program (ZUS Coffee, 2024).

Figure 2.3.3 a: ZUS Coffee Malaysia Logo (ZUS Coffee, 2024).

Figure 2.3.3 (a) above shows the logo of ZUS Coffee Malaysia Mobile Apps. It has a happy blue fluffy mascot that has strong facial expressions, portraying a fun and friendly brand personality. Such a specific method is not only an effective visualization option but also a possibility to sell ZUS merchandise, which combines both branding and sales (ZUS Coffee, 2024). Based on this, the logo of Ai-Orders might feature an element of soft character to make the brand more tangible and provide a chance of integrating a future merchandise.

- **ZUS Coffee's Home Page Analysis**

Figure 2.3.3 b: ZUS Coffee Home Page (ZUS Coffee, 2024).

The above figure 2.3.3 (b) shows the Home Page of the ZUS Coffee mobile application, which will help users to get involved in the application with such important aspects as the ZUS balance, the ZUS Points, and the offer of promotion such as the ZUS Festival. Another prominent part of the app is short-term offers that make the user seem engaged in the process either by gaining a bonus point or having access to exclusive offers and eminent alternatives to either delivery or pick up (FIUU, 2023). This design is meant to keep the users engaged in receiving rewards and the design is very colorful to drive an idea of promotion into an app. Yet, the emphasis on the promos can confuse new clients and, perhaps, make them unable to use all the functions of the app. Nevertheless, the home page turns out to be sufficient in terms of promoting customer engagement and loyalty through the accessibility of the key functions and action in real-time first-hand offers (Vulcan Post, 2021).

- **ZUS Coffee's Order Option Page Analysis**

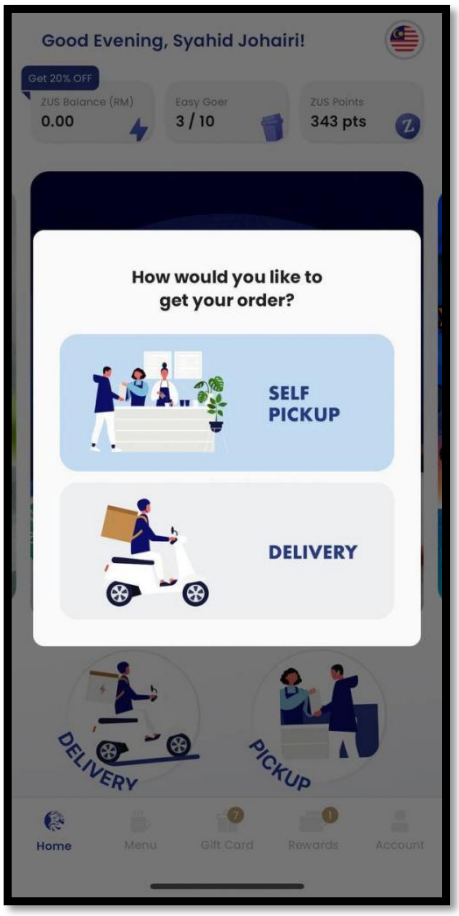


Figure 2.3.3 c: ZUS Coffee Order Option Page (ZUS Coffee, 2024).

Figure 2.3.3 (c) above shows the Order Option Page of the ZUS Coffee, in which a user selects Self-Pickup or Delivery option to have his order. Customers can easily choose the mode they want their drinks delivered in because the app offers them the opportunity in clear icons (FIUU, 2023). Self-Pickup gives the option of placing an order and self-collection of the drinks at the store, and through Delivery, the order gets delivered to the location. This ergonomic design creates ease as it makes the process flexible, and much more convenient (Vulcan Post, 2021).

This dual-option system would assist ZUS Coffee to satisfy various customers' needs, decrease congestion in the stores, and enhance customer experience. Customers will have a choice that best fits them either because they would want to save time by picking up their order or they would want delivery. Nevertheless, the efficiency of the app is determined by the competence of the backend to process orders at the peak time and achieve error-free and timely deliveries or pickups (Tan, 2022).

- **ZUS Coffee's Delivery Option Page Analysis**

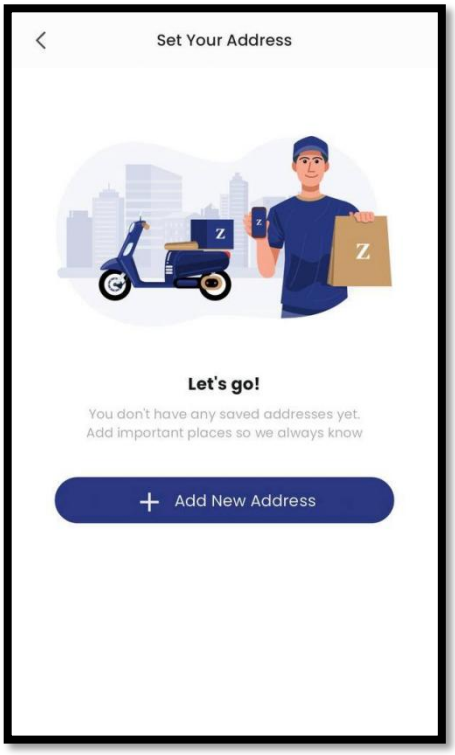


Figure 2.3.3 d: ZUS Coffee Delivery Option Page (ZUS Coffee, 2024).

The above figure 2.3.3 (d) portrays the "Delivery Option Page" of ZUS Coffee. This page requires the user to address where they would want their items to be delivered prior to making an order. It also motivates users to provide new addresses, presenting them with a simplistic interface with an easily visible button reading "Add New Address." The picture depicts a delivery man carrying a box of ZUS Coffee, which further confirms that the delivery service is convenient. The app recommends customers to ensure they store their addresses so that they do not have to repeatedly input their delivery information into the future customers (ZUS Coffee, 2024). This aspect is meant to streamline the process of placing orders such that users will not be forced to enter their delivery details several times. Its provision of this functionality makes its customers have a more positive overall user experience by making the process of receiving the delivered product much faster and easier in case of returning customers (Vulcan Post, 2021).

This feature would aid in the fostering of customer loyalty due to convenience that the feature will bring even more to users that consistently make orders of the same place. Nevertheless, one of the areas where improvement can be elucidated includes integration of location-based services that would provide the user with addresses that would be associated with their current location, hence enhancing responsiveness and efficiency of the app. This would reduce input by the user and optimize customer experience on the order process (Tan, 2022).

- **ZUS Coffee's Self-Pickup Option Page Analysis**

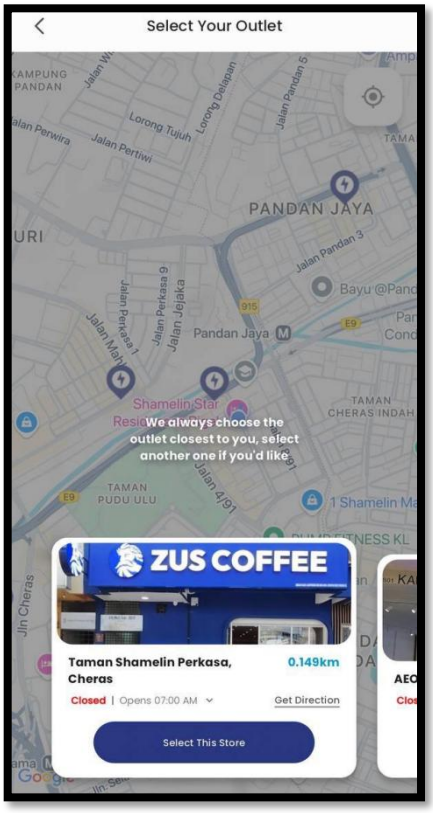


Figure 2.3.3 e: ZUS Coffee Self Pickup Option Page (ZUS Coffee, 2024).

Figure 2.3.3 (e) above shows ZUS Coffee's "Self-Pickup Option Page." On this page, there is a map, which shows stores of a ZUS Coffee located nearby and the nearest one is pointed out, which is an attention to the convenience of people. The app is already designed in such a way that it indicates the closest outlet by picking a store that is nearest to the location of the user, although alternatively, the user may choose to change their store. The details of the store, like the store name, distance and the opening hours, are provided with a button as 'Get Direction', thus it gets easy for a user to navigate to the selected store. This capability makes the self-pickup process straight to the point as individuals will be able to pick out the nearest outlet through it easily without performing a manual search (Vulcan Post, 2021). The combination of real-time data with geolocation services offered by ZUS Coffee positively affects the user experience, promoting rapid decision-making and an extra convenience of customers in general (ZUS Coffee, 2024).

The strategy will also help in minimizing the waiting times and customer satisfaction. Even greater user experience can be achieved by adding live information on store traffic or an estimate of self-pickup orders waiting time. Nevertheless, with the existing functionality, it is easy to go to a chosen store and obtain the order as quickly as possible, which makes the whole process more effective and customer-friendly (Tan, 2022).

- **ZUS Coffee's Menu Page Analysis**

Figure 2.3.3 f : ZUS Coffee Menu Page (ZUS Coffee, 2024).

Figure 2.3.3 (f) shows the "Menu Page" of the ZUS Coffee app, featuring a clean and user-friendly design. On the page there are featured the so-called “Top Picks” and “Top Picks of the Month” which point out such popular beverages as the “Australian Chocolate”, “Spanish Latte”, and “Zussies 1st Choice!” and their prices as well. The menu has been arranged in the form of categories where customers are able to navigate within the menu including categories like “Flavored Americano”, “Banana Series” and “ZUS Signature”. Customers are attracted to use such promotional tags as "Zero Calories" and "Coffee-Free," which help the customers feel more involved in the exploration process (ZUS Coffee, 2024).

This categorized mode assists the user to locate his/her preferred beverage or even a new one within a short time. But there is still something ZUS Coffee can do to make the menu better by implementing a custom recommendation system that will work based on order history or past preferences as well as seen on other successful apps. Overall, the menu screen is a comfortable order page that invites the user to interact (Tan, 2022).

- **ZUS Coffee's Gift Card Page Analysis**

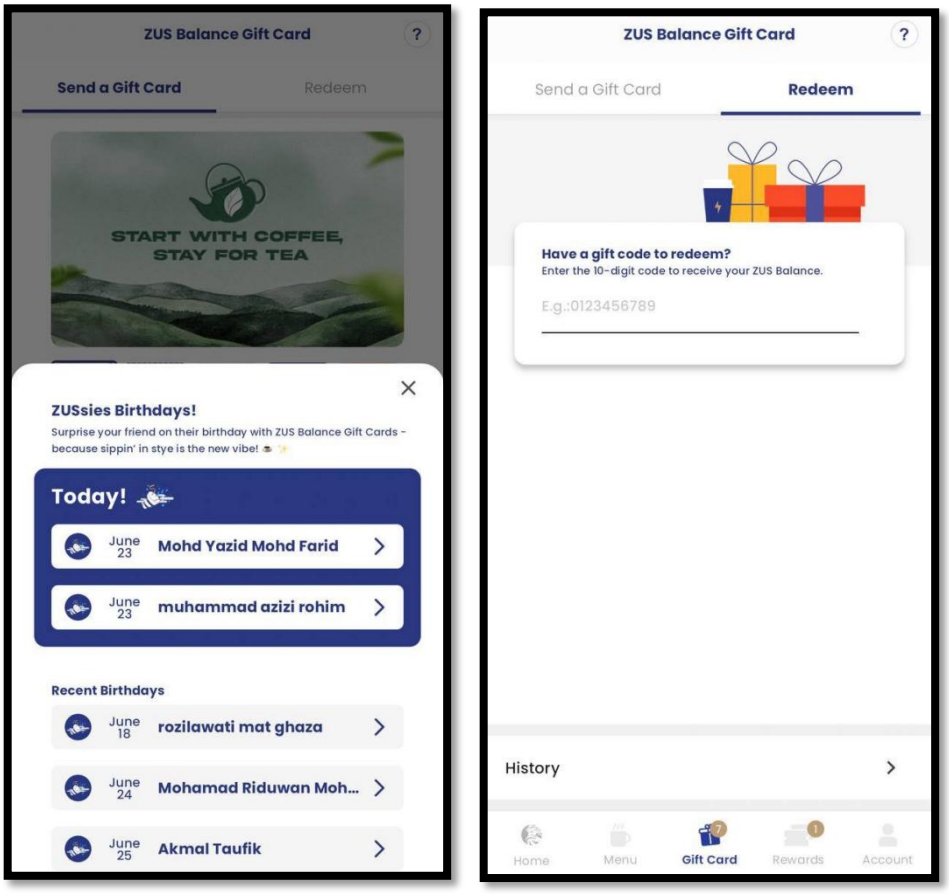


Figure 2.3.3 g: ZUS Coffee Gift Card Page (ZUS Coffee, 2024).

Figure 2.3.3 (g) shows the "Gift Card" section of the ZUS Coffee app, under the Gift Card section under the option of ZUS Balance Gift Card. The interface gives you either the possibility to send a Gift Card, or to redeem one. To this end, the app cultivates the concept of giving gift cards to friends perhaps on their birthday. The interface shows the quotation, the icons that are highlighted in the "ZUSsies Birthdays!" section, promoting the idea of the user to give surprise to his friends with ZUS Balance Gift Card (Vulcan Post, 2021). It has a list of users who have birthdays today. Under that, it shows Recent Birthdays including the names and dates (ZUS Coffee, 2024). This aspect encourages social gifting and interaction with the balance of digital convenience and one-on-one celebration presenting the ideas of ZUS Coffee to establish greater community interaction and customer loyalty through considerate, sharable functions (Tan, 2022).

The second image in Figure 2.3.3 (g) shows the "Redeem" page for ZUS Coffee Gift Cards, where the user can have a 10-digit code to add value to his or her ZUS Balance. The convenience factor is an added benefit, thus the feature appeals to the loyalty that is likely to increase customer returns to the store due to gift card uses by incorporating them into the larger reward system of the app (ZUS Coffee, 2024).

- **ZUS Coffee's Order History Page Analysis**

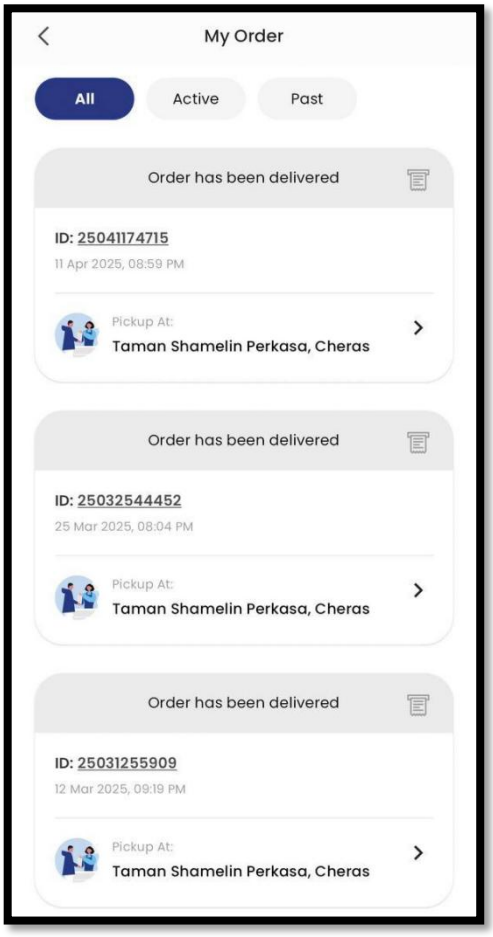


Figure 2.3.3 h: ZUS Coffee Order History Page (ZUS Coffee, 2024).

Figure 2.3.3 (h) shows the ZUS Coffee Order History Page. This is the page where the user gets a detailed history of his past orders. The page categorizes orders into two categories, Active and Past, so that their users can promptly find their running and past orders. In the case of each order, the page shows the order ID, delivery status (Order has been delivered), the place of pickup and time of the order. This aspect makes customers more convenient because they have a chance to get access to their previous orders easily and know their history or order goods again. Also, per each order, it will be clickable to see more information, which makes the process very smooth and convenient (ZUS Coffee, 2024).

- **ZUS Coffee's Reward Page Analysis**

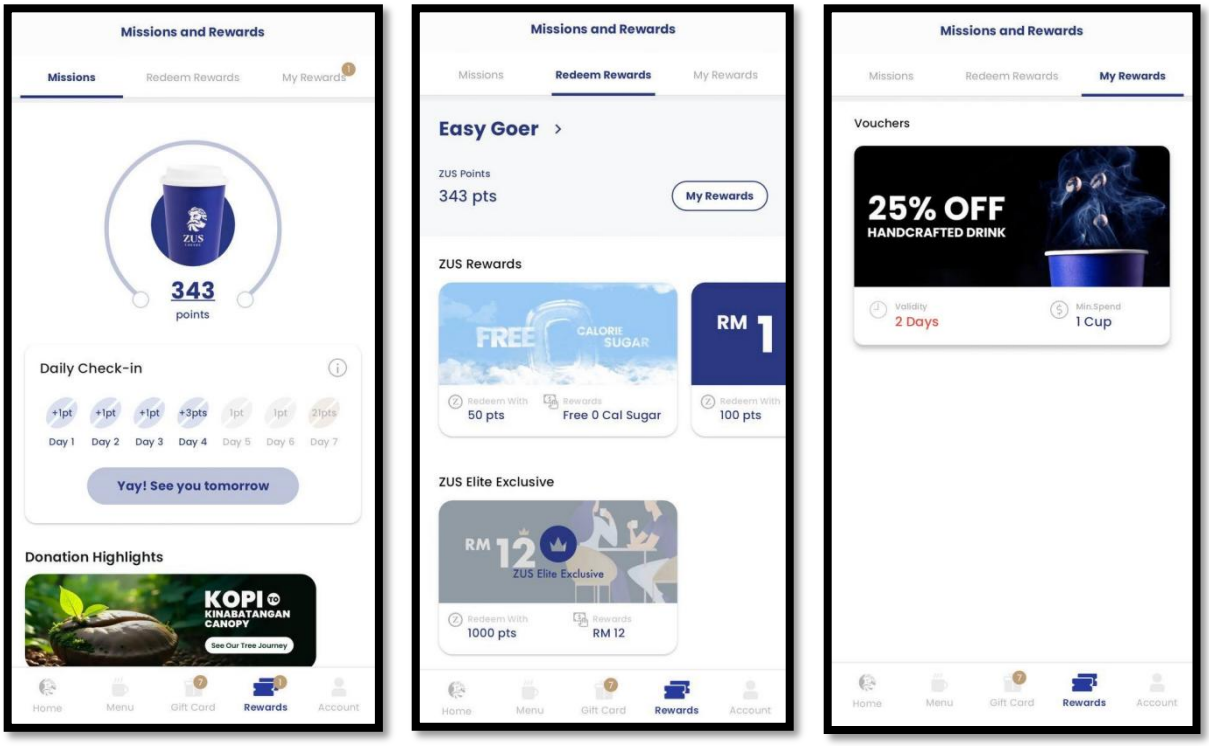


Figure 2.3.3 i: ZUS Coffee Reward Page (ZUS Coffee, 2024).

The first figure in Figure 2.3.3 (i) shows the "Missions and Rewards" section of the ZUS Coffee app, where users can see their current point balance, such as 343 ZUS points. The page promotes daily logs whereby the user is awarded with a progressive number of points on frequent activity. To take an example, checks-in provide 1 point on the first day and a maximum of 3 points on the 4th day. Such a gamified system encourages users to use the app every day, prevents boring, and assists in client retention (ZUS Coffee, 2024).

The second figure in Figure 2.3.3 (i) presents the "Redeem Rewards" section, where users can exchange their ZUS points for rewards. For example, a person can receive 50 points, which are convertible into a reward of "Free 0 Cal Sugar" and 100 points in exchange of a reward of RM 1. Higher tiers satisfactions, such as RM 12 rewards, become available when one acquires 1000 points and one can see clear ways of incentivizing people to earn and exchange points. This system will make people buy more and interact more, and special rewards of a higher tier will make the application more interesting and feel more elite (Vulcan Post, 2021).

The third figure in Figure 2.3.3 (i) shows the "My Rewards" section, where users are able to view active rewards, such as a 25% discount on handcrafted drinks, with details on validity and minimum spend (Vulcan Post, 2021). This section allows users to track points and access personalized vouchers. Offering tangible benefits like discounts promotes repeat visits and strengthens the app's role in driving customer loyalty (Tan, 2022).

- **ZUS Coffee's Tiered Membership Page Analysis**

Figure 2.3.3 j: ZUS Coffee Tiered Membership Page (ZUS Coffee, 2024).

The ZUS Coffee mobile application includes a tier membership system that is aimed at appreciating customer loyalty depending on the quantity of coffee cups bought.

The first figure in Figure 2.3.3 (j) introduces the Easy Goer tier, the entry-level membership for new ZUS Coffee customers. This tier has basic rewards, including "Buy 1 Free 1" voucher once 10 cups are bought, free delivery of orders with over RM30, birthday treats, and ZUS points earned with every RM1 spent. The Easy Goer tier aims at attracting new clientele to communicate with the brand and buy it more than once to become their first step toward reward (ZUS Coffee, 2024).

The second figure in Figure 2.3.3 (j) displays the Rising Star tier, which customers can reach by ordering more ZUS drinks. On this tier, they get a complimentary drink starting on the 10th cup as well as complimentary delivery on an order of RM27 and above, a birthday treat, and 1.5 times ZUS Points with purchase of RM1. The Rising Star tier will also reward the customers who are stepping into regulars with more appealing offers, so their perpetuation is encouraged, and their interest in ZUS Coffee will be enhanced (ZUS Coffee, 2024).

The third figure in Figure 2.3.3 (j) highlights the Super Addict tier, which rewards ZUS Coffee’s most loyal customers. This tier renewed members will have one free drink per eight cups, free delivery on orders more than RM25, birthday gifts, and 2 ZUS Points (2x points on every RM 1 spent). The Super Addict tier will target making loyalty stronger by providing a greater reward to the customers who come to the establishment regularly, so that they could feel appreciated and valued (ZUS Coffee, 2024).

The fourth figure in Figure 2.3.3 (j) showcases the ZUS Elite tier, the highest membership level. The most premium tier made with the most premium rewards with a free drink with every 8 cups purchased, free delivery of orders worth RM25 and over, two birthday vouchers, and ZUS points 2 times as much as every RM1 spent. ZUS Coffee ZUS Elite tier is a top-level tier membership that ZUS Coffee is going to allocate to the most loyal to the company customers as this opportunity will offer benefits that will support the company in persuading people to remain loyal to the brand and create a stronger connection with it (ZUS Coffee, 2024).

- **Advantage and Disadvantage**

The ZUS Coffee mobile app is an exciting and hassle-free way of holding onto customers, and it promises to make the coffee more enjoyable due to the possibilities. The benefits of the app are that the ordering procedure is smooth, and it enables the customers to order, check their rewards and choose between the delivery and self-pick option. This allows an effective implementation of orders to be placed and the fact that the data related to the customers is properly stored and effective in relation to staff and the running of the business (FIUU, 2023). Moreover, tiered rewards program also promotes customer loyalty, in various levels, starting with the entry-level, Easy Goer, and up to high-end ZUS Elite, encouraging them to visit more and receive such rewards as free drinks, free delivery, birthday gifts, and other rewards. Another feature that has made the app unique is the ability to send and redeem gift cards making the app much versatile. The next one is daily check-ins and the system of gamified rewards, in which customers obtain their points when being engaged with the brand (Vulcan Post, 2021).

However, the app does have its disadvantages. Although the rewards program is tempting, it could have little value to the first-time customers or those with less usage of the application since the initial stages require time to amass points, which may not have offerings to these customers. Also, even with the improved mobile ordering features, other users might face some difficulties with the use of the app, namely, with the navigation, in case they are not experienced with the interface (FIUU, 2023). There is also a reduction in the ability to give the customer extremely personalized promotions or recommendations as well as compared to its rivals some coffee apps (FIUU, 2023). Lastly, while the app facilitates both pickup and delivery options, these services depend heavily on local store availability, which could limit convenience for users in less-served locations (Vulcan Post, 2021).

In conclusion, the ZUS Coffee mobile app is a holistic app dedicated to coffee lovers with several advantages associated with regular consumers and several barriers to its adoption by first-time users of the app or casual guests reducing the number of beverages purchased (Vulcan Post, 2021).

2.4 Comparison of Related Existing Project

Table 2.4 (a) shows the comparison of the related existing mobile apps in the food and beverage (F&B) industry.

Table 2.4 a: Comparison of Related Existing Projects

Features	Starbucks	Tealive	ZUS Coffee
Customization Options	A lot of customization of drinks such as milk type, add-ons, flavors and size	Customizable tea orders such as sugar level, ice level, and add toppings.	Customizable orders including drink size, milk type, sugar level, and toppings
Loyalty Program Features	**Starbucks Rewards:** Get points (Stars) when purchases redeemable for free drinks and food	**Tealive Club:** Earn T'points with tiered rewards	**ZUS Coffee Rewards:** Earning points for every purchase, redeemable for discounts or free drinks
POS Integration	Completely incorporated with POS that allows easy order flow and control of inventories	Fully integrated with POS for order processing and tracking loyalty points	Integrated with POS for order management, processing, and real-time inventory updates
Real-time Order Tracking	Real time tracking with order status notifications	Basic updates but no detailed tracking	Real-time order tracking for both pickup and delivery orders
Analytics and Reporting Tools	Latest analytics to aid in monitoring the sales trends and customer behavior	Basic analytics for data tracking, less detailed reporting	Emerging analytics for personalized rewards and insights, offering recommendations based on user data
Inventory Management	Stock visibility in real time to avoid ordering stocks which are out of stock	Standard inventory control with real-time updates for availability	Real-time stock visibility through integration with the POS system, ensuring accurate availability
Operational Management (Staff Tools)	Improved barista workflow integration to deal with mobile orders	Integrated with operations including drive-in and delivery orders	Order management interface with ability to track and fulfill orders efficiently
App Scalability & Flexibility	Handle millions of orders per day, scalable and flexible	Scalable for increased digital orders, flexible with third-party integrations	Scalable functionality designed to handle increased volume of orders and integrate with multiple platforms
Payment Options	Starbucks Card, credit/debit cards, e-wallet, Apple Pay, Google Pay	Cashless payments, integrates with e-wallets like Touch 'n Go	In-app payments, credit/debit card, gift card integration
User Interface & User Experience (UI/UX)	Polished, intuitive, user-friendly interface with easy customization options	Fun, engaging design with a focus on usability and personalization	Modern and user-friendly interface with clear options for drink customization and easy navigation

Multi-Channel Ordering (Omnichannel)	Available for in-store pickup, drive-thru, delivery, and mobile ordering	In-store pickup, delivery via third-party apps, mobile ordering	Pickup and delivery orders via the app with third-party integration for delivery tracking
Customer Data Utilization	Personalizes promotions and recommendations based on customer data	Use data to personalize offers and drive loyalty	Personalizes rewards and offers based on user purchase history and preferences
Personalization Features	Tailored offers and recommendations based on purchase history	Customized user experience based on purchase history and location	Personalized rewards and suggestions based on preferences, order history, and customer behavior
Security Features	Secure encryption, no two-factor authentication (2FA)	Secure payment processing and user authentication	Secure transactions with encryption and privacy protection, no mention of 2FA (just like Starbucks)

2.5 Discussion

Based on the comparison of the current mobile ordering systems, Ai-Orders in Ai-CHA will combine the functionality of the full security system comparable to the one of Starbucks. The Starbucks app uses a robust encryption process, safe payment gateways, and information security, which protects the customer body and dealings (Starbucks, 2024). Nevertheless, a lack of two-factor authentication (2FA) can be considered one of the security features that Starbucks is yet to explore and will be introduced in Ai-Orders. With the implementation of 2FA, customers at Ai-Orders will be asked to confirm their identity not only by submitting a password but also using some secondary security feature like one-time password (OTP) to their mobile device. This will be an improved security mechanism to avoid unauthorized access, especially in the transaction of money and personal details in the mobile ordering system.

Ai-Orders will also incorporate several advanced features inspired by mobile apps such as Starbucks, Tealive, and ZUS Coffee, focusing on creating a seamless and secure ordering process. To give an example, order tracking in real-time, the function also available on both Starbucks and ZUS Coffee apps, will be added to Ai-Orders allowing customers to track the orders via the whole process (Starbucks, 2024; ZUS Coffee, 2024). This openness helps to develop trust among customers since they know that their order is being attended to in the right way. A personalized loyalty program shall be tier-based as is in Tealive app or multi-tiered as is in ZUS Coffee so that Ai-CHA may introduce personalized promotions depending on the customer behavior (Tealive, 2024; ZUS Coffee, 2024). Such personalization assists in better customer engagement and high retention rates through specific rewards that are based on customer preference (Tan, 2022).

Security features such as real-time payment encryption, tokenization, and multi-factor authentication (for both user logins and order payments) will be fully integrated into Ai-Orders, ensuring that all customer data and transactions are securely processed. The deployment of these security tools may be perfectly compliant with the possibilities that are already adopted in Starbucks and Tealive applications, and, therefore, Ai-CHA will be able to offer a secure and safe service (Starbucks, 2024; Tealive, 2024). The feature of integration with the POS system will enable Ai-Orders to track the real-time processing of payments and have the synchronization of orders in place and securely document the transactions. Moreover, 2FA will also secure customer accounts against authorized people. Integrating these features and advanced analytics, Ai-Orders will guarantee that Ai-CHA, besides augmenting the experience of the customers, will scale safely with the growth of the business on the online ordering market.

2.6 Conclusion

In conclusion, the Ai-Orders platform of Ai-CHA will combine the advantages of the most popular mobile ordering apps, including Starbucks, Tealive, and ZUS Coffee, by brushing off their weaknesses and methodological obstacles. It will also include flexibility in ordering, the highly competitive loyalty program, tracking of orders in real time and the ability to integrate with the POS that will not only improve customer experience but also make the operations of the staff more efficient (Tan, 2022). With the use of sophisticated data analytics and sufficient security features, such as two-factor authentication (2FA), Ai-Orders will provide a safe, personal, and scalable solution to the growing digital needs of Ai-CHA.

The functionality selected to be implemented into Ai-Orders, such as real-time tracking of orders, POS integration will enhance its efficiency of operations by reducing the possibility of human error and order delivery on time and accurately. Just like Tealive and ZUS Coffee, the loyalty program is going to reward customers with their purchase and give personalized promotions according to the preferences of the customer to the specific coffee brand and will encourage repeat business (Tealive, 2024; ZUS Coffee, 2024). Customer information and transactions will be secured in real-time through encryption of payment and identity verification security features that will increase the confidence of the platform.

Overall, the evolution of Ai-Orders will enable Ai-CHA an all-around digital solution that supports both the growing market of online orders as well as bringing functional benefits to the business. As it has improved security features, is operated by real-time analytics and is easy to use, Ai-Orders will prove a useful asset to both customers and employees of the Ai-CHA, enabling the organization to build more customer loyalty, whose operations can be simplified, and making the Ai-CHA competitive on the contemporary food and beverage market (Tan, 2022).

3 METHODOLOGY

3.1 Introduction

The following section describes the kind of methodology that will be applied to guarantee that the workflow of this project is properly carried out. According to Bhatt (2021), project methodology defines the plan of action and steps that project participants take to acquire and interpret the information in a certain topic field. This can include the strategic planning of the steps in the manner that the project can be able to meet the objectives through the tools and techniques chosen. The methodology covers all the most important aspects, such as project design, methods of gathering data, data analysis procedures, and the general framework according to which the process of project development will be implemented.

For this Ai-Orders project, Waterfall Methodology will be used. The Waterfall Model is a well-defined and sequential approach to software development in which a stage should be finished prior to entering another (Sommerville, 2021). This approach is particularly efficient in case the project specifications clearly defined and highly unlikely to alter substantially throughout the development pace. Such Waterfall approach guarantees that delivery of the projects is done in an orderly way, and each step has its specific milestone (Sommerville, 2021). This approach will be suitable to the Ai-Orders project since clear and measurable progress can be tracked, and every single stage of project implementation must be properly planned, performed, and checked, and then, after that, the next stage of the project should be prepared.

This chapter will provide a clear and detailed explanation of the approach adopted, along with an analysis of how the key aspects of the Waterfall methodology align with the objectives of this project.

3.2 Waterfall Methodology

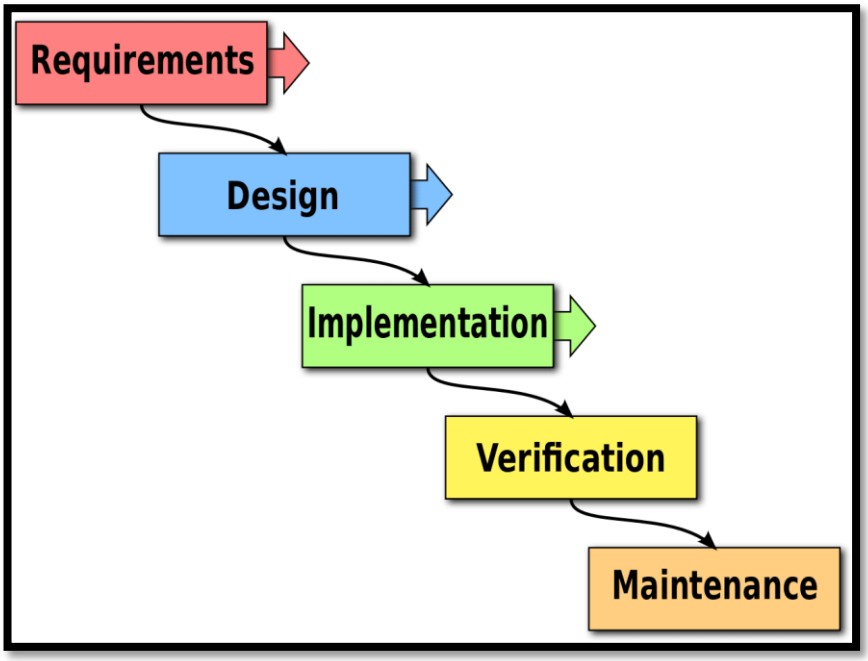


Figure 3.2 a: Waterfall Methodology Diagram (Atlassian,2024).

Figure 3.2 (a) above shows the Waterfall Methodology Diagram. According to Atlassian (2024), the Waterfall method is classic in project management where there is a linear and sequential application of how the design is completed. Every stage must be done before the next one begins, meaning that there is a proper progression of the lifecycle of a project (Atlassian, 2024). The given methodology will work specifically well in the case of projects, the requirements and scope of which are quite clear, and little changes are made in the process of development. It also offers specific structure when it comes to planning, designing, testing, implementing, and deployment of systems, which is why it is a great choice in the case of projects that demand rigorous documentation and definite schedule (Atlassian, 2024).

The development of the Ai-Orders system in the Ai-CHA used the Waterfall methodology to provide a systematic and disciplined route. The project started off with a thorough requirements analysis process, then its design, implementation, extensive and intensive testing, deployment and finally documentation (Atlassian, 2024). All the phases were carefully planned and implemented, which made it possible to have clear stages and deliverables. Systematic control made the direction of the project technically easy and reduced chances of risk as well as having a product that would satisfy the requirements and standards of the set project.

3.3 Phases in Waterfall Methodology

In this part, all the phases in Waterfall Methodology will be explained to be used in development of the Ai-Orders system of Ai-CHA Ice Cream and Tea. Waterfall methodology is sequential with properly staged steps. These phases entail gathering of requirements, system designing, implementing, testing, deployment and maintenance (Atlassian, 2024). One stage must be finished, and another stage starts, the project is ordered and predictable in its performances (Atlassian, 2024). In subsections below, the presentation of the approach of every phase toward this project will be described in detail.

3.3.1 Requirement Analysis

The phase of requirement analysis plays a key role in comprehending and recording the needs of Ai-CHA Ice Cream & Tea to the Ai-Orders system. Primary methods of data capture at this stage will be a questionnaire by using Google Form (with major stakeholders like Ai-CHA employees and customers) and observing the present in-house running business. The given research tools will contribute to finding out the functional requirements of the system, such as options of customization of orders, ways of payment, and programs of loyalty, as well as the use of POS system (Muneer et al., 2021). This shall be used to lay the basis of determining the specifications of the system, which will be used during design and development phases. Facts that are collected during this stage make sure that the system meets the requirements of the business and the satisfaction of the users (Muneer et al., 2021).

3.3.2 System Design

In system design phase, the information collected during requirements gathering will be used to design in detail the manner which Ai-Orders system will operate. This step means generation of flowcharts, wireframes, use case diagrams to display the structure of the system and interaction with its users (Farris et al., 2022). These artifacts will depict system design, data flow and the major elements of the system such as order management system, point of sale (POS) integration and user interface design (Farris et al., 2022). The aim will be to come up with a detailed design document that will present how the system is going to work so that there is an easy transition to the implementation stage (Farris et al., 2022).

3.3.3 Implementation

At the implementation stage, design specifications that were outlined at the previous stage will be applied to initiate actual development of the Ai-Orders system. To create the web application, the development staff will code to support such main functionality as making orders, paying, interacting with a POS system (Muneer et al., 2021). The development will be done based on the set specifications that have been listed in the design phase. Through the system, the system will be tested with the unit level

in mind so that as the system is produced, every component works as it should then proceed to another level (Al-Kilidar et al., 2021).

3.3.4 Testing

The Ai-Orders system testing activity will include several strategies to make the software align with the given requirements and thus be ready to work without any troubles. Such a phase will comprise System Testing, Integration Testing, Unit Testing, and User Acceptance Testing (UAT) (Khan & Sulaiman, 2023). It aims to verify that every component works as expected individually and in cohesion, with the ultimate system delivering the efficient and smooth user experience (Khan & Sulaiman, 2023).

Unit Testing will be aimed at testing individual elements of the system at the system level in such a way that every task is working as expected (Khan & Sulaiman, 2023). This will entail verification of features like log-in of users, ability to customize orders (add sugar and milk), make payments, and record points in the loyalty and reward system. The above features will be tested individually to establish whether they are fulfilling their tasks appropriately. Unit testing will check down to the smallest level of the system that functions first before it is to be incorporated into the bigger system. This will reduce the risks of problems that occur because of combining components (Khan & Sulaiman, 2023).

The Integration Testing will assess the effectiveness of the collaboration of the different parts to form a complete system. This testing will be done on confirming the interactions of the web app and the POS system and the backend database Integration testing is going to test the compatibility of parts of the system in talking to each other (Muneer et al., 2021). It will test whether the order that was entered into the web application properly flows into the POS system and real-time inventory updates. Further, there will be integration testing to test the ability of the customers to use the app to make payments and that the points of rewards are accurate. This step also checks that user credentials are validated appropriately by secure means of logging on like email and password authentications (Khan & Sulaiman, 2023).

System Testing is done to verify the performance of the Ai-Order system in its entirety, that is, all the components are interrelated and are a complete system. This step entails functional and non-functional testing. In functional testing, the system is tested to ensure that it performs as expected. This includes processing orders, giving customers a real-time update, and tracking of the loyalty points (Muneer et al., 2021). The non-functional testing will evaluate the performance of the system in the varying conditions including the speed, reliability, and security (Farris et al., 2022).This is with regards to the ability of the system to support large numbers of orders being made concurrently and not crashing the system as well as ensuring that the data of the customer is safely stored and sent. There will also be end-to-end testing of the system where the app to the backend is involved, and all the parts are fully integrated and not a single section can be operated independently (Khan & Sulaiman, 2023).

Finally, the User Acceptance Testing (UAT) will be conducted to ensure that the system matches the expectations of the end-users and their requirements. The system will be tested by a sample of real customers, along with the members of Ai-CHA staff, to determine how functional or effective the system is and how manageable. The responses of the users will be taken to understand the areas to improve upon to ensure that the system delivers a good and smooth experience. This test stage will make sure that the Ai-Orders system will meet the business objectives including the improvement of the efficiency of work and customer satisfaction as well as discover the problems that should be discussed before the implementation of the specified system. Once UAT is complete, the adjustments needed will be executed thus ensuring that the overall product when deployed is reliable, secure and user friendly (Khan & Sulaiman, 2023).

3.3.5 Deployment

Deployment phase consists of moving the Ai-Orders system out of development situation and to live production. First, pilot implementation in a controlled environment will be organized to make sure that the system performs as it is designed with actual users. Throughout this step, the performance of the system will be observed and any problem that will be noted will be solved prior to the complete implementation. The deployment process will be completed by making the system available to any customer after it is over the pilot stage (Atlassian, 2024).

3.3.6 Maintenance

Maintenance is carried out so that there is smooth running of the Ai-Orders system after implementation. It also involves carving after sales, correcting any issues that arise and installing any new upgrade to better the system. Areas of improvement will be determined by frequent checks undertaken on the server/system and by feedback received by the users. Maintenance phase will also entail the introduction of new features or change it as the business needs and user requirements take different directions and therefore, the system is relevant and functional in the long run (Farris et al., 2022).

3.4 Conclusion

In a nutshell, the adoption of Waterfall methodology to the development process of the Ai-Orders has been able to offer a systematic and structured format in the management process of the project. The sequential flow of the specified phases, that are requirements gathering, system design, implementation, testing, deployment and maintenance will see to it that every step is well planned and executed. The approach provides well-documented and trackable milestones that are critical in the effective realization of an effective and flexible online ordering system of Ai-CHA Ice Cream & Tea (Atlassian, 2024).

In addition, the Waterfall approach will not only create phases of work to be performed but also review and examine the system carefully before getting to the next phase. The testing period is also important as it helps find and fix the problems so that the product is also to be reliable and should work and fit the needs. The Ai-Orders system will also upgrade the customer experience and the operational process, adding such characteristics as the real-time order tracking, customized loyalty programs, and two-factor authentication (Khan & Sulaiman, 2023).

Overall, the Waterfall methodology has played an essential role in the successful creation of a high-quality mobile application that will achieve the aims of Ai-CHA, enhance customer loyalty, and reduce management activity in the company (Farris et al., 2022).

4 REQUIREMENTS

4.1 Introduction

Requirement gathering is an important activity in project management and software development life cycle. It is a process of gathering, writing and examining needs that determine the main aspects and capabilities of a system or program (TechTarget, 2023). The effective completion of a project can highly depend on the completeness and accuracy of collected requirements respectively since these requirements serve as the obvious confirmation of how the system will be designed and executed. In this chapter the procedures involved in the collection of requirements of Ai-Orders, an online ordering of Ai-CHA Ice Cream Tea has been indicated. The information needed was acquired with the help of the combination of on-store activities observations with a questionnaire that had been sent to customers and employees offering a lot of valuable information regarding their needs and issues (TechTarget, 2023).

Requirements can be classified into two categories which are functional and non-functional. According to Lucidchart (2023), both sets of requirements must be elicited clearly to ensure that both utility of the system to the users and business needs are met. Functional requirements define the functionalities that need to be offered by the system including placing an order, ordering custom drink, making payment, and connectivity with the POS system. These capabilities supplement the activities that users must accomplish directly. Non-functional requirements, in their turn, outline in what ways the system must behave and what features it must possess, including security, reliability, usability, and scalability (Lucidchart, 2023). These requirements are essential to make the system not only working but also effective and able to offer flawless user experience in different conditions (Lucidchart, 2023).

This chapter will also discuss the methods used to prioritize these requirements, how they were validated, and how the collected data was analyzed to guide the design of the Ai-Orders system. Additionally, it will also touch upon the issues that appeared in the process of data collection and how they were mitigated in such a way that the results of the process meet the expectations of the users and business objectives (Lucidchart, 2023).

4.2 Data Gathering Techniques

For this project, I applied interviews, observations, and questionnaires to acquire the needed data. These techniques assisted in getting to know of the existing problems and opportunities with Ai-CHA and the requirements of the customers and personnel. The material gathered in such a way was indispensable to the planning of a system that would fit the practical requirements, better the handling of the orders, and the general efficiency of operations (GeeksforGeeks, 2024).

4.2.1 Interview

To have useful information on the personal preferences and expectations of the client towards the Ai-Orders web app, an interview was held with its client (Muneer et al., 2021). The client feedback also included core considerations that the user would want to have in the application which were ease of use, compatibility with the current Point-of-Sale (POS) machine and the need to want to provide a personal touch in the ordering process to the customers. Besides that, the interview allowed learning operational issues of staff, such as order processing errors, working during peak hours, real-time inventory updates (Muneer et al., 2021). This discussion provided a better idea of how the client envisioned the app and it was possible to create a system which will fit the vision and improve customer satisfaction as well as the efficiency of the whole thing.

4.2.2 Observation

In addition to the interview, observation was conducted at Ai-CHA's Taman Shamelin Perkasa outlet starting from its opening on 1st October 2024. The observation time was about 4 weeks in total and was aimed at developing the idea of getting acquainted with the issues of the staff and the customers who experience peak hours. The late afternoon (3 PM to 6 PM) and evenings (7 PM to 9 PM) used to be the periods of the highest customer traffic (peak hours). It has been reported that the handling of the orders manually during such rush hours created a lot of waiting times and sometimes errors in the handling of large numbers of orders. Moreover, it was unsynchronized online and store orders and resulted in the inefficient filling of the orders (GeeksforGeeks, 2024). Such observations made it abundantly clear that a online ordering system capable of becoming an extension of the Point-of-Sale (POS) system that is already established in Ai-CHA would be instrumental in facilitating the increase of operational efficiency and order accuracy (GeeksforGeeks, 2024)

4.2.3 Questionnaire

The Ai-Orders system will benefit greatly by getting a questionnaire created using Google Forms to Ai-CHA customers and residents of Taman Shamelin Perkasa. The questionnaire will have 15 questions that will help in getting the preferences of the customers, their satisfaction with the ordering system that is in place and their expectation as far as the online ordering system is concerned. The questions covered aspects such as preferred ordering methods, desired features (like drink customization, real-time order tracking, and loyalty rewards), and the overall experience with in-store service (GeeksforGeeks, 2024).

Among the responses, there was a great need to have more customized drinks available, quicker delivery, and additional order tracking. The results were essential in dictating the most salient characteristics of the Ai-Orders system and were useful in coming up with user-friendly interfaces that would meet the needs of customers and the staff members (GeeksforGeeks, 2024).

4.3 Functional Requirements

Functional requirements are specifications that describe vital functionality and capabilities that a system will need to execute to attain its primary goals. In the example of Ai-Orders system, such requirements outline the essential functionality that will help to optimize the ordering process, provide customers with better experience, and simplify the work of Ai-CHA. This involves the capability of the system of placing orders, payment processing, interaction with customers in terms of their engagement with loyalty programs, and integration with the Point-of-Sale (POS) system (Muneer et al., 2021). Outlining these needs will give the Ai-Orders system the desired functionality and make it like the working objectives of Ai-CHA Ice Cream and Tea (GeeksforGeeks, 2024).

4.3.1 Customer Functional Requirements

Table 4.3.1 (a) defines the key functional requirements for managing orders efficiently through the Ai-Orders system.

Table 4.3.1 a: Functional Requirements for Order Management

Functional Requirement	Expected Result
Order Placement	Each customer is allowed to make personalized orders using the application by choosing beverage, topping, and payment modes.
Order Tracking	The customers can monitor their orders in real-time, and updates are given at every step of the process of ordering.
Payment Processing	The system guarantees the safe transfer of funds in different ways such as credit cards and mobile wallets.
Order Integration with POS	The POS system is directly connected with the online orders, and this ensures that they are processed smoothly and precisely.

Table 4.3.1 (b) outlines the functional requirements for customer engagement and loyalty features that will drive customer retention and repeat business.

Table 4.3.1 b: Functional Requirements for Customer (Loyalty Program)

Functional Requirement	Expected Result
Loyalty Program	With every purchase the customers receive loyalty points that can be redeemed as a discount or as a free item.
Tiered Rewards System	Loyalty is earned by the customers, who receive more benefits with the frequency of their orders, getting through the stages.
Personalized Promotions	The system will also provide customized offers depending on the behavior of a customer like buy one get one free during a birthday.

4.3.2 Admin Functional Requirements

Table 4.3.2 (a) highlights the functional requirements for integrating the Ai-Orders system with Ai-CHA's existing POS system, enabling better operational management.

Table 4.3.2 a: Functional Requirements for POS Integration

Functional Requirement	Expected Result
POS Integration	The Ai-Orders happens to be equipped with Ai-CHA POS system; thus, orders and stocks can be updated in real time.
Order Processing Efficiency	Orders coming in can be managed in real-time, there is real-time availability of all orders in the Admin Dashboard as staff just view and manage without much manual entry of orders hence multi-client error is minimal.
Sales Tracking	The system gives real-time data about sales, and thus management can monitor its performance and make informed decisions based on the data.

4.4 Non-Functional Requirements

Non-functional requirements focus on the overall quality attributes of the system, addressing aspects like performance, security, scalability, and usability. These requirements ensure that the Ai-Orders system functions efficiently, is secure, and provides a seamless experience for users. While functional requirements define what the system must do, non-functional requirements describe how well the system performs these tasks, ensuring it meets the expected service levels. The Ai-Order system's long-term success depends on its ability to deliver a high level of reliability, security, performance, and ease of use (GeeksforGeeks, 2024).

Table 4.4 (a) presents the list of non-functional requirements for the Ai-Orders system, focusing on key aspects like security, scalability, reliability, and user experience. These non-functional requirements help ensure the system operates efficiently and securely while providing a user-friendly experience.

Table 4.4 a : Non-Functional Requirements for Ai-Order System

Non-Functional Requirement	Expected Result
Performance	It is advised that orders and payments system process a response within 2-3 seconds, which promises efficient response times, giving a positive effect on the user experience.
Reliability and Availability	The system should be able to sustain 99% uptime which means that web app and POS System are available without much hiccups and outage issues. There ought to be backup procedures that can be used to recover the failures that can be reoccurring.
Scalability	The system must be such that it can support the growing number of users, orders, and locations with no considerable performance loss. The above building should have an option of expanding to more Ai-CHA outlets as the business expands.
Security	The system should have payment transactions using encryption that is secure, and protection of the data by authenticating data through authorization of users. The live data communication between the web app and POS should be encrypted to ensure the safety of the customer data.
Usability	The web application and POS System must have a user-friendly interface and must have limited training with the staff and customers. The design of the app must also be made to focus on accessibility so that every user has a great time.
Data Integrity and Logging	The system should safely record all the orders and payment records as well as customer details. Integrity of the data of the customers and transactions will be maintained with regular backups and good data protection policies.
Maintainability	The system must be able to be modular with the parts being able to be quickly updated or changed. The detailed documentation needs to be included to aid troubleshooting and maintenance of the system, as well as further enhancements.

4.5 System Requirements

System requirements are crucial in comprehending the technical environment that will be required to develop and to operate Ai-Orders online ordering system. These struggles include software and hardware requirements, which are used to enable the smooth work of the system and be beneficial to the needs of the Ai-CHA Ice Cream & Tea operations (Farris et al., 2022). The software needs are based on the technologies which are used to develop the application, deal with databases and to integrate systems and the hardware needs are the physical infrastructure required to support the software components (Farris et al., 2022).

4.5.1 Software Requirements

The software requirements define the tools and technologies used to build and deploy the Ai-Orders system. Each component of the system relies on a carefully selected technology to ensure functionality, efficiency, and scalability.

i. Figma

Figure 4.5.1 a : Figma Logo (Figma, 2024).

Figure 4.5.1 (a) represents the Figma Logo. The Figma will be applied to the designing of the user interface (UI) and user experience (UX) of Ai-Orders system. Figma is a strong, cloud-based design that makes collaborative designing possible after which the team would design wireframe, user flow, and high-fidelity prototype prior to coding (Sutherland, 2023). Figma, grounded in ease of use, can simplify the design process and accommodating feedback of all stakeholders, which is why it is an optimal option when it comes to making sure that the app will be intuitive and user-friendly (Sutherland, 2023).

ii. Visual Studio Code

Figure 4.5.1 b: Visual Studio Code (Microsoft, 2024).

Figure 4.5.1 (b) shows the Visual Studio Code (VS Code) Logo. VS code will be used primarily as a tool where the code of the Ai-Orders system will be written and controlled. VS Code is an adaptable and potent editor that can handle many programming tongues, which include JavaScript, Dart, HTML, and CSS (Hayes, 2022). It can easily be used to develop and debug code because of its versatility with other extensions and is thus a must-have tool among developers (Hayes, 2022).

iii. PHP and CodeIgniter 4

Figure 4.5.1 c: PHP and CodeIgniter 4 Logo (CodeIgniter Foundation, 2024).

Figure 4.5.1 (c) represents the PHP and CodeIgniter 4 logo. The Ai-Orders system is built using PHP with the CodeIgniter 4 framework as the main backend technology. CodeIgniter 4 follows the Model–View–Controller (MVC) architecture, which separates business logic, user interface, and data access. This framework is used to implement core modules such as branch management, menu management, order processing, membership, loyalty points, vouchers, and wallet transactions. It provides routing, session management, security features, and a structured way to develop scalable web applications (CodeIgniter Foundation, 2024).

iv. MySQL / MariaDB Database

Figure 4.5.1 d: MySQL/MariaDB Logo (Oracle, 2024).

Figure 4.5.1 (d) shows the MySQL/MariaDB logo. MySQL (or MariaDB, which is a compatible variant) is used as the relational database management system (RDBMS) for the Ai-Orders system. It stores all critical data such as users, branches, menu items, orders, order items, membership records, loyalty point transactions, vouchers, and wallet top-ups. The use of a relational database allows structured querying with SQL, supports relationships between tables, and ensures data consistency and reliability for business transactions (Oracle, 2024).

v. phpMyAdmin

Figure 4.5.1 e: phpMyAdmin Logo (phpMyAdmin Project, 2024).

Figure 4.5.1 (e) represents the phpMyAdmin logo. phpMyAdmin is used as a web-based database management tool to interact with the MySQL/MariaDB database. It allows the developer to create and modify tables, run SQL queries, import and export data, and inspect records through a graphical interface. In the Ai-Orders project, phpMyAdmin is especially useful for testing queries, troubleshooting database errors, and managing the production database on the hosting server (phpMyAdmin Project, 2024).

vi. cPanel Web Hosting

Figure 4.5.1 f: cPanel Logo (cPanel LLC, 2024).

Figure 4.5.1 (f) shows the cPanel logo. cPanel is used as the web hosting control panel to deploy the Ai-Orders system to an online environment. Through cPanel, the developer can manage files, configure domains and subdomains, set up the production database, and adjust PHP settings. It also provides access to tools such as File Manager and phpMyAdmin. Using cPanel ensures that the Ai-Orders system can run on a live server and be accessed by real users over the internet (cPanel LLC, 2024).

vii. ToyyibPay

Figure 4.5.1 g: ToyyibPay Logo (ToyyibPay, 2024).

Figure 4.5.1 (g) shows the ToyyibPay Logo. The payment gateway to the Ai-Orders system will be ToyyibPay, which will enable customers to make secure payments and different modes of payments, such as online banking or credit cards and e-wallets. ToyyibPay is a user-friendly, secure, fast, and efficiently operated payment solution widely used in Malaysia, it has a user-friendly interface (ToyyibPay, 2024). Through its integration of ToyyibPay, Ai-Order will guarantee customers a pleasant and secure payment process, which is extremely essential to bringing about customer satisfaction and reducing the ordering process (ToyyibPay, 2024).

4.5.2 Hardware Requirements

Figure 4.5.2 a: Laptop Lenovo LOQ 15ARP9

Table 4.5 a : Laptop Lenovo LOQ 15ARP9 Details

Specification	Details
Processor	AMD Ryzen 5 4600H
Graphics Card	NVIDIA GeForce GTX 1650
RAM	16GB DDR4
Storage	1TB SSD
Display	15.6-inch Full HD (1920 x 1080) IPS
Operating System	Windows 11

4.6 Conclusion

The chapter has presented the functional and non-functional requirements that were necessary in the Ai-Orders system. Such conditions were identified due to closely executed research approaches, such as monitoring the present presence in the store at Ai-CHA and carrying out a survey with the clientele and the workers. With their needs, limitations, and expectations, the concept of functionality of the system was established, including online ordering, menu customization, and integration with POS (TechTarget, 2023). Other non-functional requirements such as system security, scalability and performance also played an important role in Ai-Orders to make sure that the system is functional and in pace with the performance (Lucidchart, 2023).

In addition, the hardware and software which is required to create and to operate the system was described. Such kind of hardware as mobile devices (customers), computers (staff), and the POS system have been chosen according to the demands of the system and the working environment of Ai-CHA. The choice of software tools, such as PHP and CodeIgniter 4, phpMyAdmin, MySQL, and cPanel Web Hosting relied on the possibility to seamlessly integrate, process the data in real-time as well as have comfortable and convenient user experience. Each data collected during the investigation and needs-gathering would help to provide the future Ai-Orders solution that would correspond to both user requirements and organizational interests, ensuring the current issues would be resolved and delivery of a scalable, efficient, and secure system of placing the orders would be possible (GeeksforGeeks, 2024; TechTarget, 2023).

5 ANALYSIS

5.1 Introduction

In the analysis chapter of the online ordering system in Ai-Orders, the researchers have concentrated in assessing the current setbacks and business ineffectiveness in Ai-CHA Ice Cream & Tea. The goal of this chapter is to clarify the central problems being solved by Ai-CHA now, specifically, the inefficiency of the order processing, customer engagement, and manual orders processing, that causes slow work and possible customer dissatisfaction. The solution to these challenges and the enhancement of customer experience and the efficiency of the operations provided by the implementation of the Ai-Orders system with its new functions, such as real-time order tracking, the integration with POS system, and a personalized loyalty program are also discussed in the analysis. Also, this chapter will discuss the technological and functional needs of the Ai-Orders system and provide solutions that will shorten the ordering process, engage the user and simplify the processes involved. Addressing these problems, this chapter will be a good basis to design and realize the implementation of a system that suits the business objectives and business needs of Ai-CHA (Pressman & Maxim, 2021).

5.2 Data Gathering Analysis

In this part, the approach taken in collecting data to learn about the existing inefficiency in the ordering system of Ai-CHA is described. It was imperative to collect the data to establish major points of improvement and create a worthwhile basis upon which the Ai-Orders system can be designed. Interview sessions with the clients, the observation of the in-store activities and a questionnaire sent to the customers and residents are the three major methods that were employed in the gathering of data on this project. Such approaches gave a great idea about the problems that Ai-CHA has and helped to shape the web app and the admin panel development. According to Sommerville (2022), multiple data collection methods, including interviews and observations, should be combined so that the results could be triangulated, and the requirements identified would be sufficient and pertinent.

5.2.1 Interview Analysis

An interview was conducted with the client, the operation manager of Ai-CHA Ice Cream & Tea, to obtain the useful information that was then transferred to the development of Ai-Orders web application.

- **Interview Details**

Figure 5.2.1 a: Interviewee Picture

Name: Hendrik Leong Wai Xun

Position: Ai-CHA Marketing Manager

Location: Taman Shamelin Perkasa, Kuala Lumpur, Malaysia

Date: 23rd June 2025

Figure 5.2.1 b: Interview with the client via Google Meet

- **Purpose of the interview**

This interview was intended to collect the necessary information to customize the Ai-Orders system to the operation requirement and processes at Ai-CHA. The focus of the interview was to determine the expectations of the client, issues with the existing ordering system, and the major features that should be involved in the system to reduce the work with orders and provide better experience to customers. More specifically, such administrative features as order management, menu item personalization, payment options integration, and rewarding loyalty were discussed. According to Kumar and Raj (2021), interviewing the stakeholders is among the most powerful instruments in requirement engineering because they contribute to the space between the business necessity and tech-savvy identification.

- **Feedback Analysis**

The tables presented below were all based on the feedback analysis obtained in the interview with the Marketing Manager of Ai-CHA who is Hendrik Leong Wai Xun. It was intended to grasp the weaknesses of the existing manual ordering system and see the possibility of automation. Ten (10) structured questions were given in the process of the interview and included topics like customer preferences, expectation of the loyalty program, challenge of administrations during peak hours, and the significance of POS integration. The analysis of the feedback was organized so that the actionable requirements can be obtained that would form the main features of the Ai-Orders app. This is in line with industry's best practices that underline successive gathering of the feedback with main stakeholders to guarantee the congruency between user anticipations and design of the system (Alsmadi, 2023).

Table 5.2.1 a : Feedback Analysis of Question 1

QUESTION 1	What features would you like to see in the Ai-Order system?
ANSWER	The client does expect features like real-time orders tracking, friendly user interface, and customization of drinks according to individual needs.
ANALYSIS	All these details are key features of the application to be used to make the customer successful experience and improve the ordering process.

Table 5.2.1 b: Feedback Analysis of Question 2

QUESTION 2	How important is integration with Ai-CHA's existing POS system?
ANSWER	It needs integration with the POS system to perform well and prevent duplication of orders.
ANALYSIS	Order accuracy will increase, and delivery process will be faster through integration.

Table 5.2.1 c: Feedback Analysis of Question 3

QUESTION 3	What are the main pain points with the current ordering process?
ANSWER	Delays in the service, wrong orders, and lack of customization of the orders to customers
ANALYSIS	These pain points highlight the need for a more efficient system with a strong focus on user experience.

Table 5.2.1 d: Feedback Analysis of Question 4

QUESTION 4	Would you prefer a self-service app for customers to place orders?
ANSWER	Yes, a self-service app would reduce waiting times and allow customers more control over their orders.
ANALYSIS	Self-service aligns with current industry trends and provides convenience for both customers and staff.

Table 5.2.1 e: Feedback Analysis of Question 5

QUESTION 5	Do you agree that adding loyalty rewards would increase customer retention?
ANSWER	Yes, rewarding customers for frequent orders would incentivize them to keep coming back.
ANALYSIS	Loyalty programs are a powerful tool for enhancing customer engagement and improving retention.

Table 5.2.1 f: Feedback Analysis of Question 6

QUESTION 6	Should the app have real-time updates for customers regarding their order status?
ANSWER	Yes, providing real-time updates is crucial to improving transparency and customer satisfaction.
ANALYSIS	Real-time updates will ensure customers are informed, reducing anxiety and enhancing their overall experience.

Table 5.2.1 g: Feedback Analysis of Question 7

QUESTION 7	What kind of payment methods would you like the app to support?
ANSWER	The system should support online payments, mobile wallets, and in-store payments.
ANALYSIS	A variety of payment methods enhances the flexibility and appeal of the app for different customer preferences.

Table 5.2.1 h: Feedback Analysis of Question 8

QUESTION 8	Would you find it helpful to have a feature that allows staff to manage orders more effectively?
ANSWER	Yes, the staff needs an efficient order management tool to handle peak hours.
ANALYSIS	Providing staff with an intuitive order management system is essential for maintaining smooth operations during busy times.

Table 5.2.1 i: Feedback Analysis of Question 9

QUESTION 9	Would you prefer the app to have a feature that recommends drinks based on customer preferences or past orders?
ANSWER	Yes, recommendations would enhance customer experience by personalizing their visit.
ANALYSIS	Personalization is a key factor in improving customer experience and increasing sales.

Table 5.2.1 j: Feedback Analysis of Question 10

QUESTION 10	How important is it for the app to be easy to use for both staff and customers?
ANSWER	Very important. Both staff and customers must be able to navigate the app easily without training.
ANALYSIS	Simplicity and ease of use are crucial for ensuring both customers and staff can operate the app effectively without issues.

The feedback analysis received as the result of the interview with the client has served to be of great relevance as to highlighting the important features as well as functionality the Ai-Orders system ought to comprise. The answers note the relevance of such options as live tracking of orders, customer-specific drink production, integration with the POS system and ease of use. Also, the availability of a loyalty rewards program, self-service alternative, live update, and variety of payment methods would lead to the increased customer engagement and efficiency of the operations (Kumar and Raj, 2021). They can be used as the basis of improving the system design and making it useful to the customers and staff positively (Alsmadi, 2023).

5.2.2 Observation Analysis

In this section, observations were made on the Ai-CHA Ice Cream and Tea outlet in Taman Shamelin Perkasa to learn how the store is experiencing difficulties in dealing with the flow of customers and delivery of their orders. This was to determine the current system used to process manual orders on peak hours and to establish possible areas where Ai-Orders mobile system can enhance customer experience (Raj & Tolety, 2022). The following figures below reveal various details of the outlet work, demonstrating at the same time how busy the store should be and how the work process could be improved with the implementation of the online ordering system.

Figure 5.2.2 a: Ai-CHA Ice Cream & Tea Outlet at Taman Shamelin Perkasa

Figure 5.2.2 (a) shows the front of Ai-CHA Ice Cream & Tea at Taman Shamelin Perkasa on the grand opening day. The figure highlights that there is a huge flow of people in front of the store and it is like rush hour. This observation demonstrates that Ai-CHA must deal with order management on the one hand, particularly in cases when substantial groups of customers come in at a time. Waiting in long queues may frustrate the customers and thus an efficient mobile ordering system is of great importance (Alharthi et al., 2021). Customers would be able to make orders in advance with an integrated application such as Ai-Orders thus saving the employees in shops, especially during peak hours, eventually leading to customer satisfaction (Alharthi et al., 2021).

Figure 5.2.2 b: Seating Area at Ai-CHA

The seating area is well structured to serve more than one group but at peak hours, the amount can be filled within a few minutes. As shown in the observation accomplished in the second week of the opening of Ai-CHA Taman Shamelin Perkasa, it is quite difficult to manage such large volumes using no specific mobile ordering system. In absence of such a system, inefficiencies may creep in the operations (Kumar et al., 2023). If Ai-CHA implements Ai-Orders, customers would have the option to pre-order, effectively skipping the wait in line. That would make the speed of the service much faster in general, make the dining experience efficient, as well as make the staff and customers much happier (Kumar et al., 2023).

Figure 5.2.2 c: Counter Area of Ai-CHA

Figure 5.2.2 (c) shows the front counter area, where customers place their orders and interact with the staff. The figure was taken on the fourth week of Ai-CHA Taman Shamelin Perkasa inauguration emphasizes the situation where people are busy when it comes to handling the customer traffic. It is important in such traffic to manage properly, and it is crucial to have a system which enables us to enter a command to a mobile device of a customer directly into the point-of-sale (POS) systems (Lee & Lim, 2022). Appealing to the concept of Ai-Orders that can only improve the efficiency of the peak period, since the employees could only work on the order preparation, it would connect with the POS and therefore minimize the possibilities of order errors (Lee & Lim, 2022).

To sum up, it can be concluded that the observations validate that Ai-CHA, as much as it offers quality customer experience, struggles during the busy hours. These inefficiencies could be decreased through an efficient ordering system such as Ai-Orders which would provide an easier process of ordering and enhance the customer experience. The inclusion of real-time tracking and mobile payment capabilities will also help Ai-CHA to improve internal operations, thereby being able to better serve customers (Patel & Desai, 2023).

5.2.3 Questionnaire Analysis

A survey questionnaire was sent under Google Forms; the 77 respondent represents the regular customers and residents of Taman Shamelin Perkasa who purchased Ai-CHA. The primary topics that were addressed in the survey included order customization, waiting time, as well as loyalty programs. The feedback given by customers suggested that they would find a more efficient and self-service type of ordering system appealing and the staff emphasized difficulty in dealing with too many orders at once and managing the inventory. According to Kharel et al. (2022), customer experience input is critical considering the needs of the users that require high-volume food and beverage platforms to be designed based on customer feedback. The data obtained through this questionnaire was of help in establishing the functional requirements of Ai-Orders to make the system serve the needs of the customers as well as the staff with effectiveness. Moreover, the optimization of data collection through digital tools, such as Google Forms, contributes to greater reliability and availability of answers (Ramli et al., 2021).

- **Question 1 Analysis**

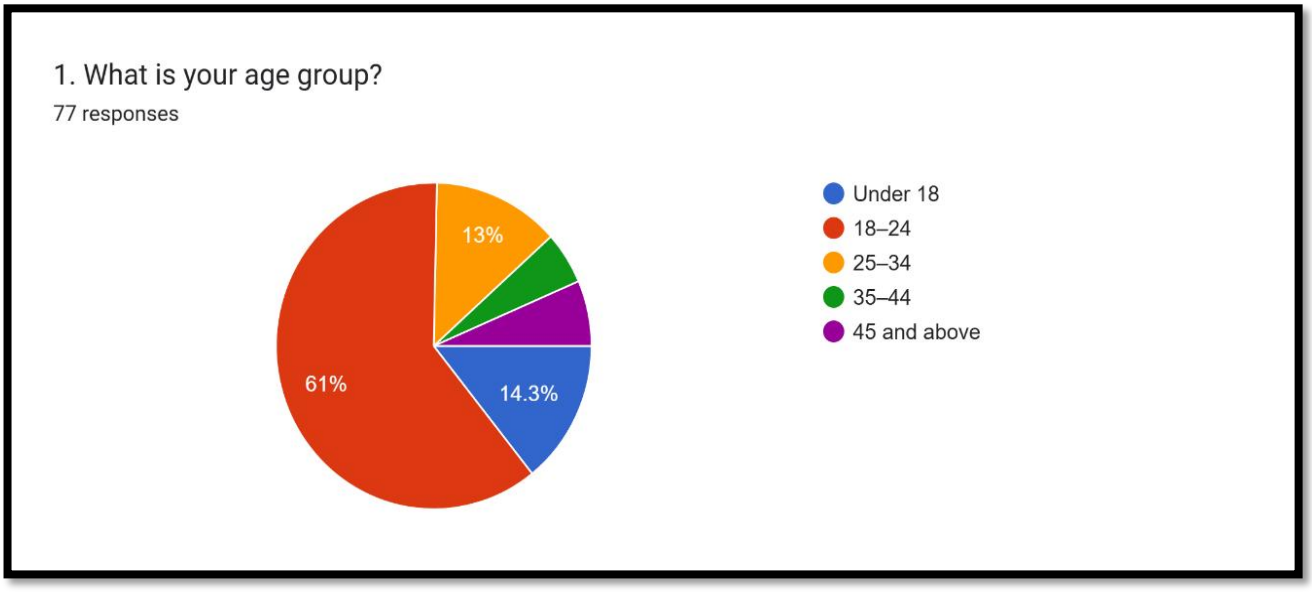


Figure 5.2.3 a: Result of Question 1

Figure 5.2.3 (a) shows the result of Question 1. The finding indicates that most of the respondents (61%) are between 18-24, whereas 25-34 stand at 14.3 percent. The Under 18 (13%) and the 35-44 (11%) age groups categories of the survey participants are smaller. The lowest representation among the respondents by percentage (1%) is in the 45 and more group. It can thus be concluded that Ai-CHA will have a larger market among younger people, especially those between the ages of 18-34 years who are likely to visit the store more frequently and be willing to utilize online ordering apps (Kharel et al. 2022).

➢ Question 2 Analysis

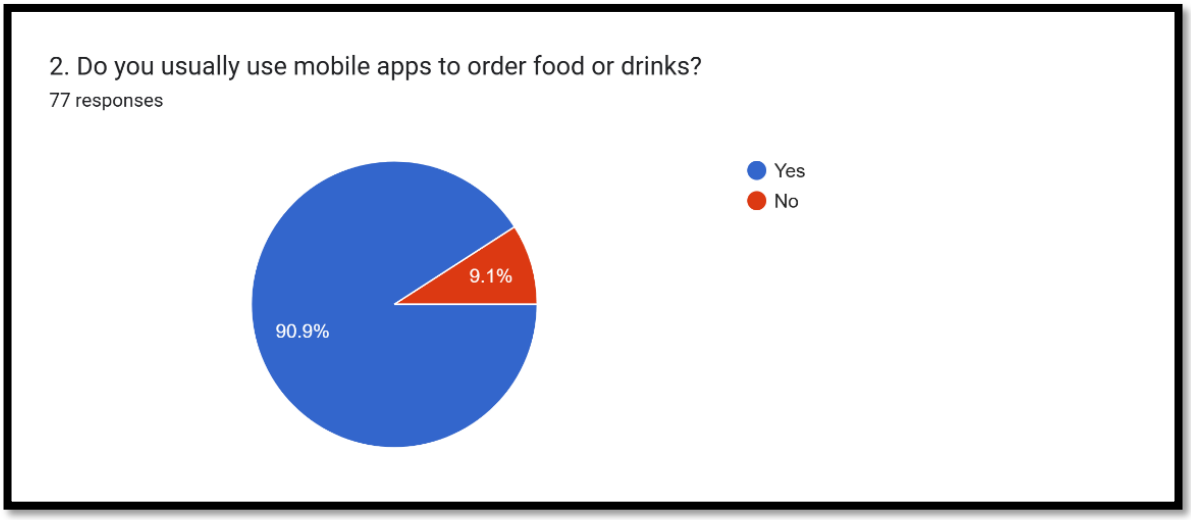


Figure 5.2.3 b: Result of Question 2

Figure 5.2.3 (b) shows the result of Question 2. Almost all respondents (90.9%) affirmed that they prefer using mobile applications to order food or beverages, which signifies that people highly regard digital means of ordering things. In contrast, the only reason that part of the respondents said they do not use mobile applications to check this information was only 9.1% of them. This implies that the use of mobile apps to place orders of food and drinks is a usual practice by the survey participants and Ai-CHA can utilize the use of an online ordering app to fulfill the expectations of a customer and to simplify the ordering process (Kharel et al. 2022).

➢ Question 3 Analysis

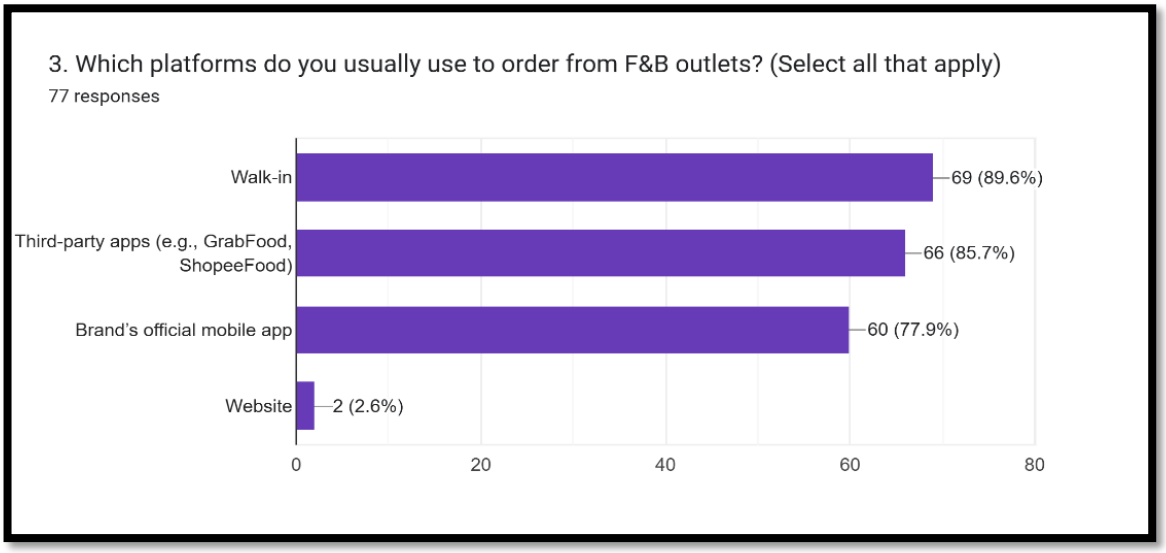


Figure 5.2.3 c: Result of Question 3

Most of the respondents (89.6%) indicated that they usually make orders with food and beverage (F&B) establishments by walk-in as they preferred their orders in real-time and in-store. There was also a trend of third-party apps such as GrabFood and ShopeeFood which saw 85.7 percent of the

respondents using them to make a delivery. Also, 77.9 percent of respondents reported that they use the official mobile application of the brand, where a tendency towards brand-related digital ordering services is observed. On the other hand, the percentage of ordering via a web-based app was 2.6 percent, implying that mobile applications and third-party applications are predominant in the F&B ordering future. This shows the necessity to incorporate a webapplication in the system of ordering the Ai-CHA to appeal to the customers' needs (Ramli et al., 2021).

➢ Question 4 Analysis

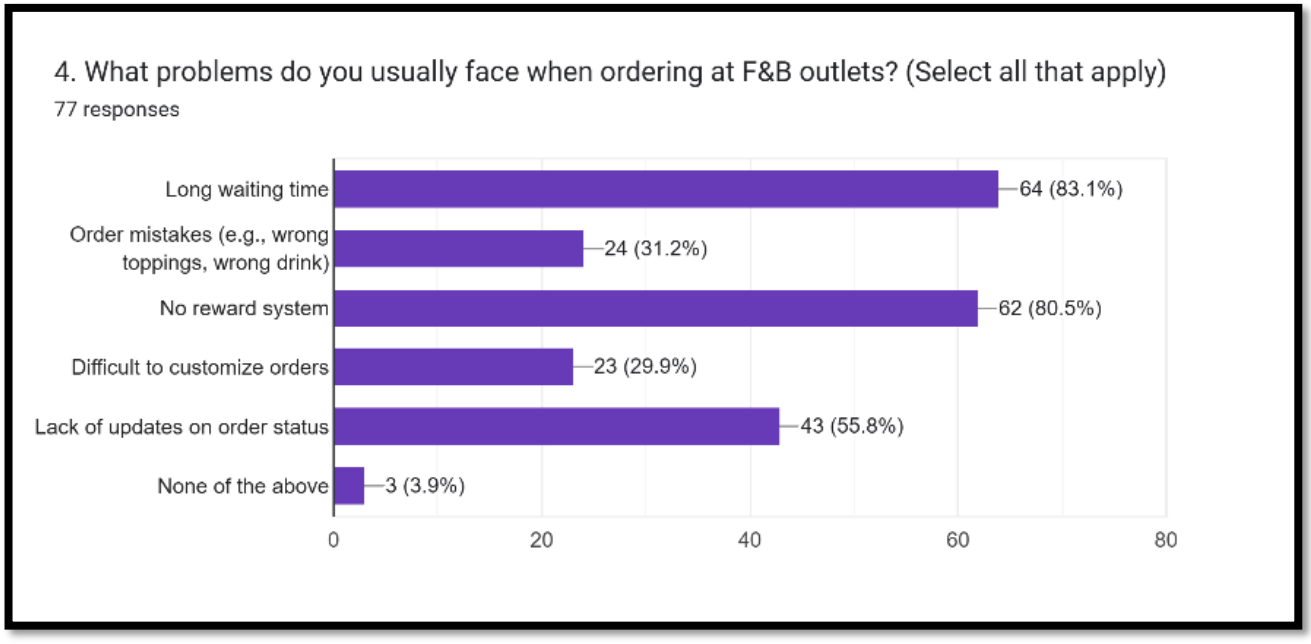


Figure 5.2.3 d: Result of Question 4

Figure 5.2.3 (d) shows the result of Question 4. Based on the data, it can be seen that the greatest concerns of respondents when making orders in F&B outlets are that they wait too long, there is no reward system, and their orders are not correct such as wrong topping or wrong beverage. Precisely, 83.1 percent of the respondents cited long waiting as a major problem, whereas 80.5 percent cited lack of reward system. Also, 31.2 percent of the respondents cited order errors as an issue and 29.9 percent could not customize their orders. Moreover, 55.8 percent of the respondents cited the lack of update in the status of their order which indicates the necessity of having another, more effective and smooth system that can accommodate these issues. Very little (3.9%) did not experience any of the problems mentioned. This implies that the service of order taking could be enhanced due to the implementation of a convenient and fast online ordering system with real-time information about an order, increased customization, and a reward system might contribute to a large customer experience improvement at Ai-CHA (Ramli et al., 2021).

➢ Question 5 Analysis

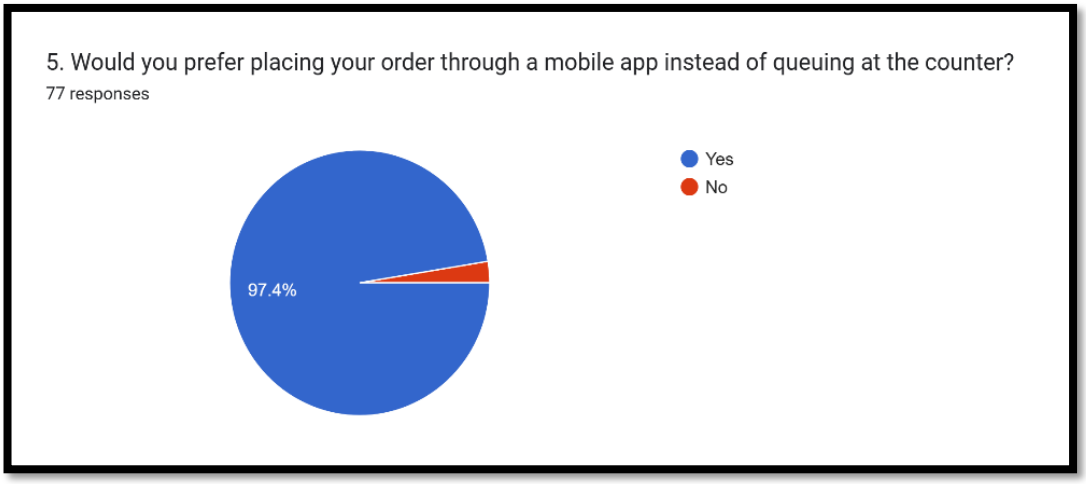


Figure 5.2.3 e: Result of Question 5

Figure 5.2.3 (e) shows the result of Question 5. An astounding 97.4 percent of respondents showed that they would consider making their orders at a web app instead of waiting in the line at the counter. This indicates a high preference over convenience and efficiency, and most customers are drawn to the convenience of using mobile apps to place orders, which would probably be based on time-saving advantages and the lessening of inconvenience of having to place orders in long queues at stores. Fewer percentages (2.6%) reported the contrary side, thus indicating a noticeable need to have a system to order meals on-the-go and make a customer experience better at Ai-CHA. The information is very much in favor of using web applications to place the order as per customer taste (Ramli et al., 2021).

➢ Question 6 Analysis

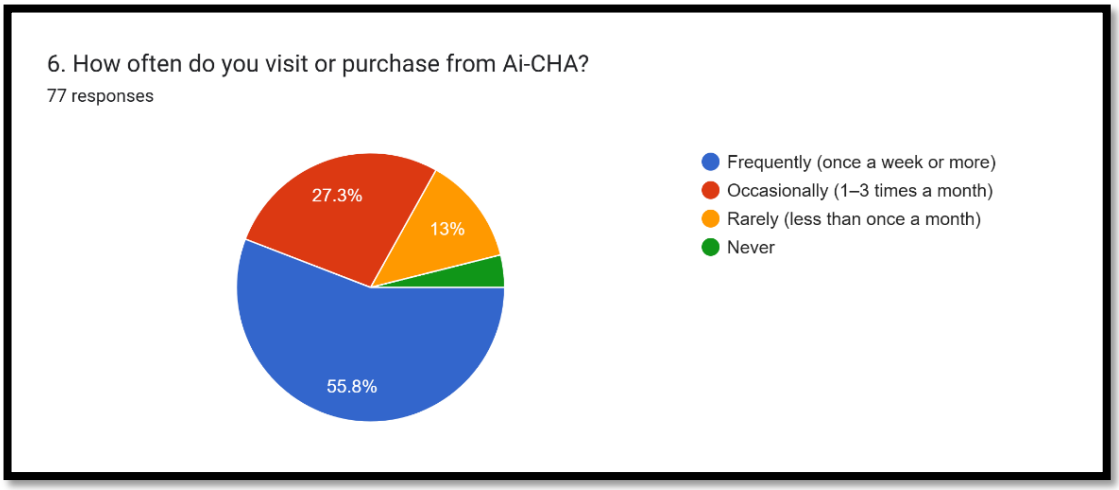


Figure 5.2.3 f: Result of Question 6

Figure 5.2.3 (f) shows the result of Question 6. Most of respondents (55.8%) expressed that they have visited or bought at Ai-CHA regularly, at least one time per week and beyond. It shows that there is a high level of customer base that interacts with the brand consistently, which implies that it has

developed a credible customer following. Besides, 27.3 percent of respondents said that they buy at Ai-CHA sometimes (1-3 times a month), 13 percent, rarely (less than once a month). An insignificant proportion of 3.9% are those who have never shopped at Ai-CHA which further portrays that the brand is quite popular among its local customer bases. The information shows that it represents loyal customers that can be expanded further in case a more convenient and effective online ordering system is introduced (Ramli et al., 2021).

➢ Question 7 Analysis

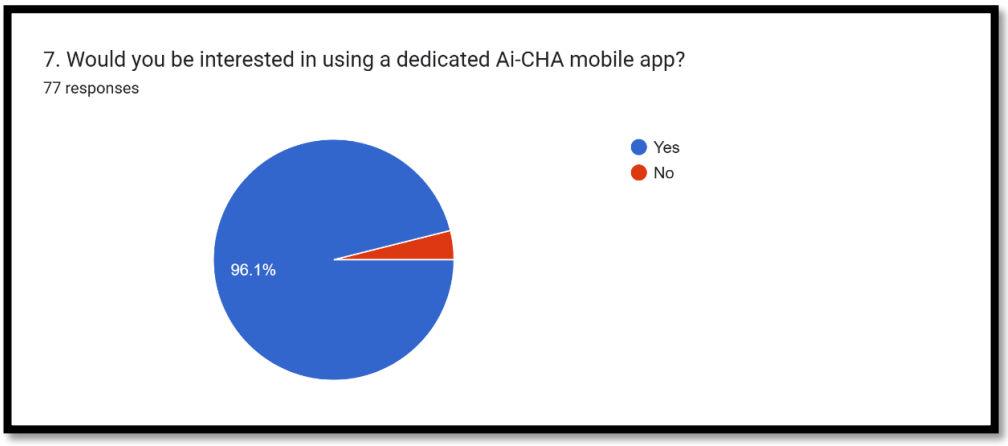


Figure 5.2.3 g: Result of Question 7

Figure 5.2.3 (g) shows the result of Question 7. The greatest number of respondents were eager to use a specialized Ai-CHA web application as 96.1 percent said they were interested, whereas only 3.9 percent were not interested. The high level of positive response means that there is a great need to implement a mobile application solution, implying that clients want a more convenient and efficient method of approaching the brand (Ramli et al., 2021).The existence of such a high level of interest justifies the suggestion that the decision to introduce a specific Ai-CHA web app could potentially increase customer interest, improve the order process, and the overall customer experience.

➢ Question 8 Analysis

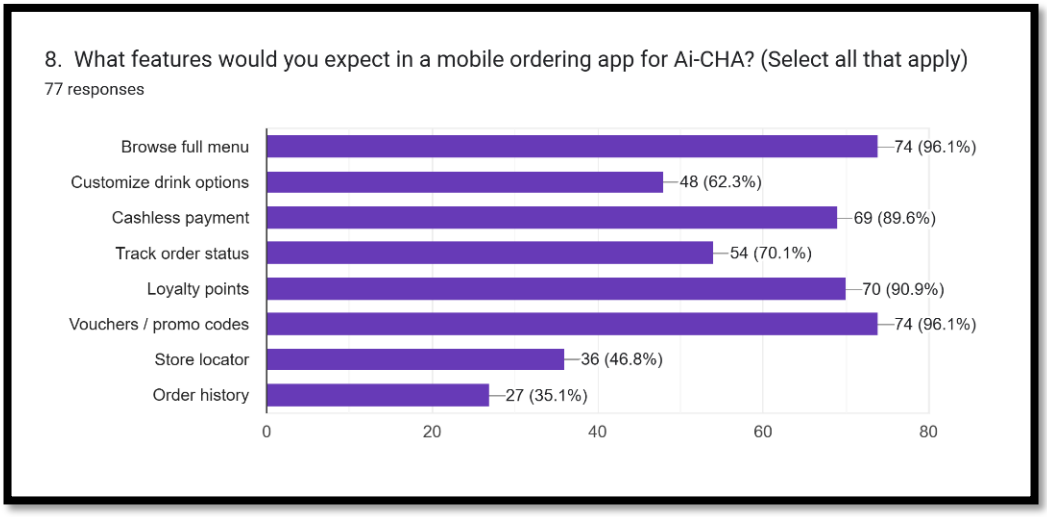


Figure 5.2.3 h: Result of Question 8

Figure 5.2.3 (h) shows the result of Question 8. The respondents also shared some major features that they would like to see in an online ordering app of Ai-CHA. The option of browsing full menu and using promo codes or vouchers was the highest popularity, as both features are chosen by 96.1 percent of the participants. The customization drinks options and cashless payments were also greatly attractive, as 62.3 and 89.6 percent of respondents were interested in these functions respectively. Other notable features included the ability to track order status (70.1%), loyalty points (90.9%) and store locator (46.8%). However, fewer respondents (35.1%) indicated interest in accessing their order history, suggesting it is not as essential as the other features. Such results give specific information about customers' preferences in online ordering, which will inform the development of functions of the Ai-CHA app (Ling et al., 2021).

➢ Question 9 Analysis

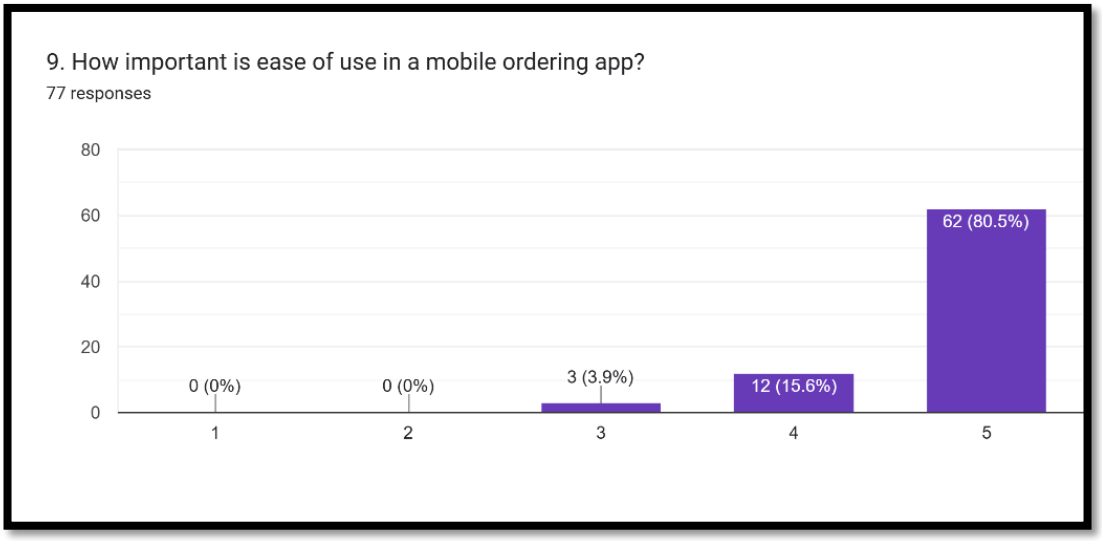


Figure 5.2.3 i: Result of Question 9

Figure 5.2.3 (i) shows the result of Question 9. Ease of use of an online ordering app was prioritized overwhelmingly by the respondents with 80.5 percent choosing the highest rating of 5, which could be interpreted to mean that ease of use is of extreme importance to respondents. Moreover, 15.6 percent of the respondents indicate the rating 4 and it indicates that a rather great share of the respondents considers usability as rather important. Very few, namely, 3.9 percent of the respondents rated it at 3 (important), and none rated it at three lowest choices of 1 or 2 (very not important and not important). This implies that a minimalistic and user-friendly user-interface is important to most users to improve their use of an online ordering app (Ling et al., 2021).

➢ Question 10 Analysis

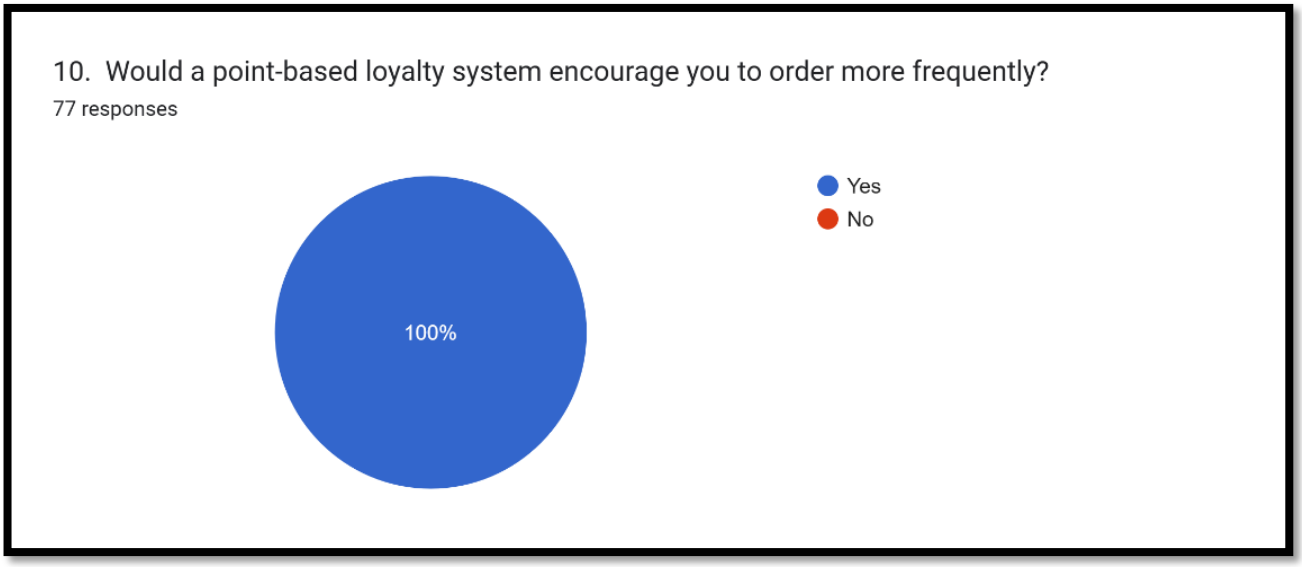


Figure 5.2.3 j: Result of Question 10

Figure 5.2.3 (j) shows the result of Question 10. The largest percentage of respondents (100%) indicated that they would be likely to order more often in case of a system with points as a part of loyalty program. This that there was no disagreement over the idea of a loyalty program which literally engages customers and offers them rewards on the purchase. The fact that there is massive support for this system means that customers appreciate incentives and are driven by rewards themes, and this should be considered an important place to incorporate in the Ai-CHA web application (Lakshman & Faiz, 2021).

➢ Question 11 Analysis

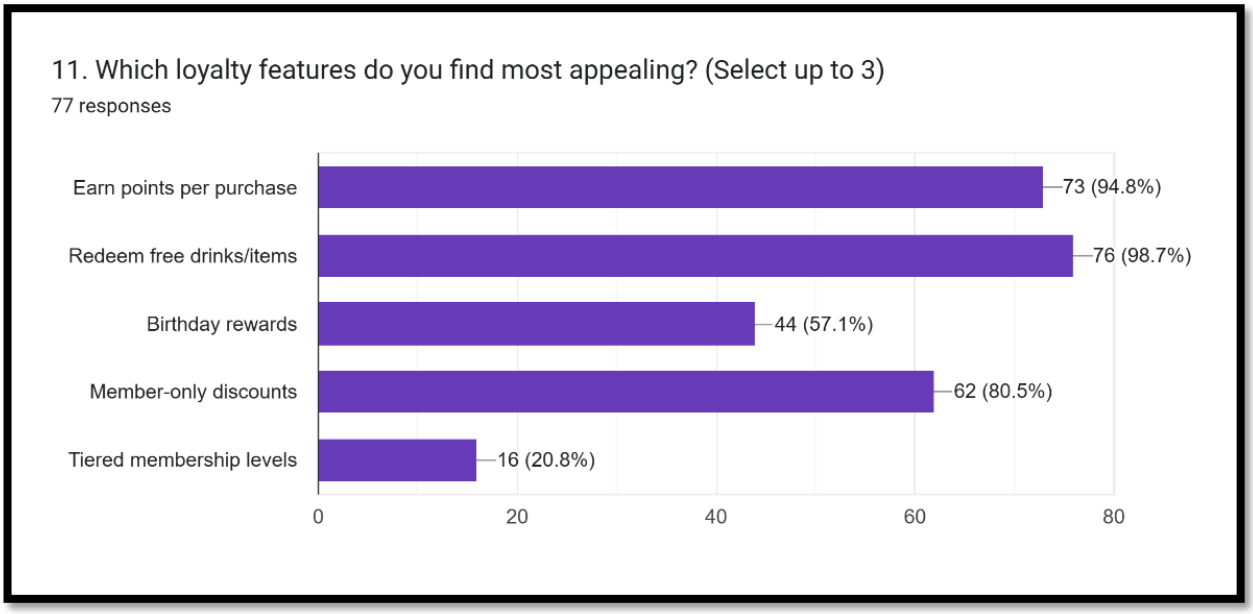


Figure 5.2.3 k: Result of Question 11

Figure 5.2.3 (k) shows the result of Question 11. The answers point out the most attractive loyalty aspects that customers would desire in an online ordering system of Ai-CHA. The capability to redeem free drinks or items was voted by 98.7 percent of voters as the most popular feature followed by the gaining of points per purchase, which was voted by 94.8 percent. Moreover, 80.5 percent of participants showed their concern with member-only discounts whereas 57.1 percent revealed their concern with birthday rewards. Tiered membership levels were the least attractive aspect whose selection was preferred by just 20.8 percent of the respondents. The findings stress that customers put much emphasis on such tangible rewards as free items and points gained due to purchases offered, and therefore these options should be the cornerstones of the web application-based loyalty program at Ai-CHA (Lakshman & Faiz, 2021).

➢ Question 12 Analysis

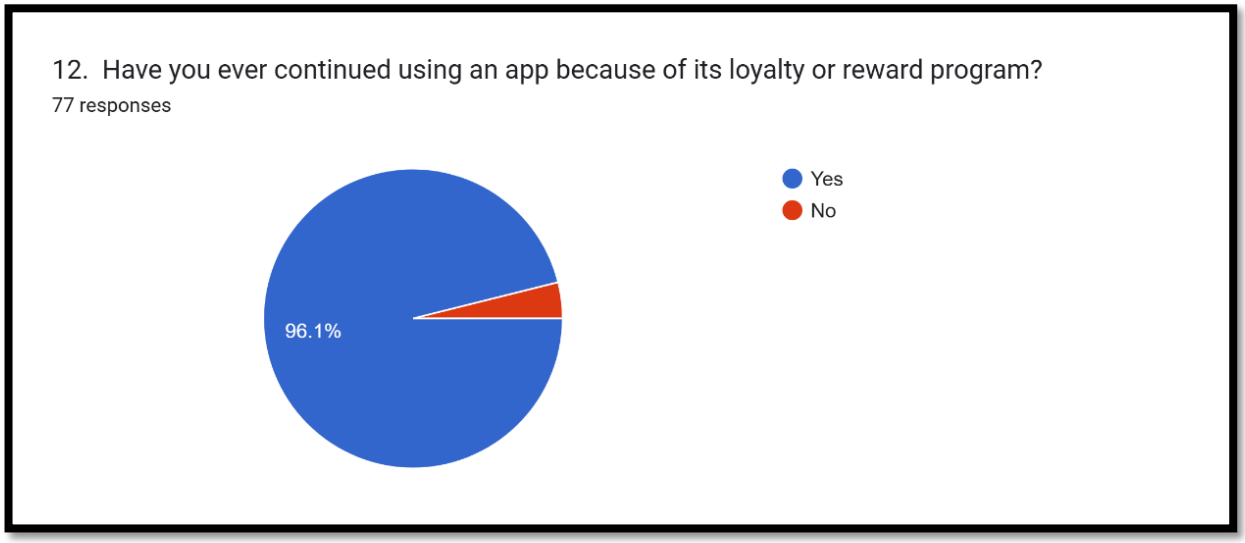


Figure 5.2.3 l: Result of Question 12

Figure 5.2.3 (l) shows the result of Question 12. An overwhelming majority, 96.1 percent of the respondents claimed that they have at some point been using an app based on its loyalty or rewards scheme, making the importance of loyalty or reward schemes in customer retention even more visible (Lakshman & Faiz, 2021). A total of 3.9 percent of respondents replied that it did not make them continue using this app. This implies that loyalty and reward systems are vital to prompt repetitive interaction and customer loyalty and are, therefore, an important characteristic that Ai-CHA needs to bear in mind in the web app to enhance the user retention and satisfaction levels (Lakshman & Faiz, 2021).

➢ Question 13 Analysis

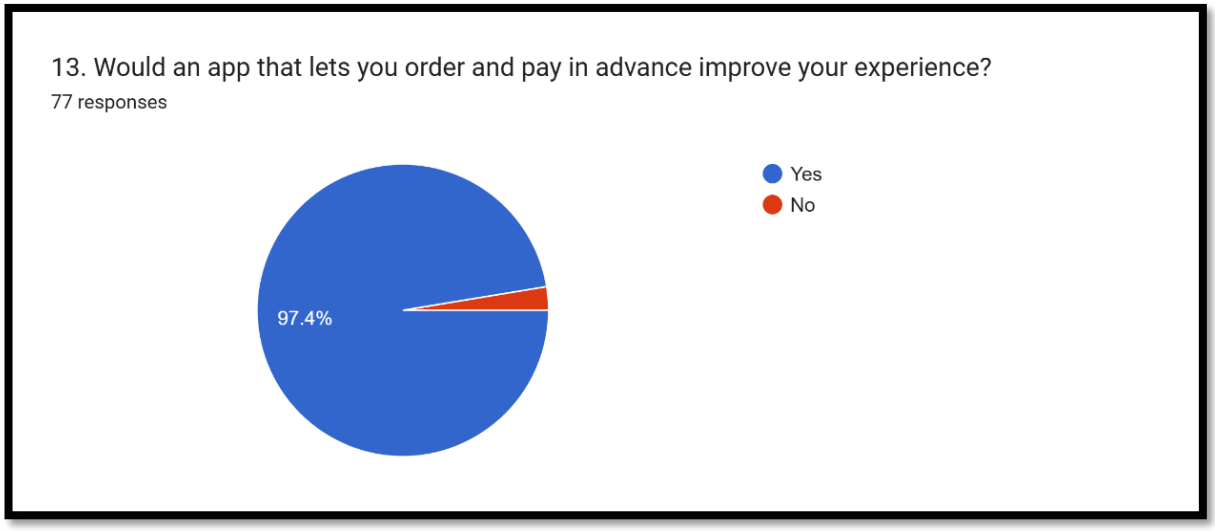


Figure 5.2.3 m: Result of Question 13

Figure 5.2.3 (m) shows the result of Question 13. The result was startling when 97.4 percent of the respondents said they would prefer an app which enables them to place their orders and pay before they arrive. This overwhelming positive testifies to the fact that the idea of pre-ordering and paying with the help of an app appeals to the customers as it provides comfort and saves their time, which, in turn, might assist in making the process much smoother and avoiding such long queues (Kharel et al. 2022). There was a dissent of only 2.6% of the participants who replied No to this question, which illustrates that most of the users understand the advantages of having such a feature in the system to enhance the overall ordering process. Consequently, that functionality may be of great value both to the client satisfaction and the efficiency of the work (Ling et al., 2021).

➢ Question 14 Analysis

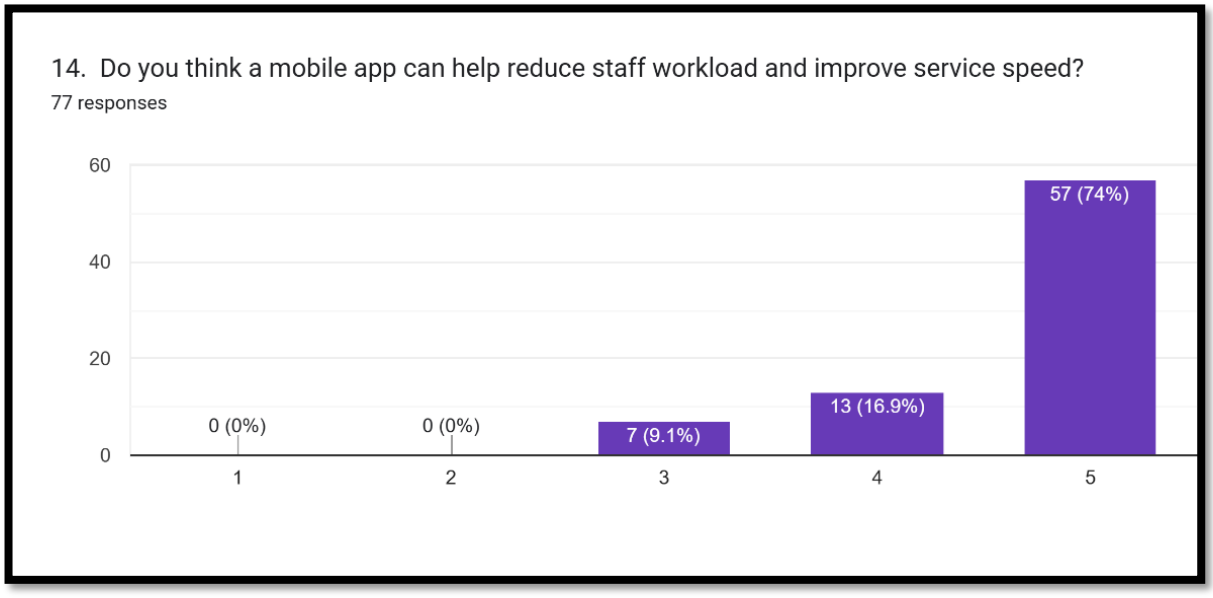


Figure 5.2.3 n: Result of Question 14

A significant 74 percent of respondents really agreed (on a score of between 5 and 5) that web apps would assist in decreasing the workload on staff and getting the services faster. This was followed by 16.9 percent of the respondents who gave it a fourth mark, which is an indication that majority of the customers are seeing the possibility of a mobile application to boost operational efficiency. The percentage of those who gave the impact of the mobile app scale 3 (neutral) was only 9.1 percent and none of the participants gave a rating of 1 or 2 (strongly not agreed and not agreed), implying that there is a consensus in the view of positive influence that a web app may have. This indicates a high level of expectation regarding the deployment of a web application that would influence the efficiency of operations and staff productivity and delivery of service (Mponela et al., 2024).

➢ Question 15 Analysis

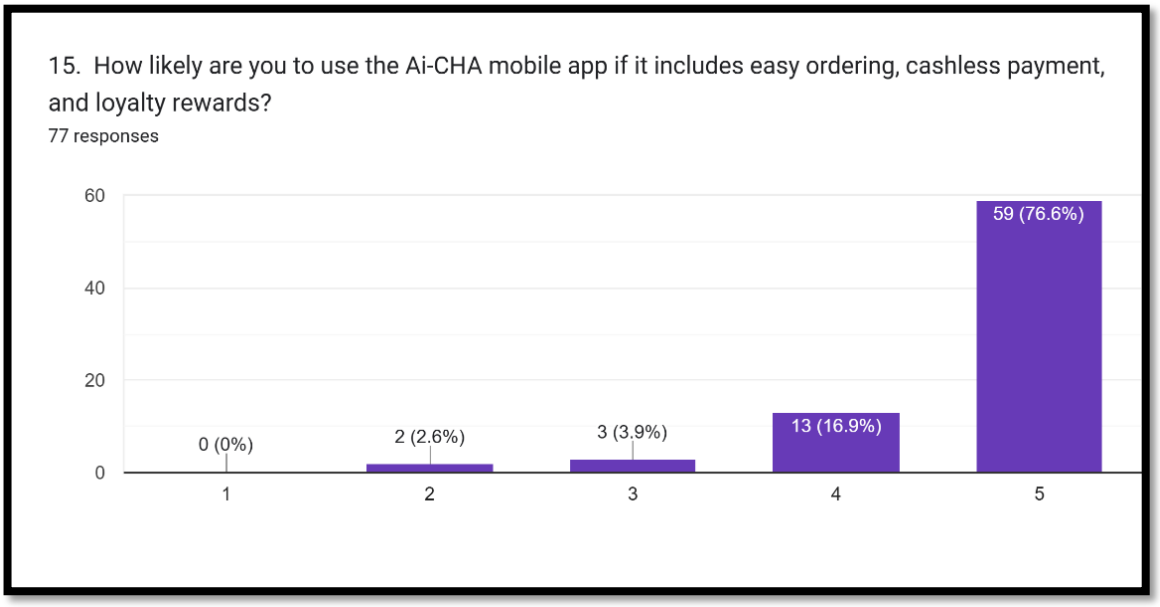


Figure 5.2.3 o: Result of Question 15

Figure 5.2.3 (o) shows the result of Question 15. Majority of the respondents (76.6%) indicated that they were highly likely to utilize the Ai-CHA web application in case it contains an easy ordering, cashless payment, and loyalty awards and rated it at 5. Also, 16.9% graded it as 4 and this is a sign that majority of people would find these features very attractive and would inspire them to use the app. The results of the survey show that the percentage of people showing low interest was only 2.6 percent, and the value of the appeal scored 2 (unlikely) when it comes to this specific app. 3.9 percent of people showed an equally neutral value of 3 (neutral). This implies that these features are highly appealing to the customers and could be used as a trigger to engagements (Mponela et al., 2024).

5.3 Use Case Model

In this section, the use case model describes the core functionalities of the Ai-Orders web application and how different users interact with the system.

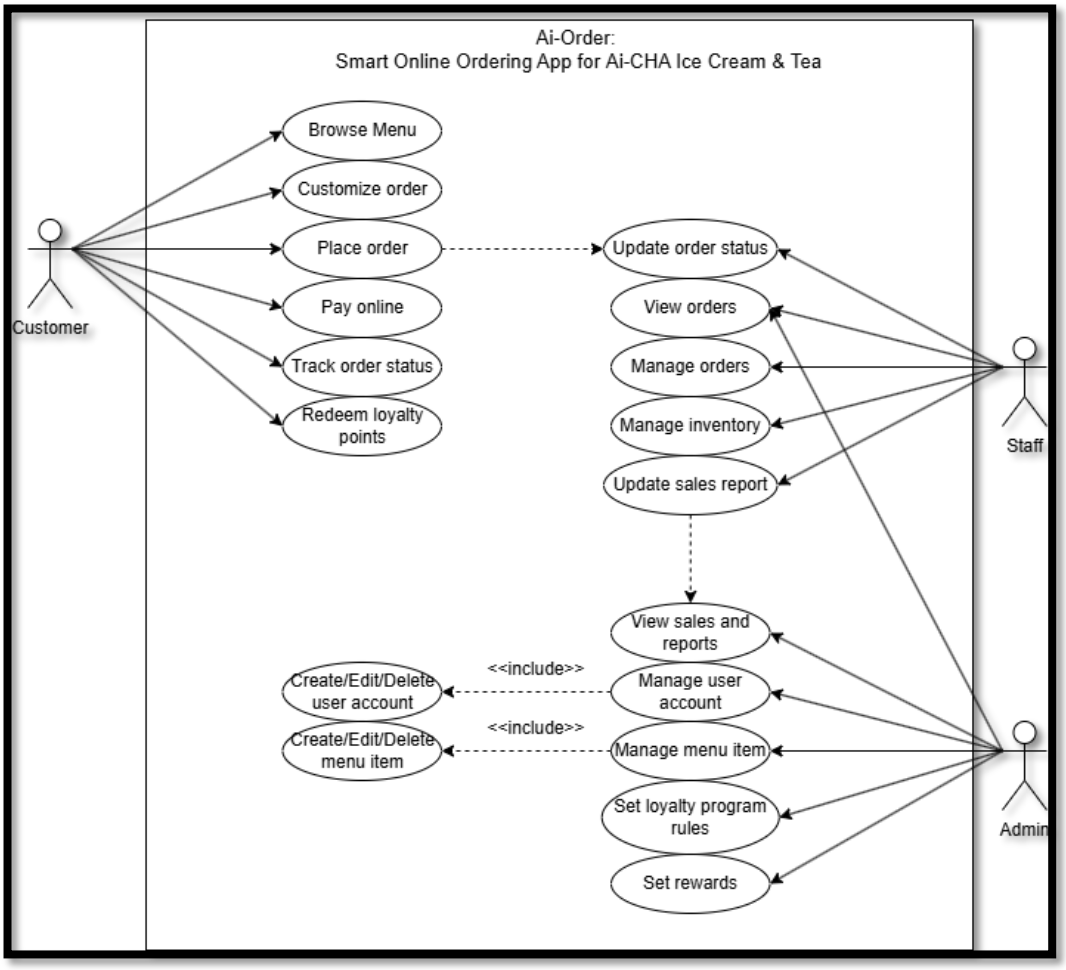


Figure 5.3 a: Use Case Diagram

The above figure 5.3 (a) presents the use case diagram of the Ai-Orders online ordering app, which illustrates the interaction of three main user roles Customer, Staff, and Admin. Depending on respective duties, each of the roles has access to certain features. The customers can go through the menu, order customization, order and pay online, check order status and order redemption points. Staff are involved in basic working duties like updating order status, viewing and management of orders, managing inventory and updating sales reports. Admin actor Here the actor has access to more system management such as user accounts, menu items, setting loyalty program rules, setting rewards, and sales reports.

The use case diagram also included relationships to display reusable or dependent actions that are shared by many actors which allow modularity and system integrity (Sommerville, 2022). Such defined way lets making use of role-based access control and introduce effective workflows along all objects of the Ai-Order system. Use case models is one of the core elements of system analysis that assists in explaining the functional requirements of all user types (Sommerville, 2022).

5.4 Flowchart

A flowchart is a graphical representation that provides the procedures and choices for accomplishing a task or work that needs to be done. It has standard symbols which are rectangles, used to denote actions, diamonds to denote the decision and arrows to denote flow of control (Hebb, n.d.). With the references to the Ai-Orders system, flowcharts will serve as the visual representation of the dynamics of the interactions among three key actors of the system: Customer, Staff, and Admin. The diagrams assist in having a logical structure of each of the user processes, enhance interaction between stakeholders, and as guidelines in the development and testing of the system (Lucidchart, 2023).

5.4.1 Customer Flowchart

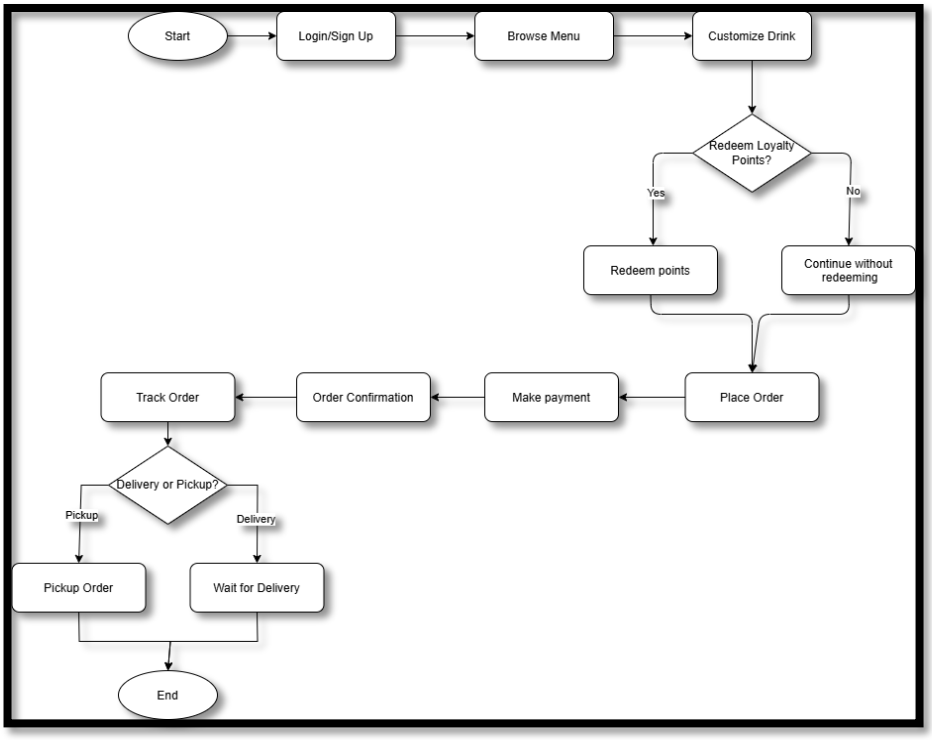


Figure 5.4.1 a: Customer Flowchart Diagram

The Figure 5.4.1 (a) above shows the Customer Flowchart of the Ai-Orders web application which has a visible sequence of actions performed by a customer in making an order. Proceedings start by a customer either logging in or signing up to use the app. After authentication, the customer goes through the menu and places an order on customized preference depending on the level of sugar required, choice of toppings and size. This is followed by a decision point whereby the customer is asked to decide whether to redeem loyalty points or otherwise. When they press yes then the reward redemption request is processed in the system and when they press no then the user proceeds to the next step. This choice making rational enables flexibility of user experience and encourages the loyalty system. It is also a necessary element of customer engagement improvement (Nguyen & Lim, 2021). After the customization and loyalty redemption processes, the user gets the order and follows through the order by secure payment through the installed cashless payment methods.

After making a successful payment an order confirmation appears. Another decision point is then presented to the customer where he/she is offered an option of picking up or of having the product delivered, which is another flow in the flow. Depending on the choice, the customer will either wait for it to be delivered or later collect the order. Also, the system allows real-time monitoring of their order so that the customers can know where their order is. This well-organized, and intuitive process denotes the best practice in UI/UX design and allows a user to have smooth experience throughout the customer journey (Lucidchart, 2023). The navigation process implemented through the flowchart will be both intuitive and short of delays, enhancing the satisfaction and reducing the organizational burden on the Ai-CHA employees.

5.4.2 Staff Flowchart

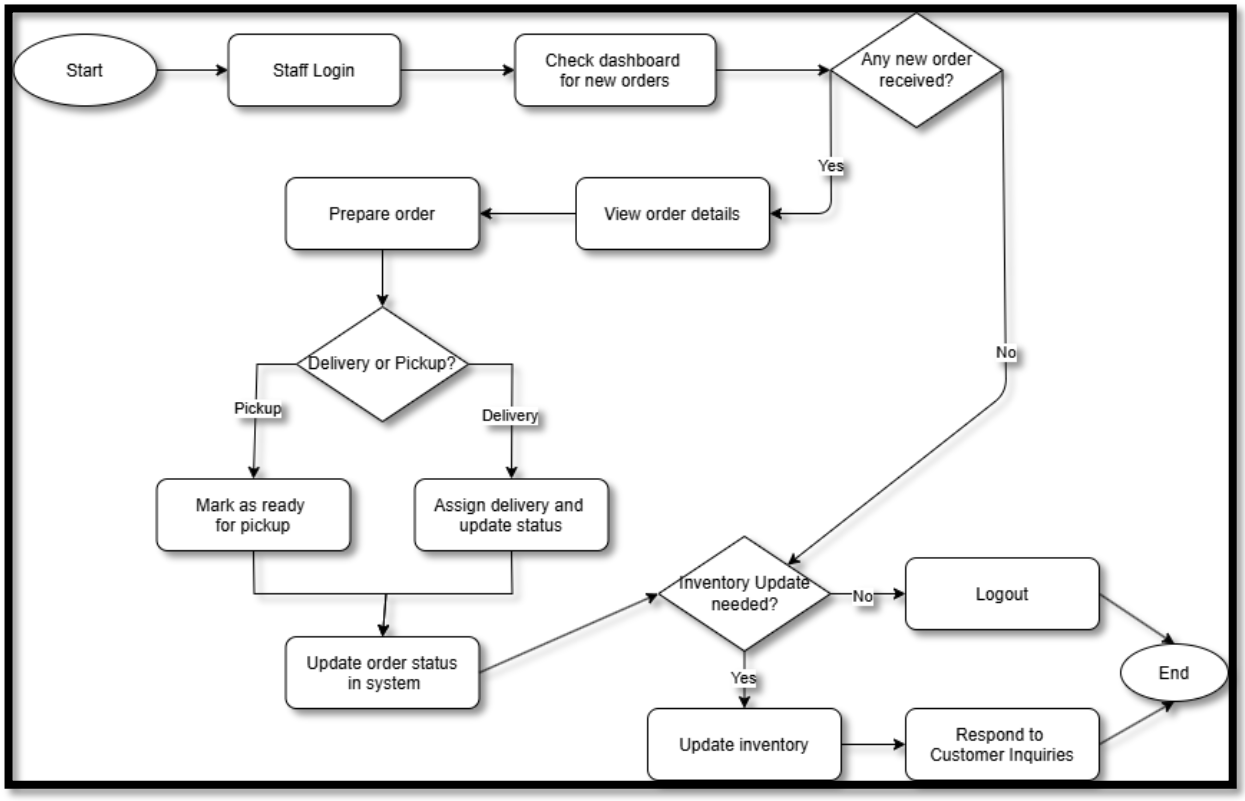


Figure 5.4.2 a: Staff Flowchart Diagram

Figure 5.4.2 (a) above represents Staff Flowchart of the Ai-Order system, the process describing the working process undertaken by the staff members in the attribute of managing the orders placed by the customers. The module starts with logging in with the staff and opening the dashboard to see any new orders. In case a new order arrives, the employees get to see the details of the orders and start creating the order. Once prepared, a choice option is provided whether an order will be delivered or fetched. In case it is a pick-up, then it is marked that the order is ready and in the case of delivery, the delivery staff is assigned and accordingly updated. Such a system will fast track every order by making sure that it is received and implemented in a timely manner so that there are fewer incidences of miscommunication and fixing up during business peak hours (Som e et al., 2023).

After the handling of the order preparation and delivery or pickup, the members of the staff will have to update the order on the system. The other node of decision involves whether inventory update is necessary. In case of an inventory change after recent orders, the staff receives a prompt to refresh the inventory to ensure real-time accuracy of the inventory level. When the said inventory jobs have been done or are not yet needed, the process would involve handling the customer orders or inquiries so as to maintain constant contact and service. Lastly, the staff members log out to close their session. This step-by-step cycle improves the efficiency of the operation, reduces the number of mistakes in orders, and aids more effective inventory management. It can also be seen as a response to current approaches to automating processes using digital tools, which focus on the high degree of automation of a company to minimize the impact of human error and maintain customer satisfaction (Pressman & Maxim, 2021; Som e et al., 2023).

5.4.3 Admin Flowchart

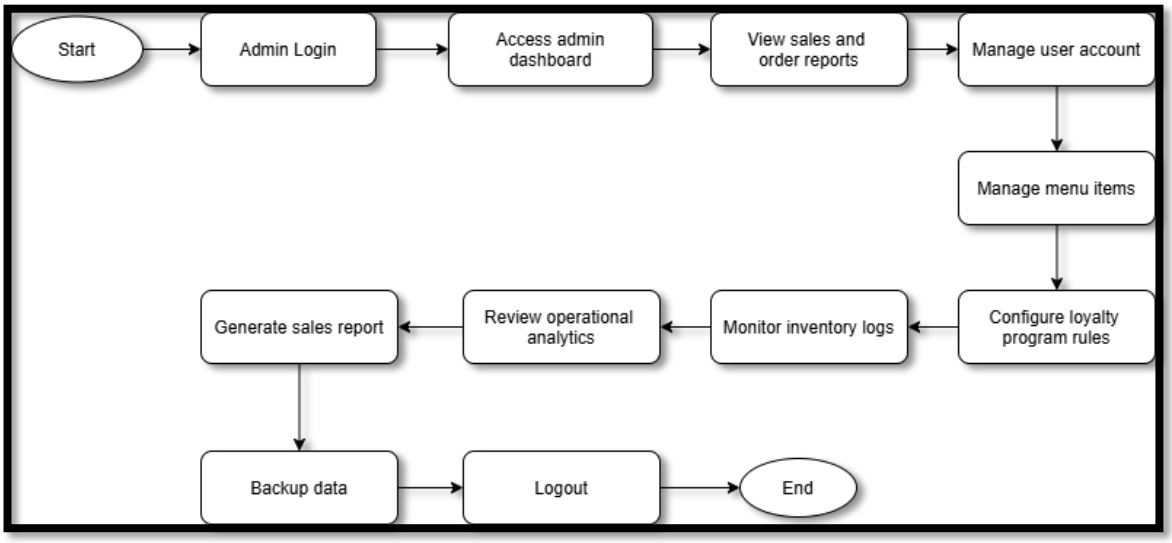


Figure 5.4.3 a: Admin Flowchart Diagram

Figure 5.4.3 (a) is the Admin Flowchart of the Ai-Order mobile application and includes the major administrative tasks that are involved in making sure that the system always runs efficiently in a secure manner. The administrator logged into the system after which he or she is given a centralized dashboard, which will act as the control center of backend management. With this dashboard, the admin can carry out user management options which is the creation, editing or deletion of customer and staff accounts. This involves changing passwords, role assignments and role covering allowing rights. Moreover, it is the work of an admin to edit menu entries. This involves changing the availability of items, its prices, description, and pictorial representation so that customers can see the most accurate and current items available in the app (Pressman & Maxim, 2021). The flexibility to set the custom settings of loyalty programs enables the admin to specify the rules on how to earn and redeem the points and create the flexibility to manage promotions and customer engagement strategies to match different business objectives (White & Miers, 2021).

In addition to the management of content and the user, the admin is also indispensable in analytics and monitoring of the system. The flowchart features the tasks of producing the sales reports and overviewing operational analytics which are necessary in order to define trends in the performance and make well-informed decisions. To use one example, Ai-CHA, the manager can devote more resources to manufacturing those kinds of products that sell best, to find out the most appropriate time to make orders to reduce wastages. Tracking inventory records will enable the admin to know of any such changes in stock which would help to prevent shortages or excessive stocking. The other important activity within the flow is the consistency of data storage and backup in case a system crashes or is attacked by hackers. This implies that this process will validate system reliability and be in line with the best practices in information system governance. The flowchart of the orderly working process in the company, which is provided by its admin, is essential to the business due to ensuring its continuity, optimization of the working system, and strategic plans, that is, its scalability and resilience (White & Miers, 2021; Nguyen & Lim, 2021).

5.5 BPNM (Business Process Modelling Notation)

BPMN diagram is a standard visual presentation and representation in Ai-Order of business processes or workflows. It includes the cooperation of the actors between Customer, Staff and Admin, and proves how all of them are involved in the whole process of ordering. BPMN charts include definitions of workflows such as events (circles), activities (rectangles), and gateways (diamonds), which are simple and concise notations, that can help both technical and non-technical stakeholders to comprehend the functioning of the systems (Object Management Group, 2022).

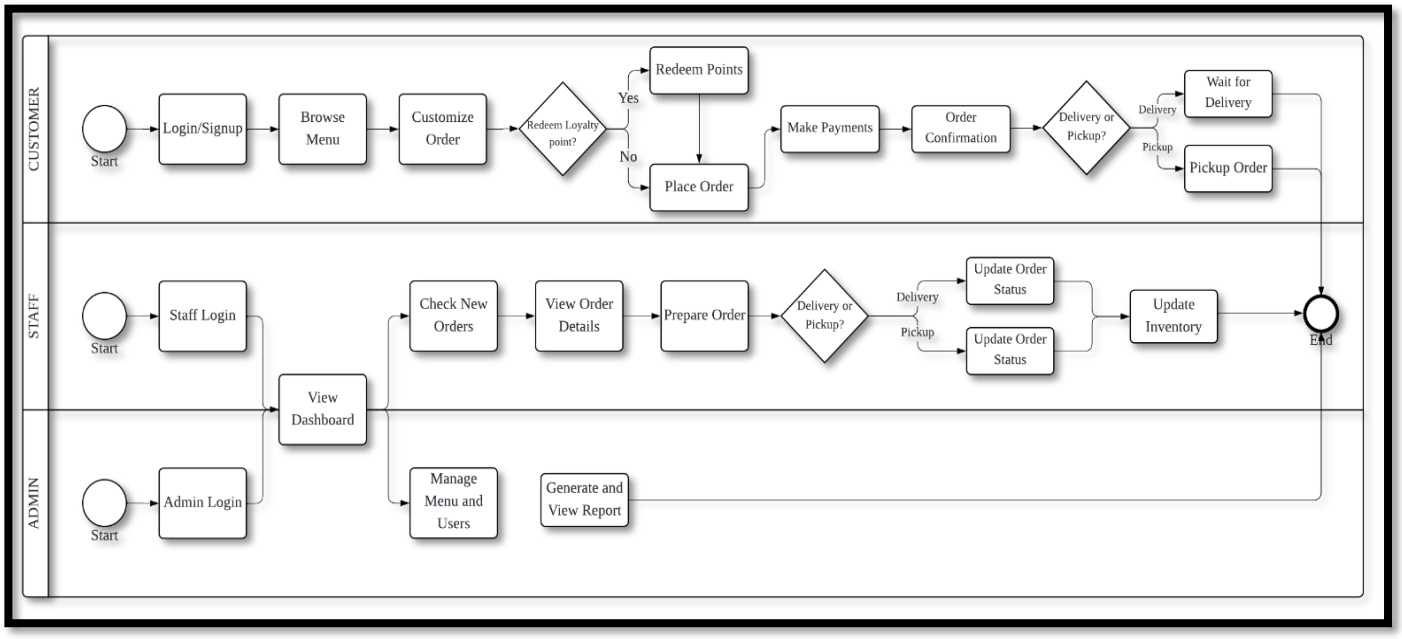


Figure 5.5 a: BPNM Diagram

Figure 5.5 (a) displays the Business Process Model and Notation (BPMN) diagram for the Ai-Order system, which systematically represents the flow of operations of the three key participants Customer, Staff and Admin. The diagram depicted in a swimlane format allows visualizing boundaries between the roles of each actor and distinguishing between them so that the processes can be organized as per each participant in the process. In the customer queue, this process starts by logging in or registering, selecting the menu, customizing it, and right after that, either use loyalty points or not, make an order, and final payment. The customer must place the order and then he/she can choose whether to pick it up or have it delivered, and the customer has the ability of tracking his order in real time. This front-end workflow contributes to the greater customer experience, improving interaction and reducing the level of friction in the buying phase (Munoz & Dumas, 2022).

On the Staff swimlane, the tasks start by the employees logging-in to the system and checking new orders. Then the staff gets the order and checks the details, makes the items and sets the order as available to collect or makes the order ready to deliver. Staff will also track and alert inventory positions as well as updating inventory levels to ensure efficient and precise operations. In the meantime, Admin swimlane is used to control the back-end system operations such as logging in to the administrator

panel, updating menu entries and user accounts, and creating the billing analysis sales reports. These practices promote the efficiency of the operations, precision of data, and corporate management. The BPMN format makes all dependencies of the processes highly visible and effective as they allow the stakeholders to work together and streamline the entire ordering process cycle (Gonzalez & Gutierrez, 2023). Such an approach to modeling corresponds to the current trends in the uncovered BPM that traces its history to the service business where automation of service processes and their transparency are prioritized (Gonzalez & Gutierrez, 2023).

5.6 Conclusion

In this chapter, a complete analysis of the Ai-Order system was performed, and it was seen how the Ai-Order system reduced the operations and user-based issues in the Ai-CHA Ice Cream & Tea business. The review started with a collection and assessment of requirements of both the customers and the staff via observation and questionnaires. The experiences showed a high demand for a digital ordering solution with a capability to have self-service features, minimize waiting time, improve the accuracy of orders, and include loyalty programs as they would become the drivers of customer retention. Such results were used in setting functional and non-functional requirements of the system and thus not only able to perform key functions in the application such as placing orders and tracking inventory but also to provide an easy and assurable experience (Pressman & Maxim, 2021).

The use case model has provided clear details of how three actors with names Customer, Staff, and Admin interact with each other and what kind of responsibilities each of them has and what set of functionalities of the system they have access to. It was also supported by the construction of more elaborate flowcharts specific to each actor with their processes and interaction with the system displayed. This group of processes could be connected in the BPMN diagram, which allows visualizing the whole picture of the business workflow and dependencies within the system on its high level. This chapter has provided a good groundwork towards the creation of Ai-Order, since it linked conceptual creation with practical application areas. Finally, the analysis will ascertain that the system satisfies business expansion and operations efficacy besides functional demands of Ai-CHA (Object Management Group, 2022; White & Miers, 2021).

6 DESIGN

6.1 Introduction

A design is a very important stage of the development of the Ai-Orders system, that translates the requirements of the analysis step into an actionable plan of blueprint. This stage is important in making sure that every aspect of the system is well planned and organized to be implemented easily. It entails coming up with user-friendly interfaces, powerful database as well as efficient workflow and at the same time keeping the system secure. Krysik (2023) asserts that design phase will not only focus on the visual and functional part of the system, but it will also lay down a base upon which the system will be developed, to steer the team to a smooth deployment. Within the framework of Ai-Orders, the design stage will be aimed at the development of user-friendly interfaces among administrators, branches, counters, kitchen and customer, the construction of safe and effective backend architecture, and the arrangements of the data flow to facilitate real-time transactions and interactions.

6.2 Interface Design

The Ai-Orders system will not be successful without interface design since it determines the way users will operate within the platform. According to Johnson (2021), not only aesthetics are the priorities of the UI design, but also usability is the point that guarantees that the platform itself is intuitive and user-friendly. In the case of Ai-Orders, the interface design shall encompass the five main user roles including administrators, branch, counter, kitchen and customer. The design should be user-centric, as proposed by Nielsen and Molich (2021), whereby each component is put to help the user comprehend and navigate it, which results in a more pleasant experience.

6.2.1 Web Apps (Customer Interface)

One of the major components of the Ai-Orders web app is the customer interface. It should be attractive to the eye and should give the customer an easy method of communicating with the menu, formulating their own orders and payment. The design will make it possible so that the customer can navigate through the menu items and make their choices without taking a lot of steps to check their cart and to check out. Order status and payment confirmations will also be included in the notifications, which will add to the overall user feedback. This interface will be designed using the principles of modern UI/UX, which is accentuated by Norman (2021), as it will ensure a pleasant and uninterrupted experience that will stimulate returning to the orders and an increase in customer satisfaction. Accessibility and design will also guarantee that the app can be used by as many different types of users as possible, such as those with disabilities (Shneiderman et al., 2022).

6.2.1.a: Authentication Page

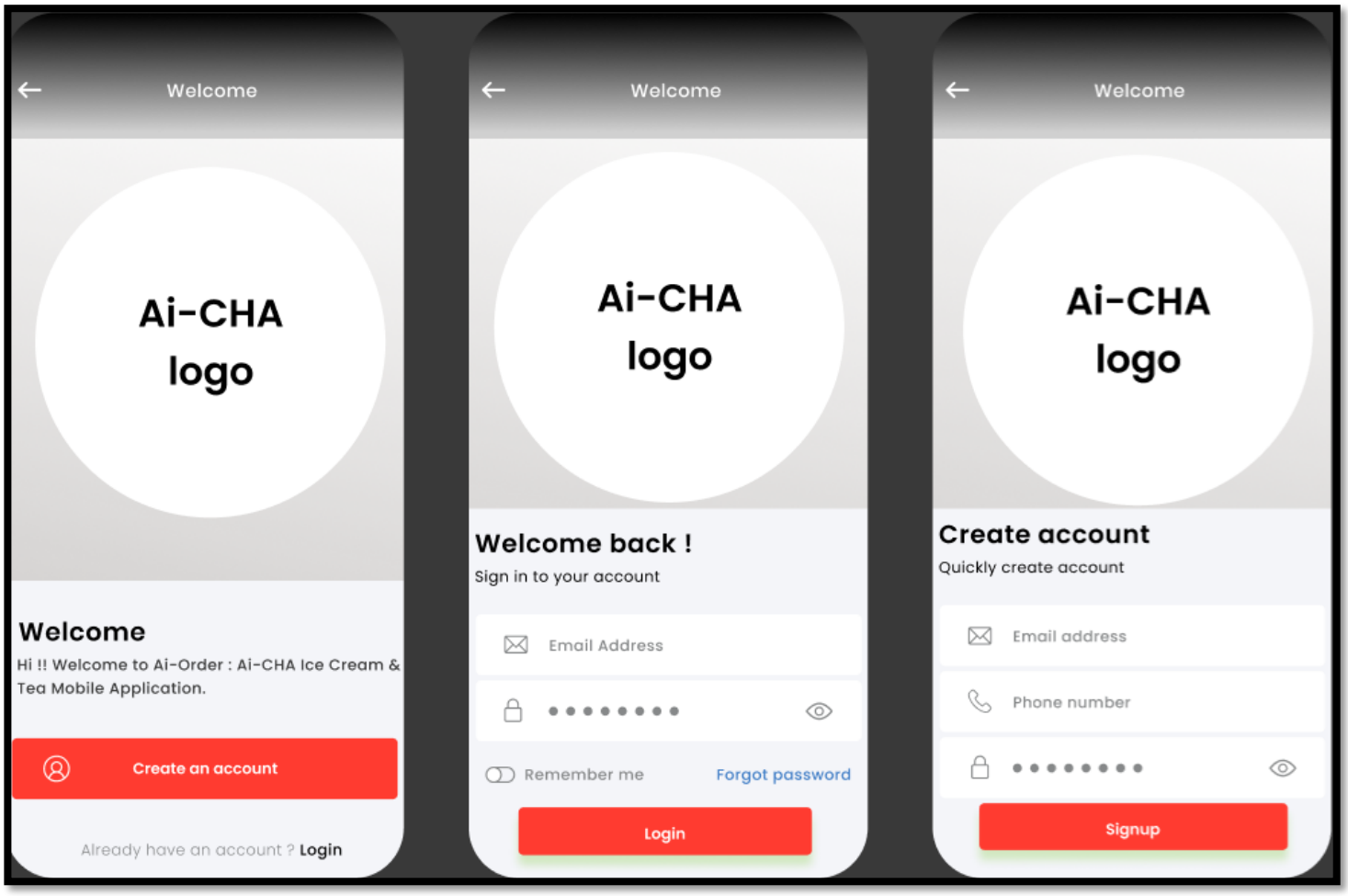


Figure 6.2.1 a: Authentication Page

Figure 6.2.1(a) shows the authentication pages of the Ai-Orders web app. The initial screen is a short introduction to the site to new users who are given a choice to create an account. The second screen is that of returning users, which offers a Welcome back! message and a login form in which the users are allowed to insert their email and password. There are also options in the login page in which the user can either remember their credentials or change their password in case of need. The third screen will be focused on the creation of a new account where the user would have to provide their email address, phone number, and password. The bottom button completes the account creation process through a signup button. The design makes the transition between one task to another smooth, with noticeable call-to-action elements, like the creation of an account and a login button, enabling the customers to use the features of the app fast.

6.2.1.b: Home Page

Figure 6.2.1 b: Home Page

Figure 6.2.1(b) shows the home page of the Ai-Orders web app. The user is welcomed to a customized message on the top of the screen, which is, Good Evening, Fadhil Amin! as well as a synopsis of their present balance in RM and accumulated Ai-Points (PTS). Established below this, there is a Promotions section which is in the spotlight with one being able to check out any promotion or offers going on which adds excitement to the usage and provides incentives to keep on using the app. The section of the best sellers shows the popular dishes, which give the user a direct way to trending products. The icons of the navigation are displayed at the bottom part of the screen, and the user can easily navigate through the main sections of the app using clear navigation icons i.e. Home, Menu, Order, Reward and Profile. Order Now button is developed in a catchy red color and thus finding an action and order within a short period of time is easy. This design guarantees a friendly, efficient and interactive experience with the key information on the frontline.

6.2.1.c: Pickup Store Page

Figure 6.2.1 c: Pickup Store Page

Figure 6.2.1(c) shows the pickup store page of the Ai-Orders web app. On this page, the user is given a choice of Ai-CHA store of his or her choice to pick up the orders. There is a search bar on top of the page, and the user can easily locate the stores by location. The closest Ai-CHA store to the user is highlighted below the search bar, and hence the user will find it easy to use the closest one. The list shows several locations of Ai-CHA stores, containing their names and a blank space where the full address should be. The users only need to tap on any store in order to make it their pickup point. The navigation icons of the app Home, Menu, Order, Reward and Profile are also provided at the bottom of the screen and can be easily used to navigate the app. The design makes the process of selecting stores in the store a smooth and efficient way of doing things as each user will be directed to the desired pickup location.

6.2.1.d: Menu Page

Figure 6.2.1 d: Menu Page

Figure 6.2.1(d) shows the menu page of the Ai-Orders web app. On this page, they can navigate through the menu items offered on the page according to the category of Boba, Fruit, Dessert and Coffee. The name of the store and the time of pickup are shown on the upper right-hand side of the online store, so users will always be aware of where and when their order will be ready. Top Picks section lists the popular items, and each of the items is also displayed with the image, name, and price. Users will be able to tap on the items that they desire with ease. Under the menu items, there is a summary of the chosen items, the order total price, and the checkout. Necessary sections are easily accessed via the bottom navigation bar: Home, Menu, Order, Reward, Profile, providing flawless and easy access to the needed areas.

6.2.1.e: Order Customization Page

Figure 6.2.1 e: Order Customization Page

Figure 6.2.1(e) shows the order customization page of the Ai-Orders web app. On this page, the user is able to customize their order by picking their choices of cup size, level of sugar and add-on toppings. The item image and name are shown on the page with the short description of the item. In terms of the cup size, the users may select the type of cup size which may include Regular, Large and Hot with their corresponding costs. Sugar Level: depending on the tastes, the sugar level may be set to Normal Sugar, Half Sugar or No Sugar. Also, users have the option to add toppings like Boba, Grass Jelly or Coconut Jelly at an extra charge. The final cost of the personalized order is shown in the bottom, and the Buy Now and Add to Cart buttons are present. The navigation bar located at the bottom will give immediate access to other pages such as Home, Menu, Order, Reward and Profile with ease and smooth customization process.

6.2.1.f: Order Cart Page

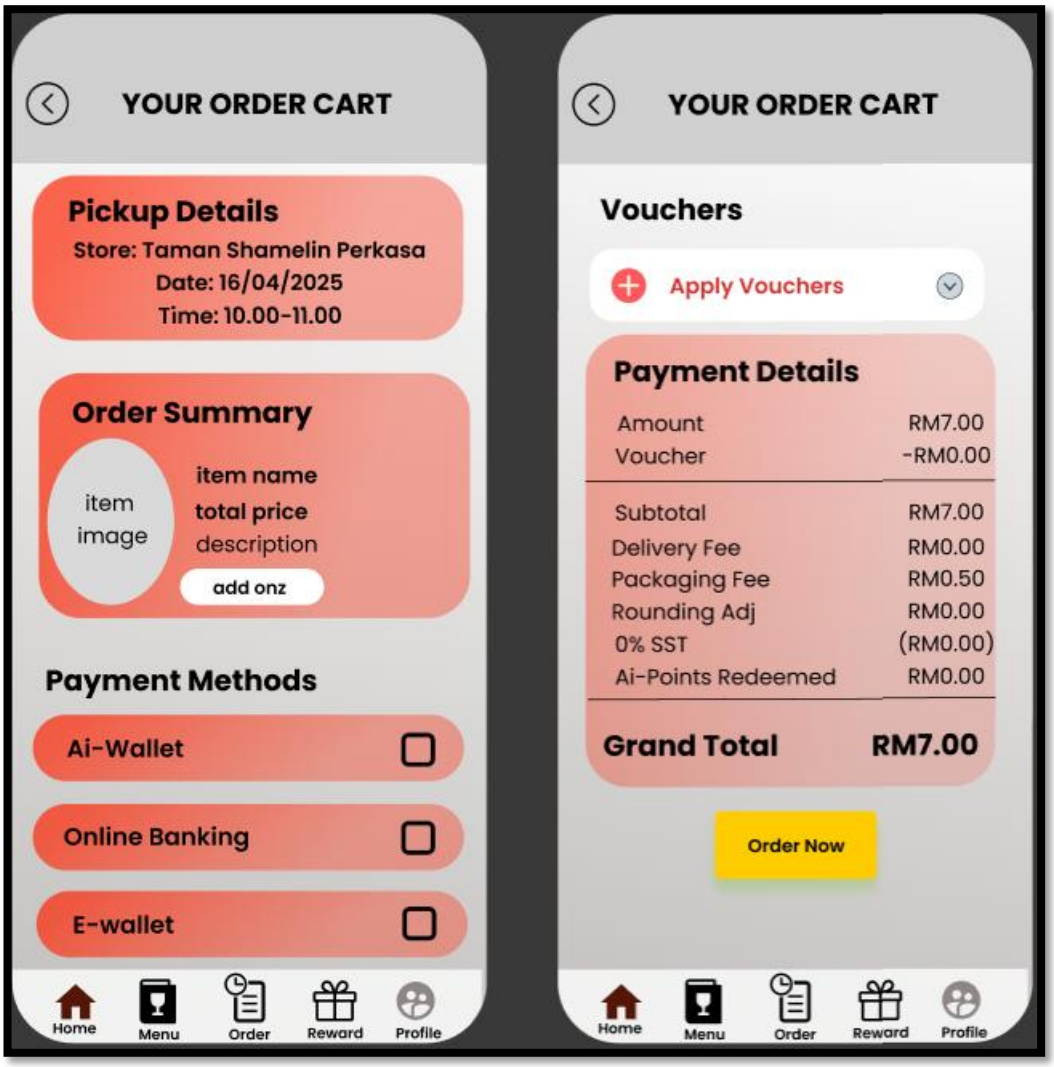


Figure 6.2.1 f: Order Cart Page

Figure 6.2.1(f) shows the order cart page of the Ai-Orders web app. Here, the user is able to view his/her order to go ahead with payment. The pickup details section shows the store, date and time of pickup of the orders. Order summary section is quite a detailed list of the items ordered with a description, name, and price of the item ordered and offers an option of adding more items. Users are allowed to choose their favorite mode of payment that includes Ai-Wallet, Online Banking, or E-wallet. The vouchers section will permit users to apply for any discounts or any promotions to make their order more affordable. The payment details at the right side are summarized, the total amount, the subtotal, the fee to deliver the product, and the fee to package the product, and the Ai-Points redeemed. The total is shown at the bottom, and the user can go ahead and tap the Order Now button to make the purchase. The layout offers convenience in use and is designed in clear and well-structured segments to go through the order and make the payment.

6.2.1.g: Order History Page

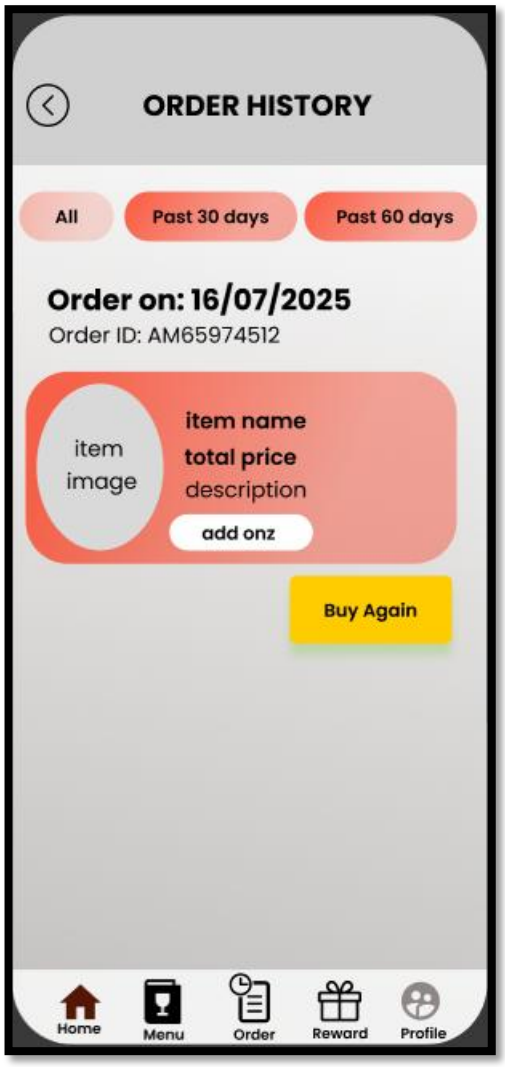


Figure 6.2.1 g: Order History Page

Figure 6.2.1(g) shows the order history page of the Ai-Orders web app. This page enables the user to see their recent orders, and it can be filtered to All, Past 30 days, and Past 60 days to make the user easy track on what he or she has purchased previously. The information about the order date, order ID, name of the item, price and description of the item are shown in each order. The picture of the item is also displayed to provide a visual definition of the product. Users are also able to choose any of the previous orders to see more information or to use the Buy Again button that helps them to re-order the same products. This will include the following feature, which will ease the process of reordering and enable the user to simplify their future shopping by accessing their previous orders at a short time. The bottom navigation bar gives access to other parts of the app, and the movements between the various pages are easy.

6.2.1.h: Reward Page

Figure 6.2.1 h: Reward Page

Figure 6.2.1(h) shows the reward page of the Ai-Orders web app. The page will allow the users to follow and control their Ai-Points, and the balance balance is shown on the top, with 120 points. The Point Detail section that is posted below shows the number of points collected and the expiration date of the points so that people can keep a track of the duration in which they have been able to use their rewards. The page also has the option to redeem points or get vouchers which gives the user the opportunity to redeem their points to the form of rewards or discounts. The user-friendly design tempts the user to explore the rewarding system and allows it to be convenient to look at the balances and actually redeem them. The bottom navigation bar also has the quick links to Home, Menu, Order, Reward, and Profile areas to allow easy navigation in the app.

6.2.1.i: Profile Page

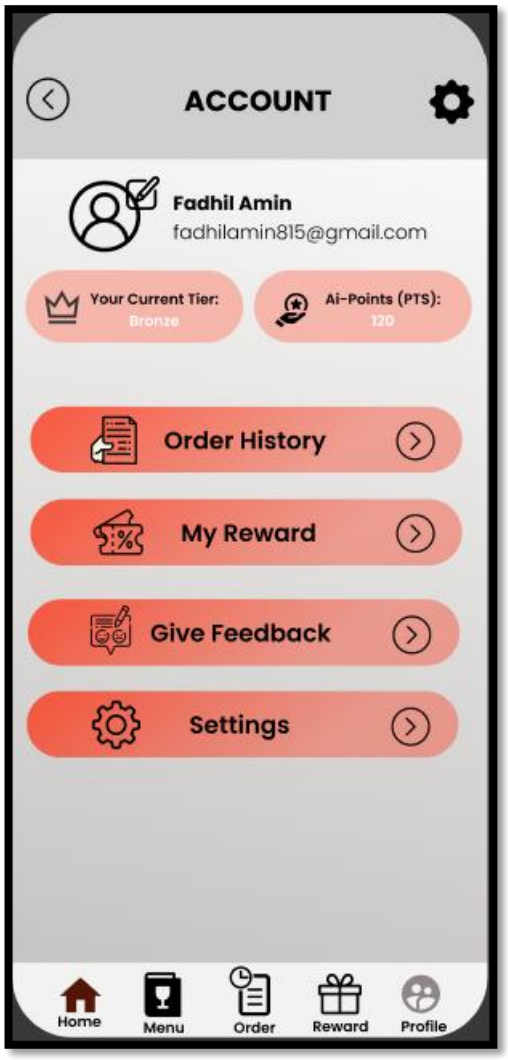


Figure 6.2.1 i: Profile Page

Figure 6.2.1(i) shows the profile page of the Ai-Orders web app. The personal details of the user such as name, email address and Ai-Points balance are shown in this page. The user is offered a few options to operate their account: Order History in which they could see their past orders; My Reward in which they could see rewards and vouchers; Give Feedback in which the user could see their review about Ai-Orders and Settings in which the user could modify his/her preferences and account settings. The sections have distinct icons and buttons that allow easy navigation, which makes the process simple to the user and navigate effectively in the app to handle their account and interact with the app features. The lower navigation menu helps in navigating smoothly between the app sections as it has Home, Menu, Order, Reward and Profile.

6.2.1.j: Edit Profile Page

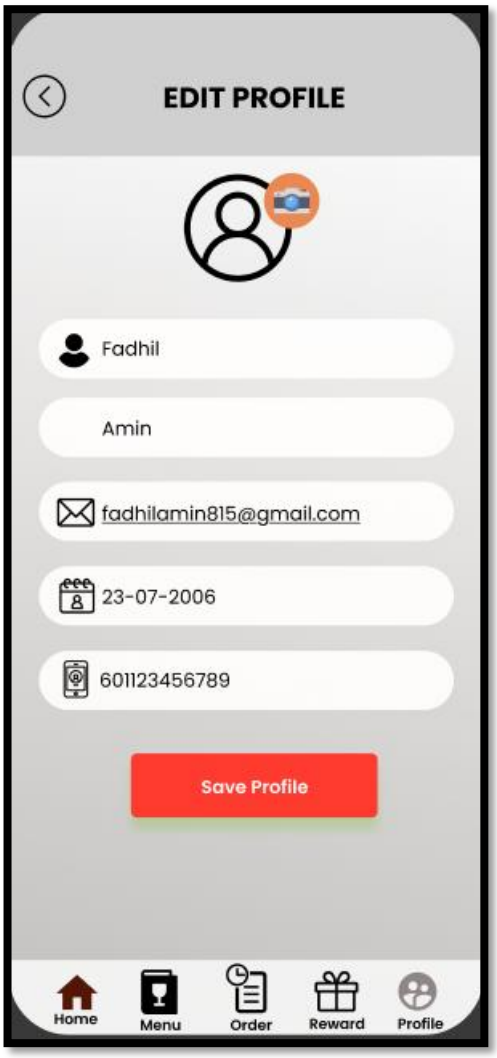


Figure 6.2.1 j: Edit Profile Page

Figure 6.2.1(j) shows the edit profile page of the Ai-Orders web app. In this page, the users have the opportunity to update their personal details (first name, surname, email address, date of birth and phone number). The icon of the profile picture gives the users the option of changing or posting a picture. After completing all the required changes, the user has the opportunity to tap the Save Profile button at the bottom and save the changed information. Easy access to home, menu, order, reward, profile areas is also available in the bottom navigation bar, which is a guarantee of easy navigation between various functionalities on the app.

6.2.1.k: Feedback Page

Figure 6.2.1 k: Feedback Page

Figure 6.2.1(k) shows the feedback page of the Ai-Orders web app. On this page, a user can express their views and recommendations that can be used to enhance the platform. At the top, there is the text Every Feedback helps. What can we improve?" invites the users to rate the Product or Service, each shown with an icon and tag. A rating section on the rating experience of the product based on a five-star rating system is provided below, allowing the users to give a quick and visual opinion on their satisfaction. Such an easy and user-friendly design promotes involvement among customers in the process, and therefore, the customers can easily share their experiences and this will make Ai-Orders improve its level of quality and service. The bottom navigation bar has smooth access to other major parts of the app, such as Home, Menu, Order, Reward and Profile.

6.2.2 POS System (Admin Interface)

The interface by the administrator will provide the most detailed and unlimited access to the Ai-Order system. The administrators will be in a position to control and administer all facets of the platform such as the management of all stores, administrators, employees, and consumers. The interface will enable the administrators to add, edit or delete store locations, assigning roles and tracking user activities in each of the stores. Krug (2021) discusses the interface of an effective administrator that must focus on control with an intuitive appearance that would not overwhelm a user. Through the administrator, the dashboard will be centralized in control of orders, menus, categories, loyalty point, and customer feedback. The administrators will receive comprehensive performance reports, sell data analysis and control over the loyalty reward distribution to the customer. Also, the position of the administrator will be able to examine and initiate feedback on customers in all the stores, making sure that the system works efficiently and that the problems are addressed timely (Shneiderman et al., 2022).

6.2.2.a: Choose Role Page

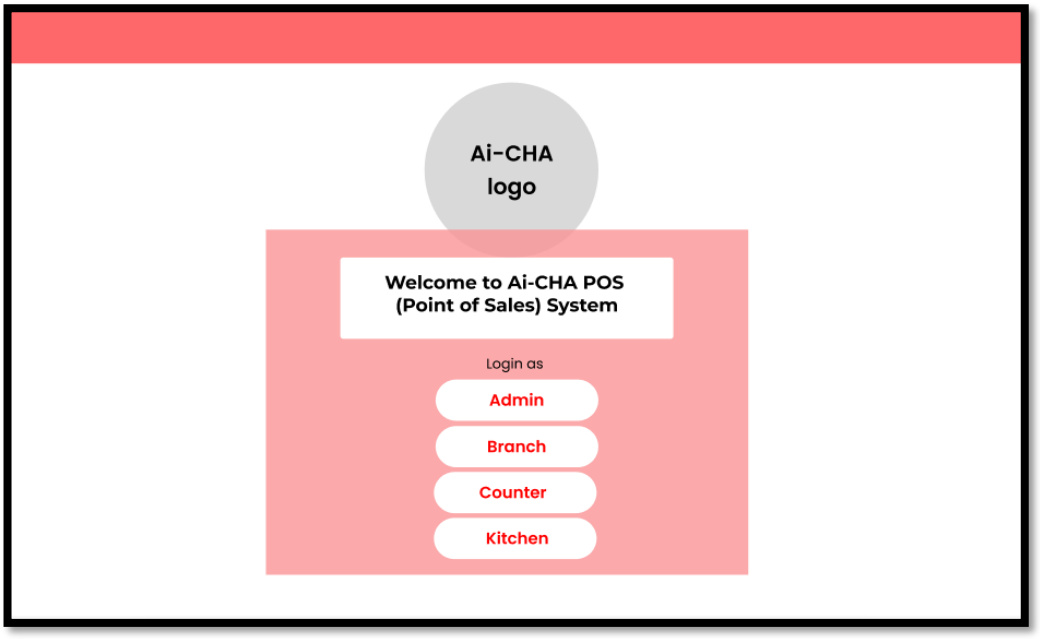


Figure 6.2.2 b: Choose Role Page

Figure 6.2.2(a) shows the Choose Role Page of the Ai-CHA POS system for administrator's access. When one opens the system, he or she is greeted with the Ai-CHA logo at the top, which strengthens the brand image. A friendly text welcomes a visitor to the central part of the site, " Welcome to Ai-CHA POS (Point of Sales) System," in order to make it clear what this platform is all about. Under this, the users are asked to log-in where they are required to make a selection by clicking on one of the following buttons: the administrator, the branch, the counter and the kitchen. The button of the administrator is specially emphasized so that the user has a vivid direction to reach the top tier of the system. Its minimalistic and clean design makes the page simple to navigate, and the user-friendly interface has made the selection of role easy to allow the user to log in to the system fast.

6.2.2.b: Admin Login

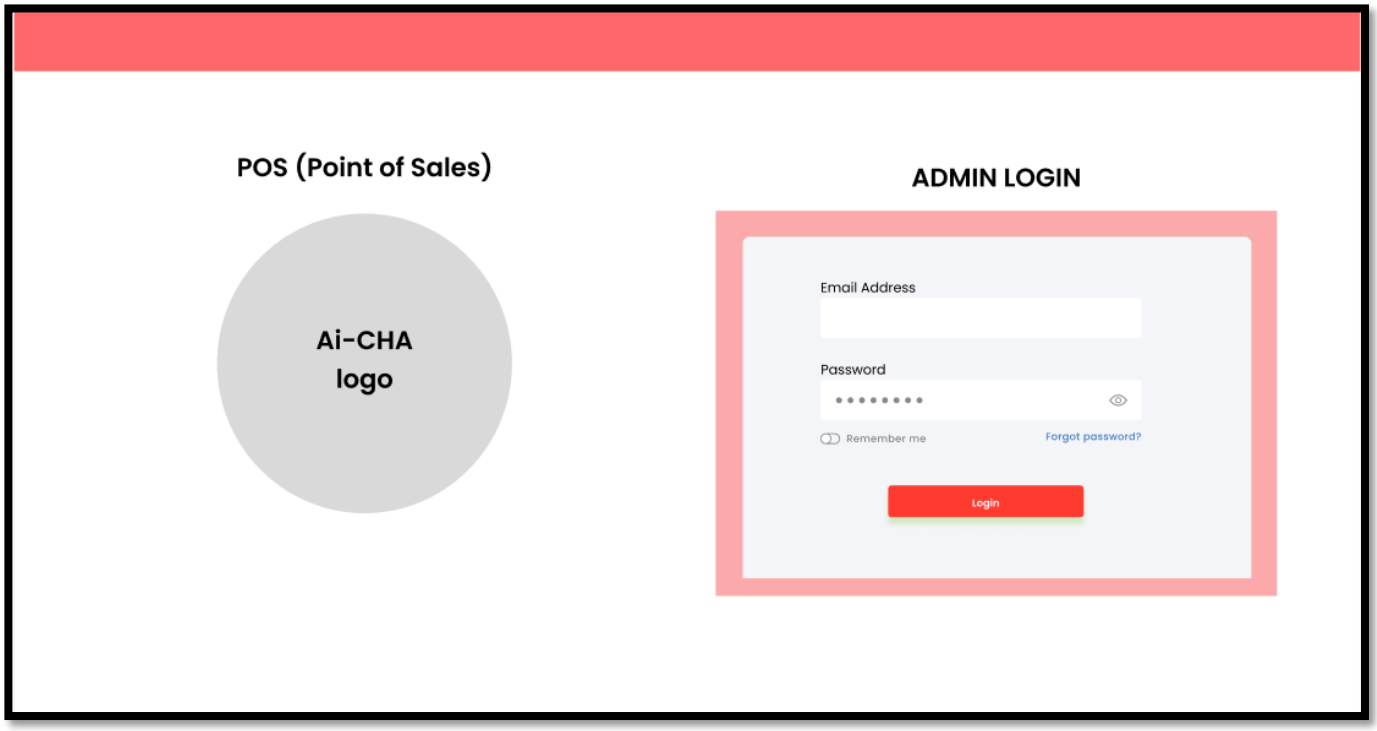


Figure 6.2.2 b: Admin Login Page

Figure 6.2.2(b) shows the Admin Login page for the Ai-CHA POS system. The logo of Ai-CHA appears prominently on the left, which strengthens the brand. The page is separated into two large parts, the Admin Login form and the logo. The form is a login form that is on the right side with the fields of Email Address and Password. The system allows users to enter their credentials to get access to the system. The form also has the choice of remembering the login and forgetting password link in case of necessity. The red color of the Login button is highlighted in green color, and thus it stands out and can be easily identified. The design is simple and uncluttered, and the Admin has smooth and easy user experience in regard to logging in.

6.2.2.c: Admin Dashboard

Figure 6.2.2 c: Admin Dashboard

Figure 6.2.2(c) shows the Admin Dashboard of the Ai-CHA POS system. The dashboard will give a holistic picture of the key metrics and working of the system. In the left side bar, it has the navigation options of the different sections, such as Dashboard, Stores, User Accounts, Category, Menu Items, Orders, Feedback, and Reports. There are several summary boxes at the top of the main screen that indicate key data points, which include Total Admin, Total Staff, Weekly Sales, Total Category, Total Menu, Total Users, and Total Stores, in which each category can be viewed in details through the options. The summary boxes reduce the time it takes the Admin to look at the state of things at a glance. Under the summary are the graphs and analytics of monthly sales growth, sales performance by store, and customer acquisition cost, which are useful in the business performance and trends. The page is made to provide a friendly user interface of well presented actionable data on the page so that the admin of the page can monitor and make effective decisions. The Log Out button is also set at the bottom of the sidebar so that it is easy to access.

6.2.2.d: Admin - User Management Page

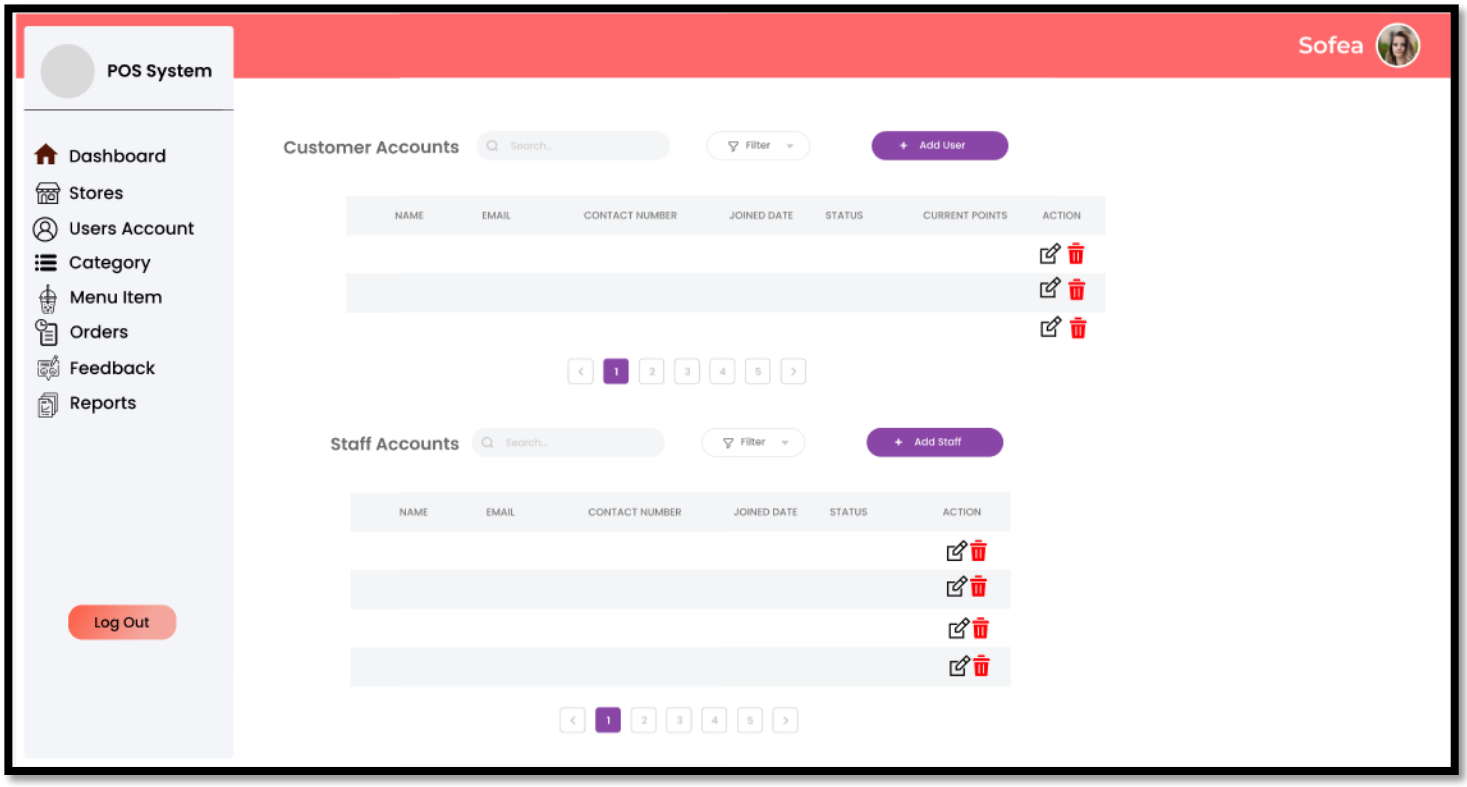


Figure 6.2.2 d: Admin - User Management Page

Figure 6.2.2(d) shows the User Management Page for the Admin in the Ai-CHA POS system. In this page, the admin will be able to manage Customer Accounts and Staff Accounts. The Customer Accounts will show a list of the users who have their name, email, contact number, the date of joining, status and the current points. The Staff accounts section also displays the staff record where it has the possibilities to edit or delete an account. Every account entry has got an Edit and Delete icon that can be used to easily edit or delete accounts. Each section also has the possibility to Search specific accounts or Filter the data at the top. The Admin has also the facility of Add User or Add Staff though large action buttons. There are pagination controls in the bottom which also enable easy navigation through several pages of accounts. This design will have an effective user management whereby, the administrator will have all the authority over customer and employee account information.

6.2.2.e: Admin - Menu Management Page

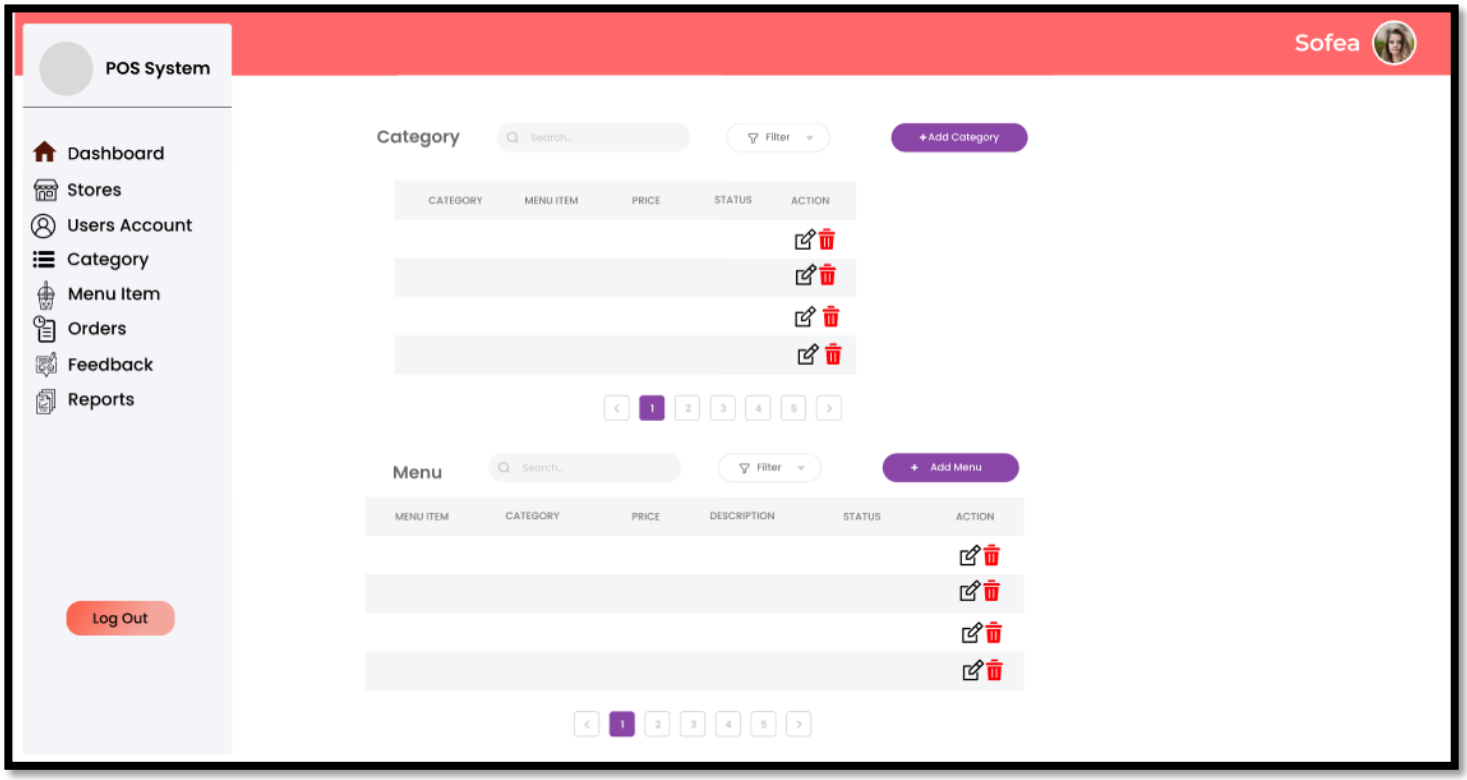


Figure 6.2.2 e: Admin - Menu Management Page

Figure 6.2.2(e) shows the Menu Management Page for the Admin in the Ai-CHA POS system. The page enables the administrator to deal with Categories and Menu Items effectively. The Category section presents the list of categories existing in the system, and each category has its name, menu item, price, status, and an opportunity to edit it or delete it. Menu section contains the menu items with appropriate information including menu item name, category, price, description, and status. There are also options for editing and deleting each menu item to make it easier to make changes or delete the item. To add new categories or menu items, the Add Category and the Add Menu buttons on the top of their respective sections can be used by the person in the role of the administrator. The page also has a search and filter option that allows one to have a quick look through the categories and menu items. At the bottom there are pagination controls ensuring that the admin can easily navigate several pages of categories and menu items. This structure is meant to give total control of the menu structure and therefore the admin can easily arrange and add or otherwise change the menu items whenever necessary.

6.2.2.f: Admin - Order Management Page

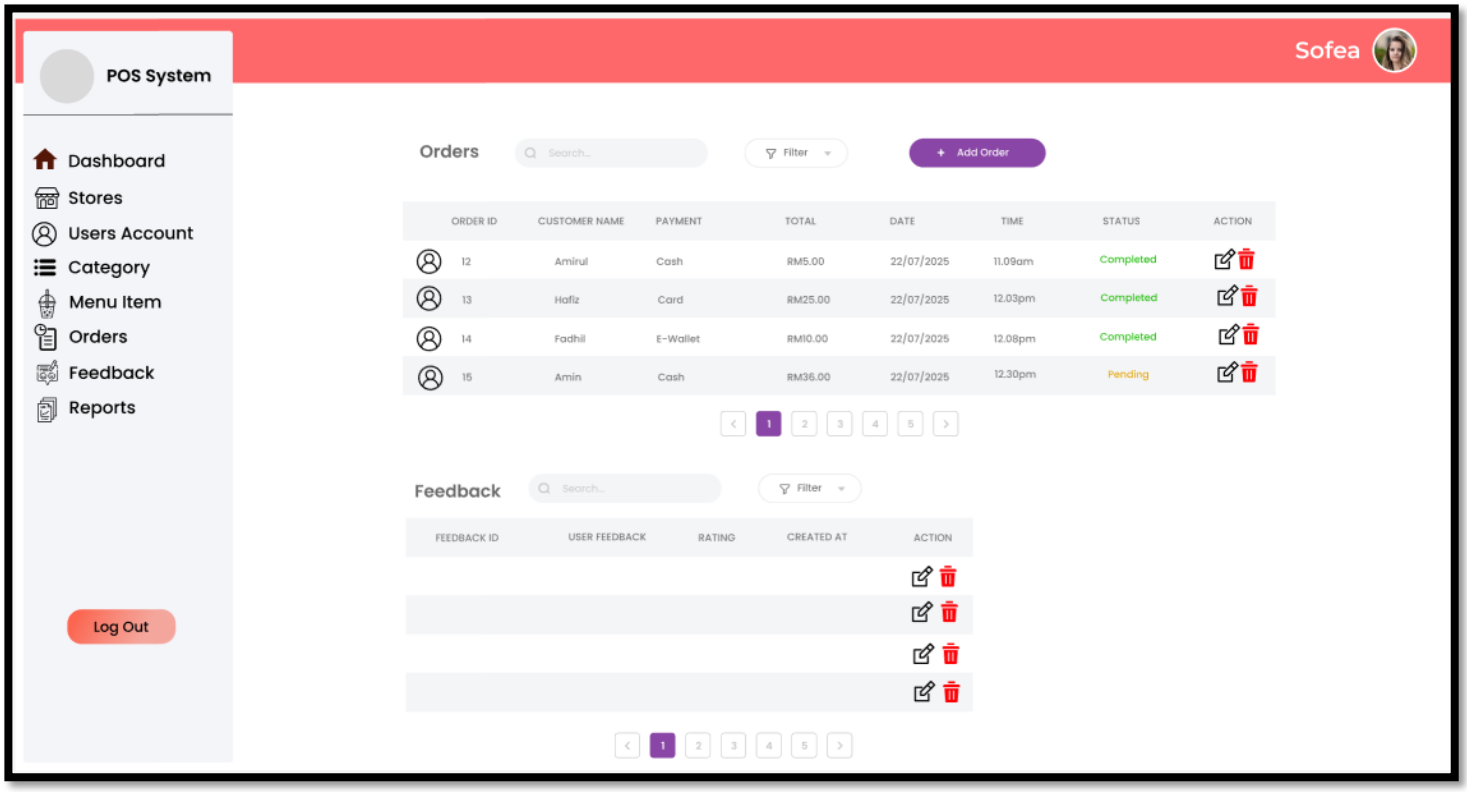


Figure 6.2.2 f: Admin - Order Management Page

Figure 6.2.2(f) shows the Order Management Page for the Admin in the Ai-CHA POS system. This page enables the admin to be effective in managing and monitoring all the orders that have been put in the system. The Orders part shows a comprehensive list of orders; the order ID, customer name, payment mode, total, date, time, order status (e.g. completed, pending), and actions that can be performed on a particular order. Every row has Delete and Edit buttons, which allow a person to make order changes or delete the orders quickly. The page also enables the admin to Add Order with the large button on the upper-right. Under the order list, there is the Feedback section that displays the user feedback with the Feedback ID, User Feedback, Rating and the date of creation. Once again, there are Edit and Delete feedback options that can be used to handle user reviews. It also has search and filter facilities to allow the admin to quickly find specific orders or feedback and pagination controls to get through the data. The design is simple, and it offers an easy user interface in managing the orders and customer feedback. The bottom of the sidebar has a Log Out button that makes sure that one logs out safely.

6.2.2.g: Admin - Store Management Page

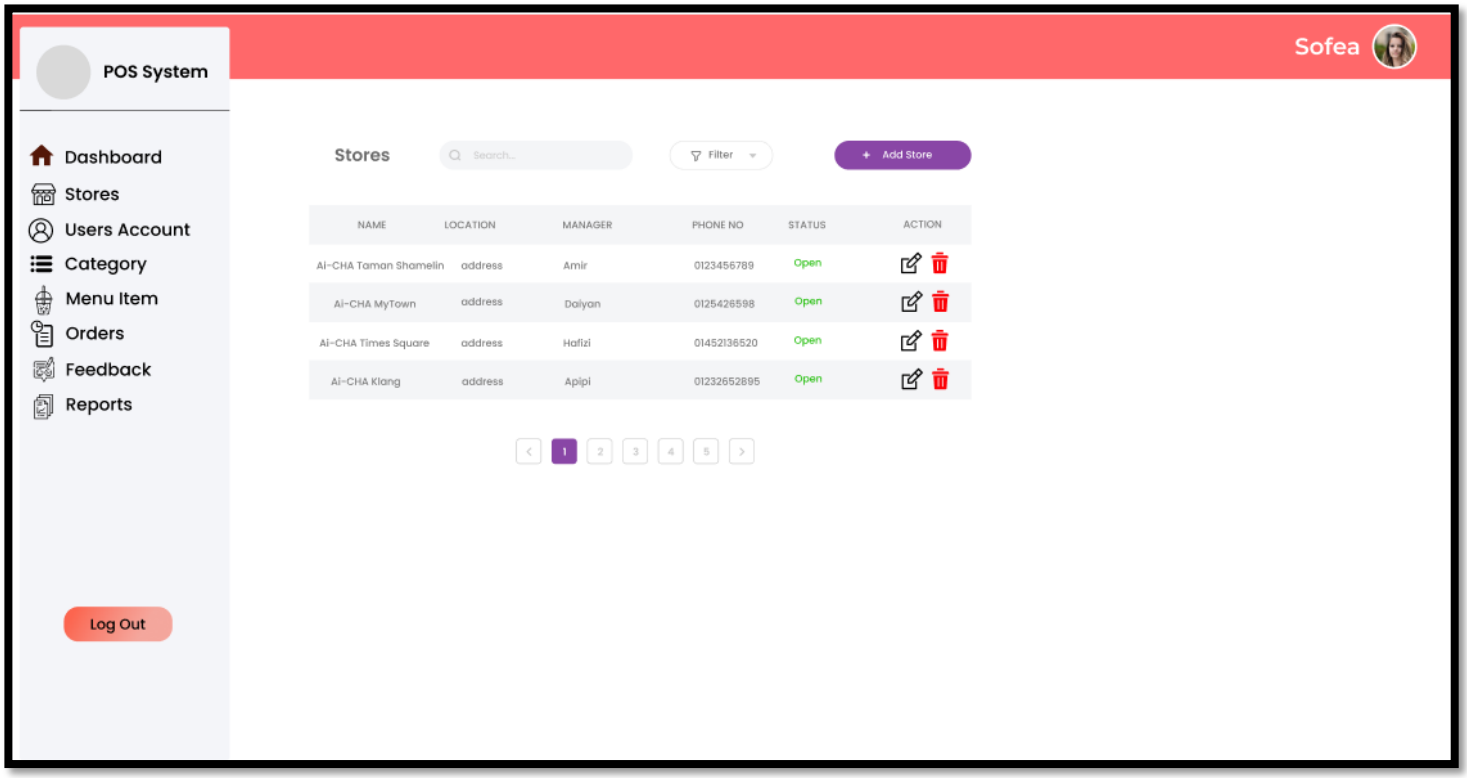


Figure 6.2.2 g: Admin - Store Management Page

Figure 6.2.2(g) shows the Store Management Page for the Admin in the Ai-CHA POS system. This page will give the admin full control of the stores, and they are able to see crucial information like the name of the store, store location, store manager, phone number, and store status (e.g., Open). Every store entry has an option to edit or delete the store thus making it easy to manage the store data. An Add Store button is located in the upper-right part, and it enables the administrator to add stores to the system. The page also has a search and filter option to enable one to easily find a particular store. Pagination buttons will enable the administrator to browse through the various pages of stores. This easy-to-use design gives the system efficiency in managing and monitoring all stores the Ai-CHA brand. The bottom of the sidebar has the Log Out button to guarantee safe access to the system.

6.2.2.h: Admin - Report Page

Figure 6.2.2 h: Admin - Report Page

Figure 6.2.2 (h) shows the Report Page for the admin in the Ai-CHA POS system. The use of this page is created to show in-depth performance analytics in the form of a visual report. The primary section will have Weekly Revenue Sales Report in the form of a graph. In the graph, the sales performance of six various sales representatives in various days of the week (Monday to Friday), each day is color-coded (e.g. blue on Monday, green on Tuesday, etc.). The graph also includes sales that are projected, which aid the admin to compare the actual sales with the projections. The page permits the visualization of the trends of data easily, which is expected to assist in decision-making, since it offers insights regarding the performance of sales teams. The bottom of the sidebar has the Log Out button to guarantee safe access to the system.

6.2.3 POS System (Branch Interface)

Branch interface will give a detailed and hierarchical perspective of the operations of the system. Branch is to the managers so that they can manage user accounts, sales, and orders and make some changes with the menu items. The system of branch dashboard will be designed with efficiency in mind, with easy access to some of its most important functionalities, like user management, order tracking, and performance reporting. The proposed dashboard, providing aggregated information, will enable the admins to make more informed decisions, as suggested by Saffer (2021). It will also feature such features as order analytics, which will allow managers to understand the behavior and sales pattern of customers, data-driven decision-making. This is aimed at creating actionable and clear image of system performance (Buchanan, 2021).

6.2.3.a: Branch Login

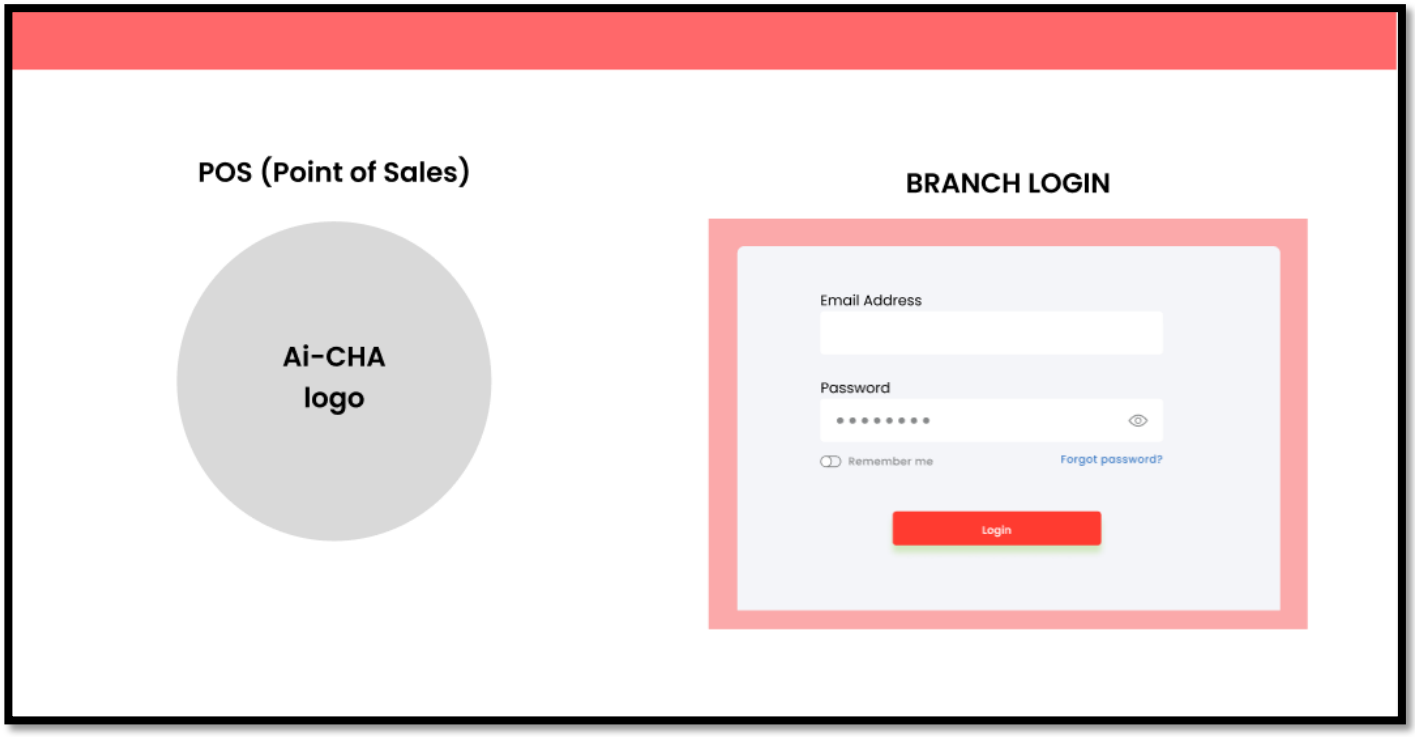


Figure 6.2.3 a: Branch Login

Figure 6.2.3(a) shows the Branch Login page for the Ai-CHA POS system. The identity of the brand is created by the Ai-CHA logo on the left side. The managers have the right-hand side of the page where the login form is displayed where the managers are able to type in their email address and password to enter in the system. The form will have the choice of remembering the usernames and passwords to use in future sessions and a find a way to forget passwords, in the event that the users will be required to reset their passwords. The red button, the Login button, is placed in an outstanding position. The simple and clean design has made the page to be easy to use with the managers being able to log-in and manage the POS system in a very short time.

6.2.3.b: Branch Dashboard

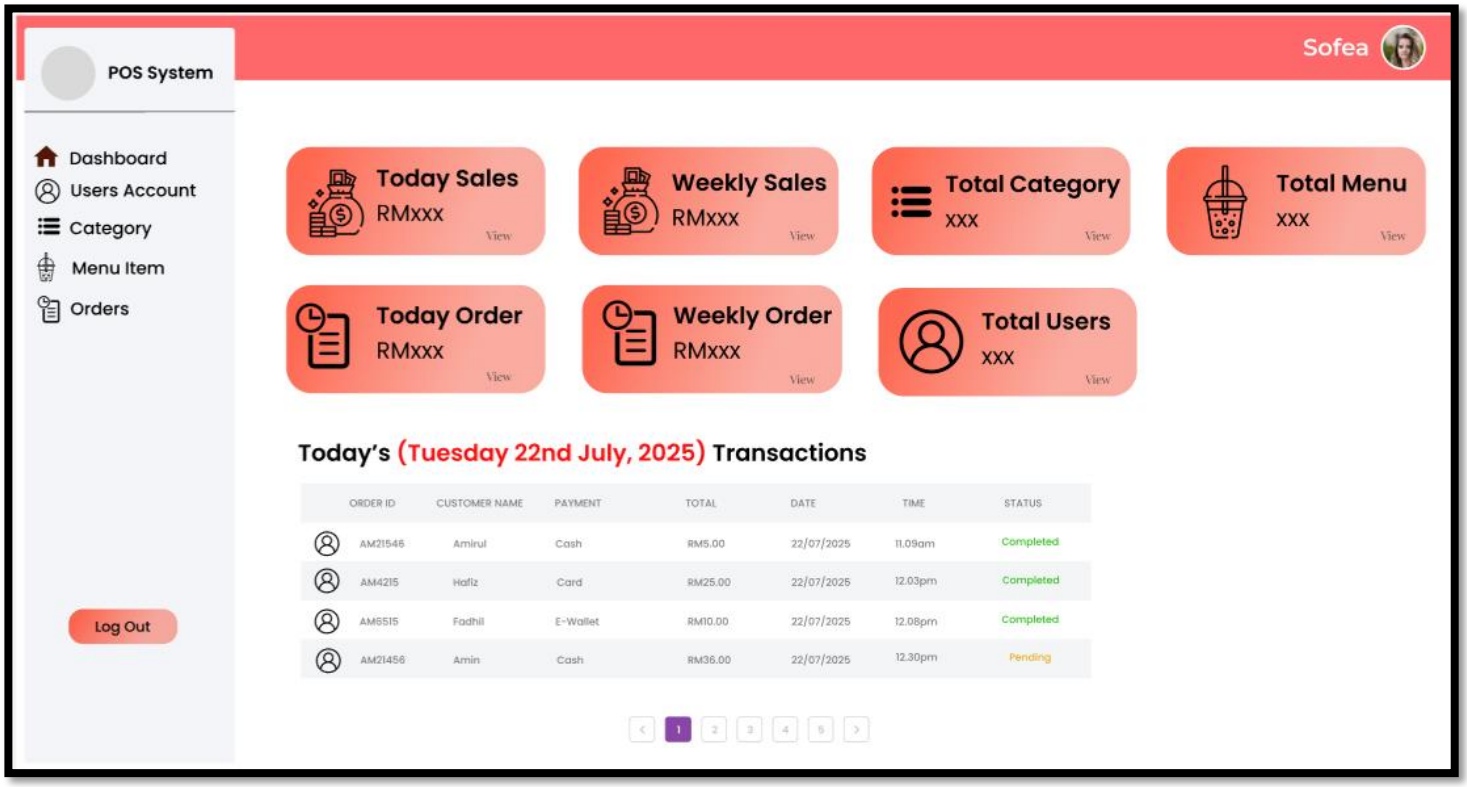


Figure 6.2.3 b: Branch Dashboard

Figure 6.2.3(b) shows the Branch Dashboard of the Ai-CHA POS system. The current page gives the manager a summary of the performance of the system on a daily and weekly basis. There are several summary boxes at the top with more significant metrics like Today Sales, Weekly Sales, Today Orders and Weekly Orders and links to expand them into a more detailed one. The Total Category box, the Total Menu box, and the Total Users box allow the manager to have a quick access to data of the total number of categories, menu items and total users in the system.

Under these summary boxes, there is a list of all orders on the current day stored in a table known as transactions with information about the order ID, customer name, payment method, order amount, date, and time, and also the order status (e.g. Completed or Pending). The status is coded in color to be precise and the branch can easily follow the progress of individual order. Pagination functions enable the administrator to move across the various pages of transactions.

This design provides an easy interface to the manager to handle and track sales and orders with ease. There is a secure access to the system through the Log Out button at the bottom.

6.2.3.c: Branch - User Management Page

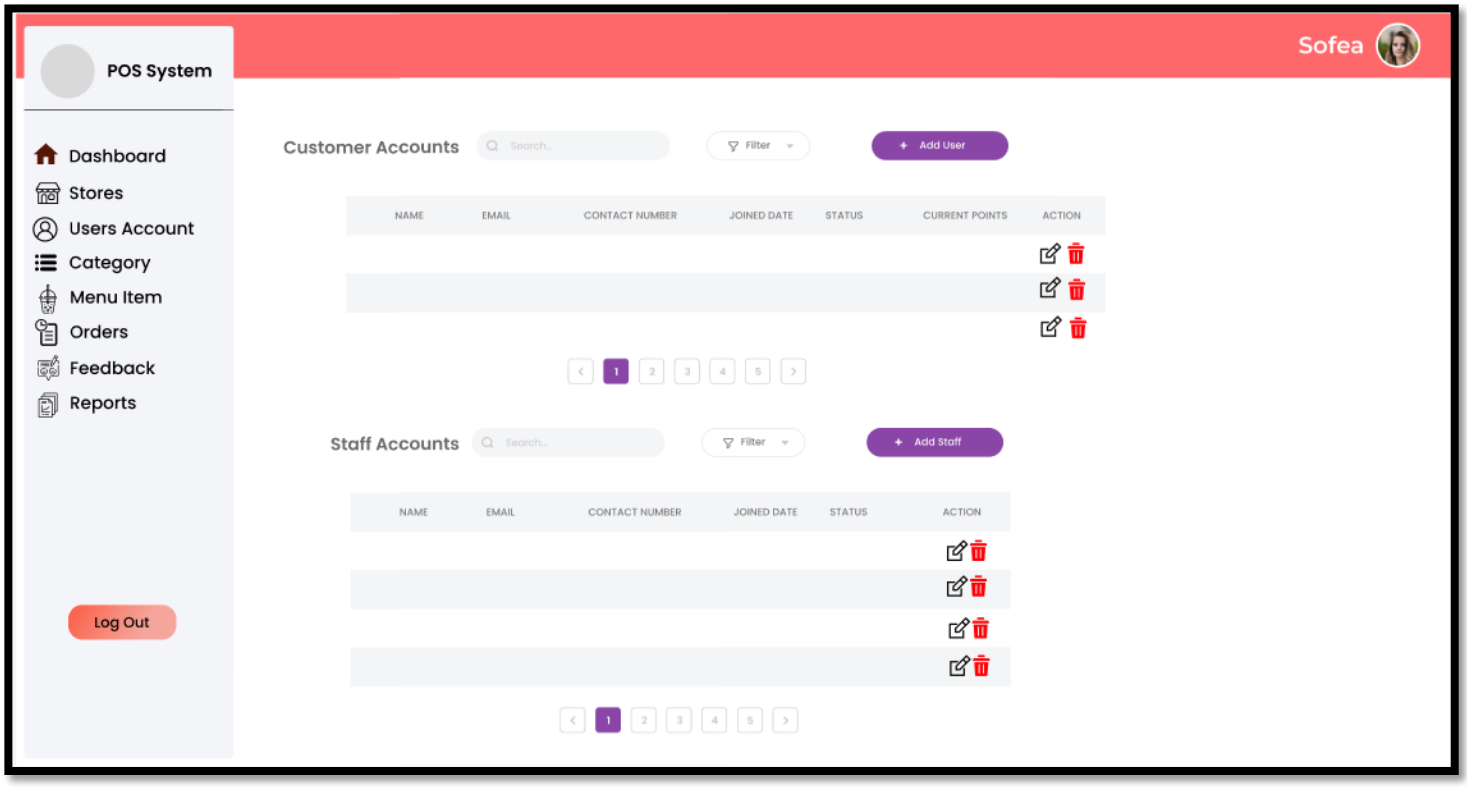


Figure 6.2.3 c: Branch - User Management Page

Figure 6.2.3(c) shows the User Management Page for the Branch in the Ai-CHA POS system. The manager uses this page to manage Customer Accounts and Staff Accounts. Customer Accounts section shows the list of customers with their name, email, contact number, date of joining it, status, and current points. The add and delete icons are provided in each customer entry to easily manage them. On a similar note, the Staff Accounts section displays the staff members and their respective details and the manager is in a position to carry out tasks such as editing or removing the staff accounts.

The page will have a search and filter feature that is easy to navigate and locate a particular account. Moreover, the Add User and Add Staff are on the top of their respective parts and the manager can add new users or staff using these buttons. At the bottom, pagination controls allow browsing through several pages of accounts without complications. At the bottom of the system, the Log Out button provides the security of access to the system. This design would allow the administrator to handle the customer and staff records effectively in the system.

6.2.3.d: Branch - Menu Management Page

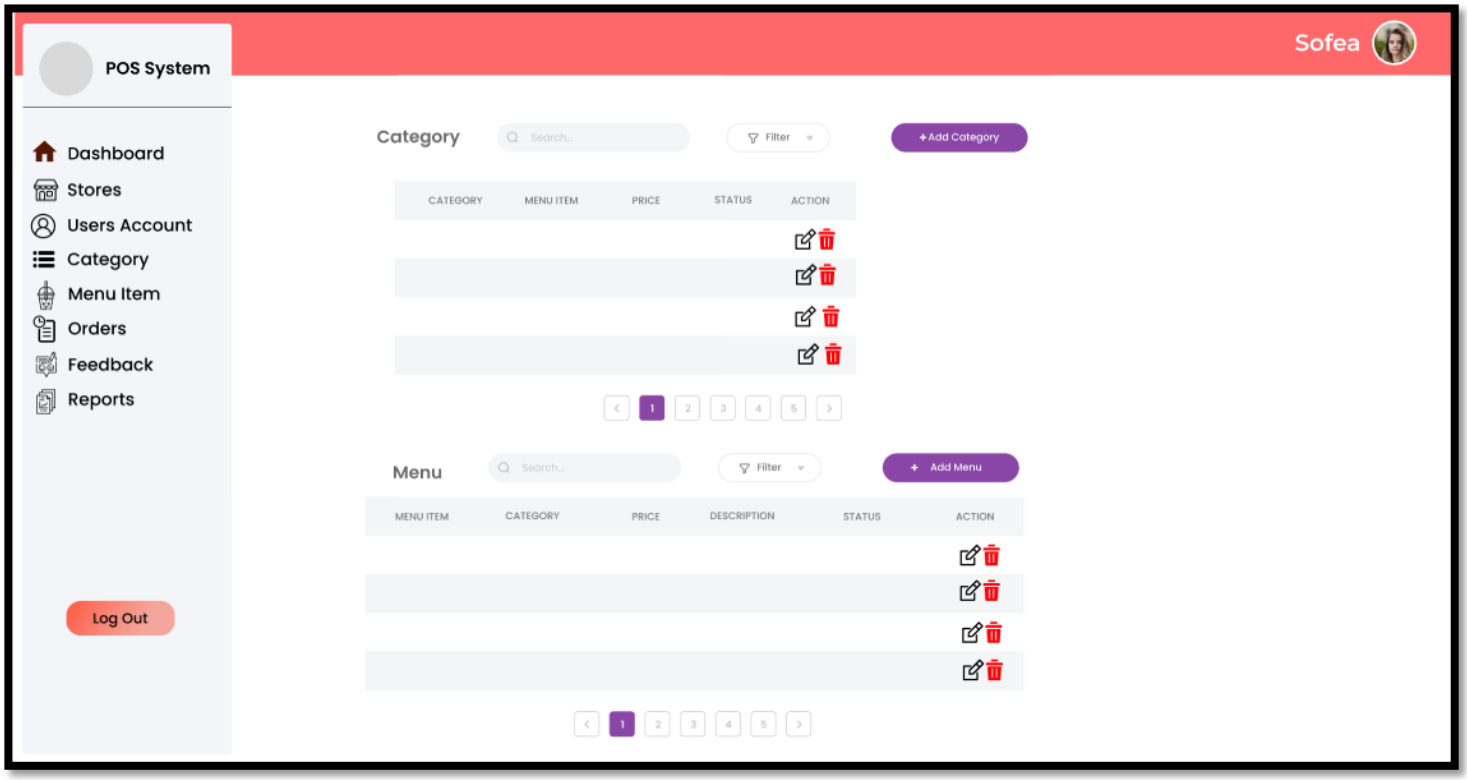


Figure 6.2.3 d: Branch - Menu Management Page

Figure 6.2.3(d) shows the Menu Management Page for the Branch in the Ai-CHA POS system. Through this page, the manager will be able to manage Categories as well as Menu Items. The manager is free to view and control the categories in the Category section, information about the category, menu items, price, and status. The available icons can be used to perform actions by the manager like adding categories or deleting categories. Likewise, the Menu section shows all the menu items, the category, price, description, and status of menu items to give the manager the opportunity to edit or delete menu items whenever necessary. The manager may take a search and filter option at the upper part of both sections and find specific categories or items in the menu within a moment. One can also add new categories or menu items by clicking on the Add Category button and Add menu button respectively. The page will also have pagination controls that can be used to move through several pages of categories and menu items. This design enables a well-structured interface to the manager to effectively run what the store has to offer. At the bottom of the system, the Log Out button provides the security of access to the system.

6.2.3.e: Branch - Order Management Page

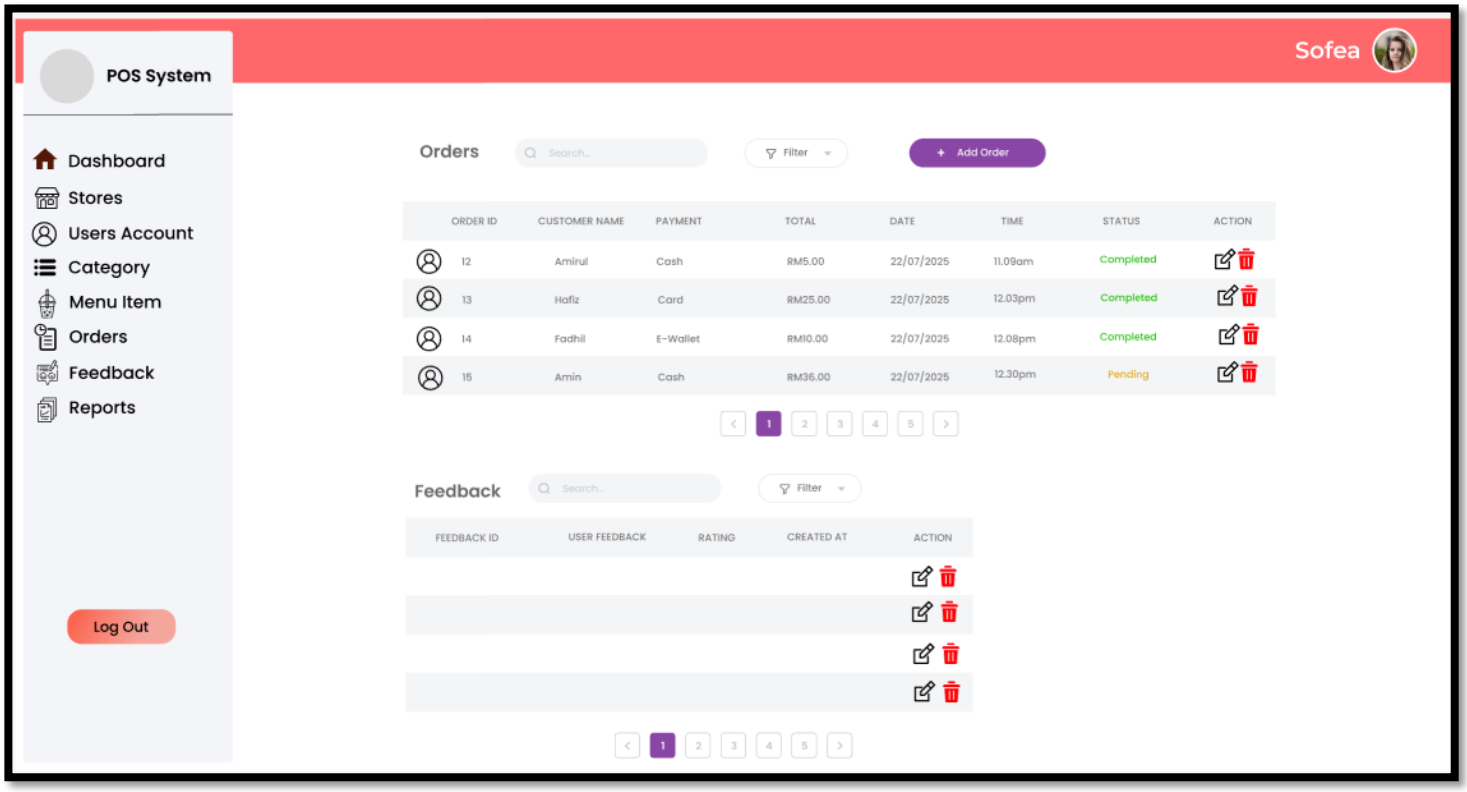


Figure 6.2.3 e: Branch - Order Management Page

Figure 6.2.3(e) shows the Order Management Page for the Branch in the Ai-CHA POS system. This page enables the manager to control and keep track of the orders taken by customers. The Orders section will show most important information about the orders such as the Order ID, Customer Name, Payment Method, Total Amount, Date, Time and Order Status (e.g. Completed or pending). There are corresponding Edit and Delete buttons to each order, which enables the manager to amend any order or delete it.

In the section below the orders, the Feedback, there is a list of user feedback, accompanied by Feedback ID, User Feedback, Rating, and the Creation Date. The action buttons are provided to allow the manager to edit or delete entries of feedback. The page has search and filter options so that the manager can easily locate certain orders or feedback. Also, there are pagination controls which enable the manager to control and navigate between multiple pages of orders and feedback. Add Order button is located at the upper right and helps to add an order directly. This design is aimed at facilitating effective organization of orders and feedback and all the information will be well presented to the manager. At the bottom of the system, the Log Out button provides the security of access to the system.

6.2.4 POS System (Counter Interface)

The Counter interface has been developed by considering the staff users in such a manner that they can simplify the process of accepting orders, changing the order status and controlling the menu. The experience of the staff will be simplified by orders being displayed properly and easily accessed buttons to update their order, and a user-friendly dashboard to monitor the progress of their order in real time. The design will also be oriented towards clarity and speed to ensure that the staff handles numerous orders without being distracted when dealing with cluttered interfaces or the unnecessary steps. Garrett (2021) suggests that efficiency can be enhanced through the creation of a task-oriented interface which allows staff to make fewer decisions and causes less fatigue. Also, manual entry of orders of walk-in customers will be implemented in this interface, which will guarantee flexibility and adaptability in busy settings.

6.2.4.a: Counter Login

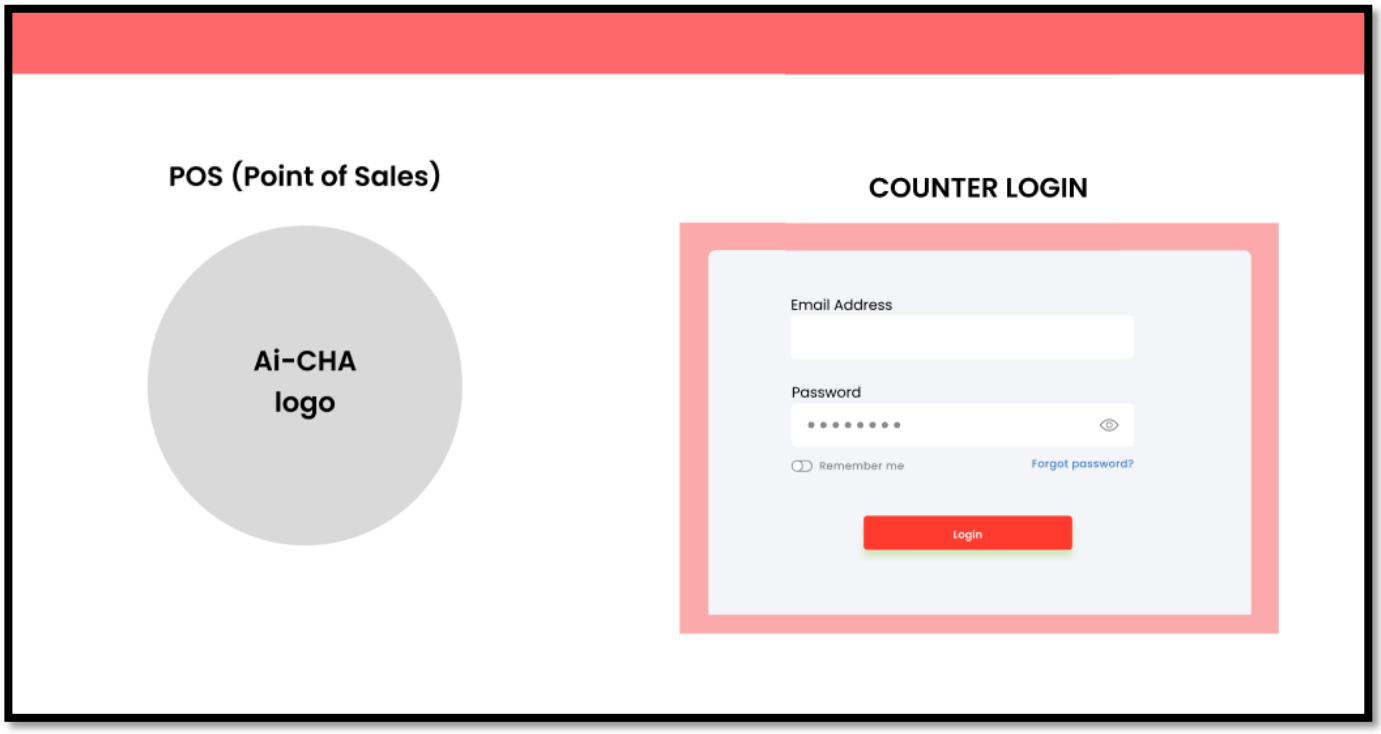


Figure 6.2.4 a: Counter Login Page

Figure 6.2.4(a) shows the Counter Login page for the Ai-CHA POS system. The page is structured such that the Ai-CHA logo is displayed in the top and this generates brand awareness. At the right-hand side, the staff will be able to log in by filling their email address and morphing password in the given boxes. The staff have a Remember me option that saves their login details to be used later and a Forgot password. link in case they require resetting their logins. The big Login button, done in red and green is easily recognized. The simplicity and clear design of this layout makes the overview a seamless and efficient entry into the POS system because the staff members can access it in a very short time.

6.2.4.b: Counter Dashboard

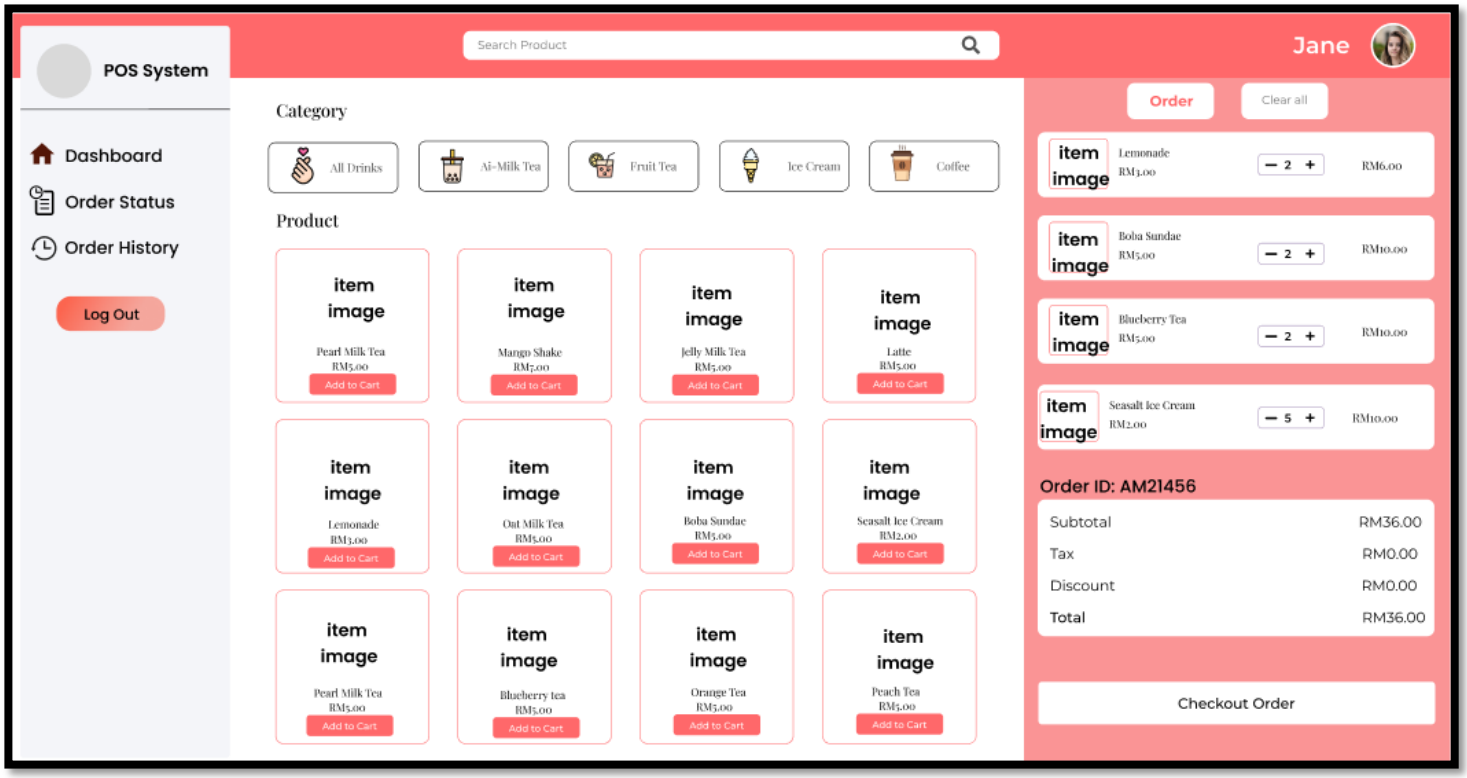


Figure 6.2.4 b: Counter Dashboard

Figure 6.2.4(b) shows the Counter Dashboard for the Ai-CHA POS system. The navigation links to the Dashboard, Order Status and Order History are provided on the left side of the page and the staff can easily access other vital parts of the system. There is a search bar at the top where one can access products within the shortest possible time and beneath, there are several categories of products that the staff can shop in, including All Drinks, Ai-Milk Tea, Fruit Tea, Ice Cream and Coffee.

The product grid shows the image of a menu item, its name, and price and the staff can easily add a menu item to the cart by pressing the "Add to Cart" button. The summary of the order displays the products that have been added to the cart with their quantity changes and the total cost on the right side. It also shows the subtotal, tax, discount and the amount of a single order (ID). Finally, the Checkout Order button serves to enable the staff to finalize the order process at the bottom. The bottom has the Log out button that makes the system log out securely. This design has an intuitive user-friendly display that enables the staff to easily handle customer orders and monitor their status too.

6.2.4.c: Counter - Payment Dashboard

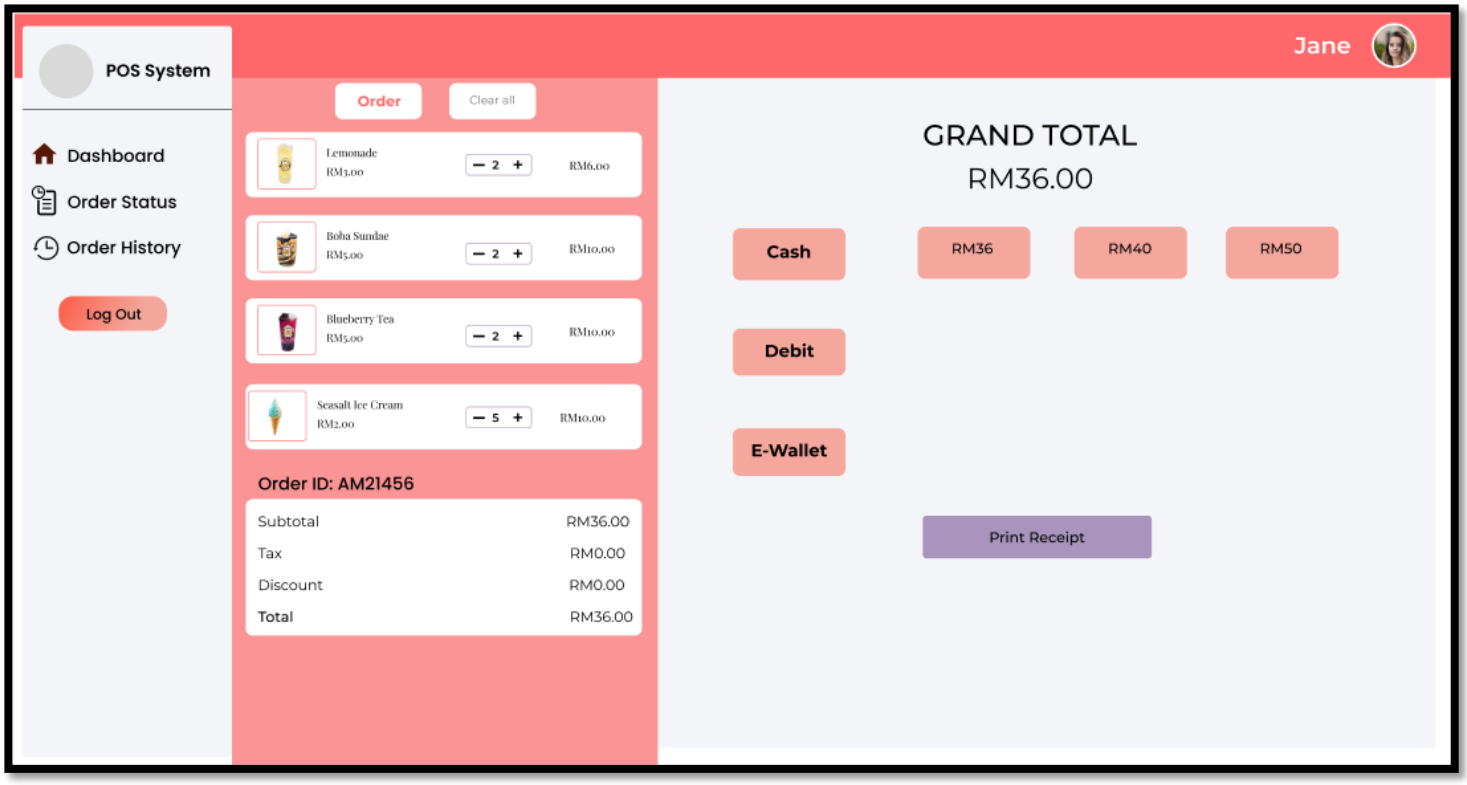


Figure 6.2.4 c: Counter - Payment Dashboard

Figure 6.2.4(c) shows the Counter - Payment Dashboard for the Ai-CHA POS system. This page will enable the staff to access the details of the final order and to pay. On the left side, the summary of orders will show what is ordered and the order quantity and total prices ordered plus the order ID. The order total is well drawn on the bottom which displays a subtotal, tax and discounts (where applicable). The payment options are given on the right side where the Cash, Debit, and E-Wallet buttons are given where the staff can choose the payment option. The payment options are visible as well as the amount the customer is paying (RM36, RM40, RM50) and it is easy to handle various values of payments by the staff. Once the payment is completed, the staff is given an opportunity to print the receipt of the customer using the Print Receipt button. The design is user-friendly, and the staff would have a smooth and efficient transaction process. The system has a Log Out button at the bottom that allows safe access to the log out of the system.

6.2.4.d: Counter - Order Status

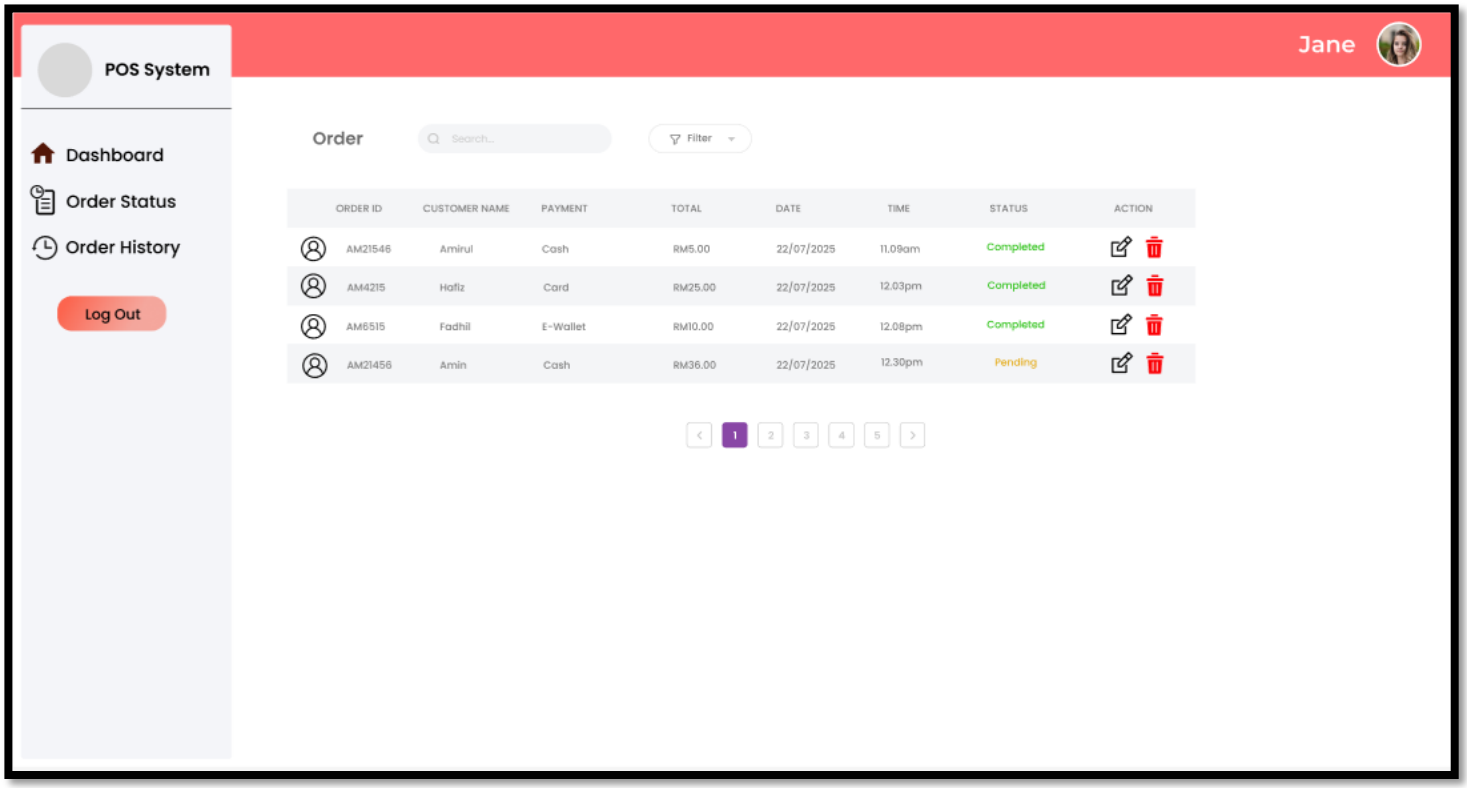


Figure 6.2.4 d: Counter - Order Status

Figure 6.2.4(d) shows the Counter - Order Status page for the Ai-CHA POS system. On this page, the staff can trace and control customer order status. Order Status section gives the Order ID, Customer Name, Payment Method, Total, Date, Time, and the Status of each order (e.g. Completed or Pending). The orders have the option of edit and deletes so that the staff can edit or delete the orders when the need arises. The status is color-coded to differentiate between orders that are completed (green) and those with pending orders (yellow), which makes it easy to be able to identify the progress of any given order by the staff. The page has search and filter features to find a particular order easily and pagination features that enable staff to navigate a variety of pages of orders. The design is such that the staffs can effectively handle and trace the orders during the day and the Log Out button gives a secure option to log out.

6.2.4.e: Counter - Order History

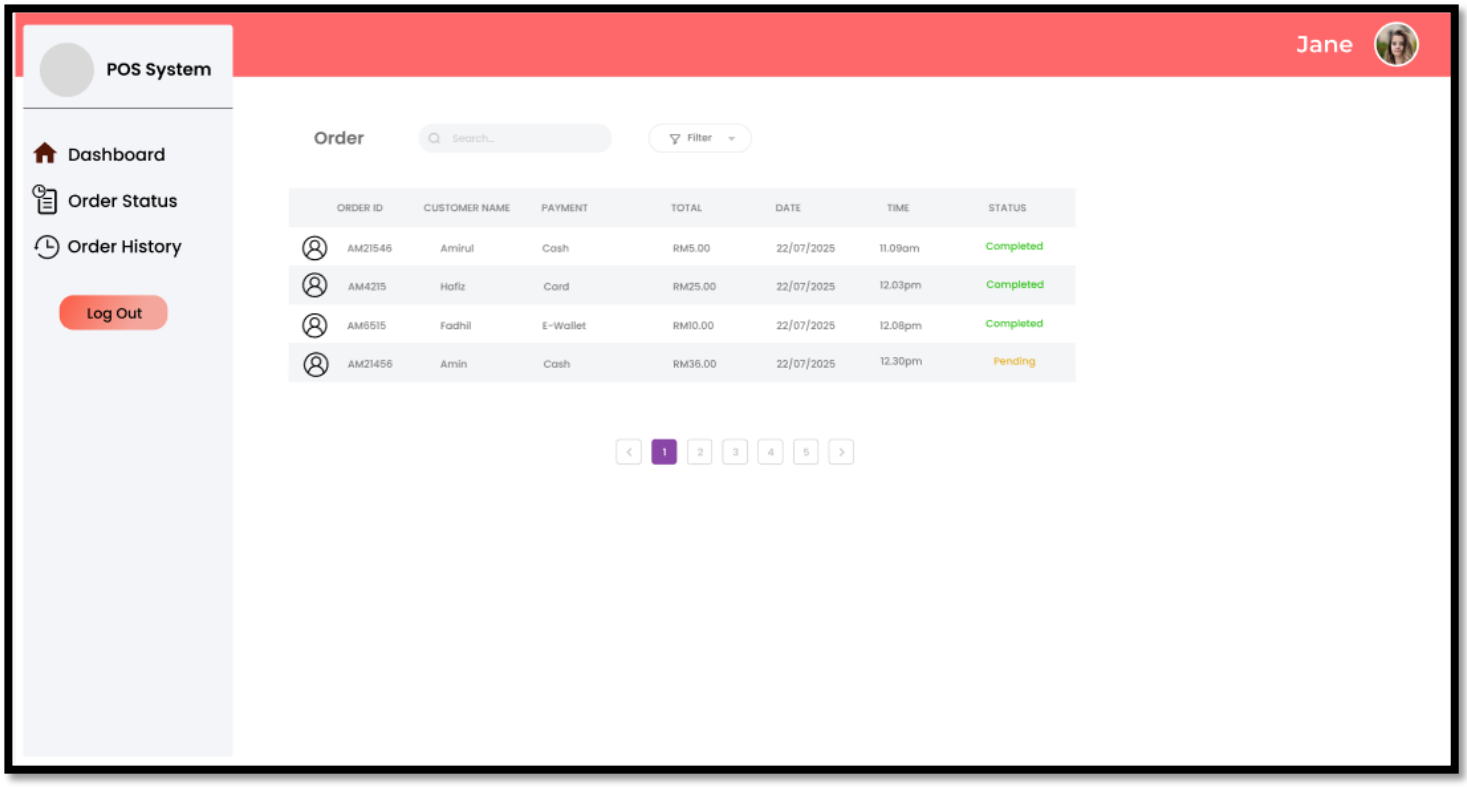


Figure 6.2.4 e: Counter - Order History

Figure 6.2.4(e) shows the Counter - Order History page for the Ai-CHA POS system. The staff can access this page to be able to review and track previous orders. Order ID, Customer Name, Method of payment, total, date, time, and status of each order are provided in the table. The status of the orders is color coded and the Completed orders are displayed in green whereas the Pending ones are displayed in yellow and a staff can easily determine the progress of the order. The page also has a search option as well as filter options where staff can use to find specific orders easily. At the bottom of the page there are pagination controls where the staff can navigate the various pages of order history. The Log Out button makes the staff have the security to leave the system log out when they are done. The design of this layout is to provide the staff with a systematic preview of the transaction history to be referred to easily.

6.3 Database Design

The design of the database in this project would be a crucial aspect in making sure the organisation, storage, and retrieval of data is accurate in all Ai-Orders modules. It entails a process of organizing table, relationships and constraints such that the system can easily handle information pertaining to customers, branch, menu, order, loyalty points and wallet transactions. A well-designed database enhances performance, maintains data integrity and facilitates safe management of sensitive information besides ensuring that the system is scalable and maintainable with time (Redgate, 2023). Since Ai-Orders is a customer ordering service, which means it combines POS functions and loyalty management in one database, the database has to support a high read/write load with several roles at the same time without interfering with the consistency and speed of service (Taipalus, 2024).

The Ai-Orders database is carried out in the form of a relational model with MySQL. The basic objects are users, roles, branches, menu sizes, menus, toppings, orders, order items, wallet top-ups, vouchers, voucher claims, memberships, user points and point transactions. Referential integrity is enforced with the help of primary keys and foreign keys to ensure that table relationships are valid and none of the orphan records are generated (Acceldata, 2024; Intelligent DS, 2022). Artefact support artefacts like the Entity Relationship Diagram (ERD) and relationship matrix give a pictorial description of how entities interact and how the data moves around the system which becomes a key in implementation and subsequent upkeep (Baeldung, 2023). All these designs decisions combined can guarantee Ai-Orders the ability to expand to several outlets and remain consistent in data, traceable, and easy to manage.

6.3.1 Data Dictionary

Data dictionary is a structured reference of all the objects of the database used in Ai-Orders. Data dictionary A centralized repository of metadata that defines the elements of data, their attributes and relationships within a database or information system to assist stakeholders in gaining insight into the structure, meaning and rules of each data item (Arkon Data, 2023; U.S. Geological Survey, 2025). In Ai-Orders, key tables are enlisted along with their fields, data types, sizes, default values and keys in the data dictionary.

The data dictionary ensures that there is clarity and consistency in the manner of defining and accessing data within the application by capturing such information. It acts as metadata facilitating proper management of data, simplicity in the troubleshooting process and simplified onboarding of subsequent developers (Acceldata, 2024). In practice, it can ensure that there are accurate relationships between customers and orders, outlets and loyalty records and minimizes the chances of duplication or an incompatible schema upgrade in a future upgrade. To conclude, database dictionary is a critical technical manual upon which the Ai-Orders can operate and loyalty information in a consistent and sustainable manner.

6.3.1.1.Branches Table

Table 6.3.1 (1): Data Dictionary of Table “branches”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each branch record.
name	varchar(100)	Branch name as shown to users.
code	varchar(7)	Short branch code used in order numbers, reports, etc.
state	varchar(100)	State/region where the branch is located.
slug	varchar(120)	URL-friendly unique text for the branch (used in links/routing).
phone	varchar(30)	Branch contact phone number (can include country code, spaces, symbols).
address	varchar(255)	Full branch address for display, delivery, and pickup info.
status	tinyint(1)	Branch status flag (1 = active/open, 0 = inactive/closed).

Table 6.3.1(1) shows the data dictionary of table “branches”. The branches table stores the master information for every Ai-CHA outlet registered in the Ai-Orders system. Each record represents a single branch and includes its human-readable name, unique branch code and state, together with contact details such as phone number and full address. The lat and lng fields keep the geographic coordinates of the outlet so that location-based features (for example store locator and pickup branch selection) can be supported. The status field indicates whether the branch is active and allowed to receive orders, while the created_at and updated_at timestamps record when the branch information was first created and last modified.

6.3.1.2. Branch Code Counters

Table 6.3.1 (2): Data Dictionary of Table “branch_code_counters”.

Field Name	Data Size (Type)	Description
prefix	char(3)	Three-letter state/region prefix used in branch codes (e.g., KUL, PHG), serving as the primary key of the table.
last_no	int	Last running number assigned for this prefix (e.g., 3 → next branch code will use 4).

Table 6.3.1(2) shows the data dictionary of the **branch_code_counters** table. This small helper table keeps track of the latest running number for each three-letter branch prefix used in Ai-Orders. When a new branch is created, the system reads last_no for the relevant prefix, increments it and then generates a branch code such as KUL0004. By centralising these counters, the platform can create sequential, non-overlapping branch codes without relying on complex database functions.

6.3.1.3.Banners Table

Table 6.3.1 (3): Data Dictionary of Table “banners”

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each banner record.
title	varchar(120)	Main heading text displayed on the banner.
subtitle	varchar(255)	Supporting text or tagline shown below the title.
placement	varchar(24)	Location code where the banner will appear in the system (e.g., home_top, home_slider, promo_section).
image_path	varchar(255)	File path or URL to the banner image asset.
cta_text	varchar(60)	Call-to-action label displayed on the banner button (e.g., “Order Now”, “View Promo”).
cta_url	varchar(255)	Target URL or route that users are redirected to when clicking the banner.
status	tinyint(1)	Banner status flag (1 = active/visible, 0 = inactive/hidden).
sort_order	tinyint	Display priority among banners in the same placement; lower values appear earlier.
starts_at	datetime	Start date and time when the banner becomes active.
ends_at	datetime	End date and time when the banner should stop appearing.
created_at	datetime	Date and time when the banner record was created.
updated_at	datetime	Date and time when the banner record was last modified.

Table 6.3.1(3) presents the data dictionary of the banners table. This table manages all promotional and informational banners displayed in the Ai-Orders interfaces. Each banner stores its main content (title, subtitle, image_path), together with behaviour fields such as placement, cta_text and cta_url to control where it appears and what happens when users interact with it. The status, sort_order, starts_at and ends_at columns allow administrators to schedule campaigns, control their visibility and define the display order. The created_at and updated_at timestamps support management and auditing of banner changes over time.

6.3.1.4. Categories Table

Table 6.3.1 (4): Data Dictionary of Table “categories”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each category record.
branch_id	int	Foreign key referencing the branch that owns this category allows different branches to have their own category sets.
name	varchar(100)	Display name of the category.
slug	varchar(120)	URL-friendly unique text for the category, used in routing or links.
description	varchar(255)	Short description of the category, explaining what type of items it contains.
status	tinyint(1)	Category status flag (1 = active/visible, 0 = inactive/hidden).
created_at	datetime	Date and time when the category record was created.
updated_at	datetime	Date and time when the category record was last updated.

Table 6.3.1(4) shows the data dictionary of the categories table. This table stores the menu category structure for each branch in Ai-Orders, such as drinks, desserts or promotional sets. The branch_id field links categories to a specific outlet, while name, slug and description determine how the category is displayed to customers. The status flag controls whether a category is currently available for ordering, and the timestamp fields support tracking and auditing of category changes.

6.3.1.5. Email Verifications Table

Table 6.3.1 (5): Data Dictionary of Table “email_verifications”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each email verification record.
email	varchar(190)	Email address that needs to be verified (e.g., during registration or email change).
code	varchar(12)	Verification code/OTP sent to the user’s email.
session_id	varchar(64)	Identifier used to link the verification request to a specific session or device.
expires_at	datetime	Date and time when the verification code becomes invalid.
used	tinyint(1)	Flag indicating whether this code has already been used (1 = used, 0 = not yet used).
created_at	datetime	Date and time when the verification request was created.

Table 6.3.1(5) shows the data dictionary of the email_verifications table. This table supports secure verification of user email addresses in Ai-Orders. When a user registers or updates their email, a verification entry is created for the given email with a one-time code tied to a session_id. The

expires_at and used fields ensure that codes are time-limited and cannot be reused, while created_at provides a record of when the verification request was initiated for auditing and security monitoring.

6.3.1.6. Feedbacks Table

Table 6.3.1 (6): Data Dictionary of Table “feedbacks”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each feedback record.
user_id	int	ID of the customer who submitted the feedback.
order_id	int	ID of the related order the feedback is referring to.
branch_id	int	ID of the branch where the order was placed or experience occurred.
rating	tinyint(1)	Numeric rating score (e.g., 1–5 stars) given by the customer.
comment	text	Written feedback/review from the customer.
image_path	varchar (255)	Optional path/URL to an image attached with the feedback (e.g., photo of drink or issue).
status	enum('pending', 'published', 'hidden','flagged')	Moderation status of the feedback: pending (awaiting review), published (visible in app), hidden (manually hidden), flagged (requires further investigation).
admin_reply	text	Response message written by an admin or manager to the customer.
admin_id	int	ID of the admin/staff who replied or handled the feedback.
replied_at	datetime	Date and time when the admin reply was submitted.
created_at	datetime	Date and time when the feedback was created by the customer.
updated_at	datetime	Date and time when the feedback record was last updated (e.g., status change, reply edit).

Table 6.3.1(6) shows the data dictionary of the feedbacks table. This table records customer reviews and complaints linked to specific orders and branches in Ai-Orders. Customers can rate their experience, write comments and optionally attach images, all stored in rating, comment and image_path. The status field supports moderation workflows, while admin_reply, admin_id and replied_at capture how and when management responded. The timestamps created_at and updated_at provide a full history for service-quality analysis and follow-up actions.

6.3.1.7. Memberships Table

Table 6.3.1 (7): Data Dictionary of Table “memberships”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each membership record.
user_id	int	Foreign key linking the membership to its owner in the users table.
card_no	varchar(20)	Membership card number, typically a system-generated unique ID.
display_code	varchar(16)	Short, user-friendly membership code shown on screens or receipts (e.g., for manual key-in).
qr_token	varchar(64)	Encrypted or random token encoded inside the QR code for scanning and fast identification.
status	tinyint(1)	Membership status (1 = active, 0 = inactive/blocked).
last_used_at	datetime	Date and time when the membership was last used for earning or redeeming benefits.
created_at	datetime	Date and time when the membership record was created.
updated_at	datetime	Date and time when the membership details were last updated.

Table 6.3.1(7) shows the data dictionary of the memberships table. This table manages Ai-Orders membership identities that link customers to loyalty benefits and wallet features. Each membership is tied to a user account (user_id) and can be represented physically or digitally through a card_no, human-readable display_code and QR-based qr_token for quick scanning at the counter. The status and last_used_at fields indicate whether the membership is currently valid and how recently it has been used, while the timestamps created_at and updated_at support tracking and maintenance of membership records.

6.3.1.8. Menus Table

Table 6.3.1 (8): Data Dictionary of Table “menus”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each menu item.
category_id	int	Foreign key referencing the category to which this menu item belongs.
name	varchar(120)	Display name of the menu item (e.g., “Brown Sugar Milk Tea”).
slug	varchar(150)	URL-friendly unique text for the menu item, used in routing/links.
description	varchar(255)	Short description of the drink/food, ingredients or selling points.
price	decimal(10,2)	Base selling price of the menu item in Ringgit Malaysia (RM), before branch overrides or size variations.
sort_order	int	Position of this item within its category; lower values appear first.
image_path	varchar(255)	File path or URL to the menu item image shown in the app.
status	tinyint(1)	Item status flag (1 = active/visible, 0 = inactive/hidden).
created_at	datetime	Date and time when the menu item was created.
updated_at	datetime	Date and time when the menu item was last updated.
created_at	datetime	Date and time when the menu item was created.
updated_at	datetime	Date and time when the menu item was last updated.

Table 6.3.1(8) shows the data dictionary of the menus table. This table stores the master list of drinks and food items offered in Ai-Orders. Each record is grouped under a category through category_id and includes display information such as name, description and image_path. The price field provides the base price used when no branch-specific or size-based pricing is applied, while sort_order and status control how and whether the item is shown to customers. The timestamps created_at and updated_at support maintenance and auditing of menu configuration changes.

6.3.1.9. Menu Branches Table

Table 6.3.1 (9): Data Dictionary of Table “menu_branches”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each menu–branch mapping record.
menu_id	int	Foreign key referencing the menu item being configured for a specific branch.
branch_id	int	Foreign key referencing the branch where this menu configuration applies.
is_available	tinyint(1)	Availability flag at this branch (1 = menu item is sellable at this branch, 0 = hidden/not sold).
branch_price	decimal(10,2)	Branch-specific selling price for the menu item in Ringgit Malaysia (RM). Overrides the default price when set.

Table 6.3.1(9) shows the data dictionary of the menu_branches table. This table controls branch-level availability and pricing of menu items in Ai-Orders. Each record links a menu item (menu_id) to a particular outlet (branch_id) and indicates whether that item is currently offered at the branch through is_available. Where needed, branch_price allows branches to have customised prices that differ from the global menu price, supporting local promotions or cost differences between locations.

6.3.1.10. Menu Sizes Table

Table 6.3.1 (10): Data Dictionary of Table “menu_sizes”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each menu size record.
menu_id	int	Foreign key referencing the base menu item that this size belongs to.
label	varchar(40)	Size label displayed to users (e.g., “Regular”, “Large”).
price	decimal(10,2)	Selling price for this particular size in Ringgit Malaysia (RM).
status	tinyint(1)	Size status flag (1 = active/available, 0 = inactive/hidden).
sort_order	tinyint	Display order of sizes under the same menu item; lower values appear first.
created_at	datetime	Date and time when the menu size record was created.
updated_at	datetime	Date and time when the menu size record was last updated.

Table 6.3.1(10) shows the data dictionary of the menu_sizes table. This table stores the different size options available for each drink or food item in Ai-Orders. Each record links to a base menu item via menu_id and defines a human-readable label with its corresponding price. The status and sort_order fields control which sizes are currently offered and how they are arranged in the user interface, while created_at and updated_at provide an audit trail for any changes to size configuration.

6.3.1.11. Menu Toppings Table

Table 6.3.1 (11): Data Dictionary of Table “menu_toppings”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each menu–topping mapping record.
menu_id	int	Foreign key referencing the menu item that can use this topping.
topping_id	int	Foreign key referencing the topping option available for the menu item.
status	tinyint(1)	Availability flag for this mapping (1 = active/allowed, 0 = inactive/not allowed).

Table 6.3.1(11) presents the data dictionary of the menu_toppings table. This junction table defines which toppings are allowed for each menu item in Ai-Orders. Every record links one menu (menu_id) to one topping (topping_id), enabling a many-to-many relationship between drinks/foods and optional add-ons. The status field lets the system temporarily enable or disable specific combinations without deleting them, supporting seasonal toppings or branch-specific customisation.

6.3.1.12. Orders Table

Table 6.3.1 (12): Data Dictionary of Table “orders”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each order record.
order_no	varchar(32)	System-generated human-readable order number (e.g., ORD-KUL-20251120-003).
source	enum('counter','mobile')	Channel where the order was created: counter (POS in-store) or mobile (customer app/web).
user_id	int	ID of the customer who placed the order (for guest/anonymous orders this may be null or a generic user).
branch_id	int	ID of the branch where the order will be prepared and collected.
staff_id	int	ID of the staff member who handled the order at the counter, if applicable.
status	enum('pending','confirmed', 'preparing','ready', 'completed','cancelled')	Operational status of the order along its lifecycle.
payment_method	enum('cash','card', 'ewallet','wallet')	Method selected to pay for the order: cash, card, external e-wallet or internal Ai-Orders wallet.

payment_status	enum('unpaid','paid', 'refunded','void')	Financial status of the order: whether it is unpaid, successfully paid, refunded or voided.
paid_at	datetime	Date and time when payment was completed (for paid orders).
subtotal_rm	decimal(10,2)	Total of all order items before any discounts, points or rounding (RM).
discount_rm	decimal(10,2)	Combined monetary discount applied to the order (vouchers, promos, manual discount) in RM.
points_spent	int unsigned	Number of loyalty points used to offset the bill for this order.
points_value_rm	decimal(12,2)	RM value of the points redeemed on this order.
points_awarded	int	Number of new loyalty points awarded for this order (based on eligible spend).
rounding_rm	decimal(12,2)	Rounding adjustment applied to follow cash/0.05 rounding rules; can be positive or negative.
total_rm	decimal(10,2)	Final amount payable by customer after discounts, points and rounding.
voucher_id	int	ID of the voucher definition applied to this order, if any.
voucher_claim_id	int	ID of the specific voucher claim used by the user (from voucher_claims), if applicable.
voucher_code	varchar(40)	Snapshot of the voucher code used on the order, stored for history even if the voucher changes.
pickup_name	varchar(100)	Name of the person who will collect the order (can differ from account holder).
pickup_phone	varchar(30)	Contact phone number for order pickup notifications.
pickup_at	datetime	Scheduled pickup date and time requested by the customer.
pickup_time_label	varchar(32)	Human-friendly label for pickup time (e.g., “ASAP”, “Today 5:00–5:30 PM”).
note	varchar(255)	Optional special instructions from the customer (e.g., “less ice”, “separate toppings”).
queue_no	int unsigned	Counter queue number used by the branch to call customers when drinks are ready.
created_at	datetime	Date and time when the order was created.
updated_at	datetime	Date and time when the order record was last updated (status change, payment update, etc.).
idempotency_key	varchar(64)	Unique key used to prevent duplicate order creation when the same request is submitted multiple times.

Table 6.3.1(12) shows the data dictionary of the orders table. This table forms the core of the Ai-Orders transaction layer by storing every customer order placed through the counter POS or mobile channel. It combines operational information (branch, staff, order status and pickup details) with financial data such as payment method, payment status, subtotals, discounts, loyalty points usage and final payable amount. Voucher-related fields (voucher_id, voucher_claim_id, voucher_code) link orders to the loyalty and promotion modules, while queue_no supports in-store fulfilment workflows. The idempotency_key and timestamp fields ensure that orders are created reliably, traceable over time and protected from accidental duplicates.

6.3.1.13. Order Counters Table

Table 6.3.1 (13): Data Dictionary of Table “order_counters”.

Field Name	Data Size (Type)	Description
branch_code	char(7)	Branch code for which this counter applies (e.g., KUL0001), matching the code on the branches table.
ymd	char(8)	Business date in YYYYMMDD format representing the order date (e.g., 20251120).
seq	int	Sequence slot or internal counter row number used together with branch_code and ymd to ensure unique records.
last_no	int unsigned	Last order running number generated for the given branch and date (e.g., 25 → next will be 26).
created_at	datetime	Date and time when this counter row was first created.
updated_at	datetime	Date and time when the counter was last updated after generating a new order number.

Table 6.3.1(13) shows the data dictionary of the order_counters table. This table is used internally by Ai-Orders to generate sequential, per-branch, per-day order numbers without conflicts. For each branch (branch_code) and business date (ymd), the system stores the latest running number in last_no and updates it whenever a new order is created. The seq field supports uniqueness or sharding of counters if needed, while created_at and updated_at provides an audit trail for the evolution of order sequences over time.

6.3.1.14. Order Items Table

Table 6.3.1 (14): Data Dictionary of Table “order_items”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each order item row.
order_id	int	Foreign key referencing the parent order that this item belongs to.
menu_id	int	ID of the original menu item selected by the customer.
size_id	int	ID of the selected size option from menu_sizes.
sugar_id	int	ID of the selected sugar level option (if managed as a separate lookup).
item_name	varchar(160)	Snapshot of the menu item name at the time of ordering (kept even if the menu name later changes).
size_label	varchar(60)	Snapshot label of the chosen size (e.g., “Large”).
sugar_label	varchar(60)	Snapshot label of the chosen sugar level (e.g., “Less Sugar”).
qty	int	Quantity of this item ordered.
unit_price_rm	decimal(12,2)	Unit price per item in Ringgit Malaysia (before toppings and discounts).
toppings_total_rm	decimal(12,2)	Total additional charge for all toppings attached to this line.
line_subtotal_rm	decimal(12,2)	Subtotal for this line before discounts: (unit_price_rm + toppings_total_rm) × qty.
line_discount_rm	decimal(12,2)	Total discount applied to this line item (from vouchers or promotions).
line_total_rm	decimal(12,2)	Final payable amount for this line after discounts.
created_at	datetime	Date and time when the order item record was created.

Table 6.3.1(14) shows the data dictionary of the order_items table. This table stores detailed line items for every order placed in Ai-Orders. Each record links back to its parent order through order_id and captures the exact configuration chosen by the customer, including menu item, size, sugar level and quantity. Pricing is broken down into unit price, toppings, subtotal, discount and final line total so that bills, reports and voucher effects can be clearly traced. Snapshot fields such as item_name, size_label and sugar_label ensure that historical orders remain accurate even if menu settings change later, while created_at records when the line item was created.

6.3.1.15. Order Status Logs Table

Table 6.3.1 (15): Data Dictionary of Table “order_status_logs”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each status log entry.
order_id	int	Foreign key referencing the order whose status is being logged.
status	varchar(20)	Order status at this point in time (e.g., pending, preparing, ready, completed, cancelled).
note	varchar(255)	Optional remark explaining the status change (e.g., “Customer requested cancel”).
staff_id	int	ID of the staff user who performed or triggered the status update.
created_at	datetime	Date and time when this status change was recorded.

Table 6.3.1(15) shows the data dictionary of the order_status_logs table. This table provides an audit trail for every change to an order’s status in Ai-Orders. Each log entry ties a specific order_id to a new status, records who made the change through staff_id, and stores any additional explanation in note. The created_at timestamp captures when the update occurred, allowing administrators to trace the full lifecycle of an order from creation until completion or cancellation.

6.3.1.16. Payments Table

Table 6.3.1 (16): Data Dictionary of Table “payments”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each payment record.
user_id	int	ID of the user/customer who made the payment.
channel	enum('cash','wallet')	Payment channel used: cash for physical cash, wallet for Ai-Orders e-wallet payments.
amount	decimal(12,2)	Payment amount in Ringgit Malaysia (RM).
status	enum('paid','void','refunded')	Final status of the payment: paid (successful), void (cancelled/invalid), refunded (amount returned to customer).
reference_type	varchar(60)	Type/name of the related business document, usually the module that generated the payment (e.g., "order").
reference_id	int	ID of the related record in its own table (for example, the order ID).
description	varchar(255)	Optional description or remark about the payment (e.g., “Counter payment for ORDER-001”).
created_at	datetime	Date and time when the payment record was created.
updated_at	datetime	Date and time when the payment record was last updated.

Table 6.3.1(16) shows the data dictionary of the payments table. This table records confirmed payment entries for Ai-Orders transactions, capturing who paid (user_id), how they paid (channel) and how much they paid (amount). Each payment is linked back to its originating document using reference_type and reference_id, typically pointing to an order. The status field indicates whether the payment is valid, voided or has been refunded, while the description column allows additional notes for reconciliation. The timestamps created_at and updated_at provide an audit trail for financial reporting and troubleshooting.

6.3.1.17. Points Policies Table

Table 6.3.1 (17): Data Dictionary of Table “points_policies”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each points policy record.
code	varchar(40)	Short code for the policy (e.g., DEFAULT, DOUBLEPOINTS2025), used internally or for configuration.
name	varchar(120)	Descriptive name of the points policy shown in the admin interface.
earn_rate	decimal(10,4)	Rate used to calculate points earned from spending (e.g., points per RM spent).
redeem_value	decimal(10,4)	Monetary value of one point when redeemed (e.g., RM value per point).
expiry_days	int	Number of days after earning that points remain valid before expiring.
status	tinyint(1)	Policy status flag (1 = active/in use, 0 = inactive).
created_at	datetime	Date and time when the points policy was created.
updated_at	datetime	Date and time when the policy was last updated.

Table 6.3.1(17) shows the data dictionary of the points_policies table. This table defines how loyalty points are managed in Ai-Orders, including how many points customers earn from their spending (earn_rate), how much discount those points are worth when redeemed (redeem_value), and how long they remain valid (expiry_days). Multiple policies can be created for different campaigns or branches, with status indicating which ones are currently active. The code, name, created_at and updated_at fields support easy identification, configuration and auditing of changes to the loyalty rules.

6.3.1.18. Point Transactions Table

Table 6.3.1 (18): Data Dictionary of Table “point_transactions”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each point transaction record.
user_id	int	ID of the user/member whose loyalty points are affected.
policy_id	int	Foreign key referencing the points_policies record used for this calculation (earn/redeem rules).
type	enum('award','redeem', 'adjust','expire')	Type of points movement: award (earn points), redeem (spend points), adjust (manual correction) or expire (automatic expiry).
points	int	Number of points added or deducted. Positive integer; the effect depends on type.
amount	decimal(12,2)	Monetary value in Ringgit Malaysia (RM) associated with this transaction (e.g., order total or discount value).
reference_type	varchar(50)	Type/name of the related business document (e.g., "order", "voucher_claim").
reference_id	int	ID of the related record in its own table, linking the transaction to a specific order, voucher claim, etc.
expires_at	datetime	Date and time when the awarded points from this transaction will expire (for award type).
meta	longtext	Additional metadata in text/JSON format (e.g., calculation breakdown, campaign info).
created_at	datetime	Date and time when the point transaction was created.

Table 6.3.1(18) shows the data dictionary of the point_transactions table. This table acts as the detailed ledger for the Ai-Orders loyalty system, recording every change to a user’s points balance. Each entry specifies the type of movement (type), the number of points involved and any related monetary amount, while reference_type and reference_id link the transaction back to the underlying business event such as an order or voucher claim. The policy_id and expires_at fields allow the system to trace which points policy was applied and when earned points will expire, and the meta column provides flexibility to store additional structured or unstructured information for auditing and reporting.

6.3.1.19. State Code Table

Table 6.3.1 (19): Data Dictionary of Table “state_codes”.

Field Name	Data Size (Type)	Description
state	varchar(120)	Full name of the state or territory (e.g., “Kuala Lumpur”, “Pahang”). Serves as the primary key.
code	char(3)	Standard three-letter code assigned to the state (e.g., KUL, PHG), used in branch and order code generation.

Table 6.3.1(19) shows the data dictionary of the state_codes table. This reference table provides a fixed mapping between Malaysian state names and their standard three-letter codes used in Ai-Orders. By centralising this information, the system can consistently generate branch codes, prefixes and reporting labels based on the code value, while still displaying the full state name to users in interfaces and documents.

6.3.1.20. State Prefixes Table

Table 6.3.1 (20): Data Dictionary of Table “state_prefixes”.

Field Name	Data Size (Type)	Description
state_pattern	varchar(120)	Text pattern used to match the branch’s state name (e.g., “Kuala Lumpur”, “Selangor”). May use partial names or patterns for flexible matching.
prefix	char(3)	Three-letter code assigned to the matched state (e.g., KUL, SEL), used when auto-generating branch codes and order numbers.

Table 6.3.1(20) presents the data dictionary of the state_prefixes table. This lookup table defines the mapping between a state name pattern and a standard three-letter prefix used within Ai-Orders. When a new branch is created, the system checks the state_pattern to determine the correct prefix, which is then combined with running numbers or dates to form branch codes and order numbers. This design centralises the state–prefix configuration so that changes to naming rules can be managed without modifying application logic.

6.3.1.21. Sugar Level Table

Table 6.3.1 (21): Data Dictionary of Table “sugar_levels”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each sugar level option.
label	varchar(40)	Display label for the sugar level (e.g., “Normal”, “Less Sugar”, “No Sugar”).
status	tinyint(1)	Availability flag (1 = active/usable, 0 = inactive/hidden).
sort_order	tinyint	Ordering position of the sugar level in selection lists; lower values appear first.

Table 6.3.1(21) shows the data dictionary of the sugar_levels table. This lookup table defines the standard sugar options that can be applied to drinks in Ai-Orders. Each sugar level is identified by id and presented to users using the label field, while status and sort_order control which options are currently available and how they are arranged in the ordering interface.

6.3.1.22. Toppings Table

Table 6.3.1 (22): Data Dictionary of Table “toppings”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each topping record.
name	varchar(80)	Display name of the topping (e.g., “Pearl”, “Cheese Foam”).
price	decimal(10,2)	Additional price charged for this topping in Ringgit Malaysia (RM).
Status	tinyint(1)	Availability flag for the topping (1 = active/available, 0 = inactive/hidden).

Table 6.3.1(22) shows the data dictionary of the toppings table. This table stores the master list of all optional add-ons that can be attached to drinks or food items in Ai-Orders. Each topping is identified by id and described by a human-readable name, with price indicating the extra charge applied when customers select it. The status field is used by administrators to enable or disable specific toppings without deleting their records, supporting seasonal or branch-specific offerings.

6.3.1.23. Users Table

Table 6.3.1 (23): Data Dictionary of Table “users”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each user account.
name	varchar(100)	Full name of the user as displayed in the system.
email	varchar(100)	User’s login email address; also used for notifications and password resets.
phone	varchar(30)	Contact phone number for the user.
profile_image	varchar(255)	File path or URL to the user’s profile picture.
password	varchar(255)	Hashed password used for authentication.
role	enum('administrator', 'branch','counter', 'kitchen','customer')	User role that controls access rights: administrator (system-wide admin), branch (branch manager), counter (cashier/frontline staff), kitchen (kitchen staff), customer (end-user ordering via app).
branch_id	int	Foreign key linking staff accounts to the branch they belong to; usually null for customers and super administrators.
status	tinyint(1)	Account status (1 = active, 0 = inactive/blocked).
created_at	datetime	Date and time when the user account was created.
updated_at	datetime	Date and time when the user record was last updated.
deleted_at	datetime	Soft-delete timestamp; filled when the account is logically removed but kept for history.
reset_token	varchar(255)	Temporary token generated for password reset requests.
token_expiry	datetime	Expiry date and time of the password reset token.

Table 6.3.1(23) presents the data dictionary of the users table. This table stores all user accounts that interact with Ai-Orders, including administrators, branch staff and customers. Core identity information such as name, email, phone and profile_image is stored together with secure authentication data in password. The role and branch_id fields determine the user’s responsibilities and the branch context in which they operate, enabling role-based access control. Account lifecycle is managed through status, created_at, updated_at and deleted_at, while reset_token and token_expiry support secure, time-limited password recovery workflows.

6.3.1.24. User Points Table

Table 6.3.1 (24): Data Dictionary of Table “user_points”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each user points record.
user_id	int	Foreign key linking to the user/member who owns these loyalty points.
balance	int	Current total loyalty points available for the user.
updated_at	datetime	Date and time when the points balance was last recalculated or updated.

Table 6.3.1(24) presents the data dictionary of the user_points table. This table stores the current loyalty points balance for each Ai-Orders member. The user_id column links the record to a specific user account, while balance represents the latest available points after all earning and redemption activities recorded in the transaction tables. The updated_at field indicates when the balance was last refreshed, helping the system and administrators verify the recency and accuracy of the loyalty information.

6.3.1.25. Vouchers Table

Table 6.3.1 (25): Data Dictionary of Table “vouchers”.

Field Name	Data Size (Type)	Description
Id	int	Primary key. Unique identifier for each voucher record.
Code	varchar(40)	Voucher code entered or scanned by users (e.g., WELCOME10). Must be unique.
Name	varchar(120)	Human-readable voucher name shown in the app (e.g., “RM5 Off Any Drink”).
Type	enum('amount', 'percent','menu')	Voucher type: amount = fixed RM discount, percent = percentage discount, menu = free/discounted menu item(s).
amount_rm	decimal(10,2)	Discount value in Ringgit Malaysia when type='amount'.
percent_off	decimal(5,2)	Discount percentage (e.g., 10.00, 25.50) when type='percent'.
menu_free_qty	int	Number of free menu items granted when type='menu' (e.g., “Buy 1 Free 1” → 1).
points_cost	int	Number of loyalty points required to claim/redeem this voucher, if the voucher is part of the points redemption catalogue.
start_at	datetime	Date and time when the voucher becomes valid.
end_at	datetime	Date and time when the voucher expires and can no longer be used.
Status	tinyint(1)	Voucher status flag (1 = active, 0 = inactive/hidden).
created_at	datetime	Date and time when the voucher record was created.

updated_at	datetime	Date and time when the voucher record was last updated.

Table 6.3.1(25) shows the data dictionary of the vouchers table. This table defines all promotional vouchers available in the Ai-Orders loyalty and discount system. Each voucher has a unique code and descriptive name, and the type field controls how the benefit is calculated: fixed amount discount, percentage discount or free menu items. Fields such as amount_rm, percent_off, menu_free_qty and points_cost store the parameters needed to apply the correct discount and handle points-based redemptions. The validity window of each voucher is managed through start_at, end_at and status, while created_at and updated_at provide an audit trail for campaign configuration changes.

6.3.1.26. Voucher Claims Table

Table 6.3.1 (26): Data Dictionary of Table “voucher_claims”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each voucher claim record.
voucher_id	int	Foreign key referencing the voucher that was claimed by the user.
user_id	int	ID of the user/member who owns this claimed voucher.
order_id	int	ID of the order where the voucher was applied (filled once the voucher is used).
points_spent	int	Number of loyalty points deducted from the user to claim this voucher, if applicable.
claimed_at	datetime	Date and time when the voucher was first claimed by the user.
claim_code	varchar(64)	Unique code or token representing the claimed voucher, used for validation and redemption.
status	enum('claimed','used', 'expired','cancelled')	Current status of the claim: claimed (available but not yet used), used (redeemed on an order), expired (past validity period) or cancelled (manually voided).
created_at	datetime	Date and time when the voucher claim record was created.
updated_at	datetime	Date and time when the record was last updated.
used_at	datetime	Date and time when the voucher was actually redeemed on an order.

Table 6.3.1(26) shows the data dictionary of the voucher_claims table. This table tracks every instance where a user claims a voucher in the Ai-Orders loyalty system. Each claim links a specific voucher to a user and optionally to the order where it is redeemed. The points_spent field records how many loyalty points were consumed to obtain the voucher, while status, claimed_at and used_at describe the lifecycle of that claim from creation to redemption, expiry or cancellation. These details provide a clear audit trail for voucher usage and support accurate reporting of loyalty benefits given to customers.

6.3.1.27. Voucher Menus Table

Table 6.3.1 (27): Data Dictionary of Table “voucher_menus”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each voucher–menu mapping record.
voucher_id	int	Foreign key referencing the voucher that provides the discount or promotion.
menu_id	int	Foreign key referencing the menu item that is eligible for this voucher.

Table 6.3.1(27) shows the data dictionary of the voucher_menus table. This table acts as a linking (junction) table to support a many-to-many relationship between vouchers and menu items in Ai-Orders. Each record specifies that a particular voucher (voucher_id) can be applied to a specific menu item (menu_id). By using this structure, the system can define vouchers that apply to multiple drinks/foods and, at the same time, allow each menu item to be targeted by different voucher campaigns without duplicating voucher details.

6.3.1.28. V Orders History Table

Table 6.3.1 (28): Data Dictionary of Table “v_orders_history”.

Field Name	Data Size (Type)	Description
id	int	Order ID from the underlying orders table.
order_no	varchar(32)	System-generated human-readable order number (e.g., ORD-KUL-20251120-003).
source	enum('counter','mobile')	Channel where the order was created: counter (POS in-store) or mobile (customer app/web).
user_id	int	ID of the customer who placed the order.
branch_id	int	ID of the branch responsible for preparing the order.
staff_id	int	ID of the staff member who handled the order, if any.
status	enum('pending','confirmed', 'preparing','ready', 'completed','cancelled')	Operational status of the order in its lifecycle.
payment_method	enum('cash','card', 'ewallet','wallet')	Payment method used: cash, card, external e-wallet or internal Ai-Orders wallet.
payment_status	enum('unpaid','paid', 'refunded','void')	Financial status of the order: unpaid, successfully paid, refunded or voided.
paid_at	datetime	Date and time when payment was completed (for paid orders).

subtotal_rm	decimal(10,2)	Total of all order items before any discounts, points or rounding (RM).
discount_rm	decimal(10,2)	Total discount applied to the order in RM.
points_spent	int unsigned	Number of loyalty points redeemed to reduce this order's payable amount.
points_value_rm	decimal(12,2)	RM value represented by the redeemed points.
rounding_rm	decimal(12,2)	Rounding adjustment applied (e.g., to nearest RM0.05); may be positive or negative.
total_rm	decimal(10,2)	Final payable amount after discounts, points and rounding.
voucher_id	int	ID of the voucher configuration applied, if any.
voucher_claim_id	int	ID of the specific claimed voucher used by the customer, if applicable.
voucher_code	varchar(40)	Snapshot of the voucher code used on the order.
pickup_name	varchar(100)	Name of the person who will collect the order.
pickup_phone	varchar(30)	Contact phone number for pickup notifications.
pickup_at	datetime	Scheduled pickup date and time.
pickup_time_label	varchar(32)	Human-friendly label for pickup time (e.g., "ASAP", "Today 5:00–5:30 PM").
note	varchar(255)	Optional special instructions from the customer.
queue_no	int unsigned	Queue number used by the branch to call the customer when the order is ready.
created_at	datetime	Date and time when the order was created.
updated_at	datetime	Date and time when the order record was last updated.
idempotency_key	varchar(64)	Unique key used to prevent duplicate order creation from repeated requests.

Table 6.3.1(28) presents the data dictionary of the v_orders_history view. This database view exposes historical order records using the same key business and financial fields from the orders table, but in a read-only form optimised for reporting and history screens. It summarises each order's channel, branch, payment information, voucher usage, loyalty-point redemption and pickup details, allowing the system to query past transactions efficiently without directly manipulating the base orders table.

6.3.1.29.V Orders Active Table

Table 6.3.1 (29): Data Dictionary of Table “v_orders_active”.

Field Name	Data Size (Type)	Description
id	int	Order ID from the underlying orders table.
order_no	varchar(32)	System-generated human-readable order number (e.g., ORD-KUL-20251120-003).
source	enum('counter','mobile')	Channel where the order was created: counter (in-store POS) or mobile (customer app/web).
user_id	int	ID of the customer who placed the order.
branch_id	int	ID of the branch responsible for preparing the order.
staff_id	int	ID of the staff member who handled the order at the counter, if any.
status	enum('pending','confirmed', 'preparing','ready', 'completed','cancelled')	Operational status of the order in its lifecycle. The view only includes “active” rows (e.g., pending/confirmed/preparing/ready).
payment_method	enum('cash','card', 'ewallet','wallet')	Payment method chosen by the customer: cash, card, external e-wallet or internal wallet.
payment_status	enum('unpaid','paid', 'refunded','void')	Financial status of the order: unpaid, paid, refunded or void.
paid_at	datetime	Date and time when payment was confirmed.
subtotal_rm	decimal(10,2)	Total of all order items before discounts, points or rounding (RM).
discount_rm	decimal(10,2)	Overall discount amount applied to the order (RM).
points_spent	int unsigned	Number of loyalty points redeemed on this order.
points_value_rm	decimal(12,2)	Monetary value (RM) represented by the redeemed points.
rounding_rm	decimal(12,2)	Rounding adjustment applied to meet cash/0.05 rounding rules.
total_rm	decimal(10,2)	Final amount payable by the customer after all discounts, points and rounding.
voucher_id	int	ID of the voucher configuration applied to the order, if any.
voucher_claim_id	int	ID of the specific claimed voucher used by the customer.
voucher_code	varchar(40)	Snapshot of the voucher code applied on the order.
pickup_name	varchar(100)	Name of the person who will collect the order.
pickup_phone	varchar(30)	Contact phone number for pickup notifications.
pickup_at	datetime	Scheduled pickup date and time.
pickup_time_label	varchar(32)	Human-friendly label for pickup timing (e.g., “ASAP”, “Today

		6.00–6.30 PM").
note	varchar(255)	Special instructions from the customer (e.g., "less ice", "separate toppings").
queue_no	int unsigned	Queue number used by the branch to call customers when drinks are ready.
created_at	datetime	Date and time when the order was created.
updated_at	datetime	Date and time when the order record was last updated.
idempotency_key	varchar(64)	Unique key used to prevent duplicate order creation from repeated requests.

Table 6.3.1(29) presents the data dictionary of the v_orders_active view. This view exposes all currently active or in-progress orders by reusing the main business fields from the orders table but filtering out purely historical records. It is mainly used to drive real-time screens such as the counter dashboard, kitchen order board and customer "ongoing orders" list. By querying this view, the system can quickly retrieve only relevant live orders—including channel, branch, payment information, voucher usage, loyalty-point redemption and pickup details—without repeatedly applying complex filters directly on the base orders table.

6.3.1.30. Wallets Table

Table 6.3.1 (30): Data Dictionary of Table "wallets".

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each wallet record.
user_id	int	Foreign key that links the wallet to its owner in the users/members table. Each user normally has one wallet.
balance	decimal(12,2)	Current available wallet balance for the user, stored in Ringgit Malaysia (RM).
created_at	datetime	Date and time when the wallet record was first created.
updated_at	datetime	Date and time when the wallet information or balance was last updated.

Table 6.3.1(30) presents the data dictionary of the wallets table. This table stores the current e-wallet balance for each Ai-Orders user. The user_id column links the wallet to its owner, while the balance field holds the latest available amount after all successful top-ups, spending, refunds and adjustments recorded in wallet_transactions. The timestamp fields created_at and updated_at help track when the wallet was created and when it was last modified, supporting audit and troubleshooting activities.

6.3.1.31. Wallet Topups Table

Table 6.3.1 (31): Data Dictionary of Table “wallet_topups”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each wallet top-up request.
user_id	int	ID of the user whose wallet is being topped up.
amount	decimal(12,2)	Requested top-up amount in Ringgit Malaysia (RM).
status	enum('pending','success', 'failed','void')	Processing status of the top-up: pending (created, awaiting payment), success (payment confirmed, wallet credited), failed (payment error) or void (cancelled/expired).
gateway	varchar(30)	Payment gateway or channel used for the top-up (e.g., ToyyibPay).
gateway_ref	varchar(120)	Reference returned by the gateway, such as transaction ID or reference number.
bill_code	varchar(120)	Generated bill code used to identify this top-up in the payment gateway.
bill_id	varchar(120)	Internal bill identifier assigned by the gateway (if provided).
payment_url	varchar(255)	URL that redirects the user to the payment page for this top-up.
idempotency_key	varchar(64)	Unique token used to prevent duplicate top-up records when the same request is sent multiple times.
meta	text	Additional metadata or raw gateway response stored in text/JSON format.
paid_at	datetime	Date and time when the payment was successfully completed (for success records).

Table 6.3.1(31) shows the data dictionary of the wallet_topups table. This table stores all e-wallet top-up requests initiated by Ai-Orders users before they become actual wallet balance movements. Each record links a user (user_id) with a specific top-up amount and tracks its lifecycle through the status field. Integration with external payment gateways is handled via gateway, bill_code, bill_id, gateway_ref and payment_url, while idempotency_key and meta provide safety and flexibility for processing callbacks and storing extra gateway information. The paid_at, created_at and updated_at timestamps support proper reconciliation and audit of top-up activities.

6.3.1.32. Wallet Transactions Table.

Table 6.3.1 (32): Data Dictionary of Table “wallet_transactions”.

Field Name	Data Size (Type)	Description
id	int	Primary key. Unique identifier for each wallet transaction record.
user_id	int	ID of the user/member who owns the wallet and to whom this transaction belongs.
type	enum('topup','spend', 'refund','adjust')	Type of wallet transaction: topup adds balance, spend deducts balance (e.g., for orders), refund returns balance to the wallet, and adjust is a manual correction by admin.
amount	decimal(12,2)	Monetary value of the transaction in Ringgit Malaysia (RM). Positive amount; the effect (add/deduct) depends on type.
status	enum('pending','success', 'failed','void')	Processing status of the transaction: pending (created/awaiting confirmation), success (applied to wallet balance), failed (payment or operation failed) or void (cancelled/reversed).
reference_type	varchar(60)	Type/name of the related business entity (e.g., "order", "wallet_topup", "adjustment"), used to know which module created this transaction.
reference_id	int	ID of the related record in its own table, such as the linked order ID or wallet_topups ID.
idempotency_key	varchar(64)	Unique token to prevent duplicate wallet transactions when the same payment callback or request is received multiple times.
gateway	varchar(30)	Payment channel or gateway used (e.g., ToyyibPay, cash, card, manual).
gateway_ref	varchar(120)	Reference value returned by the gateway or channel, such as bill code, transaction ID or receipt number.
meta	text	Additional details in free text or JSON format (e.g., raw gateway response, device info, debug notes).
created_at	datetime	Date and time when the wallet transaction record was created.
updated_at	datetime	Date and time when the record was last updated.

Table 6.3.1(32) shows the data dictionary of the wallet_transactions table. This table records every movement of value in the Ai-Orders wallet, including top-up operations, spending on orders, refunds and manual balance adjustments. Each transaction is linked to the owning user (user_id) and can be tied to a specific source document via reference_type and reference_id. The type and status fields describe the nature and lifecycle stage of the transaction, while gateway and gateway_ref capture information about the payment channel that processed it. The idempotency_key and meta columns support safe integration with external payment gateways by preventing duplicate entries and storing additional technical details. Together, these fields provide a complete audit trail for computing wallet balances and reviewing wallet-related activities.

6.3.2 Data Flow Diagram (DFD)

6.3.2.1 Main Level

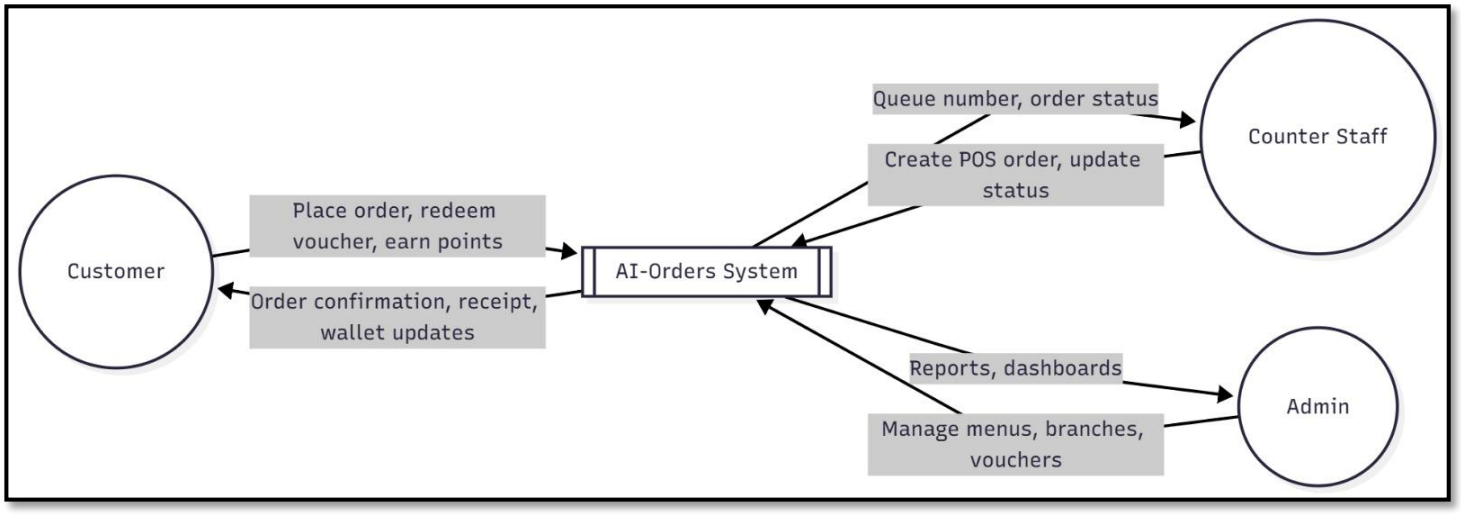


Figure 6.3.2 (1): Main Level Data Flow Diagram (DFD)

Figure 6.3.2(1) shows the main level Data Flow Diagram (DFD) for the Ai-Orders System, representing the interactions of the core actors of the central system. The customer makes requests, including an order, redeeming vouchers and earning points to the Ai-Orders System, and gets a response of confirmation of an order, a digital receipt and wallet or points updates. This identifies the customer facing roles of Ai-Orders as an online ordering and loyalty platform.

The Ai-Orders System communicates on the operations side with counter personnel and the administration users. The counter staff are given the queue number and the order status and can make a POS order and update order status when drinks are sold as they transfer to the completed status and not in pending position. Admin users make use of the system to edit menus, branches and vouchers as well as reviewing reports and dashboards created using transactions data. All these flows indicate how the Ai-Orders System serves as the central nervous system linking customers, outlet staff and administrators in one and the same integrated condition.

6.3.2.2 Create Order

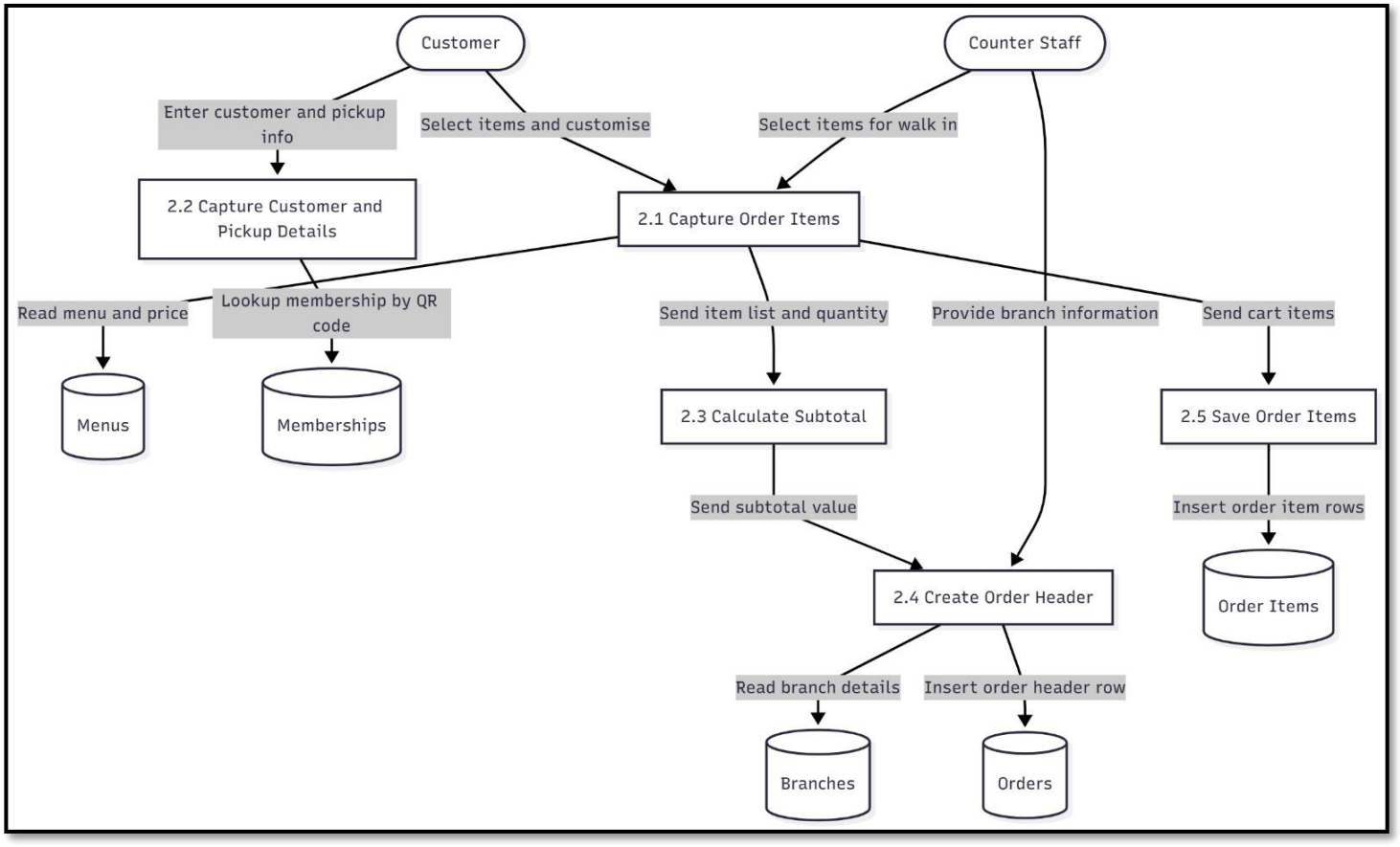


Figure 6.3.2 (2): Create Order Data Flow Diagram (DFD)

Figure 6.3.2(2) shows the Create Order Data Flow Diagram, and it is used to describe the process of assembling an order in Ai-Orders, whether it is an online or a walk-in customer. It begins with the Customer or Counter Staff picking items and configuring them (size, sugar, toppings) in 2.1 Capture Order Items which reads the menu information and prices in the Menus data store. Simultaneously, the customer or the staff provides pickup details and a membership QR code, which may be scanned using 2.2 Capture Customer and Pickup Details, will search for membership information in Memberships data store. This would make sure that the system understands who is placing the order, which branch will make the order, and whether the order should have some loyalty benefits.

After verifying the cart, 2.3 Calculate Subtotal accepts the list and quantities of the items and calculates the sub total and then to 2.4 Create Order Header, which also reads a branch information in the Branches data store. The order header, including customer, branch, subtotal and status are entered into the Orders data store, and each individual drink and customization is entered in separate rows in the Order Items data store by the 2.5 Save Order Items stored procedure. Collectively, these processes will ensure that all orders are stored with a distinct connection between customer, branch and detailed items which will be used in subsequent calculation of payments, kitchen preparation and loyalty in subsequent DFDs.

6.3.2.3 Payment

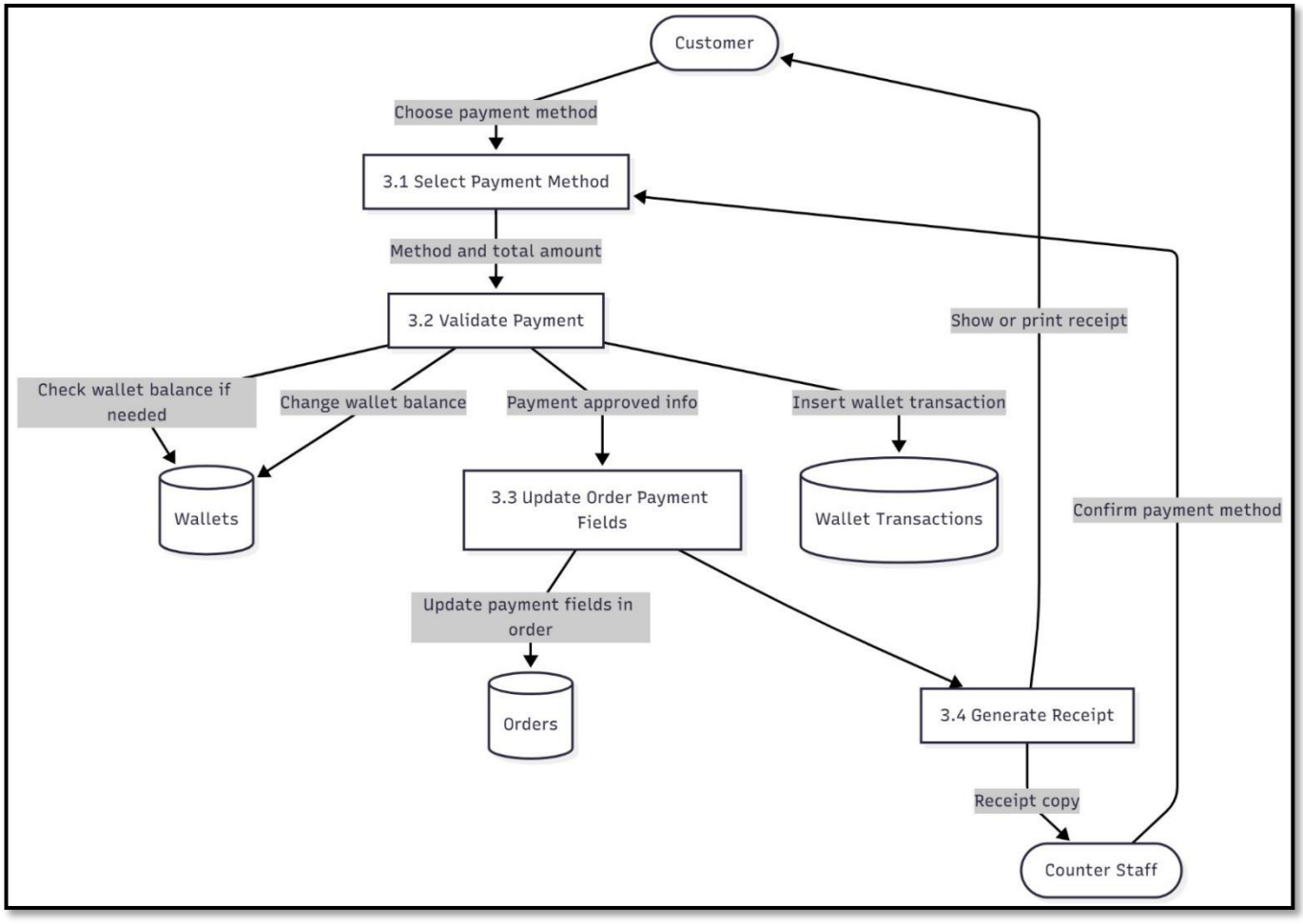


Figure 6.3.2 (3): Payment Data Flow Diagram (DFD)

Figure 6.3.2(3) shows the Payment Data Flow Diagram, which focuses on how Ai-Orders processes payments for confirmed orders. The flow takes off when the Customer (or counter staff acting on behalf of a walk-in customer) selects a payment option in 3.1 Select Payment Method. This is handed over to 3.2 Validate Payment that verifies any status requirements including available Wallets balance to make wallet payment. When the wallet method is implemented, the current balance is read, and it must be confirmed to be sufficient and when so authorized an update of the wallet balance is made and a new record is added in the Wallet Transactions data store.

Upon validation, 3.3 Update Order Payment Fields is called upon to obtain the information about the payment approval and update the details of the respective order record in the Orders data store with status, payment method and paid amount. As soon as payment is made successfully the order payment is recorded and 3.4 Generate Receipt is used to generate a receipt which can be displayed onscreen or printed, which will act as evidence of payment to both the Customer and the Counter Staff. This DFD helps to make sure that all payments cause the regular changes in wallet balances and records on orders and also to create the clear receipt to be used in the operational and audit purposes.

6.3.2.4 Apply Vouchers and Points

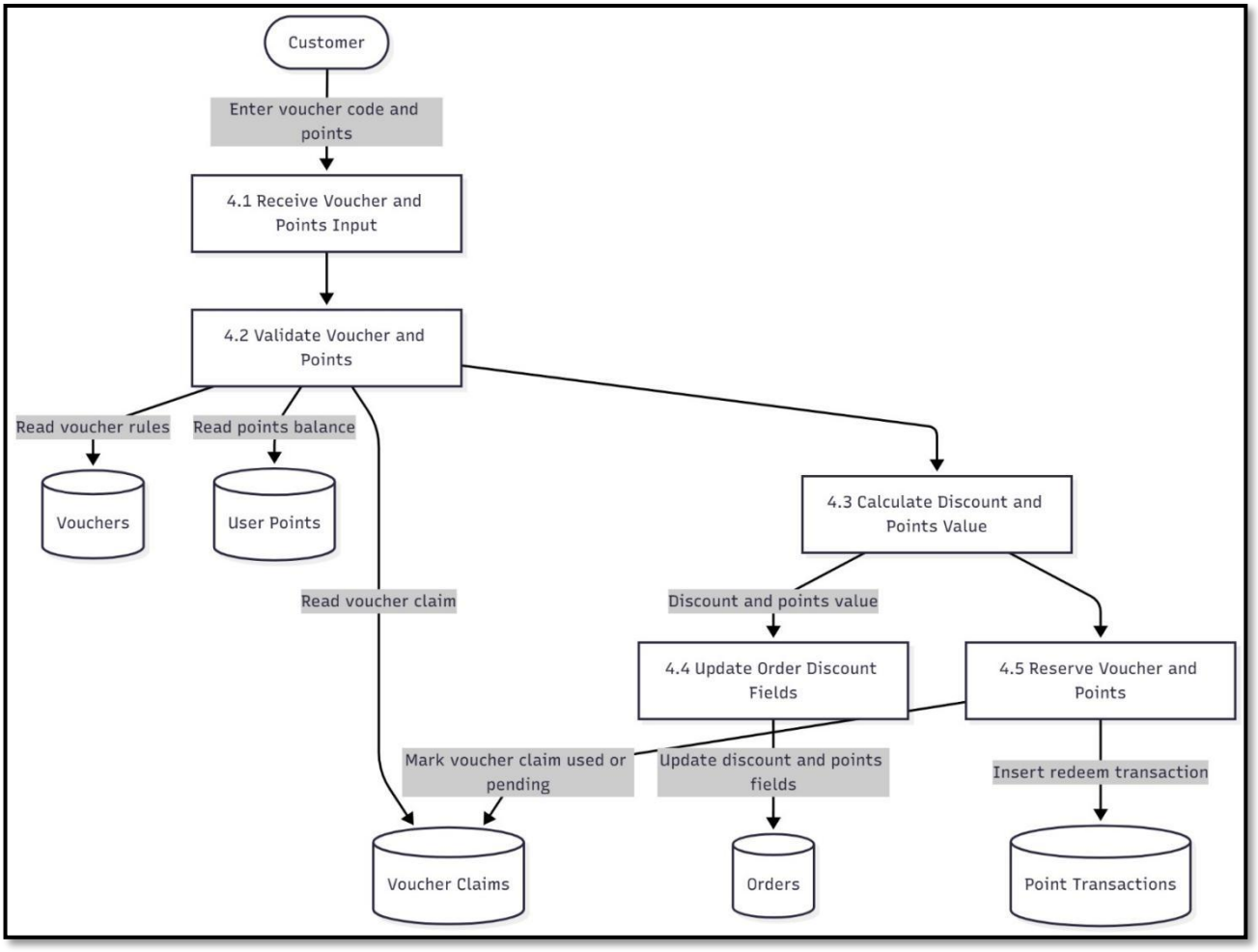


Figure 6.3.2 (4): Apply Vouchers and Points Data Flow Diagram (DFD)

Figure 6.3.2(4) shows the Apply Vouchers and Points Data Flow Diagram, which explains how Ai-Orders handles discounts at checkout. It starts by the Customer typing in a voucher code and the amount of Ai-Points to redeem in 4.1 Receive Voucher and Points Input. This is then fed into 4.2 Validate Voucher and Points which verifies voucher policies based on the Vouchers data store, retrieves the current balance of the customer based on User Points and where possible, searches on a record in Voucher Claims. The process will continue only in case the voucher is valid in the current order and the customer has sufficient points.

After the validation is successful, the discount amount donated by the voucher and the redeemed points is then calculated with the help of 4.3 Calculate Discount and Points Value. These values get posted to 4.4 Update Order Discount Fields which updates the appropriate fields of the Orders data store such that the amount the company is due to pay is accurate. Meanwhile 4.5 Reserve Voucher and Points records as used or pending in Voucher Claims and enters a redeem transaction into Point Transactions, temporarily locking up redeemed points. This makes sure that it is not possible to reuse vouchers and points and keeps a good audit trail of all redemptions.

6.3.2.5 Update Loyalty Points

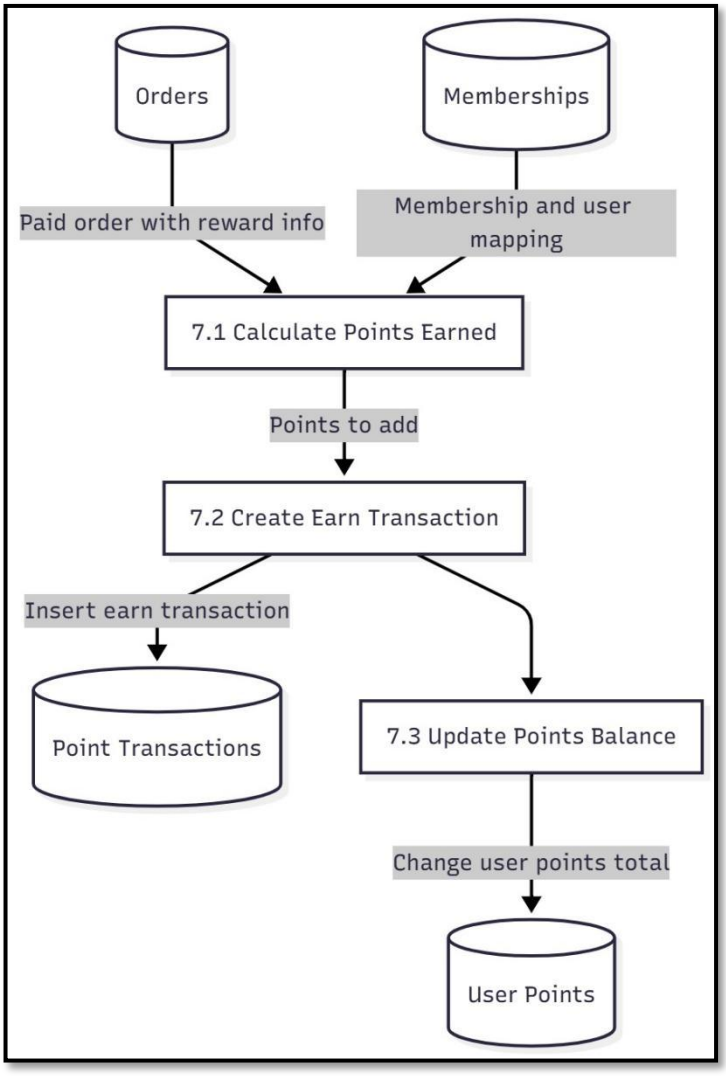


Figure 6.3.2 (5): Update Loyalty Points Data Flow Diagram (DFD)

Figure 6.3.2(5) shows the Update Loyalty Points Data Flow Diagram, which explains how Ai-Orders awards points after an order is successfully paid. This process begins with a read of an order with reward information paid out of the Orders data store and a transaction with the customer record in Memberships.

In 7.1 Calculate Points Earned, the system uses the existing earning rules (such as, points per ringgit) to calculate the number of Ai-Points to be added to that transaction. The resultant calculated value is then transferred as points to be added to the subsequent process. In 7.2 Create Earn Transaction, an entry in the point transactions data store is made with all the membership ID, order reference, and number of points earned. The next step will be 7.3 Update Points Balance which will update the overall balance of the customer in User Points data store by adding the new points to the current balance. This makes sure that each change in the loyalty points can be traced in the transaction log and the current balance of a member keeps the rewards accurate and consistent throughout the system.

6.3.2.6 Update Wallet

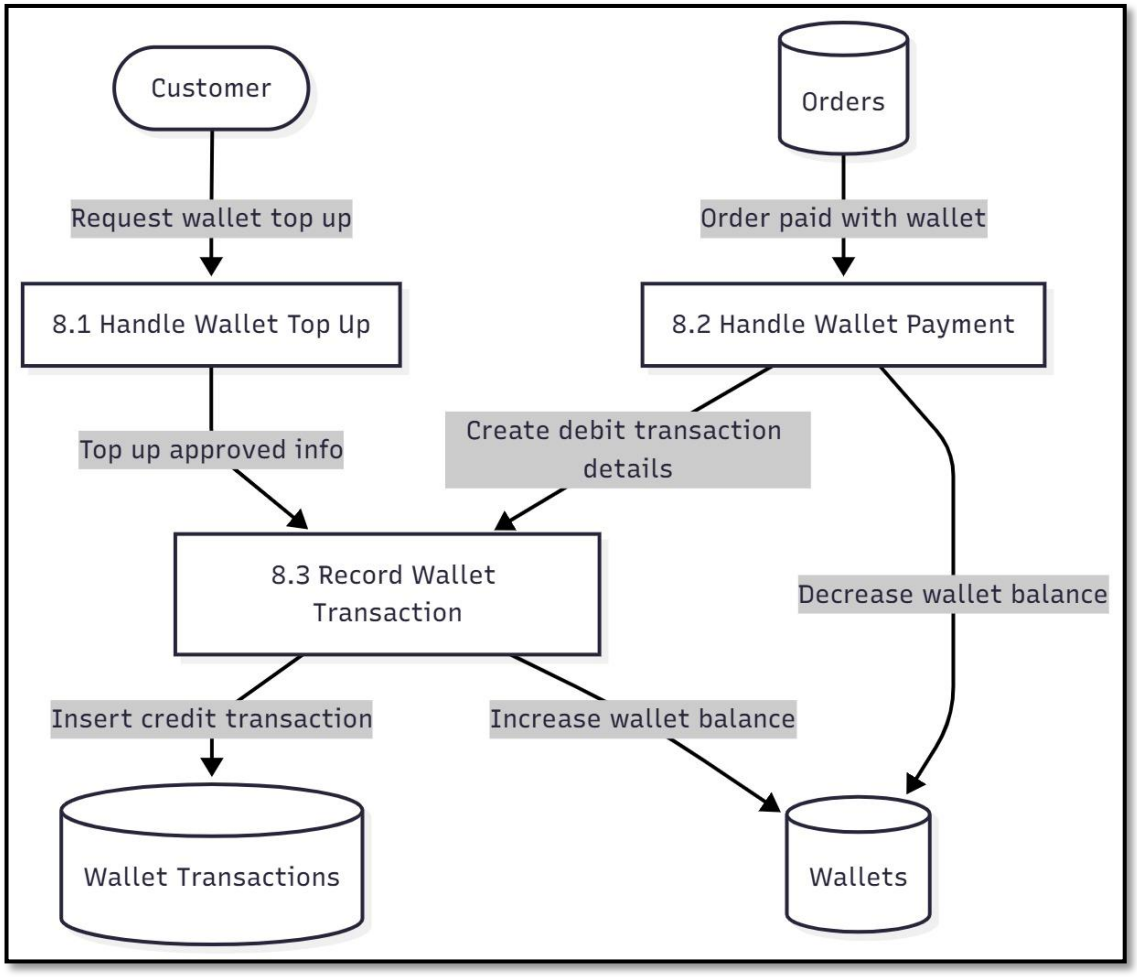


Figure 6.3.2 (6): Payment Data Flow Diagram (DFD)

Figure 6.3.2(6) shows the Update Wallet Data Flow Diagram, which explains how Ai-Orders manages wallet top-ups and payments. On requesting a wallet top-up, 8.1 Handle Wallet Top Up is activated. After external payment gateway approves the top-up, the approval notification is transmitted to 8.3 Record Wallet Transaction, which inserts a credit transaction in the Wallet Transactions data store and adds to the balance of the customer in Wallets. This will ensure that each top-up is monitored in clear and auditable record, and that the wallet balance is up to date to represent the most recent approved amount.

On the spending side, an order that is in the Orders and is marked as order paid with wallet produces the corresponding details of a debit transaction and transfers them to 8.3 Record Wallet Transaction. The process captures a debit transaction in Wallet Transactions and reduces the wallet balance in Wallets respectively. Ai-Orders ensures that wallet balances are maintained by recording credit (top-up) and debit (payment) operations together; therefore, giving a full account of the flow of money in and out of each customer wallet.

6.3.3 Entity Relational Diagram (ERD)

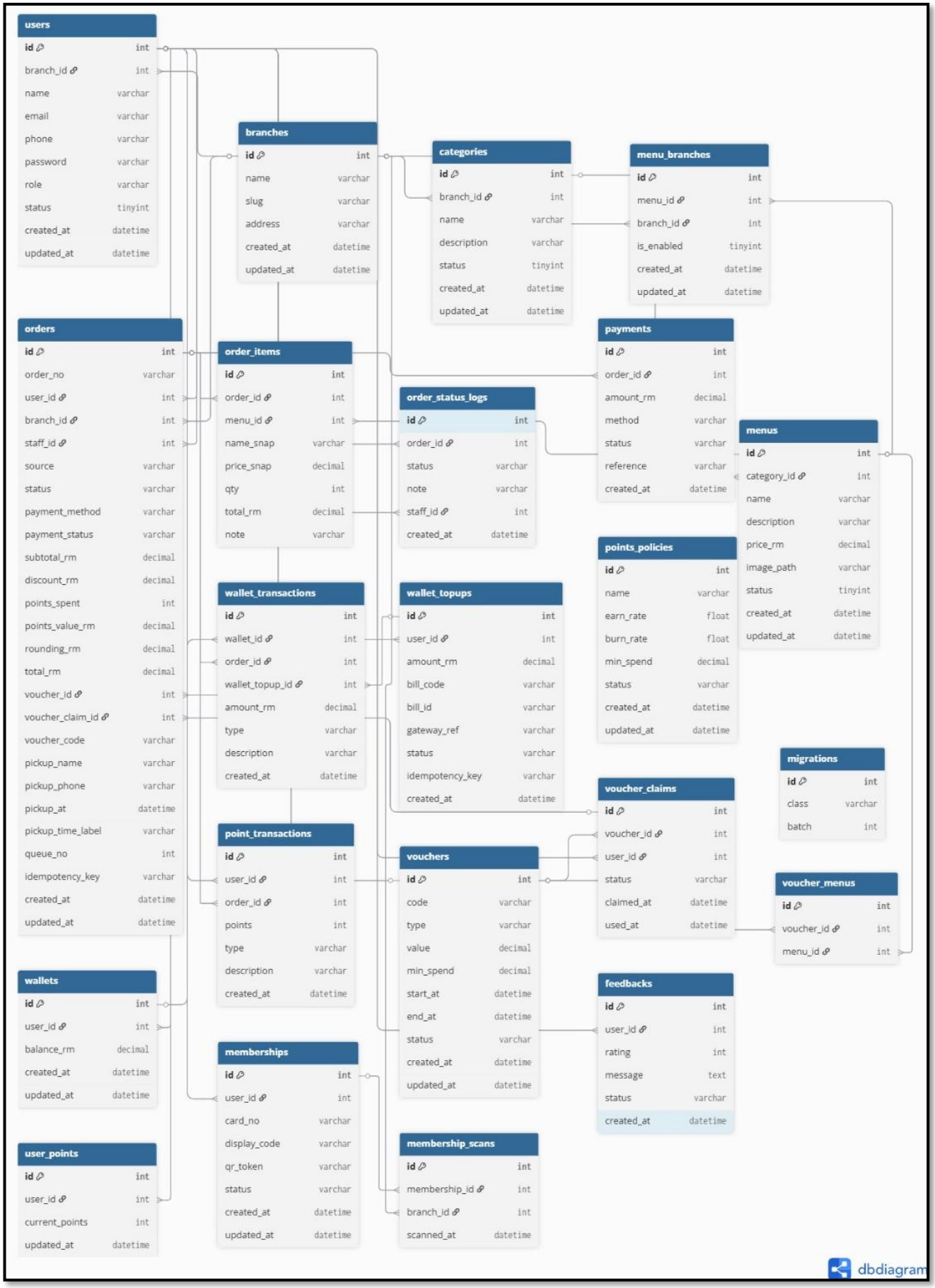


Figure 6.3.3: (ERD) for the Ai-Orders POS & Loyalty System

The Figure 6.3.3 represents the Entity Relationship Diagram (ERD) of the Ai-Orders POS & Loyalty System, which is a modeling of the way all the significant data entities are organized and connected in the MySQL database. Its main operational flow is user-centric with the users, branches, orders and orderitem tables as the core with each order being associated with a particular customer and branch and the orderitem capturing the menu that was ordered, size, price and quantity. The supporting tables like categories, menus, menubranches and payments give the extra information that is required to deal with the product catalogues as well as outlet availability and payment details. The ERD allows enforcing referential integrity, and it facilitates easier and more coherent data development, update, and query by defining primary keys and foreign keys among these entities (Baeldung, 2023; Vertabelo, 2024).

The specialised modules which make Ai-Orders distinct of simple POS are also brought into light in the ERD. Memberships, userpoints, pointspolicies and pointtransactions, vouchers, voucherclaims and vouchermenus are some of the tables related to loyalty which handle earning and redeeming of Ai-Points, discount campaigns and eligibility rules. Payment and wallet functionality are enabled by using wallets, wallettopups and wallettransactions in order to track each credit or debit to a top-up or order event. Other tables such as orderstatuslogs, membershipscans and feedbacks are used to take record of the history of operations and customer feedback to monitor the quality of service. As a whole, the ERD serves as a blueprint of the connection between transactional, loyalty, and reporting data that is to be implemented and enhanced in the future regarding the Ai-Orders system (Lucidchart, 2023).

6.4 Flow of the System

This section describes the flow of data and requests over the Ai-Orders POS & Loyalty System since the time a customer obtains the web application till the time the information is being processed, stored and sent back to the user. It gives the previous design artefacts, DFD, ERD and database design, the relationship with the real runtime behavior of the system, demonstrating how the front-end, backend API and specialized services (authentication, ordering, loyalty and wallet) interrelate with one another. Through the description of these flows, this section enables the readers to know how various modules interact to support other features like registration, online ordering, payment, earning points and redemption voucher and how the system ensures consistency between user data, order and loyalty data across various outlets.

6.4.1 Web App Flow

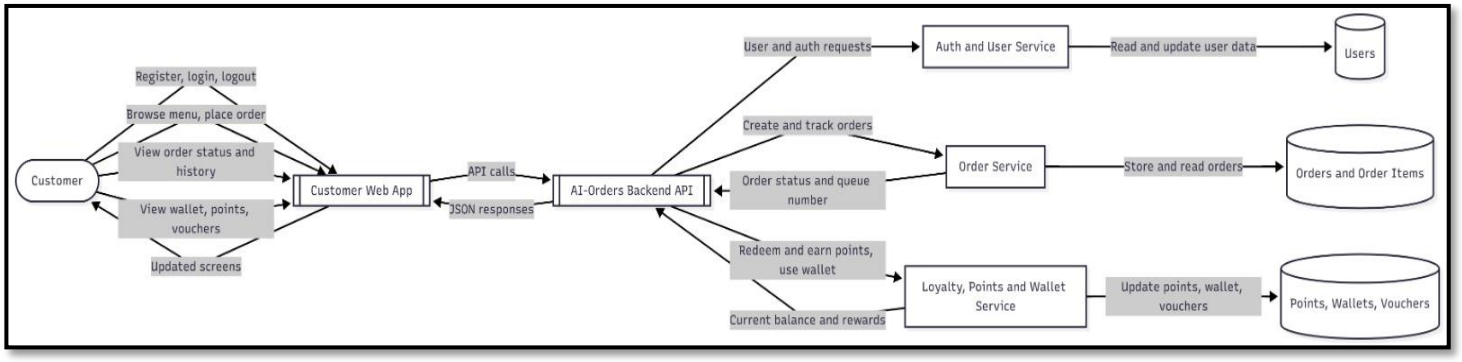


Figure 6.4.1: Web Application flow for Ai-Orders

Figure 6.4.1 shows the web application flow for Ai-Orders, starting from the customer's interaction with the browser-based Customer Web App. It is through this interface that users can also register, log in or log out; browse the Ai-CHA menu; place and personalise orders; view their order status and history and check wallet, points and voucher balances. All of these activities cause API calls of the Customer Web App to the central Ai-Orders Backend API with the following response in the form of JSON, which updates the on-screen pages in real time and, as a result, customers can always view the most current information about their orders and rewards.

The Ai-Orders Backend API in the background transfers every request to the corresponding internal service. The Auth and User Service is used to identify and perform profile-related operations and authentication; it reads and modifies the records in the Users database. The Order Service receives order creation requests and tracking requests and stores and retrieves the data presented in the Orders and Order Items tables, which include the queue numbers and status of each branch. The Loyalty, Points and Wallet Service handles loyalty-based activities like earning or redeeming points, and utilizing the wallet and updates the wallet, points and vouchers data store. The Customer Web App in turn responds to the backend by receiving structured JSON responses that it then uses to update the corresponding screens to offer a frictionless end-to-end user input to database update and visual feedback experience.

6.4.2 POS System Flow

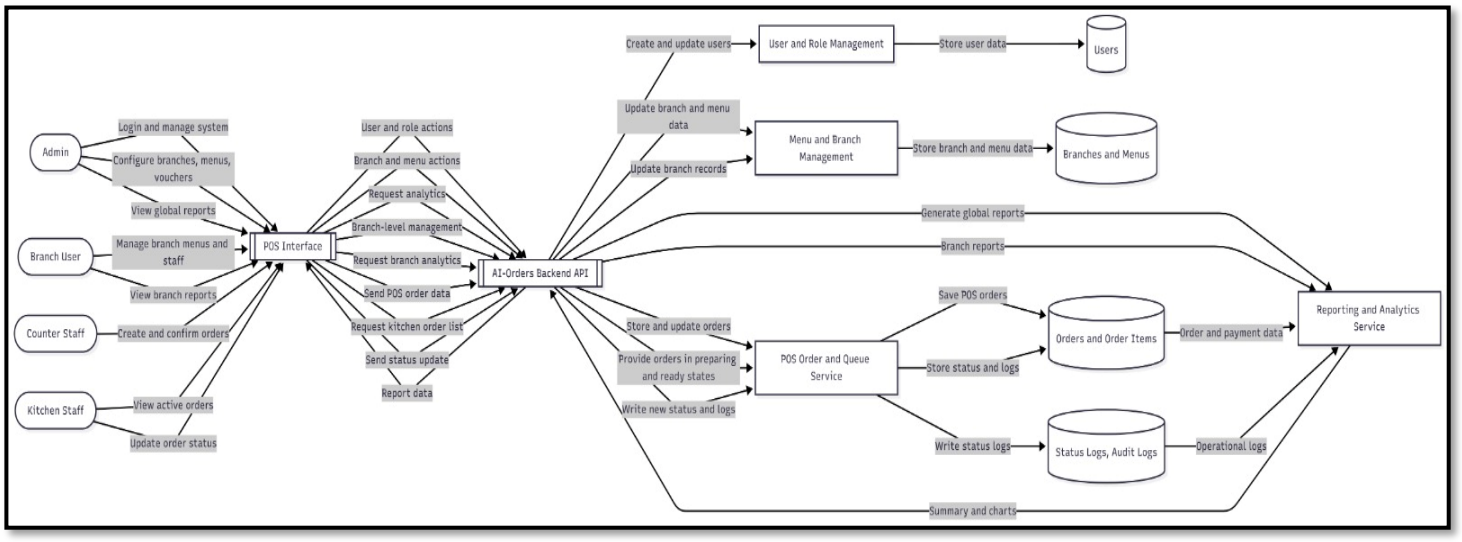


Figure 6.4.2: POS System flow for Ai-Orders

Figure 6.4.2 illustrates the POS system flow of Ai-Orders that encompasses the interaction of Admin, Branch User, Counter Staff and Kitchen Staff via the POS Interface that is shared. All roles have a variety of functions: Admin opens branches and menu and vouchers, manages users and roles, and sees the global reports; Branch Users have access to personal outlets menu and staff and can see the branch reports; Counter Staff can create POS orders, and confirm them; Kitchen Staff can see what orders are open and change their status of preparation. All these front-end activities are forwarded to the POS Interface to the Ai-Orders Backend API in the form of requests like user and role actions, branch-level management, send POS order data or send status update.

The requests are redirected to the specialised services within the backend. Users database User accounts are stored and updated by the User and Role Management service. Menu and Branch Management service removes the records in Branches and Menus data store and can create branch-level views in the POS. The POS Order and Queue Service receives operational requests made by both counter and kitchen staff, stores POS orders and updates their status in the Orders and Order Items tables and writes status and audit information to the Status Logs / Audit Logs store. Lastly, Reporting and Analytics Service will read these data sources and generate global and branch reports, dashboards and charts that will be returned to the POS Interface to Admin and Branch Users. This flow is necessary to ensure that a single, consistent backend is shared across all the positions and yet with access to the functions and data which are appropriate to the duties of the position.

6.5 Conclusion

To sum it up, this chapter has outlined the general design and development of the Ai-Orders POS & Loyalty System and how each element interrelates to contribute to the business goals of Ai-CHA. The system architecture, database design, data dictionary, DFDs and ERD together give a vivid design of how the customer, order, payment, wallet, voucher and loyalty data is organized and processed. The front front-end interfaces and the main and POS flows pictorially explain how the front-end interfaces interact with the backend API and specialised services to process registration, online ordering, POS operations, payment processing and rewards management in a secure and consistent way.

All in all, the proposed design will make Ai-Orders a modular system and scalable and maintainable and address the functional requirements of the different user roles such as customers, counter staff, kitchen staff, branch managers and administrators. The well spelt out procedures of making orders, redeeming vouchers and points, process payments, updating wallets and awarding loyalty points have contributed towards reducing errors and ensuring a good record of all outlets. Such design underpinning offers a solid technical foundation of the implementation, testing, and deployment procedures in the following chapters, and the further improvement of the application including more payment methods, new analytics and new loyalty.

7 IMPLEMENTATION

7.1 Introduction

This chapter explains how the approved design for the Ai-Orders POS & Loyalty System was implemented as a working web application. The solution is built on a classic LAMP-style stack using PHP 8 and the CodeIgniter 4 framework for server-side logic, MySQL for relational data storage, and a responsive HTML/CSS/JavaScript front end. CodeIgniter 4 provides a lightweight MVC structure, routing, form handling, and security helper (CSRF, validation), which supports modular development of features such as ordering, POS dashboards, loyalty points, vouchers and wallet transactions (CodeIgniter Foundation, 2024). MySQL 8 is used to manage normalized tables for users, branches, menus, orders, payments, vouchers and points, ensuring ACID-compliant transactions and reliable reporting for sales and loyalty analytics (Oracle, 2024).

Development and testing were carried out on a Windows 11 laptop using Visual Studio Code as the main IDE, XAMPP as the local web server and database stack, and Google Chrome as the primary browser for debugging and responsive testing. Windows 11 offers stable performance, built-in security features such as TPM 2.0 and Secure Boot, and broad driver and browser support suitable for modern web development (Microsoft, 2024). Visual Studio Code provides integrated source control, terminal access, and extensions for PHP, MySQL, and front-end tooling, enabling efficient coding, debugging and project management from a single environment (Visual Studio Code, 2024). The deployment version of Ai-Orders runs on a shared Linux hosting environment (cPanel) using the same PHP/MySQL stack, which simplifies migration from local development to production.

7.2 Execution Platform

7.2.1 Windows 11

Figure 7.2.1: Windows 11

Figure 7.2.1 shows the Windows 11 desktop used as the primary execution platform for Ai-Orders development and testing. Windows 11 (64-bit) was selected because it is optimized for current hardware, supports modern browsers and development tools, and includes security features that protect local databases and source files (Microsoft, 2024). The platform integrates smoothly with XAMPP, Visual Studio Code and Git, allowing the local Apache–MySQL–PHP stack, IDE, and version control to run together without compatibility issues. This environment ensured that the Ai-Orders system could be developed, debugged and demonstrated reliably before being deployed to the live hosting server.

7.3 Implementation Tools

7.3.1 Visual Studio Code

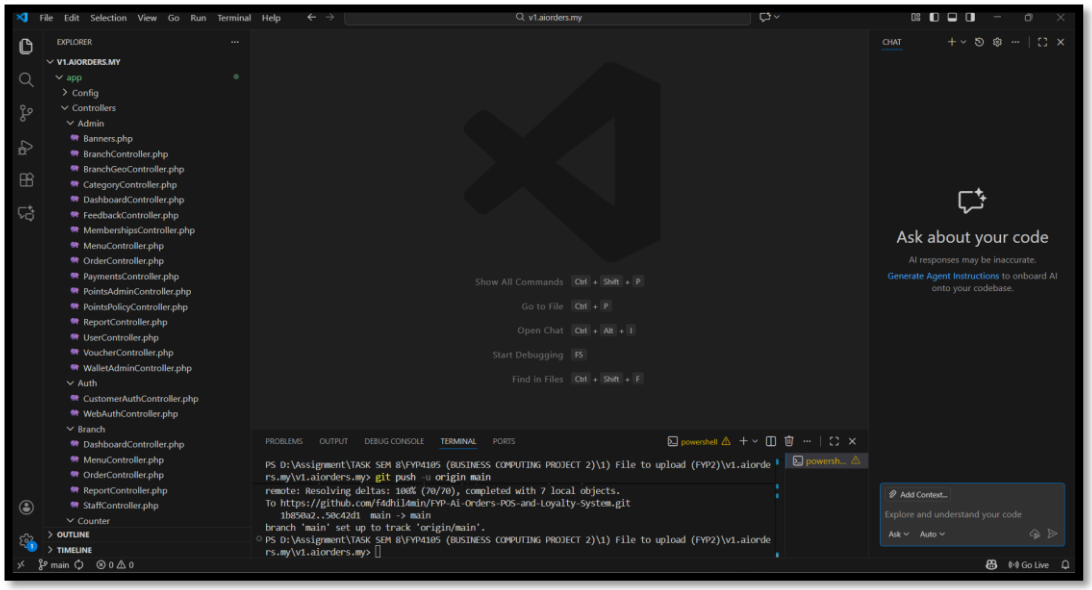


Figure 7.3.1: Visual Studio Code

Figure 7.3.1 presents a screenshot of Visual Studio Code with Ai-Orders project files and PHP controllers open. VS Code was the main IDE for writing PHP, HTML, CSS and JavaScript, chosen for its lightweight installation, fast startup and rich ecosystem of extensions (Visual Studio Code, 2024). The built-in Git integration was used to manage commits and branches, while the integrated terminal allowed php spark commands, Composer operations and database migrations to be executed without leaving the editor. Extensions such as PHP Intelephense, PHP Debug and MySQL tools helped with code completion, debugging and quick inspection of queries, which increased productivity and reduced syntax errors during implementation.

7.3.2 PHP and CodeIgniter 4

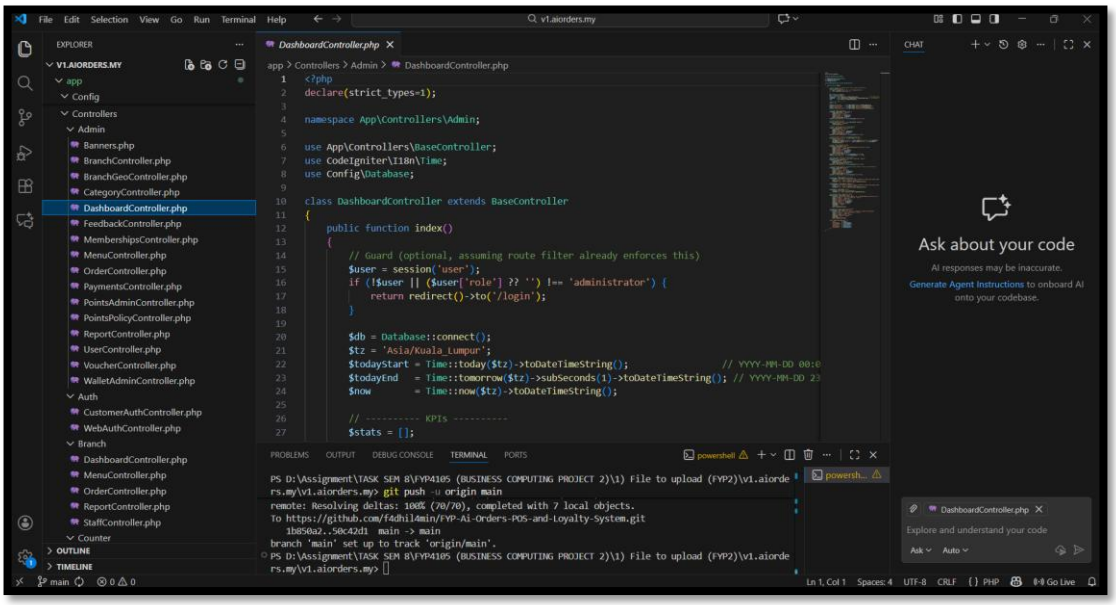


Figure 7.3.2: PHP and CodeIgniter

Figure 7.3.2 shows a snippet of a CodeIgniter 4 controller used to handle customer orders. PHP 8 provides the server-side runtime for processing HTTP requests, generating dynamic views and communicating with the MySQL database, while CodeIgniter 4 supplies an MVC structure, routing, filters and configuration management (CodeIgniter Foundation, 2024). Controllers were used to coordinate order flows (create order, apply vouchers, process payments), models encapsulated database access for tables such as orders, order_items, wallet_transactions and user_points, and views rendered role-specific dashboards for admin, branch, counter and kitchen staff. CodeIgniter's helpers and validation rules simplified tasks such as form handling, CSRF protection and input sanitization, which helped maintain security and code consistency across the system.

7.3.3 MySQL Database

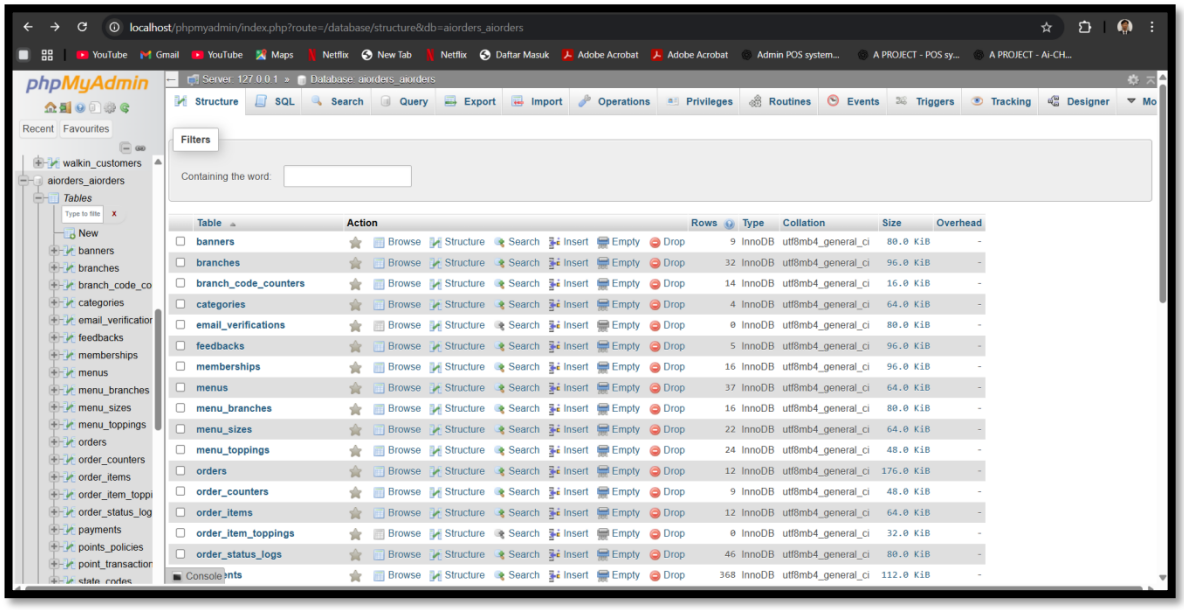


Figure 7.3.3: MySQL Database

Figure 7.3.3 illustrates the MySQL database view for the Ai-Orders schema, including tables for branches, menus, memberships, wallets and loyalty transactions. MySQL 8 was chosen as the relational database management system because it offers mature support for SQL, indexing, foreign keys and transactional integrity, which is essential for accurate order totals and points calculations (Oracle, 2024). The schema was normalized to reduce redundancy and ensure consistent relationships between key entities such as orders, items, payments and rewards. phpMyAdmin and MySQL Workbench were used during development to inspect data, run ad-hoc queries and verify the behavior of triggers or constraints, especially when testing wallet top-ups and automatic points awarding after order completion.

7.3.4 HTML

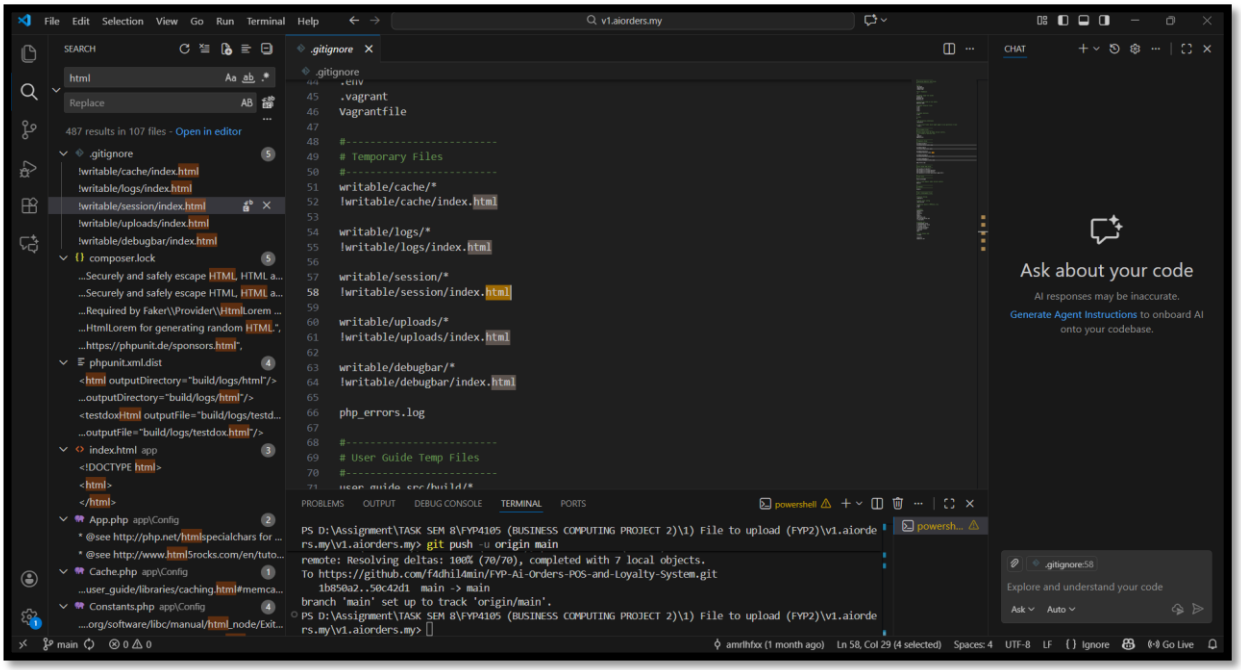


Figure 7.3.4: HTML

Figure 7.3.4 shows an HTML snippet from the customer ordering page. HTML5 defines the semantic structure of the Ai-Orders interfaces, including navigation bars, product listings, forms and tabbed sections for order history and vouchers. Semantic elements such as <header>, <nav>, <section> and <form> were used to improve accessibility and provide clearer structure for screen readers and search engines, in line with current recommendations on semantic HTML (Telerik, 2024). This structured markup also made it easier to apply CSS styling and JavaScript behavior consistently across customer, POS and admin views.

7.3.5 CSS

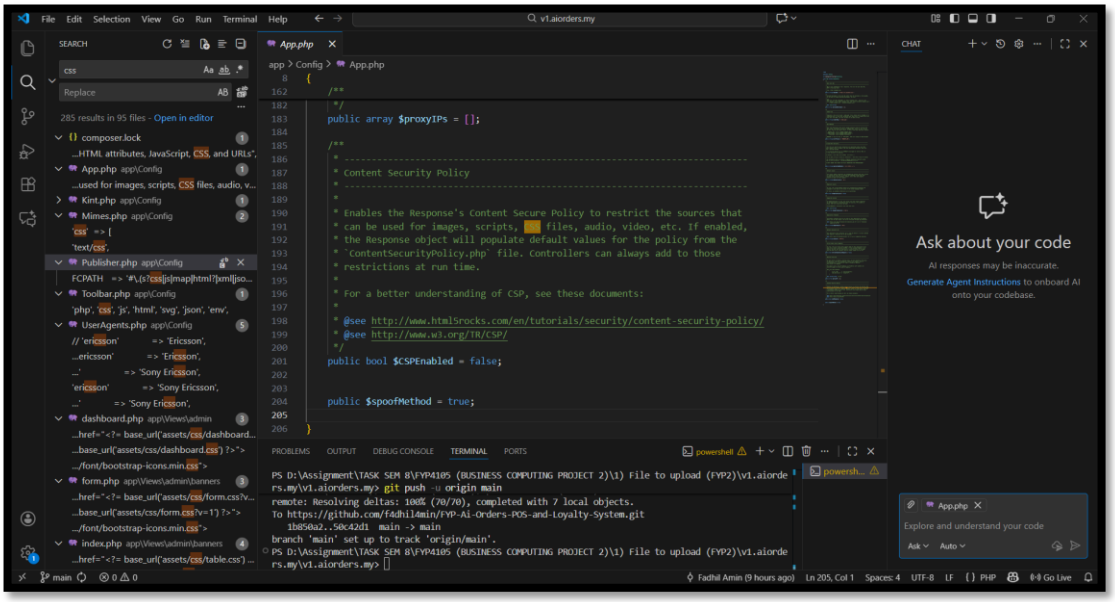


Figure 7.3.5: CSS

Figure 7.3.5 presents a CSS file from the Ai-Orders project that defines the main theme for customer and POS interfaces. CSS was used to implement the system's visual identity—brand colours, typography, button styles, cards and layout grids—as well as responsive behaviour for mobile and desktop screens. Layouts were built using flexbox and simple grid patterns to adapt to different screen sizes, following modern responsive web design practices that emphasize flexible layouts and media queries (Google, 2023; Coyier, 2024). Shared utility classes were created for spacing, shadows and border radii so that both the customer web app and staff dashboards look consistent and are easy to maintain.

7.3.6 Javascript

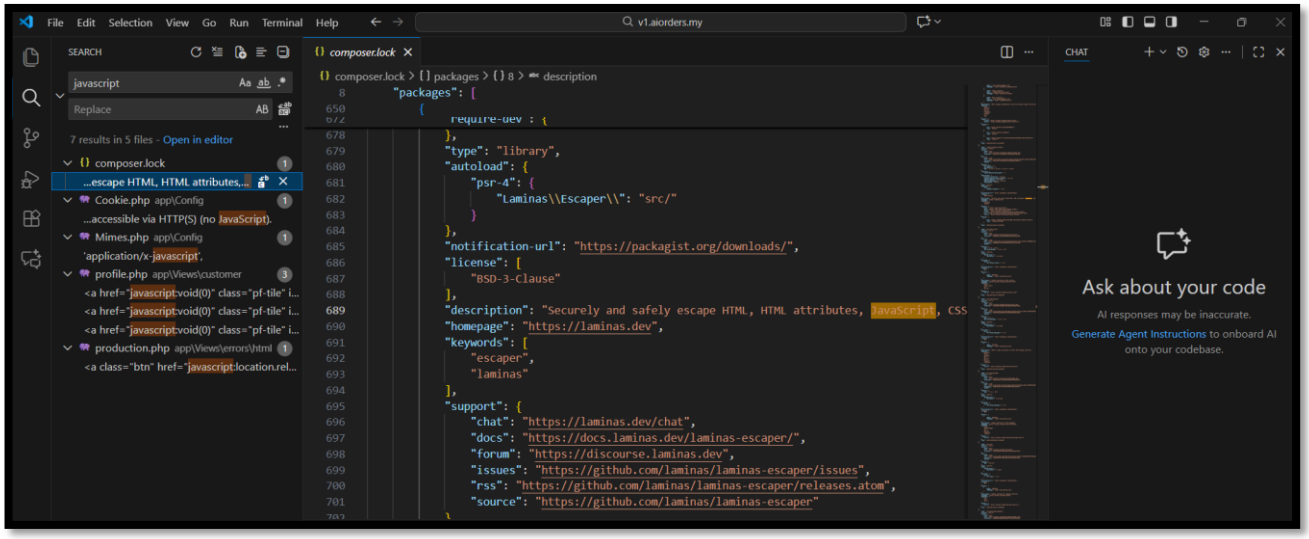


Figure 7.3.6: JavaScript

Figure 7.3.6 shows a JavaScript module used to handle cart updates and voucher previews on the customer side. JavaScript was responsible for client-side interactivity, such as dynamically updating order totals, applying vouchers and points, validating forms before submission, and polling order status for the live order-tracking page. The implementation follows modern JavaScript guidance that encourages modular scripts, clear separation of concerns and reliance on the standard ECMAScript features supported by current browsers (Mozilla, 2024; Daily Dev, 2024). By handling as much validation as possible in the browser—while still enforcing checks on the server—the system provides a smoother user experience without compromising data integrity.

7.3.7 Hardware Used

Figure 7.3.7: Laptop Lenovo LOQ 15ARP9

Table 4.5 b : Laptop Lenovo LOQ 15ARP9 Details

Specification	Details
Processor	AMD Ryzen 5 4600H
Graphics Card	NVIDIA GeForce GTX 1650
RAM	16GB DDR4
Storage	1TB SSD
Display	15.6-inch Full HD (1920 x 1080) IPS
Operating System	Windows 11

7.4 System Interface

7.4.1. Landing Page

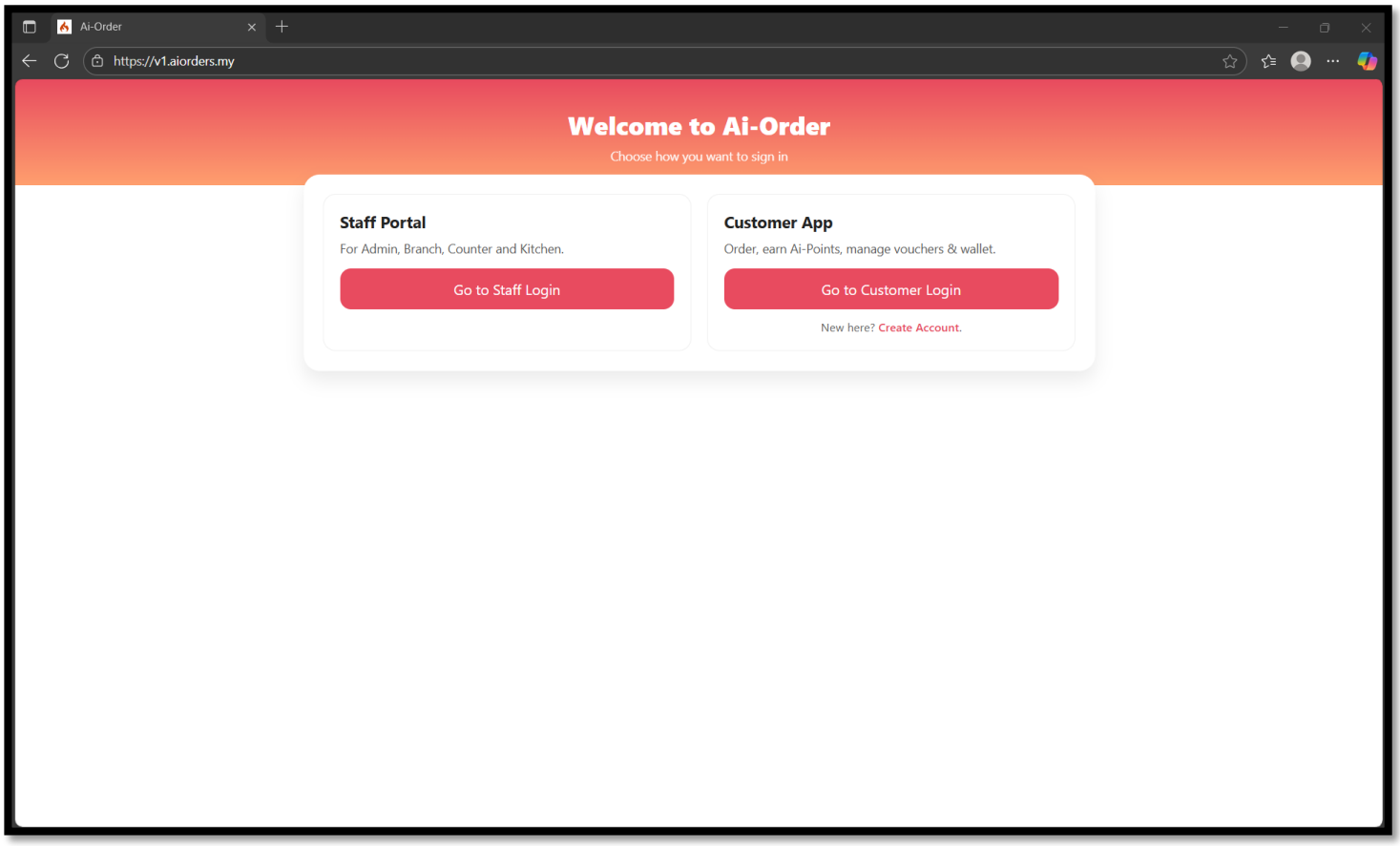


Figure 7.4. 1: Ai-Order system landing page.

Figure 7.4.1 shows the landing page of the Ai-Order system. This web page acts as the main entry point where users choose the appropriate portal based on their role. On the left, the Staff Portal button directs administrators, branch managers, counter staff and kitchen staff to the staff login interface. On the right, the Customer App button leads customers to the ordering module where they can place orders, earn Ai-Points, and manage vouchers and wallet balance, with a link for new users to create an account. This clear separation of access helps to enforce role-based authentication and simplifies navigation for both staff and customers.

7.4.2. Staff Login Page

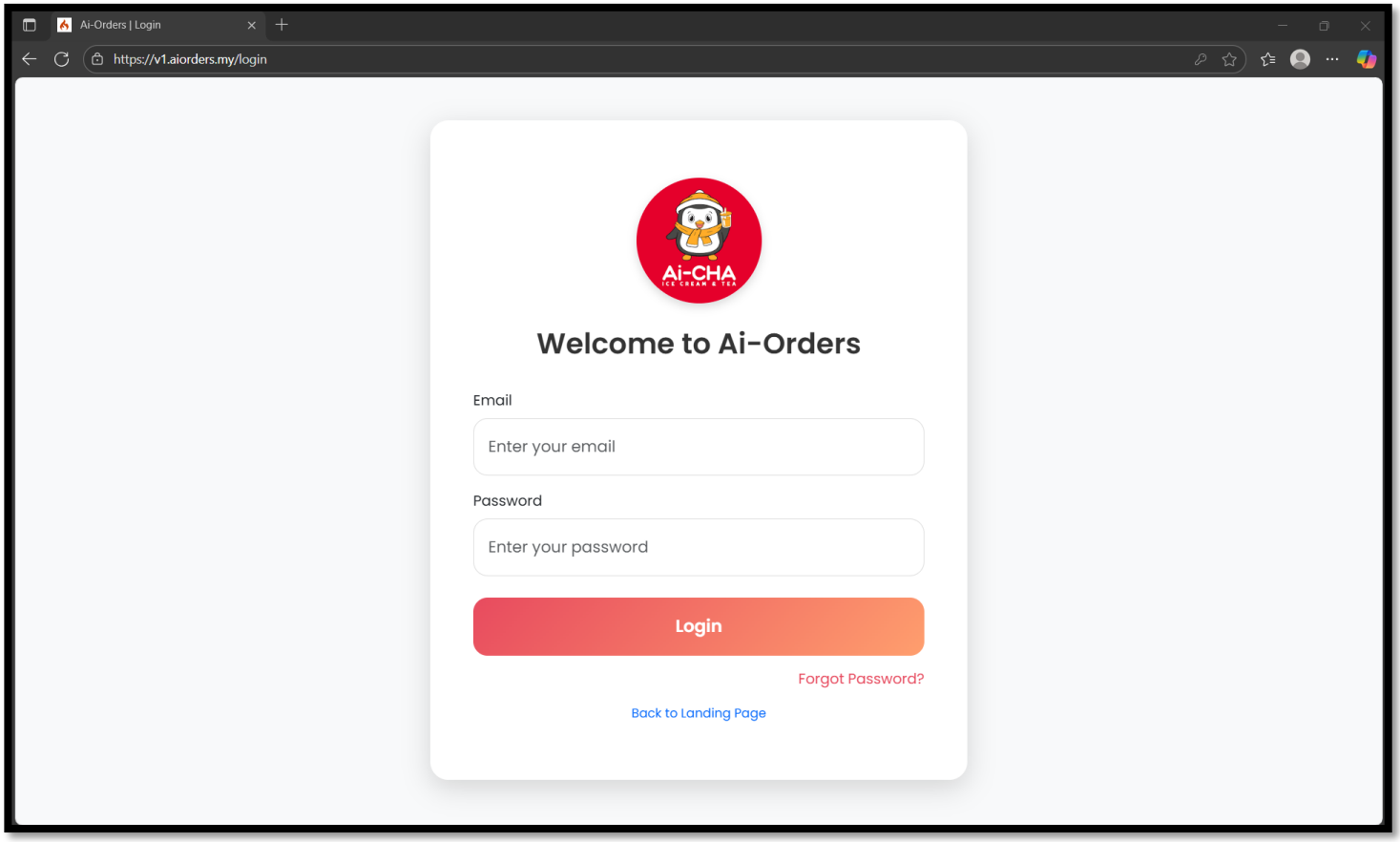


Figure 7.4. 2: Ai-Orders staff portal login page

Figure 7.4.2 shows the login interface for staff users of the Ai-Orders system. This page is used by administrators, branch managers, counter staff and kitchen staff to access the internal management modules. Users are required to enter a registered email address and password before they can proceed, which helps to enforce authenticated access. A Forgot Password? link is provided to allow staff to recover their credentials, while a Back to Landing Page link lets users return to the main entry screen. The interface adopts Ai-CHA branding and a simple layout to ensure a clear and user-friendly login process.

7.4.3. Staff “Forgot Password” Page

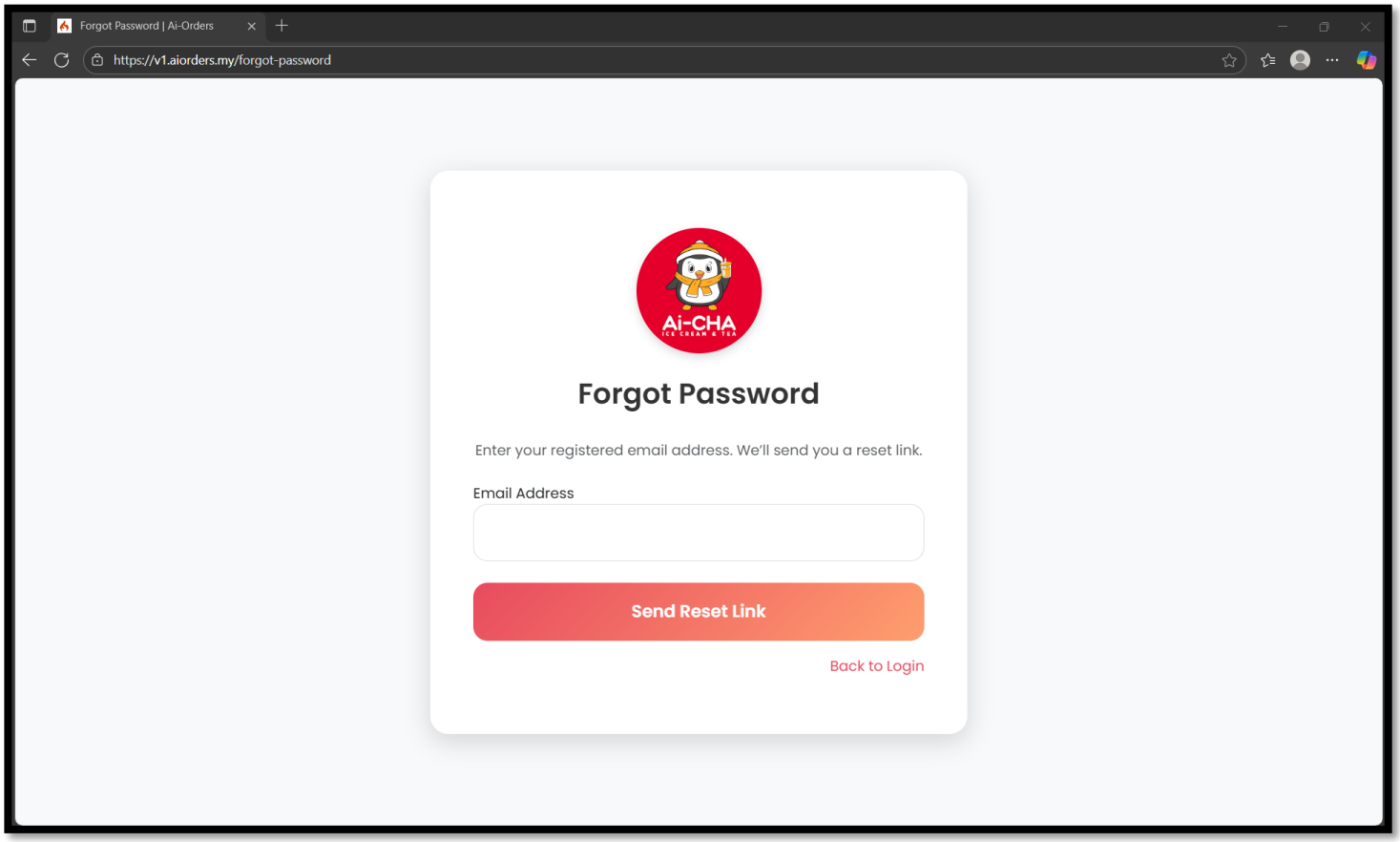


Figure 7.4. 3: Ai-Orders staff password recovery page.

Figure 7.4.3 illustrates the Forgot Password interface for staff users in the Ai-Orders system. When a staff member forgets their login credentials, they can enter their registered email address on this page to request a password reset link. This mechanism helps to maintain account security by ensuring that only verified users can regain access to the system. A Back to Login link is also provided to allow users to return to the main login page if they remember their password or accessed this screen by mistake.

7.4.4. Staff Password Reset Page

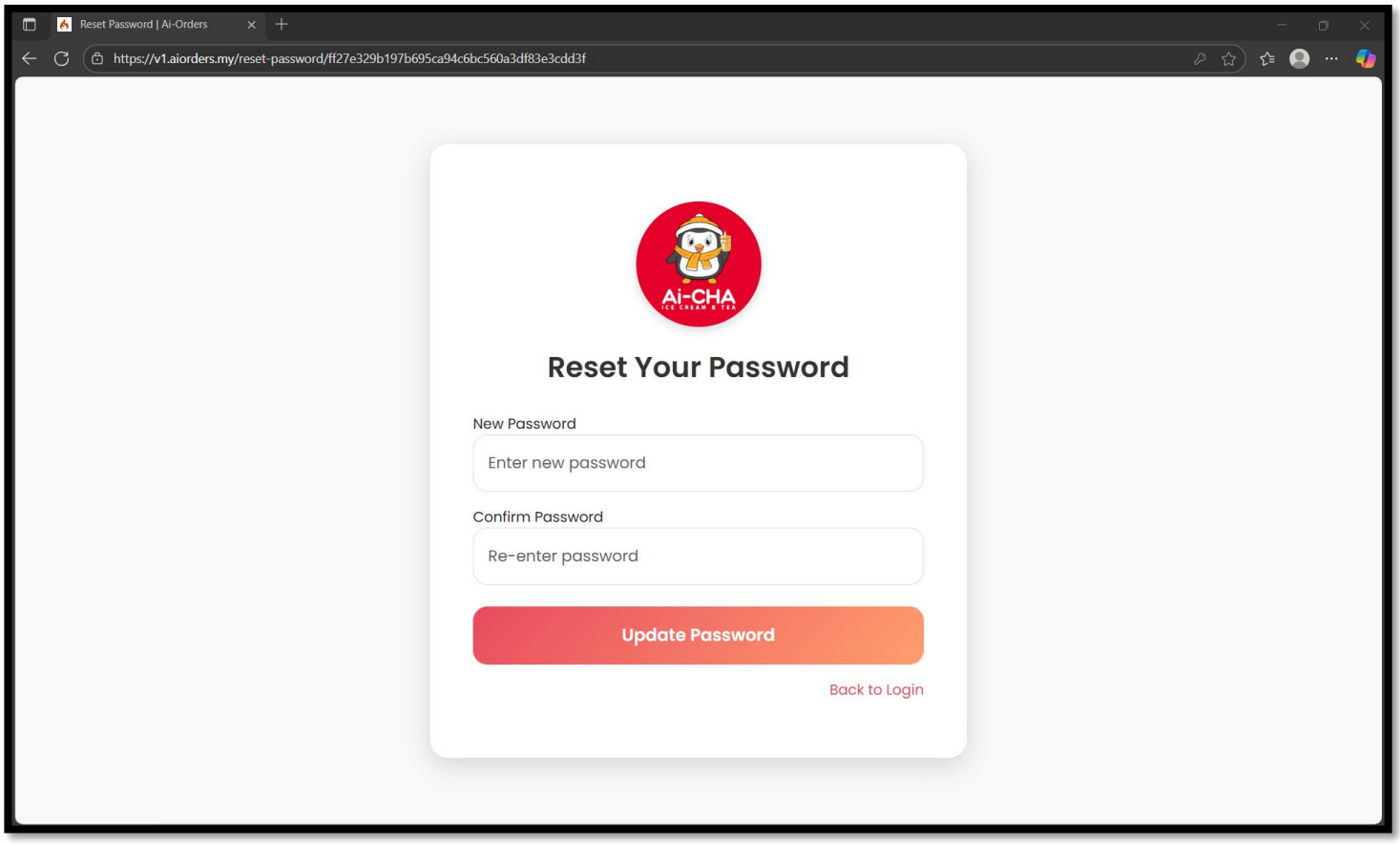


Figure 7.4. 4: Ai-Orders staff password reset page.

Figure 7.4.4 shows the password reset interface that is displayed after a staff member accesses the secure reset link sent to their email. On this page, the user is required to enter a new password and confirm it by retyping the same value before submitting the form. This double-entry process reduces typing errors and helps ensure that the new credential is set correctly. Once the Update Password button is clicked, the system validates the inputs and updates the staff account in the database. A Back to Login link is provided to guide users back to the main login page after the reset process is completed.

7.4.5. Admin Dashboard Interface

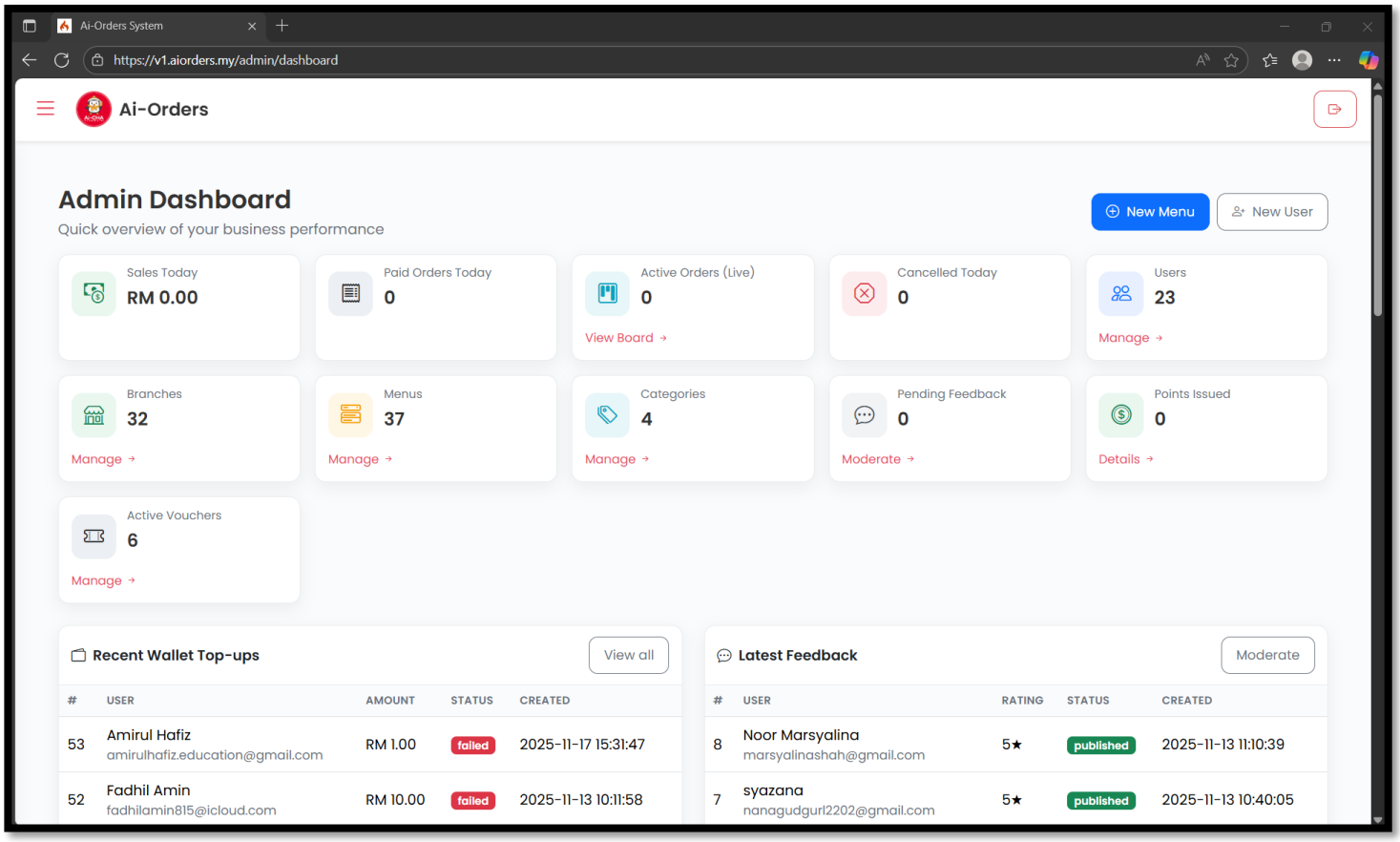


Figure 7.4. 5: Ai-Orders admin dashboard page.

Figure 7.4.5 shows the admin dashboard for the Ai-Orders system. This interface provides a quick overview of overall business performance, including sales for the day, number of paid orders, active and cancelled orders, total users, branches, menus, categories, active vouchers and points issued. Each summary card links to its respective management module, allowing the administrator to maintain branches, menus, users and vouchers efficiently. Shortcut buttons such as New Menu and New User support faster setup of new items and staff accounts. At the bottom of the screen, the dashboard lists recent wallet top-ups and latest customer feedback, enabling the admin to monitor wallet transactions and service quality in real time.

7.4.6. Banner Management Interface

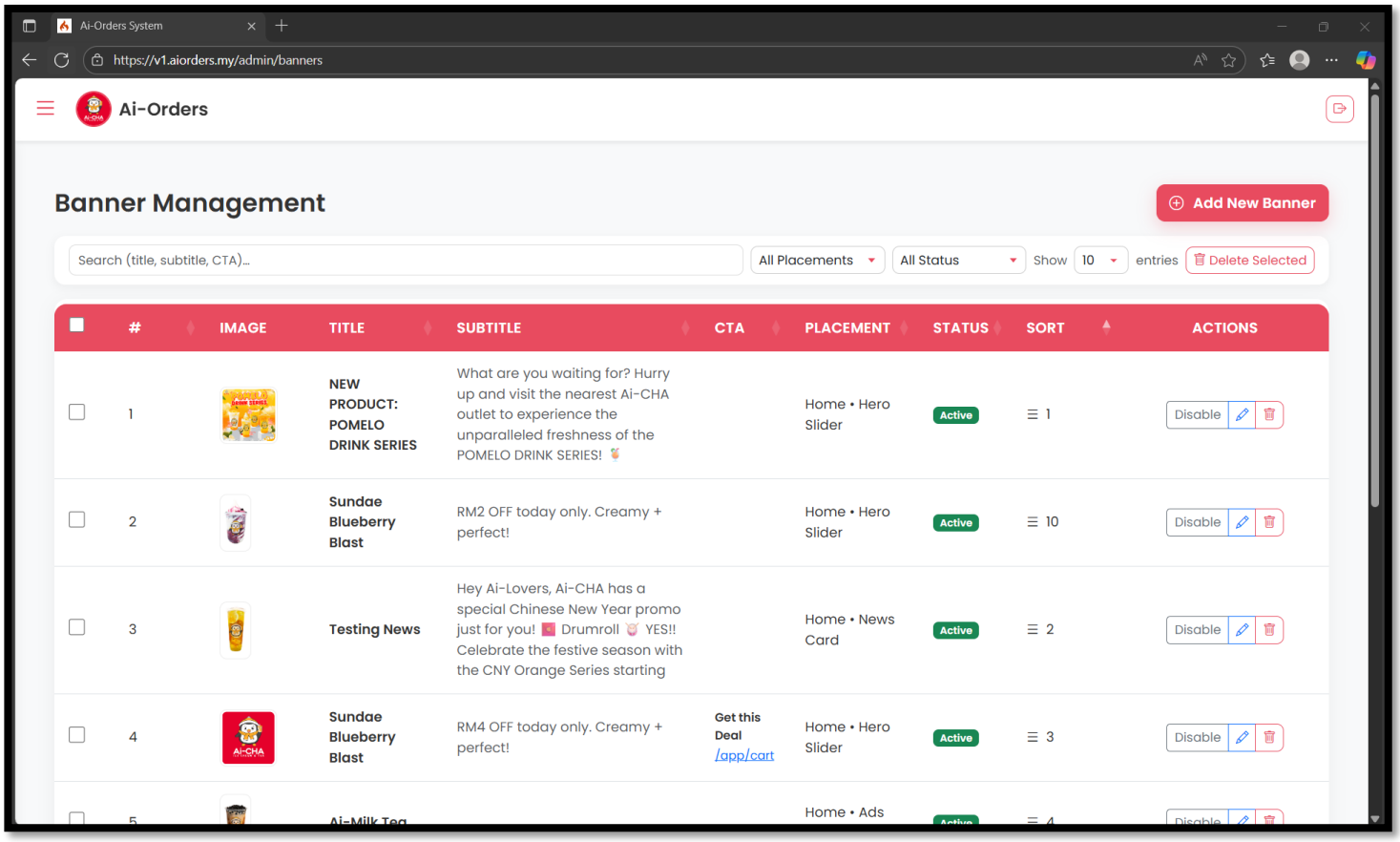


Figure 7.4. 6: Ai-Orders admin banner management page.

Figure 7.4.6 shows the banner management interface used by the administrator to maintain promotional content displayed on the customer web application. The page lists all existing banners together with their image, title, subtitle, call-to-action (CTA) text, placement, status, display order and available actions. A search bar and filter dropdowns allow the admin to quickly locate specific banners by placement or status. The Add New Banner button is provided to create new promotional banners, while each row includes options to disable, edit or delete an item. Bulk selection and Delete Selected functionality support efficient housekeeping. This module ensures that marketing messages on the customer interface remain up to date and consistent with ongoing campaigns.

7.4.7. Create Banner Interface

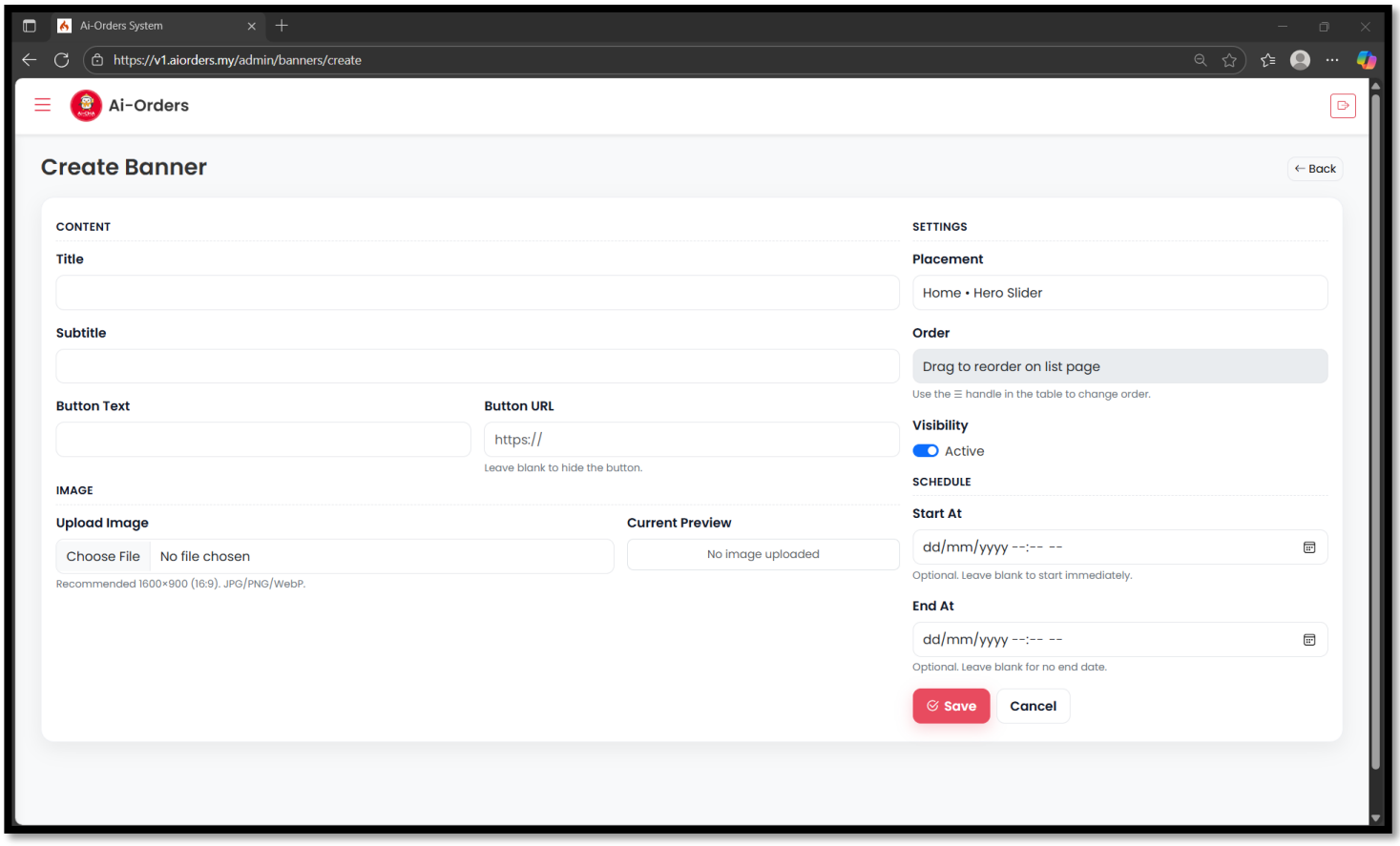


Figure 7.4. 7: Ai-Orders admin create banner page.

Figure 7.4.7 shows the interface used by the administrator to create a new promotional banner for the customer application. On the left side, the form allows the admin to define the banner content, including title, subtitle, button text, button URL and image upload, with a preview panel to confirm the selected visual. On the right side, configuration fields are provided to set the placement location, display order, visibility status and optional schedule (start and end date) for the banner. After completing the details, the admin can save or cancel the operation. This screen supports flexible and scheduled marketing campaigns without requiring technical changes to the system.

7.4.8. Edit Banner Interface

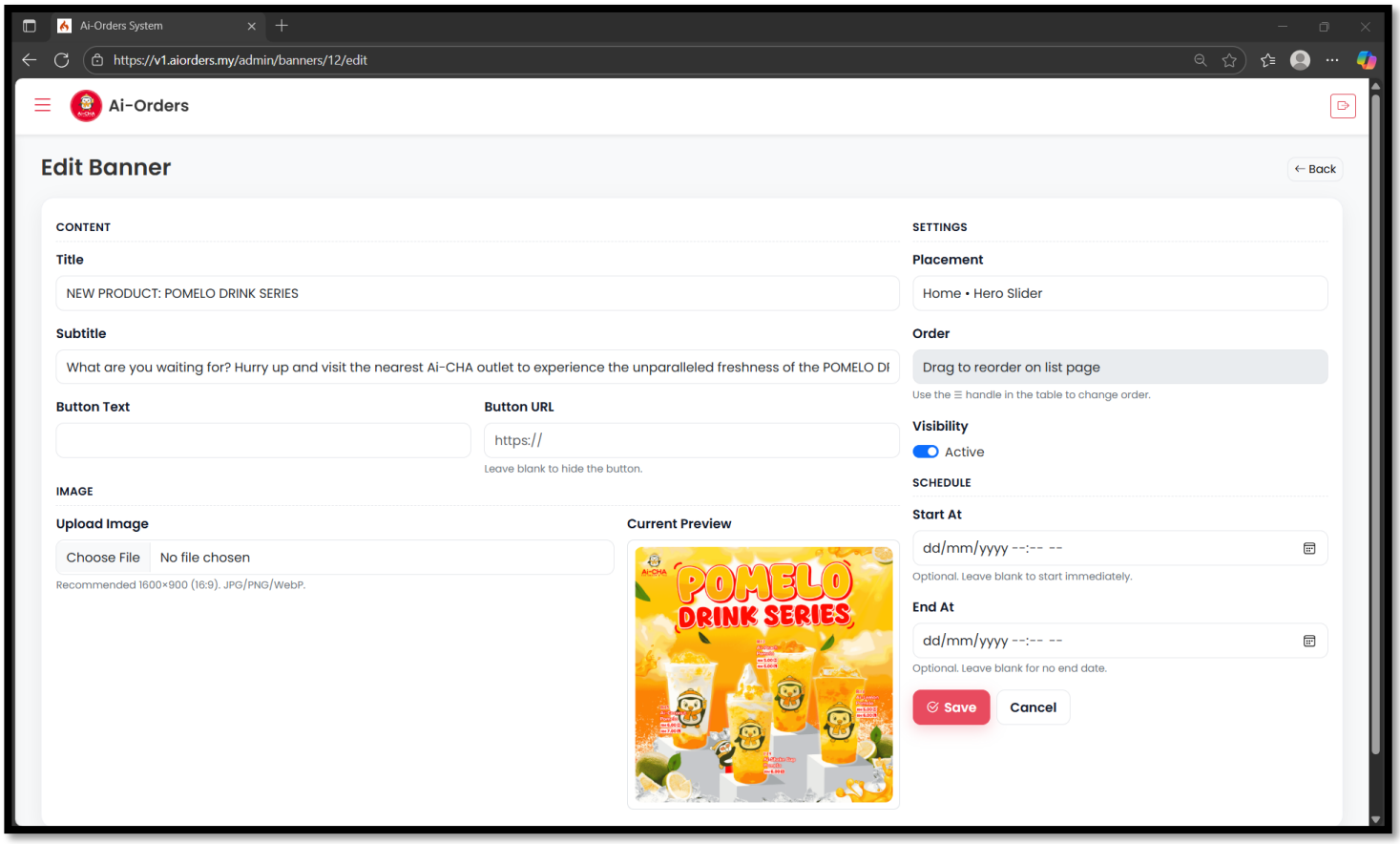


Figure 7.4. 8: Ai-Orders admin edit banner page.

Figure 7.4.8 shows the interface for editing an existing promotional banner in the Ai-Orders system. The form loads the current banner details, including title, subtitle, button text, button URL and uploaded image, so that the administrator can easily revise the content without recreating the banner from scratch. On the right panel, the admin can adjust the placement, display order, visibility status and optional start and end schedule. A live preview of the current image is displayed to reduce mistakes before saving. The Save and Cancel buttons complete the update process, ensuring that promotional materials on the customer site can be updated quickly in response to new campaigns.

7.4.9. Branch Management Interface

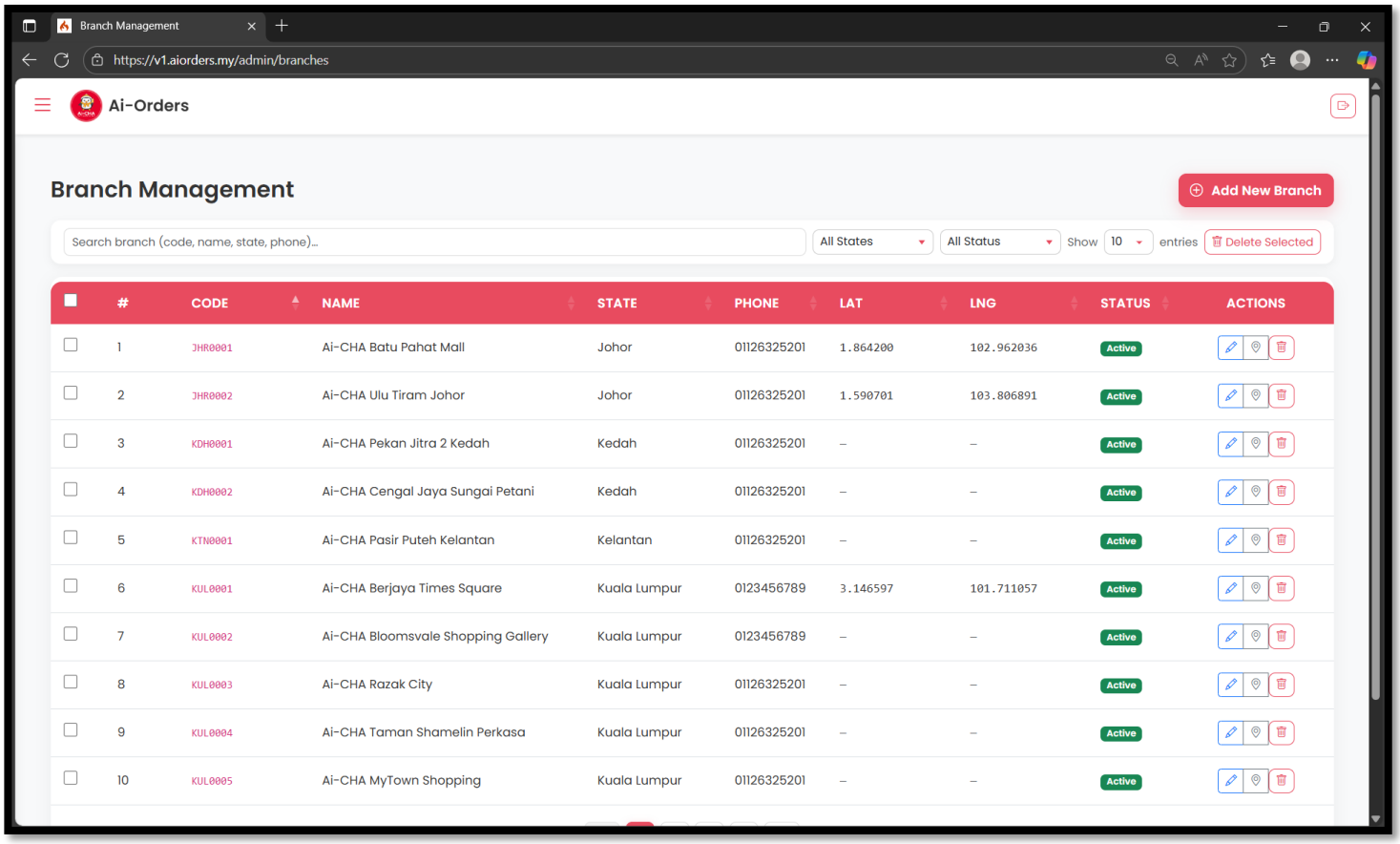


Figure 7.4. 9: Ai-Orders admin branch management page.

Figure 7.4.9 shows the branch management interface used by the administrator to maintain Ai-CHA outlet information. The table lists all registered branches together with their system-generated branch code, outlet name, state, phone number, latitude/longitude coordinates and current status. A search bar and filter dropdowns (by state and status) help the admin quickly locate specific branches within a large network. The Add New Branch button is used to register new outlets, while the action buttons on each row allow editing details, updating map location or deleting records. Bulk selection and Delete Selected functions support efficient data maintenance. This module ensures that all operational branches are accurately recorded and available to other parts of the system such as ordering, reporting and delivery routing.

7.4.10. Add New Branch Interface

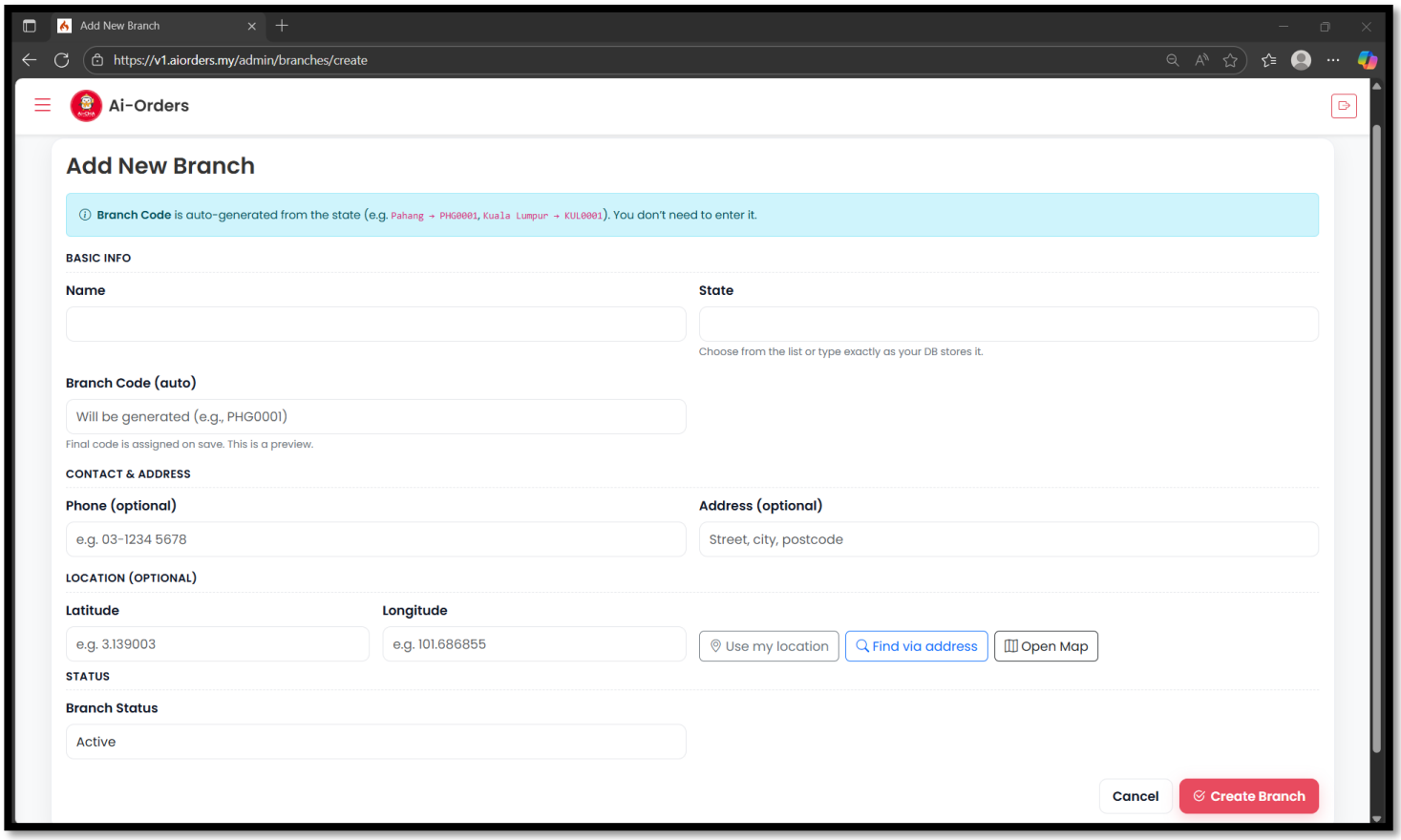


Figure 7.4. 10: Ai-Orders admin add new branch page.

Figure 7.4.10 shows the interface used by the administrator to register a new Ai-CHA outlet in the Ai-Orders system. The form captures the basic branch information, including name and state, while the Branch Code (auto) field is generated automatically based on the selected state to maintain a consistent coding format across all outlets. Optional fields are provided for phone number and full address so that contact details can be stored in one place. The Location section allows the admin to record latitude and longitude manually or by using helper buttons such as Use my location, Find via address and Open Map to improve geolocation accuracy. Finally, the branch status can be set (e.g. Active) before clicking Create Branch to save the new outlet, or Cancel to discard the entry.

7.4.11. Edit Branch Interface

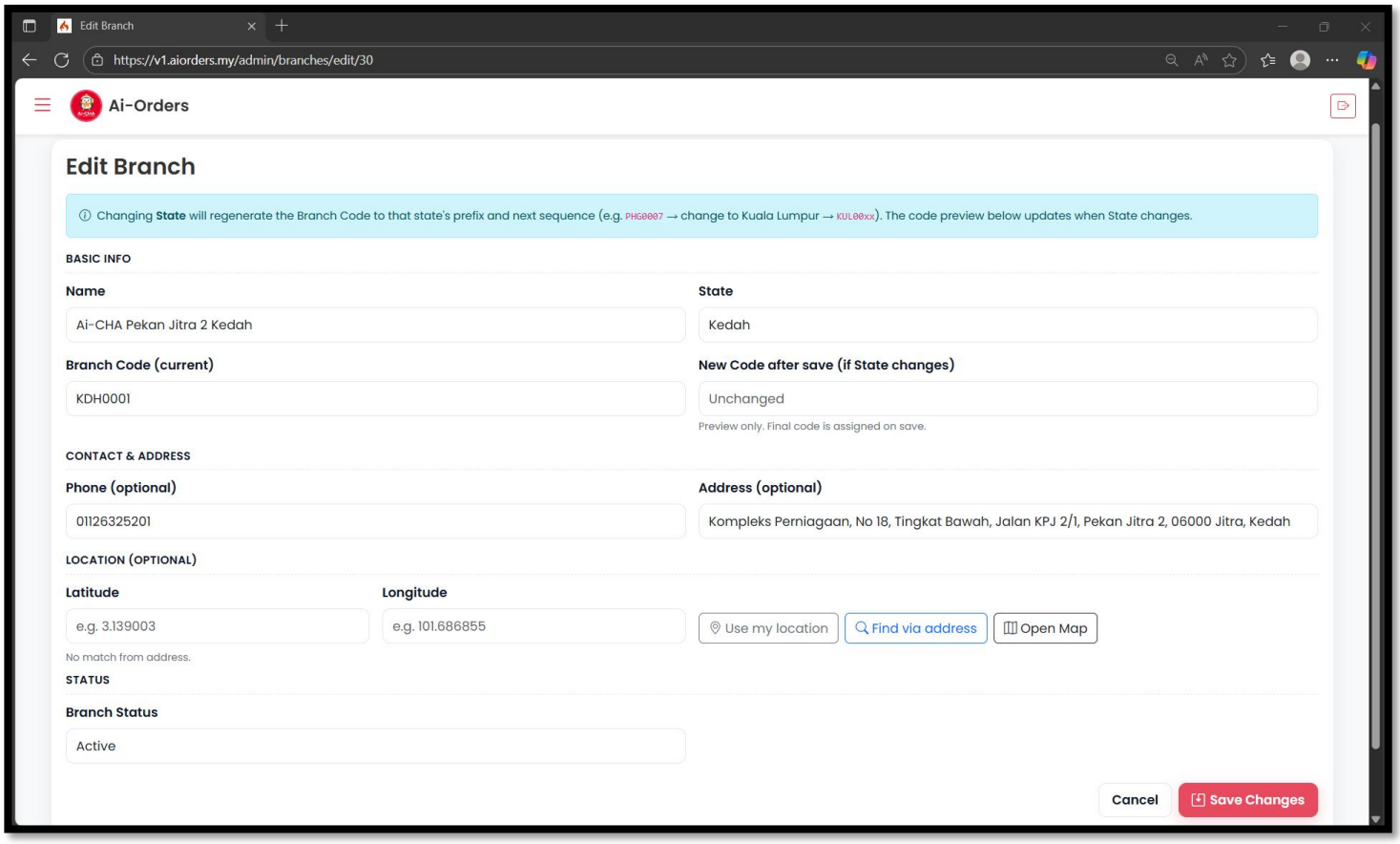


Figure 7.4. 11: Ai-Orders admin edit branch page.

Figure 7.4.11 shows the interface for editing an existing branch record in the Ai-Orders system. The form displays the current outlet information, including name, state, branch code, phone number, address and optional latitude/longitude coordinates. An informational note at the top explains that changing the state will automatically regenerate the branch code using the new state prefix and next running sequence, ensuring consistent coding across all outlets. The location tools (*Use my location*, *Find via address* and *Open Map*) help the administrator refine the branch position on the map. The branch status can also be updated before saving. The *Save Changes* and *Cancel* buttons complete the update process, allowing branch data to be maintained accurately as the business expands or relocates outlets.

7.4.12. User Management Interface

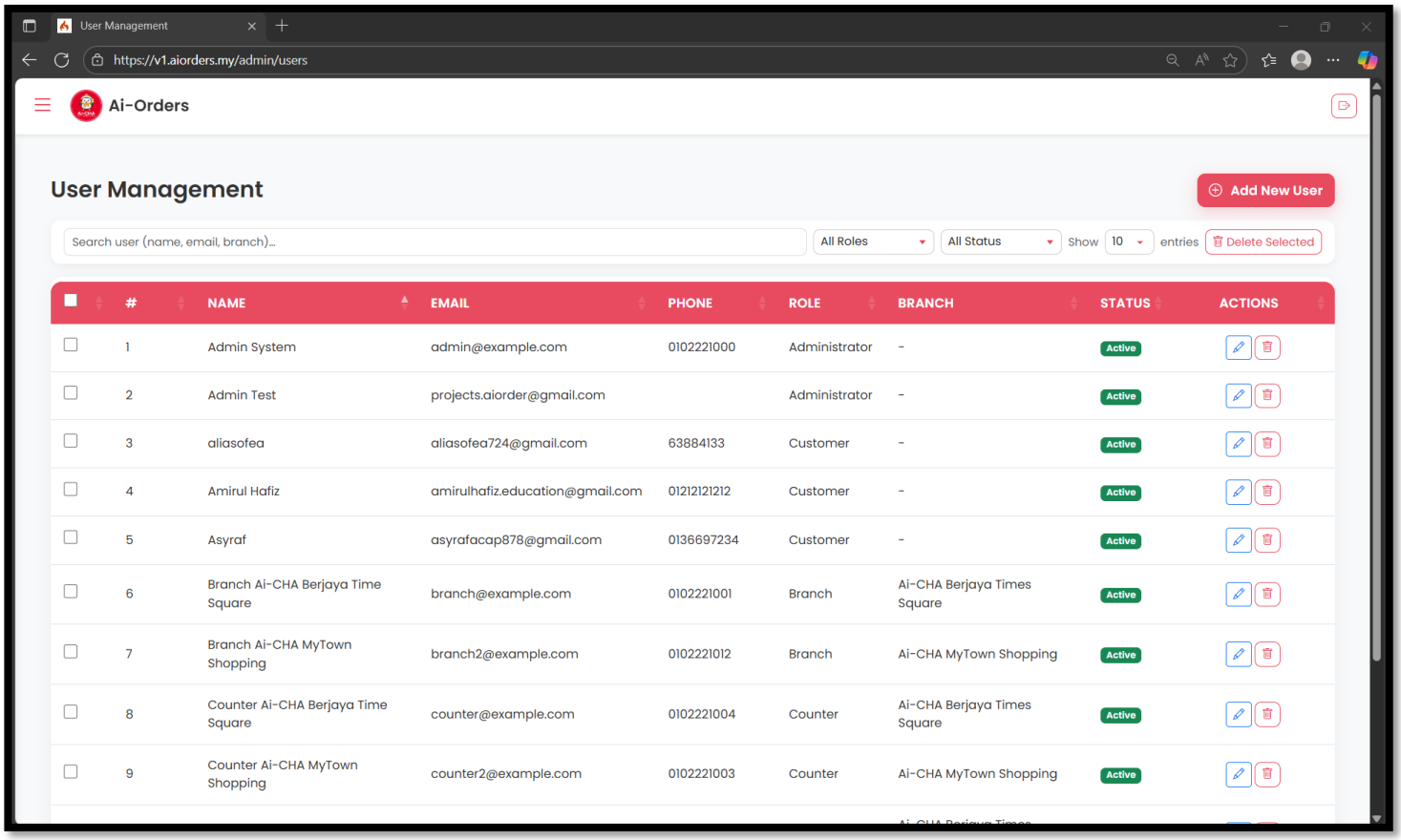


Figure 7.4. 12: Ai-Orders admin user management page.

Figure 7.4.12 shows the user management interface where the administrator maintains all system accounts. The table lists each user's name, email address, phone number, role (such as Administrator, Branch, Counter or Customer), assigned branch and current status. A search bar and dropdown filters by role and status help the admin quickly locate specific users in a growing database. The *Add New User* button is used to register new staff or customer accounts, while the action buttons allow editing or deleting individual records. Bulk selection and *Delete Selected* support efficient housekeeping. This module enforces role-based access control by ensuring that only authorised users with valid roles and statuses can log in to the Ai-Orders system.

7.4.13. Add New User Interface

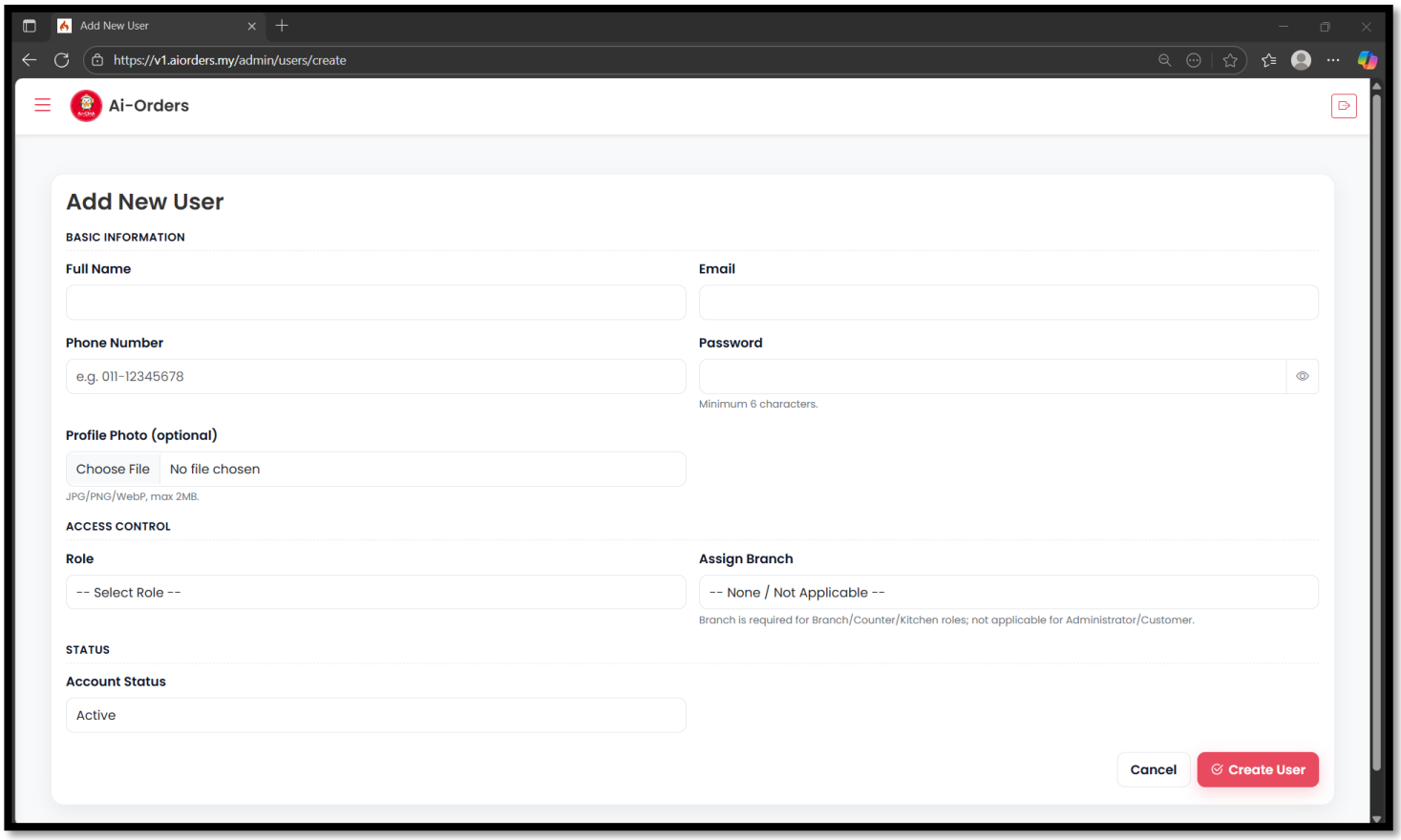


Figure 7.4. 13: Ai-Orders admin add new user page.

Figure 7.4.13 shows the interface used by the administrator to create a new user account in the Ai-Orders system. The form collects basic information such as full name, email, phone number and password, with an option to upload a profile photo for easier identification of staff. In the *Access Control* section, the admin selects the appropriate role (e.g. Administrator, Branch, Counter, Kitchen or Customer) and assigns a branch where required. The *Account Status* field allows the account to be activated or deactivated at the point of creation. After filling in the details, the administrator can save the record using the *Create User* button or cancel the operation. This screen supports controlled onboarding of new staff and customer accounts while enforcing role-based permissions.

7.4.14. Edit User Interface

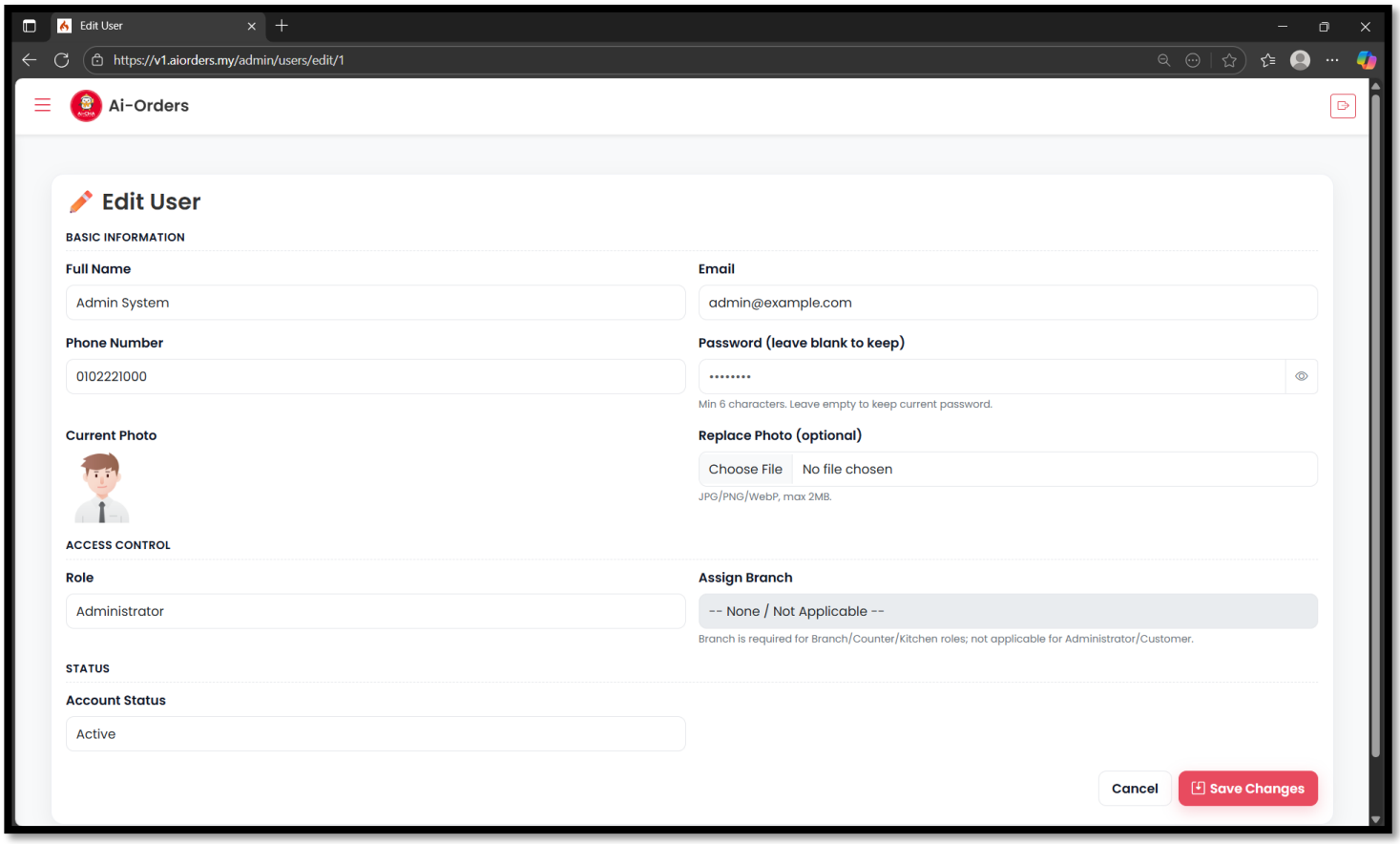


Figure 7.4. 14: Ai-Orders admin edit user page.

Figure 7.4.14 shows the interface for updating an existing user account in the Ai-Orders system. The form displays the current details of the selected user, including full name, email, phone number and profile photo, allowing the administrator to make corrections when staff information changes. The password field can be left blank to keep the existing password, which reduces unnecessary resets. In the *Access Control* section, the admin may change the user's role or branch assignment if their responsibilities are updated, while the *Account Status* field allows the account to be activated or deactivated. The *Save Changes* and *Cancel* buttons complete the edit process, ensuring that user records and access rights remain accurate over time.

7.4.15. Membership Management Interface

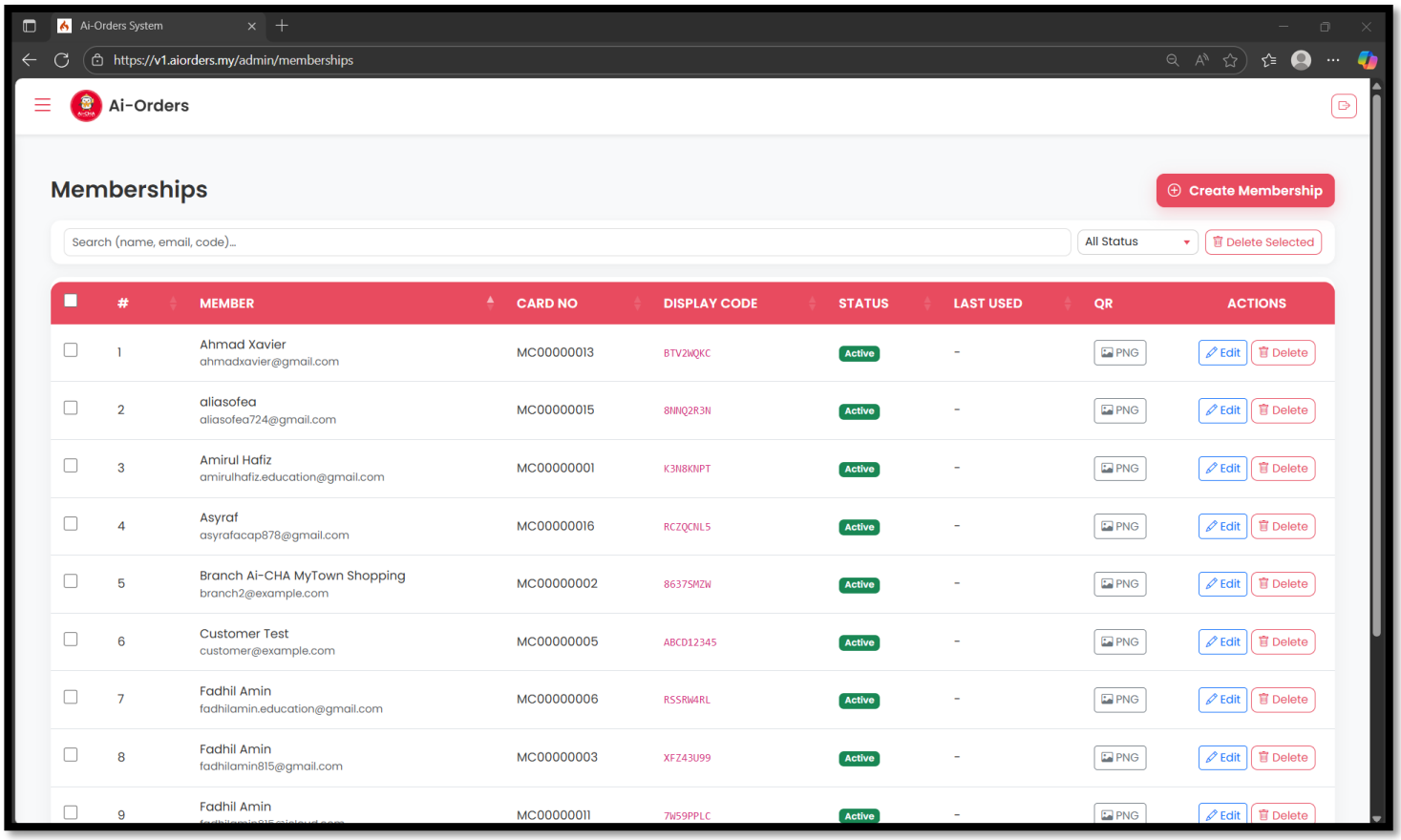


Figure 7.4. 15: Ai-Orders admin membership management page.

Figure 7.4.15 shows the membership management interface where the administrator maintains all loyalty memberships linked to Ai-Orders. Each record lists the member's name and email, system-generated card number, display code used at the counter, membership status, last used date and a shortcut to the QR image for scanning. A search bar and status filter help the admin quickly locate specific members, while the *Create Membership* button allows new membership cards to be issued. Action buttons on each row provide options to edit or delete memberships and bulk selection with *Delete Selected* supports efficient data housekeeping. This module ensures that loyalty members are accurately tracked so that points, vouchers and wallet benefits can be applied correctly.

7.4.16. Create Membership Interface

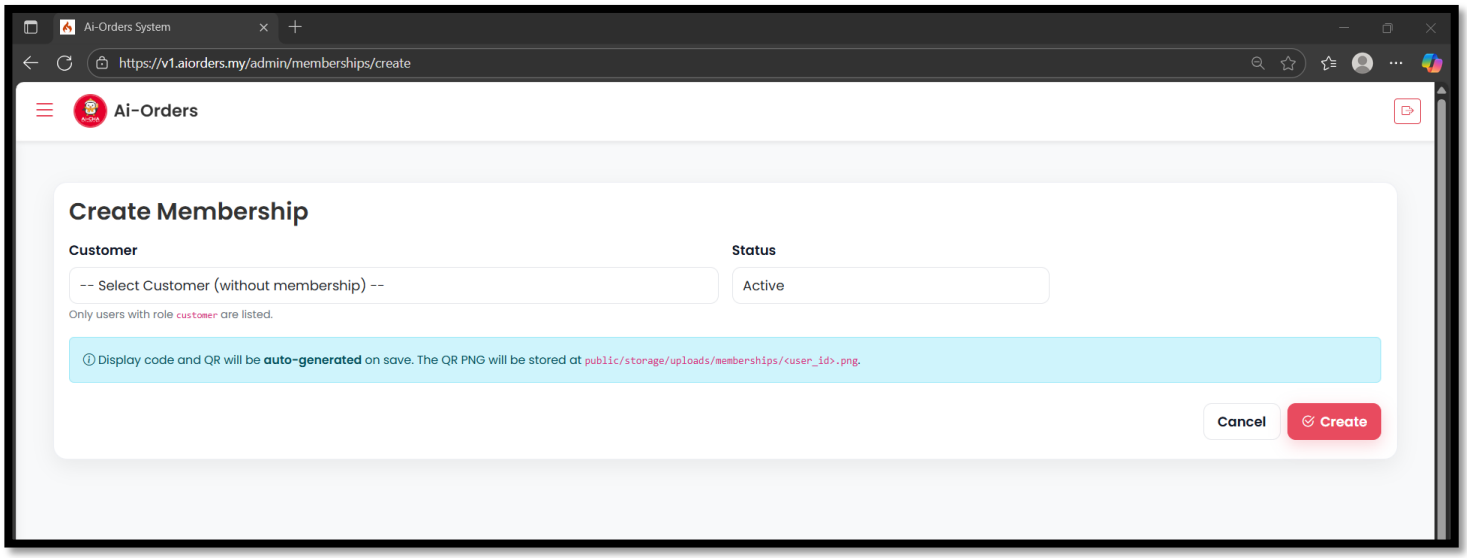


Figure 7.4. 16: Ai-Orders admin create membership page.

Figure 7.4.16 shows the interface used by the administrator to create a new loyalty membership for an existing customer. The admin selects a customer from the dropdown list, which only displays users with the *customer* role, and sets the membership status (for example, Active). An informational note explains that the system will auto-generate the membership display code and QR image upon saving, and that the QR PNG file will be stored in a predefined directory on the server. The *Create* and *Cancel* buttons complete the process. This automated approach reduces manual data entry and ensures that every membership card is uniquely identifiable and ready to be scanned at the counter.

7.4.17. Edit Membership Interface

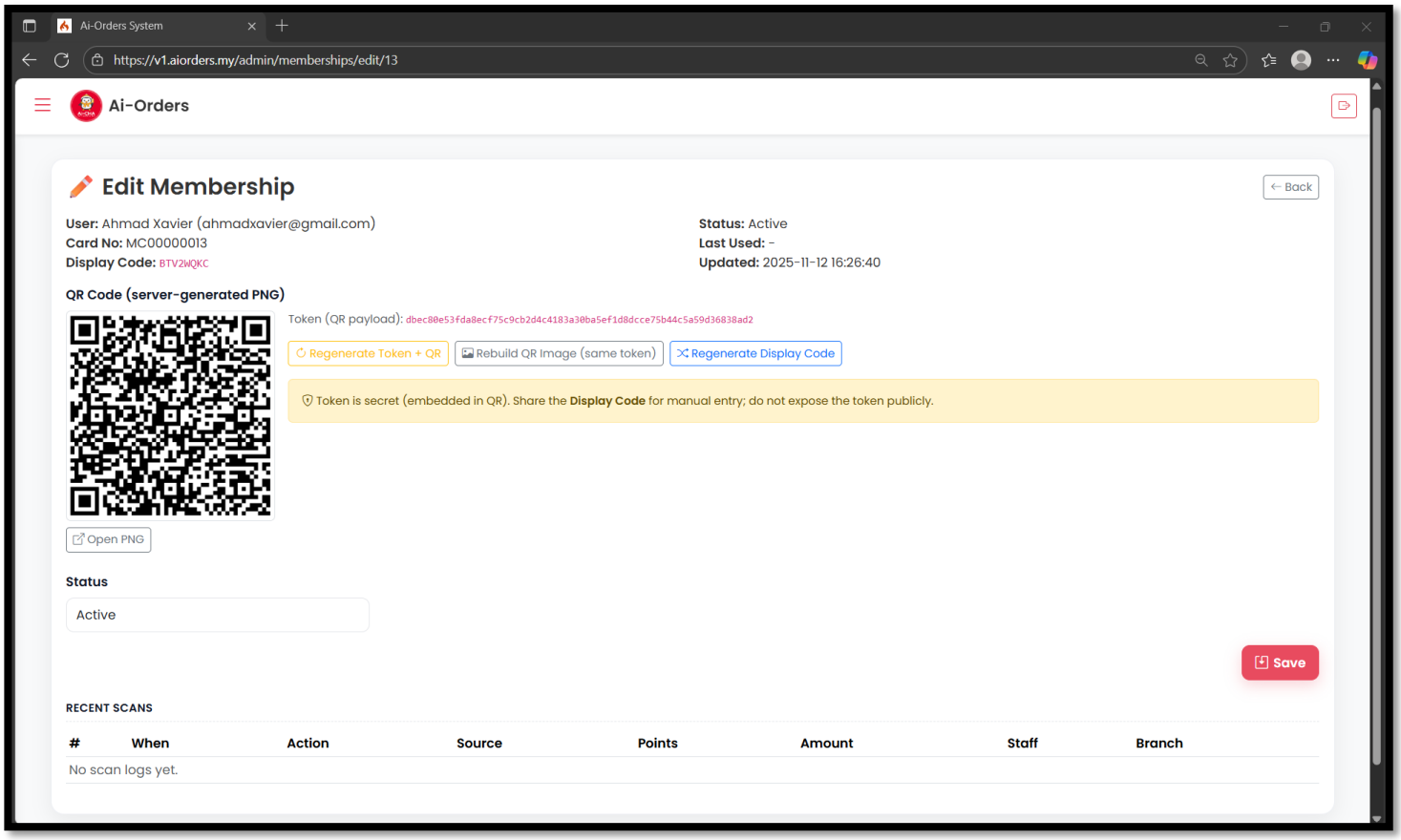


Figure 7.4. 17: Ai-Orders admin edit membership page.

Figure 7.4.17 shows the interface for viewing and updating an existing loyalty membership in the Ai-Orders system. The screen displays key membership details such as member name and email, card number, display code, status, last used date and last updated timestamp. A server-generated QR code is shown together with its internal token, and the admin is provided with controls to regenerate the token and QR image, rebuild the QR with the same token or regenerate the public display code. A highlighted notice reminds the admin that the token is confidential and that only the display code should be shared for manual entry, which helps to protect member accounts from misuse. The membership status can be changed and saved, while the *Recent Scans* section at the bottom (when populated) lists each QR scan together with points and transaction details, supporting audit and traceability of loyalty activity.

7.4.18. Voucher Management Interface

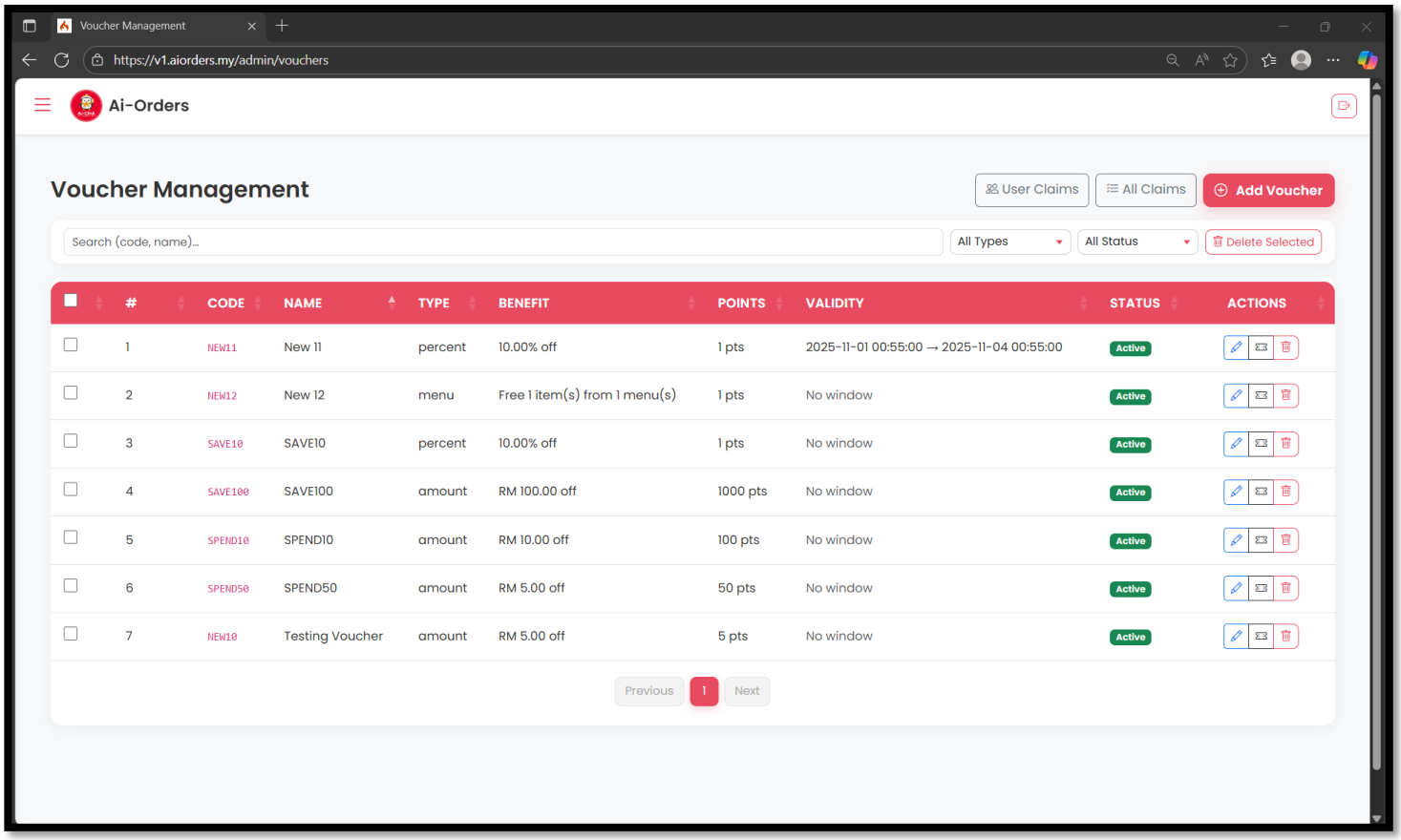


Figure 7.4. 18: Ai-Orders admin voucher management page.

Figure 7.4.18 shows the voucher management interface where the administrator configures promotional vouchers used in the Ai-Orders loyalty programme. Each row in the table displays the voucher code, name, type (percent, amount or menu-based), benefit description, points required to redeem, validity window, status and available actions. The search bar and type/status filters help the admin quickly locate specific vouchers, while the *User Claims* and *All Claims* buttons provide shortcuts to view voucher usage history. The *Add Voucher* button is used to create new promotions, and the action buttons on each row allow editing, viewing claim records or deleting vouchers. Bulk selection and *Delete Selected* support efficient housekeeping. This module enables flexible configuration of discounts and rewards that can be applied during customer checkout.

7.4.19. Add Voucher Interface

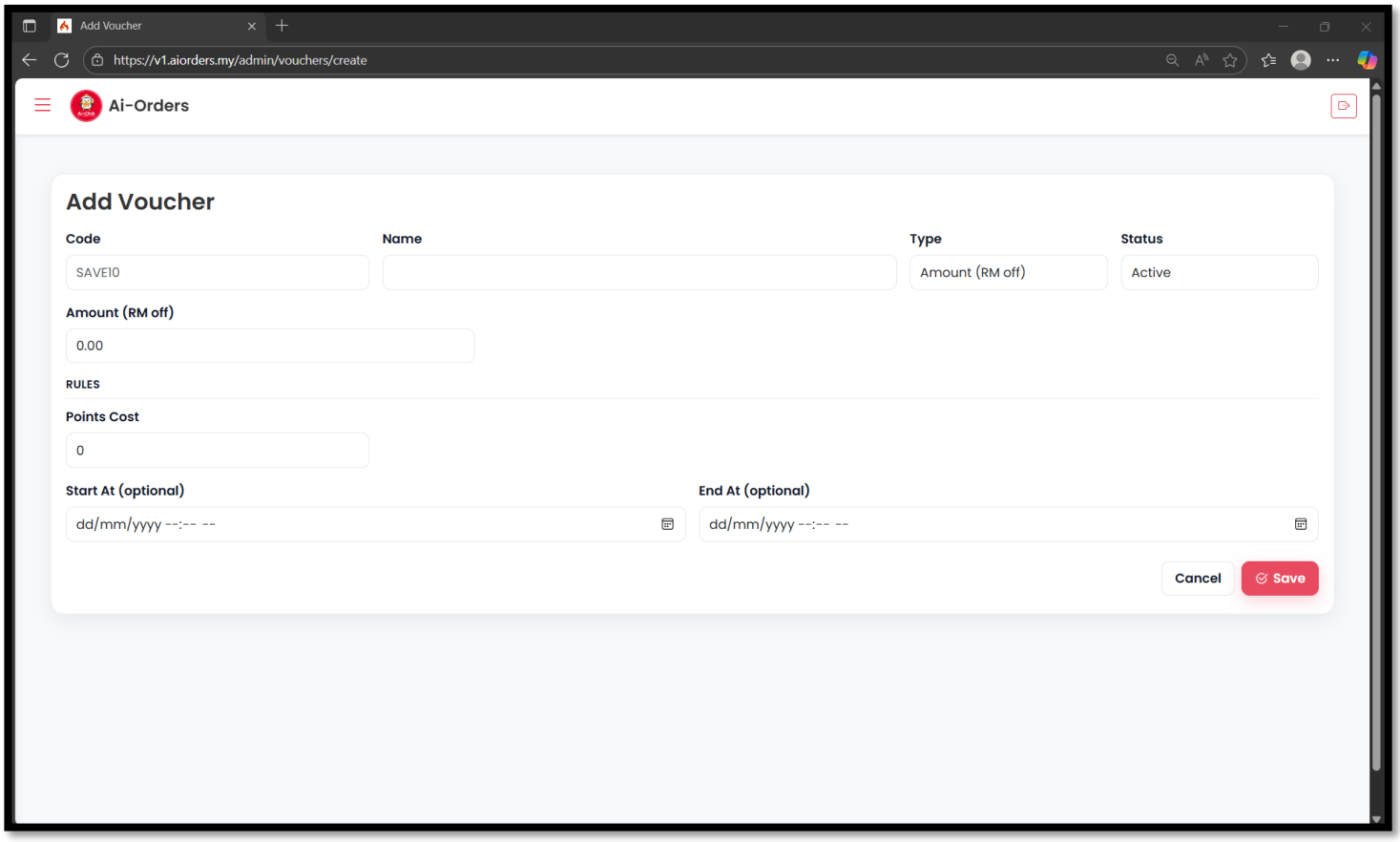


Figure 7.4. 19: Ai-Orders admin add voucher page.

Figure 7.4.19 shows the interface used by the administrator to configure a new voucher in the Ai-Orders system. The form allows the admin to define the voucher code, name, type (for example, fixed amount discount in RM) and initial status. Under the *Rules* section, the administrator specifies the discount amount and the points cost required for customers to redeem the voucher. Optional *Start At* and *End At* fields provide a validity window, enabling time-limited campaigns without additional system changes. After completing the configuration, the admin can save the voucher using the *Save* button or cancel the operation. This screen supports flexible setup of loyalty rewards that can later be applied during customer checkout.

7.4.20. Edit Voucher Interface

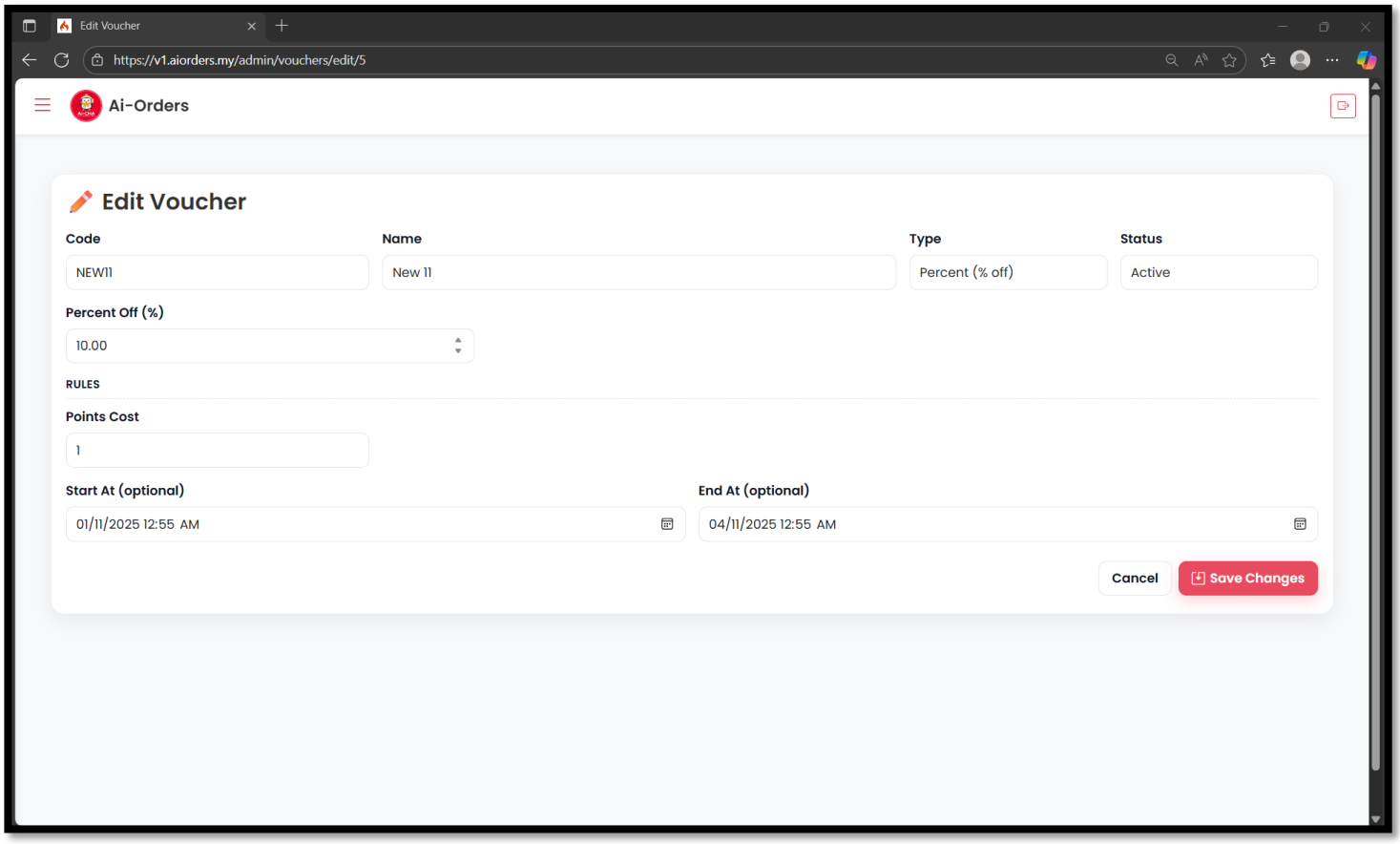


Figure 7.4. 20: Ai-Orders admin edit voucher page.

Figure 7.4.20 shows the interface for updating an existing voucher in the Ai-Orders system. The screen loads the current voucher details, including code, name, type (for example, percentage discount), and status, so the administrator can fine-tune an active promotion without recreating it. The *Percent Off* field defines the discount value, while the *Points Cost* field specifies how many loyalty points customers must spend to redeem the voucher. Optional *Start At* and *End At* date–time fields allow the validity window to be adjusted to match campaign periods. After editing, the administrator can confirm changes using the *Save Changes* button or cancel the operation, ensuring that voucher rules remain accurate and aligned with ongoing marketing strategies.

7.4.21. User Voucher Claims Summary Interface

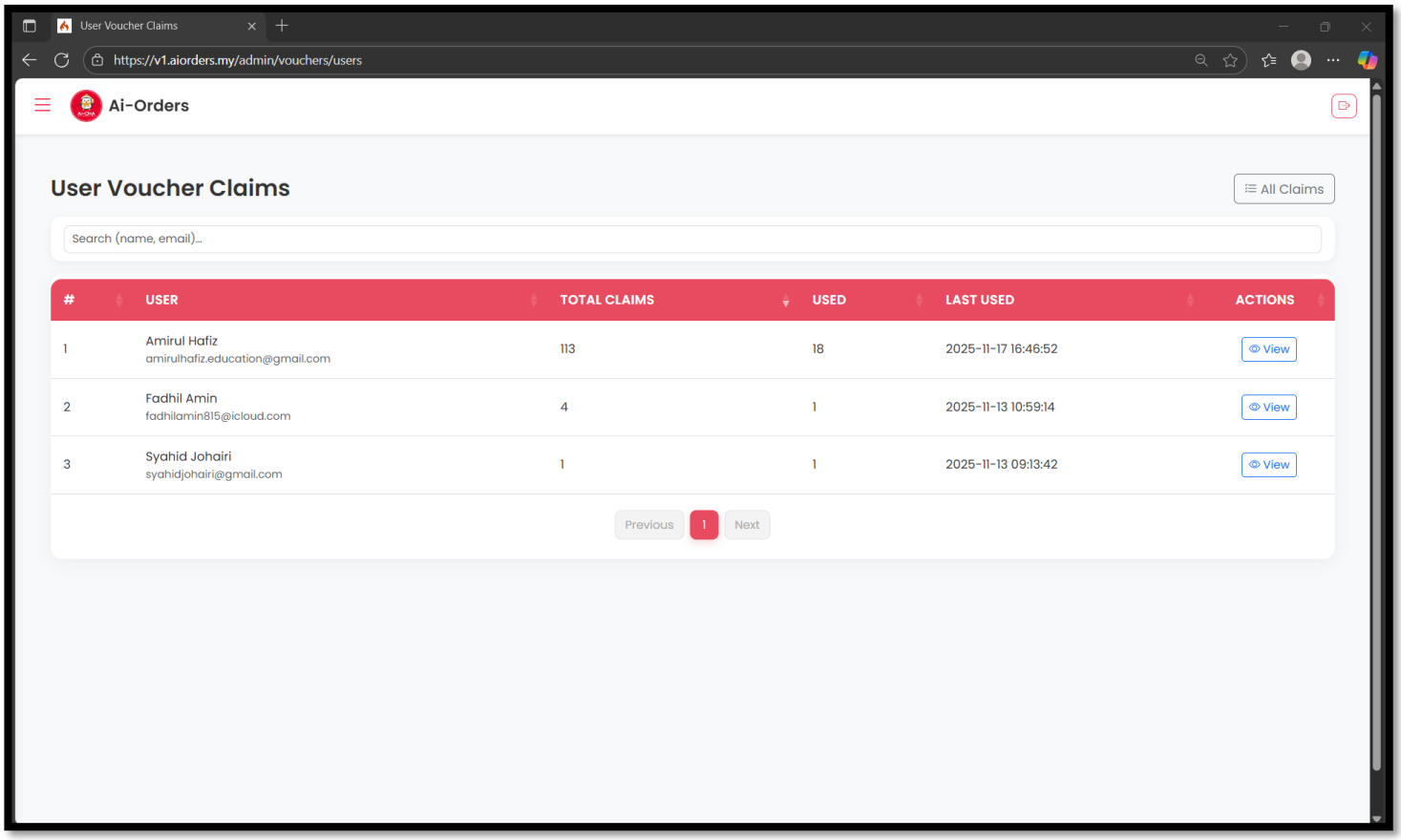


Figure 7.4. 21: Ai-Orders admin user voucher claims summary page.

Figure 7.4.21 shows the summary interface for user voucher claims in the Ai-Orders system. This page aggregates voucher activity by user, displaying each customer's name and email, total number of vouchers claimed, number of vouchers used and the timestamp of the last usage. A search bar allows the administrator to quickly locate a specific user, while the *All Claims* button provides a shortcut to view detailed claim records across the system. The *View* action on each row opens the individual claim history for that user. This summary helps the admin monitor voucher engagement, identify active loyalty members and evaluate the effectiveness of promotional campaigns.

7.4.22. User Voucher Claims Detail Interface

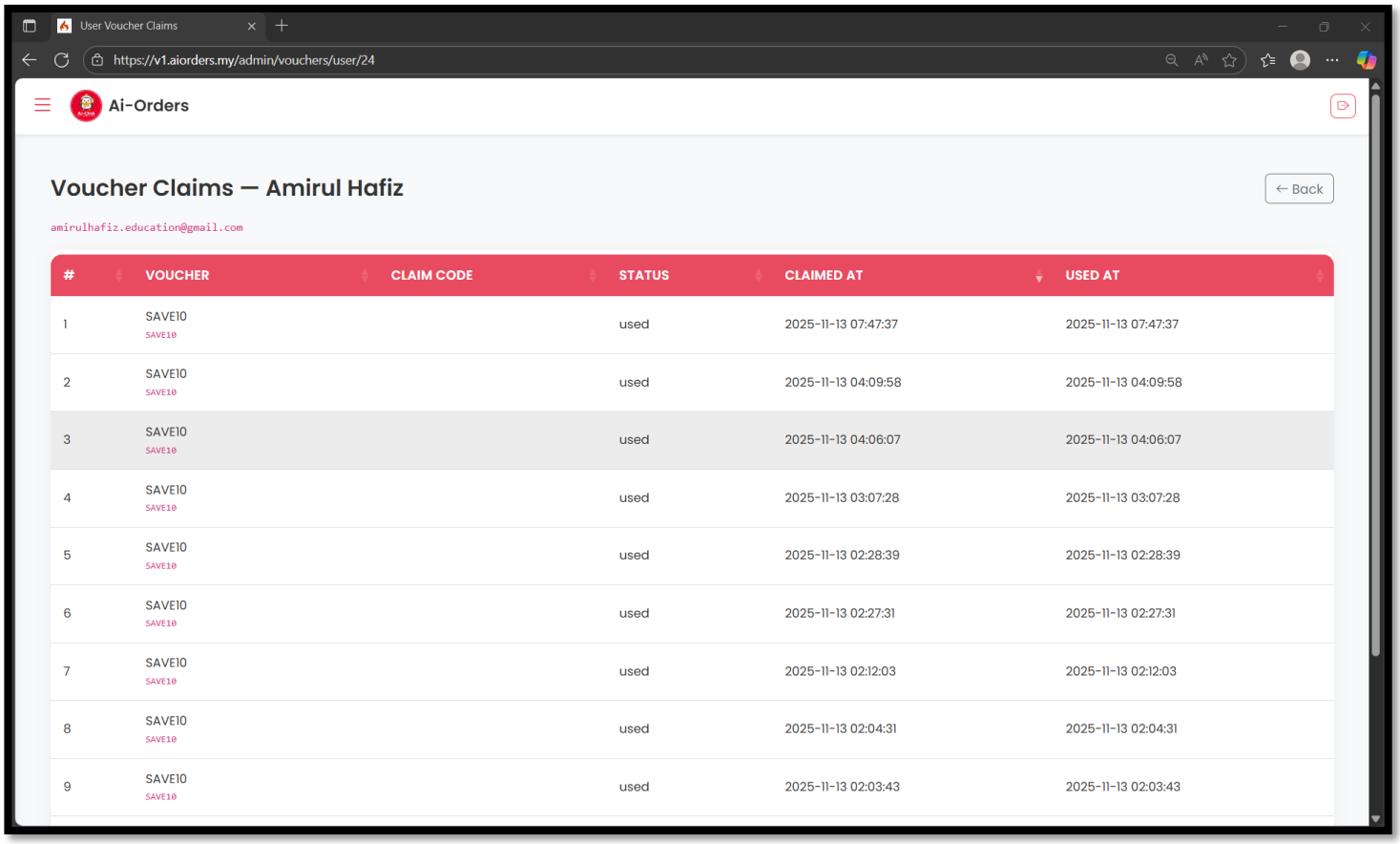


Figure 7.4. 22: Ai-Orders admin user voucher claims detail page.

Figure 7.4.22 shows the detailed voucher claim history for a specific customer in the Ai-Orders system. After selecting a user from the summary screen, the administrator can view every voucher claim made by that customer, including voucher name, claim code, status, claim date and usage date. This chronological list allows staff to verify whether a voucher was actually redeemed at a particular time and to investigate any disputes related to discounts or loyalty points. The interface supports transparency and auditing for individual customer voucher activity while maintaining a simple layout that is easy for administrators to read.

7.4.23. All Voucher Claims Interface

Figure 7.4.23 shows the consolidated voucher claims interface in the Ai-Orders system. Unlike the user-specific view, this screen lists every voucher claim across all customers, including user name and email, voucher name, claim code, status, claim date and usage date. A search bar and status filter allow the administrator to quickly trace particular claims based on user, email or voucher code. The *User Claims* button at the top provides a shortcut back to the per-user summary view. This global log supports auditing, detection of abnormal usage patterns and verification of discount application during system maintenance or dispute resolution.

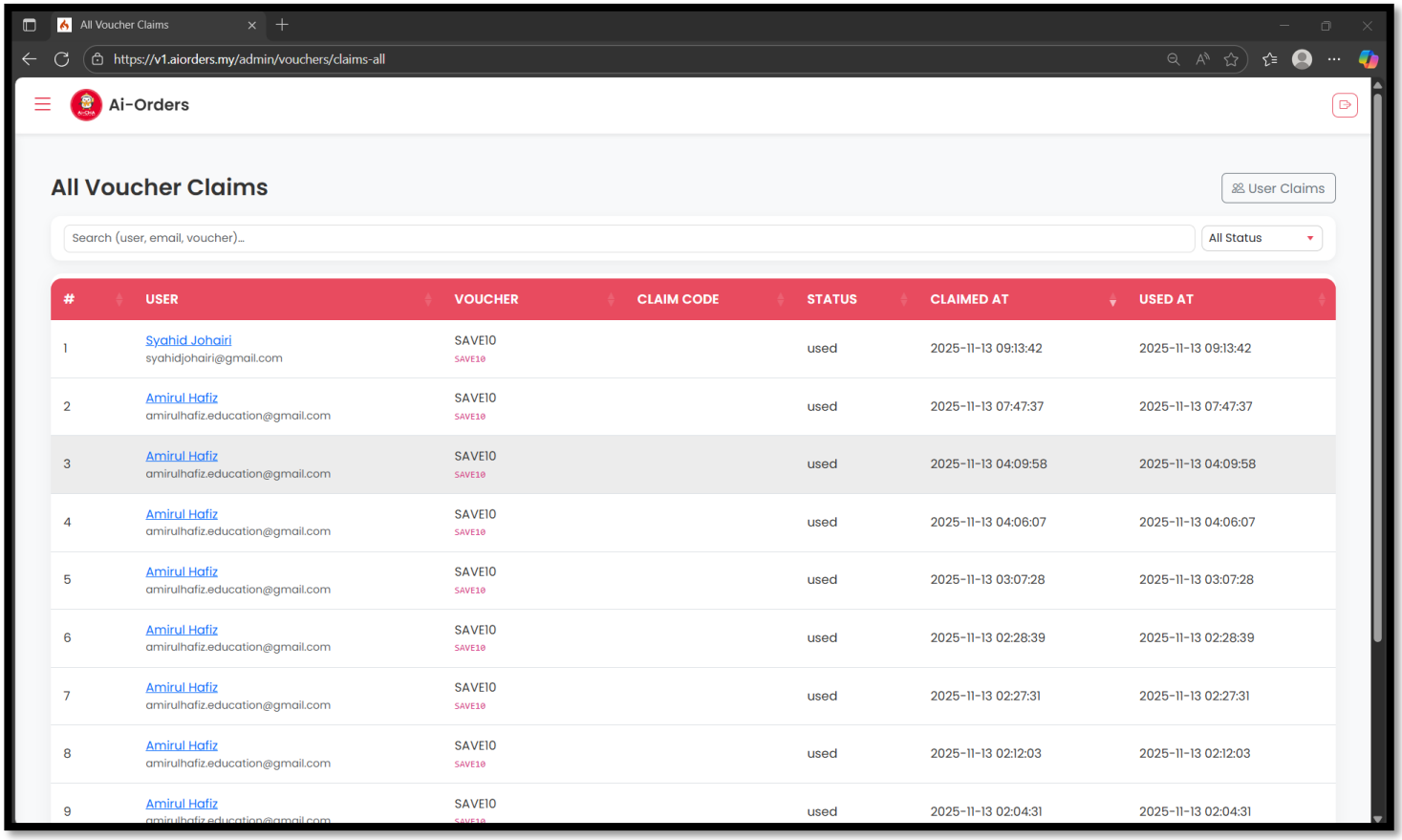


Figure 7.4. 23: Ai-Orders admin all voucher claims page.

Figure 7.4.23 shows the consolidated voucher claims interface in the Ai-Orders system. Unlike the user-specific view, this screen lists every voucher claim across all customers, including user name and email, voucher name, claim code, status, claim date and usage date. A search bar and status filter allow the administrator to quickly trace particular claims based on user, email or voucher code. The *User Claims* button at the top provides a shortcut back to the per-user summary view. This global log supports auditing, detection of abnormal usage patterns and verification of discount application during system maintenance or dispute resolution.

7.4.24. Feedback Management Interface

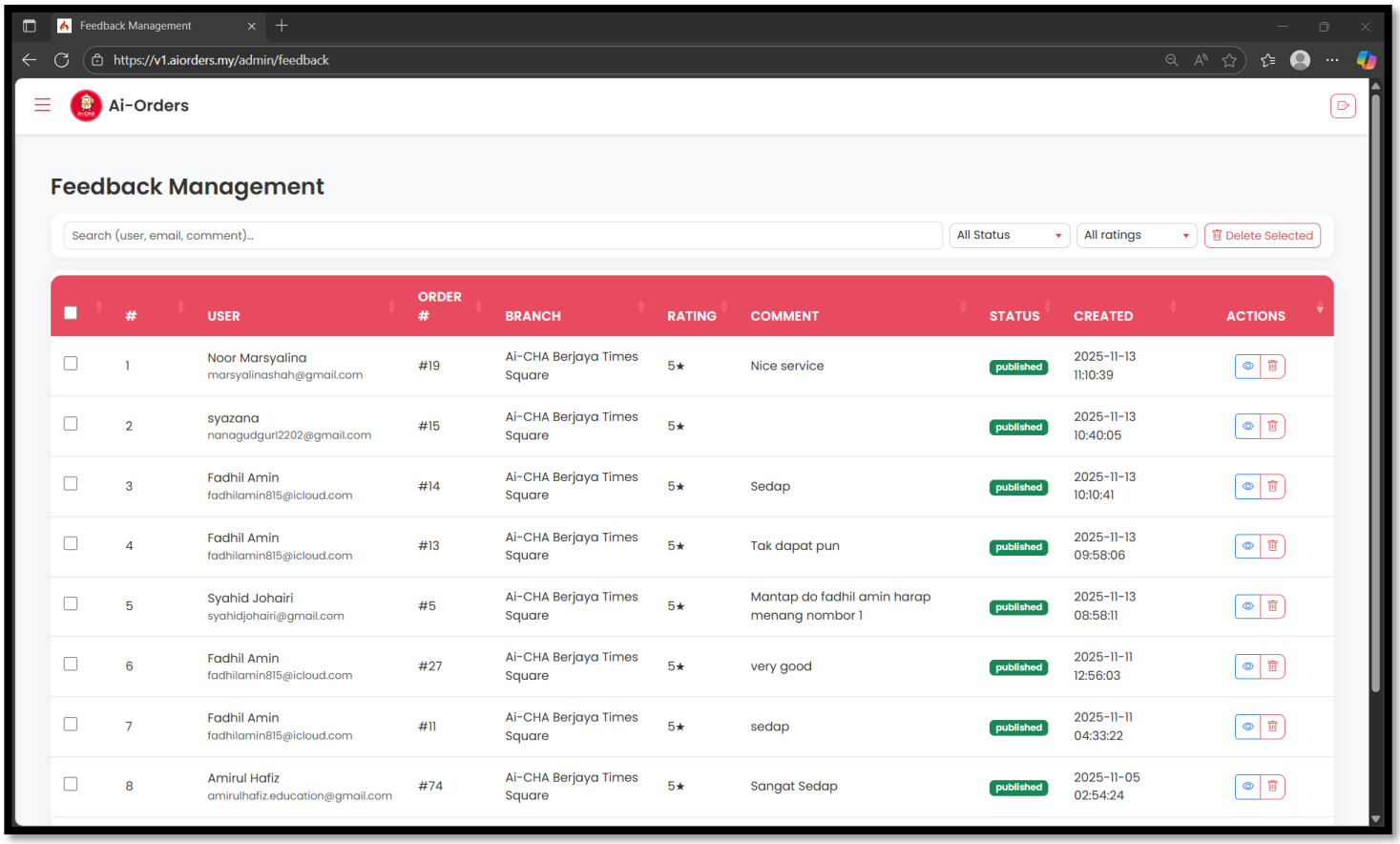


Figure 7.4. 24: Ai-Orders admin feedback management page.

Figure 7.4.24 shows the feedback management interface where the administrator reviews customer ratings and comments submitted after completing orders. The table lists each feedback entry together with the user's name and email, related order number, branch, star rating, written comment, publication status and created timestamp. A search bar and dropdown filters (by status and rating) help staff quickly locate specific feedback, while the action buttons allow them to view the full details or delete inappropriate entries. Bulk selection with *Delete Selected* is provided for housekeeping. This module enables the business to monitor service quality at each outlet and respond to customer issues based on structured, system-recorded feedback.

7.4.25. Feedback Detail and Admin Reply Interface

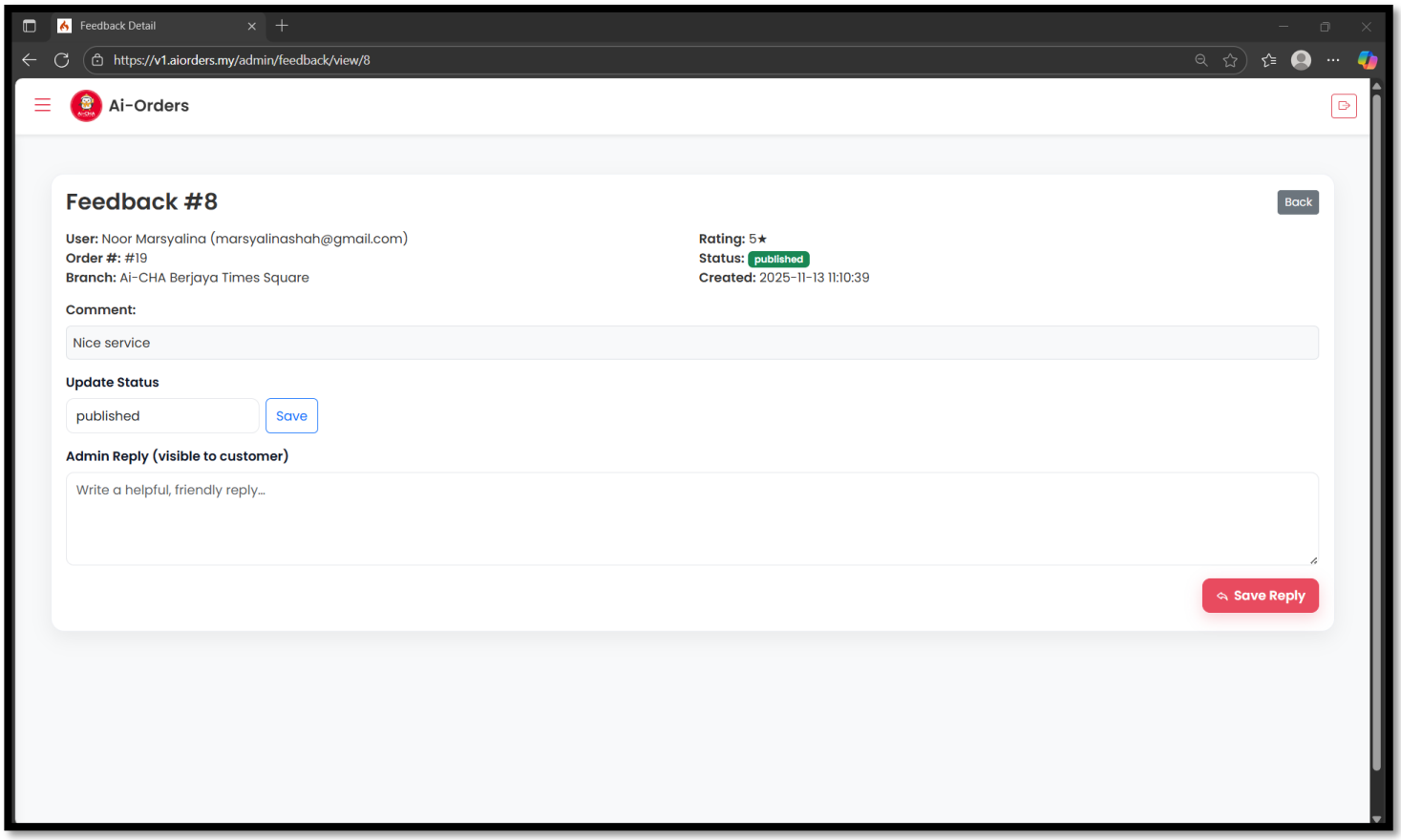


Figure 7.4. 25: Ai-Orders admin feedback detail and reply page.

Figure 7.4.25 shows the detailed feedback view for a specific customer review in the Ai-Orders system. The screen displays key information such as user name and email, related order number, branch, star rating, status and created timestamp. The original comment is shown in full, and the administrator can update the publication status (for example, published or hidden) using the *Update Status* control. A text area labelled *Admin Reply (visible to customer)* allows the business to send a personalised response that will be shown to the customer in the app. The *Save Reply* button records the response in the database. This interface supports two-way communication between Ai-CHA and its customers and helps the business manage its online service reputation.

7.4.26. Menu Management Interface

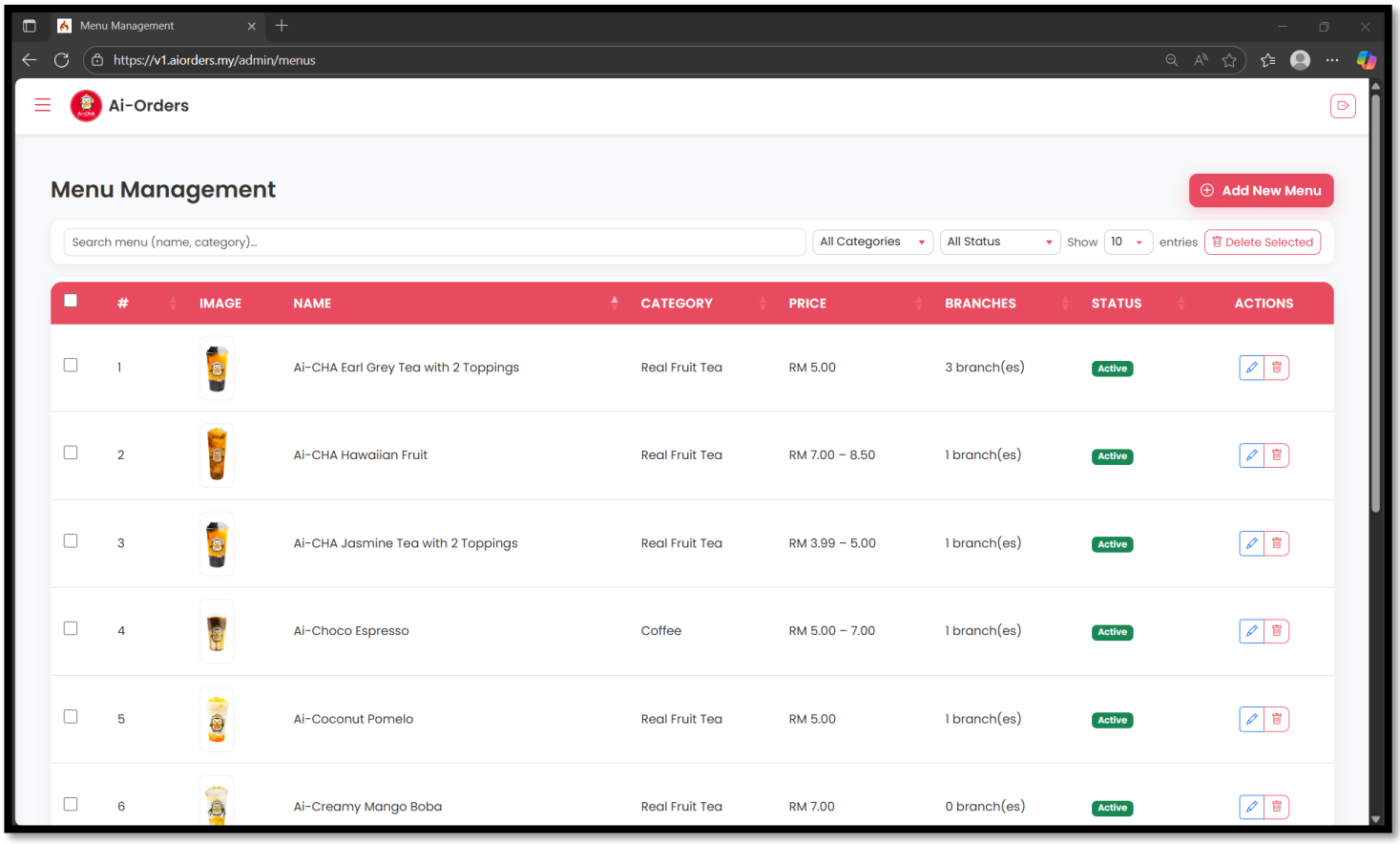


Figure 7.4. 26: Ai-Orders admin menu management page.

Figure 7.4.26 shows the menu management interface where the administrator maintains all drinks and food items offered in Ai-Orders. Each row lists the menu image, name, category, price range and number of branches where the item is available, together with its current status. A search bar and filters by category and status help staff quickly locate specific products within a large catalogue. The *Add New Menu* button allows new items to be created, while the action buttons on each row enable editing or deleting existing menus. Bulk selection with *Delete Selected* supports efficient housekeeping. This module ensures that the digital menu displayed to customers and counter staff is always accurate and up to date across all branches.

7.4.27. Add New Menu Interface

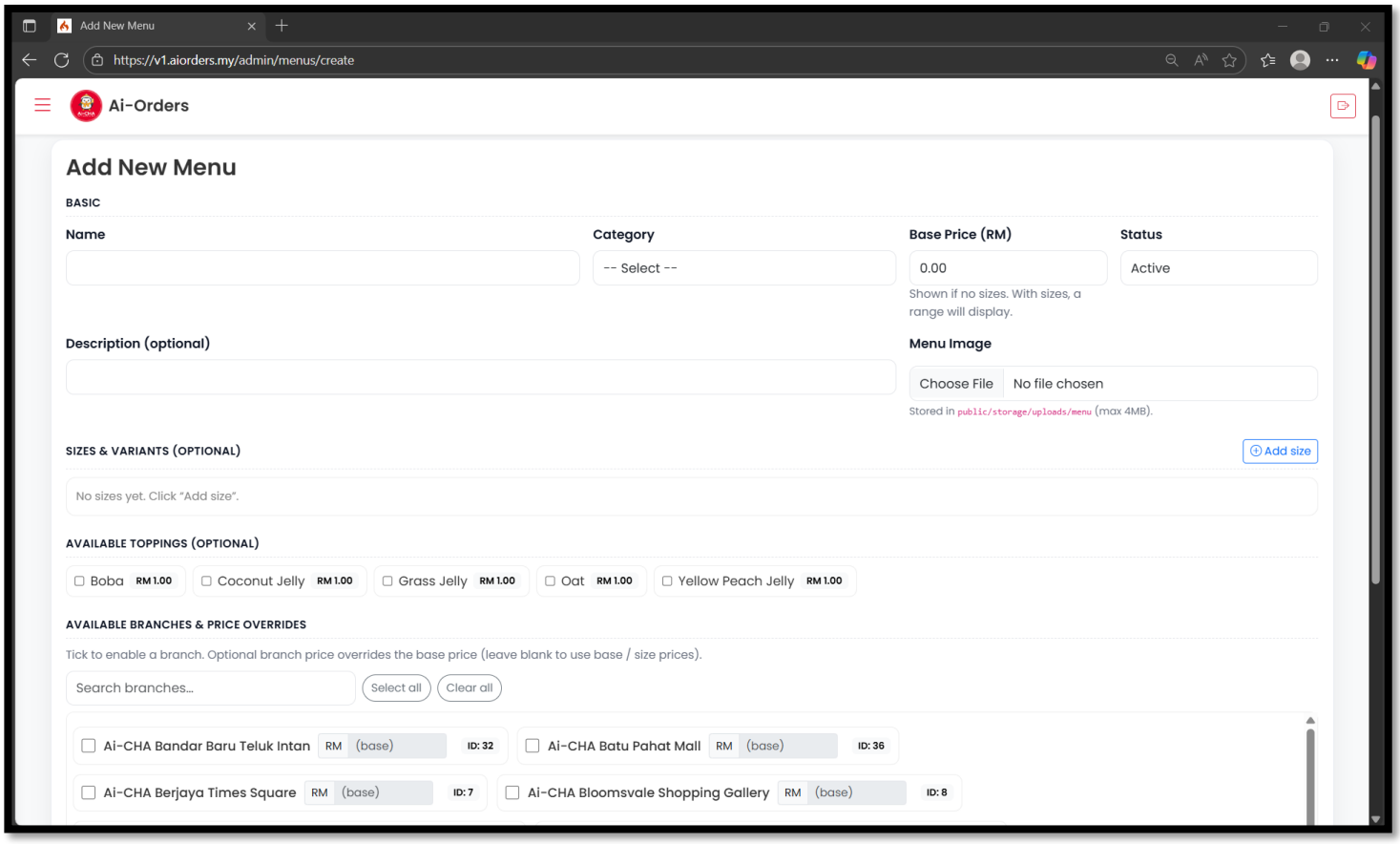


Figure 7.4. 27: Ai-Orders admin add new menu page.

Figure 7.4.27 shows the interface used by the administrator to register a new menu item in the Ai-Orders system. In the *Basic* section, the admin specifies the menu name, selects a category, sets the base price in Ringgit Malaysia and defines the initial status (for example, Active). An optional description field and image upload allow the product to be presented more clearly to customers. The *Sizes & Variants* area lets the admin add multiple cup sizes with different prices, while the *Available Toppings* section enables or disables predefined toppings that can be selected during ordering. At the bottom, the *Available Branches & Price Overrides* panel is used to choose which outlets will sell the item and, if necessary, override the base price for individual branches. This flexible screen ensures that new drinks or food items can be configured once and deployed consistently across the Ai-CHA network.

7.4.28. Edit Menu Interface

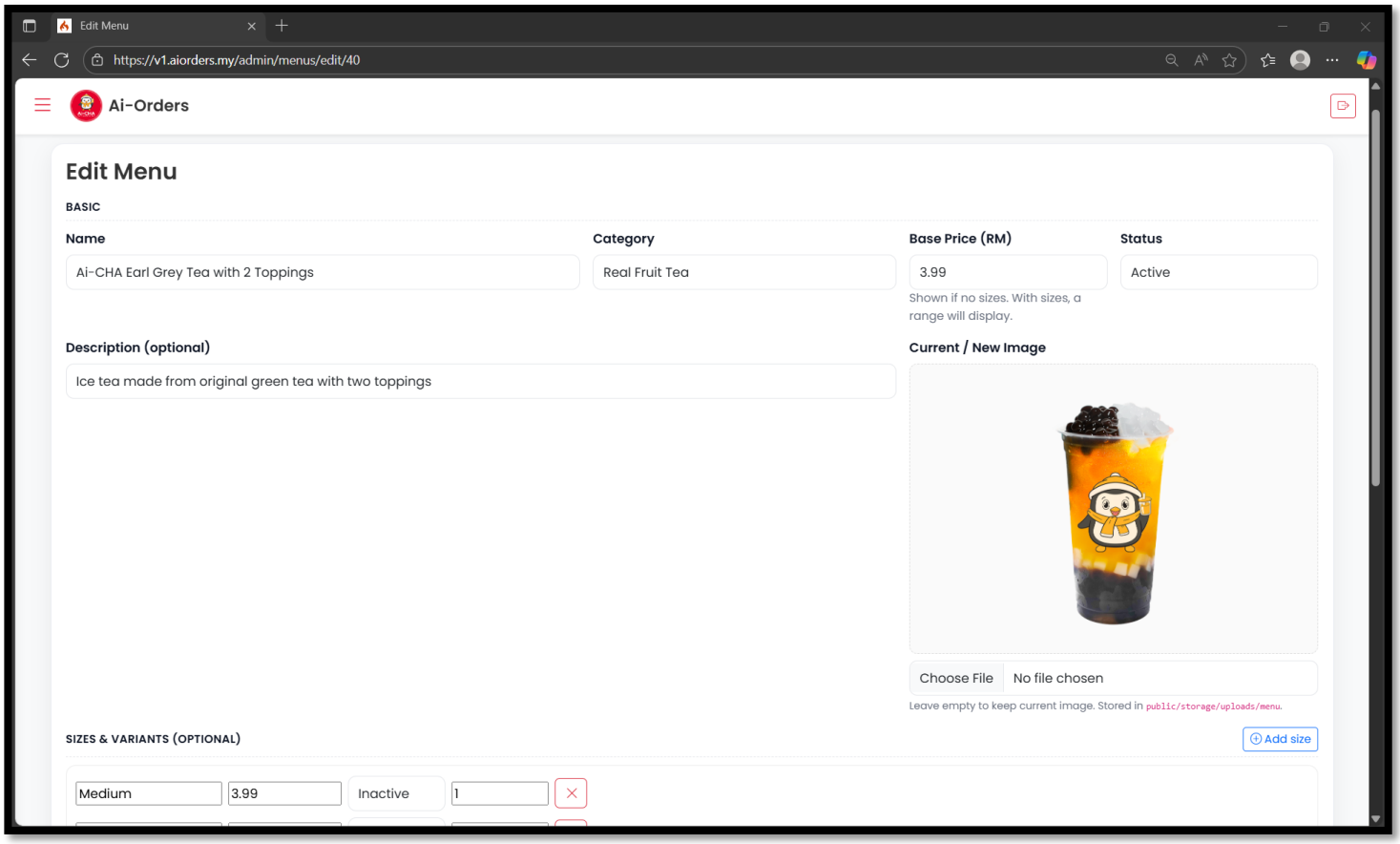


Figure 7.4. 28: Ai-Orders admin edit menu page.

Figure 7.4.28 shows the interface for updating an existing menu item in the Ai-Orders system. The screen loads the current product details, including name, category, base price, status and description, so that the administrator can correct information without recreating the item. On the right, the current product image is displayed with an option to upload a new image if the visual needs to be refreshed. Below, the *Sizes & Variants* section (partially shown) allows the admin to adjust size labels, prices and availability, while branch-level settings can be modified further down the page. The *Save* action (not shown in this crop) commits these changes to the database, ensuring that menu data, pricing and presentation remain consistent with the latest Ai-CHA offerings.

7.4.29. Category Management Interface

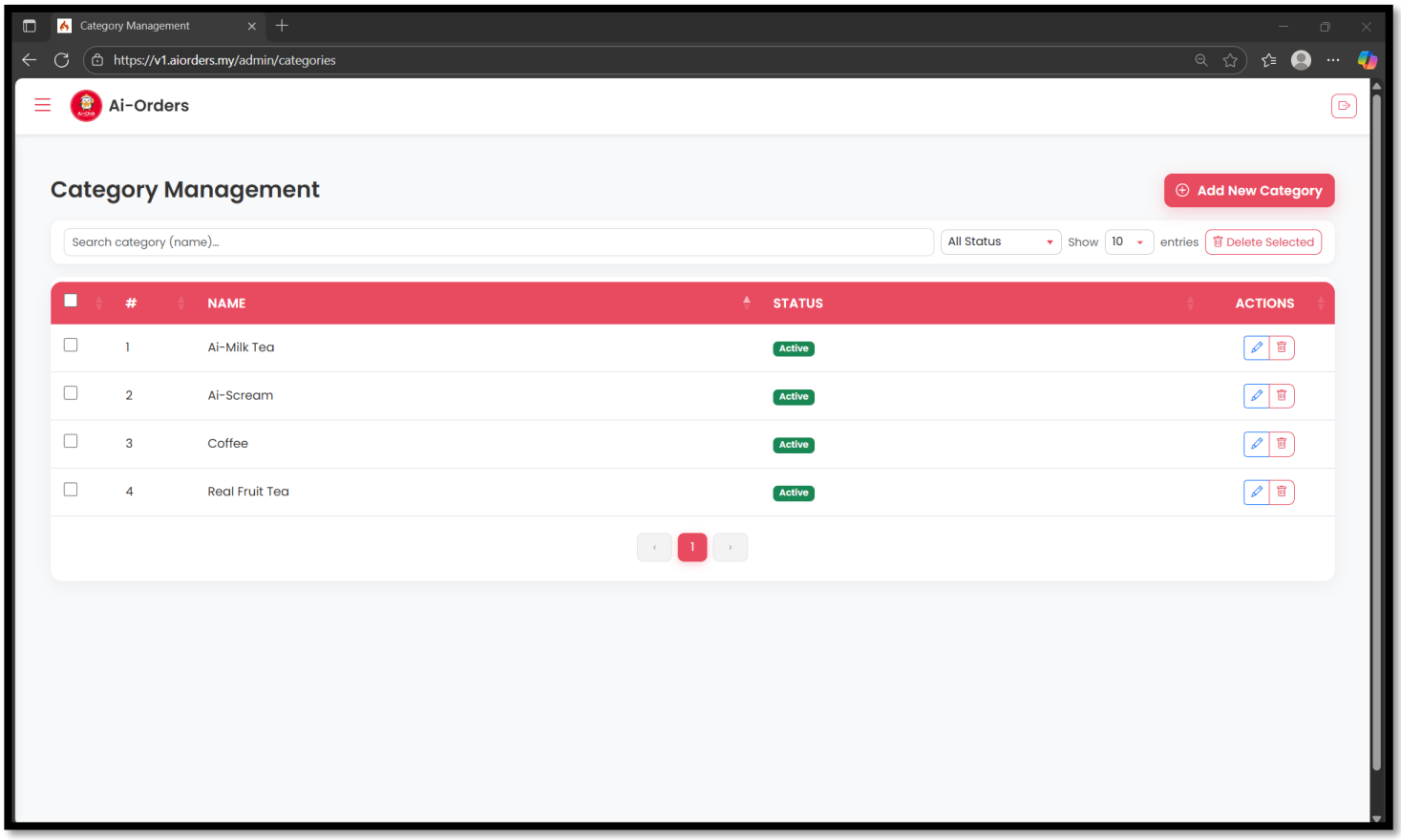


Figure 7.4. 29: Ai-Orders admin category management page.

Figure 7.4.29 shows the category management interface used by the administrator to organise menu items into logical groups. The table lists each category name together with its current status, allowing staff to see at a glance which categories are active in the system. A search bar and status filter help the admin quickly locate specific categories, while the *Add New Category* button is used to create additional groups when new product lines are introduced. Action buttons on each row allow categories to be edited or deleted, and bulk selection with *Delete Selected* supports efficient housekeeping. This module ensures that the menu structure presented to customers remains clear and consistent across all branches.

7.4.30. Add New Category Interface

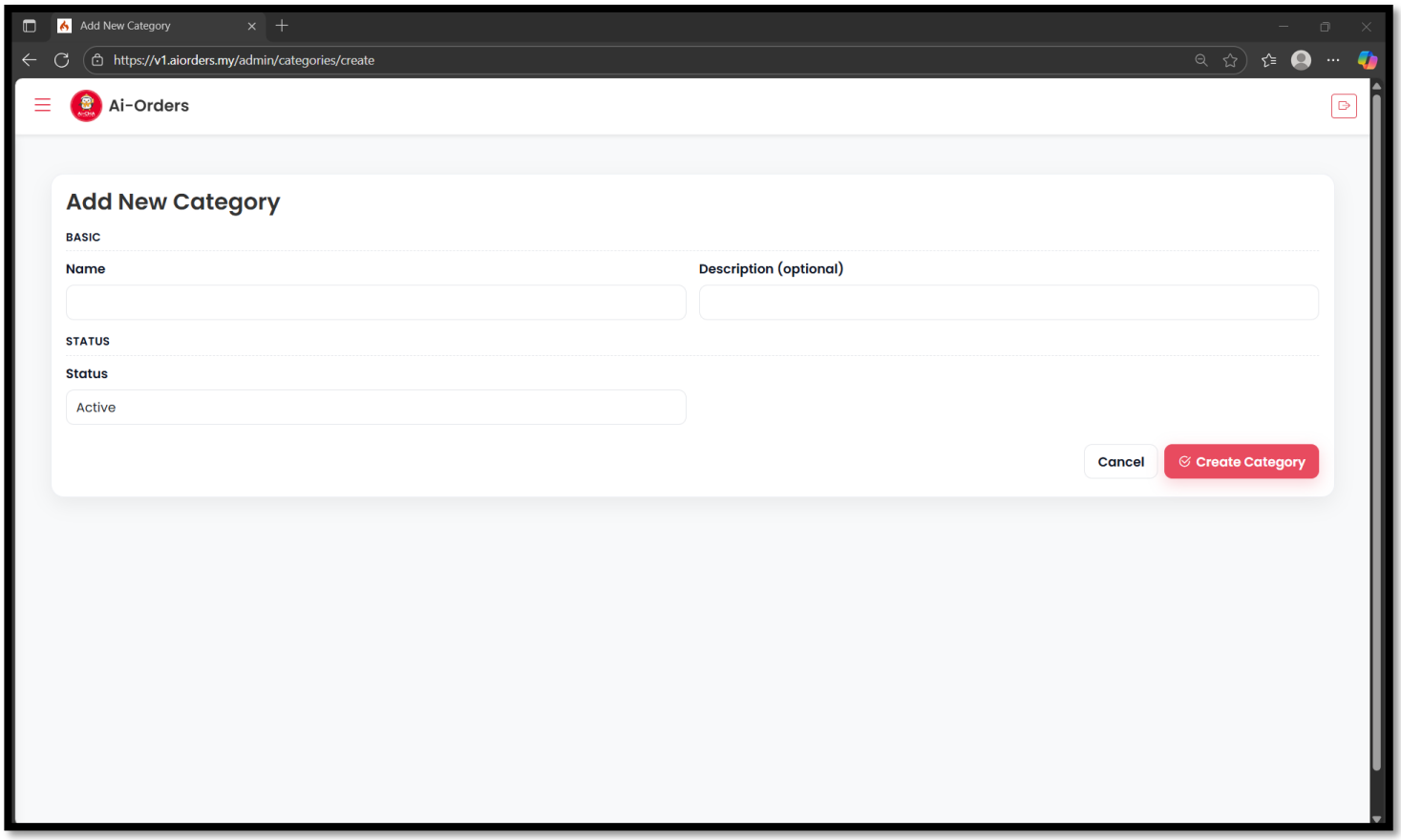


Figure 7.4. 30: Ai-Orders admin add new category page.

Figure 7.4.30 shows the interface used by the administrator to create a new product category in the Ai-Orders system. The form is kept simple, requiring only the category name and status, with an optional description field to clarify how the category should be used. After entering the information, the admin can confirm the creation using the *Create Category* button or cancel the operation. This screen allows the menu structure to be expanded in a controlled way whenever Ai-CHA introduces new drink or dessert lines.

7.4.31. Edit Category Interface

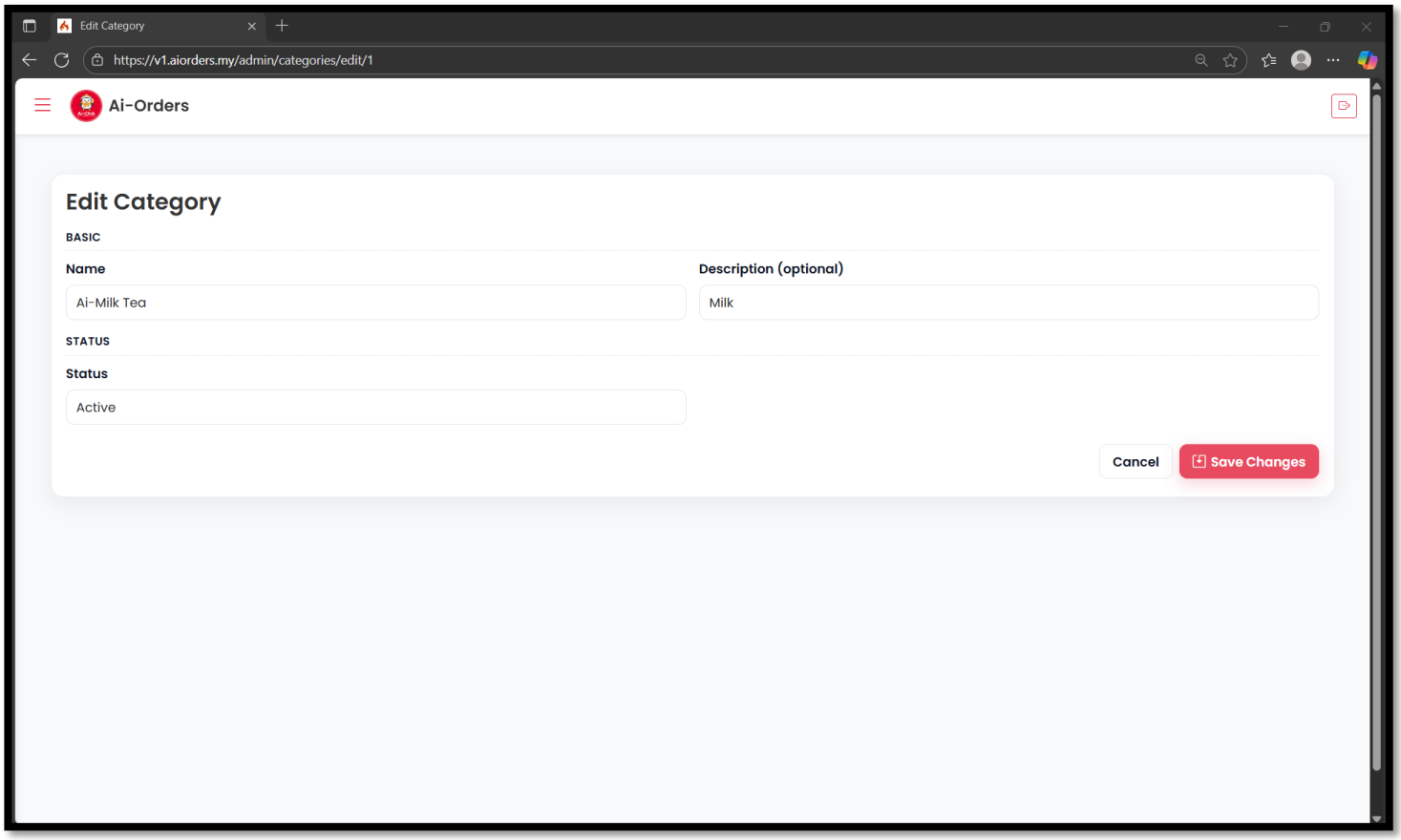


Figure 7.4. 31: Ai-Orders admin edit category page.

Figure 7.4.31 shows the interface for updating an existing product category in the Ai-Orders system. The form displays the current category name, optional description and status so that the administrator can correct spelling, rename a category or change whether it is active without affecting other records. After making the necessary adjustments, the admin can confirm the update using the *Save Changes* button or discard modifications with *Cancel*. This screen helps ensure that the category structure used to group menu items remains accurate and aligned with Ai-CHA's evolving product lines.

7.4.32. Wallet Balances Interface

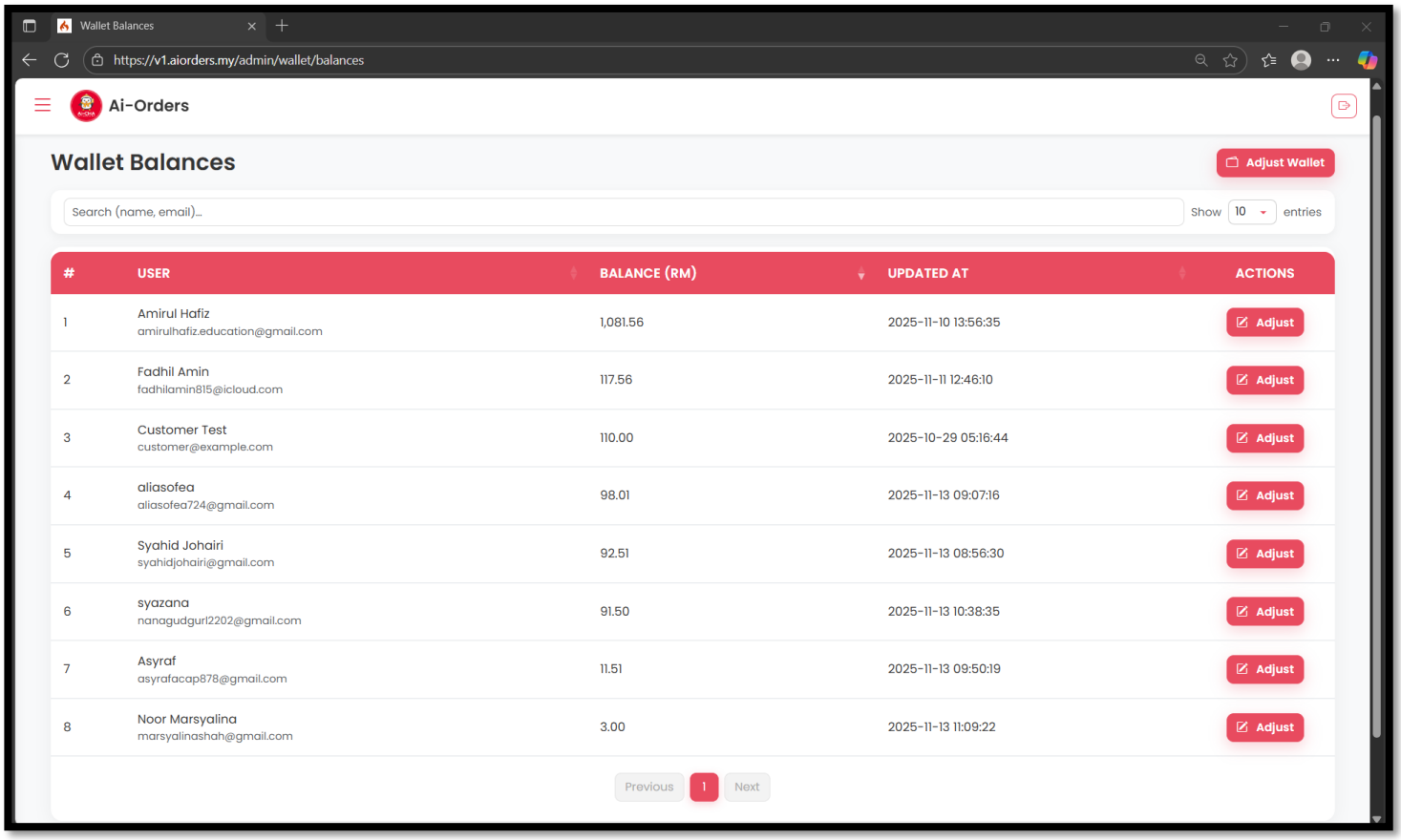


Figure 7.4. 32: Ai-Orders admin wallet balances page.

Figure 7.4.32 shows the wallet balances interface used by the administrator to monitor and manage customers' e-wallet amounts. The table lists each user together with their email address, current wallet balance in Ringgit Malaysia and the timestamp of the last update. A search bar helps staff quickly locate a specific customer, while the *Adjust* button on each row opens the adjustment screen for that user. The global *Adjust Wallet* button at the top provides a shortcut to perform manual credits or debits when resolving issues such as refunds, failed payments or promotional top-ups. This module ensures that wallet balances remain accurate and traceable across the Ai-Orders platform.

7.4.33. Adjust Wallet Interface

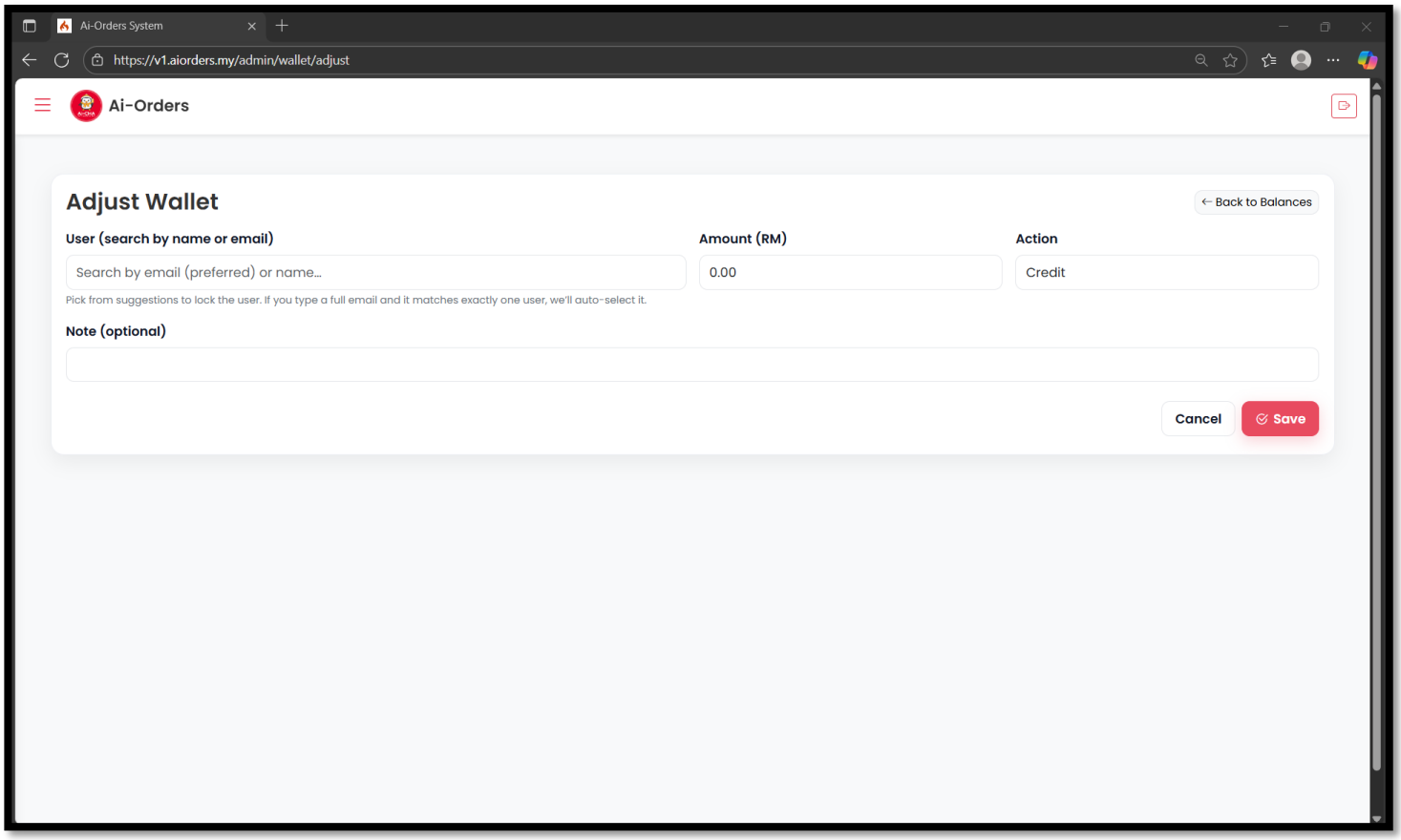


Figure 7.4. 33: Ai-Orders admin adjust wallet page.

Figure 7.4.33 shows the interface used by the administrator to manually adjust a customer's wallet balance. The admin first searches for a user by email or name, then enters the adjustment amount in Ringgit Malaysia and selects the action type, such as credit or debit. An optional note field is provided to record the reason for the adjustment (for example, refund for cancelled order or compensation for service issue), which supports later auditing. The *Save* button applies the change and updates the wallet ledger, while *Cancel* returns to the balance list without making modifications. This screen ensures that exceptional wallet corrections are handled in a controlled and traceable manner.

7.4.34. Wallet Transactions Interface

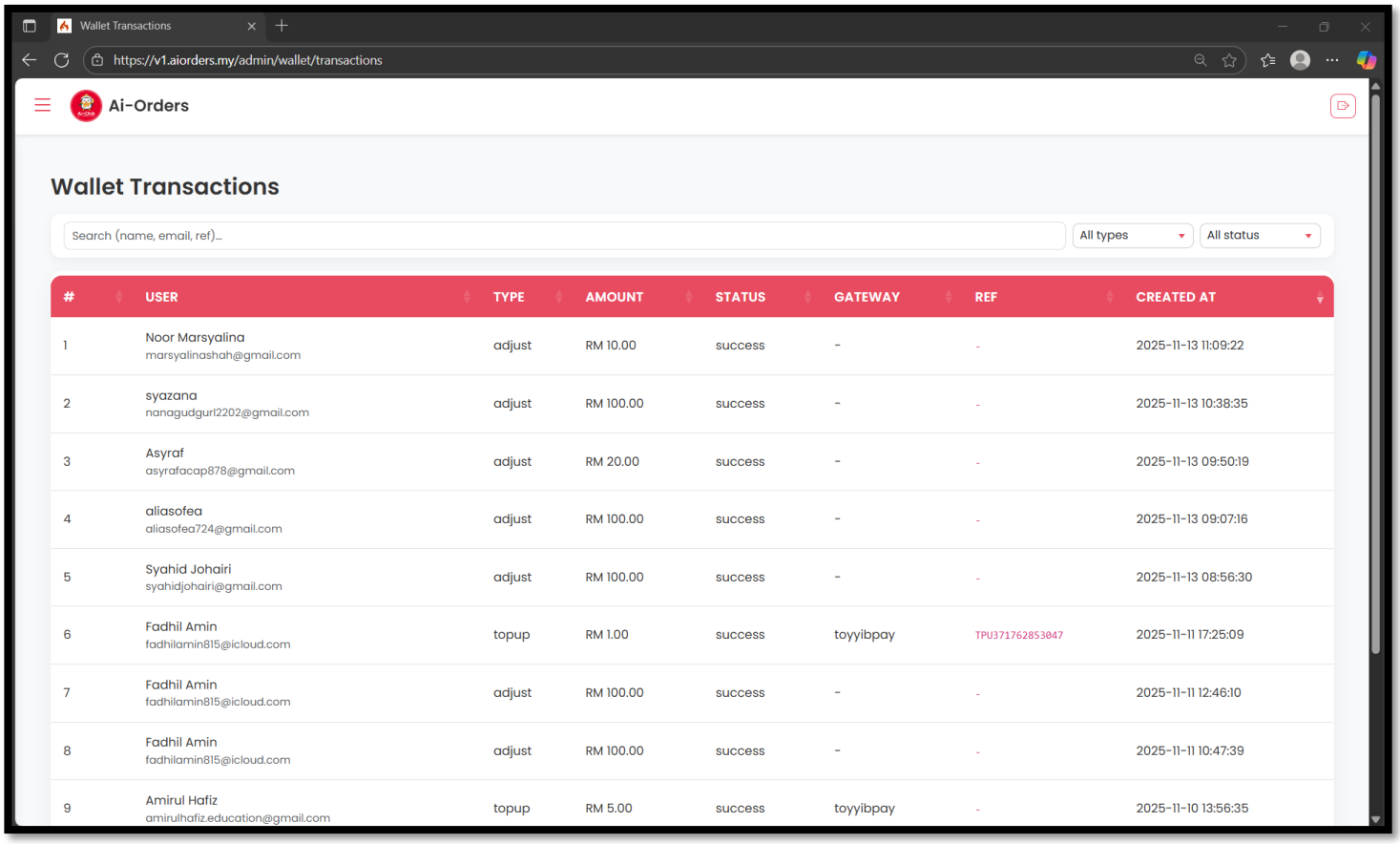


Figure 7.4. 34: Ai-Orders admin wallet transactions page.

Figure 7.4.34 shows the wallet transactions interface, which provides a detailed ledger of all e-wallet activities in the Ai-Orders system. Each record lists the user's name and email, transaction type (such as *topup* or *adjust*), amount in Ringgit Malaysia, status, payment gateway (for example, ToyyibPay for online top-ups), reference number and created timestamp. A search bar and dropdown filters by type and status allow administrators to quickly trace specific transactions, for instance when investigating payment issues or verifying refunds. This comprehensive log supports financial reconciliation, auditing and monitoring of both automated top-ups and manual adjustments performed by staff.

7.4.35. Payments History Interface

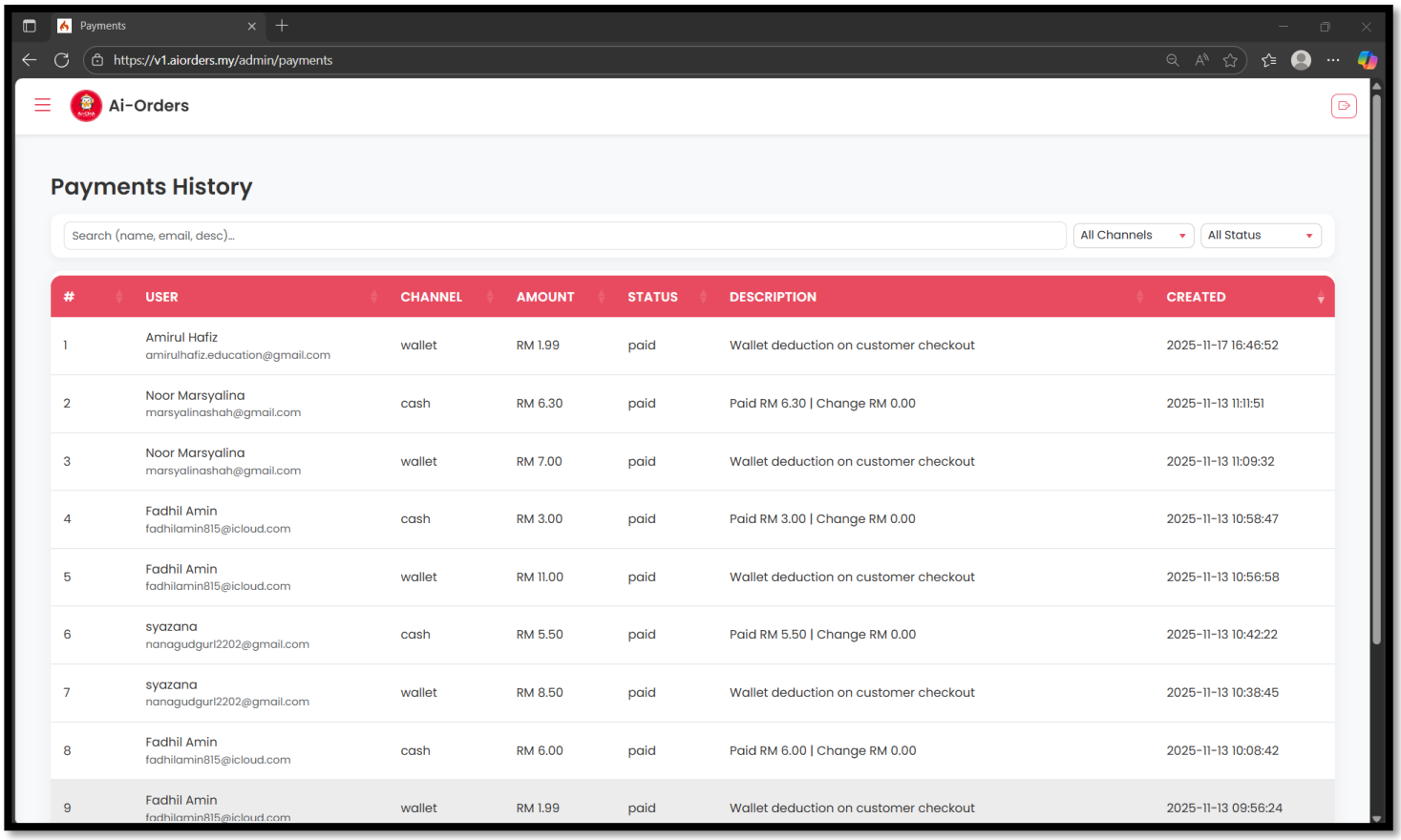


Figure 7.4. 35: Ai-Orders admin payments history page.

Figure 7.4.35 shows the payments history interface that records all order payments processed through Ai-Orders. Each row lists the customer's name and email, payment channel (such as cash or wallet), amount paid, payment status and a short description indicating how the payment was handled (for example, wallet deduction at customer checkout or cash received with change amount). The created timestamp column provides the exact date and time of each transaction. A search bar and dropdown filters by channel and status help administrators quickly trace specific payments when performing reconciliation or resolving disputes. This module acts as a central ledger for all settlement activities across both counter and customer channels.

7.4.36. Global Points Policies Interface

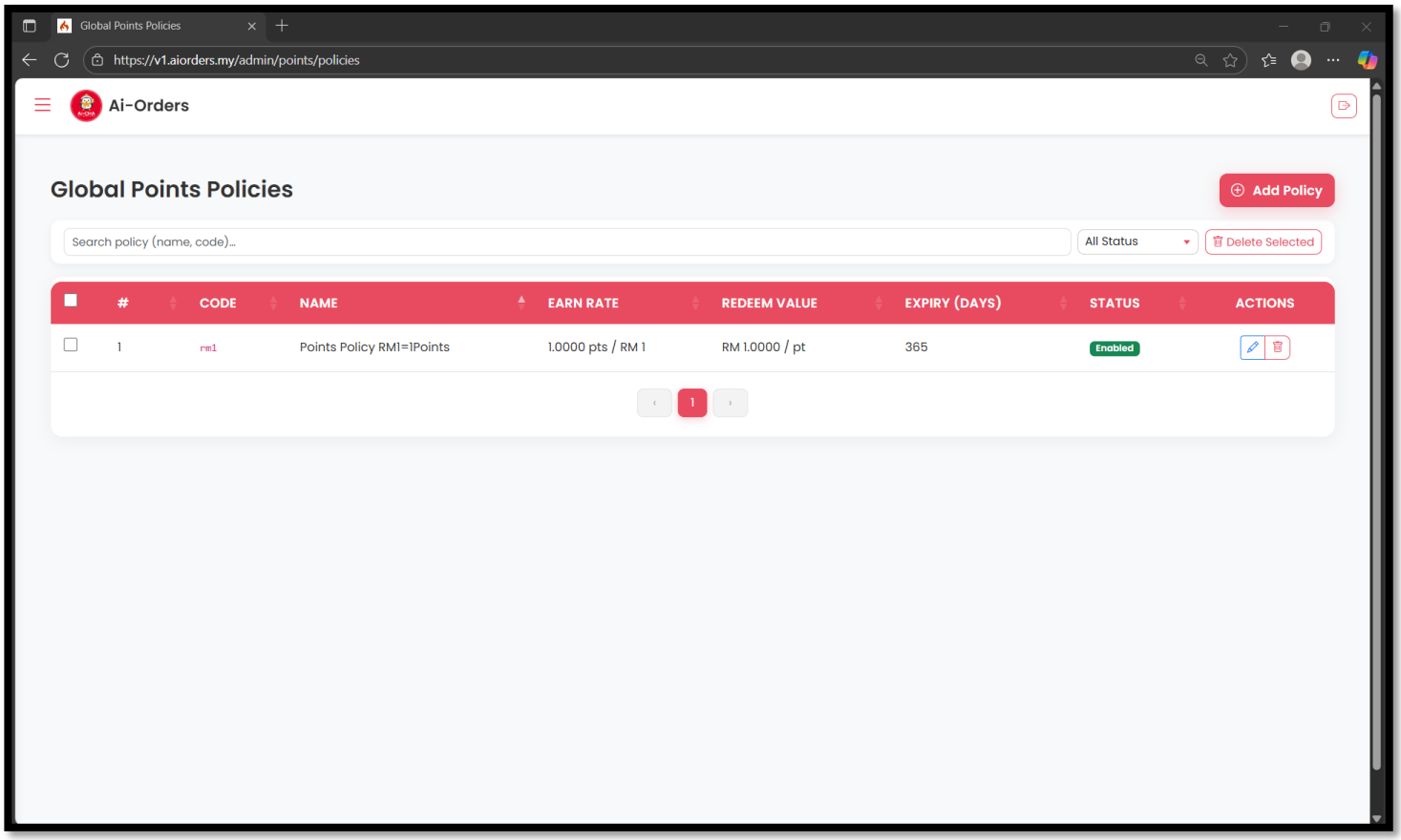


Figure 7.4. 36: Ai-Orders admin global points policies page.

Figure 7.4.36 shows the interface used to configure global points policies for the Ai-Orders loyalty programme. Each record specifies a policy code and name, together with the earn rate (number of points earned per Ringgit spent), redeem value (Ringgit value per point), points expiry period in days and the policy status. A search bar and status filter help the administrator locate policies quickly, while the *Add Policy* button allows new configurations to be introduced when the business wants to adjust its loyalty strategy. Action buttons on each row enable editing or deleting existing policies. This module centralises control of how Ai-Points are earned and redeemed, ensuring that all branches and channels follow the same reward rules.

7.4.37. Add Points Policy Interface

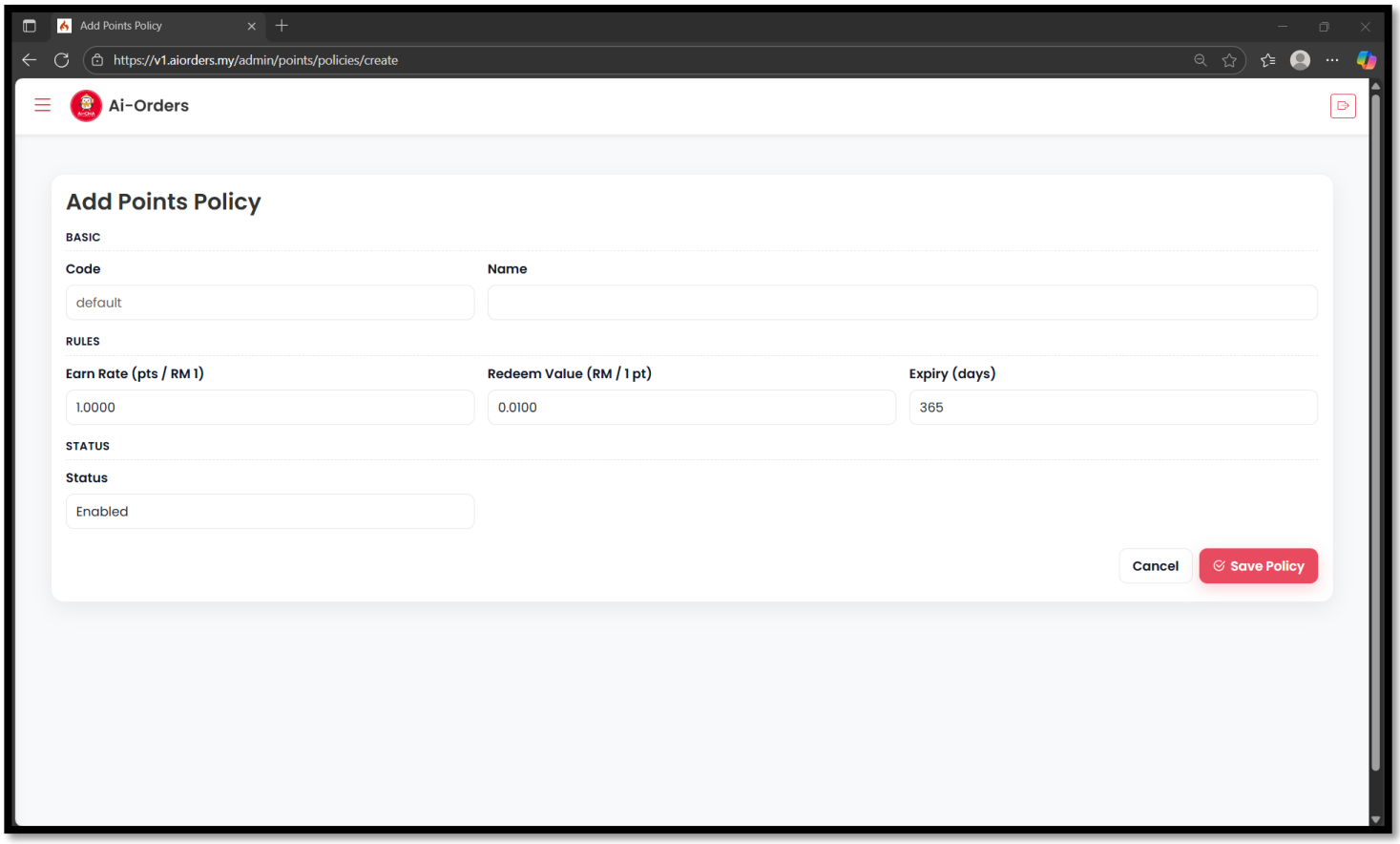


Figure 7.4. 37: Ai-Orders admin add points policy page.

Figure 7.4.37 shows the interface used by the administrator to configure a new global points policy in the Ai-Orders system. The *Basic* section captures a unique policy code and descriptive name so that different policies can be identified easily. Under *Rules*, the admin defines the earn rate (number of points awarded for each RM1 spent), redeem value (Ringgit value per 1 point) and the points expiry period in days, which together determine how attractive and sustainable the loyalty programme will be. The *Status* field specifies whether the policy is enabled for use across the platform. After entering the required values, the administrator can save the configuration using the *Save Policy* button or cancel the operation. This screen allows Ai-CHA to fine-tune its loyalty strategy without changing system code.

7.4.38. Edit Points Policy Interface

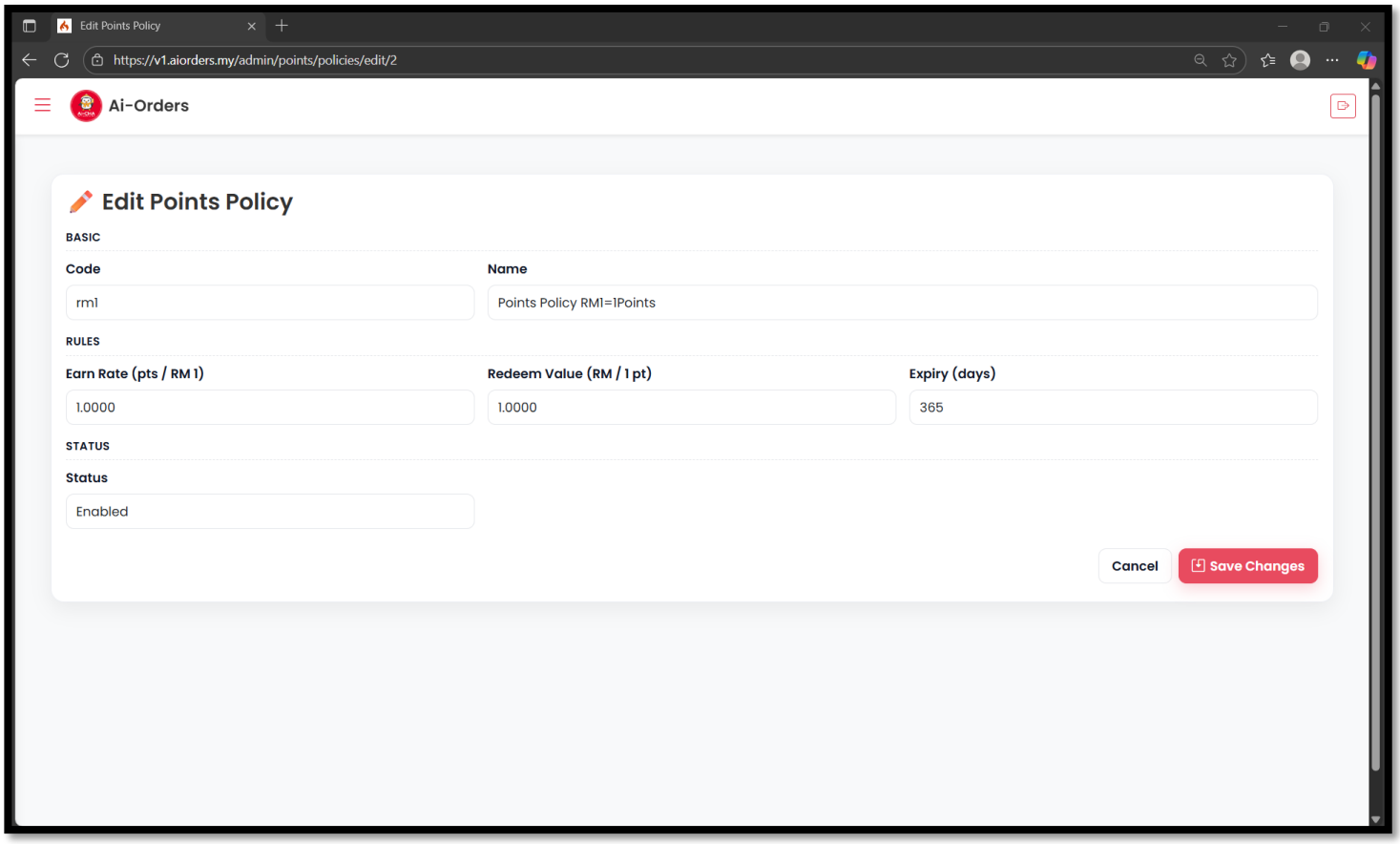


Figure 7.4. 38: Ai-Orders admin edit points policy page.

Figure 7.4.38 shows the interface for updating an existing global points policy in the Ai-Orders system. The form displays the current policy code and name together with the main rule parameters: earn rate (points per RM1 spent), redeem value (Ringgit per 1 point) and points expiry in days. These fields allow the administrator to fine-tune how quickly customers earn Ai-Points and how much discount they receive when redeeming them, without changing application code. The *Status* field indicates whether the policy is currently enabled. After adjusting the values, the admin can commit the new configuration using the *Save Changes* button or cancel the operation. This screen ensures that loyalty rules remain flexible and can be aligned with Ai-CHA's marketing strategy over time.

7.4.39. Point Balances Interface

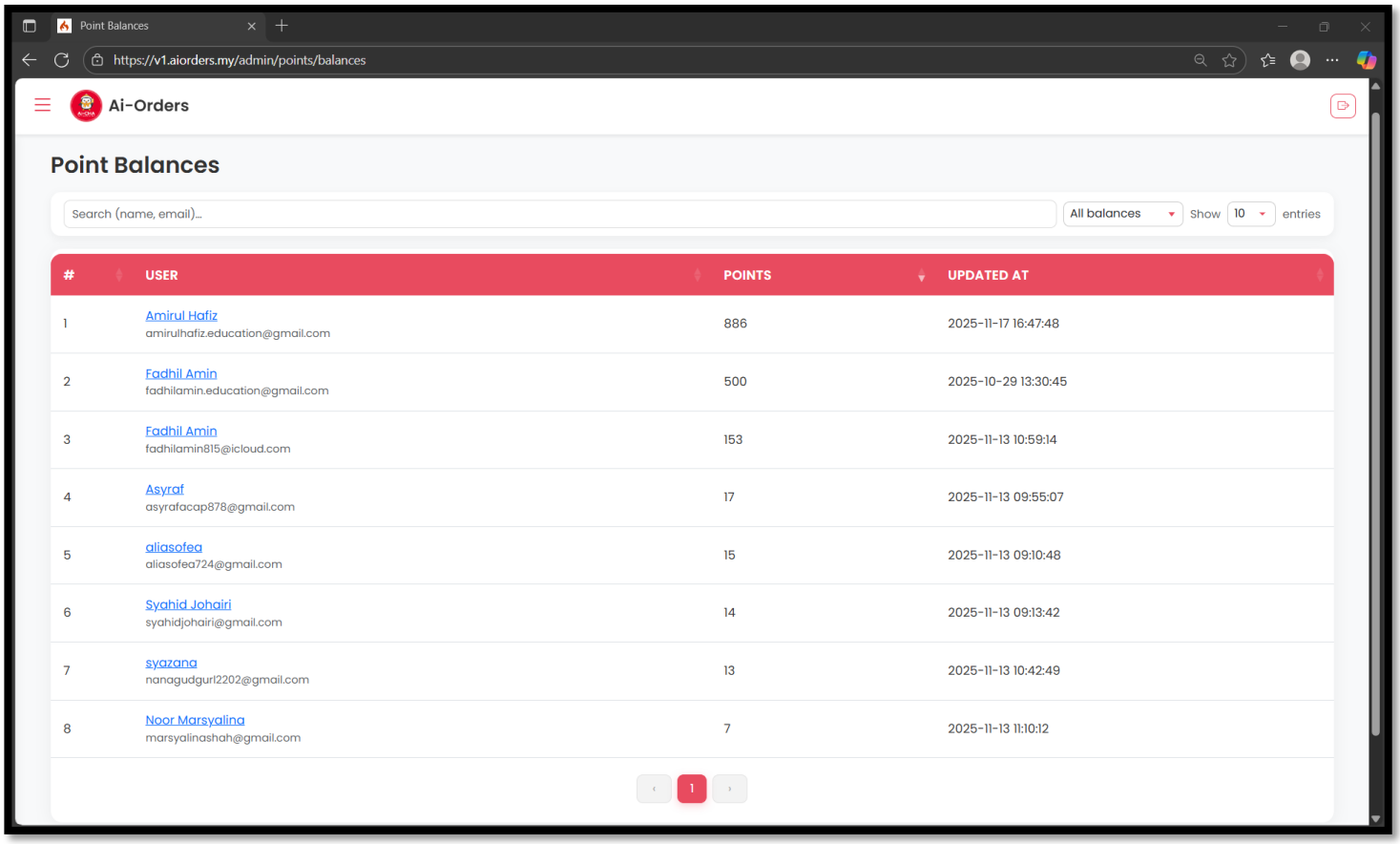


Figure 7.4. 39: Ai-Orders admin point balances page.

Figure 7.4.39 shows the point balances interface used by the administrator to monitor customers' loyalty points in the Ai-Orders system. Each row lists the user's name and email, current points balance and the timestamp when it was last updated. A search bar at the top allows staff to quickly find a specific customer by name or email, while the dropdown filter (for example, *All balances*) can be used to narrow the list based on balance status. From this overview, the admin can verify whether points have been correctly awarded or redeemed for each user and identify highly engaged members who frequently collect Ai-Points.

7.4.40. User Points Detail Interface

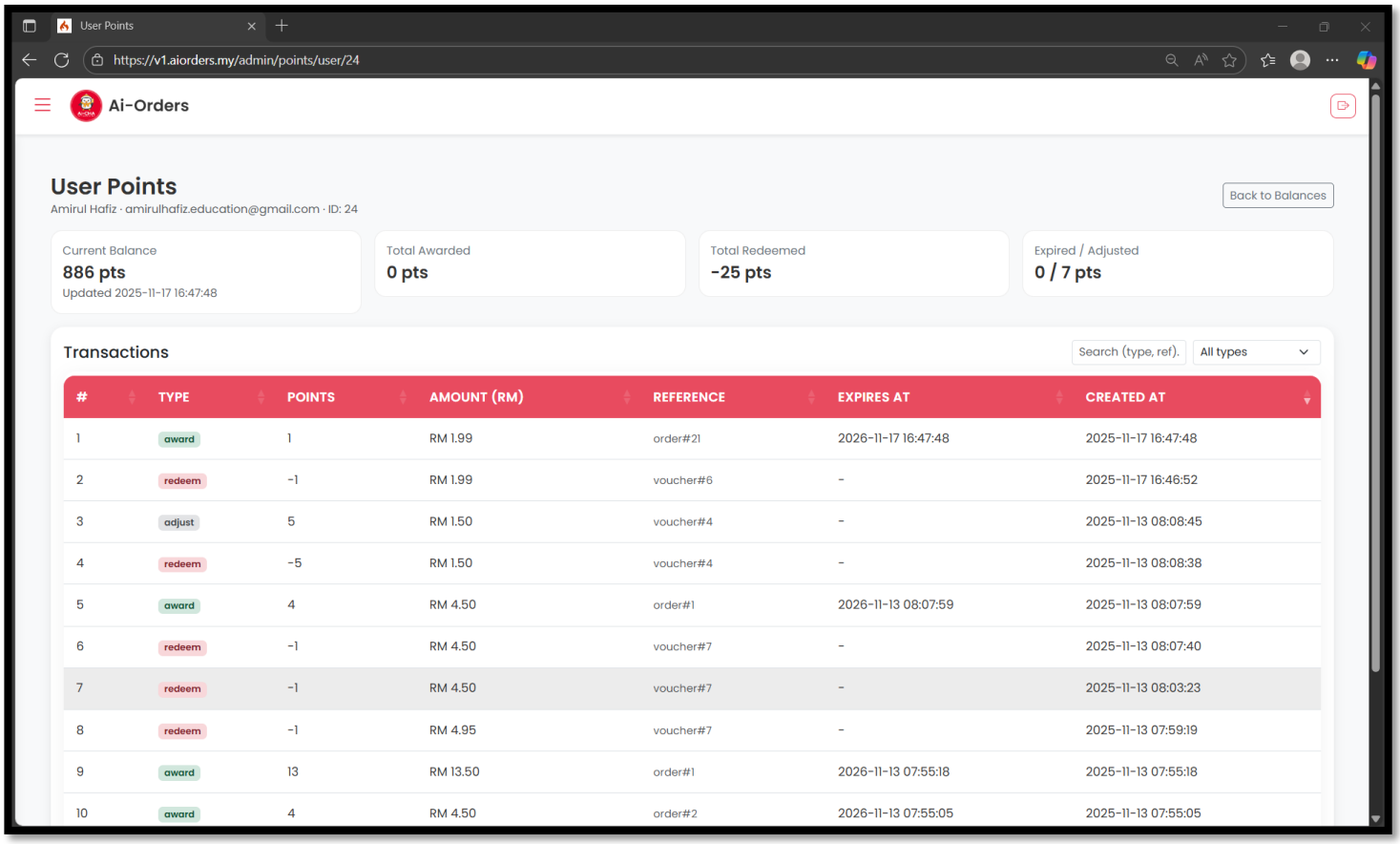


Figure 7.4. 40: Ai-Orders admin user points detail page.

Figure 7.4.40 shows the detailed points history for a specific customer in the Ai-Orders system. At the top, summary cards display the user's current balance, total points awarded, total points redeemed and the number of expired or manually adjusted points. The *Transactions* table below lists every points movement with its type (award, redeem or adjust), points value, related Ringgit amount, reference (such as order or voucher number), expiry date and created timestamp. A search box and type filter help the administrator quickly locate particular entries. This interface allows Ai-CHA to trace exactly how a customer's Ai-Points balance was calculated, supporting transparent loyalty management and troubleshooting of any disputes.

7.4.41. Point Transactions Interface

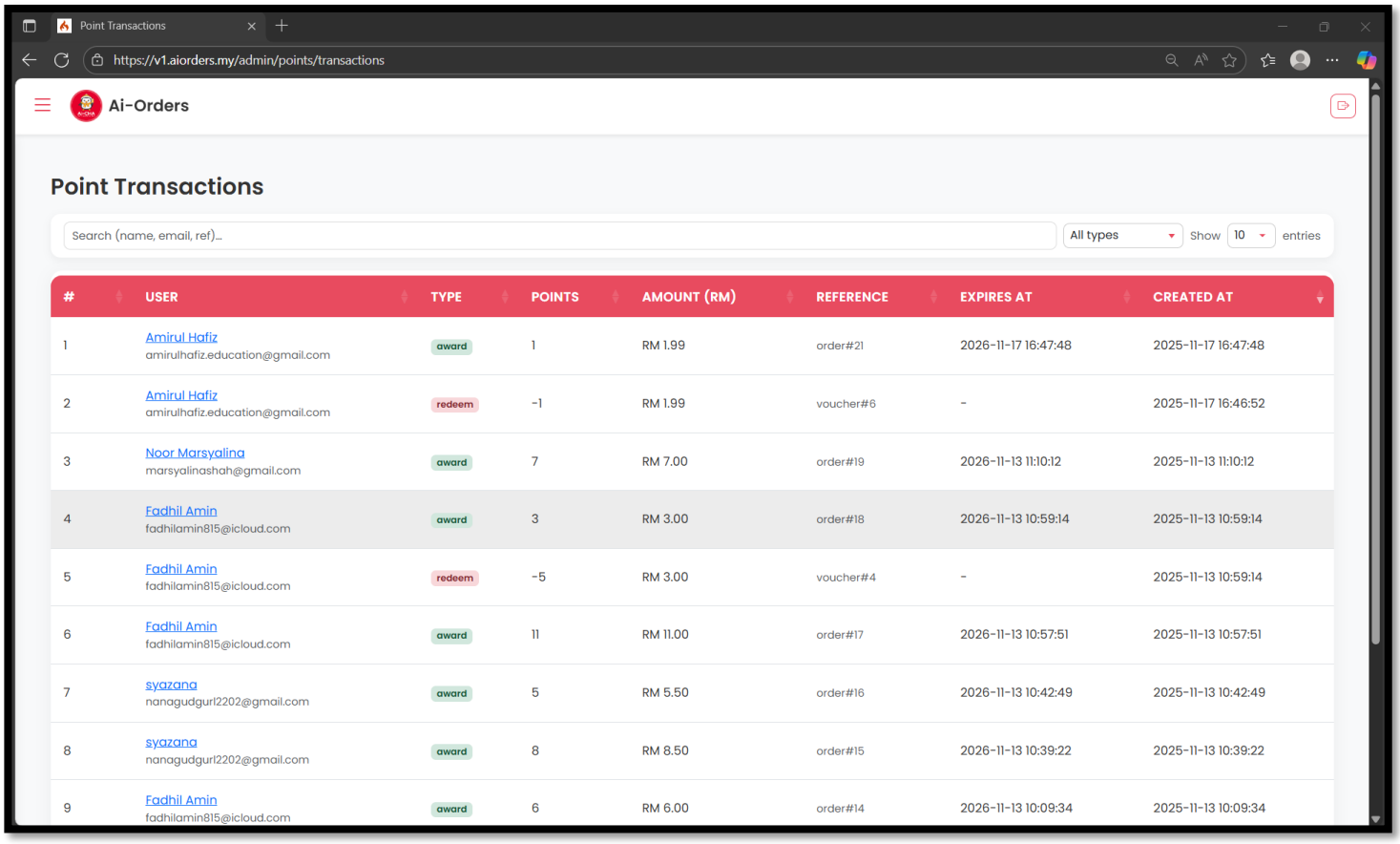


Figure 7.4. 41: Ai-Orders admin point transactions page.

Figure 7.4.41 shows the point transactions interface, which lists all Ai-Points activities across every customer account. Each row records the user's name and email, transaction type (award or redeem), number of points involved, equivalent Ringgit amount, reference (such as order or voucher number), expiry date and created timestamp. A search bar and type filter at the top help administrators quickly find specific records, for example all points earned from a particular order or all redemptions by a certain user. This global ledger allows Ai-CHA to monitor the overall performance of the loyalty programme, verify that points are being calculated correctly and support investigations when customers query their points balance.

7.4.42. Active Orders (All Stores) Interface

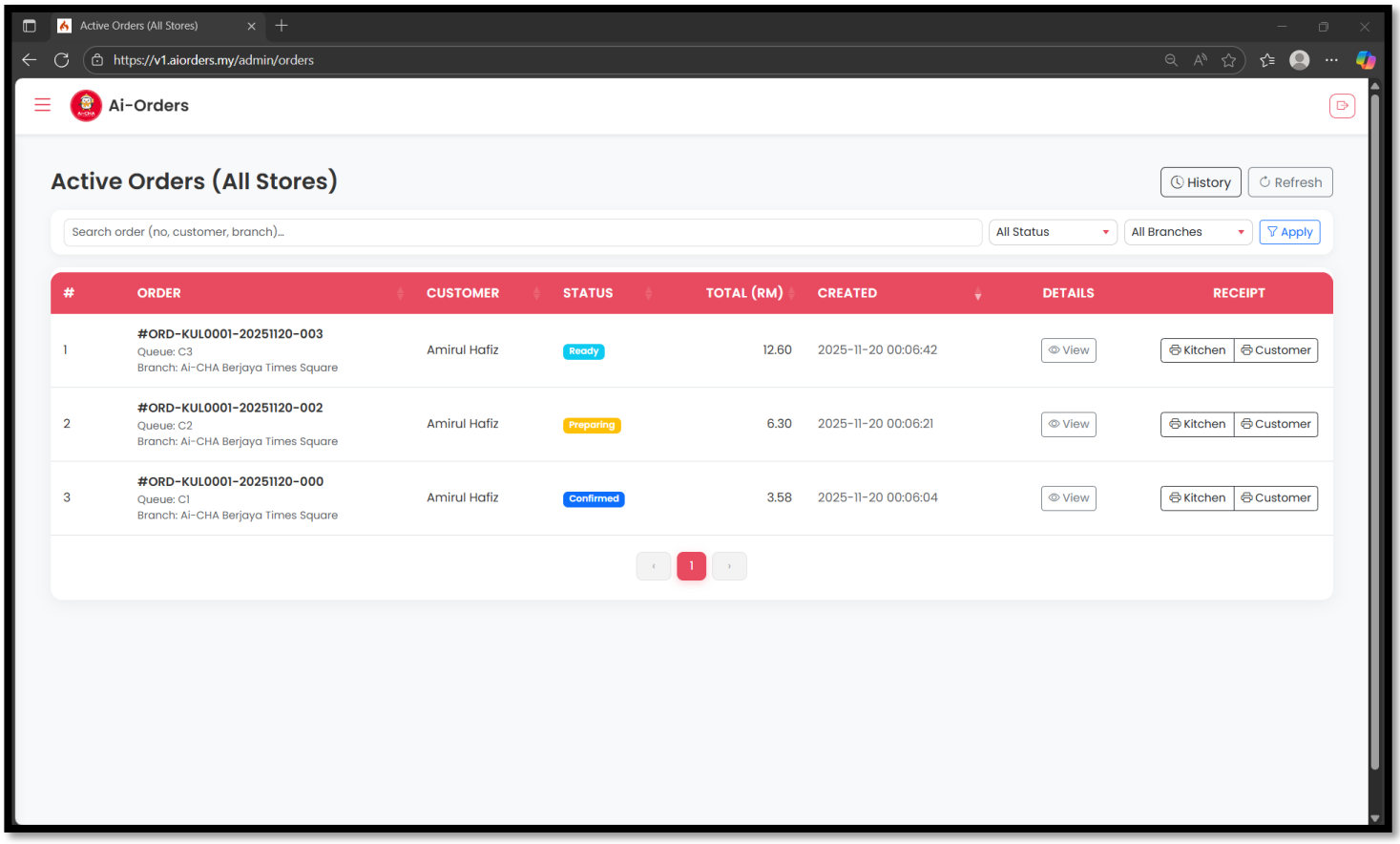


Figure 7.4. 42: Ai-Orders admin active orders list for all branches.

Figure 7.4.42 illustrates the *Active Orders (All Stores)* page, where administrators can monitor every ongoing order across all Ai-CHA branches in real time. Each row displays the order number (including branch prefix and queue number), customer name, current status (such as *Confirmed*, *Preparing* or *Ready*), total payment amount and order creation time. Filters at the top allow the admin to search by order number, customer or branch, as well as narrow the view by status or specific outlets. Action buttons in the *Details* and *Receipt* columns let staff open the full order summary, print kitchen or customer receipts and quickly jump to the kitchen board. This interface centralises live operational monitoring and helps the management team track order flow and service performance across multiple stores.

7.4.43. Order History (All Stores) Interface

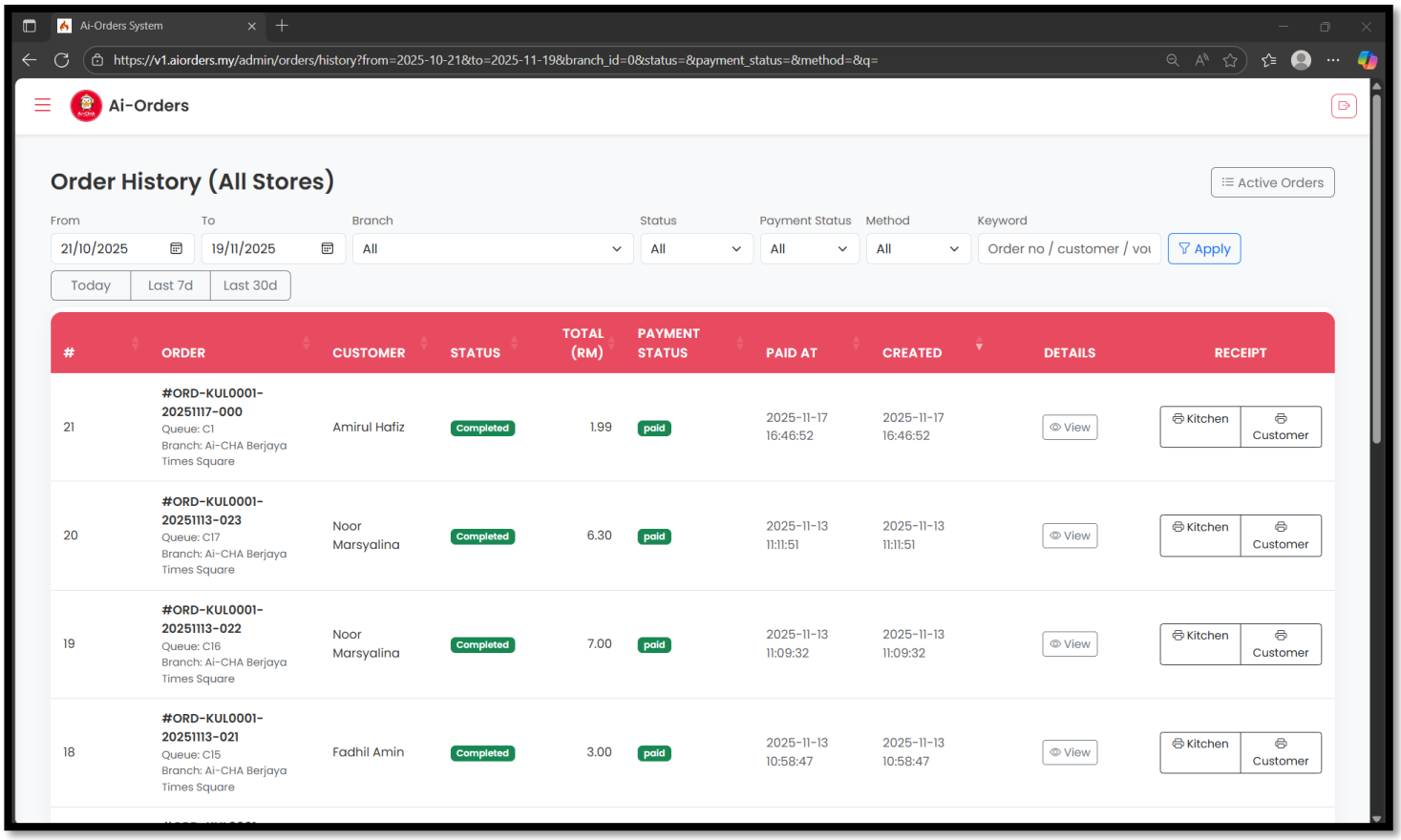


Figure 7.4. 43: Ai-Orders admin order history list for all branches.

Figure 7.4.43 illustrates the Order History (All Stores) page, which provides administrators with a consolidated log of every order recorded across all Ai-CHA branches. At the top of the interface, the admin can define a date range using the From and To fields or use shortcuts such as **Today**, **Last 7d** and **Last 30d**. Additional filters allow the list to be narrowed by branch, order status, payment status, payment method and a keyword search that supports order number, customer name or voucher code. The main table then lists each order with its running index, formatted order number (including branch and queue details), customer name, final status, total amount in Ringgit Malaysia, payment status, paid time and creation time. In the final columns, the **View** button opens the detailed order breakdown, while the **Kitchen** and **Customer** buttons enable re-printing of respective receipts when needed. This historical view helps management audit transactions, resolve customer enquiries and cross-check sales figures across multiple outlets in a structured and traceable manner.

7.4.44. Sales Report (All Branches) Interface

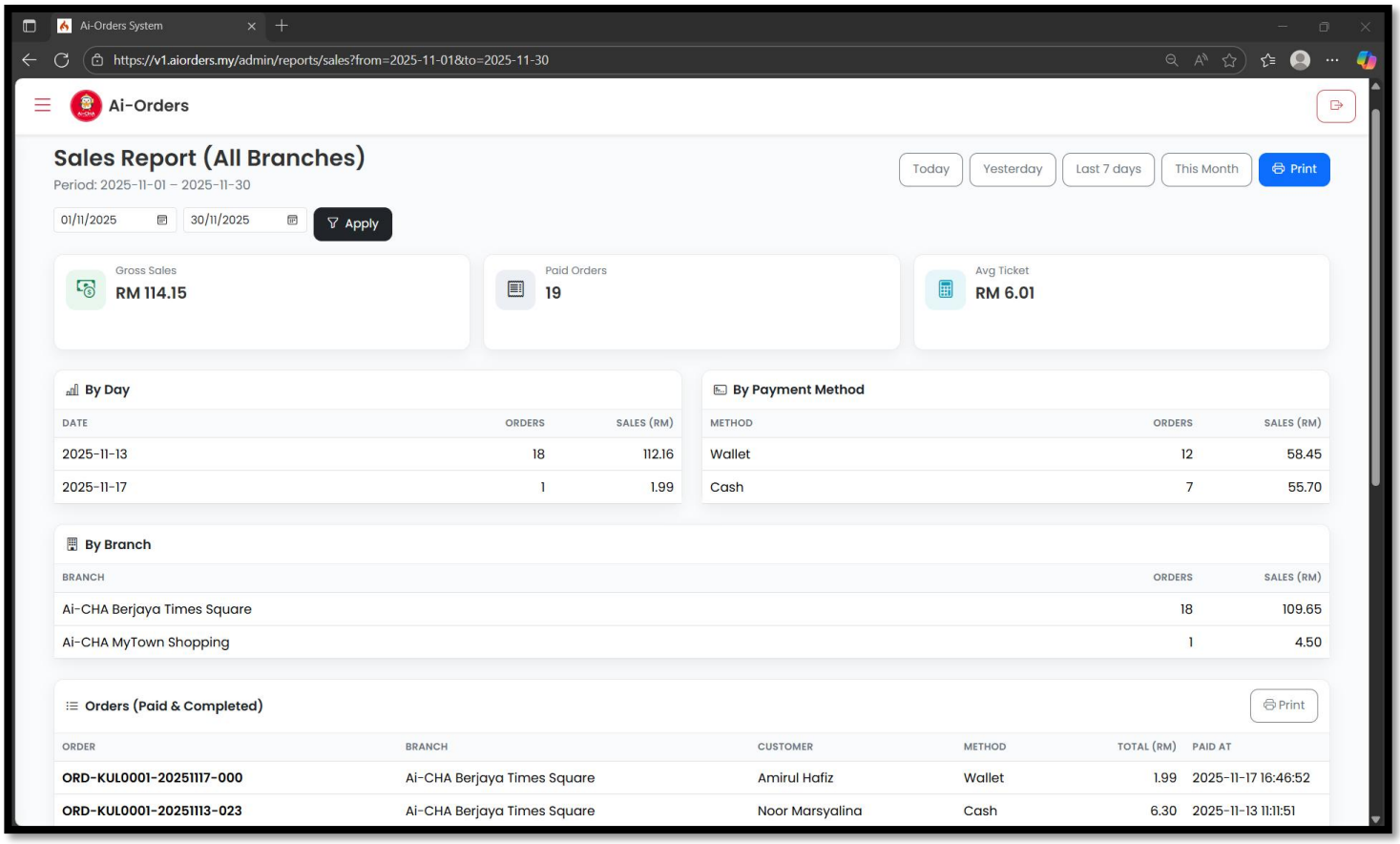


Figure 7.4. 44: Ai-Orders admin sales report summary for all branches.

Figure 7.4.44 shows the Sales Report (All Branches) page, which summarises overall sales performance for a selected period across every Ai-CHA outlet. At the top, the administrator can set the reporting range using the From and To date fields, or quickly choose shortcuts such as Today, Yesterday, Last 7 days and This Month, before clicking Apply to refresh the figures. Three summary cards display the key KPIs: total gross sales in Ringgit Malaysia, the number of paid orders and the average ticket value per order. Below, the report breaks down performance By Day, By Payment Method and By Branch, allowing management to identify peak dates, preferred payment channels and the contribution of each store to overall revenue. At the bottom, an Orders (Paid & Completed) table lists every qualifying order with its branch, customer, payment method, total amount and payment time, together with a Print button for exporting the report. This interface helps administrators conduct financial monitoring, compare branch performance and prepare summary figures for accounting or management review.

7.4.45. Branch Dashboard Interface

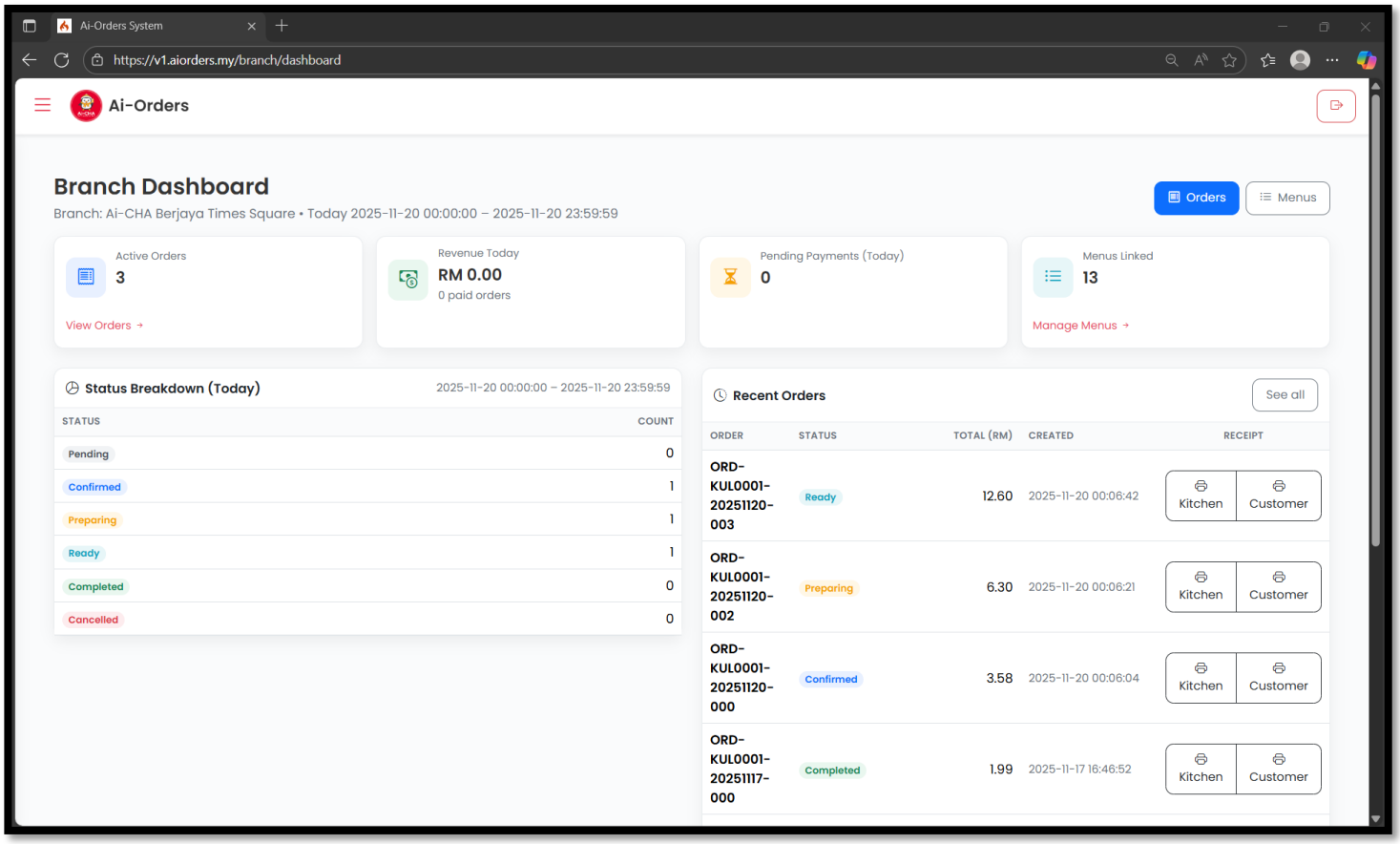


Figure 7.4. 45: Ai-Orders branch-level dashboard overview.

Figure 7.4.45 presents the Branch Dashboard page, which gives each outlet a real-time summary of its operational performance for the current day. At the top, the system displays the selected branch name and the active date range, followed by four key metric cards showing the number of active orders, today's revenue (based on paid orders), the count of pending payments and the total number of menus linked to the branch. Quick links such as View Orders and Manage Menus, together with the Orders and Menus toggle buttons on the right, allow the branch manager to jump directly into detailed management screens. The lower section is divided into two panels: Status Breakdown (Today) summarises how many orders are in each status (Pending, Confirmed, Preparing, Ready, Completed and Cancelled), while Recent Orders lists the latest transactions with their status, total amount, creation time and buttons to print kitchen or customer receipts. This dashboard helps branch managers monitor live activity, identify bottlenecks and ensure that all orders for the day are progressing smoothly.

7.4.46. Branch Staff Management Interface

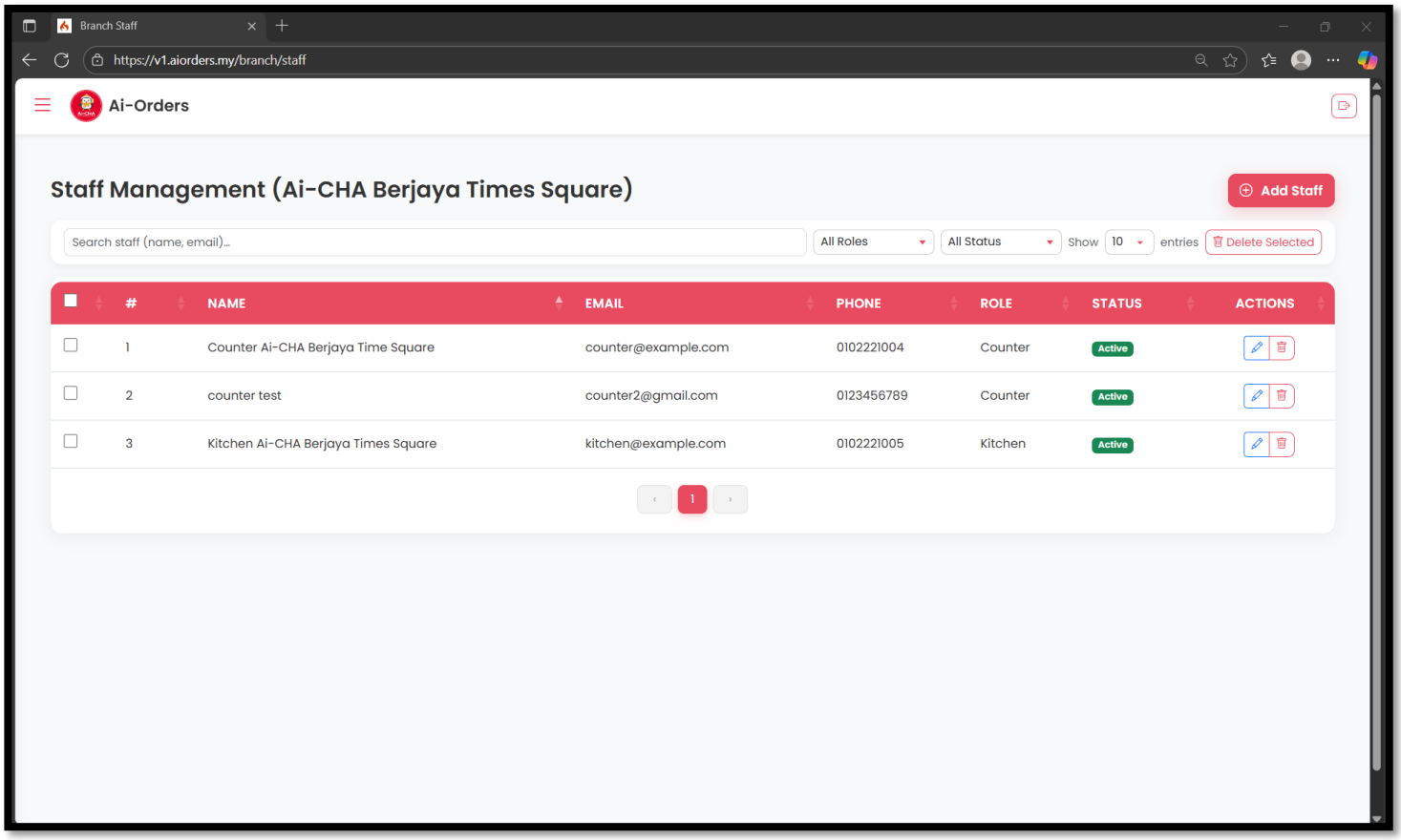


Figure 7.4. 46: Ai-Orders branch staff listing and maintenance screen.

Figure 7.4.46 shows the Staff Management page for a specific outlet, where the branch manager can manage counter and kitchen staff accounts for Ai-CHA Berjaya Times Square. A search bar at the top allows filtering by staff name or email, while dropdowns provide additional filtering by role (such as Counter or Kitchen) and status (Active or Inactive), as well as an option to control how many entries are displayed per page. The **Add Staff** button on the right opens a form to register new staff for the branch. The table lists each staff member with a running index, name, email, phone number, assigned role and current status label. Checkboxes in the first column allow multiple users to be selected and removed using the **Delete Selected** button, and the action icons in the **Actions** column enable quick editing or deletion of individual staff records. This interface ensures that each branch can independently maintain accurate staff profiles and access control for the POS and kitchen systems.

7.4.47. Add Staff (Counter/Kitchen) Interface

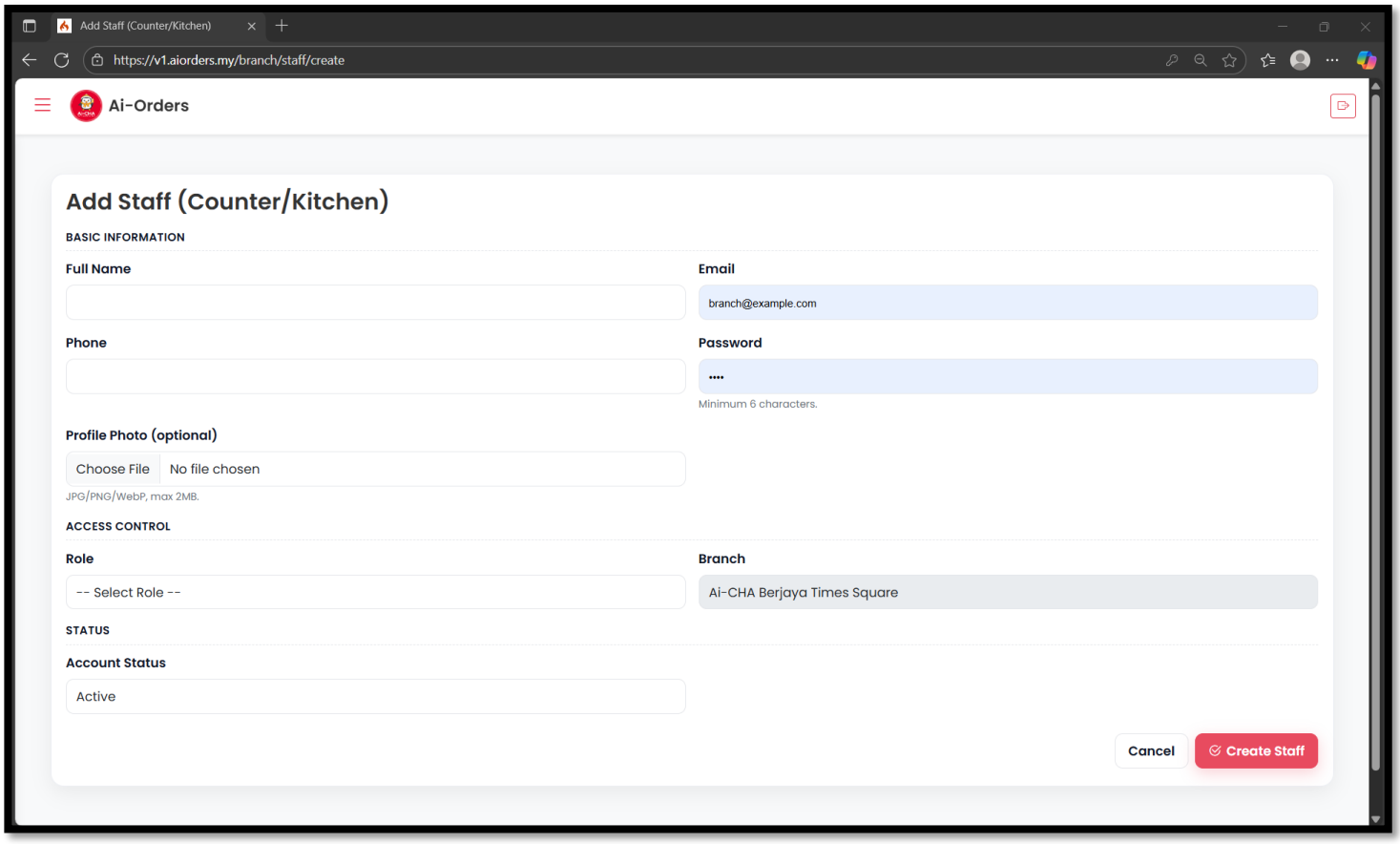


Figure 7.4. 47: Ai-Orders branch add staff form.

Figure 7.4.47 shows the Add Staff (Counter/Kitchen) page, where a branch manager can register new user accounts for outlet staff. The form collects basic information such as full name, phone number, email address and password, with validation to ensure a minimum password length. An optional profile photo upload field allows the manager to attach a staff portrait in JPG, PNG or WebP format, limited to 2MB for performance and storage control. Under the **Access Control** section, the manager selects the staff role (for example, Counter or Kitchen), while the Branch field indicates the outlet where the account will be assigned. The **Account Status** dropdown lets the manager activate or temporarily disable the account at creation time. At the bottom of the form, **Cancel** returns to the staff list without saving, whereas **Create Staff** saves the new record and grants the user access to the POS or kitchen system according to the selected role.

7.4.48. Edit Staff Interface

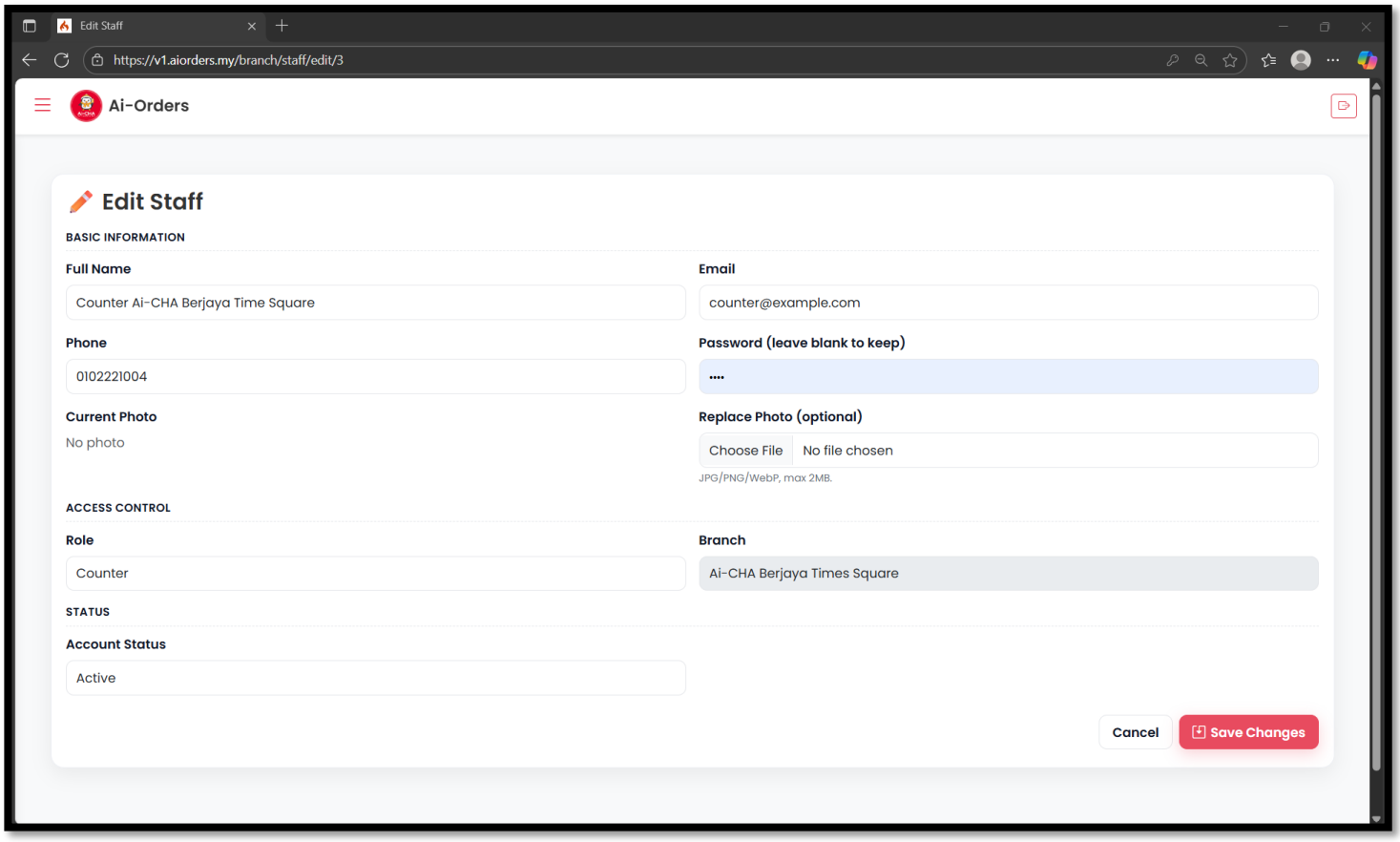


Figure 7.4. 48: Ai-Orders branch edit staff form.

Figure 7.4.48 displays the Edit Staff page, which is used by branch managers to update existing counter or kitchen staff accounts. The form is pre-filled with the staff member's current details, including full name, phone number, email address and assigned role, so that only the fields requiring changes need to be modified. For security, the Password (leave blank to keep) field allows the manager to set a new password only when necessary, while leaving it empty preserves the existing credentials. The Current Photo section shows whether a profile image has been uploaded, and the Replace Photo (optional) field supports uploading a new JPG, PNG or WebP image if the staff portrait needs to be updated. The branch field is fixed to indicate the outlet that owns the account, and the Account Status dropdown enables the manager to switch the user between Active and Inactive without deleting the record. At the bottom of the form, Cancel discards any modifications, whereas Save Changes applies the updates to the staff profile, ensuring that user information and access permissions remain accurate over time.

7.4.49. Branch Menus Interface

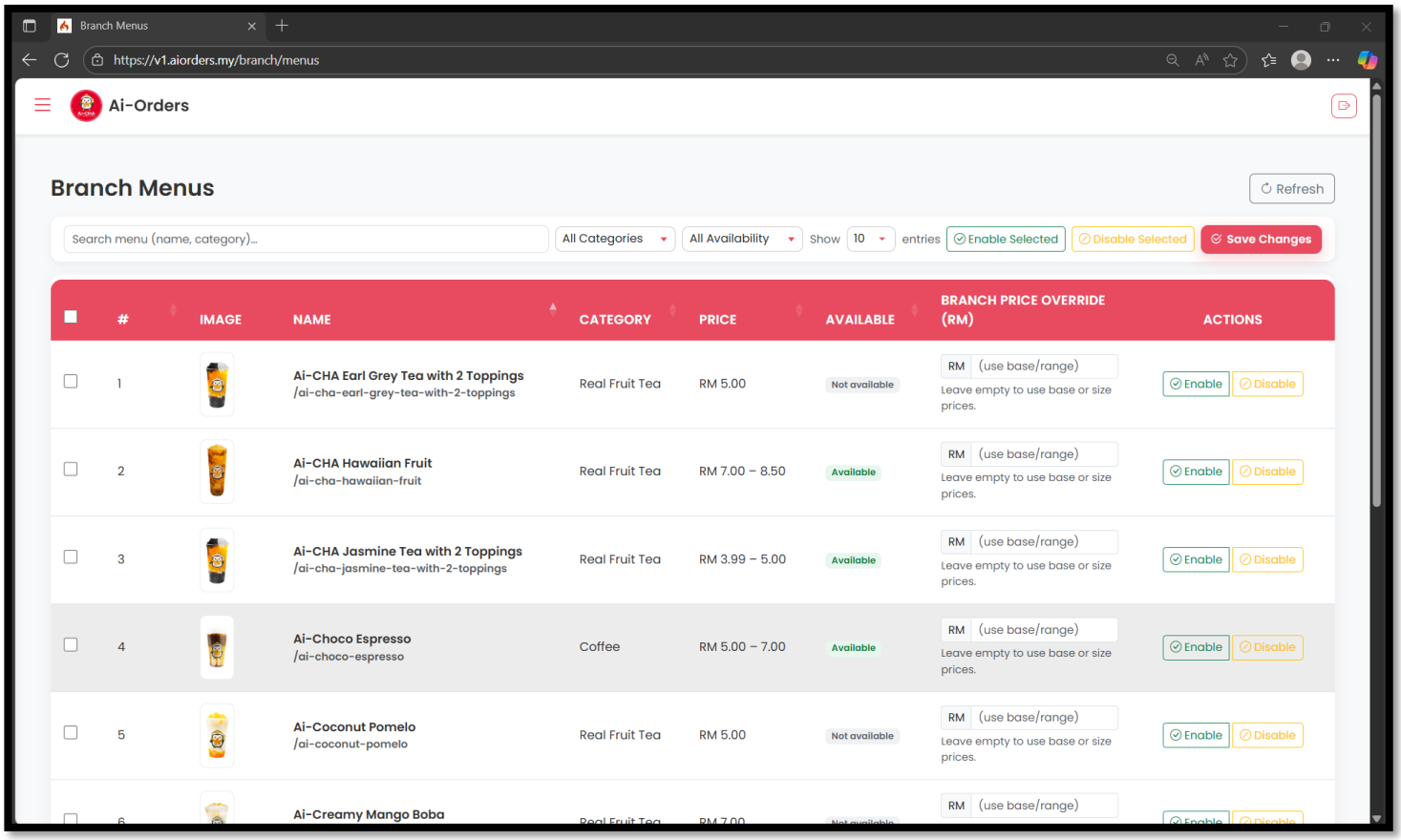


Figure 7.4. 49: Ai-Orders branch-level menu availability and pricing screen.

Figure 7.4.49 illustrates the Branch Menus page, where each outlet manages which drinks are offered and how they are priced locally. A search bar and dropdown filters at the top allow the branch manager to quickly narrow the list by menu name, category and availability, as well as control how many entries are shown. The table presents every menu item with its image, name and slug, base category, standard price range and current availability status (Available or Not available) for that particular branch. In the Branch Price Override (RM) column, the manager can optionally key in branch-specific prices, while leaving the field empty will use the global base or size-based prices defined at system level. Checkboxes on the left, together with the Enable Selected, Disable Selected and Save Changes buttons at the top-right, support bulk updates to menu availability. Per-row Enable and Disable buttons also provide quick toggling for individual items. This interface gives branches flexibility to tailor their active menus and prices while still complying with the centralised product catalogue.

7.4.50. Active Orders (Branch) Interface

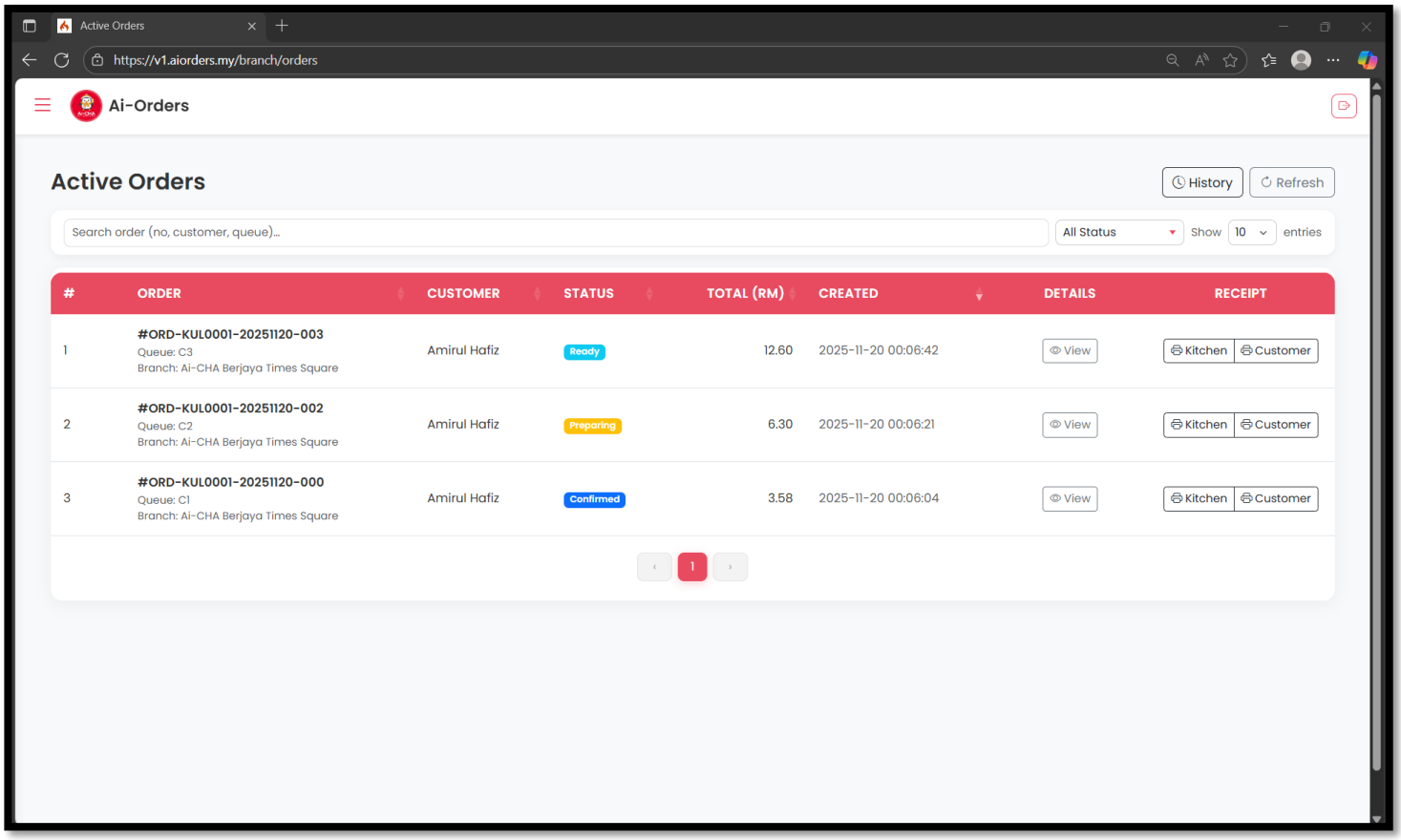


Figure 7.4. 50: Ai-Orders branch active orders list.

Figure 7.4.50 presents the Active Orders page at branch level, where outlet staff can monitor all ongoing orders for their own store. At the top, a search bar allows filtering by order number, customer name or queue number, while a status dropdown narrows the list to specific stages such as Confirmed, Preparing or Ready. The History button provides a shortcut back to the branch's order history, and Refresh reloads the latest data so that staff always see an up-to-date queue. The table lists each active order with a running index, formatted order number (including queue code), customer name, current status tag, total amount in Ringgit Malaysia and creation timestamp. In the Details column, the View button opens the full order breakdown, and the Kitchen and Customer buttons under Receipt allow staff to reprint production and customer receipts when required. Pagination controls at the bottom help navigate through long queues. This screen provides counter staff with a clear, real-time view of all in-progress orders for their branch, supporting smooth coordination between the counter and kitchen.

7.4.51. Order History (Branch) Interface

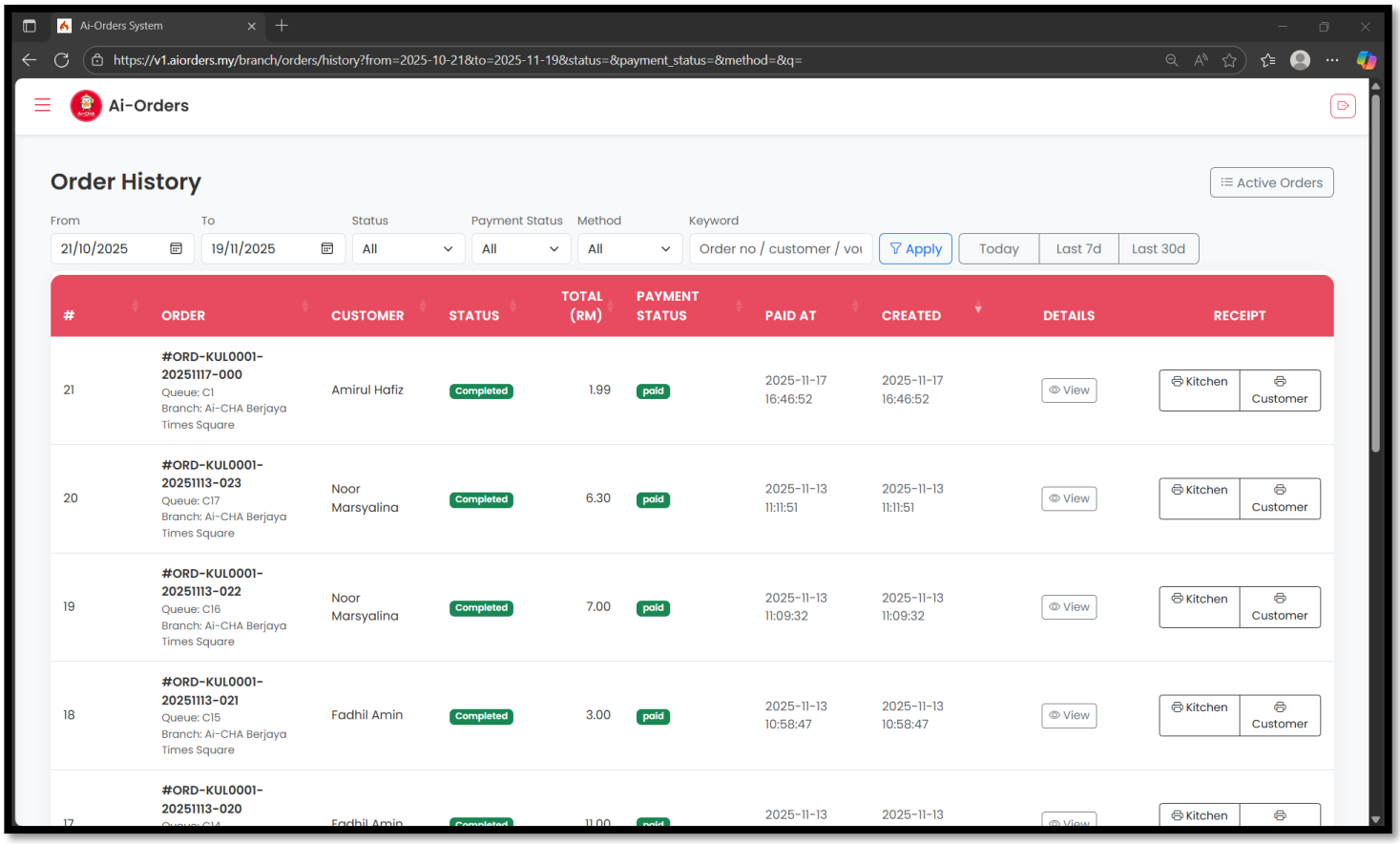


Figure 7.4. 51: Ai-Orders branch order history list.

Figure 7.4.51 shows the Order History page for a single branch, where outlet staff can review all completed and cancelled orders handled by their store within a selected period. At the top, the staff can filter records using the From and To date pickers, then refine further by order status, payment status, payment method and a keyword field that accepts order numbers, customer names or voucher codes. Quick shortcut buttons such as Today, Last 7d and Last 30d speed up date selection, while the Apply button refreshes the list and the Active Orders button takes staff back to the live in-progress orders screen. The table below summarises each order with a running index, formatted order number (including queue details and branch name), customer, final status, total amount in Ringgit Malaysia, payment status, time paid and creation timestamp. The View button under Details opens a full breakdown of items and discounts applied, and the Kitchen and Customer buttons in the Receipt column allow reprinting of both internal and customer-facing receipts. This branch-level history view supports daily reconciliation, after-sales enquiries and quick verification of past transactions without needing access to the central admin module.

7.4.52. Sales Report (Branch) Interface

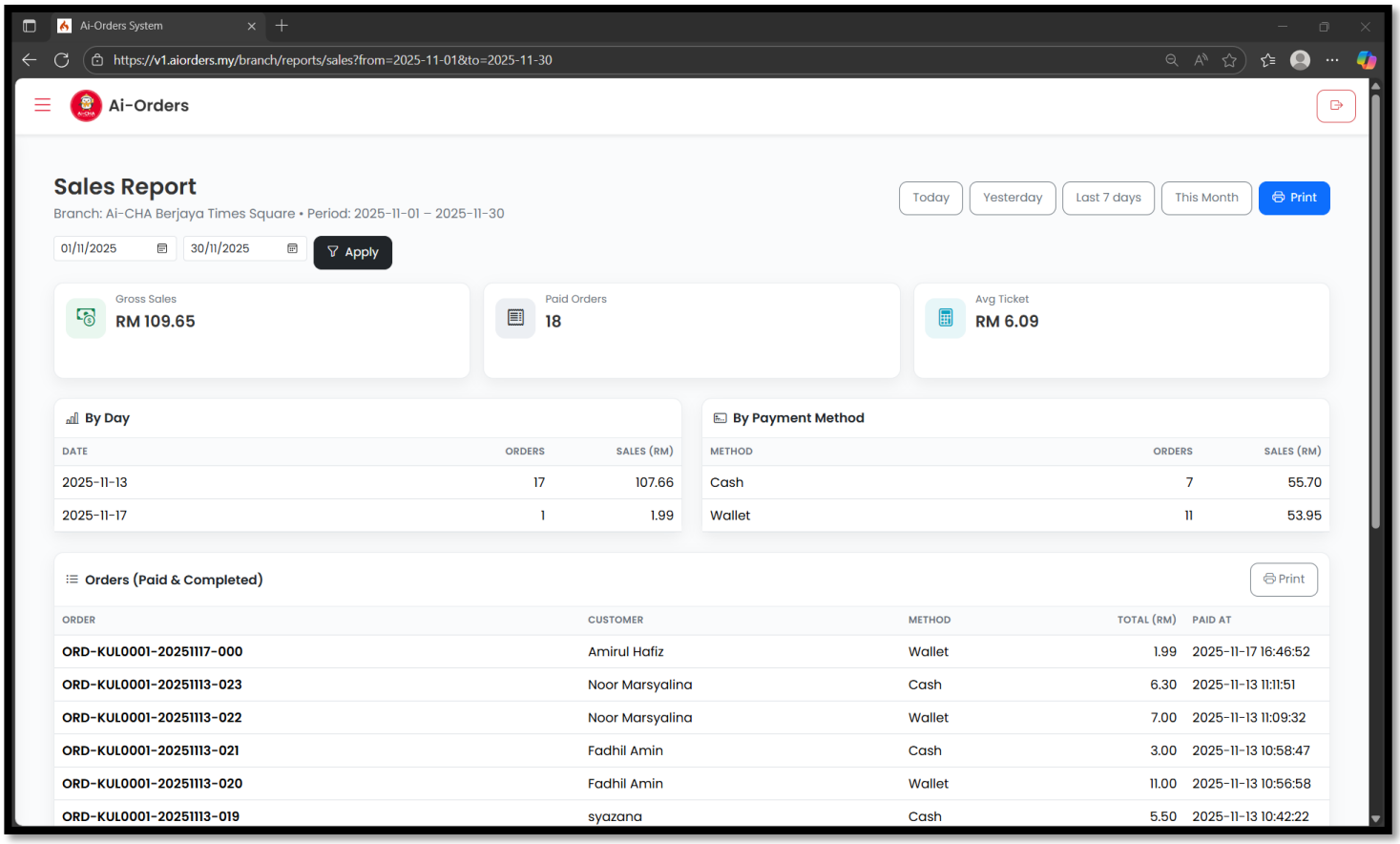


Figure 7.4. 52: Ai-Orders branch sales report summary.

Figure 7.4.52 shows the Sales Report page for an individual branch, which summarises the outlet's revenue performance within a selected date range. At the top of the screen, the system displays the branch name and reporting period, followed by From and To date pickers and an Apply button to refresh the report. Quick filters such as Today, Yesterday, Last 7 days and This Month provide shortcuts for common reporting periods, while the Print button on the right generates a printable summary for record keeping. Three KPI cards highlight the total gross sales in Ringgit Malaysia, the number of paid orders and the average ticket value for the chosen range.

Below the summary, the report is further broken down By Day and By Payment Method, allowing the branch manager to see which dates are the busiest and how many orders are paid via cash or wallet. The Orders (Paid & Completed) section lists all qualifying orders with their order number, customer name, payment method, total amount and payment time, alongside a Print button for exporting the detailed list. This branch-level sales report helps outlet managers track their daily and monthly performance, reconcile sales with payment channels and prepare basic financial summaries without accessing the central admin module.

7.4.53. Counter Dashboard Interface

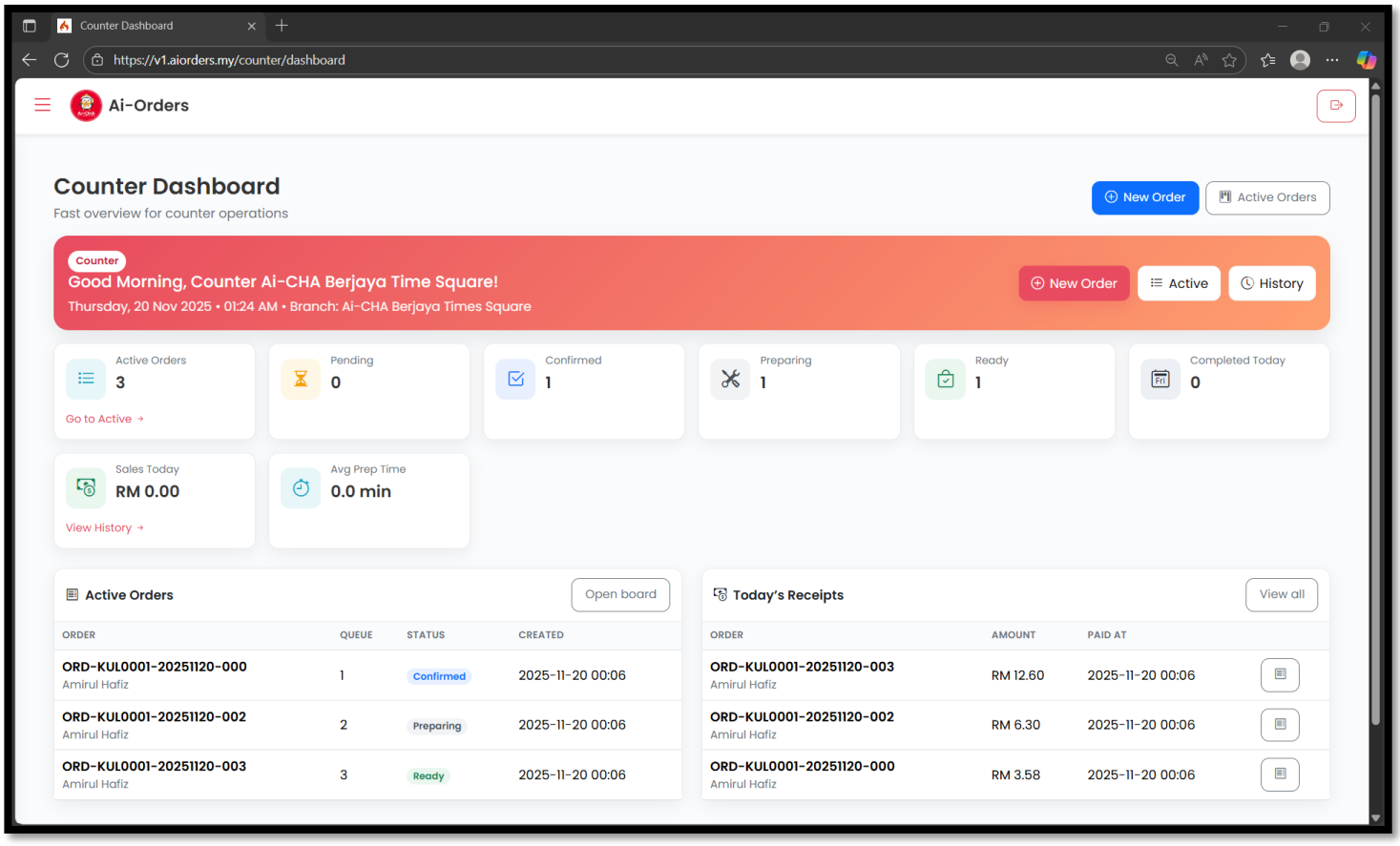


Figure 7.4. 53: Ai-Orders counter dashboard overview.

Figure 7.4.53 shows the Counter Dashboard, which provides front-line staff with a fast overview of counter operations for the current day. A prominent greeting banner at the top displays the logged-in counter name, current date and time, and branch, together with quick-action buttons for New Order, Active and History. Below the banner, a series of summary cards show key live metrics, including the number of active orders, counts for each status (Pending, Confirmed, Preparing, Ready, Completed Today), total Sales Today, and the Average Prep Time in minutes. The lower section is split into two panels: Active Orders lists all in-progress orders with queue number, status and creation time, along with an Open board button that launches the kitchen board view; Today's Receipts summarises all paid orders for the day with amount and payment time, plus a quick print icon for each receipt. This dashboard acts as the main landing page for counter staff, allowing them to monitor queues, start new transactions and reprint receipts from a single interface.

7.4.54. New Counter Order Interface

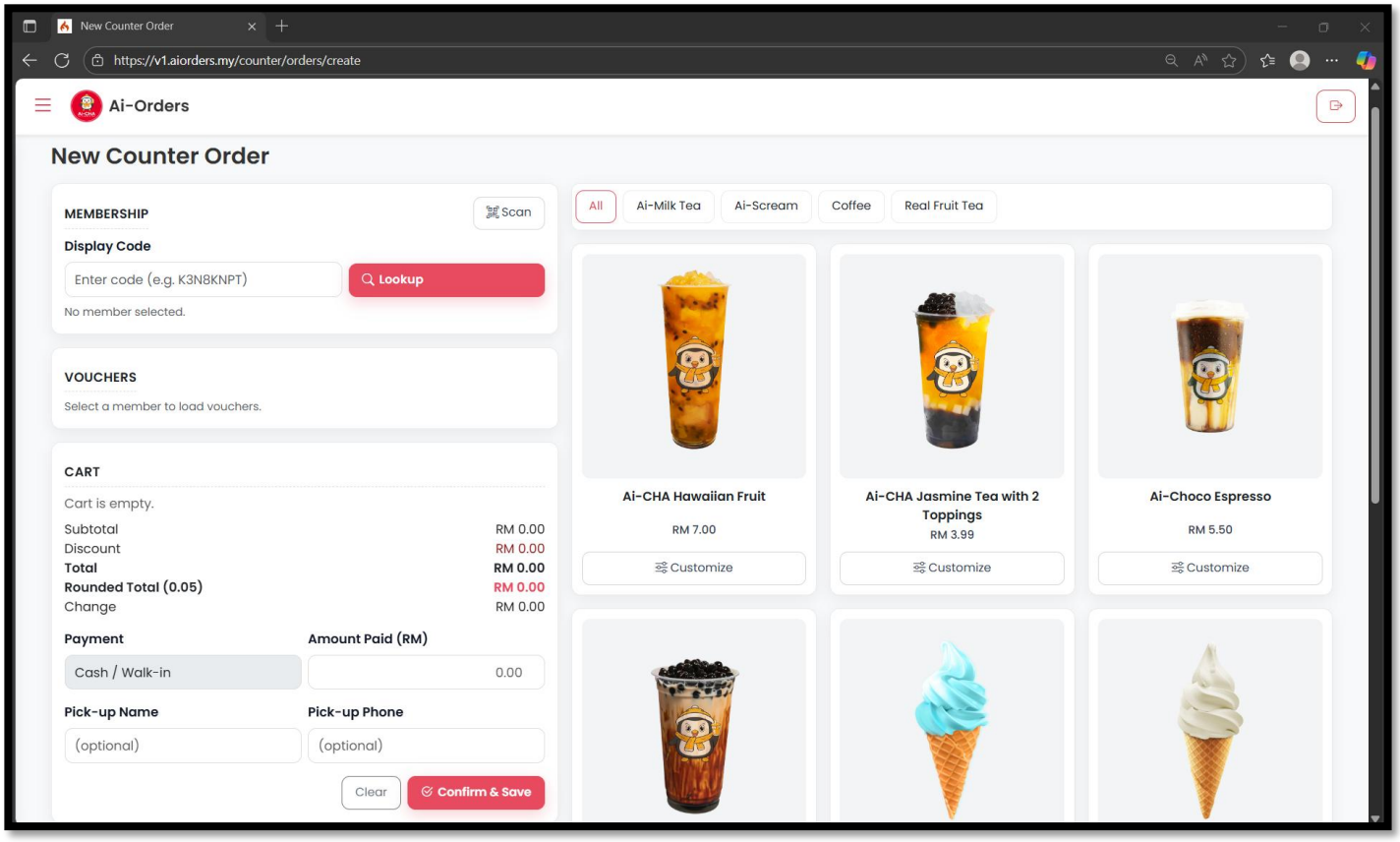


Figure 7.4. 54: Ai-Orders counter new walk-in order screen.

Figure 7.4.54 depicts the New Counter Order page, which is used by counter staff to create orders for walk-in customers. On the left panel, the Membership section allows the staff to key in or scan a member display code and perform a Lookup; once a valid member is found, their profile, available vouchers and loyalty benefits are loaded into the order. The Vouchers section beneath it lists all applicable vouchers for the selected member so that discounts can be applied during checkout. The Cart block shows a live breakdown of the order, including subtotal, discount, total, rounding adjustment to the nearest RM0.05 and calculated change. Staff can also choose the payment method (such as Cash / Walk-in), enter the amount paid and optionally capture the pick-up name and phone number before confirming the sale.

The right-hand side of the interface displays the branch's menu catalogue in a card layout. Category chips at the top (for example, All, Ai-Milk Tea, Ai-Scream, Coffee, Real Fruit Tea) allow the counter to filter products quickly. Each menu item card shows the product image, name and base price, together with a Customize button that opens a configuration screen for sizes, toppings and sugar levels. As staff add items, the cart on the left updates in real time, and the Confirm & Save button finalises the transaction and generates the necessary receipts. This design closely mirrors typical POS workflows, enabling fast, accurate order entry while still supporting Ai-Orders' loyalty and voucher features at the counter.

7.4.55. Counter Item Customization Interface

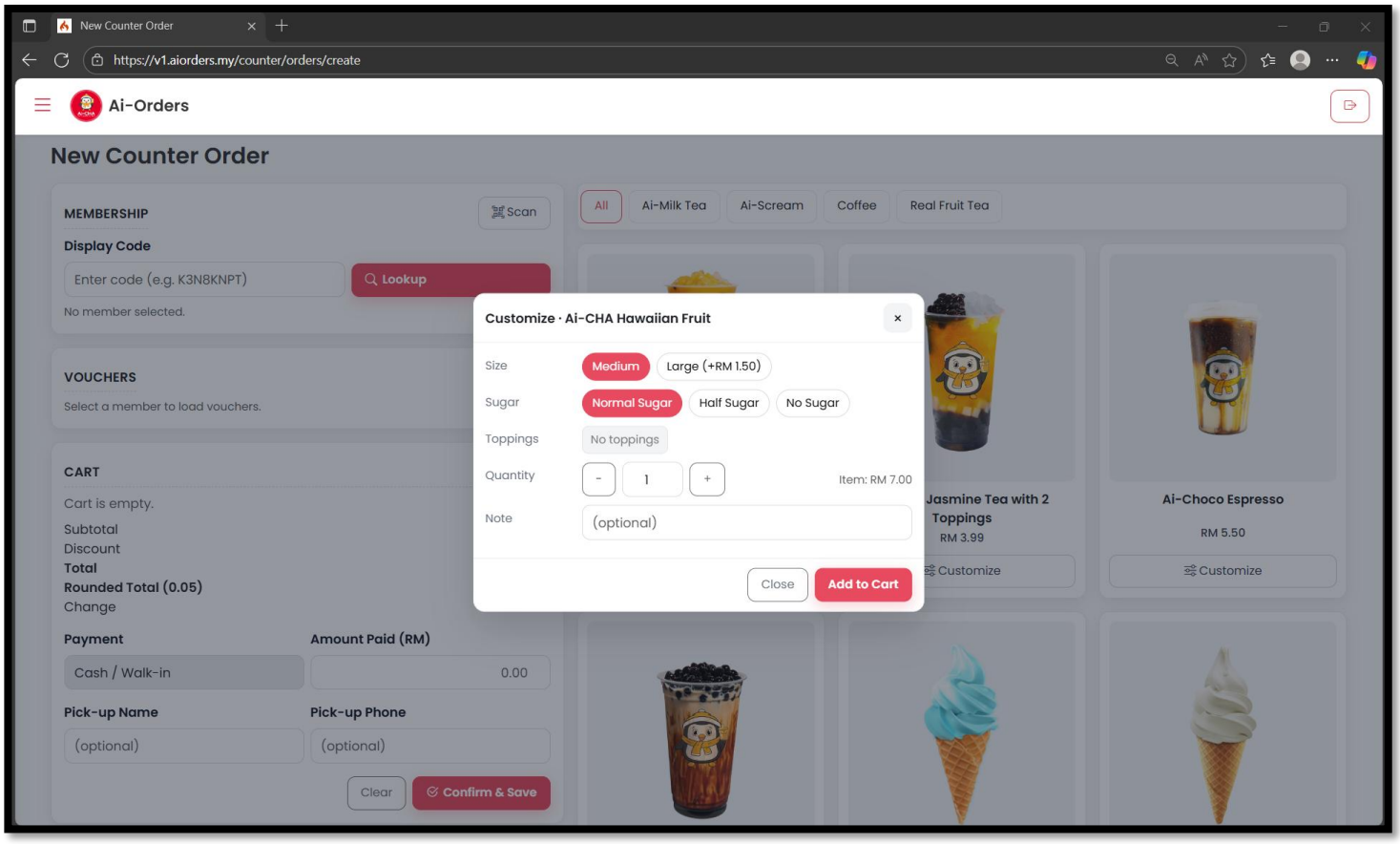


Figure 7.4. 55: Ai-Orders counter drink customisation popup.

Figure 7.4.55 illustrates the item customisation popup that appears when counter staff select Customize for a drink on the New Counter Order page. The modal clearly shows the selected menu item at the top and presents all configurable options in a step-by-step layout. Staff can choose the Size (for example, Medium or Large with an additional charge), adjust Sugar level (Normal, Half Sugar, No Sugar) and select Toppings from a list, which may add extra cost to the item. A quantity selector allows increasing or decreasing the number of cups, while the Note field captures special requests such as “less ice” or “separate toppings.” The bottom-right corner displays the current item price based on the chosen options and provides Close and Add to Cart buttons. This interface helps counter staff accurately capture personalised drink preferences while keeping the configuration process fast and easy to understand.

7.4.56. Counter Active Orders Interface

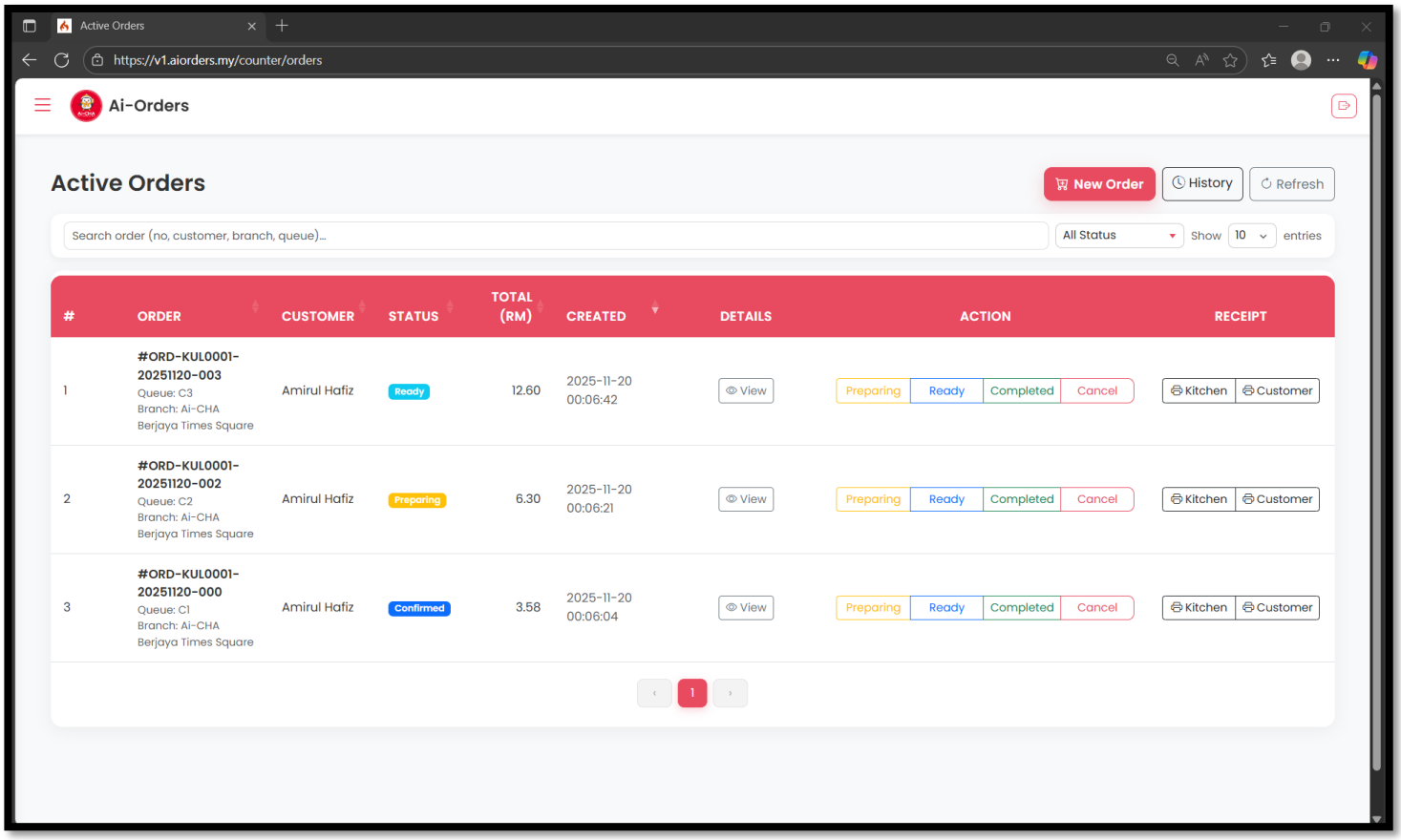


Figure 7.4. 56: Ai-Orders counter active orders list with status actions.

Figure 7.4.56 illustrates the Active Orders page in the counter module, where front-line staff can track and control all in-progress orders for their branch. A search bar at the top allows filtering by order number, customer, branch or queue, while a status dropdown limits the list to specific stages (for example, Confirmed, Preparing or Ready). Quick-access buttons in the header let staff start a New Order, open History for past transactions or Refresh the list to pull the latest updates from the system.

The main table shows each order together with its queue number, customer name, current status badge, total amount in Ringgit Malaysia and creation time. The Details column provides a View button that opens the full order summary, including items and customisations. In the Action column, dedicated buttons allow staff to progress the order through the workflow — setting it to Preparing, marking it Ready for pickup, completing the order or cancelling it when necessary. Finally, the Receipt column offers quick printing of both kitchen and customer receipts. This interface gives counter staff direct control over the real-time order lifecycle while keeping the status of every active order visible at a glance.

7.4.57. Counter Order History Interface

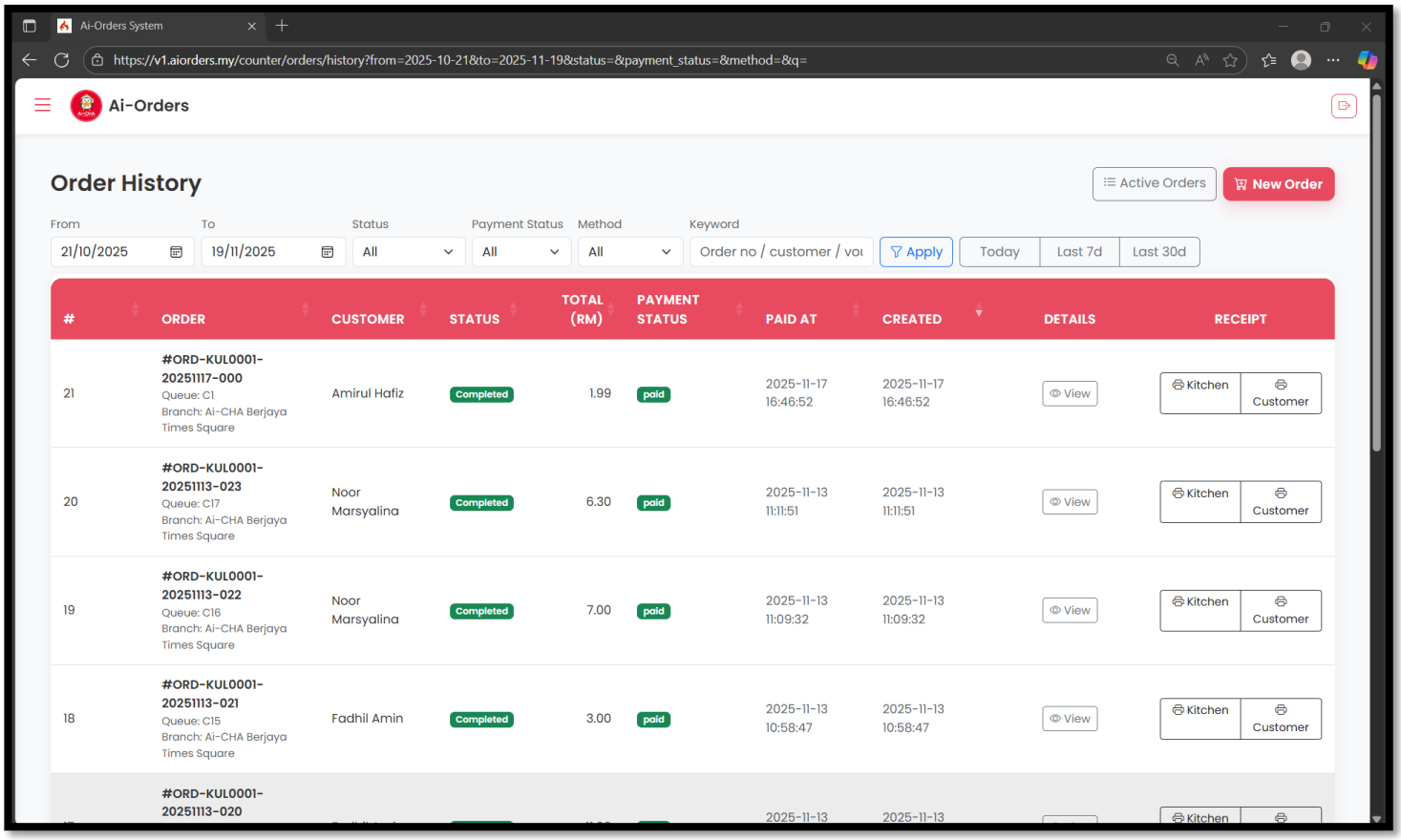


Figure 7.4. 57: Ai-Orders counter order history list.

Figure 7.4.57 displays the Order History page within the counter module, which allows counter staff to review all past transactions they have handled for the current branch. At the top, the From and To date pickers define the reporting range, while dropdown filters for Status, Payment Status and Method help narrow the results to specific scenarios such as completed and paid cash orders. A keyword field supports searching by order number, customer name or voucher code, and shortcut buttons (Today, Last 7d, Last 30d) make it easy to generate common daily or weekly views before pressing Apply. On the right, the Active Orders button lets staff quickly switch back to live orders, while New Order opens the POS screen to start another transaction.

The table lists each historical order with a running index, order number (including queue information and branch name), customer name, final status, total amount in Ringgit Malaysia, payment status, paid timestamp and original creation time. Under the Details column, the View button opens a full breakdown of items, discounts and payment details, and the Kitchen and Customer buttons in the Receipt column allow re-printing of both internal production and customer receipts when needed. This screen supports day-end reconciliation, troubleshooting customer enquiries and verifying past payments directly from the counter interface without requiring access to the admin module.

7.4.58. Kitchen Dashboard Interface

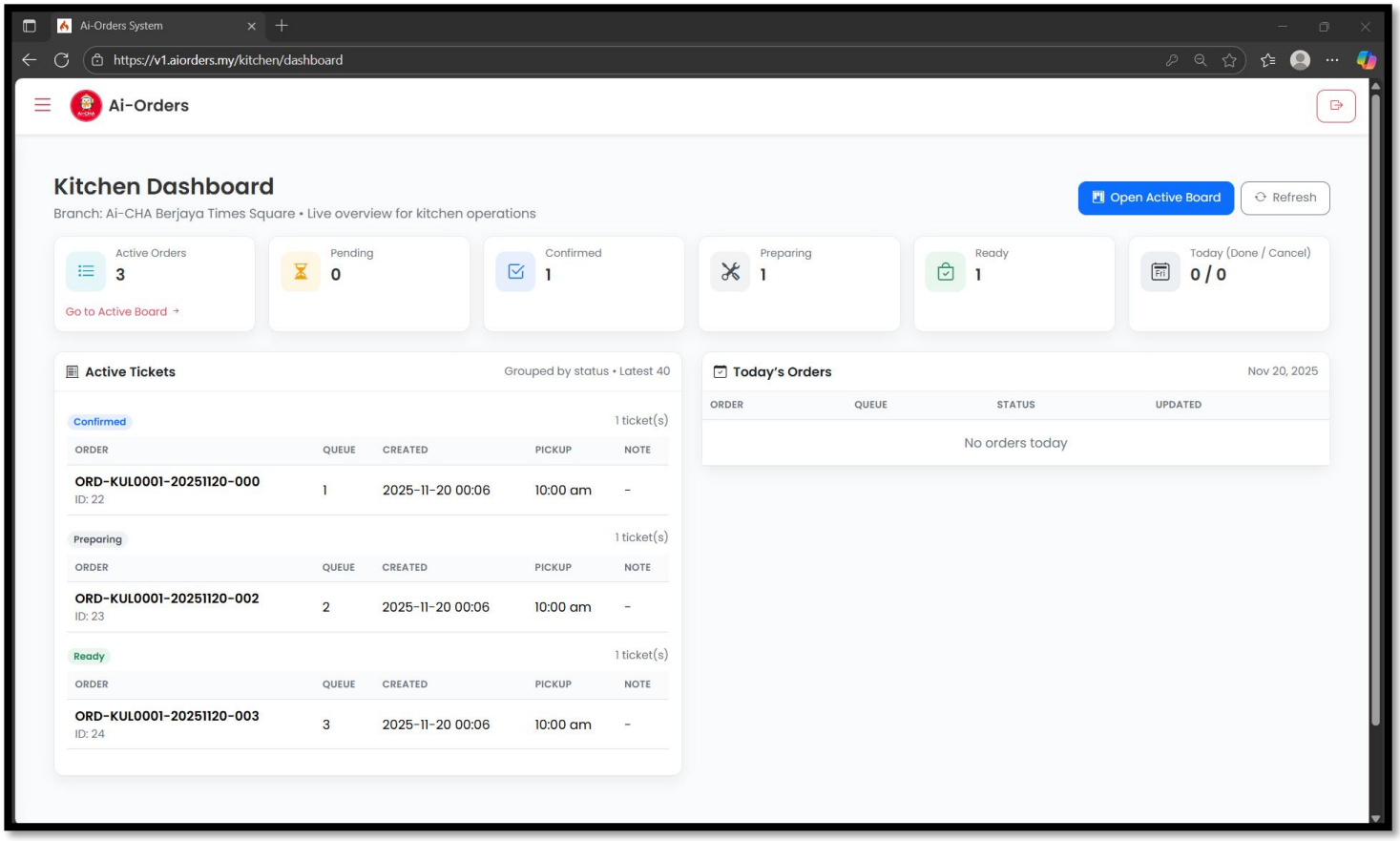


Figure 7.4. 58: Ai-Orders kitchen dashboard overview for active tickets.

Figure 7.4.58 presents the Kitchen Dashboard page, which provides a live overview of kitchen operations for a specific Ai-CHA branch. At the top, the system shows the branch name and indicates that this screen is focused on real-time kitchen activity. Summary cards display the number of active orders and how many are currently Pending, Confirmed, Preparing and Ready, along with a counter for orders completed or cancelled today. On the right, the Open Active Board button launches the full-screen kitchen board used during busy service, while Refresh reloads the latest ticket information.

The lower section is divided into Active Tickets and Today's Orders. The Active Tickets panel lists up to the latest forty tickets grouped by status (Confirmed, Preparing, Ready), showing each order number, queue position, created timestamp, pickup time and any special note from the counter. This helps kitchen staff quickly see what needs to be prepared next and which drinks are already ready for pickup. The Today's Orders panel summarises all orders handled by the kitchen for the current date, including order number, queue, status and last updated time, with an empty-state message when there are no records. Together, these components give the kitchen team a focused, real-time control centre to manage workload and maintain consistent preparation times.

7.4.59. Kitchen Active Orders Board Interface

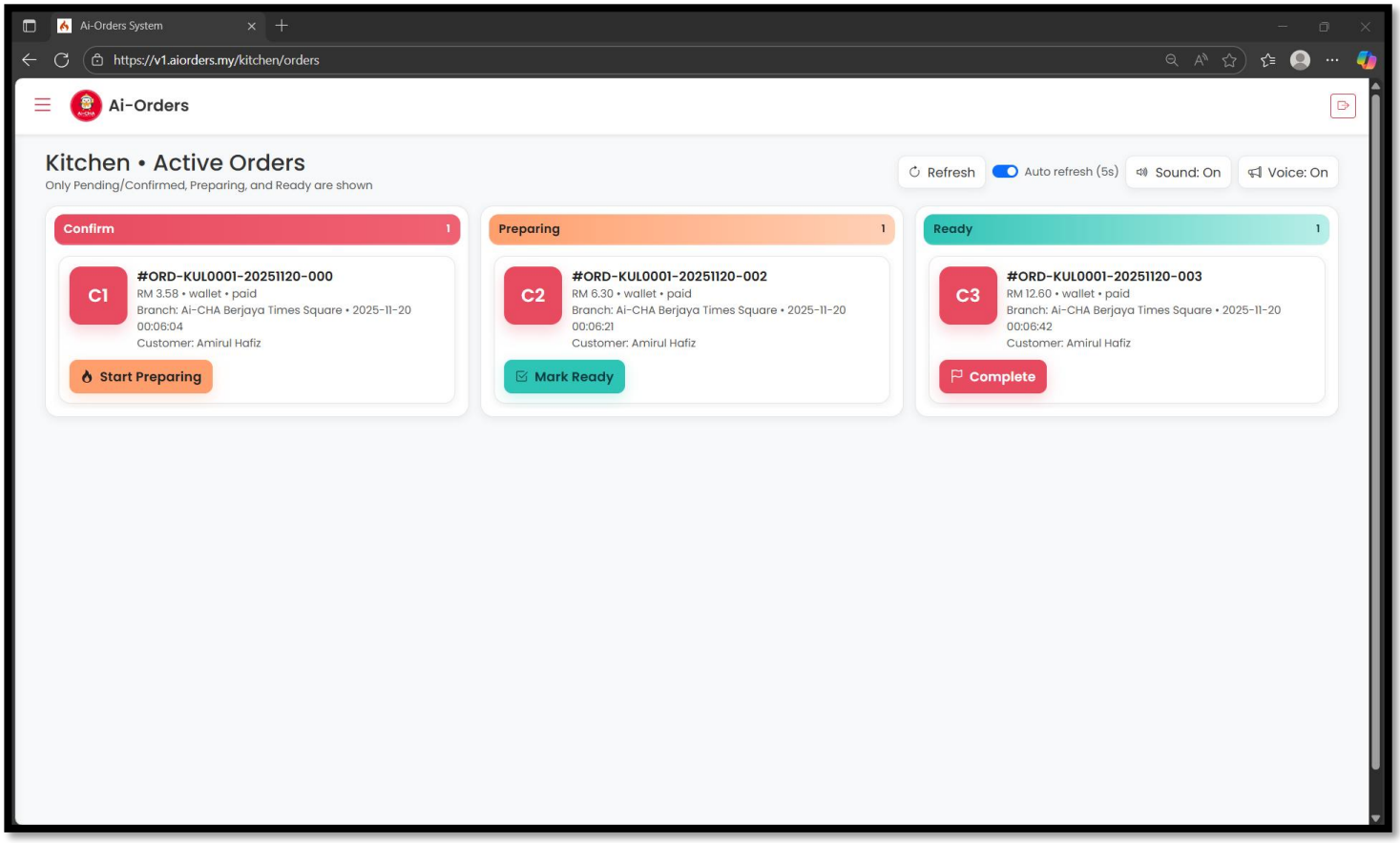


Figure 7.4. 59: Ai-Orders kitchen active orders kanban board.

Figure 7.4.59 shows the Kitchen Active Orders page, a kanban-style board where kitchen staff handle all in-progress drinks for the branch. Orders are grouped by status into three colour-coded columns: Confirm, Preparing and Ready, with a badge at the top of each column showing how many tickets it contains. Each card displays the queue code (for example, C1, C2, C3), full order number, total amount, payment method, branch, timestamp and customer name so that the barista can quickly identify the correct ticket. Action buttons at the bottom of each card allow the staff to move the ticket through the workflow — Start Preparing moves an order from Confirm to Preparing, Mark Ready moves it into the Ready column, and Complete marks it as finished and removes it from the board once the drink has been collected. At the top-right, controls for Refresh, Auto refresh (5s), Sound and Voice help ensure the display stays in sync with new orders and can play audio alerts when fresh tickets arrive. This dedicated kitchen board minimises confusion, supports high-throughput service and keeps the production queue highly visible to the entire kitchen team.

7.4.60. Customer Login Interface

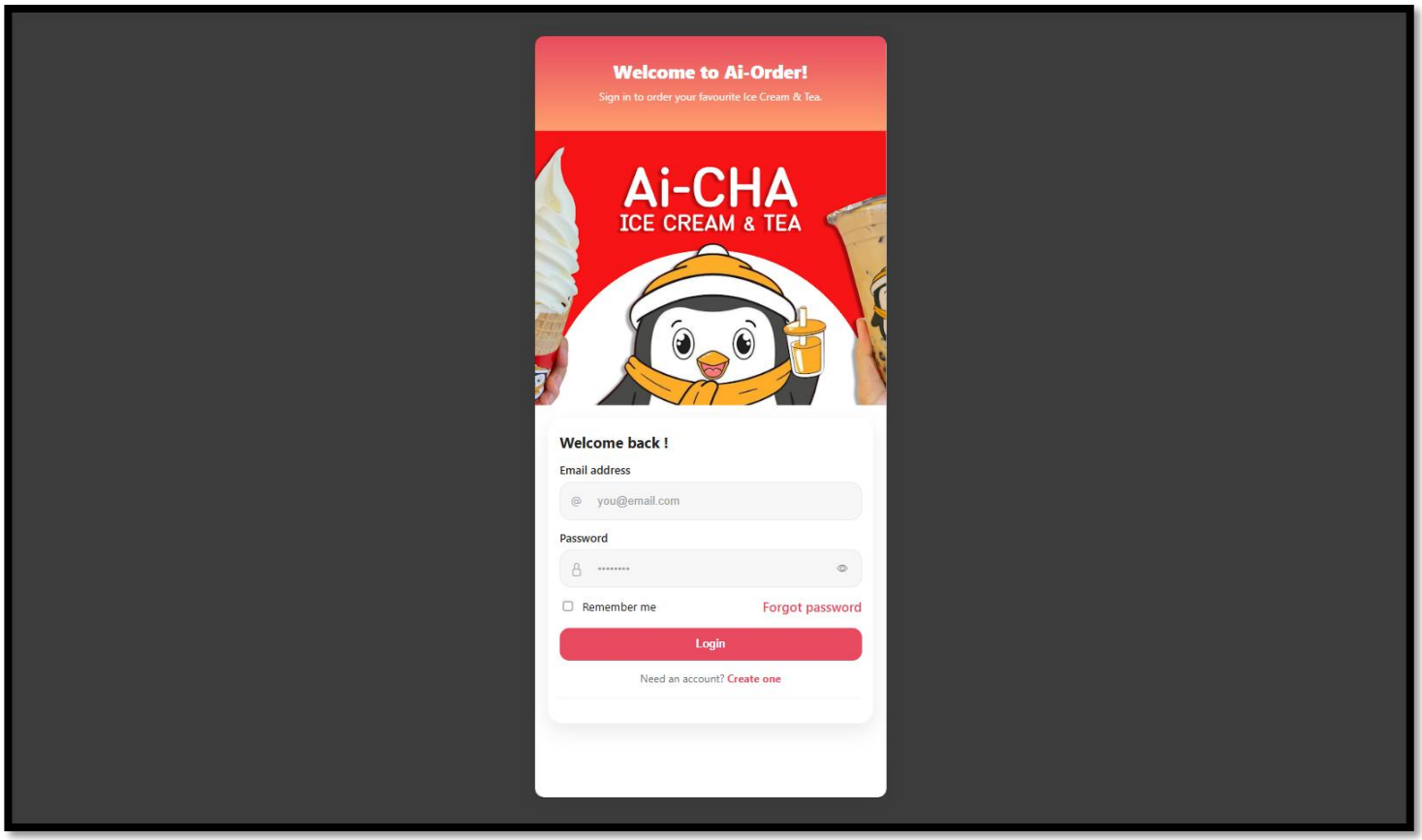


Figure 7.4. 60: Ai-Orders customer web login page.

Figure 7.4.60 shows the customer login page for the Ai-Orders web application, which is the main entry point for members who want to place online orders. The centre of the screen features a tall card with a branded hero banner that highlights the Ai-CHA mascot and product imagery, reinforcing the brand identity before users sign in. Below the banner, the form collects the customer's email address and password, with inline icons to indicate each field, a Remember me checkbox for persistent sessions and a Forgot password link for account recovery. A prominent Login button submits the credentials, while a secondary link at the bottom ("Create one") directs new users to the registration page. This simple and focused layout ensures that customers can quickly authenticate on both desktop and mobile devices before accessing membership benefits, vouchers and the ordering interface.

7.4.61. Customer Registration Interface

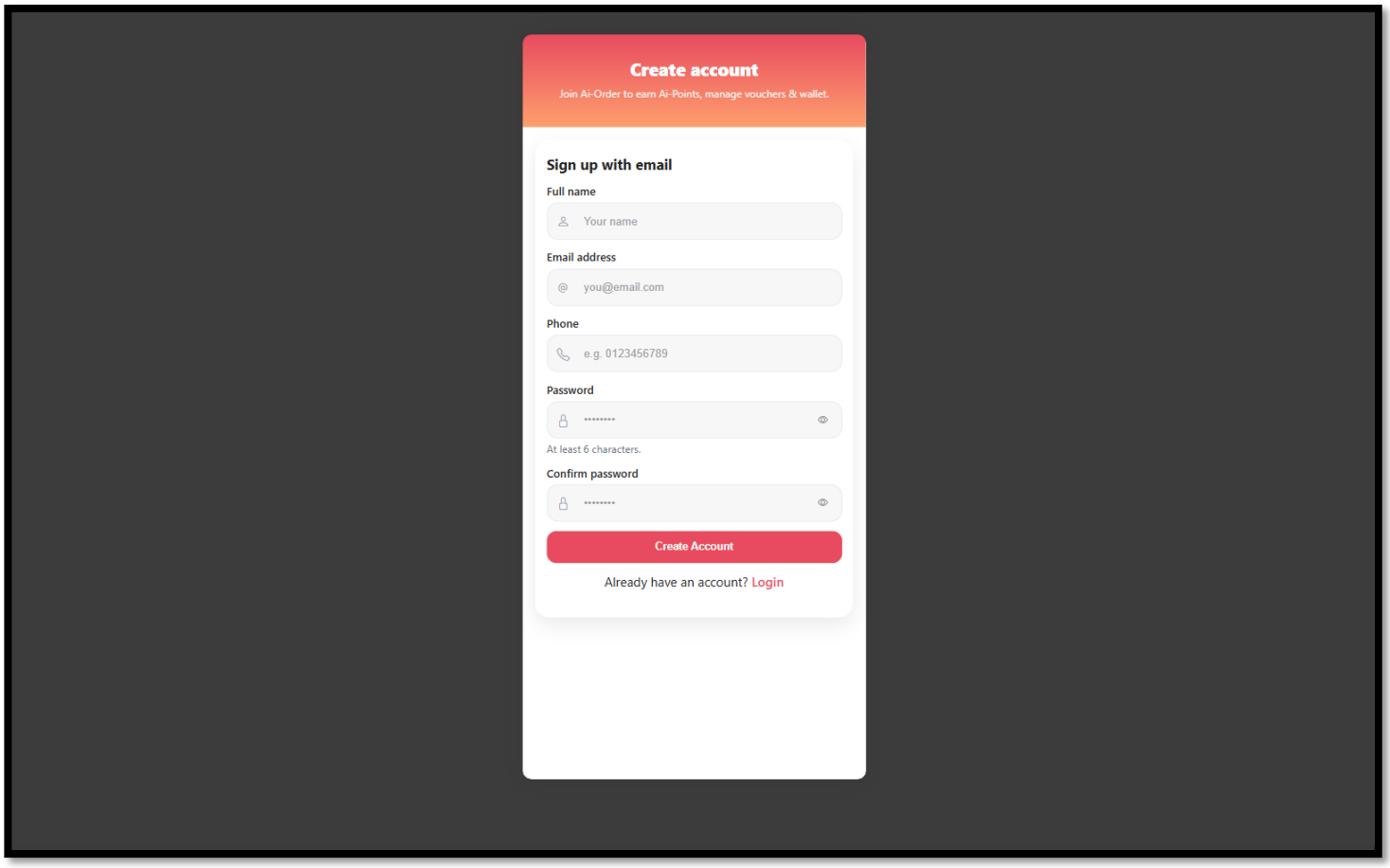


Figure 7.4. 61: Ai-Orders customer account creation page.

Figure 7.4.61 shows the Create Account page, where new customers register for an Ai-Orders membership before using the web ordering system. The centred card layout starts with a short headline and tagline explaining the benefits of joining, such as earning Ai-Points and managing vouchers and wallet balance. The registration form then collects the user's full name, email address, phone number, password and confirmation password, with placeholder hints and a note indicating the minimum password length. Eye icons beside the password fields allow users to toggle visibility to reduce typing errors. A prominent Create Account button submits the form, while a link at the bottom ("Already have an account? Login") lets existing members quickly switch back to the login page. This simple, mobile-friendly screen streamlines the onboarding process and ensures that essential contact and authentication details are captured correctly.

7.4.62. Customer Forgot Password Interface

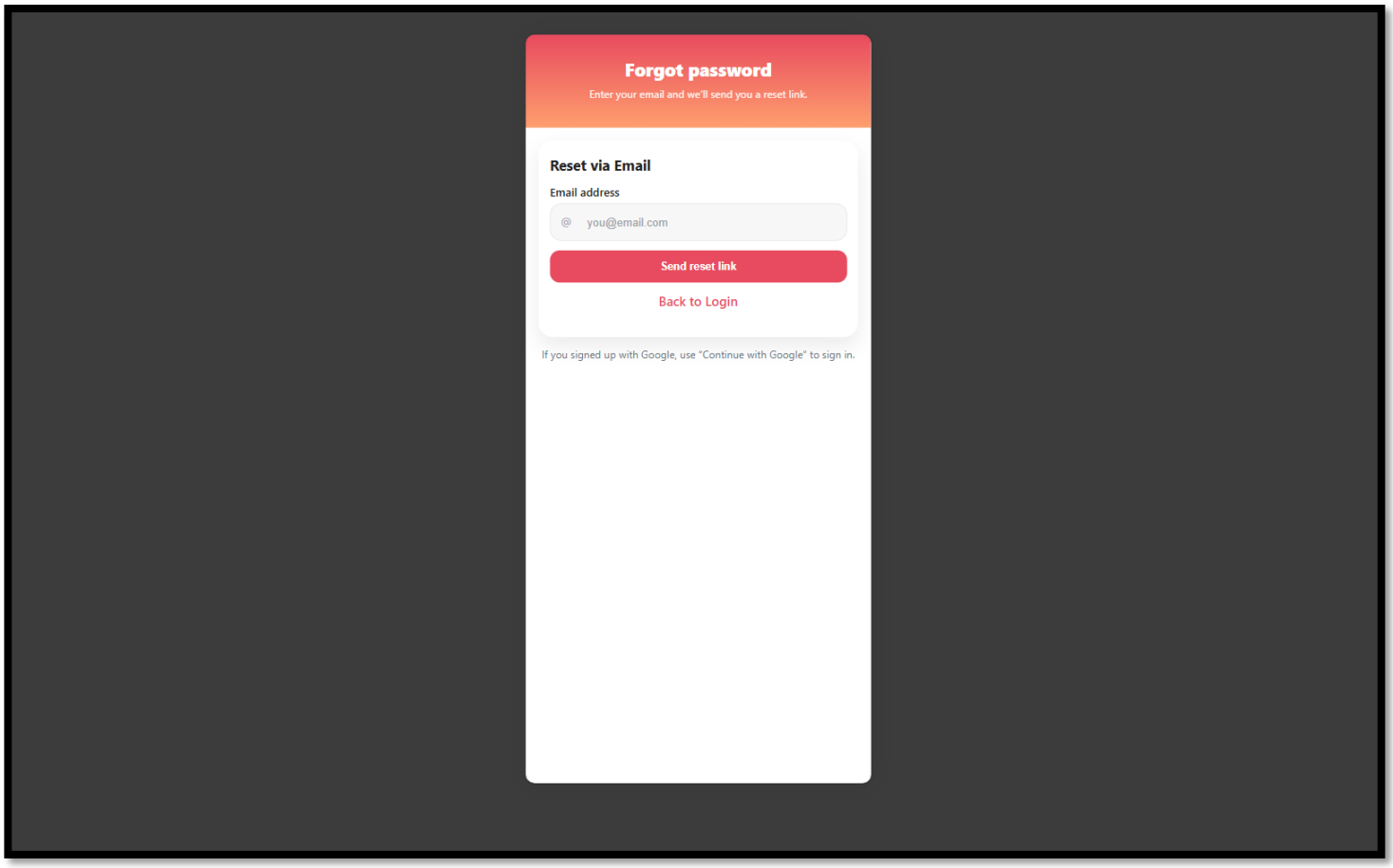


Figure 7.4. 62: Ai-Orders customer password reset page.

Figure 7.4.62 shows the Forgot Password page, which helps customers regain access to their Ai-Orders account when they cannot remember their login credentials. The card at the centre of the screen displays a clear heading and short instruction telling users to enter their registered email address. After typing the email, customers click the Send reset link button, which triggers an email containing a secure password-reset URL. A Back to Login link underneath allows users who remember their password to return to the login page without completing the reset process. A brief note at the bottom reminds users who originally signed up with Google to log in using the “Continue with Google” option instead of resetting a password. This simple, focused interface improves account recovery while maintaining security and minimising user frustration.

7.4.63. Customer Reset Code Verification Interface

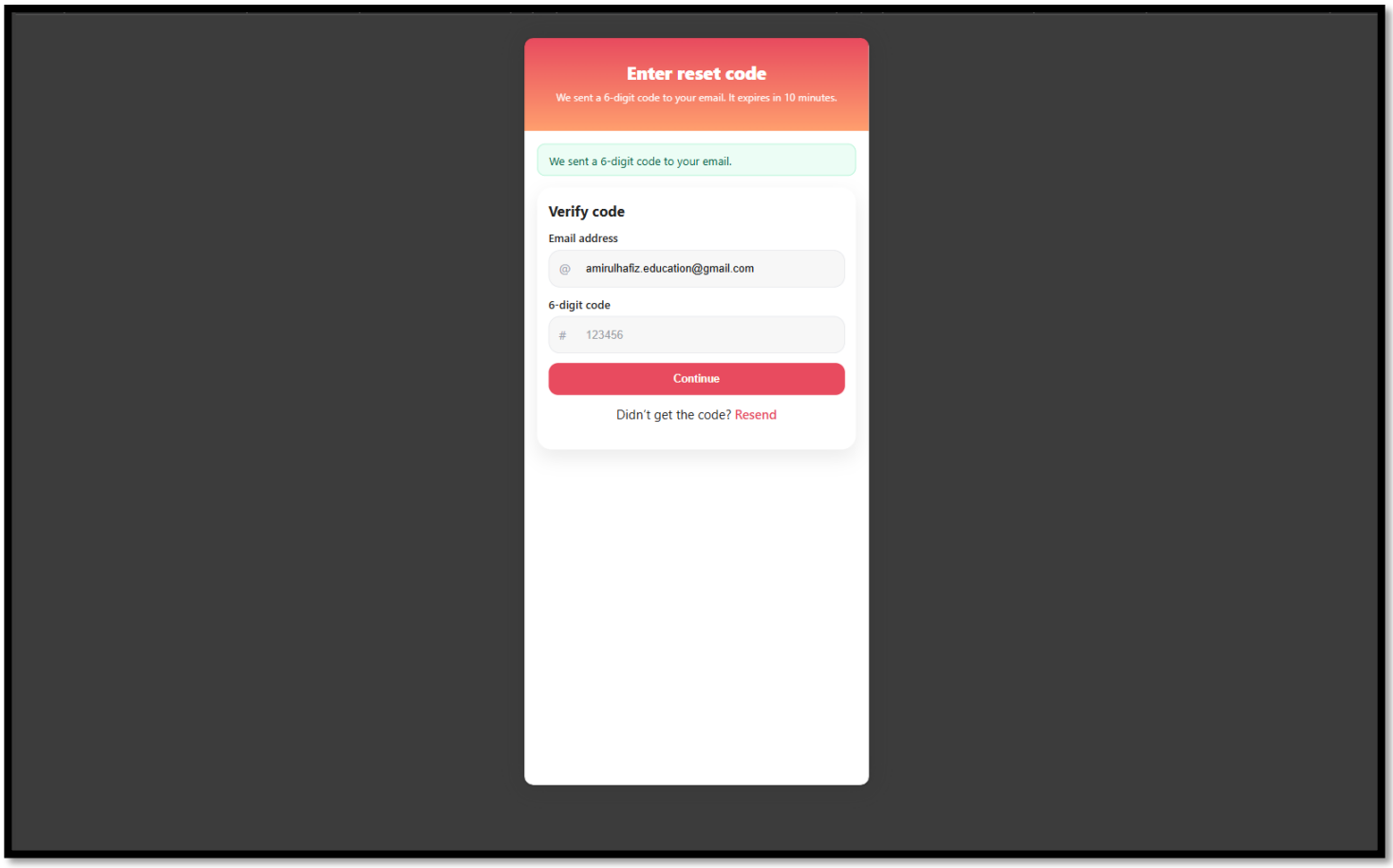


Figure 7.4. 63: Ai-Orders customer reset code verification page.

Figure 7.4.63 presents the Enter Reset Code page, which is the intermediate step in the customer password recovery flow. After requesting a reset, the system sends a 6-digit code to the user's registered email and displays a confirmation banner ("We sent a 6-digit code to your email."). The card then shows the email address being verified and provides an input field for the 6-digit code. Once the user enters the correct code and clicks Continue, the system validates it and proceeds to the page where a new password can be set. A Resend link is also provided for situations where the email is delayed or not received, ensuring that customers can easily request a new code. This verification step adds an extra security layer to the reset process by ensuring that only users with access to the registered email can change the account password.

7.4.64. Customer Set New Password Interface

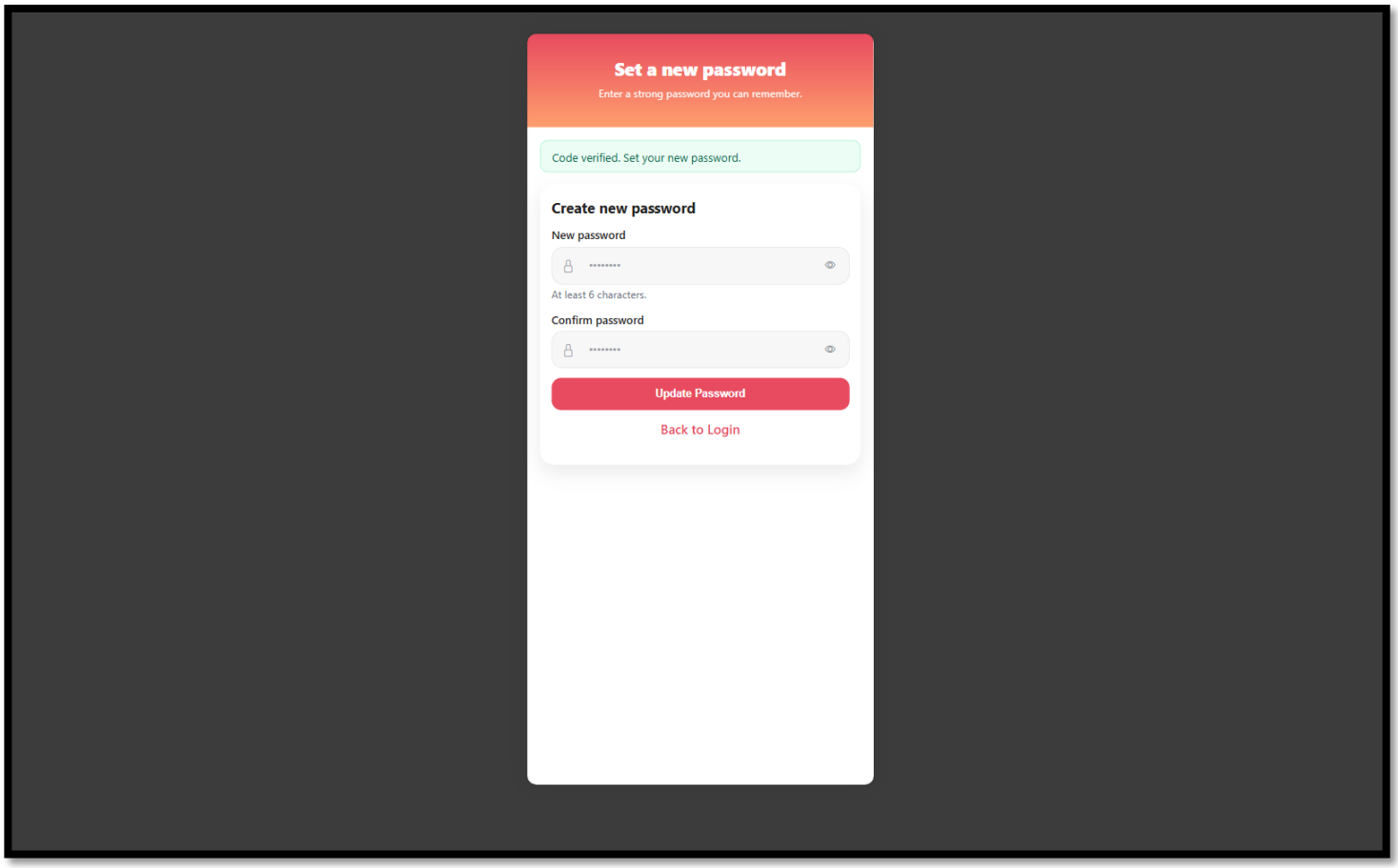


Figure 7.4. 64: Ai-Orders customer password update page.

Figure 7.4.64 shows the Set a New Password page, which appears after a customer clicks the password reset link sent to their email. A success message at the top ("Code verified. Set your new password.") indicates that the reset token is valid and that the user can safely proceed. The form then prompts the customer to create a new password and confirm it, with helper text reminding them of the minimum length requirement. Eye icons beside both fields allow users to toggle password visibility to reduce typing errors.

Once both fields match, the customer clicks Update Password to save the new credentials and reactivate access to their account, while the Back to Login link returns them to the main login page without applying any changes. This focused interface completes the password recovery flow, ensuring that only verified users can update their credentials while keeping the process simple and user-friendly.

7.4.65. Customer Home Dashboard Interface

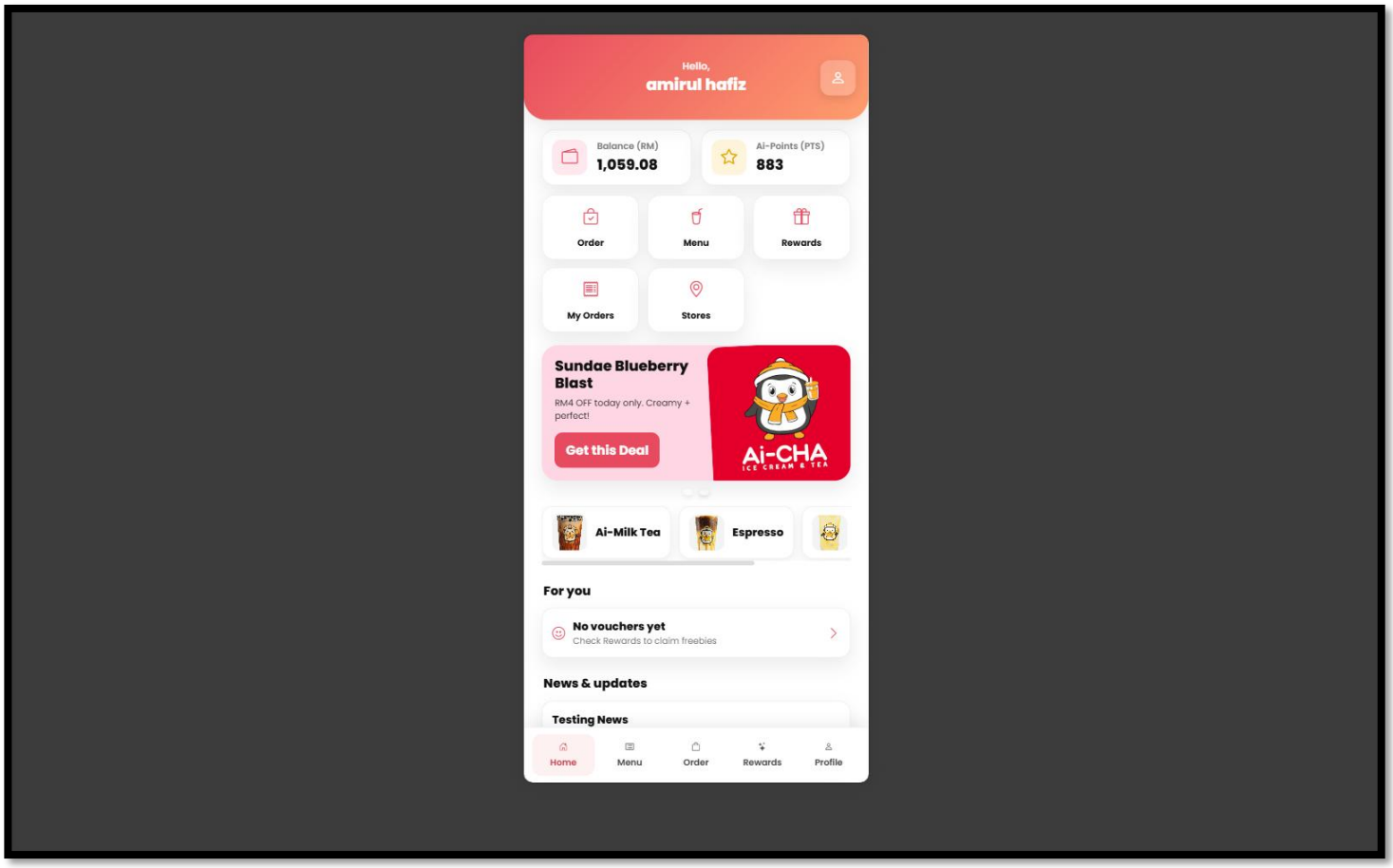


Figure 7.4. 65: Ai-Orders customer mobile home screen.

Figure 7.4.65 illustrates the main Home dashboard that customers see after logging into the Ai-Orders web app. At the top, a personalised greeting displays the member's name alongside quick access to the profile menu. Two prominent summary cards show the customer's wallet balance (RM) and Ai-Points (PTS), making it easy to check available funds and loyalty points before ordering. Below this, a grid of shortcuts provides direct navigation to the key modules: Order, Menu, Rewards, My Orders and Stores. A promotional banner highlights current campaigns or limited-time offers with a Get this Deal button to encourage voucher or menu engagement. The middle section includes horizontally scrollable category chips (such as Ai-Milk Tea and Espresso) for quick discovery of popular drink types. Further down, a For you panel summarises available vouchers or reminds users when there are none, while the News & updates section is reserved for announcements from Ai-CHA. A sticky bottom navigation bar (Home, Menu, Order, Rewards, Profile) ensures that customers can move between core features with minimal taps, providing a mobile-first, loyalty-centred experience.

7.4.66. Pickup Store Selection Interface

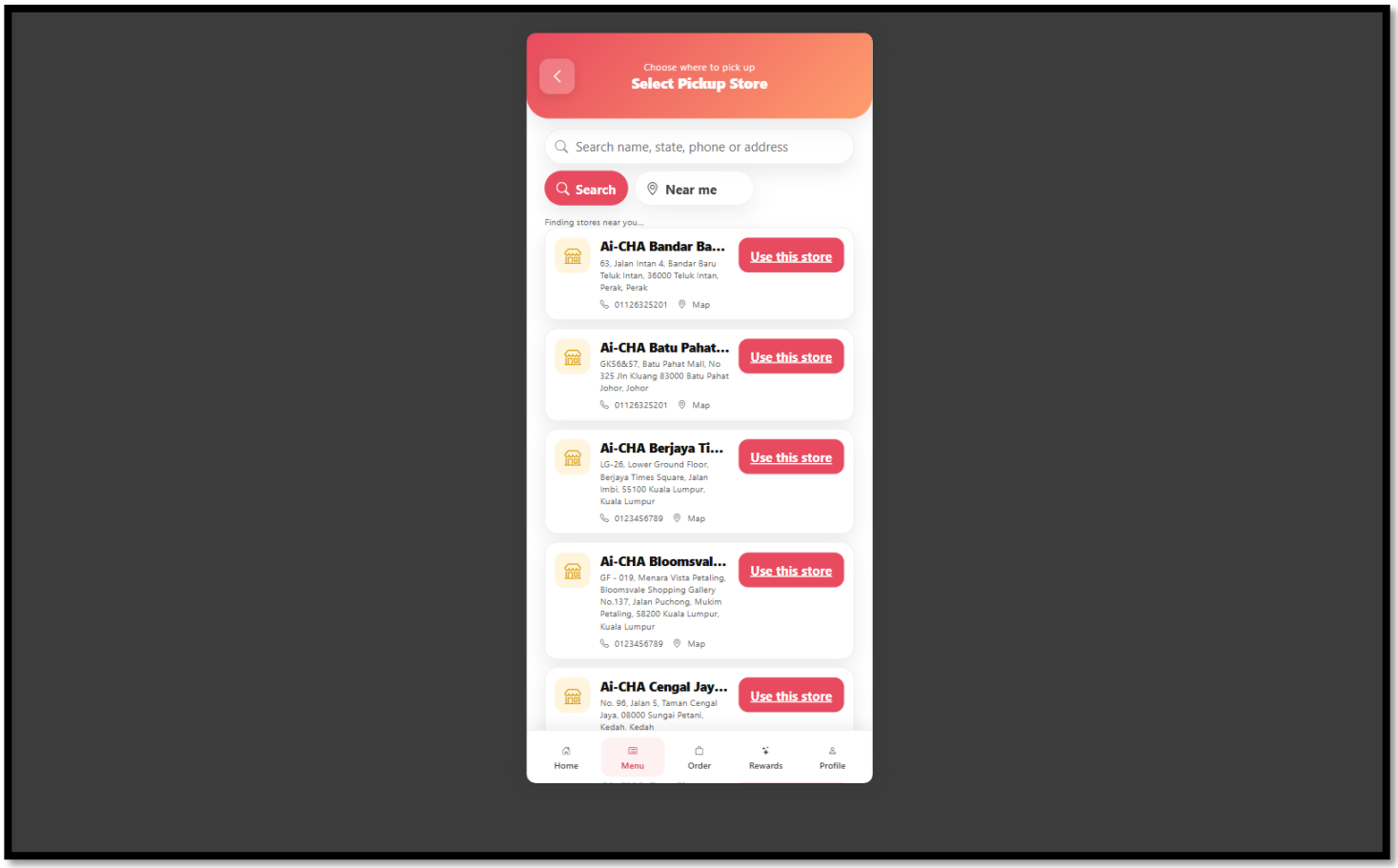


Figure 7.4. 66: Ai-Orders customer pickup store selection page.

Figure 7.4.66 shows the Select Pickup Store screen, where customers choose the Ai-CHA outlet that will prepare their order. At the top, a search bar allows users to filter stores by name, state, phone number or address. Below it, the Search button triggers a text-based lookup, while the Near me option is intended to surface nearby outlets using the customer's current location. The main list displays each available store as a card containing the outlet name, full address, contact number and a Map link for viewing the location in a maps application. On the right of every card, the Use this store button sets that outlet as the active pickup branch and returns the user to the ordering flow. The bottom navigation bar (Home, Menu, Order, Rewards, Profile) remains visible so that customers can easily switch modules without losing their selected store. This interface ensures that orders are always routed to the correct branch and supports customers in finding the most convenient pickup location.

7.4.67. Customer Menu Browsing Interface

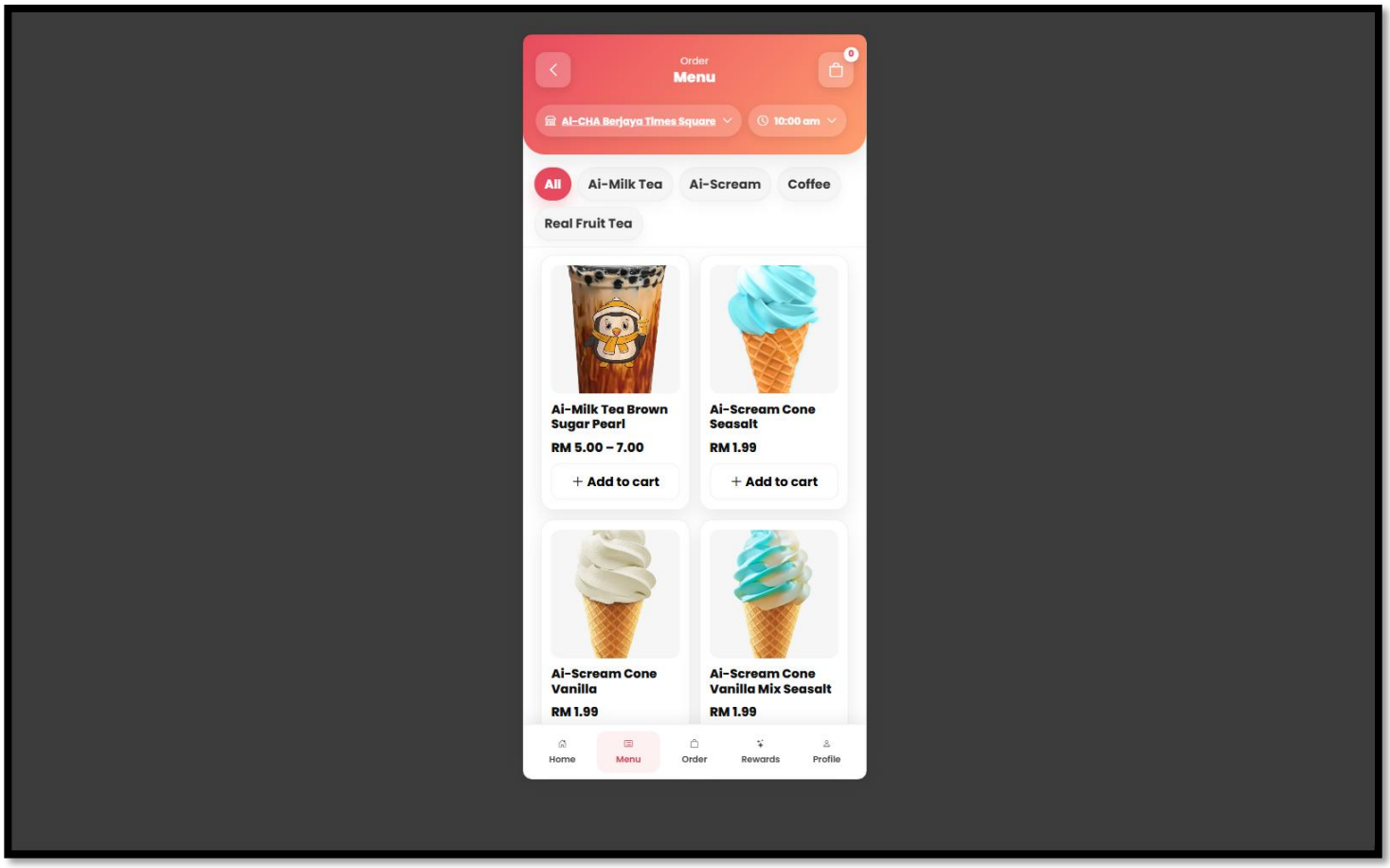


Figure 7.4. 67: Ai-Orders customer menu listing for pickup orders.

Figure 7.4.67 shows the Menu screen that customers use to browse items and start building an order for their selected pickup store. At the top, the header clearly states the current branch and preferred pickup time, allowing users to confirm that the order will be prepared at the correct outlet and time slot. A back button returns to the previous page, while a cart icon with a badge indicates how many items have already been added. Just below, category chips (such as All, Ai-Milk Tea, Ai-Scream and Coffee) let the customer quickly filter the menu based on drink type without reloading the page.

The main content area presents menu items as large, touch-friendly cards. Each card displays the product image, name and price or price range, followed by an Add to cart button that opens the customisation flow for size or toppings when needed. As users add items, the cart count in the header updates, and they can later proceed to checkout from the Order tab in the bottom navigation bar. This interface provides a mobile-first, visually rich browsing experience that encourages product discovery while keeping the ordering process simple and intuitive.

7.4.68. Customer Drink Customisation Interface

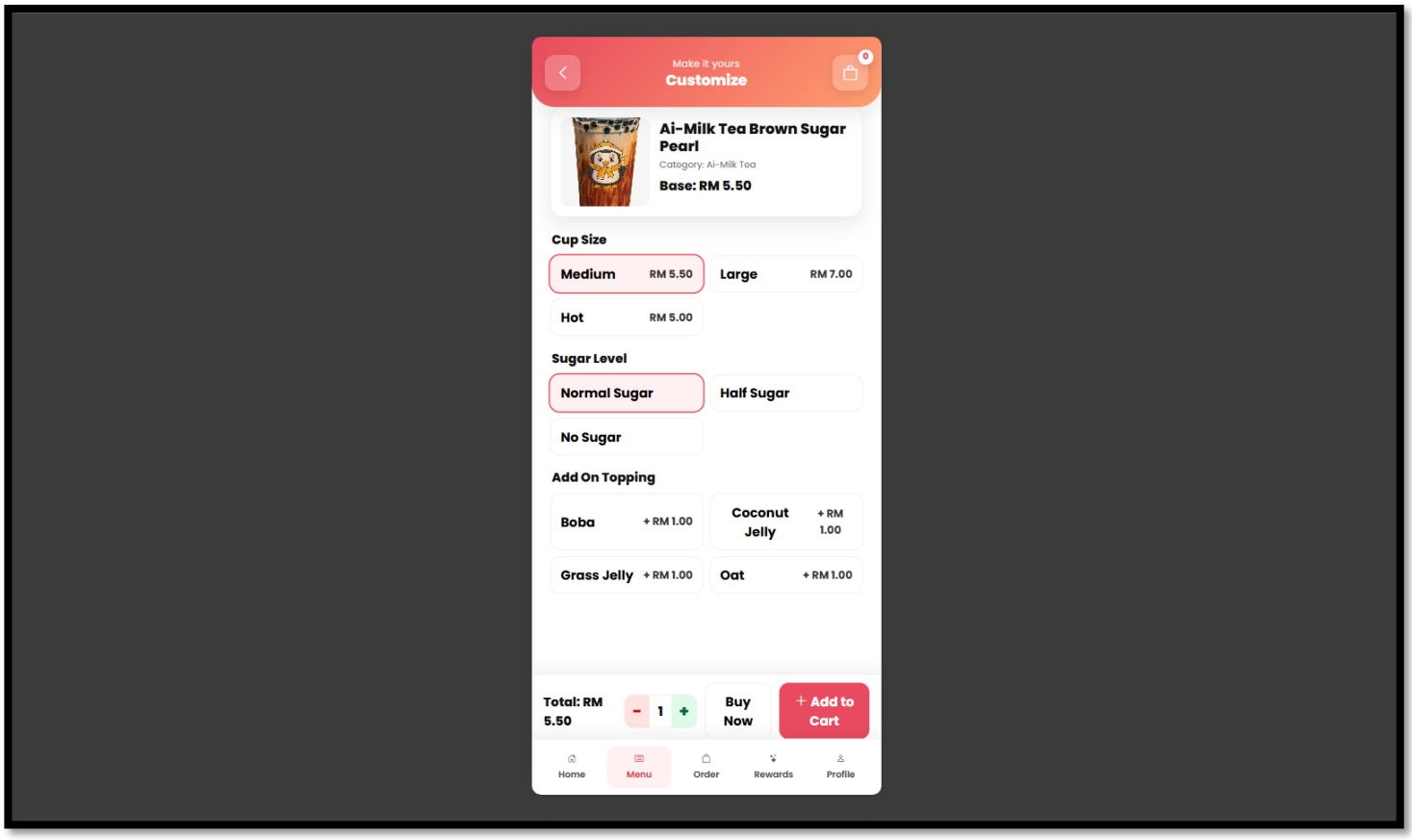


Figure 7.4. 68: Ai-Orders customer drink configuration screen.

Figure 7.4.68 shows the customer-facing customisation page that appears after a user selects a drink from the menu. At the top, the interface displays the selected product image, name, category and base price so that the customer can confirm they are editing the correct item. The page then presents several configuration options in a vertically stacked layout. Under Cup Size, users can choose Medium, Large or Hot, with each option clearly labelled with its corresponding price so that any additional charges are transparent. The Sugar Level section lets customers select Normal, Half Sugar or No Sugar, while the Add On Topping section lists add-ons such as Boba, Coconut Jelly, Grass Jelly and Oat, each showing any extra cost in Ringgit Malaysia.

At the bottom of the screen, a summary bar displays the current total price for the configured drink and a quantity selector to increase or decrease the number of cups. Customers can either tap Buy Now to proceed directly to checkout with this single item or choose Add to Cart to include it in their ongoing order before browsing more products. A cart icon with a badge remains visible in the header to indicate how many items have already been added. This interface allows customers to precisely personalise their beverages while keeping the overall price and quantity clearly visible, which helps reduce ordering mistakes and improves the online ordering experience.

7.4.69. Customer Cart and Checkout Interface

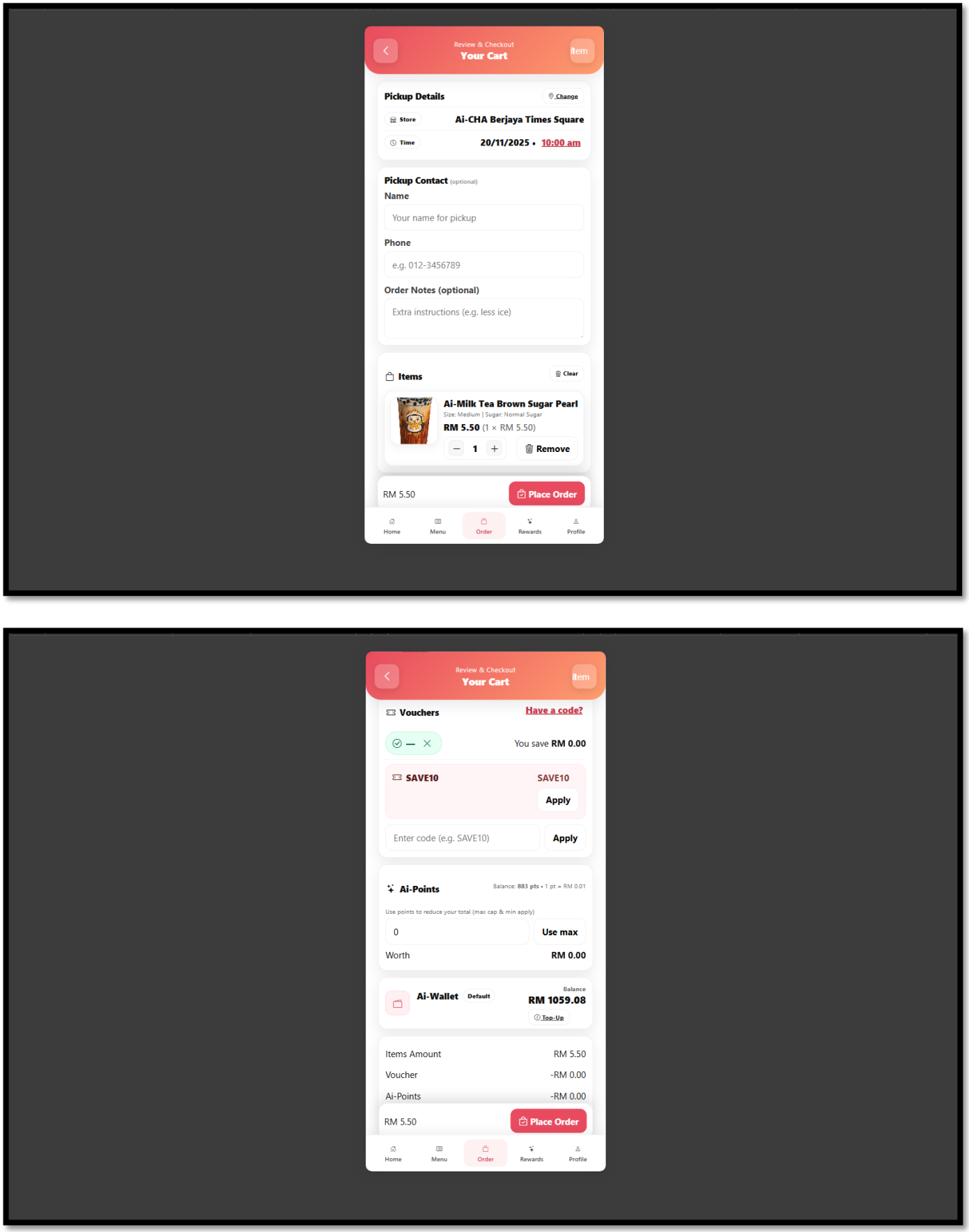


Figure 7.4. 69: Ai-Orders customer cart with pickup details, vouchers, points and wallet.

Figure 7.4.69 shows the Your Cart page, where customers review their order and complete checkout. At the top, the Pickup Details section confirms the selected store and pickup time, with a Change link to adjust either if needed. Below that, optional Pickup Contact fields allow the customer to enter a name and phone number for easier identification at the counter, and an Order Notes box captures special instructions such as “less ice” or “no straw.” The Items panel lists each drink in the cart with its size, sugar level and toppings, along with quantity controls, item subtotals and a Remove button. A running total at the bottom of the screen shows the current amount, and the Place Order button initiates payment and order creation.

The lower portion of the page focuses on discounts and payment methods. The Vouchers section lets users apply an available voucher or enter a promo code manually, with feedback on how much they save. The Ai-Points panel shows the current points balance and allows the customer to specify how many points to redeem, with a Use max shortcut and a monetary value display. Under Ai-Wallet, the interface shows the wallet balance and a Top-Up link for adding funds if necessary. A breakdown of Items Amount, Voucher discount and Ai-Points deduction leads to the final payable total above the Place Order button. This integrated cart and checkout interface brings together pickup details, order items, vouchers, loyalty points and wallet payment in one flow, ensuring customers clearly understand their savings and final amount before confirming the order.

7.4.70. Membership Rewards Interface

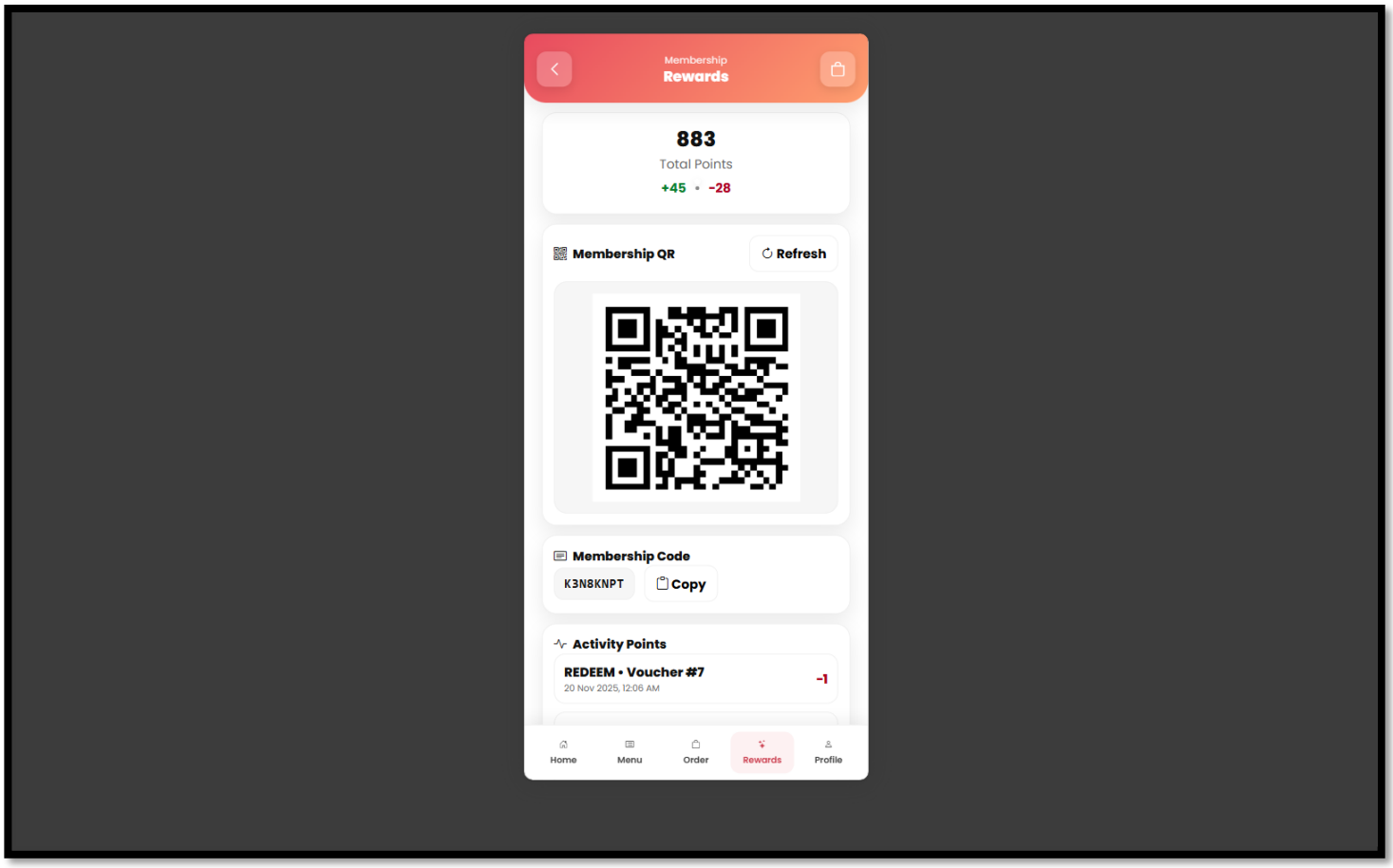


Figure 7.4. 70: Ai-Orders customer membership QR and points activity page.

Figure 7.4.70 shows the Membership Rewards screen, which acts as the customer's digital loyalty card. At the top, the interface displays the member's Total Points together with small indicators showing recent points earned and redeemed. The Membership QR section presents a large QR code that can be scanned at the counter to quickly identify the customer and link in-store purchases to their online account; a Refresh button regenerates the code when needed for security. Beneath it, the Membership Code field shows the alphanumeric display code used for manual lookup, along with a Copy button so users can easily paste it into other apps. The Activity Points panel lists recent point transactions (for example, "REDEEM – Voucher #7") with timestamps and positive or negative values to indicate earning or redemption. The persistent bottom navigation bar keeps shortcuts to Home, Menu, Order, Rewards and Profile, ensuring that users can move between ordering and loyalty features without leaving the rewards context.

7.4.71. Customer Profile Interface

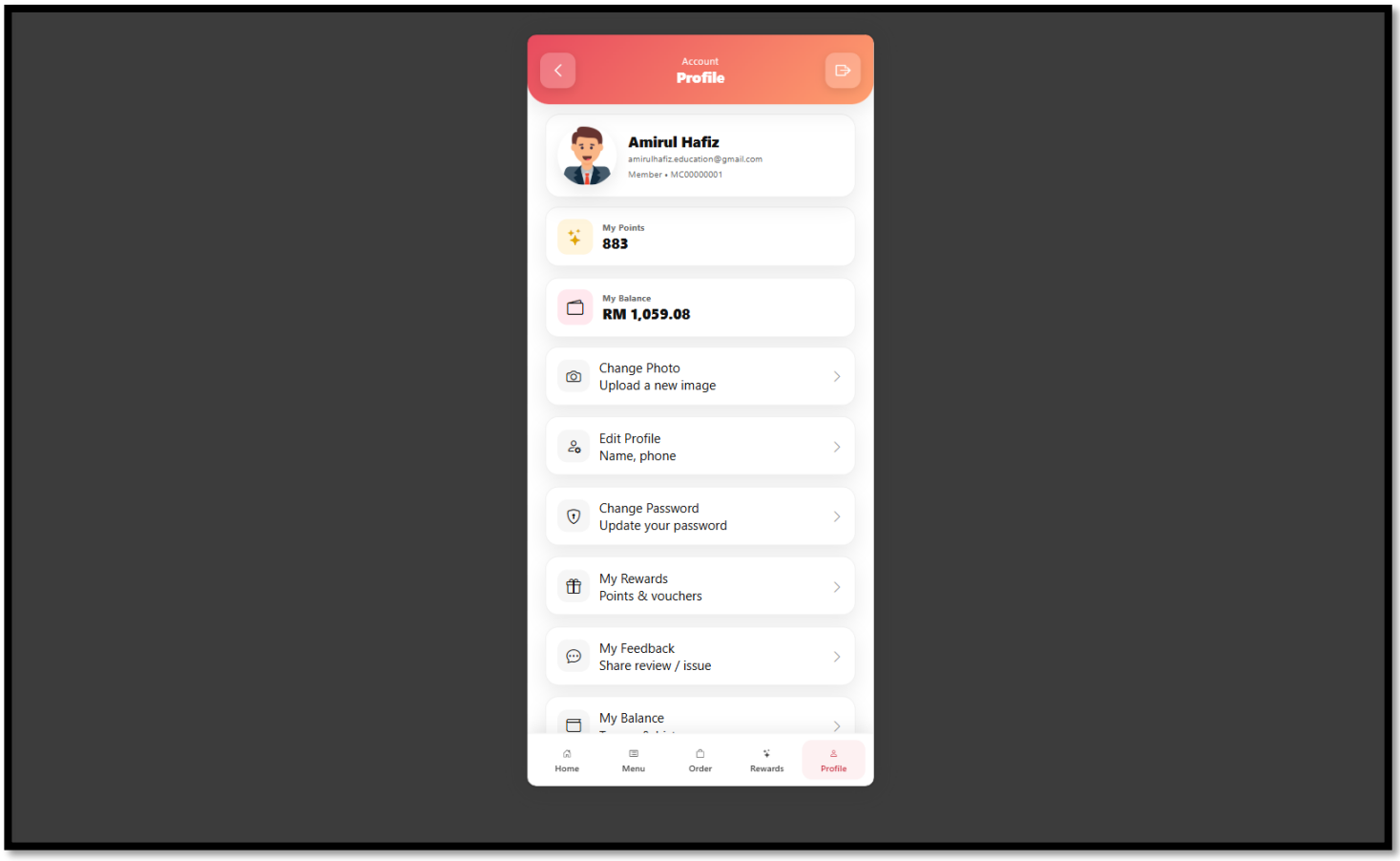


Figure 7.4. 71: Ai-Orders customer account profile page.

Figure 7.4.71 shows the Profile screen, where customers manage their personal details and access key membership-related settings. At the top, the page displays the user's avatar, full name, email address and membership number, followed by summary cards for My Points and My Balance, which mirror the loyalty points and wallet amount shown on the home dashboard. Below these summaries, a series of list-style actions provide quick access to common account functions: Change Photo for uploading a new profile image, Edit Profile to update name or phone number, and Change Password to modify login credentials. Additional entries such as My Rewards, My Feedback and My Balance allow users to review points and vouchers, submit comments or issues, and inspect wallet transactions from one central place. The bottom navigation bar remains fixed, with the Profile tab highlighted, so customers can easily switch between ordering, rewards and account management while staying within the same mobile-friendly interface.

7.4.72. Customer Edit Profile Interface

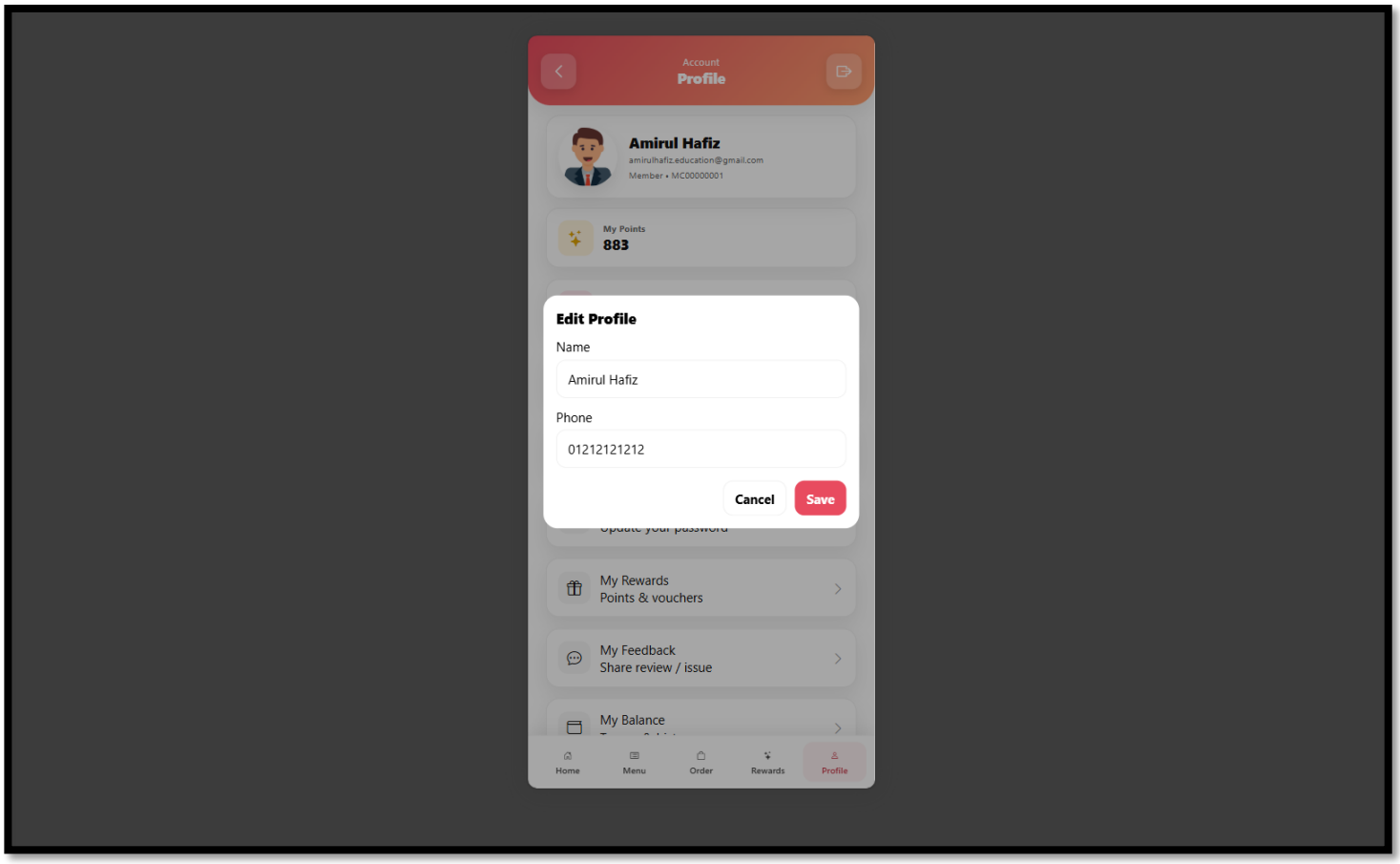


Figure 7.4. 72: Ai-Orders customer edit profile popup.

Figure 7.4.72 shows the Edit Profile popup that appears on top of the Profile screen when a customer chooses to update their personal details. The modal highlights only two key fields—Name and Phone—to keep the update process simple and focused while leaving email and membership number unchanged for identity consistency. Existing values are pre-filled so that users only need to correct or replace the relevant information. At the bottom of the popup, a Cancel button lets the user close the form without saving, while the Save button commits the changes and refreshes the main profile summary. By using a lightweight overlay instead of navigating to a separate page, this interface allows quick edits without interrupting the overall mobile experience.

7.4.73. Customer Change Password Interface

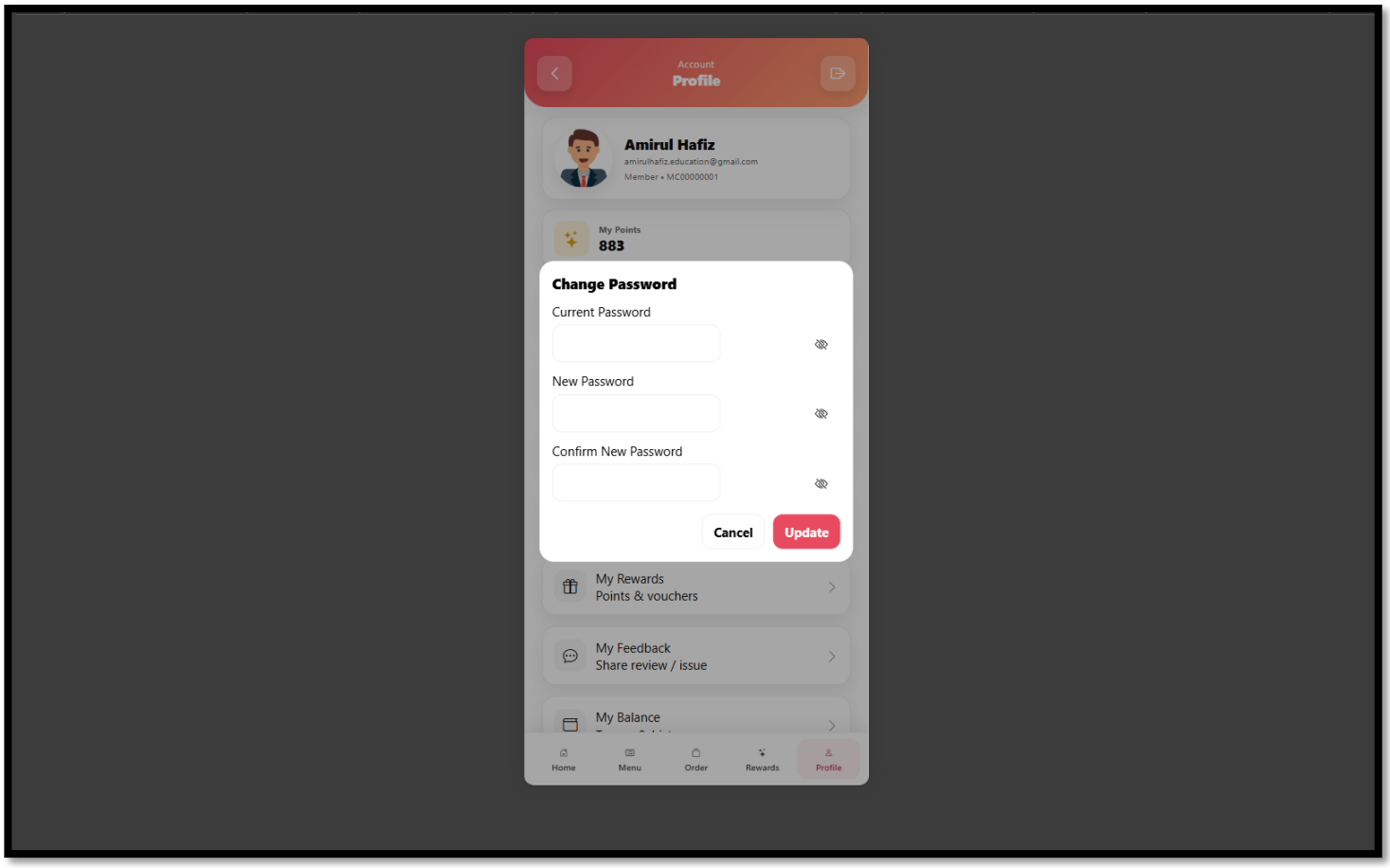


Figure 7.4. 73: Ai-Orders customer change password popup.

Figure 7.4.73 shows the Change Password popup that appears from the Profile screen when a customer chooses to update their login credentials. The modal contains three fields: Current Password, New Password and Confirm New Password, ensuring that the user verifies their identity and prevents typos before saving the change. Each field is masked by default, with an eye icon to toggle visibility so the user can check what they have typed. At the bottom, the Cancel button closes the popup without applying any modifications, while the Update button validates the input and submits the new password. This focused overlay provides a secure yet straightforward way for customers to maintain and strengthen their account security without navigating away from the main profile page.

7.4.74. Customer Feedback Interface

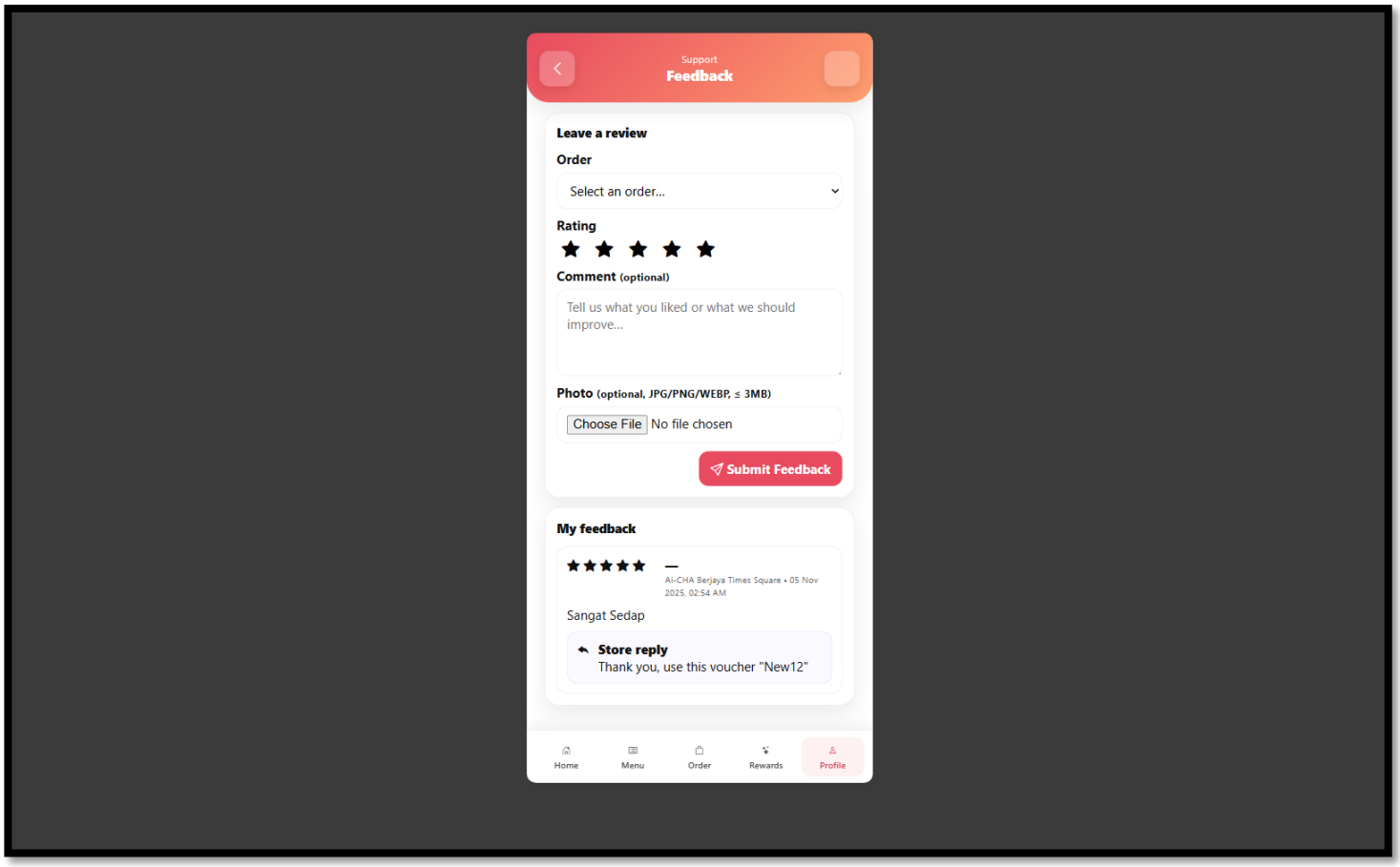


Figure 7.4. 74: Ai-Orders customer feedback and store reply page.

Figure 7.4.74 shows the Feedback screen, which allows customers to rate their experience and communicate directly with the store. In the Leave a review section, users first select an Order from a dropdown list so that each review is tied to a specific transaction. They can then give a star Rating, write an optional Comment describing what they liked or what should be improved, and optionally upload a supporting Photo (JPG/PNG/WebP, up to 3 MB). Tapping Submit Feedback sends the review to the system for the branch manager to view.

The lower My feedback panel summarises past reviews submitted by the customer, showing the star rating, store name, date and time, along with the original comment. If the branch replies, a Store reply box appears underneath, displaying the store's response (for example, thanking the customer or sharing a follow-up voucher code). This interface closes the loop between customers and outlets, turning feedback into a structured, traceable conversation that can be used to improve service quality and build loyalty.

7.4.75. Customer Wallet Overview Interface

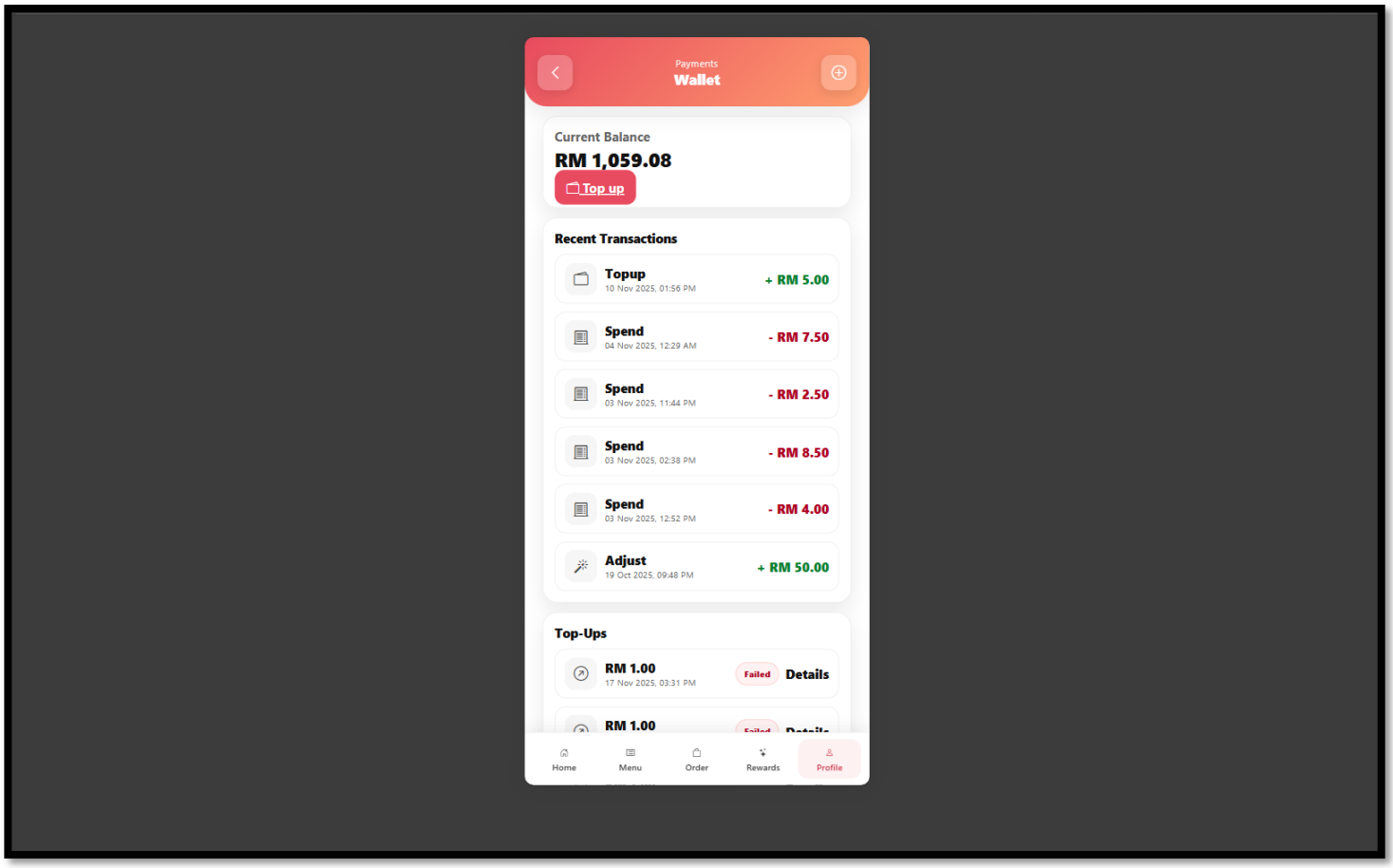


Figure 7.4. 75: Ai-Orders customer wallet balance and transaction history page.

Figure 7.4.75 shows the Wallet screen, which centralises all Ai-Wallet payment information for the customer. At the top, a summary card displays the Current Balance in Ringgit Malaysia with a prominent Top up button that leads to the wallet top-up flow. The Recent Transactions section lists the latest wallet activities such as Topup, Spend and Adjust, each with a date–time stamp and the corresponding amount in green (credit) or red (debit). This helps users quickly understand how their balance has changed over time.

Further down, the Top-Ups panel (partially shown) records individual top-up attempts, including their amount and status (for example, Successful or Failed) with a Details button for more information. The persistent bottom navigation remains visible, with the Profile tab highlighted since Wallet is accessed from the account area. Overall, this interface provides transparent wallet management, allowing customers to monitor spending, verify top-ups and maintain sufficient balance for future Ai-Orders purchases.

7.4.76. Customer Wallet Top-Up Interface

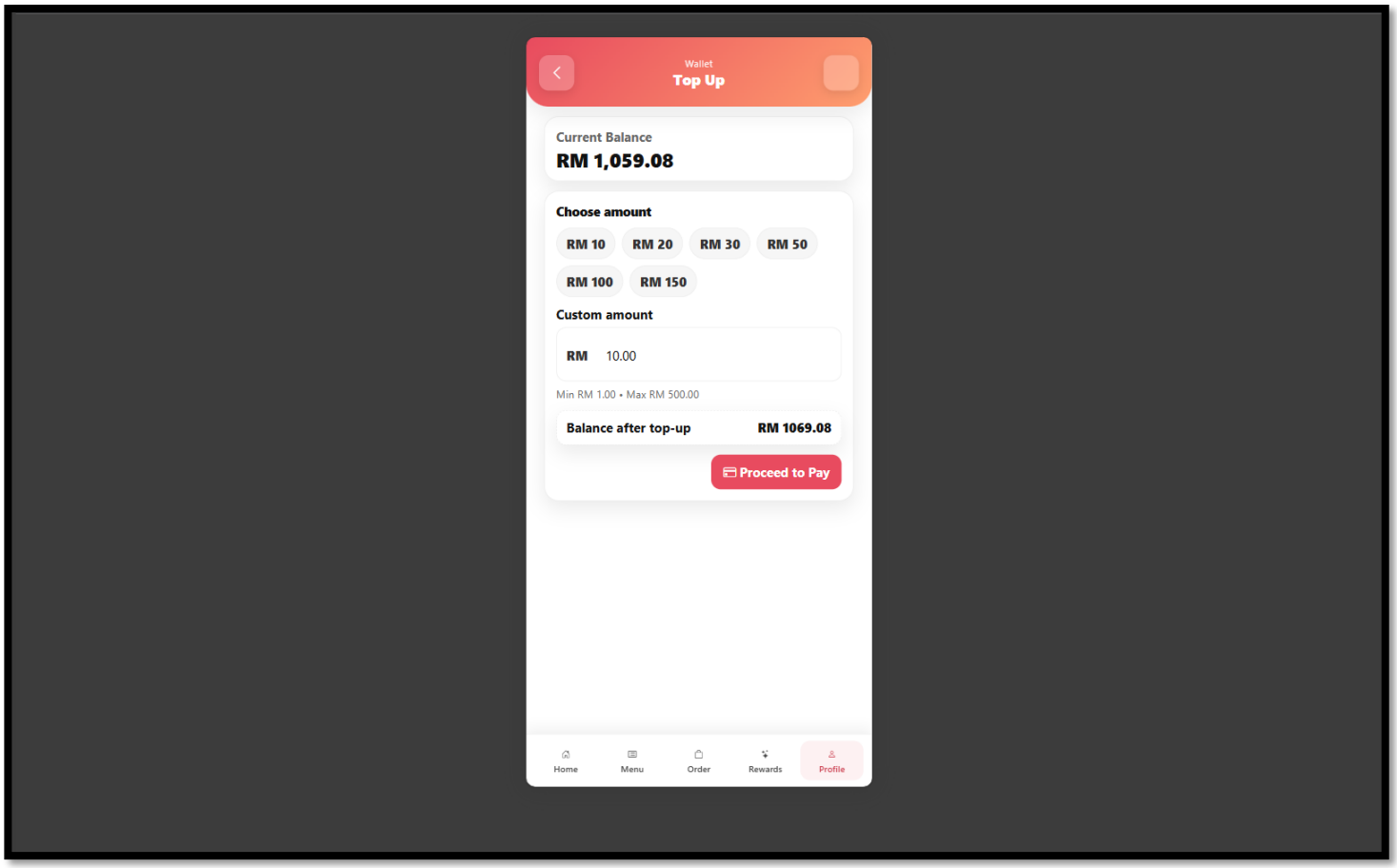


Figure 7.4. 76: Ai-Orders customer wallet top-up amount selection page.

Figure 7.4.76 shows the Wallet Top Up screen, where customers choose how much credit to add to their Ai-Wallet. At the top, the page displays the Current Balance so users know their starting amount. The Choose amount section provides several quick-select buttons (for example, RM 10, RM 20, RM 30, RM 50, RM 100 and RM 150) to speed up common top-up values. Below this, a Custom amount field allows entry of any value within the allowed range, with helper text indicating the minimum and maximum top-up limits.

Once an amount is selected, the interface calculates and shows the Balance after top-up, giving a clear preview of the new wallet total. The Proceed to Pay button at the bottom then sends the customer to the payment gateway (ToyyibPay) to complete the transaction. This design keeps the top-up process straightforward, reduces manual input errors and ensures that customers understand exactly how their wallet balance will change before confirming payment.

7.5 Significant Functions

7.5.1 Application Initialization and Configuration

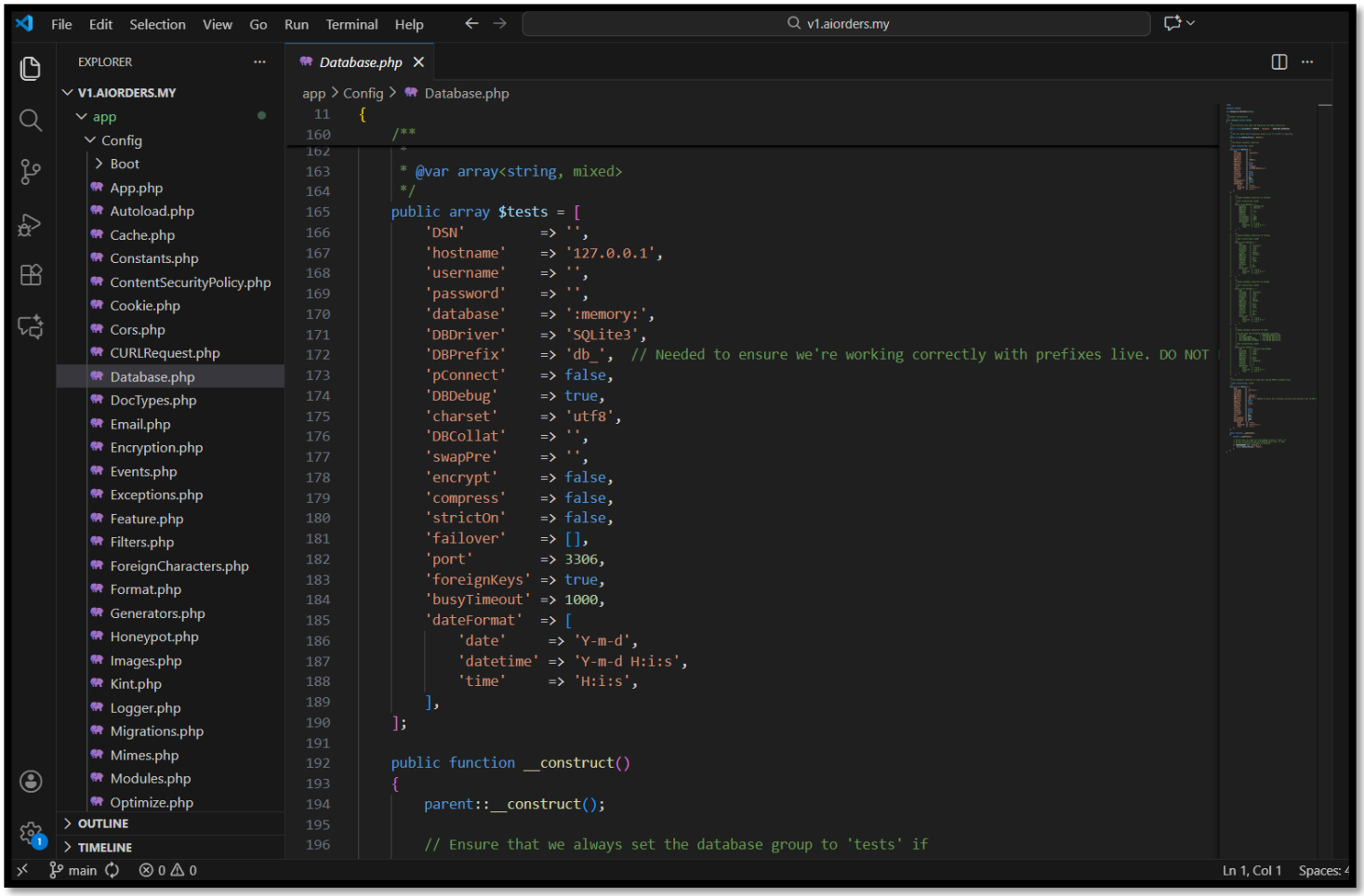
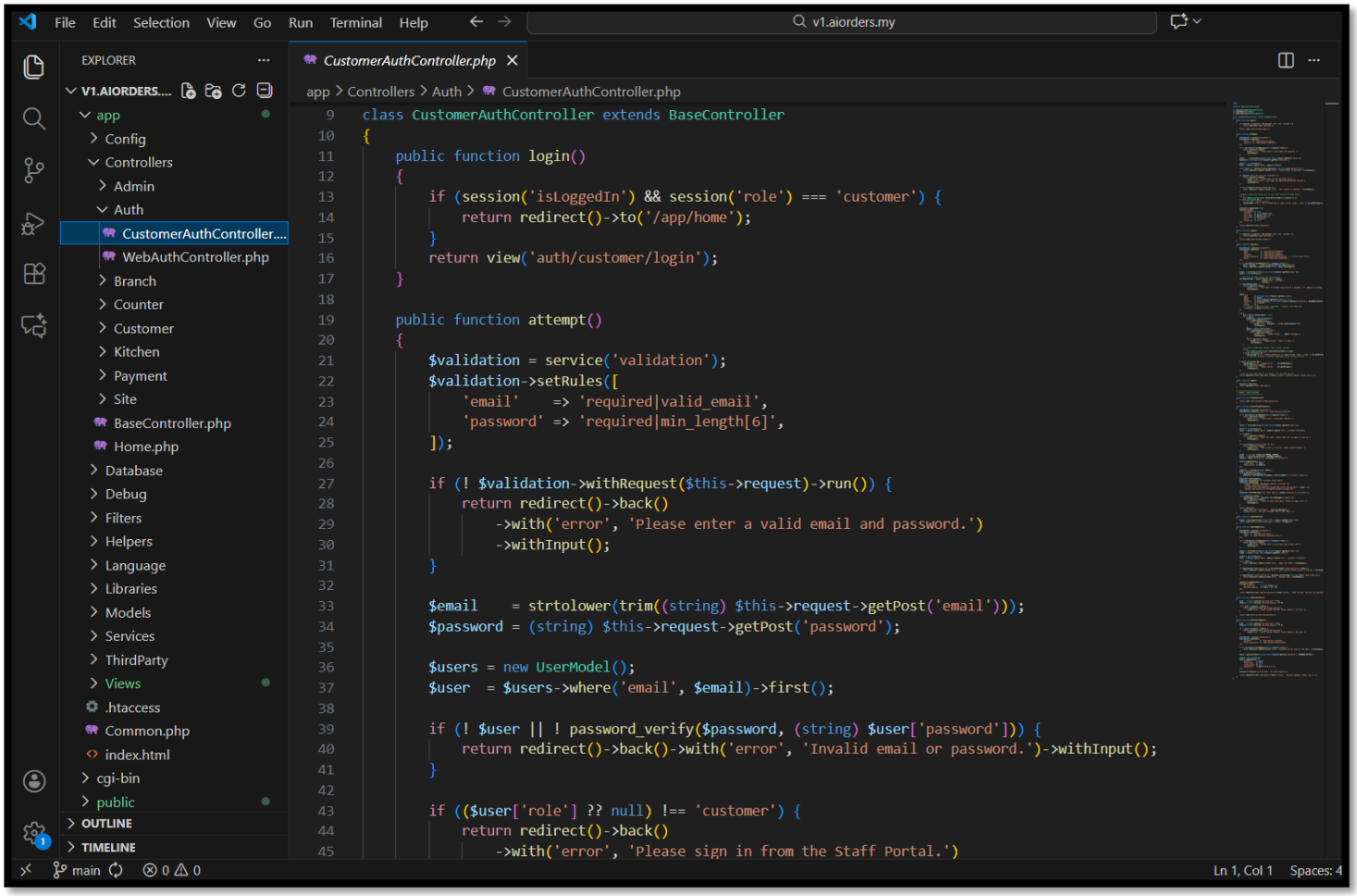


Figure 7.5.1: Main Configuration for the Ai-Orders system

Figure 7.5.1 shows the main configuration for the Ai-Orders system, including the .env settings and app/Config/Database.php file where the base URL, timezone, and database connection are defined. These configurations ensure that CodeIgniter 4 connects correctly to the MySQL database and that all modules (ordering, POS, wallet, vouchers, and points) share the same environment settings. By centralising values such as app.baseURL, database credentials, and ToyyibPay keys, the project can easily switch between local development and production hosting while keeping sensitive information out of the source code. This setup also enables session handling, CSRF protection, and error logging to work consistently across the customer web app, POS interface, and kitchen board.

7.5.2 Authentication and Role-Based Access Control




```php
class CustomerAuthController extends BaseController
{
    public function login()
    {
        if (session('isLoggedIn') && session('role') === 'customer') {
            return redirect()->to('/app/home');
        }
        return view('auth/customer/login');
    }

    public function attempt()
    {
        $validation = service('validation');
        $validation->setRules([
            'email'    => 'required|valid_email',
            'password' => 'required|min_length[6]',
        ]);

        if (! $validation->withRequest($this->request)->run()) {
            return redirect()->back()
                ->with('error', 'Please enter a valid email and password.')
                ->withInput();
        }

        $email    = strtolower(trim((string) $this->request->getPost('email')));
        $password = (string) $this->request->getPost('password');

        $users = new UserModel();
        $user  = $users->where('email', $email)->first();

        if (! $user || ! password_verify($password, (string) $user['password'])) {
            return redirect()->back()->with('error', 'Invalid email or password.')->withInput();
        }

        if (($user['role'] ?? null) !== 'customer') {
            return redirect()->back()
                ->with('error', 'Please sign in from the Staff Portal.')
```

Figure 7.5.2: Authentication and route-guard logic

Figure 7.5.2 presents the authentication and route-guard logic from the login controller and filter files (for app/Controllers/Auth/CustomerAuthController.php and app/Filters/AuthGuard.php). The code validates user credentials against the users table, creates a session containing the user's ID, role, and branch, and redirects them to the appropriate dashboard (Admin, Branch, Counter, or Kitchen). The route guard filter checks the session on every protected request and blocks unauthorised access, redirecting users back to the login page if their session is missing or their role does not match the required one. This mechanism ensures that only authenticated staff can manage orders, menus, vouchers, and reports, while customers access only their own ordering and account pages.

7.5.3 Customer Ordering and Cart Handling

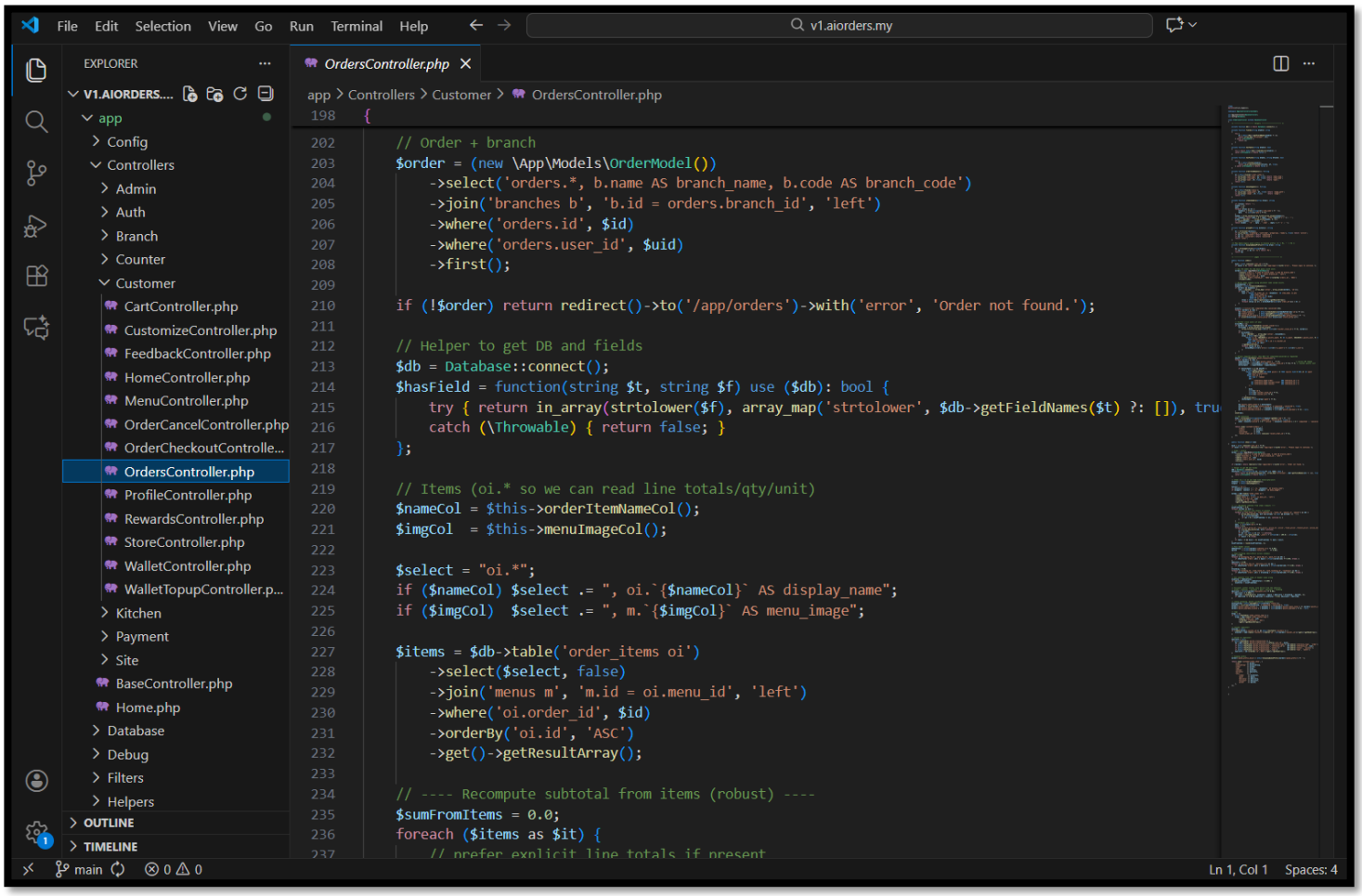


Figure 7.5.3: Core Ordering logic

Figure 7.5.3 illustrates the core ordering logic in the customer controller (for example app/Controllers/Customer/OrderController.php). The code accepts cart items from the session or AJAX requests, validates the chosen menu, size, toppings, and quantities, and calculates the subtotal based on the latest menu prices. It then creates an order header in the orders table and related rows in order_items, ensuring that both customer self-orders and counter-assisted orders follow the same data structure. Any membership QR code attached to the session is stored with the order so that vouchers and loyalty rules can be applied consistently later. This implementation keeps the ordering flow modular, making it easier to debug and extend.

7.5.4 Menu, Branch and POS Management (CRUD)

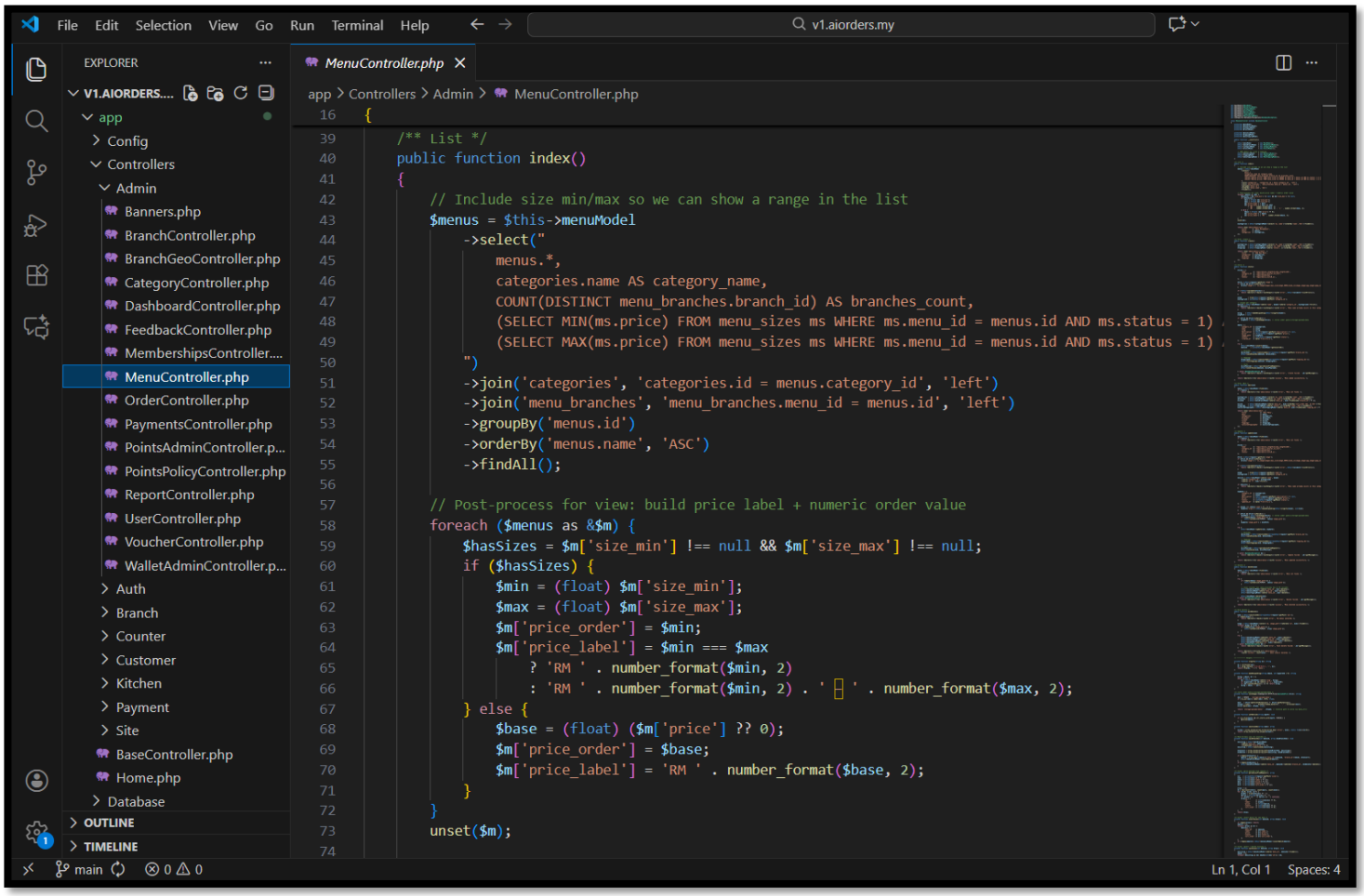


Figure 7.5.4: CRUD Implementation

Figure 7.5.4 shows the CRUD implementation for menus and branches from the admin controllers (for example app/Controllers/Admin/MenuController.php and app/Controllers/Admin/BranchController.php). These controllers allow administrators to create, update, and deactivate branches, categories, and menu items, with changes saved into the branches, categories, menus, and menu_branches tables. Validation rules prevent duplicate codes and ensure that required fields such as prices and status flags are provided. By centralising CRUD operations in these controllers, the POS, kitchen board, and customer web app always read from a consistent dataset, ensuring that only active menus and branches appear during ordering.

7.5.5 Payment and Online Checkout

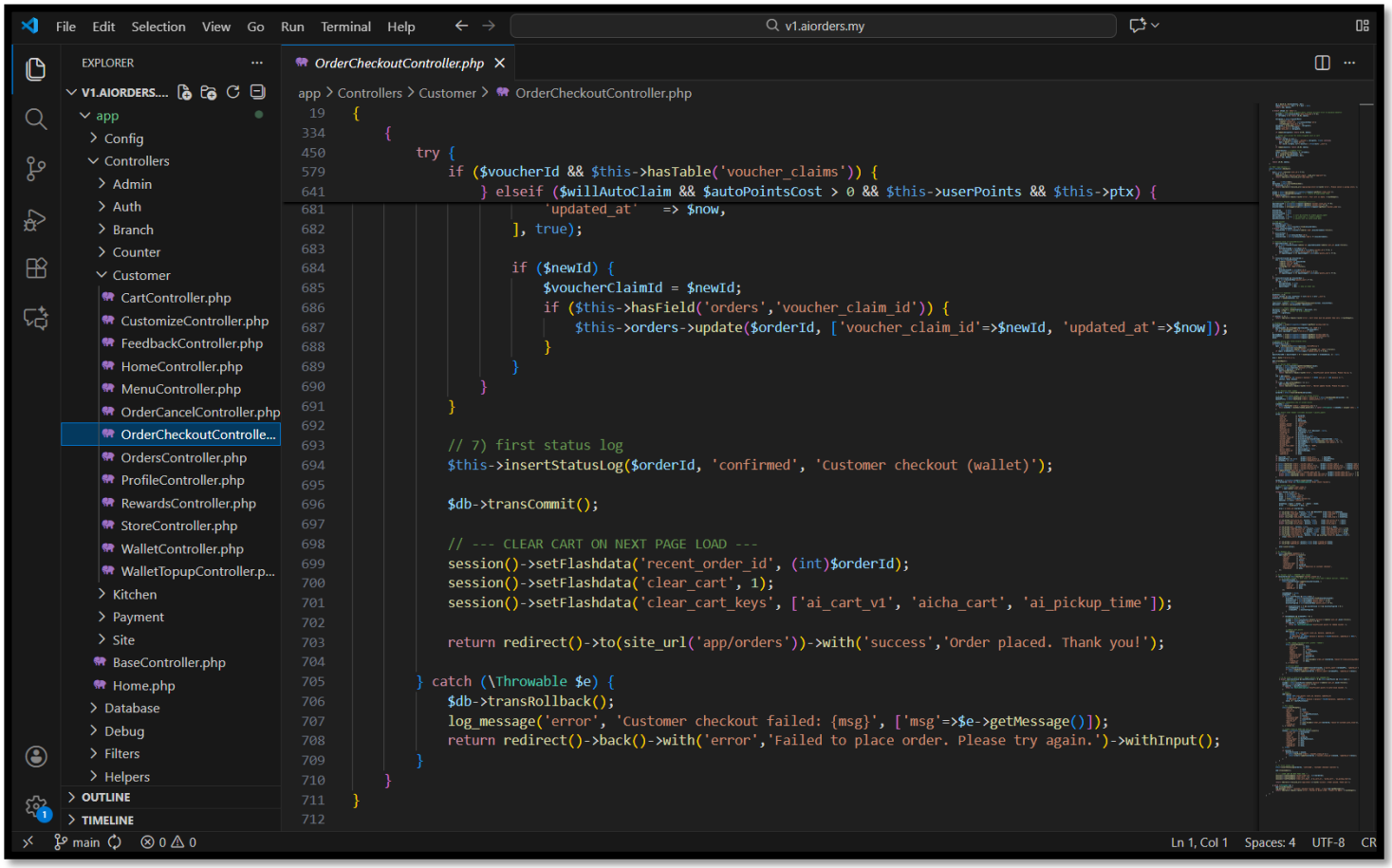


Figure 7.5.5: Checkout and Payment-handling code

Figure 7.5.5 displays the checkout and payment-handling code, typically located in app/Controllers/Customer/CheckoutController.php. The function prepares the final amount after vouchers, points, and rounding, then records the selected payment method (e.g., cash, online payment, or wallet) in the orders table. For online payments, it generates a payment request, stores a temporary status such as payment_pending, and redirects the customer to the payment page. Once the payment gateway callback or confirmation endpoint is triggered, the code verifies the response, updates payments and the order's payment_status, and generates a receipt view. This design keeps the payment workflow auditable and reduces the chance of mismatched totals.

7.5.6 Wallet Top-Up and ToyyibPay Integration

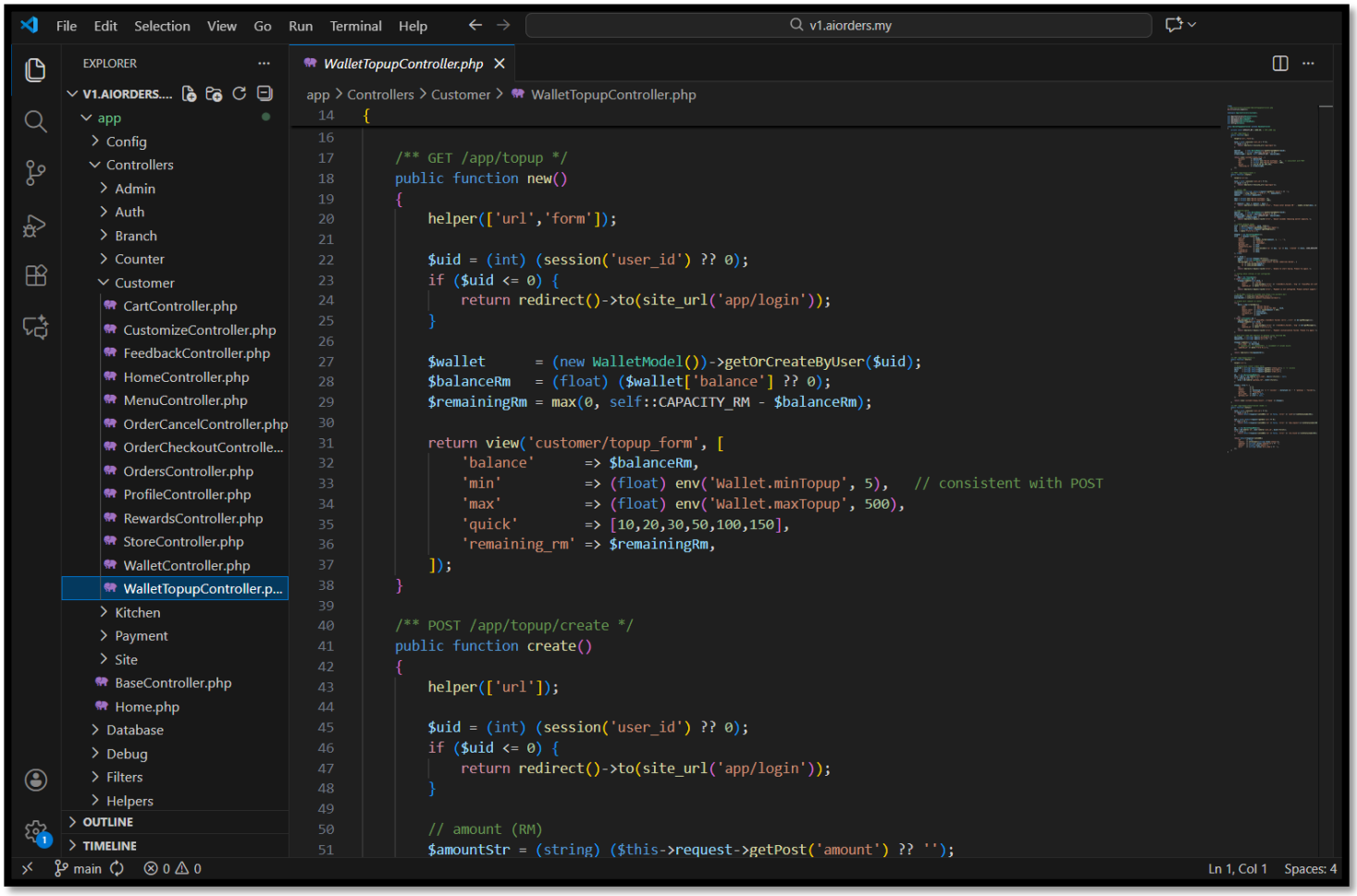


Figure 7.5.6: Wallet Top-Up Logic

Figure 7.5.6 illustrates the wallet top-up logic from the wallet controller (for example app/Controllers/Customer/WalletTopupController.php). When a customer submits a top-up request, the controller creates a record in wallet_topups with a unique bill code and amount, then calls ToyyibPay's API to generate a payment URL. After ToyyibPay confirms the transaction, a callback endpoint updates the top-up status, inserts a corresponding credit row in wallet_transactions, and adjusts the wallets.balance_rm field. The controller also includes idempotency checks so that if ToyyibPay sends the callback more than once, the wallet is not credited twice. This ensures that wallet balances remain accurate even under network retries or user refreshes.

7.5.7 Loyalty Points and Voucher Redemption

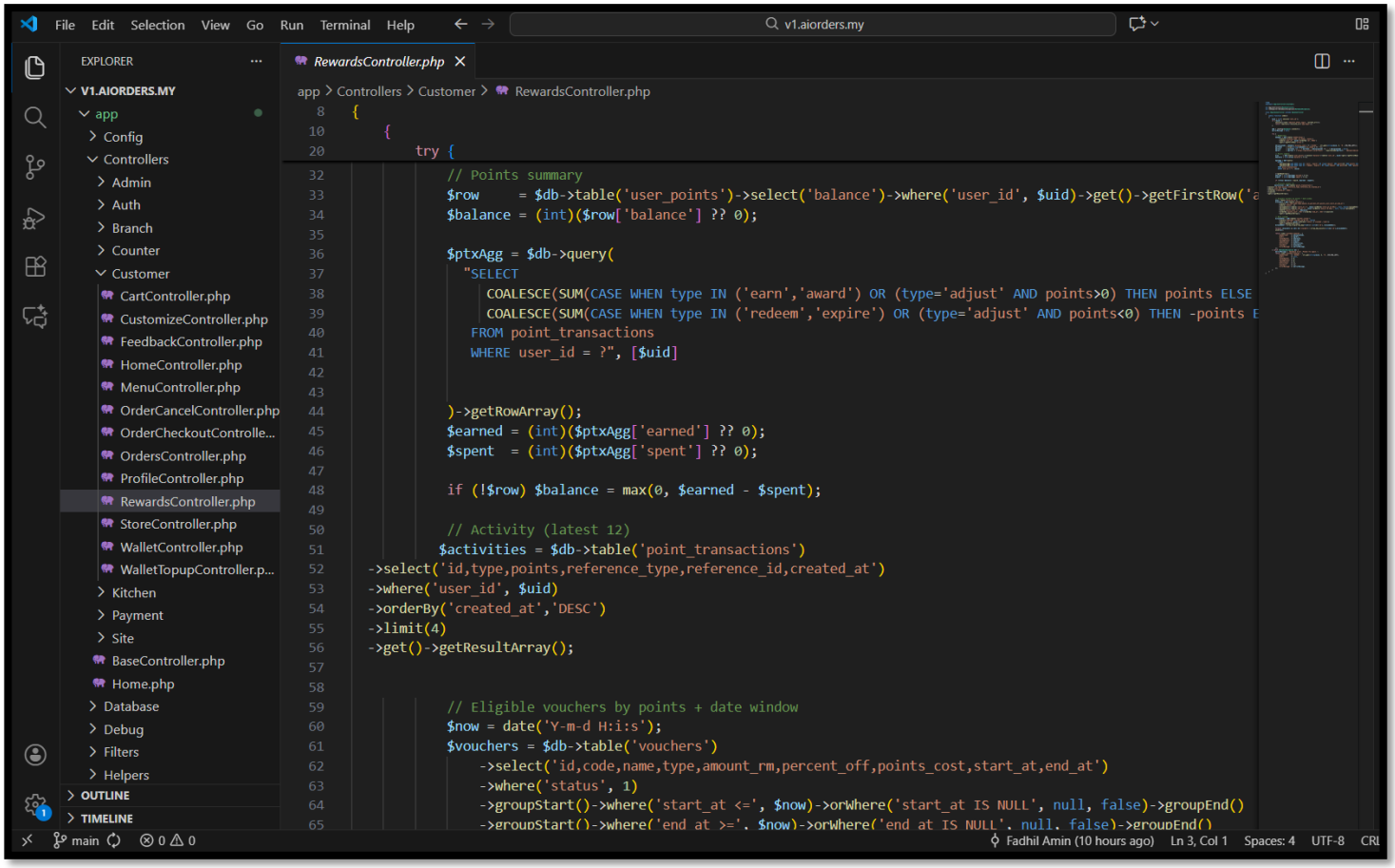


Figure 7.5.7: Loyalty and Voucher Logic

Figure 7.5.7 shows the loyalty and voucher logic implemented in a dedicated service or controller (for example app/Controllers/Customer/RewardsController.php). The code reads the active points_policies to calculate how many points a completed order should earn and inserts the result into point_transactions, while updating the customer's user_points balance. For voucher usage, the controller validates voucher rules (type, minimum spend, validity dates, usage limit) against the current order and reserves points where needed by marking voucher_claims as pending. After the order is successfully paid, the voucher claim is finalised and the reserved points are deducted; if the order is cancelled, the claim and points are safely rolled back. This implementation guarantees that points and vouchers are applied consistently across all channels.

7.5.8 Reporting and Security Checks

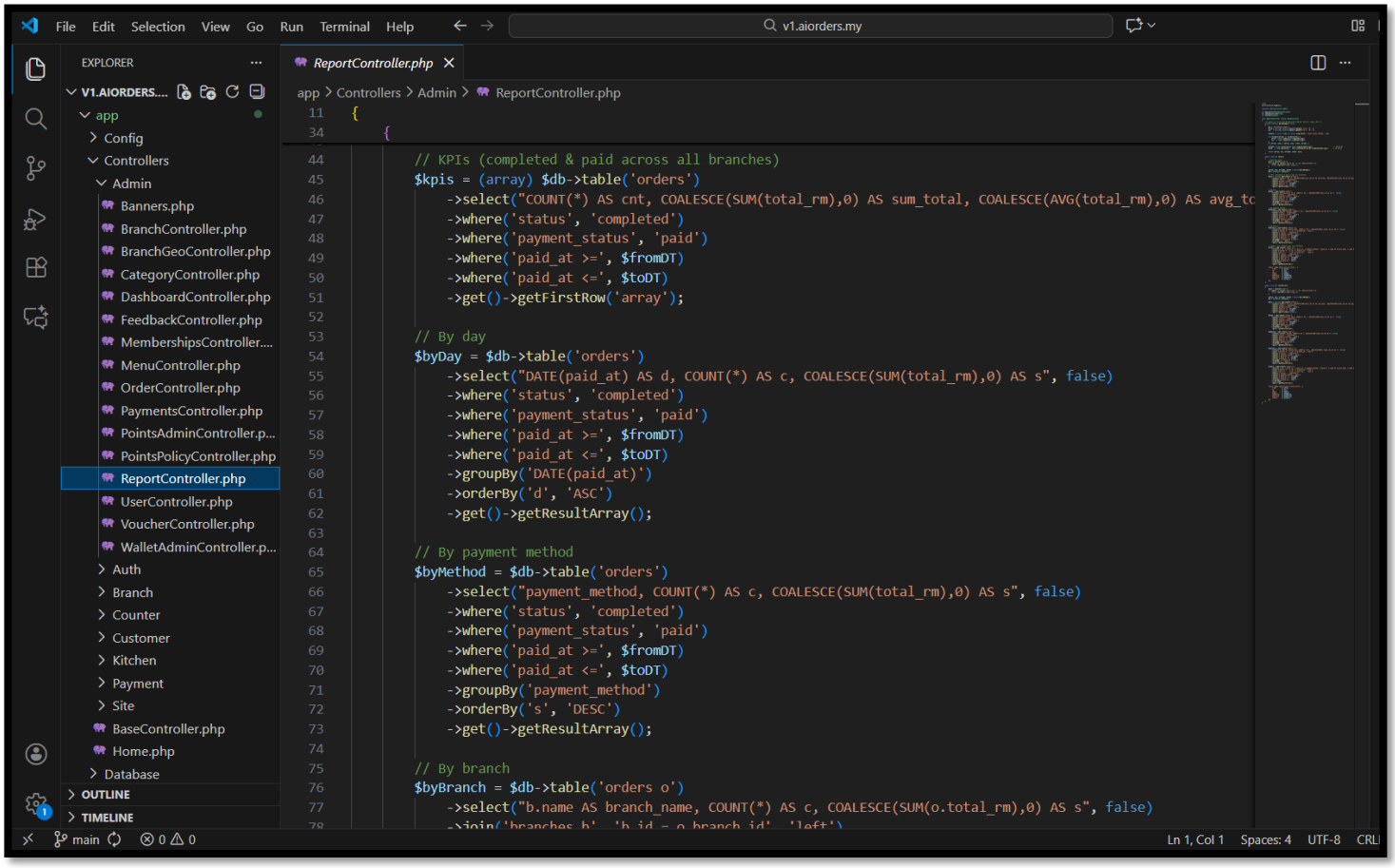


Figure 7.5.8: Reporting and Security-related code

Figure 7.5.8 presents the reporting and security-related code from the admin reporting controller and configuration files (for example app/Controllers/Admin/ReportController.php and app/Config/Filters.php). The reporting queries aggregate sales, wallet usage, and loyalty redemptions by branch and date, joining the orders, payments, wallet_transactions, and point_transactions tables to generate dashboards for management. At the same time, global filters enforce CSRF tokens on form submissions and sanitise input via CodeIgniter's validation layer. Additional checks such as verifying branch_id against the logged-in user's role prevent cross-branch data leakage. Together, these controls help maintain data integrity, protect sensitive financial information, and provide reliable analytics for decision-making.

7.6 Conclusion

In conclusion, Chapter 7 demonstrates how the Ai-Orders POS & Loyalty System's approved design was translated into a fully working implementation across customer, POS, kitchen, and admin interfaces. The chapter outlined how core components—such as environment configuration, authentication and role-based access, ordering and payment flows, wallet top-ups, and loyalty rewards—were implemented in CodeIgniter 4 with a shared MySQL schema. It also highlighted how ToyyibPay integration, branch-aware reporting, and comprehensive validation and security checks were embedded into the codebase to maintain data accuracy and protect financial transactions. Overall, the implementation realises the project's design goals by delivering a stable, maintainable, and role-driven system that supports Ai-CHA's daily operations, enhances customer experience, and provides a strong foundation for future enhancements.

8 TESTING

8.1 Introduction

Software testing is the process of evaluating and verifying that a software application or system meets specified requirements and functions as expected (BrowserStack, 2025). It is not only about detecting defects, but also about improving the quality, reliability and usability of the final product before it is used by real users (BrowserStack, 2024).

In general, software testing is organised into several levels, including unit testing, integration testing, system testing and acceptance testing (IBM, n.d.). Unit testing focuses on the smallest testable components, integration testing checks interactions between combined modules, system testing evaluates the complete system against functional and non-functional requirements, and acceptance testing validates that the system meets user and business needs (Techtarget, 2024; BrowserStack, 2025).

For the Ai-Orders system, testing was carried out in several stages:

- **Unit Testing** – to verify critical functions such as login, cart calculation, loyalty points, vouchers, wallet, and order status logic.
- **Integration Testing** – to ensure that modules such as customer ordering, POS, ToyyibPay wallet top-up, membership and reporting work correctly together.
- **System Testing** – to evaluate the behaviour of the fully integrated Ai-Orders system under realistic conditions, including functional and non-functional aspects.
- **User Acceptance Testing (UAT)** – to allow the Ai-CHA client to verify that the system supports real business processes and is suitable for daily operations (BrowserStack, 2025).

The following sections describe in detail the tests that were conducted, the units and functions involved, the inputs used and the expected outputs or errors.

8.2 Unit Testing

Unit testing focuses on testing individual units or components of a software application in isolation to ensure that each unit behaves as expected (IBM, n.d.; XenonStack, 2024). A “unit” can be a function, method or small module, and unit testing helps to detect defects early, improve code quality and make integration more reliable (HyperTest, 2024).

For Ai-Orders, unit testing was performed in the development environment using CodeIgniter 4 and a local MySQL database. The focus was on units that handle:

- Authentication and session control,
- Cart and order calculations, including rounding,
- Loyalty points and voucher logic,
- Wallet top-up and deduction rules, and
- Order status transitions and membership lookup.

The general procedure for unit testing was:

1. Preparing test data (sample users, branches, menu items, membership accounts, vouchers and wallet balances).
2. Executing the corresponding controller function or web form.
3. Observing the immediate output and any validation messages.
4. Verifying changes in the database using phpMyAdmin.

Table 8.1 Unit Testing conducted for Ai-Orders.

Unit/Function	Description	Input	Expected Output / Error	Status
Customer login	To ensure that only registered customers with correct credentials can log in.	Email and password of a registered customer; wrong password combinations.	With valid credentials, the system redirects to the customer home page and creates a session. With invalid credentials, an error message is displayed, and no session is created.	PASS
Admin / staff login	To verify that staff and admin accounts can log in and receive the correct role.	Admin/counter email and password; invalid combinations.	Successful login redirects to the appropriate dashboard (admin, counter, kitchen). Invalid login shows an error and remains on the login page.	PASS
Registration validation	To ensure that duplicate emails or phone	Registration form with an existing email/phone; form	The system shows validation errors (e.g., “email already exists”, “phone already exists”,	PASS

	numbers cannot be registered.	with missing required fields.	"field required"); the record is not saved into the database.	
Cart calculation and rounding	To verify that cart subtotal, discounts and rounding are calculated consistently.	Add menu items with different prices and toppings; apply discount and rounding; view cart and checkout pages.	Subtotal, discount, tax/service charge and final rounded total are identical on the cart and payment pages; there is no mismatch in the figures.	PASS
Loyalty points earning	To check that points are earned correctly based on the configured policy.	Complete orders for a member with various total amounts (e.g., RM10, RM50, RM100) after discounts.	Points are calculated using the earn rate and cap settings (e.g., 1 point per RM1 of eligible amount); new points are added to the member's balance and logged in `point_transactions`.	PASS
Loyalty points redemption	To verify that points can be redeemed at checkout and deducted correctly.	Member redeems a fixed number of points on an order.	Order total is reduced by the correct RM value of points; redeemed points are deducted from `user_points`; a redemption entry is recorded in `point_transactions`.	PASS
Voucher validation	To ensure that vouchers only apply when conditions are met (minimum spend, menu restrictions, expiry).	Apply a valid voucher to an eligible order; try applying the same voucher to an ineligible order or after expiry date.	Voucher is successfully applied only when conditions are satisfied. Otherwise, the system rejects the voucher with a message (e.g., "Voucher not applicable") and no discount is applied.	PASS
Wallet top-up validation	To validate that the wallet capacity (e.g., RM2,000) is not exceeded.	Perform top-up scenarios where current balance + top-up is below, equal to and above the capacity limit.	Top-up is approved when final balance does not exceed the limit; the system prevents top-up beyond the limit with a validation message; no wallet record is added in the rejected case.	PASS
Wallet debit at payment	To ensure that wallet deduction is correct when paying by wallet.	Member pays an order fully or partially using wallet balance.	Wallet balance is reduced by the exact amount used; wallet transaction log shows the deduction; order payment record	PASS

			reflects wallet as the payment method; no negative balance occurs.	
Order status transition	To confirm that orders only move through valid statuses.	Attempt transitions from `pending` → `confirmed` → `preparing` → `ready` → `completed` and some invalid jumps (e.g., `pending` → `completed`).	Valid transitions succeed and update the status field; invalid transitions are blocked and do not change the order status; appropriate messages are shown if needed.	PASS
Membership lookup (QR and code)	To verify that membership can be found by both QR token and display code.	Scan membership QR; enter alphanumeric display code; use non-existing code.	The system retrieves the correct member record and shows name/points when data is valid; an error is displayed when membership is not found; the order stores the membership ID when successful.	PASS

Unit testing showed that all critical units behaved as expected after minor corrections (for example, resolving early inconsistencies between cart total and checkout total). Once corrected, the units were considered stable and ready for integration testing.

8.3 Integration Testing

Integration testing focuses on how individual modules work together as a combined system, ensuring that data flows correctly across module boundaries and that interfaces between components function as expected (IBM, n.d.). It is particularly important because modules that work correctly on their own may still fail when they interact with other modules (Techtarget, 2024; LambdaTest, 2023).

In Ai-Orders, integration testing concentrated on the following key interactions:

- Customer web ordering ↔ POS and kitchen board,
- Membership and loyalty points ↔ orders and vouchers,
- Wallet and ToyyibPay ↔ payment and top-up records, and
- Admin configuration ↔ customer and POS interfaces.

Different browser sessions were used to simulate the various roles (customer, counter staff, kitchen staff and admin). The behaviours observed on the screen were then compared with the data stored in the database.

Table 8.2 Integration Testing conducted for Ai-Orders.

Unit/Function	Description	Input	Expected Output / Error	Status
Customer web order to POS queue	To ensure that orders placed by customers appear correctly on the POS and kitchen board.	Customer selects branch, adds items to cart and submits order via the web app.	A new order has been created with correct items, prices and branch; the order appears on the counter POS and kitchen board queue for that branch with the correct queue number and status.	PASS
POS order with membership and points	To check integration of counter POS with membership and loyalty modules.	Staff at the counter create an order, scans membership and completes payment.	The order is linked to the member; points are awarded and added to the member's balance; order details, points and membership information are stored correctly and visible in the member's order history.	PASS
Voucher redemption linked to order	To ensure that voucher usage is recorded across orders and voucher tables.	Member applies a voucher to an eligible order and completes payment.	Voucher discount is reflected in the order total; voucher status changes to "used"; the same voucher cannot be reused; voucher usage is recorded in voucher-related tables for audit.	PASS

Wallet top-up via ToyyibPay	To confirm that ToyyibPay callback and wallet module work together.	Member initiates a wallet top-up (e.g., RM50) → redirected to ToyyibPay sandbox → completes payment.	After successful payment and callback, wallet balance increases by RM50; the top-up record is marked as successful with reference/bill code; duplicate callbacks do not create extra credits.	PASS
Wallet payment for orders	To verify that wallet deduction and order payment are synchronised.	Member pays an order using wallet (full or partial), then views wallet history and order details.	Wallet balance is reduced by the amount used; wallet transaction log shows a deduction entry; order payment status shows “paid” with wallet as method; totals match across screens.	PASS
Order cancellation with loyalty rollback	To ensure that cancelling an order reverses loyalty and voucher effects.	Create an order using points and voucher for a member, then cancel the order in the POS.	Order status becomes “cancelled”; redeemed points are returned according to policy; voucher is reinstated or recorded appropriately; transaction logs show the reversal clearly.	PASS
Branch-level reporting	To check that orders from different branches are aggregated correctly.	Create orders from two or more branches; admin generates a daily report.	Admin report shows correct total sales, order count and payment breakdown per branch; there is no mixing of data between branches.	PASS
Status sync from kitchen to customer tracking	To verify that kitchen board updates appear on the customer interface.	Kitchen updates order status step-by-step (preparing → ready → completed).	The customer “My Orders” page shows updated statuses after refresh/auto-refresh; there is no mismatch between kitchen status and customer view.	PASS
Admin configuration sync	To validate that admin’s changes affect POS and customer views.	Admin edits a menu item’s price or availability; POS and customer menu views are refreshed.	Updated prices and availability appear correctly on both POS and customer-side menus; outdated data is not used; no broken items are shown.	PASS

8.4 System Testing

System testing evaluates the complete, integrated Ai-Orders system to verify that it meets the specified functional and non-functional requirements in an environment similar to the production environment (BrowserStack, 2025; IBM, n.d.). At this level, all modules that have passed unit and integration testing are combined and tested as a whole, focusing on realistic end-to-end scenarios and overall system behaviour rather than individual components (Vlink Info, 2024).

For the Ai-Orders project, system testing was carried out using:

- The full set of modules (customer web ordering, POS, kitchen board, admin dashboard, membership, loyalty points, vouchers and wallet/ToyyibPay integration).
- Sample data that reflects typical Ai-CHA operations (multiple branches, menu categories, member accounts, vouchers and wallet balances).
- Devices such as laptops and mobile phones running modern web browsers.

System testing was divided into functional testing and non-functional testing:

- Functional testing checked whether Ai-Orders correctly performs all required business processes, such as placing orders, processing payments, updating order statuses and generating reports.
- Non-functional testing focused on performance, usability, security and data consistency to ensure the system is practical and comfortable to use in day-to-day operations.

8.4.1 Functional Testing

Functional testing verifies that the system behaves according to its functional requirements by testing business processes, user interactions and data processing scenarios (BrowserStack, 2025; IBM, n.d.). In system-level functional testing, test cases are derived from the use cases and user stories rather than from internal code structure (Techtarget, 2024).

For Ai-Orders, functional system testing focused on the end-to-end workflows that involve multiple roles and modules, including:

- Guest and member ordering flows.
- Payment processing via cash, wallet and ToyyibPay.
- Multi-role daily operations across admin, counter and kitchen staff.
- Order cancellation logic and its effect on loyalty and wallet data.

Testing was performed by executing the full scenarios using the web interfaces and verifying that the results on screen matched the expected behaviour and database records. Table 8.3 summarises the main functional system tests.

Table 8.3 Functional Testing conducted for Ai-Orders.

Unit/Function	Description	Input (Test Procedure)	Expected Output / Error	Status
End-to-end guest order (pay at counter)	To verify that a guest user can place an order and complete payment at the outlet.	Guest selects nearest branch, browses menu, adds items to cart, selects "Pay at counter" and confirms order; counter staff locates the order in POS and marks it as paid after customer pays.	A new order is created with correct items, quantities and prices; order appears in the POS queue for the selected branch; order status changes from "pending" to "completed" after payment and kitchen processing; no errors occur during the process.	PASS
End-to-end member order (voucher, points and wallet/online payment)	To ensure that members can place orders with vouchers and points and pay using wallet or ToyyibPay.	Member logs in, selects branch, adds items to cart, applies an eligible voucher and redeems points, then pays using wallet or ToyyibPay; member checks order history and wallet/points balance afterwards.	Final payable amount after voucher and points is correctly calculated; payment is successful; wallet or ToyyibPay transaction is recorded; order is marked as paid and later as completed; member's wallet balance and points are updated correctly; all figures match in order details and transaction history.	PASS
Multi-role daily operation	To test a full "day in the life" scenario covering admin, customer, counter and kitchen roles.	Admin configures branches and menu items; multiple customers (guest and member) place orders; counter staff confirms and processes payments; kitchen staff updates order statuses from "preparing" to "ready" and "completed"; admin generates end-of-day sales report.	All roles can perform their tasks without conflict; orders flow correctly from customers to POS and kitchen; statuses are updated consistently across interfaces; end-of-day admin report shows correct totals and order counts that match the sample data and manual calculations.	PASS
Order cancellation scenario	To check system behaviour and data rollback when an order is cancelled mid-process.	Create sample orders for guest and member (including one with voucher and points); counter staff cancels the orders before completion; verify membership, voucher and	Cancelled orders are marked with status "cancelled"; no further status changes are allowed; for member orders, any wallet deductions, points redemptions or voucher usage are reversed according to defined rules;	PASS

		wallet information afterwards.	transaction logs clearly show the cancellation and any rollbacks; no inconsistent or orphan records remain.	
Membership identification and linking	To verify that membership is consistently applied to orders across customers and POS modules.	Member logs in and places order via web; separately, counter staff creates an order and scans membership QR or enters display code; verify membership details on both types of orders.	Orders placed by members via web are automatically linked to their membership record; orders created at POS with scanned membership show correct member name and points; membership ID is stored consistently in the order records; member's history page shows both web and POS orders.	PASS

The functional system tests demonstrate that Ai-Orders correctly supports the main business workflows required by Ai-CHA. All critical flows, such as ordering, payment, status management and reporting, operated as expected. Any minor issues (for example, wording of error messages) were fixed immediately and re-tested until the behaviour matched the requirements.

8.4.2 Non-Functional Testing

Non-functional testing evaluates characteristics of the system that are **not directly related to specific functions**, such as performance, usability, reliability and security (BrowserStack, 2024; IBM, n.d.). These aspects are important to determine whether the system is practical and comfortable to use in real-world conditions (Vlink Info, 2024).

For Ai-Orders, non-functional system testing focused on four key aspects:

1. **Usability and responsiveness** – whether the system is easy to use and displays correctly on different screen sizes.
2. **Performance under moderate load** – whether the system remains responsive when multiple users perform actions in a short period of time.
3. **Security and access control** – whether only authorised users can access protected pages and perform sensitive actions.
4. **Data consistency and integrity** – whether totals and balances remain correct across modules after multiple operations.

Table 8.4 Non-Functional Testing conducted for Ai-Orders.

Unit/Function	Description	Input (Test Procedure)	Expected Output / Error	Status
Usability and responsiveness	To examine layout, readability and navigation on different devices.	Access the customer web app and POS dashboard using a laptop and mobile phone; perform typical tasks such as logging in, browsing menu, adding to cart, processing orders and viewing reports; observe layout and interactions.	Layout automatically adapts to screen size (responsive design); buttons and text are readable on both laptop and mobile; main actions (add to cart, checkout, update status) are easy to find; no horizontal scrolling is required for core tasks on mobile; navigation is clear for new users.	PASS
Performance under moderate load	To see how the system behaves with multiple concurrent users.	Simulate several users placing orders, updating statuses and viewing reports within a short time window using multiple browser sessions.	System remains responsive; page load times remain within an acceptable range; there are no “500 Internal Server Error” messages or timeouts; all submitted orders and updates are processed correctly without duplication or loss.	PASS
Basic security and access control	To confirm that only authorised users can access protected functions and pages.	Attempt to access admin URLs without logging in; log in as a customer and try to open admin or POS URLs; attempt restricted actions such as editing branches or menus as a non-admin.	Unauthenticated users are redirected to the login page; customers cannot open admin or POS pages and see appropriate “unauthorised” messages; only admin users can access admin sections and perform sensitive actions; role-based restrictions behave as defined.	PASS
Session handling and logout	To ensure sessions are managed securely and removed after logout.	Log in as different roles (customer, admin, staff); perform some actions; click logout; press back button or re-open protected URLs.	After logout, previous session cannot be reused; accessing protected URLs redirects back to login; no sensitive information is displayed after session termination.	PASS
Data consistency and integrity	To verify that totals and balances	Perform a sequence of operations including orders, cancellations,	Sales totals, wallet balances and points balances are consistent across all relevant pages and	PASS

	remain consistent across the system after various operations.	wallet top-ups, wallet payments, points earning and redemption; then compare data in dashboards, history pages and database tables.	database records; there are no negative balances, missing records or mismatched totals; reports can be reconciled with transaction history.	

The non-functional testing results indicate that Ai-Orders are usable, responsive and secure enough for typical usage in Ai-CHA outlets. The system handles moderate concurrent activity without performance degradation, enforces role-based access properly and maintains consistent data across modules. Minor cosmetic issues, such as fine-tuning spacing on some smaller screens, were identified and corrected during this testing phase.

8.5 User Acceptance Testing (UAT)

User Acceptance Testing (UAT) is the final phase of software testing in which real users or business representatives verify that the software meets their needs and works as expected in real-world scenarios (BrowserStack, 2025; BugBug, 2025). UAT focuses on validating business requirements and usage comfort rather than low-level technical defects (TestGrid, 2024)

For Ai-Orders, UAT was conducted with the Ai-CHA Ice Cream & Tea representative, who acted as the client and primary stakeholder. The UAT session involved:

- Demonstrating the complete ordering flow from the customer's perspective, including membership identification, voucher usage and wallet payment.
- Allowing the client to use the counter POS and kitchen board interfaces to process sample orders.
- Allowing the client to explore the admin dashboard, menu configuration and basic reporting functions.
- Collecting feedback on usability, clarity of information, speed and suitability for Ai-CHA's operations.

The detailed UAT findings, including the checklist items, client comments and analysis, are documented in Sections 8.5.1 to 8.5.5 of this report.

8.5.1 Client Testing and Result

- **Interview Details**

Figure 8.5.1 a: Interviewee Picture

Name: Hendrik Leong Wai Xun

Position: Ai-CHA Marketing Manager

Location: via Google Meet

Date: 11th November 2025 (Tuesday)

Figure 8.5.1 b: Interview with the client via Google Meet

8.5.2 Functionality Feedback (Customer Side)

Table 8.5.2 a: Feedback Analysis of Question 1

QUESTION 1	Does the web app support a full customer journey—browse → customize → add to cart → checkout → payment confirmation—with a clear order number/receipt?
CLIENT FEEDBACK	I completed a full test order on mobile: browsed categories, customized sugar/ice/topping, added to cart, checked out, and received a confirmation screen with an order reference. The receipt page summarizes items, options, discounts, and totals.
ANALYSIS	A complete, linear flow reduces confusion at checkout and makes it easy for customers to verify what they bought. An explicit order reference and receipt enable smoother counter pickup and post-purchase support.

Table 8.5.2 b: Feedback Analysis of Question 2

QUESTION 2	Are account creation and login reliable with helpful validation (email/phone uniqueness, password rules, error messages)?
CLIENT FEEDBACK	I created an account with valid inputs and received clear inline errors for invalid ones. Duplicate email/phone was blocked. After logging in, the session persisted as I navigated between pages without logging me out.
ANALYSIS	Consistent validation protects data integrity and reduces support tickets caused by account issues. Stable sessions make multi-step actions (customize → checkout) feel smooth on both desktop and mobile.

Table 8.5.2 c: Feedback Analysis of Question 3

QUESTION 3	Can customers discover products efficiently using categories, search, and item detail pages?
CLIENT FEEDBACK	Category filters updated results instantly and searched for returned relevant items. Item pages displayed price, options, and images that loaded quickly without distortion.
ANALYSIS	Good discoverability shortens time-to-purchase and lowers bounce rates. Clean media and descriptive details improve trust and reduce pre-checkout hesitations.

Table 8.5.2 d: Feedback Analysis of Question 4

QUESTION 4	Do customization options (ice/sugar/toppings) recalculate prices and show selections in the cart accurately?
CLIENT FEEDBACK	When I changed options, the item price and the cart subtotal updated immediately. The cart line showed each chosen option so I could verify before paying.
ANALYSIS	Accurate, visible recalculation prevents billing disputes and reduces the likelihood of order modifications at the counter.

Table 8.5.2 e: Feedback Analysis of Question 5

QUESTION 5	Are cart actions dependable (add/remove items, change quantities, apply voucher/points) and do totals reflect the changes clearly?
CLIENT FEEDBACK	I increased/decreased quantities and removed items without glitches. Applying a test voucher showed the discount breakdown and updated the total. The final amount matched the summary.
ANALYSIS	Predictable cart behavior builds confidence and reduces abandonment. Transparent discount math helps customers understand savings and lowers refund requests.

8.5.3 Functionality Feedback (Admin Side)

Table 8.5.3 a: Feedback Analysis of Question 6

QUESTION 6	Can admins manage menus and branch visibility—create/edit/delete items, upload images, set prices/options, and enable/disable items per branch—with changes reflected on Web & POS immediately?
CLIENT FEEDBACK	Yes. I added items with images and categories, edited names/prices/options, and toggled visibility for specific branches. Duplicates were handled with clear validation. Changes appeared on both the web app and POS within seconds.
ANALYSIS	Fast, per-branch menu control lets outlets run local promos and seasonal rotations without affecting others. Immediate propagation keeps staff and customers aligned with the latest items and prices.

Table 8.5.3 b: Feedback Analysis of Question 7

QUESTION 7	Can admins view sales reports (filter by date/branch/payment method, totals and top items) and print them in a clean A4-friendly layout?
CLIENT FEEDBACK	Yes. I filtered daily/weekly/monthly reports by branch and payment method, checked totals and item summaries, and used the print button to produce a neat A4 report. Printed totals matched the on-screen figures and sample orders.
ANALYSIS	Clear, printable reporting supports daily closing and management reviews. Accurate filters and totals streamline handover to accounting and simplify store performance tracking.

Table 8.5.3 c: Feedback Analysis of Question 8

QUESTION 8	Can admins manage users and roles—create/edit/disable accounts, assign roles (admin/branch/counter/kitchen), enforce unique email/phone, reset passwords, and handle account status changes (active/inactive)?
CLIENT FEEDBACK	Yes. I created and edited users, assigned roles (admin, branch), and linked users to specific branches. The system blocked duplicate emails and phones, allowed password resets, and changed account statuses from active to inactive.
ANALYSIS	User and role management supports a secure, controlled environment. Enforcing unique identifiers and status changes prevents account conflicts and ensures operational integrity.

Table 8.5.3 d: Feedback Analysis of Question 9

QUESTION 9	Does membership lookup (manual code or QR scan) return the correct customer profile, and handle invalid inputs gracefully?
CLIENT FEEDBACK	Scanning a valid QR token pulled the correct member details immediately; manual code entry also worked. Invalid tokens produced a clear error without crashing the page.
ANALYSIS	Fast, accurate lookups cut queue time and reduce manual typing errors. Proper error handling avoids service interruptions.

8.5.4 Usability Feedback

Table 8.5.4 a: Feedback Analysis of Question 10

QUESTION 10	Is the checkout sequence clear (order summary → payment → confirmation), and are pick-up notes/instructions communicated?
CLIENT FEEDBACK	The checkout steps were sequential with no dead ends. After payment, the confirmation page displayed the pick-up counter instructions and any branch-specific notes.
ANALYSIS	Clear sequencing minimizes cognitive load at the point of payment. Pickup guidance reduces queue questions and speeds handover at the store.

Table 8.5.4 b: Feedback Analysis of Question 11

QUESTION 11	Can customers track order status (Confirmed → Preparing → Ready) in real time and refresh reliably?
CLIENT FEEDBACK	The status badges progressed as staff updated the order. Manual refresh reflected changes consistently, and the “Ready” state highlighted pickup instructions.
ANALYSIS	Real-time feedback lowers uncertainty and reduces counter inquiries. Timely status visibility improves the customer’s arrival timing and operational flow.

Table 8.5.4 c: Feedback Analysis of Question 12

QUESTION 12	Do “My Orders,” “Points Balance,” and “Vouchers” accurately reflect recent purchases and redemptions with a visible history?
CLIENT FEEDBACK	My last order appeared in history within seconds, points were added to the balance, and voucher usage was recorded with time and value.
ANALYSIS	Post-purchase transparency reinforces trust and encourages repeat use of loyalty features. Historical data supports self-service checks by customers.

8.5.5 Performance, Security & General Feedback

Table 8.5.5 a: Feedback Analysis of Question 13

QUESTION 13	Do web orders arrive in the POS in real time, and does the order list remain responsive during busy periods?
CLIENT FEEDBACK	A test order placed on the web appeared on the POS list immediately. Using refresh control kept the queue updated while I processed multiple orders.
ANALYSIS	Timely ingestion prevents missed tickets and maintains throughput at peak times. A responsive list helps staff prioritize and reduce waiting times.

Table 8.5.5 b: Feedback Analysis of Question 14

QUESTION 14	Does the order status workflow (Pending → Confirmed → Preparing → Ready → Completed) update both staff views and customer views, with logs?
CLIENT FEEDBACK	I advanced an order through each stage. Customer status changed accordingly, and order_status_logs captured the time, actor, and new status. The paid_at timestamp was set on completion.
ANALYSIS	A traceable workflow strengthens accountability and accelerates issue resolution if a customer questions timing or preparation steps.

Table 8.5.5 c: Feedback Analysis of Question 15

QUESTION 15	Are wallet top-ups handled securely via ToyyibPay with bank redirect + 2FA, server-verified crediting, and a printable receipt?
CLIENT FEEDBACK	I was sent to toyyibpay.com to enter my details, chose Maybank2u (FPX), then redirected to maybank2u.com.my to log in and approve via Secure2u. After approval, the app credited the amount only after ToyyibPay's server callback. Retry didn't double-credit. The wallet ledger shows amount/time/bill code/gateway ref, and I could print a receipt.
ANALYSIS	Bank-site login + Secure2u keeps credentials off the app. Server callback + idempotency stop spoofed or duplicate credits. Ledger + receipt provides clear reconciliation and auditability.

8.5.6 End User Survey

This section presents the results of the end-user survey conducted to evaluate the usability and accessibility of the Ai-Orders system for Ai-CHA Ice Cream & Tea. The survey was distributed to a group of respondents that included existing Ai-CHA customers as well as outlet staff such as counter, kitchen, and administrative users. The objective was to gather feedback on ease of use, clarity of information, navigation, visual design, performance, and overall satisfaction when using Ai-Orders for ordering and daily operations. The responses were collected using structured questions with Likert-scale options and short comments. The following charts illustrate the demographic distribution of respondents, their typical role when using the system (customer or staff), and their main purpose when accessing Ai-Orders, followed by a brief analysis of the patterns observed in each figure.

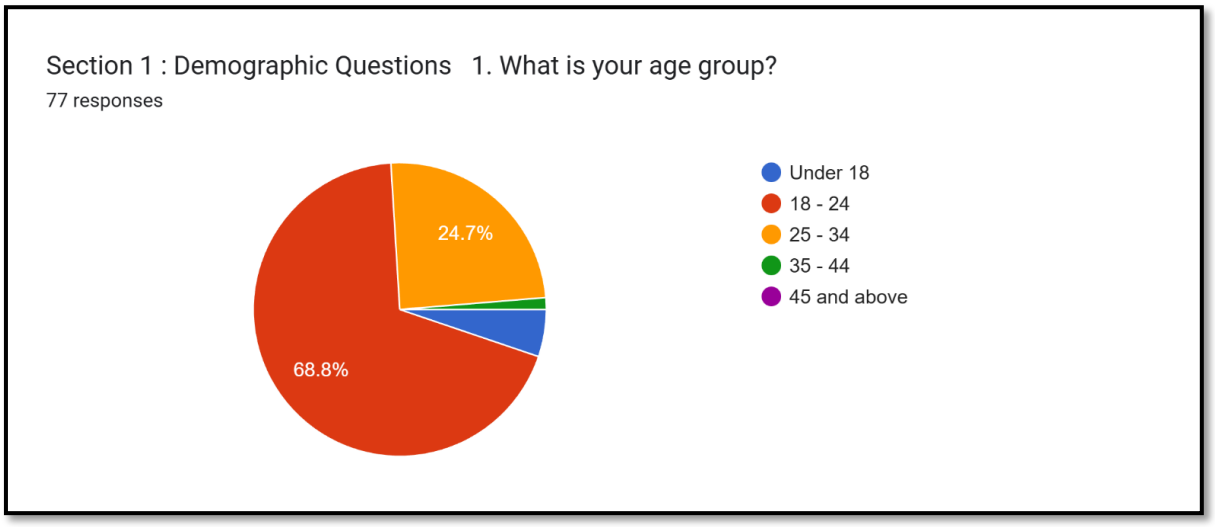


Figure 8.5.6 a: Question 1

Figure 8.5.6 (a) shows that the survey sample is strongly aligned with Ai-CHA's primary target market, with **68.8%** of respondents aged **18–24** and **24.7%** aged **25–34**, while only a small proportion fall under 18 or within the 35–44 group and almost none are 45 and above. This concentration of young adults is advantageous for evaluating Ai-Orders because this demographic is highly familiar with smartphones, QR codes and cashless payments, meaning their feedback is directly relevant to the intended usage pattern of the system. It also suggests that the user interface, features such as loyalty points and wallet top-up, and the overall flow of online ordering are being validated by the group most likely to adopt and promote the system in real life, which strengthens confidence that Ai-Orders meets the expectations of its core user segment.

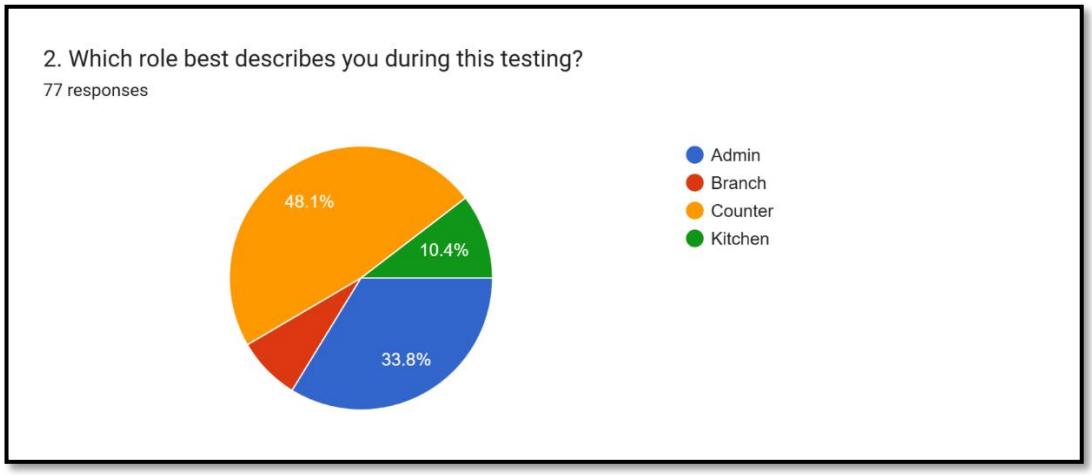


Figure 8.5.6 b: Question 2

Figure 8.5.6 (b) shows that most respondents tested Ai-Orders in the **counter** role (48.1%), followed by **admin** users (33.8%), with smaller groups from the **kitchen** (10.4%) and **branch** roles. This is a strong distribution for the evaluation because counter and admin users are the ones who use the system most frequently to handle orders, payments and configuration, while kitchen and branch users still provide input on order visibility and status updates. Overall, the graph indicates that feedback was collected from the main operational roles that are critical to Ai-Orders' daily usage.

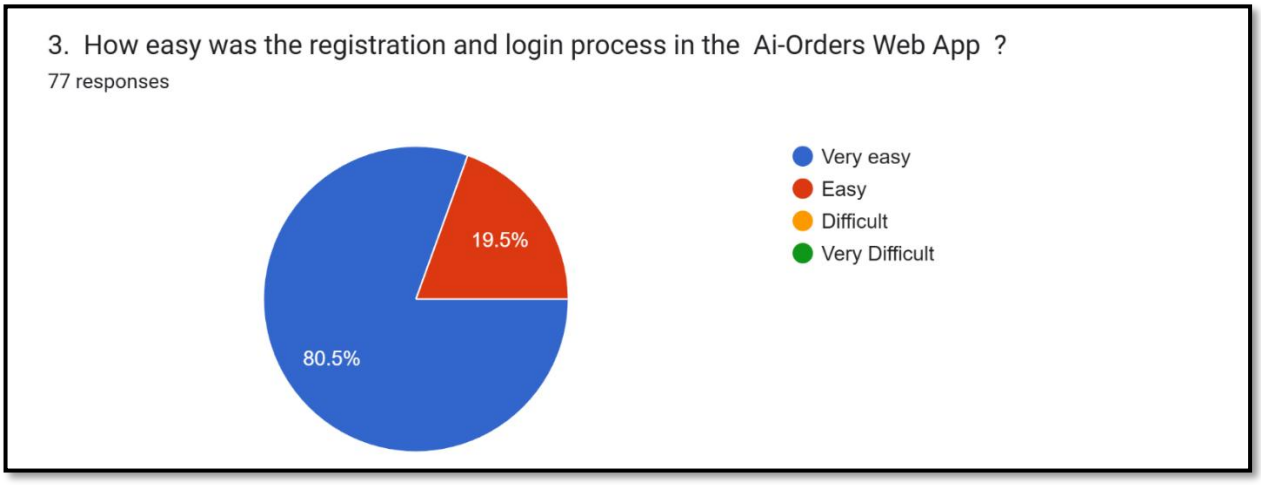


Figure 8.5.6 c: Question 3

Figure 8.5.6 (c) shows an overwhelmingly positive response towards the registration and login process in the Ai-Orders Web App, with **80.5%** of respondents rating it as **"Very easy"** and the remaining **19.5%** selecting **"Easy"**, while no one reported it as difficult. This result indicates that users can create accounts and sign in with minimal confusion or errors, suggesting that the forms, validation messages and overall flow are clear and well-designed. From a usability perspective, this is important because registration and login are the first steps in using Ai-Orders; a smooth experience here reduces drop-offs and builds user confidence to continue exploring other features such as ordering, wallet top-up and loyalty points.

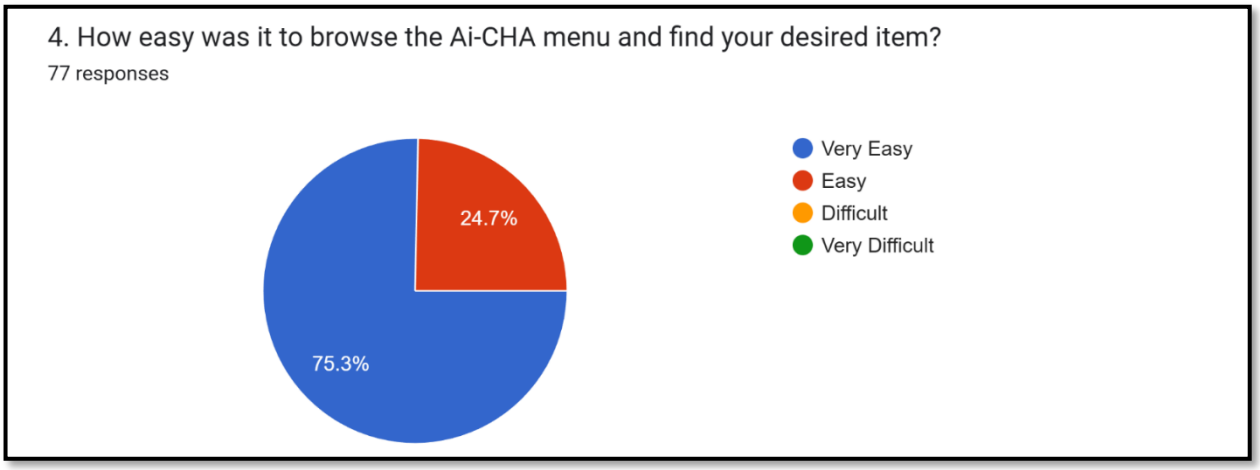


Figure 8.5.6 d: Question 4

Figure 8.5.6 (d) shows that users had a very positive experience when browsing the Ai-CHA menu, with **75.3%** rating it **"Very Easy"** and **24.7%** choosing **"Easy"**, and no respondent finding it difficult. This indicates that the menu structure, categories and item labels in Ai-Orders are clear enough for users to quickly find what they want, which is important for fast ordering in a café environment. It also suggests that the current layout already supports good usability, so future improvements can focus on adding advanced features (such as filters or favourites) rather than fixing basic navigation issues.

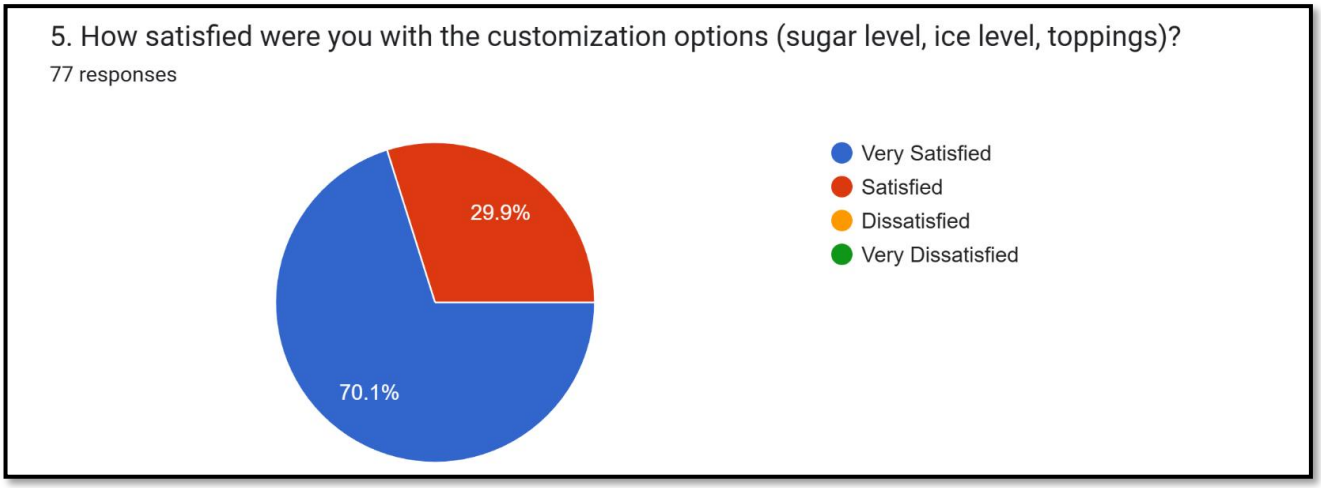


Figure 8.5.6 e: Question 5

Figure 8.5.6 (e) shows a very strong level of satisfaction with the customization options in Ai-Orders, where **70.1%** of respondents reported being **"Very Satisfied"** and the remaining **29.9%** selected **"Satisfied"**, with no one expressing dissatisfaction. This suggests that features such as choosing sugar level, ice level and toppings are clear, flexible and match users' expectations for personalizing their drinks. The result also indicates that the current design of the customization screen successfully supports Ai-CHA's concept of made-to-order beverages, so future improvements can focus on adding more variety or presets rather than fixing fundamental usability issues in this area.

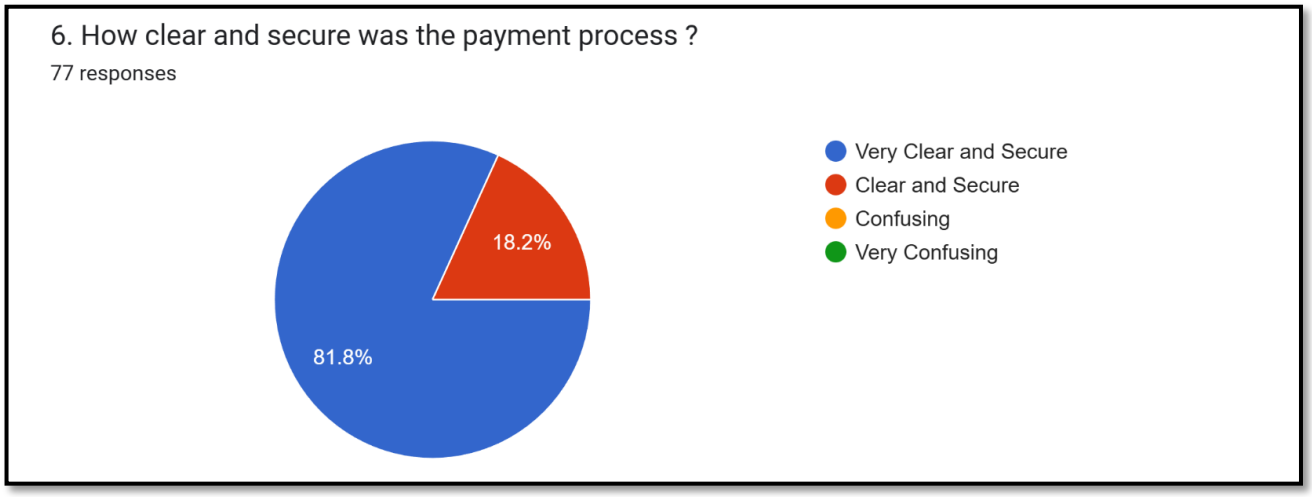


Figure 8.5.6 f: Question 6

Figure 8.5.6 (f) shows that users feel very confident with the payment process in Ai-Orders, with **81.8%** rating it **"Very Clear and Secure"** and **18.2%** choosing **"Clear and Secure"**. No respondents selected "Confusing" or "Very Confusing," which means there were no negative experiences reported. This indicates that the payment steps, messages and confirmations are easy to follow and give users a strong sense of safety. Overall, the graph suggests that Ai-Orders successfully delivers a clear and trustworthy payment experience for its users.

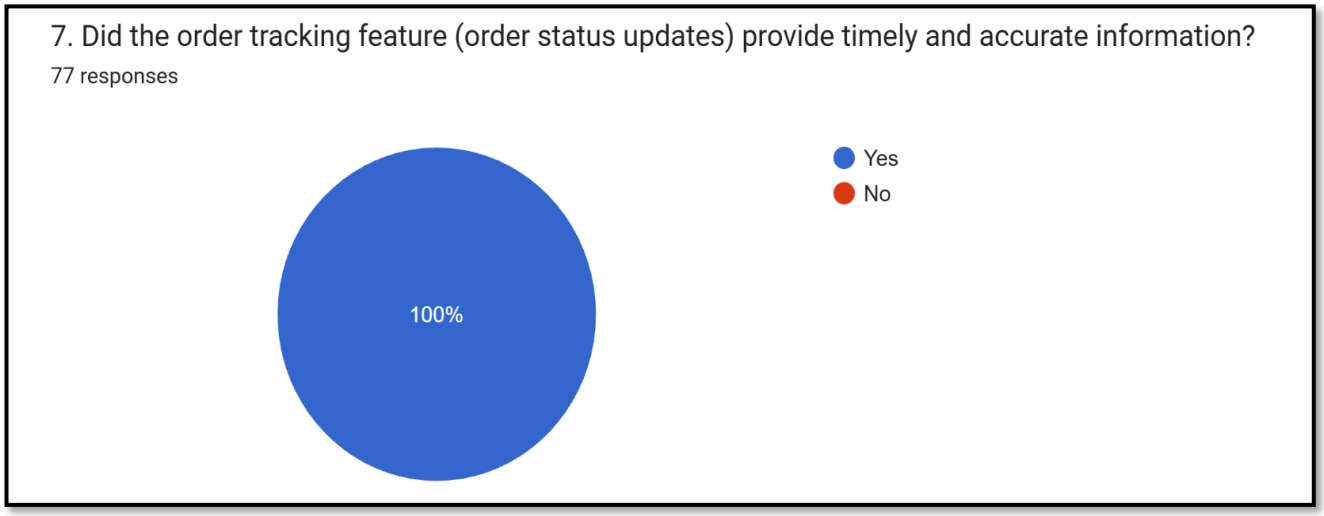


Figure 8.5.6 g: Question 7

Figure 8.5.6 (g) shows a unanimous result, where **100%** of respondents answered **"Yes"** to whether the order tracking feature provided timely and accurate information. This means every user felt that the status updates in Ai-Orders were clear and up to date. Such a result indicates that communication between customer view, counter POS and kitchen board is working smoothly. Overall, the graph suggests that the order tracking feature successfully supports users in monitoring their orders with high confidence.

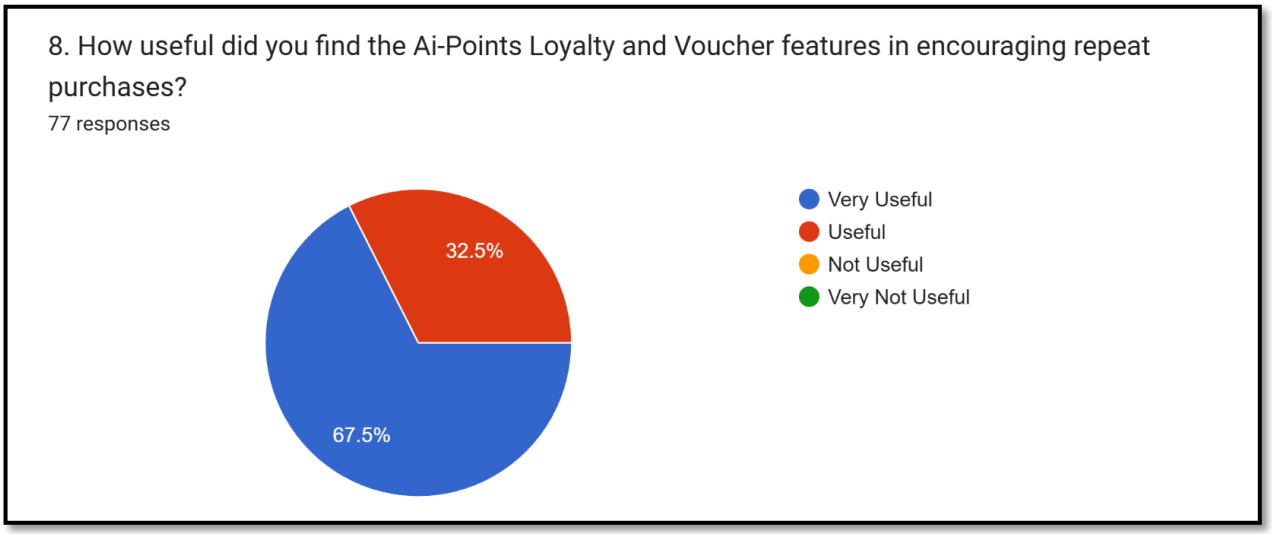


Figure 8.5.6 h: Question 8

Figure 8.5.6 (h) shows that users view the Ai-Points Loyalty and Voucher features very positively, with **67.5%** rating them **"Very Useful"** and **32.5%** selecting **"Useful"**. No respondents felt that these features were not useful. This indicates that customers clearly see value in collecting points and redeeming vouchers through Ai-Orders. Overall, the graph suggests that loyalty design is effective in encouraging repeat purchases and strengthening customer engagement with Ai-CHA.

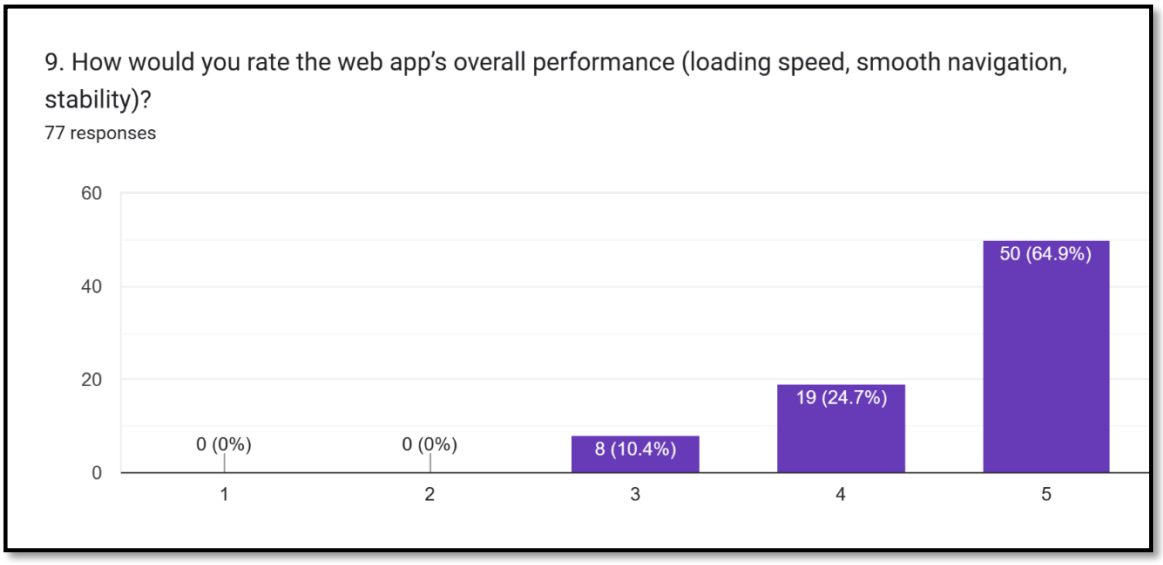


Figure 8.5.6 i: Question 9

Figure 8.5.6 (i) shows that users rated the web app's overall performance very highly, with **64.9%** giving it a score of **5** and **24.7%** rating it **4**. Only **10.4%** chose a neutral score of **3**, and no respondents rated the performance at levels 1 or 2. This means most users were satisfied with loading speed, smooth navigation and stability. Overall, the graph suggests that Ai-Orders performs reliably and feels responsive during normal use.

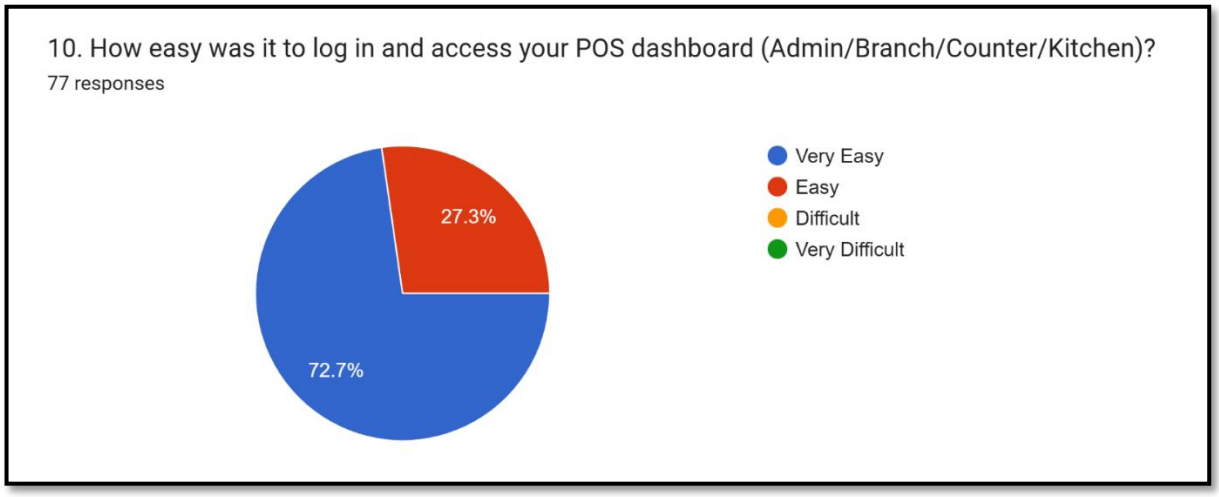


Figure 8.5.6 j: Question 10

Figure 8.5.6 (j) shows that users found it straightforward to log in and access their respective POS dashboards, with **72.7%** rating the process as **"Very Easy"** and **27.3%** choosing **"Easy"**. No one reported it as difficult or very difficult. This suggests that the role-based login flow and dashboard routing in Ai-Orders are clear and well designed for admin, branch, counter and kitchen users. Overall, the graph indicates that staff can quickly reach the correct interface and start working without confusion.

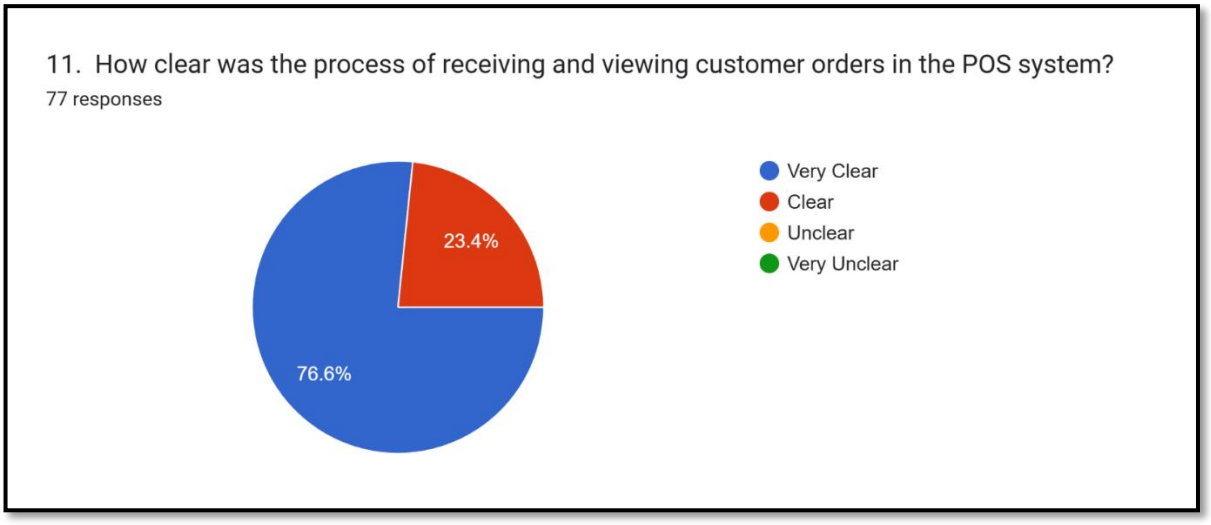


Figure 8.5.6 k: Question 11

Figure 8.5.6 (k) shows that staff felt the process of receiving and viewing customer orders in the POS system was easy to understand, with **76.6%** rating it **"Very Clear"** and **23.4%** selecting **"Clear"**. No respondents chose "Unclear" or "Very Unclear." This suggests that the order list, status indicators and layout of the POS screen are well organised for daily use. Overall, the graph indicates that Ai-Orders helps staff quickly see new orders and reduces confusion during busy periods.

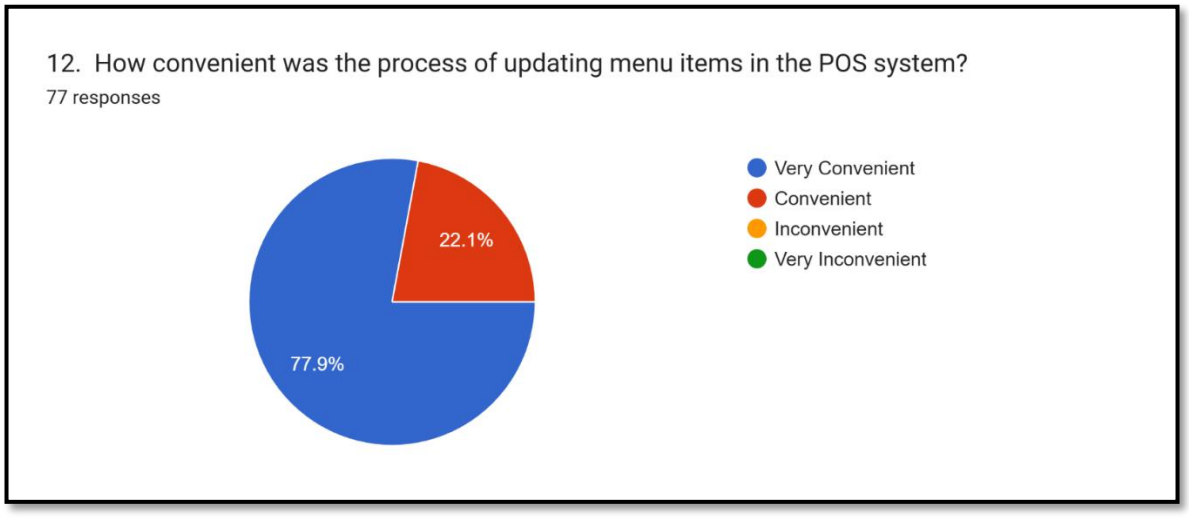


Figure 8.5.6 l: Question 12

Figure 8.5.6 (l) shows that users found updating menu items in the POS system highly practical, with **77.9%** rating the process as **"Very Convenient"** and **22.1%** choosing **"Convenient."** No respondents selected "Inconvenient" or "Very Inconvenient." This indicates that tasks such as changing prices, availability or item details can be done quickly and without confusion. Overall, the graph suggests that Ai-Orders supports efficient menu management for outlet staff.

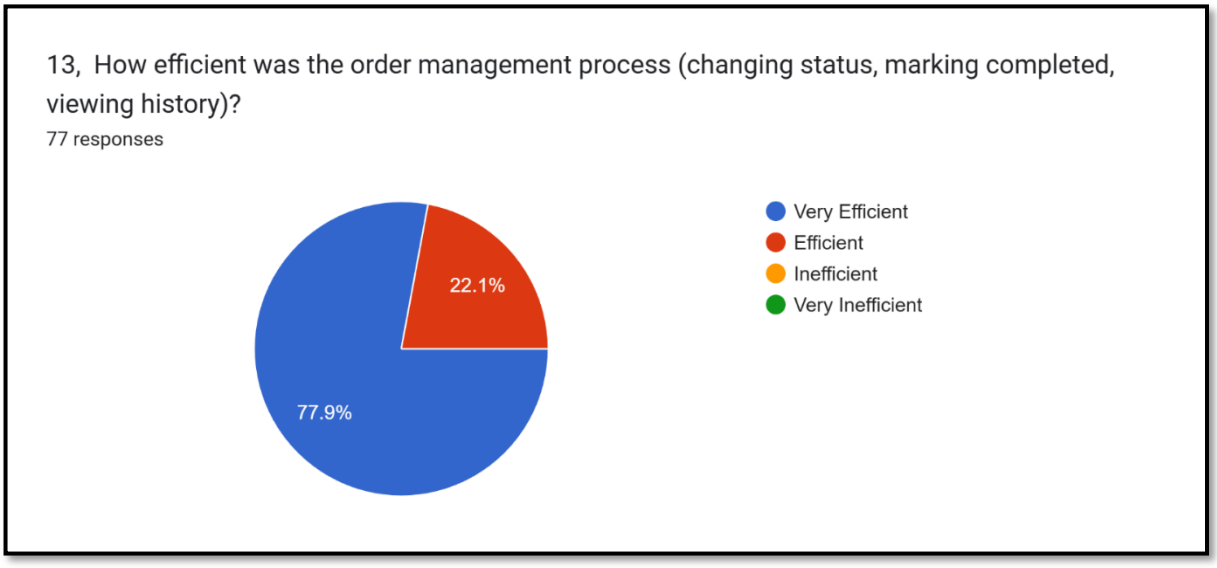


Figure 8.5.6 m: Question 13

Figure 8.5.6 (m) shows that users rated the order management process in Ai-Orders very positively, with **77.9%** choosing **"Very Efficient"** and **22.1%** selecting **"Efficient."** No respondents felt it was inefficient. This means tasks such as changing order status, marking orders as completed and viewing history can be done quickly and smoothly. Overall, the graph suggests that Ai-Orders helps staff manage orders in an organised and time-saving way.

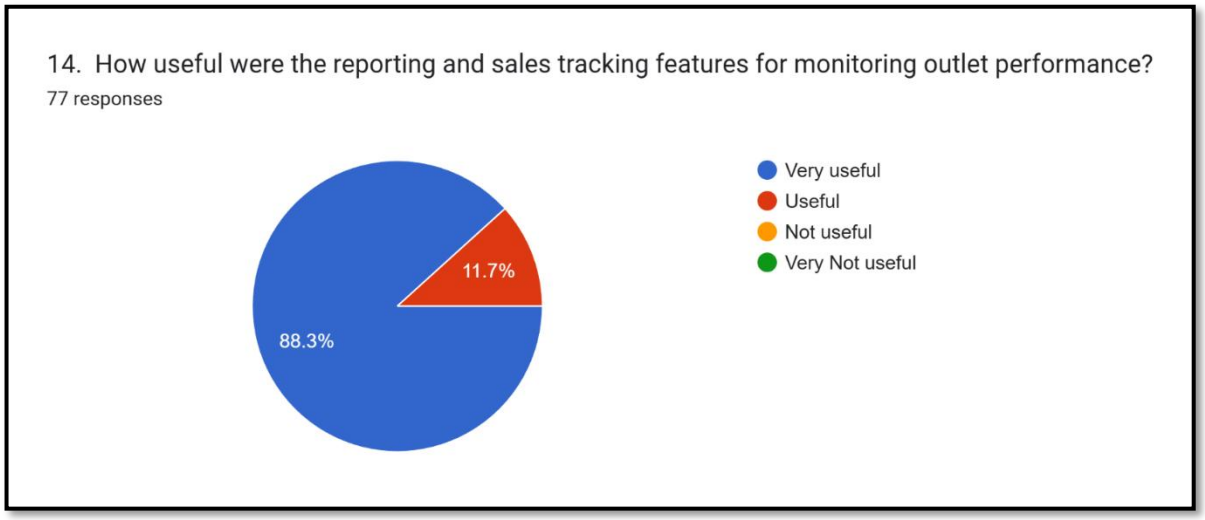


Figure 8.5.6 n: Question 14

Figure 8.5.6 (n) shows that respondents strongly valued the reporting and sales tracking features in Ai-Orders, with **88.3%** rating them **"Very useful"** and **11.7%** selecting **"Useful."** No one considered these features not useful. This means users feel the reports give clear insight into outlet performance, such as sales totals and trends. Overall, the graph suggests that Ai-Orders successfully supports managers in monitoring and making decisions about their outlets.

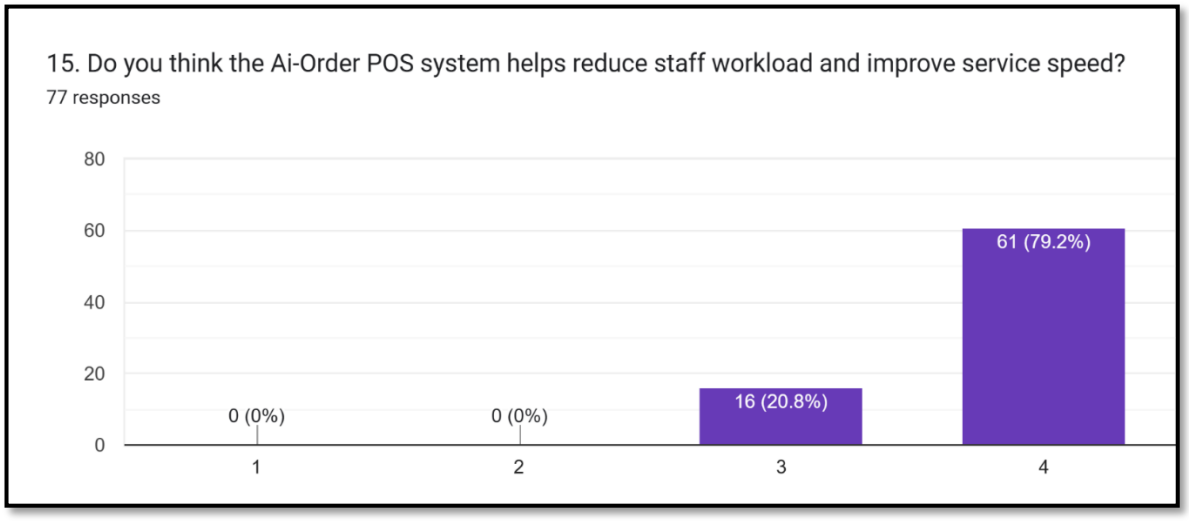


Figure 8.5.6 o: Question 15

Figure 8.5.6 (o) shows very positive views on whether the Ai-Order POS system reduces staff workload and improves service speed, with **79.2%** of respondents giving the highest rating (**4**) and **20.8%** choosing **3**. No one selected the lower ratings (1 or 2), meaning there were no negative opinions. This indicates that users clearly feel the system helps them work faster and handle orders more efficiently. Overall, the graph suggests that Ai-Orders achieves its main objective of supporting staff productivity and speeding up service.

Overall, the client agreed that Ai-Orders:

- Supports Ai-CHA's core business processes (taking orders, processing payments, tracking loyalty points and managing wallet top-ups).
- Simplifies operations compared to the previous manual or third-party ordering method.
- Offers an interface that can be used by staff after basic training, with only minor suggestions for additional reports and more descriptive labels.

8.6 Conclusion

This chapter has presented the testing activities carried out for the Ai-Orders system. Unit testing ensured that important functions such as login, cart calculation, loyalty points, vouchers, wallet operations and order status updates worked correctly on their own. Integration testing verified that these units interacted smoothly across modules, including customer ordering, POS, kitchen, membership and ToyyibPay payment gateway integration. System testing confirmed that the fully integrated Ai-Orders system met both functional and non-functional requirements under realistic usage conditions. Finally, User Acceptance Testing provided confirmation from the Ai-CHA client that the system fits the intended business processes and is practical for daily operations.

The combination of these testing levels increases confidence that Ai-Orders is stable, reliable and ready for deployment in Ai-CHA outlets. Any remaining issues are minor enhancements or cosmetic improvements that can be addressed in future iterations without affecting the core functionality of the system.

9 PROJECT MANAGEMENT

9.1 Introduction

This chapter outlines the general management strategy that was used during the development of the Ai-Orders POS & Loyalty System to Ai-CHA Ice Cream & Tea. Project management refers to knowledge, skills, tools and techniques being applied to project activities in order to effectively achieve the project requirements (Project Management Institute, n.d.). Structured planning, scheduling and risk control have significance in software projects because managing the work timeline is crucial to meet the scope limits, time and quality limitations of the work (Project Management Institute, 2021).

In the case of Ai-Orders, project management was concerned with the planning of the activities in FYP 1 and FYP 2, tracking progress in a Work Breakdown Structure (WBS) and a Gantt chart, project risks of hosting, integration and schedule. This chapter provides information on the project schedule, the WBS and the Gantt chart utilized as well as the risk management activities which were done to ensure the system was successfully completed.

9.2 Project Schedule

The project schedule is a logical plan that identifies the path of activities that would be performed in the course of developing Ai-Orders. A schedule assists the project manager in visualising what has to be done, when it has to occur and how the tasks are dependent on one another (ProjectManager.com, 2025). In this project, the schedule was done to cater to FYP 1 and FYP 2 beginning with proposal and requirements up to deployment and final presentation. FYP 1 was regarding background study, requirements gathering and system design. Tasks involved learning the current ordering process of Ai-CHA, non-functional and functional requirements, use case preparation and database and interface prototype.

In FYP2, the timeframe changed to customer, POS, kitchen, admin, loyalty and wallet modules implementation; connection with ToyyibPay and multiple testing and optimization cycles. There were certain elements during the development that particularly got prolonged longer than initially presumed to be given the time to integrate with ToyyibPay and deploy to shared hosting. To manage, the schedule was altered by focusing on core functionality (ordering, payment, loyalty and reporting), simultaneously doing testing and coding, and delaying some of the “nice-to-haves improvement to additional work. All in all, the project milestones like demonstration of the prototype, User Acceptance Testing (UAT) and final submission were realized in the revised timeline.

9.2.1 Work Breakdown Structure (WBS)

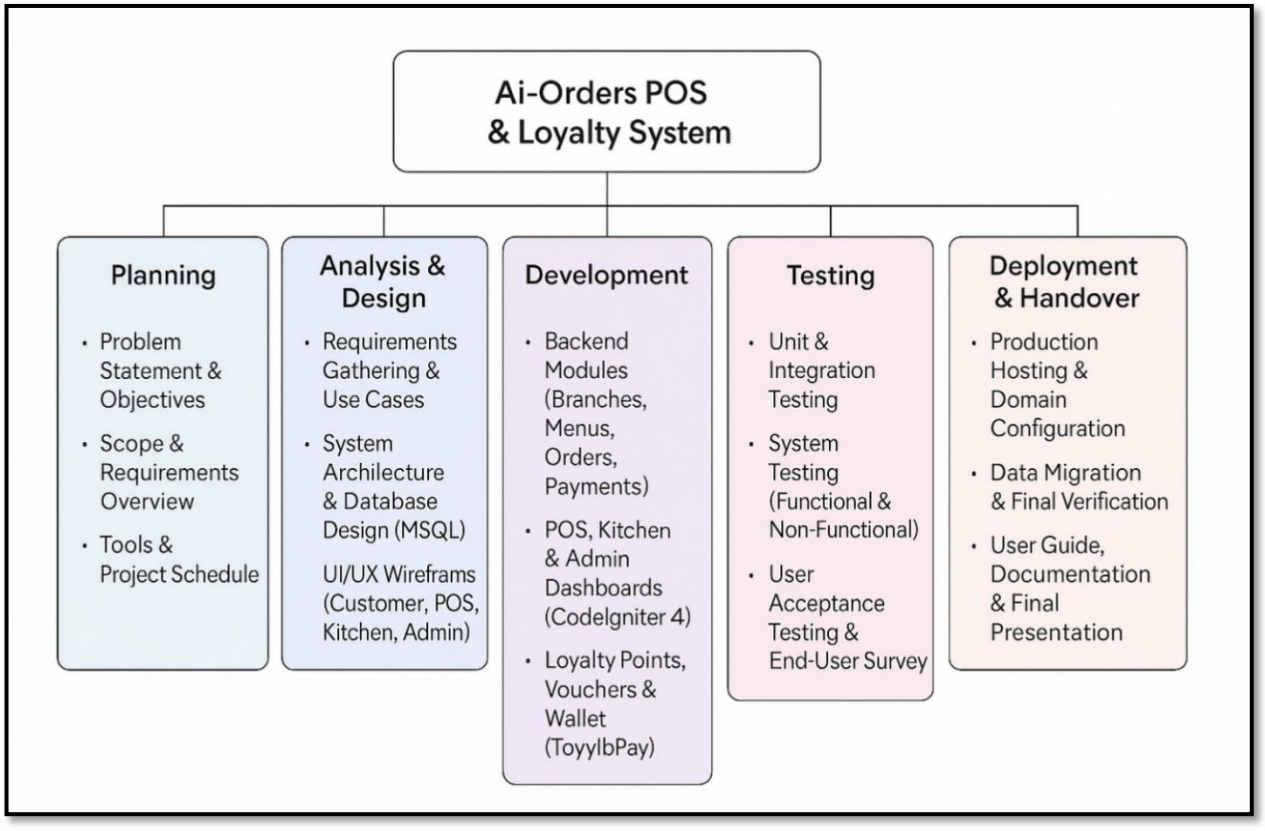


Figure 9.2.1: Work Breakdown Structure for Ai-Orders POS & Loyalty System

A Work Breakdown Structure (WBS) is a deliverable-oriented, hierarchical decomposition of the total work that needs to be carried out by the project team (Project Management Institute, 2021; ProjectManager.com, n.d.). It breaks a large project into smaller, more manageable components so that planning and control become easier (Institute of Project Management, 2020). For Ai-Orders, the WBS was organised into several major phases: Planning, Analysis & Design, Development, Testing & Evaluation, and Deployment & Handover. Each phase was further divided into detailed tasks and deliverables.

1) <u>Planning</u>

In the planning phase, the focus is on understanding why Ai-Orders is needed, what it must achieve for Ai-CHA, and how the work will be organised across the FYP timeline. This phase sets the foundation by clarifying the problem, defining clear objectives and outlining the tools and schedule that will guide the whole project.

Key activities:

- Define Problem Statement & Objectives for Ai-Orders POS & Loyalty System.
- Prepare a Scope & Requirements Overview to outline what is included and excluded.
- Decide on Tools & Project Schedule (CodeIgniter 4, MySQL, ToyyibPay, Figma, hosting, and FYP timeline).

2) Analysis & Design

The analysis and design phase translates the initial idea into a detailed system blueprint. Requirements from Ai-CHA are gathered, analysed and modelled so that both the data structure and user experience are clearly planned before coding starts.

Key activities:

- Conduct Requirements Gathering & Use Cases with Ai-CHA and supervisor.
- Design the System Architecture & Database Design (MySQL) for branches, menus, orders, payments, memberships, points, vouchers and wallets.
- Create UI/UX Wireframes for the Customer, POS, Kitchen and Admin interfaces in Figma.

3) Development

The development phase is where Ai-Orders is built based on the design. Backend logic and front-end interfaces are coded, and the loyalty, voucher and wallet features are integrated so that the system can support real outlet operations.

Key activities:

- Implement Backend Modules for Branches, Menus, Orders and Payments in CodeIgniter 4.
- Develop POS, Kitchen & Admin Dashboards (order lists, status updates, reports, user management).
- Build Loyalty Points, Vouchers & Wallet (ToyyibPay) features and link them to orders and members.

4) Testing

The testing phase ensures that Ai-Orders works correctly, is stable and is acceptable to real users. Different levels of testing are performed to catch functional errors, integration issues and usability problems before deployment.

Key activities:

- Perform Unit & Integration Testing on core functions such as ordering, points, vouchers and wallet.
- Conduct System Testing (Functional & Non-Functional) to check full workflows, performance and data consistency.
- Carry out User Acceptance Testing & End-User Survey with Ai-CHA and testers to validate usability and satisfaction.

5) Deployment & Handover

The deployment and handover phase prepares Ai-Orders for real use in Ai-CHA outlets and completes all final documentation. The system is moved to the production server, verified and then handed over with proper guides and presentation materials.

Key activities:

- Configure Production Hosting & Domain and set up the environment (.env, HTTPS, database).
- Perform Data Migration & Final Verification to ensure live orders, wallet and loyalty features work correctly.
- User Guide, Documentation & Final Presentation for the client, supervisor and evaluation panel.

9.2.2 Gantt Chart

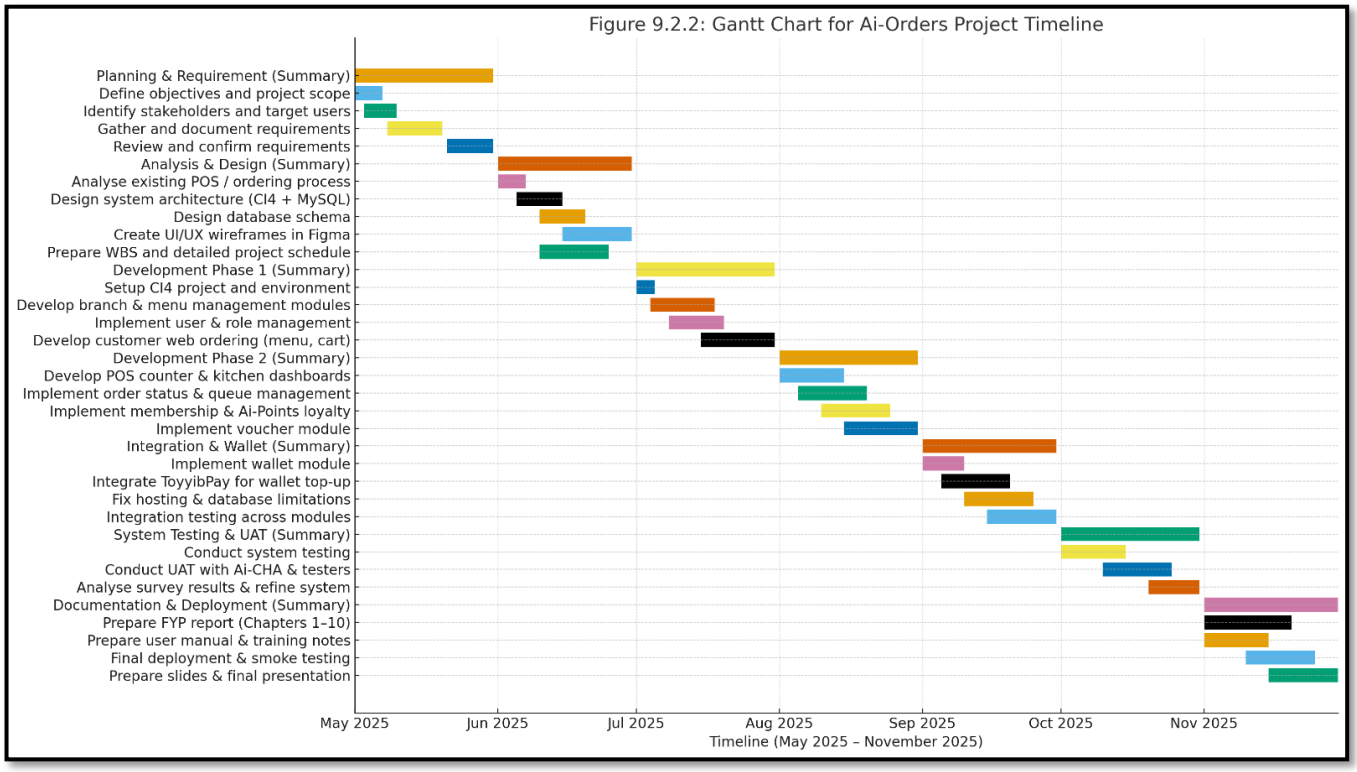


Figure 9.2.2: Gantt Chart for Ai-Orders Project Timeline

A Gantt chart is a diagrammatic tool used in the visual management of projects that depicts the project activities as horizontal bars in a timeline, thus being able to comprehend easily how the activities begin and end, their duration, and the overlapping (ProjectManager.com, 2025; TeamGantt, 2025). Figure 9.2.2 presents the Gantt chart of Ai-Orders, which is arranged between May 2025 and November 2025, the summary bars indicate the key phases, namely, Planning and Requirement, Analysis and Design, Development Phase 1, Development Phase 2, Integration and Wallet, System Testing and UAT, and Documentation and Deployment, and further underneath these are more tasks that are specific to each phase.

All planning, requirements and design (including defining the objectives, identifying the stakeholders, gathering and reviewing requirements, analysing the current POS processes, designing the CI4 + MySQL architecture, creating a database schema and preparing UI/UX wireframes in Figma and developing the WBS and detailed schedule will be included in the first section of the timeline (May June 2025). It will be characterized by development and integration (setting up the CI4 environment, branch, menu, user and ordering modules, implementing POS and kitchen dashboards, membership and Ai-Points, voucher features, and last is the wallet module with ToyyibPay integration) and overcoming hosting and database constraints and integration testing of all modules (middle period (July- September 2025)).

The last section of the chart (October2025-November2025) deals with quality assurance and project closure. The time in October will be devoted to the testing of the system and UAT with Ai-CHA and testers and polishing the system according to the results of the survey, which is demonstrated in the System Testing and UAT summary and its tasks. The month of November will be dedicated to documentation and deploying tasks, such as completing the FYP report, writing the user manual and training notes, conducting final deployment and smoke testing, and making the final presentation slides. In general, the Gantt chart is a clear mapping of every detailed task with its time window of the project, which is evident on how the project was planned to be deployed and how the overlapping tasks were planned to maintain the Ai-Orders project on track.

Project schedule Timetable outlines the way the Ai-Orders POS & Loyalty System was conducted in the period of 19 May 2025 up to 20 November 2025. It converts the Gantt chart of Figure 9.2.2 to a finer list of tasks, including the start date, finish date and duration of each activity of planning and analysis through development, integration, testing and final documentation. This schedule was the key working plan that would facilitate the day-to-day work and also ensure that all stages in the project were done before the FYP period.

Table 9.1: Project Schedule Timetable

No	Phase/Activity	Start	Finish	Duration
1	**Planning & Requirement**	19/5/2025	8/6/2025	21 days
2	Define objectives and project scope	19/5/2025	23/5/2025	5 days
3	Identify stakeholders and target users	20/5/2025	25/5/2025	6 days
4	Gather and document requirements	26/5/2025	2/6/2025	8 days
5	Review and confirm requirements	3/6/2025	8/6/2025	6 days
6	**Analysis & Design**	9/6/2025	30/6/2025	22 days
7	Analyze existing POS / ordering process	9/6/2025	14/6/2025	6 days
8	Design system architecture (CI4 + MySQL)	12/6/2025	20/6/2025	9 days
9	Design database schema	15/6/2025	23/6/2025	9 days
10	Create UI/UX wireframes in Figma	18/6/2025	30/6/2025	13 days
11	Prepare WBS and detailed project schedule	18/6/2025	30/6/2025	13 days

12	**Development Phase 1**	1/7/2025	31/7/2025	31 days
13	Setup CI4 project and environment	1/7/2025	4/7/2025	4 days
14	Develop branch & menu management modules	3/7/2025	15/7/2025	13 days
15	Implement user & role management	10/7/2025	20/7/2025	11 days
16	Develop customer web ordering (menu, cart)	15/7/2025	31/7/2025	17 days
17	**Development Phase 2**	1/8/2025	31/8/2025	31 days
18	Develop POS counter & kitchen dashboards	1/8/2025	14/8/2025	14 days
19	Implement order status & queue management	5/8/2025	20/8/2025	16 days
20	Implement membership & Ai-Points loyalty	10/8/2025	24/8/2025	15 days
21	Implement voucher module	18/8/2025	31/8/2025	14 days
22	**Integration & Wallet**	1/9/2025	30/9/2025	30 days
23	Implement wallet module	1/9/2025	8/9/2025	8 days
24	Integrate ToyyibPay for wallet top-up	5/9/2025	20/9/2025	16 days
25	Fix hosting & database limitations	10/9/2025	24/9/2025	15 days
26	Integration testing across modules	18/9/2025	30/9/2025	13 days
27	**System Testing & UAT**	1/10/2025	31/10/2025	31 days
28	Conduct system testing	1/10/2025	14/10/2025	14 days
29	Conduct UAT with Ai-CHA & testers	10/10/2025	24/10/2025	15 days
30	Analyze survey results & refine system	20/10/2025	31/10/2025	12 days
31	**Documentation & Deployment**	1/11/2025	20/11/2025	20 days
32	Prepare FYP report (Chapters 1–10)	1/11/2025	18/11/2025	18 days
33	Prepare user manual & training notes	1/11/2025	10/11/2025	10 days
34	Final deployment & smoke testing	5/11/2025	15/11/2025	11 days
35	Prepare slides & final presentation (presentation on 13/11/2025)	5/11/2025	13/11/2025	9 days
36	Final submission (report, demo video, poster, slides, system)	19/11/2025	20/11/2025	2 days

Based on Table 9.1, the initial section of the schedule was devoted to planning and analysis. The middle months were devoted to the system development and integration, and the remaining parts of October and November were devoted to the testing, deployment and documentation. The schedule also brings out the overlapping activities to utilize time effectively and to achieve major milestones like UAT, final presentation on 13 November 2025 and the final submission on 20 November 2025. In general, this was a well-organized timetable that helped the project not to fall behind schedule and minimized the chances of missing out on significant deadlines.

9.3 Risk Management

Risk management is the process of identifying, analysing and responding to risks that may affect a project's objectives (ProjectManager.com, 2025). In software engineering, risk management helps teams recognise technical, schedule and security risks early so that mitigation plans can be prepared before problems become serious (Itransition, 2024; Agilemania, 2025).

For Ai-Orders, a simple risk register was created to list potential risks, their likelihood, impact and mitigation strategies. The main categories of risk included technical integration, hosting limitations, scheduling, data security and user acceptance. Table 9.3 summarises the key risks and how they were handled.

Table 9.3: Risk Identification and Mitigation Plan for Ai-Orders

#	Risk Identification	Description	Risk Analysis	Mitigation Plan
1	Technical / Integration Risk	Potential integration problems between CodeIgniter 4, MySQL database and ToyyibPay API, leading to failed wallet top-ups or incorrect payment status.	Moderate impact, medium probability	Begin ToyyibPay integration early; use sandbox environment first; add detailed logging for API requests and callbacks; verify all return URLs; allow fallback to cash payment if online payment fails.
2	Hosting and Database Limitation Risk	Shared hosting may restrict database features (e.g. stored functions, triggers, DEFINER) which could break automatic branch or order numbering.	High impact, High probability	Test SQL scripts on production server early; move numbering logic to PHP instead of MySQL functions; simplify queries to avoid features that require special privileges.
3	Scheduling Risk	Delays due to underestimating time needed for debugging complex modules such as loyalty, vouchers and wallet.	High impact, High probability	Use WBS and Gantt chart to prioritise critical modules; set weekly goals; reduce scope by postponing non-essential features; allocate extra time near the middle of FYP II for integration and testing.

4	Data Security and Access Risk	Risk of unauthorised access to admin/POS dashboards or exposure of customer data if access control is weak.	High impact, medium probability	Implement role-based access control; enforce login checks on all staff routes; hide direct admin URLs behind authentication; use HTTPS on production and avoid storing sensitive card details.
5	Usability / User Acceptance Risk	Staff or customers may find the system difficult to use, leading to low adoption even if technically correct.	Medium impact, medium probability	Design UI in Figma and review with supervisor; run UAT sessions with Ai-CHA; conduct end-user survey; refine wording, layout and navigation based on feedback.

During implementation, some risks did materialise. Integration with ToyyibPay initially failed due to configuration issues and suspected blocking, which temporarily stopped wallet top-up testing. This was resolved by adjusting callback URLs, improving exception handling and retesting with smaller test transactions. Hosting limitations also affected the original plan to use MySQL stored functions for branch and order numbering; to mitigate this, the logic was rewritten in PHP within the CodeIgniter controllers so that it no longer depended on restricted database features.

These experiences reinforced the importance of applying risk management continuously across the software development lifecycle—identifying issues early, updating the risk register and adapting the project plan accordingly (SoftComply, 2024).

9.4 Conclusion

In conclusion, structured project management played a crucial role in the successful development of the Ai-Orders POS & Loyalty System. The use of a clear project schedule, supported by a Work Breakdown Structure and a Gantt chart, helped to organise tasks, allocate time and track progress throughout FYP I and FYP 2. When unexpected technical and hosting issues arose, these tools made it easier to adjust priorities while still achieving the main milestones.

Furthermore, a simple but effective risk management plan enabled the identification and mitigation of major risks related to integration, hosting, scheduling, security and user acceptance. By combining planning, scheduling and risk management practices drawn from recognised project management guidelines (Project Management Institute, 2021; ProjectManager.com, 2025), the project was completed within the required timeframe and delivered a functional system that meets Ai-CHA's core needs for ordering, payment and loyalty management.

10 CONCLUSION

10.1 Introduction

It is the final chapter of the Ai-Orders POS and Loyalty System development of Ai-CHA Ice Cream and Tea which sums up its overall success, difficulties and possible improvements. The systems were to resolve three key problems found in Chapter 1: the lack of a branded online ordering platform, the deficiency in digital loyalty and engagement capabilities, and the overload associated with the manual processing of the orders (Ling et al., 2021; Lakshman and Faiz, 2021; Mponela et al., 2024). In this chapter, the reflection of how the Ai-Orders system achieves these goals is the existence of a single web application to bind customer ordering, loyalty rewards and POS processes. It also talks about the constraints and limitations faced in implementation and gives a list of recommendations on how this can be improved to enhance performance, usability and scalability in the future versions.

10.2 Achievement

The Ai-Orders POS & Loyalty System has met its fundamental goals through provision of a branded, easy to use web ordering application; integrating a loyalty and voucher system based on points into the system to ensure repeat purchases are made; and integrating automated customer, counter, kitchen and administration of orders. The platform will store menu management, ordering, payment, loyalty and reporting in one platform, allowing Ai-CHA to eliminate dependence on third-party providers, retain control over its profit margin, and have a more comprehensive insight into outlet performance (Ling et al., 2021). The functional testing, system testing, and end-user survey results in Chapter 8 reveal that, the users are finding the system simple to use, efficient and can be used to lessen the workload, showing that the project objectives have been achieved on a large scale.

10.2.1 To develop an online ordering web platform for Ai-CHA

(Achieved) This was met by developing a responsive and branded web application which will enable the customers to engage directly with Ai-CHA rather than just using third-party delivery services. The customer interface allows the user to navigate the menu of the Ai-CHA by category, check the pictures and prices of the products, create custom drinks (size, level of sugar, level of ice, and toppings), place a product in the cart, use vouchers and finalize the order using wallet or online payment. The user interface is also in congruent designs and typography and is optimized to both desktop and mobile web browsers to accommodate on-the-go ordering. The usefulness of such a design was confirmed by the end-user survey, the result of which they found the registration and logging-in process, and menu navigation as either “Very easy or easy, which means that this platform is user-friendly even in the case of first-time users. Offering

Ai-CHA its own ordering channel means that Ai-Orders will directly solve the issue of the absence of a branded online presence and minimize its reliance on high-commission third-party platforms (Ling et al., 2021).

10.2.2 To increase customer retention through loyalty features

(Achieved) The experience of incorporating a digital Ai-Points loyalty system and voucher functions into the web application achieved this goal (Lakshman & Faiz, 2021). The amount of points received by registered members each time an order is fulfilled is dependent on earn-out rules which may be configured. These points can be later redeemed with discounts or special offers and voucher campaigns can be set on individual products, branches or minimum spend. All the point transactions and the use of vouchers are recorded in the system to be transparent and analyzed. According to the survey results, the Ai-Points and voucher functions were rated as an entity that users found useful or even very useful as a method of achieving repeat purchases, which proves that the loyalty mechanisms are comprehended and appreciated by the weighted users. This feature facilitates the initial purpose of enhancing the customer retention and emotional connection to the Ai-CHA brand with the help of digital rewards and customized offers (Lakshman & Faiz, 2021).

10.2.3 To automate the order handling process

(Achieved) This objective was achieved to a considerable extent because the customer orders were linked to a multi-role POS environment, which supports an administration, branch, counter, and kitchen environment (Mponela et al., 2024). When the order is made, it is displayed on the counter dashboard where personnel have the option of confirming that the order has been paid, amend the status and assign numbers to the queue. At the same time, the kitchen view has ordered items with their customizations, which assist staff to prepare drinks in order and correctly. Statuses of the order are also changed in real time to ensure that the customer can see the progress between the order statuses such as Pending, Preparing and Completed. Top ups of wallets via ToyyibPay are also supported by the system as well as capture payment history to report. The results of the end-user survey revealed that the respondents found the order tracking clarity, found the order management process easy and the entire POS flow effective in minimizing work and accelerating the speed of the service. These results show that Ai-Orders can effectively minimize human error and minimize human handling, as well as enhance operational visibility in Ai-CHA outlets (Mponela et al., 2024).

10.3 Constraint and Limitation

In the design of Ai-Orders, some limitations were present in the breadth, speed and design of the system. The greatest limitation was time: the project was supposed to be finished within 2 FYP semesters and still find a balance between it and other academic goals. This restricted the level of iterative refinement of the UI, performance optimisation and long term field testing that was possible. The second significant limitation was the shared hosting environment that limited some MySQL features such as stored functions with DEFINER privileges and complicated triggers. In order to meet these constraints, the logic originally written at database level e.g. branch or order numbering would need to be transferred into PHP controllers slightly complicating code.

There were also problems in payment integration. Sandbox and production settings of ToyyibPay were at times were giving access errors or were suspecting blocks, leading to slower testing of wallet top-up flows and more debugging and logging were necessary. Moreover, the existing system will only have one main payment gateway, which means that online payments will be impacted temporarily in case of any downtime or configuration problem. Last but not the least, the assessment was carried out primarily on groups of students and testers in a virtual setting as opposed to the entire operational outlets; thus, the results might not be a true reflection of all groups of customers or operational use. Such constraints made Ai-Orders limited to a stable, minimum-viable system and allowed room to improve it in the future.

10.4 Future Work and Recommendation

The Ai-Orders POS & Loyalty System offers a good platform upon which it can be expanded to serve the long-term digital strategy of Ai-CHA. The following areas are recommended to be worked in the future:

10.4.1 Development of native mobile applications

The next generation will have to utilize native Android and iOS applications, which will communicate with the current backend to enhance accessibility and engagement. Native applications would give it the ability to send out push notifications of order status, promotions and loyalty updates, and would be better able to handle offline and may be an easier user experience than using the browser alone.

10.4.2 Expansion of payment options and offline support

To lessen the reliance on a single gateway, the system ought to be integrated with several payment providers (adding FPX or e-wallet solutions that are popular in Malaysia). This would enhance reliability and resiliency when there is a gateway outage. The POS module could also be introduced with an offline capture mode, which will enable the staff to take orders when the internet is unstable and to synchronize the order when the internet is recovered.

10.4.3 Advanced reporting and analytics

The next step in the future should be to expand the reporting module to give more sophisticated analytics like product performance charts, peak hour trends, membership category segmentation, and the effectiveness of the promotion. In the long term, the methods of data mining or machine-learning might be implemented to suggest merchandise that sells well, offers cross-sell and up-sell options and predicts demand, helping the Ai-CHA management make more informed decisions.

10.4.4 Enhancement of loyalty personalisation and engagement

The loyalty engine can be diversified to the addition of tiers of membership levels, birthday vouchers, personalized recommendations and targeted campaigns according to the purchase history. It would enhance the level of interaction and further loyalty retention by providing more pertinent rewards and promotions, which is part of the digital loyalty programme best practice (Lakshman, Faiz, 2021).

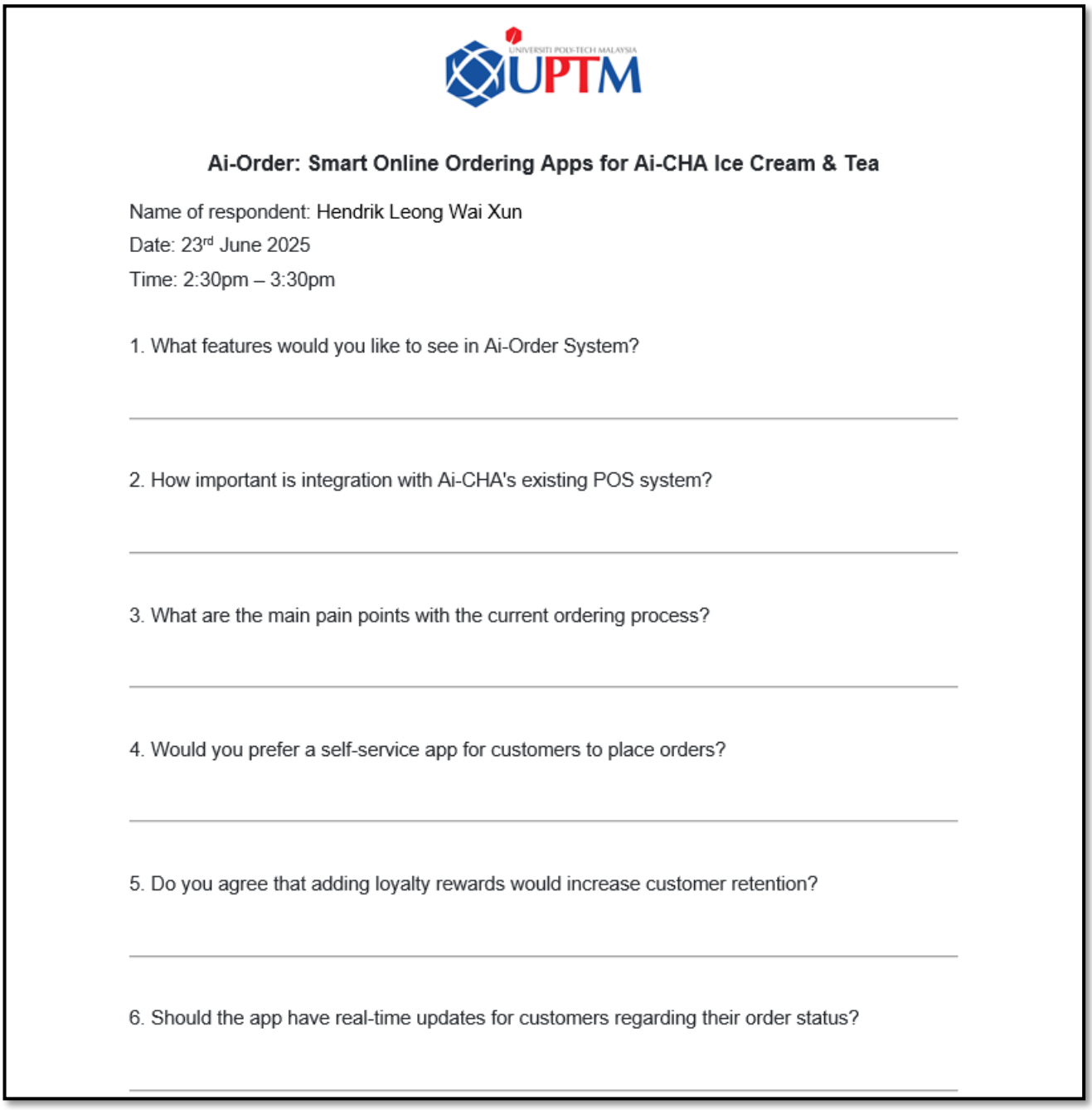
10.5 Conclusion

Overall, the Ai-Orders POS & Loyalty System is effective in providing a single, web-based system, which centralises the online ordering, Loyalty Awards and POS activities of Ai-CHA. The first problem statements are directly addressed by the system that will offer a branded ordering channel, which will decimate the dependence on third-party platforms (Ling et al., 2021), introduce a digital rewards programme, which will promote repeat purchases (Lakshman and Faiz, 2021), and automate the main steps in the order handling process to minimise mistake and staff workload (Mponela et al., 2024). During the project, the project management with the help of WBS, Gantt chart and risk planning allowed to sustain the progress even under technical limitations in hosting and payment integration.

Personally, the project has been quite an experience of learning full-stack development, database design, API integration and system testing. Such obstacles as fixing ToyyibPay integration problems, addressing hosting restrictions and troubleshooting complicated order flows needed patience, self-education, and frequent consultation with the supervisor. These experiences enhanced the technical competence, time management and problem-solving skills. Additional improvements, such as native mobile applications, more advanced analytics, diversified payment and more tailored loyalty features, will also make Ai-Orders better in usability, scalability and business value in the future, making it yet another viable solution that can be expanded with Ai-CHAs brand and operations.

Appendix A – Requirements Specification Document

➢ Interview Questions (Pre-Development)



UNIVERSITI POLY-TECH MALAYSIA
UPTM

Ai-Order: Smart Online Ordering Apps for Ai-CHA Ice Cream & Tea

Name of respondent: Hendrik Leong Wai Xun

Date: 23rd June 2025

Time: 2:30pm – 3:30pm

1. What features would you like to see in Ai-Order System?

2. How important is integration with Ai-CHA's existing POS system?

3. What are the main pain points with the current ordering process?

4. Would you prefer a self-service app for customers to place orders?

5. Do you agree that adding loyalty rewards would increase customer retention?

6. Should the app have real-time updates for customers regarding their order status?

7. What kind of payment methods would you like the app to support?

---

8. Would you find it helpful to have a feature that allows staff to manage orders more effectively?

---

9. Would you prefer the app to have a feature that recommends drinks based on customer preferences or past orders?

---

10. How important is the app to be easy to use for both staff and customers?

- **Interview Questions (Post-Development)**

UNIVERSITI POLY-TECH MALAYSIA
UPTM

Ai-Orders: Smart Online Ordering Web Apps for Ai-CHA Ice Cream & Tea

Name of respondent: Hendrik Leong Wai Xun
Date: 11th June 2025
Time: 12:30pm – 2:30pm

1. Does the web app support a full customer journey—browse → customize → add to cart → checkout → payment confirmation—with a clear order number/receipt?

---

2. Are account creation and login reliable with helpful validation (email/phone uniqueness, password rules, error messages)?

---

3. Can customers discover products efficiently using categories, search, and item detail pages?

---

4. Do customization options (ice/sugar/toppings) recalculate prices and show selections in the cart accurately?

---

5. Are cart actions dependable (add/remove items, change quantities, apply voucher/points) and do totals reflect the changes clearly?

---

6. Can admins manage menus and branch visibility (create/edit/delete items, upload images, set prices/options, and enable/disable items per branch) with changes reflected on Web & POS immediately?

---

7. Can admins view sales reports (filter by date/branch/payment method, totals and top items) and print them in a clean A4-friendly layout?

---

8. Can admins manage users and roles—create/edit/disable accounts, assign roles (admin/branch/counter/kitchen), enforce unique email/phone, reset passwords, and handle account status changes (active/inactive)?

---

9. Does membership lookup (manual code or QR scan) return the correct customer profile, and handle invalid inputs gracefully?

---

10. Is the checkout sequence clear (order summary → payment → confirmation), and are pick-up notes/instructions communicated?

---

11. Can customers track order status (Confirmed → Preparing → Ready) in real time and refresh reliably?

---

12. Do “My Orders,” “Points Balance,” and “Vouchers” accurately reflect recent purchases and redemptions with a visible history?

---

13. Do web orders arrive in the POS in real time, and does the order list remain responsive during busy periods?

---

14. Does the order status workflow (Pending → Confirmed → Preparing → Ready → Completed) update both staff views and customer views, with logs?

---

15. Are wallet top-ups handled securely via ToyyibPay with bank redirect + 2FA, server-verified crediting, and a printable receipt?

- **Questionnaire (Pre-Development)**

User Feedback Survey: Ai-Order Mobile App for Ai-CHA Ice Cream & Tea

Assalamualaikum, welcome everyone!

My name is Muhammad Fadhil Amin bin Mohd Pauzi, a final year student at Universiti Poly-Tech Malaysia (UPTM). I am currently pursuing a Bachelor of Information Technology (Honours) in Business Computing.

I am conducting this survey as part of my Final Year Project to collect opinions for the development of the **Ai-Order Mobile Ordering Application** for **Aicha Food My Sdn. Bhd.**, the company behind Ai-CHA Ice Cream & Tea.

This system aims to achieve the following objectives:

1. To provide Ai-CHA with a dedicated mobile ordering platform.
2. To implement a customer loyalty system to improve retention.
3. To automate the ordering process and reduce manual staff workload.

Thank you for participating in this survey! Your feedback will help in developing a better mobile app experience for Ai-CHA customers. This survey will take around **5 minutes** to complete. All responses are anonymous.

* Indicates required question

1. 1. What is your age group? *

Mark only one oval.

- ◯ Under 18
- ◯ 18–24
- ◯ 25–34
- ◯ 35–44
- ◯ 45 and above

2. 2. Do you usually use mobile apps to order food or drinks? *

Mark only one oval.

- Yes
- No

3. 3. Which platforms do you usually use to order from F&B outlets? *(Select all that apply)* *

Check all that apply.

- Walk-in
- Third-party apps (e.g., GrabFood, ShopeeFood)
- Brand's official mobile app
- Website

4. 4. What problems do you usually face when ordering at F&B outlets? *(Select all that apply)* *

Check all that apply.

- Long waiting time
- Order mistakes (e.g., wrong toppings, wrong drink)
- No reward system
- Difficult to customize orders
- Lack of updates on order status
- None of the above

5. 5. Would you prefer placing your order through a mobile app instead of queuing at the counter? *

Mark only one oval.

- Yes
- No

6. 6. How often do you visit or purchase from Ai-CHA? *

Mark only one oval.

- Frequently (once a week or more)
- Occasionally (1–3 times a month)
- Rarely (less than once a month)
- Never

7. 7. Would you be interested in using a dedicated Ai-CHA mobile app? *

Mark only one oval.

- Yes
- No

8. 8. What features would you expect in a mobile ordering app for Ai-CHA? *(Select all that apply)* *

Check all that apply.

- [ ] Browse full menu
- [ ] Customize drink options
- [ ] Cashless payment
- [ ] Track order status
- [ ] Loyalty points
- [ ] Vouchers / promo codes
- [ ] Store locator
- [ ] Order history

9. 9. How important is ease of use in a mobile ordering app? *

Mark only one oval.

	1	2	3	4	5	
Not	◯	◯	◯	◯	◯	Very Important

10. 10. Would a point-based loyalty system encourage you to order more frequently? *

Mark only one oval.

- ◯ Yes
- ◯ No

11. 11. Which loyalty features do you find most appealing? *(Select up to 3)* *

Check all that apply.

- [ ] Earn points per purchase
- [ ] Redeem free drinks/items
- [ ] Birthday rewards
- [ ] Member-only discounts
- [ ] Tiered membership levels

12. 12. Have you ever continued using an app because of its loyalty or reward program? *

Mark only one oval.

- ◯ Yes
- ◯ No

13. 13. Would an app that lets you order and pay in advance improve your experience? *

Mark only one oval.

- Yes
- No

14. 14. Do you think a mobile app can help reduce staff workload and improve service speed? *

Mark only one oval.

	1	2	3	4	5	
Stro	◯	◯	◯	◯	◯	Strongly agree

15. 15. How likely are you to use the Ai-CHA mobile app if it includes easy ordering, cashless payment, and loyalty rewards? *

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very likely

- **Questionnaire (Post-Development)**

User Acceptance Testing (UAT) – Ai-Orders Web Apps & POS System

Assalamualaikum and welcome everyone!

My name is Muhammad Fadhil Amin bin Mohd Pauzi (AM2304013417), a final year student at Universiti Poly-Tech Malaysia (UPTM), pursuing a Bachelor of Information Technology (Honours) in Business Computing.

I am conducting this User Acceptance Testing (UAT) as part of my Final Year Project (FYP4105), which focuses on the development of the Ai-Order System for Aicha Food My Sdn. Bhd., the company behind Ai-CHA Ice Cream & Tea.

The Ai-Order system consists of two main parts:

1) Ai-Orders Web App – for customers to browse the menu, customize drinks, make cashless payments, track orders, and earn loyalty rewards.

2) Ai-Orders POS System – for admin, branch, counter and kitchen to manage orders, update menu items, monitor sales, and generate reports.

Your feedback in this UAT will help evaluate the system's **usability, functionality, and performance**, and ensure it meets real user needs.

This survey will take around **5–10 minutes** to complete. All responses will remain **confidential** and used strictly for academic purposes.

Thank you very much for your participation and support!

* Indicates required question

1. What is your age group?

Mark only one oval.

- ◯ Under 18
- ◯ 18 - 24
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 and above

2. 2. Which role best describes you during this testing? *

Mark only one oval.

- ◯ Admin
- ◯ Branch
- ◯ Counter
- ◯ Kitchen

Section 2: Ai-Orders Web App

This section is for testers who are using the **Ai-Orders Web App.** The purpose is to evaluate the app's usability, ordering process, payment flow, order tracking, and loyalty features. Please answer the following questions based on your experience using the app.

3. 3. How easy was the registration and login process in the **Ai-Orders Web App** * ?

Mark only one oval.

- ◯ Very easy
- ◯ Easy
- ◯ Difficult
- ◯ Very Difficult

4. 4. How easy was it to browse the Ai-CHA menu and find your desired item? *

Mark only one oval.

- Very Easy
- Easy
- Difficult
- Very Difficult

5. 5. How satisfied were you with the customization options (sugar level, ice level, toppings)? *

Mark only one oval.

- Very Satisfied
- Satisfied
- Dissatisfied
- Very Dissatisfied

6. 6. How clear and secure was the payment process ? *

Mark only one oval.

- Very Clear and Secure
- Clear and Secure
- Confusing
- Very Confusing

7. 7. Did the order tracking feature (order status updates) provide timely and accurate information? *

Mark only one oval.

- Yes
- No

8. 8. How useful did you find the Ai-Points Loyalty and Voucher features in encouraging repeat purchases? *

Mark only one oval.

- ◯ Very Useful
- ◯ Useful
- ◯ Not Useful
- ◯ Very Not Useful

9. 9. How would you rate the web app's overall performance (loading speed, smooth navigation, stability)? *

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very Excellent

Section 3: Ai-Order POS System

This section is for testers who are using the **Ai-Order POS System**. The purpose is to evaluate the system's functionality for managing customer orders, updating menus, tracking sales, and generating reports. Please answer the following questions based on your role during testing.

10. 10. How easy was it to log in and access your POS dashboard (Admin/Branch/Counter/Kitchen)? *

Mark only one oval.

- ◯ Very Easy
- ◯ Easy
- ◯ Difficult
- ◯ Very Difficult

11. 11. How clear was the process of receiving and viewing customer orders in the POS system? *

Mark only one oval.

- Very Clear
- Clear
- Unclear
- Very Unclear

12. 12. How convenient was the process of updating menu items in the POS system? *

Mark only one oval.

- Very Convenient
- Convenient
- Inconvenient
- Very Inconvenient

13. 13, How efficient was the order management process (changing status, marking completed, viewing history)? *

Mark only one oval.

- Very Efficient
- Efficient
- Inefficient
- Very Inefficient

14. 14. How useful were the reporting and sales tracking features for monitoring outlet performance? *

Mark only one oval.

- Very useful
- Useful
- Not useful
- Very Not useful

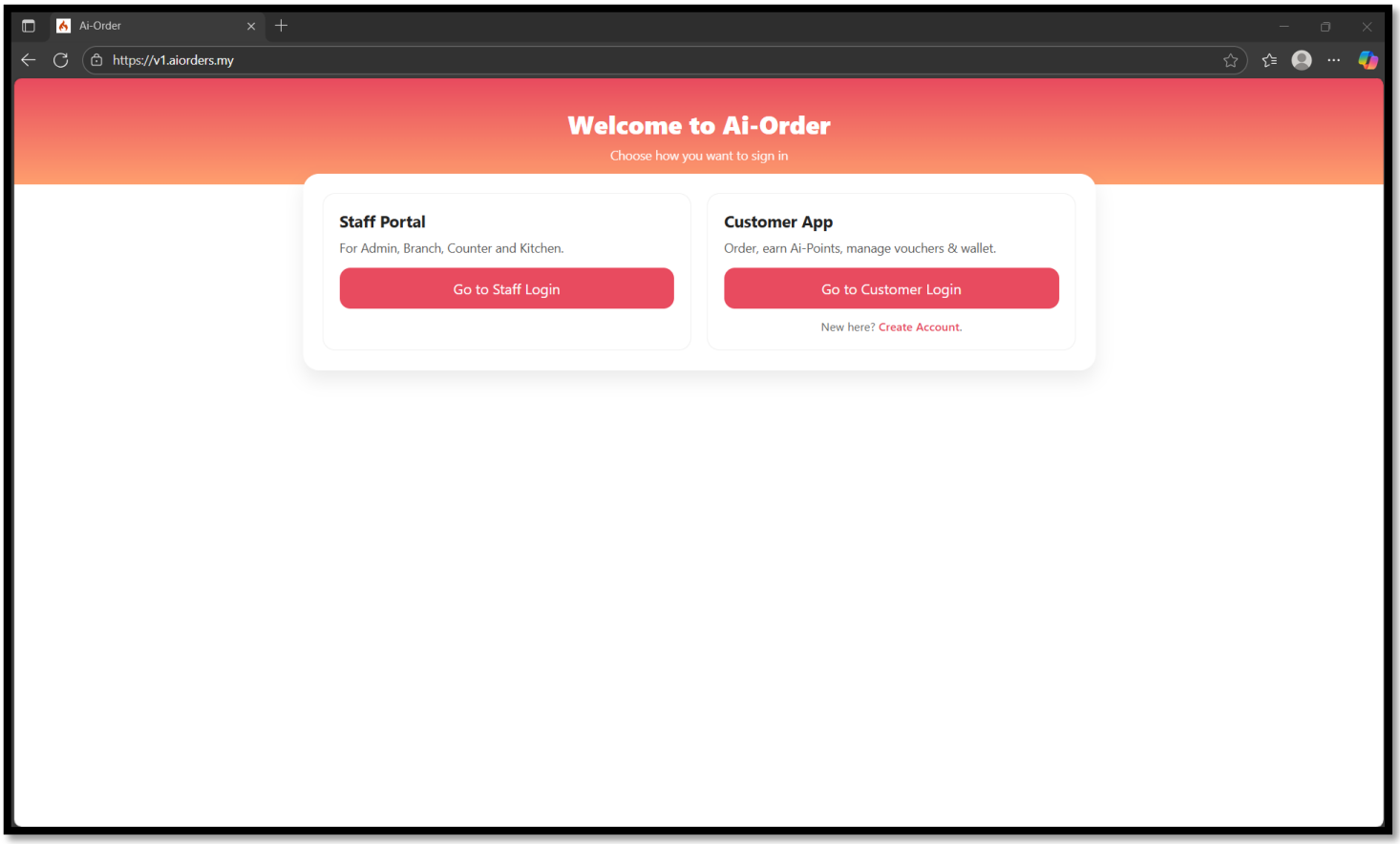
15. 15. Do you think the Ai-Order POS system helps reduce staff workload and improve service speed? *

Mark only one oval.

	1	2	3	4	
Stro	◯	◯	◯	◯	Strongly Agree

Appendix B – User Manual

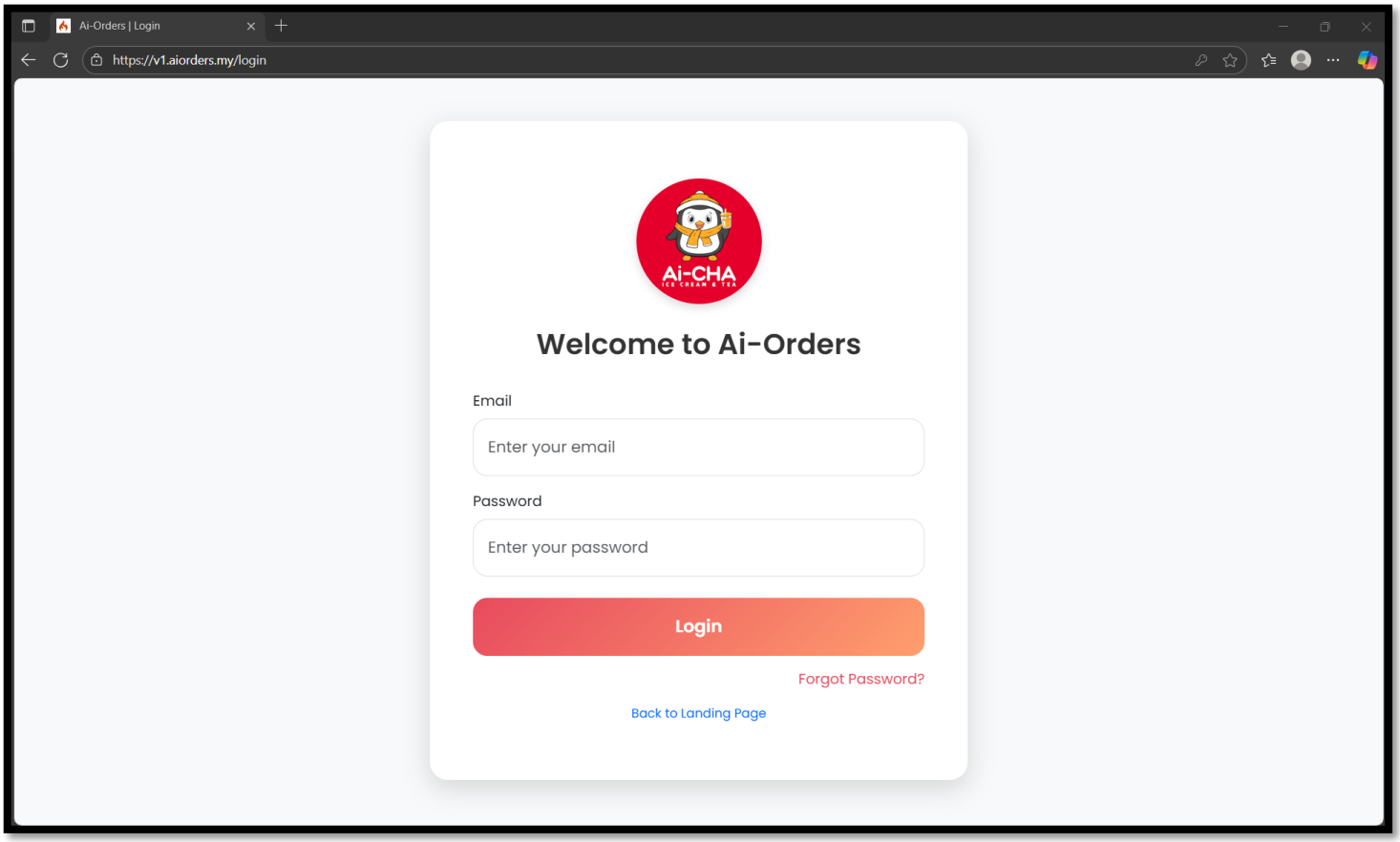
Ai Orders Landing Page



- Choose **Staff Portal** (Admin, Branch, Counter, Kitchen).
- Choose **Customer App** for ordering, vouchers, and wallet.
- Clear separation ensures secure role-based access.

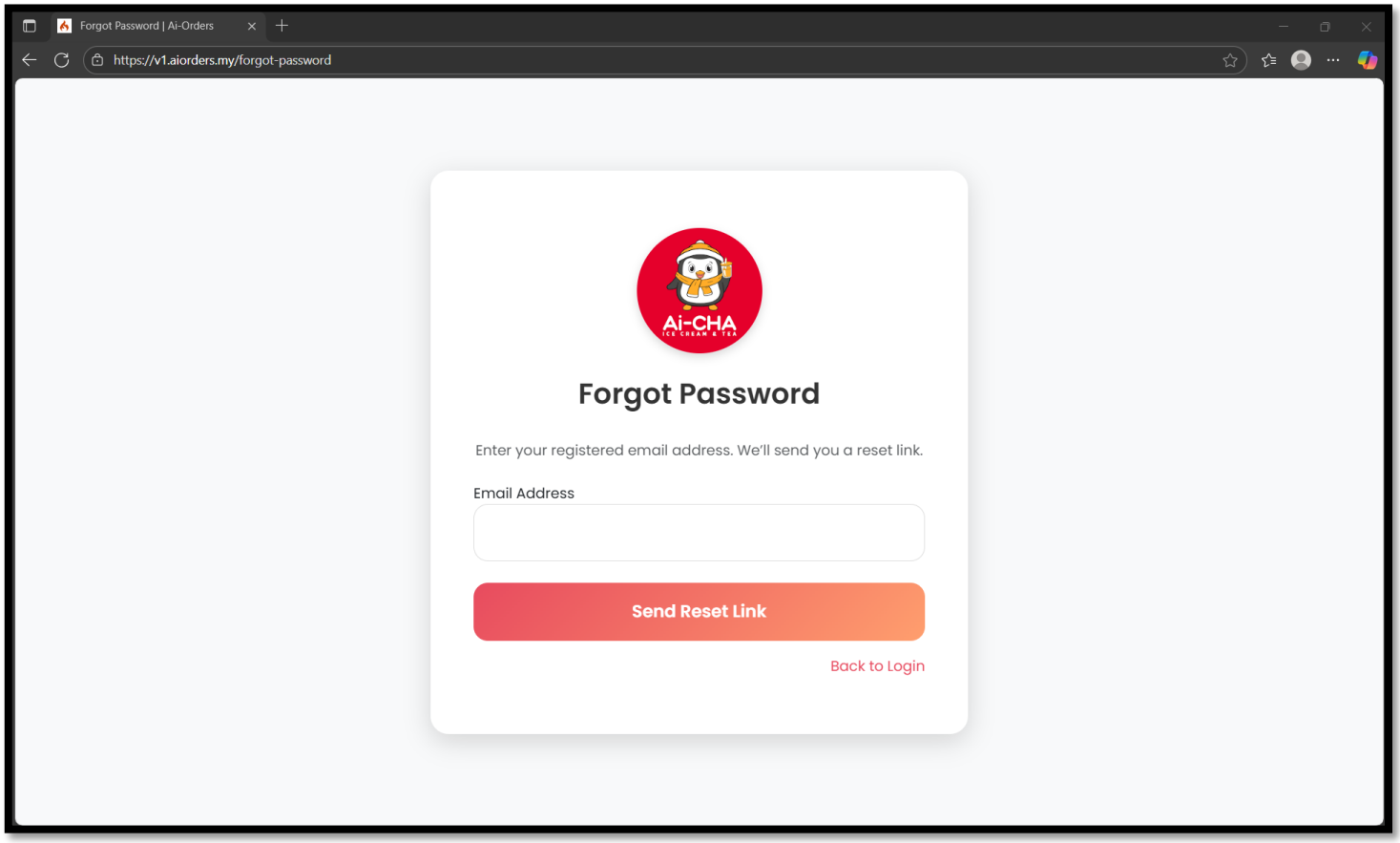
Part A: Ai - Orders Staff Portal Module

Staff Login



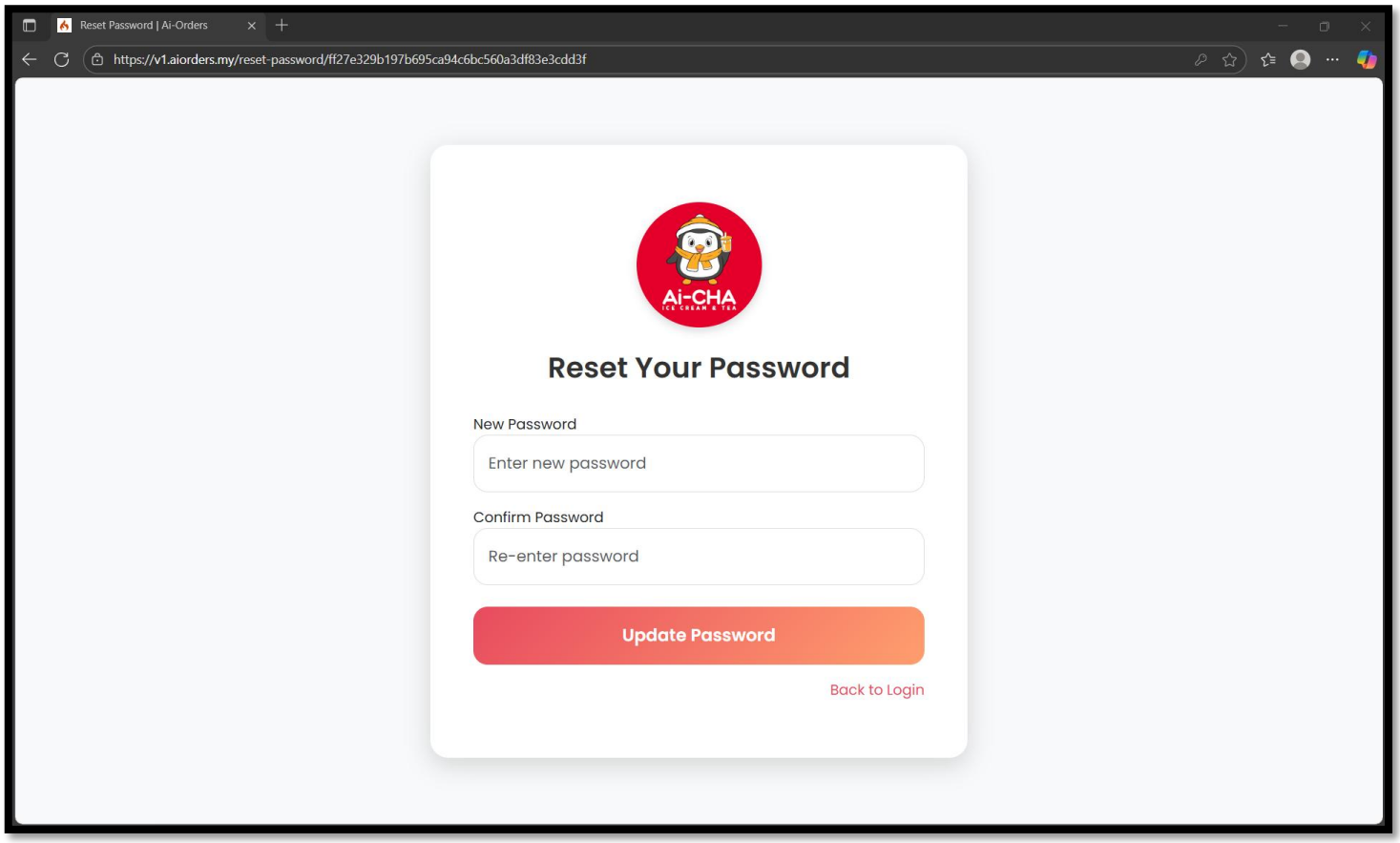
- Enter **email + password**.
- Click **Forgot Password** if needed.
- Use **Back to Landing Page** to return.

Forgot Password



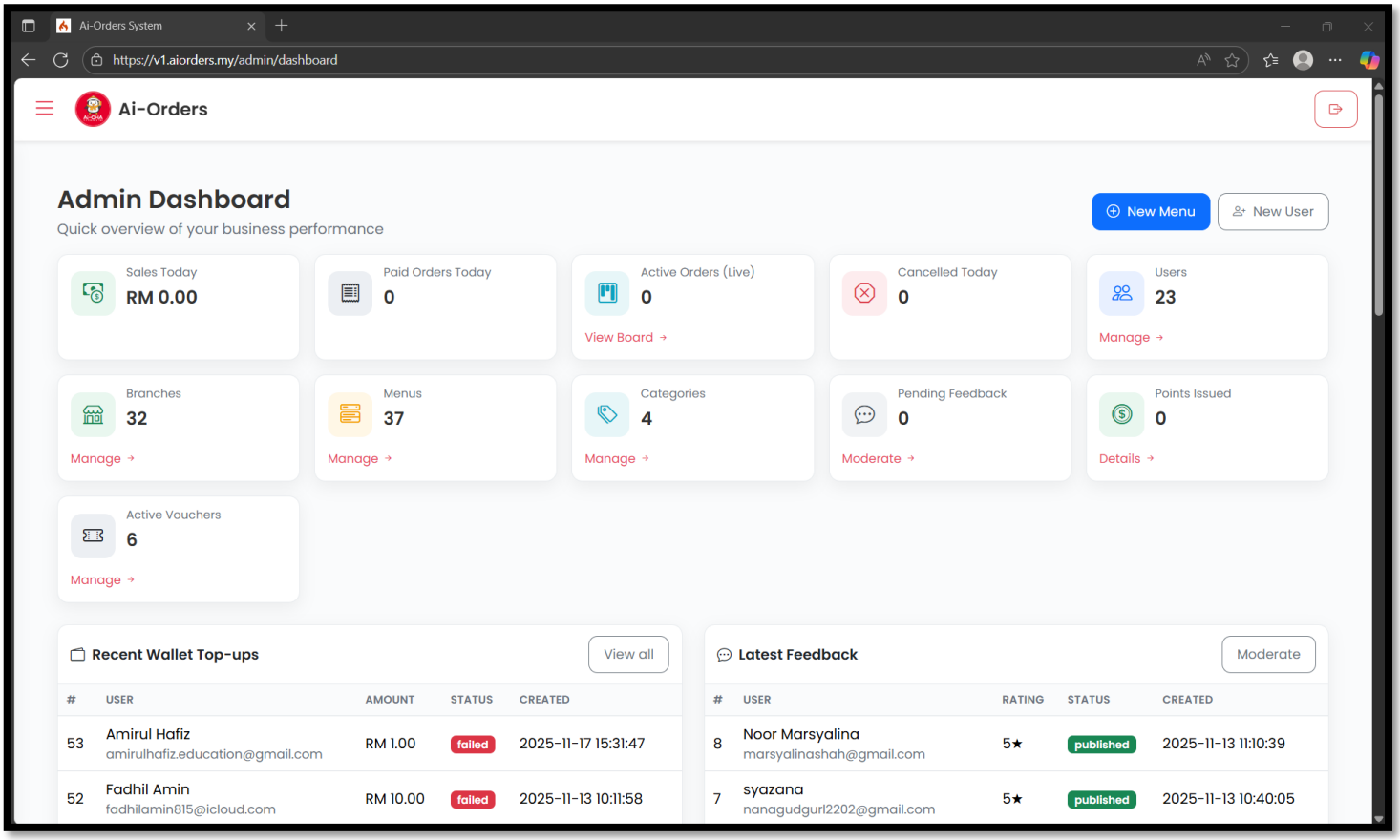
- Enter registered email.
- System sends a **password reset link**.

Reset Password



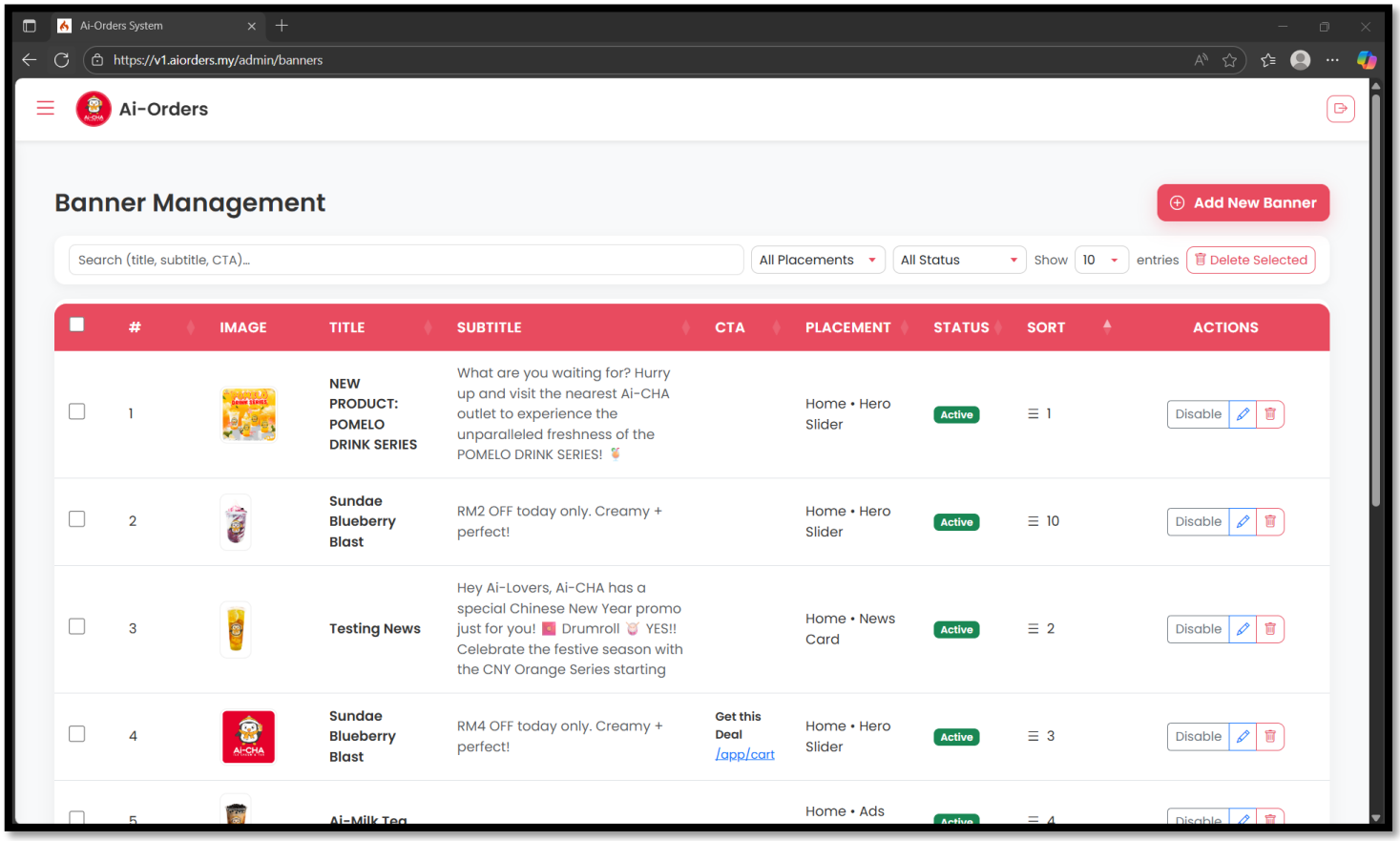
- Enter **new password**.
- Re-enter to confirm.
- Click **Update Password** → return to login.

Admin Dashboard



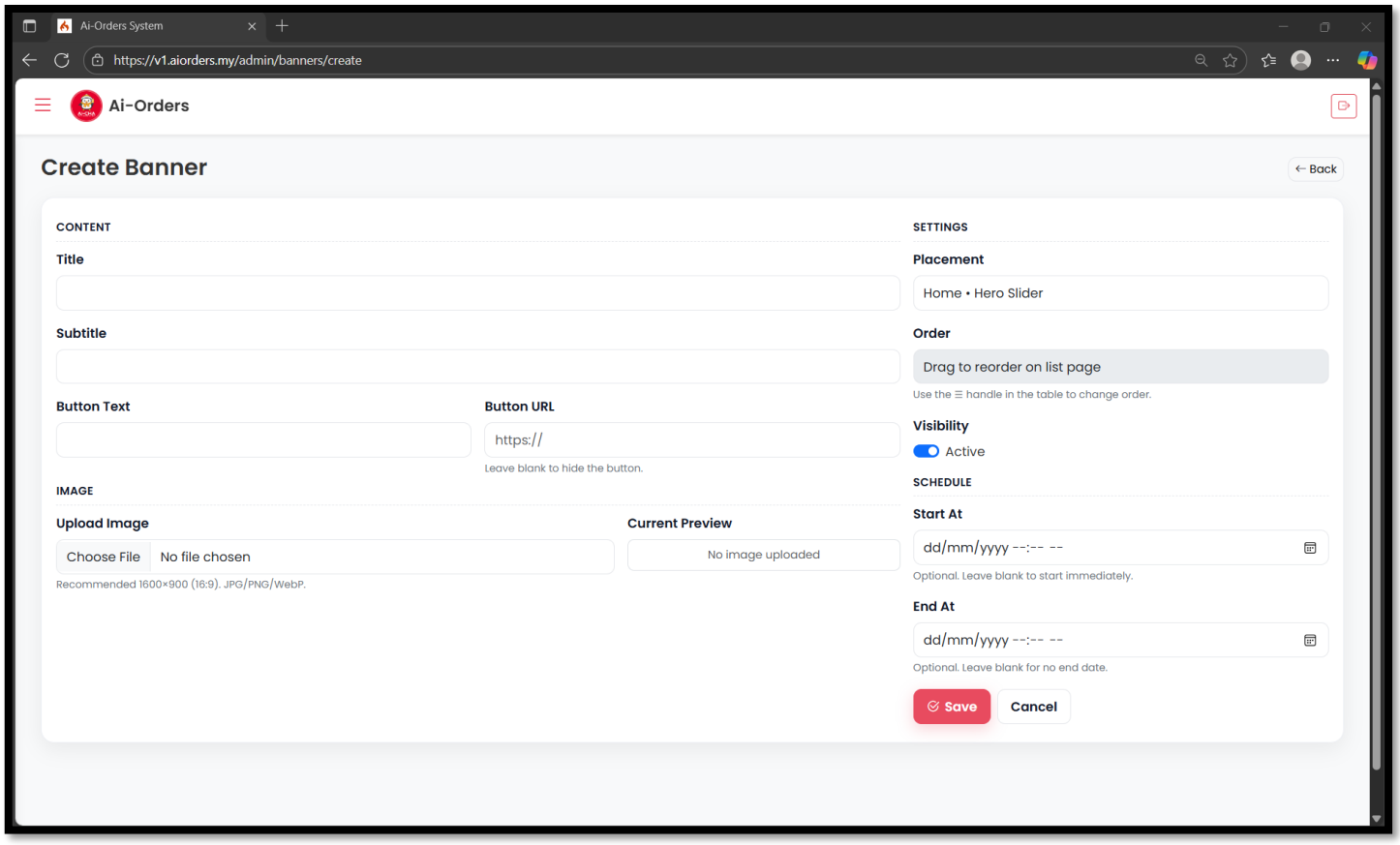
- View daily **sales**, active orders, users, branches, menus, vouchers.
- Quick actions: **New User**, **New Menu**.
- See latest **wallet top-ups** & **customer feedback**.

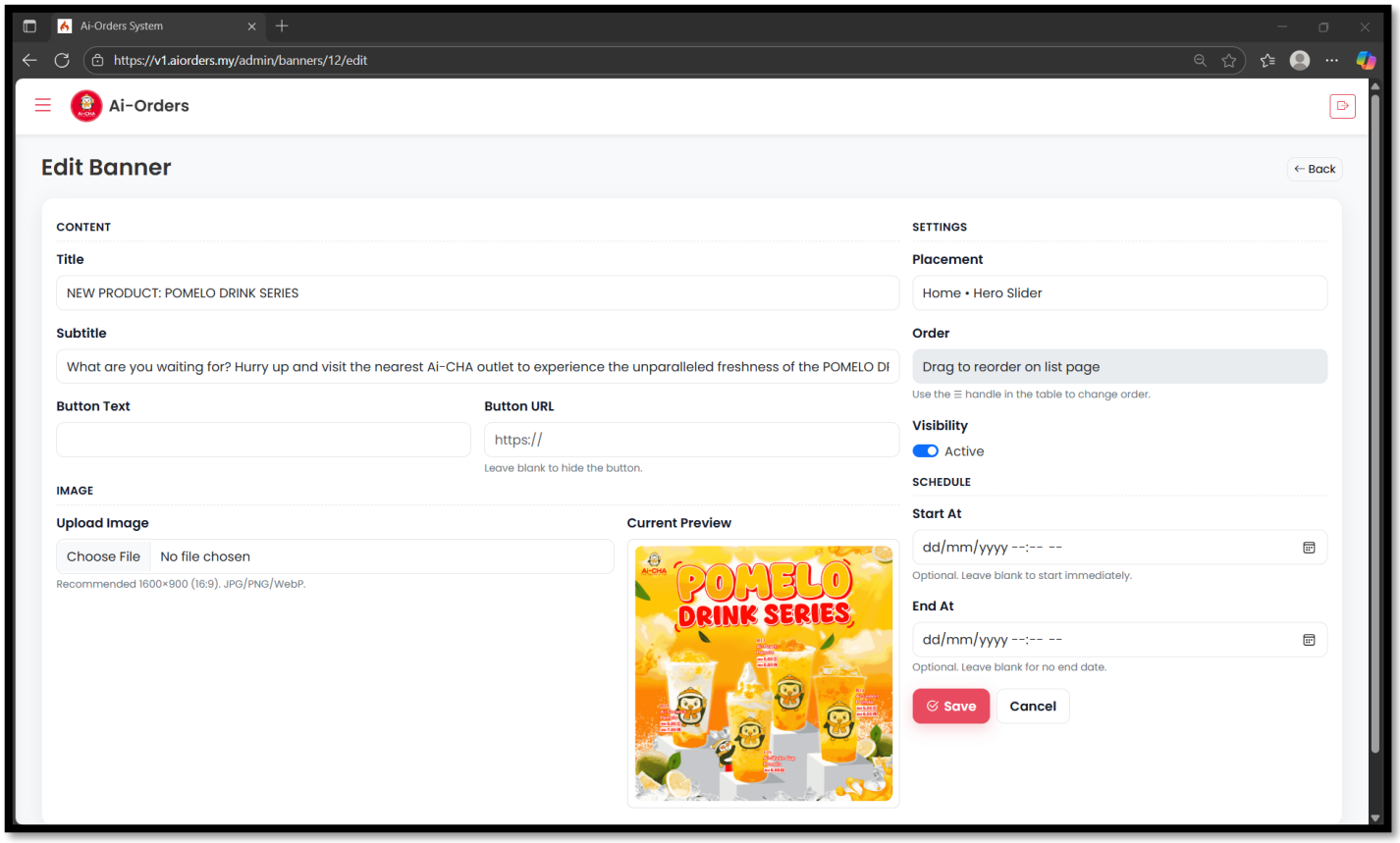
Banner Management



- View all banners with title, subtitle & status.
- Add, edit, disable or delete banners.
- Bulk delete available.

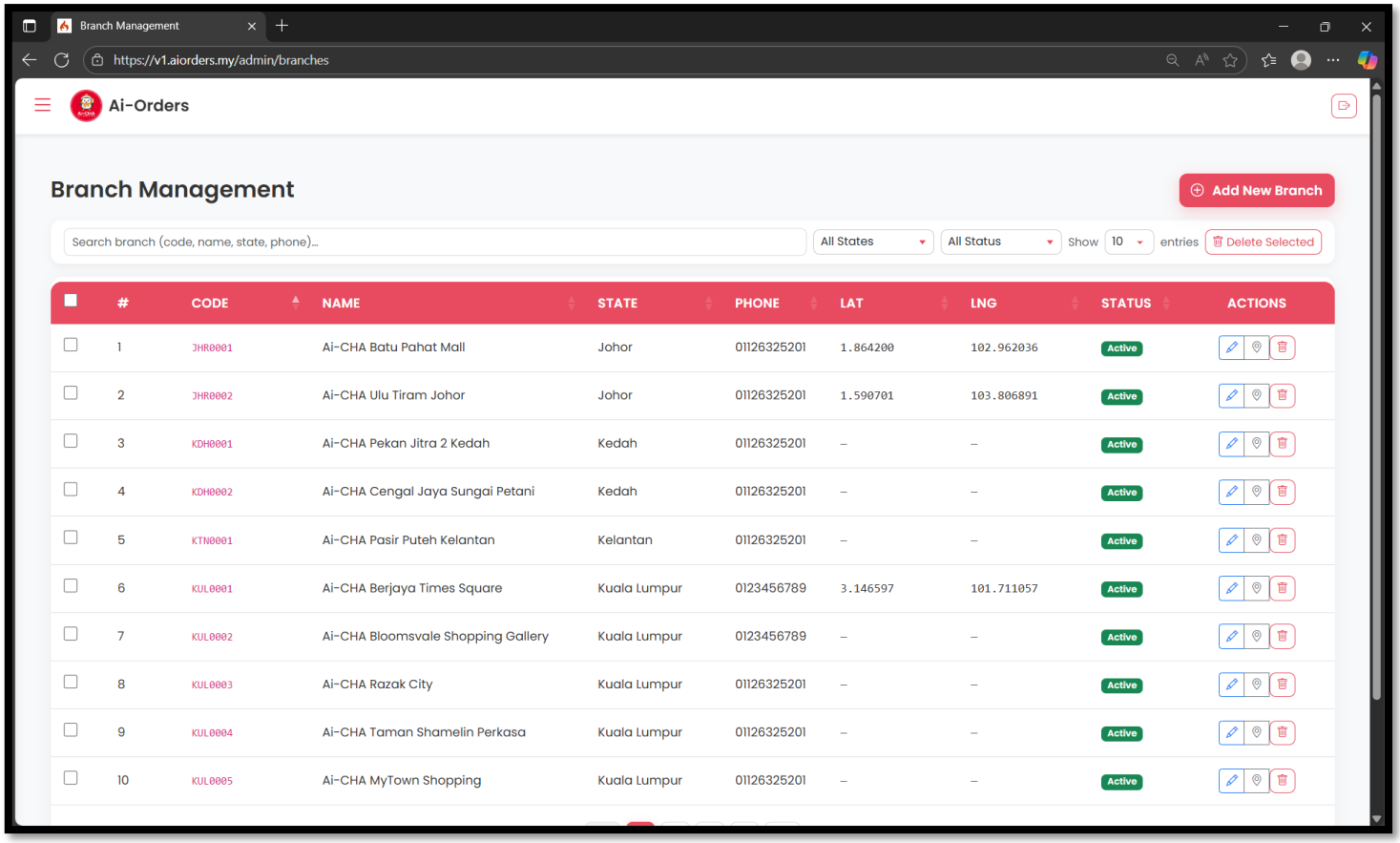
Create / Edit Banner





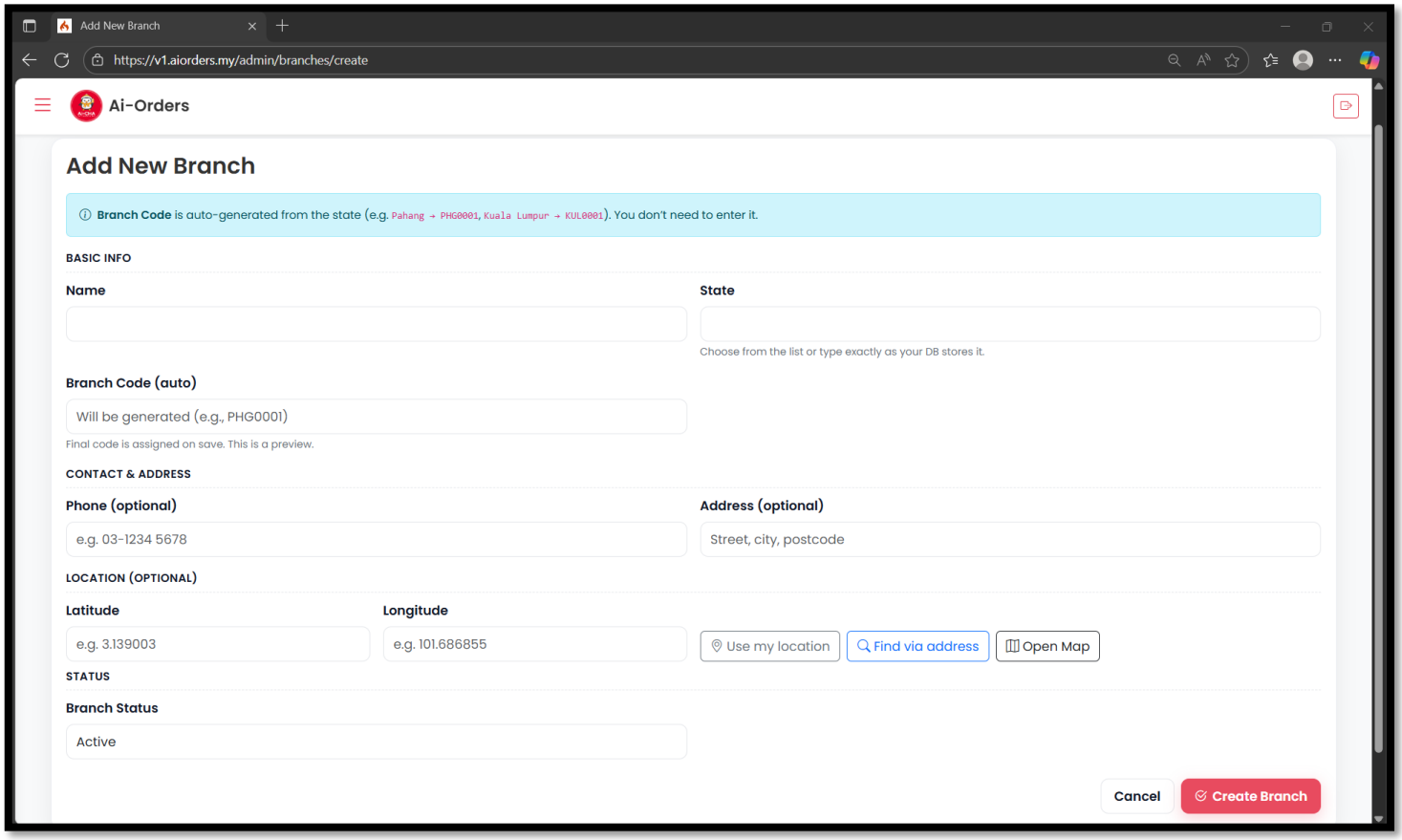
- Upload image, title, button text, URL.
- Set placement, schedule, and visibility.
- Preview before saving.

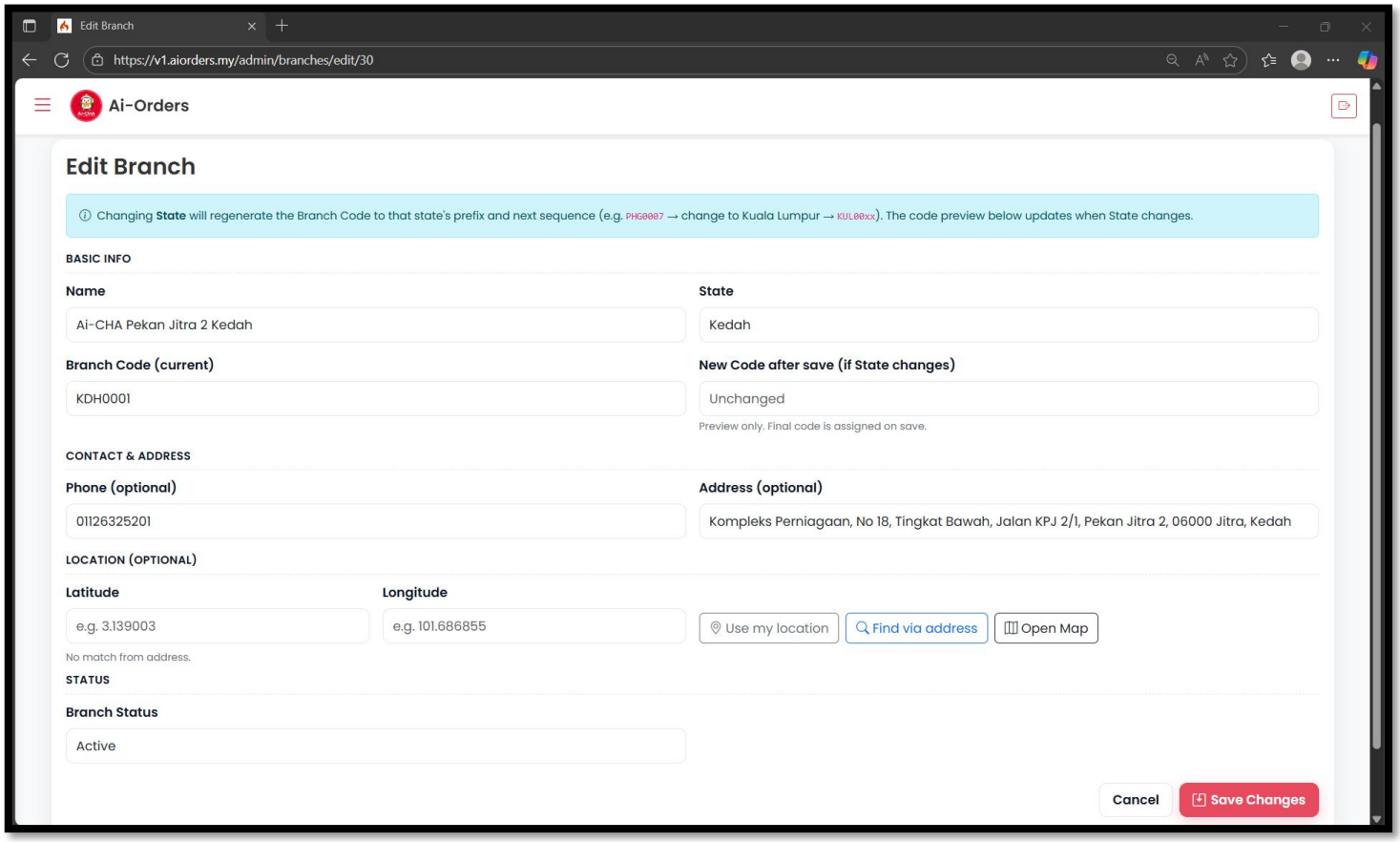
Branch Management



- View branch list with name, state, phone & coordinates.
- Add, edit, delete branches.
- Use filters by state/status.

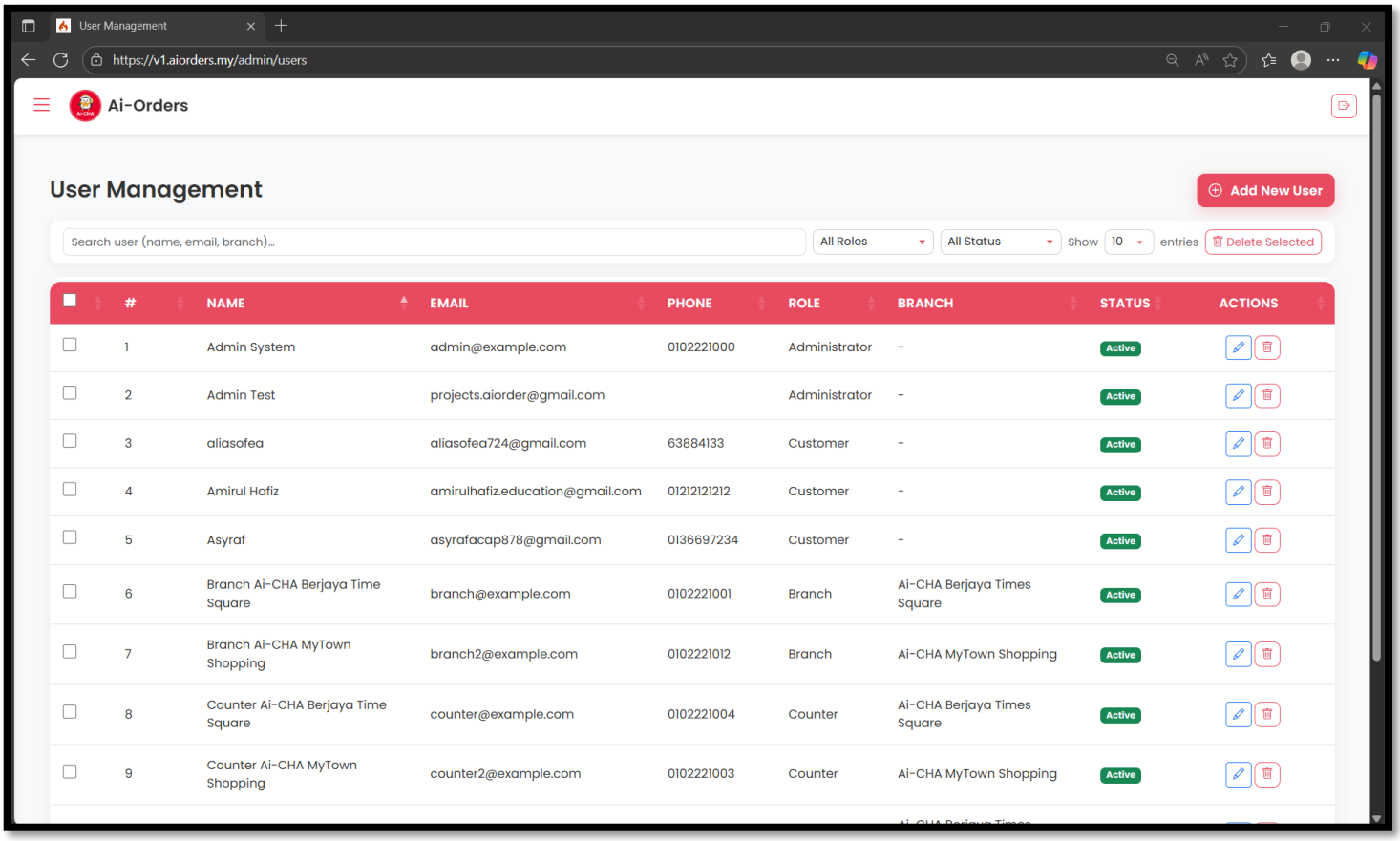
Add / Edit Branch





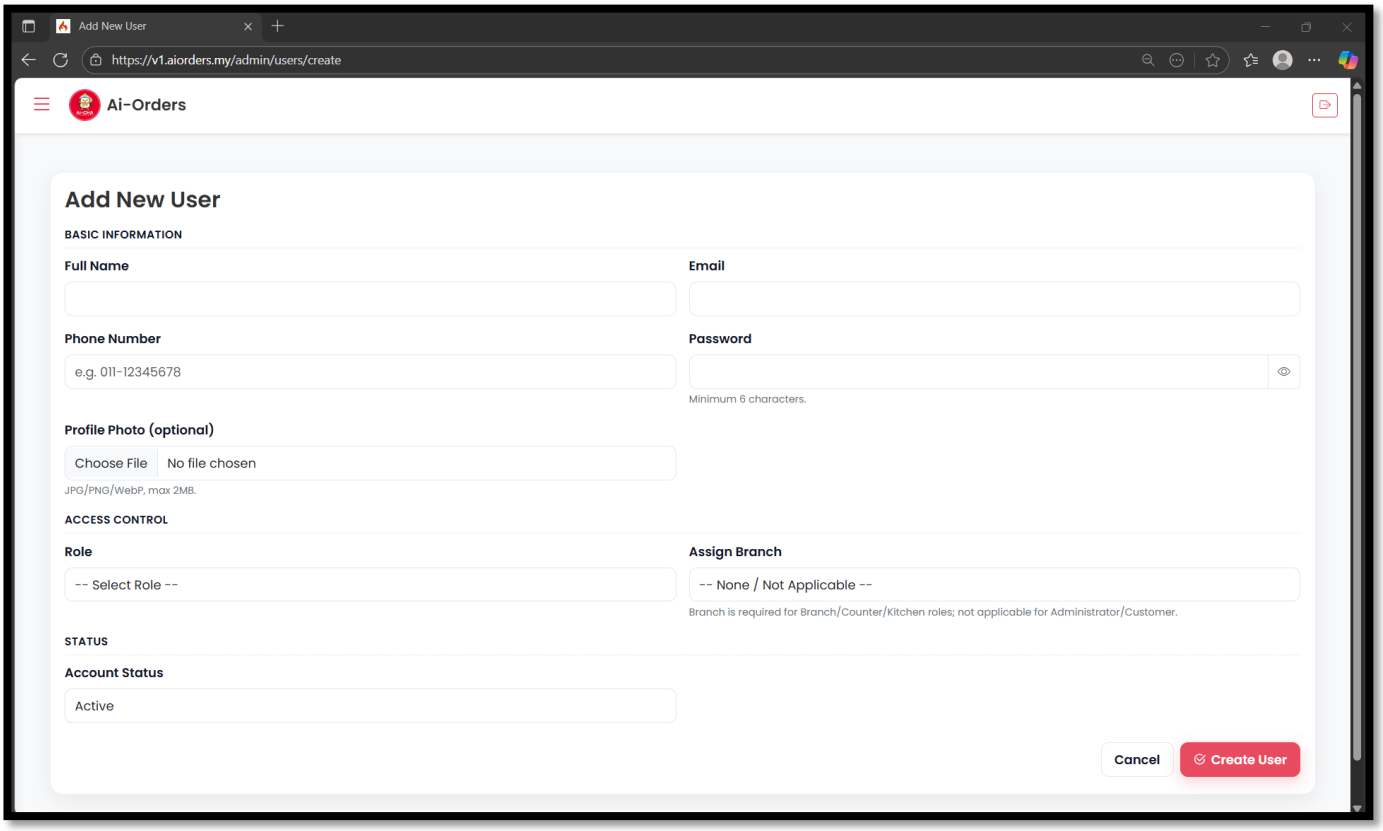
- Enter basic branch info.
- Auto-generated branch code.
- Set location via coordinates/map tools.
- Save changes or cancel.

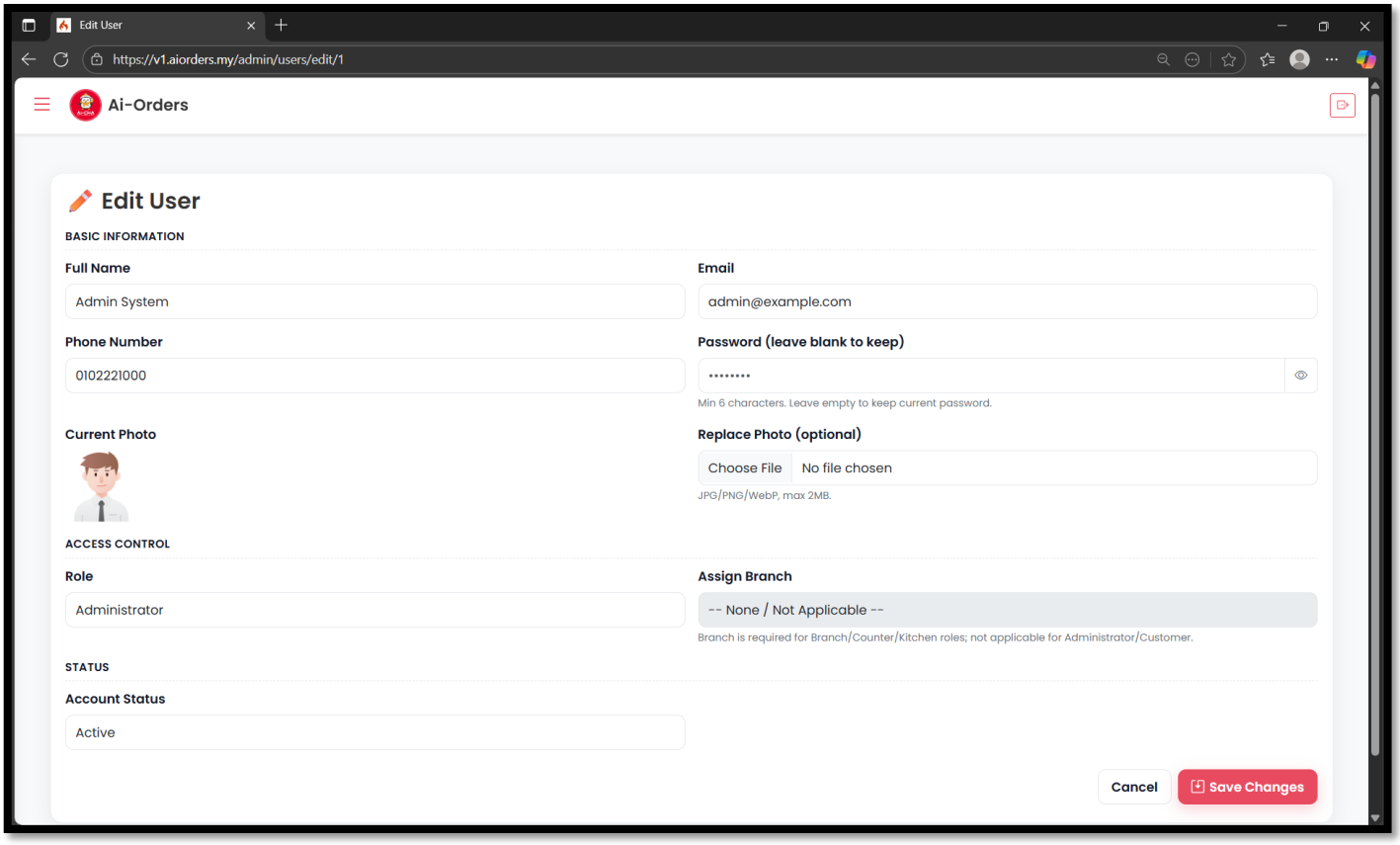
User Management



- View all system users by role.
- Add new users (Admin/Branch/Counter/Kitchen/Customer).
- Edit or delete users.
- Bulk delete available.

Add / Edit User

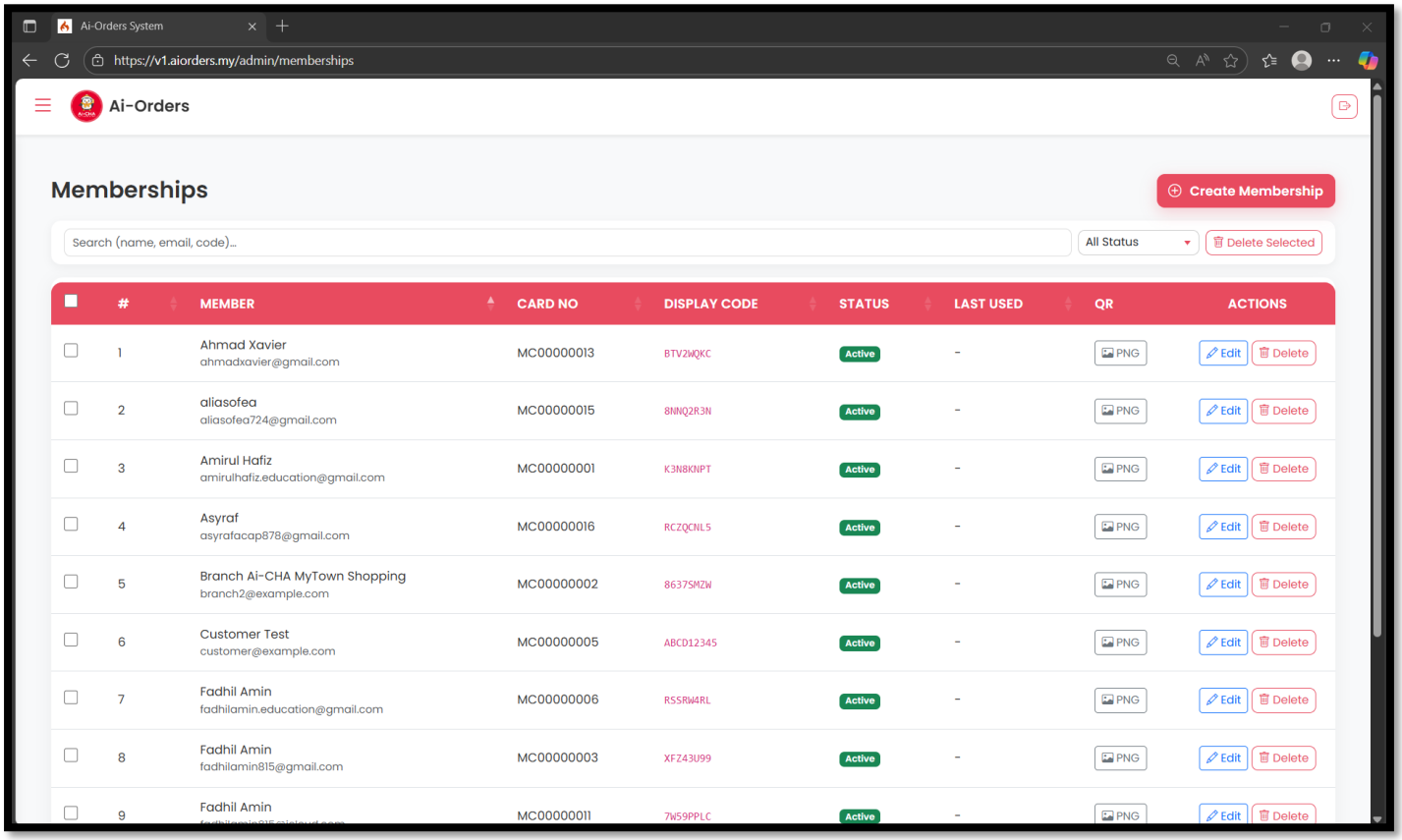


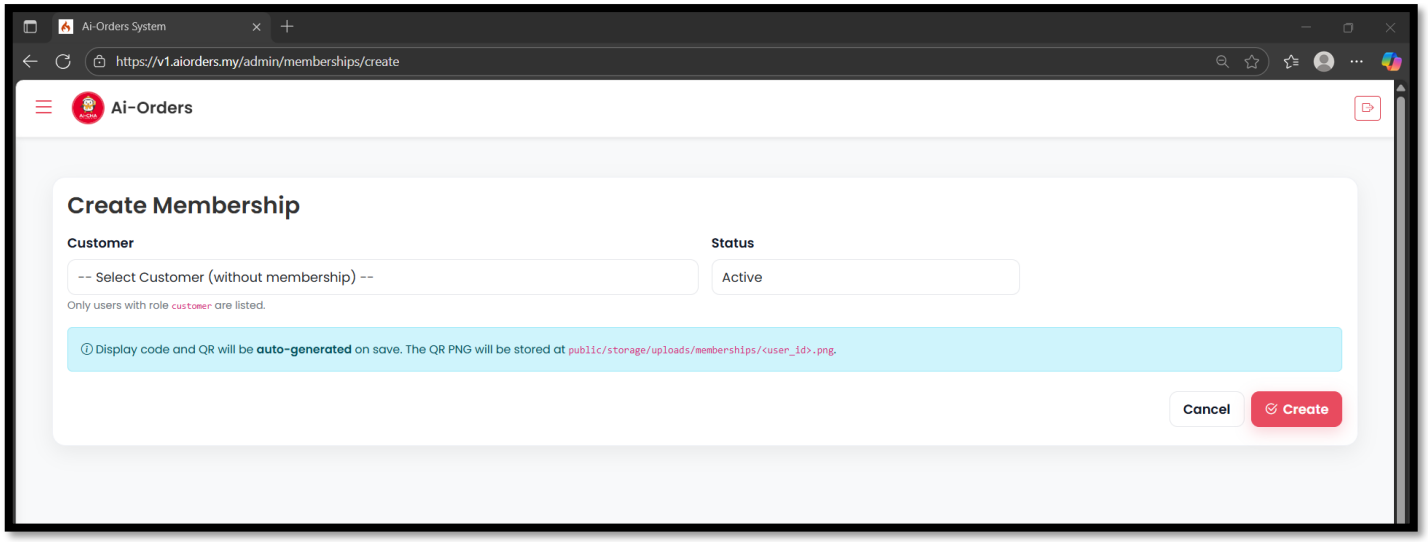


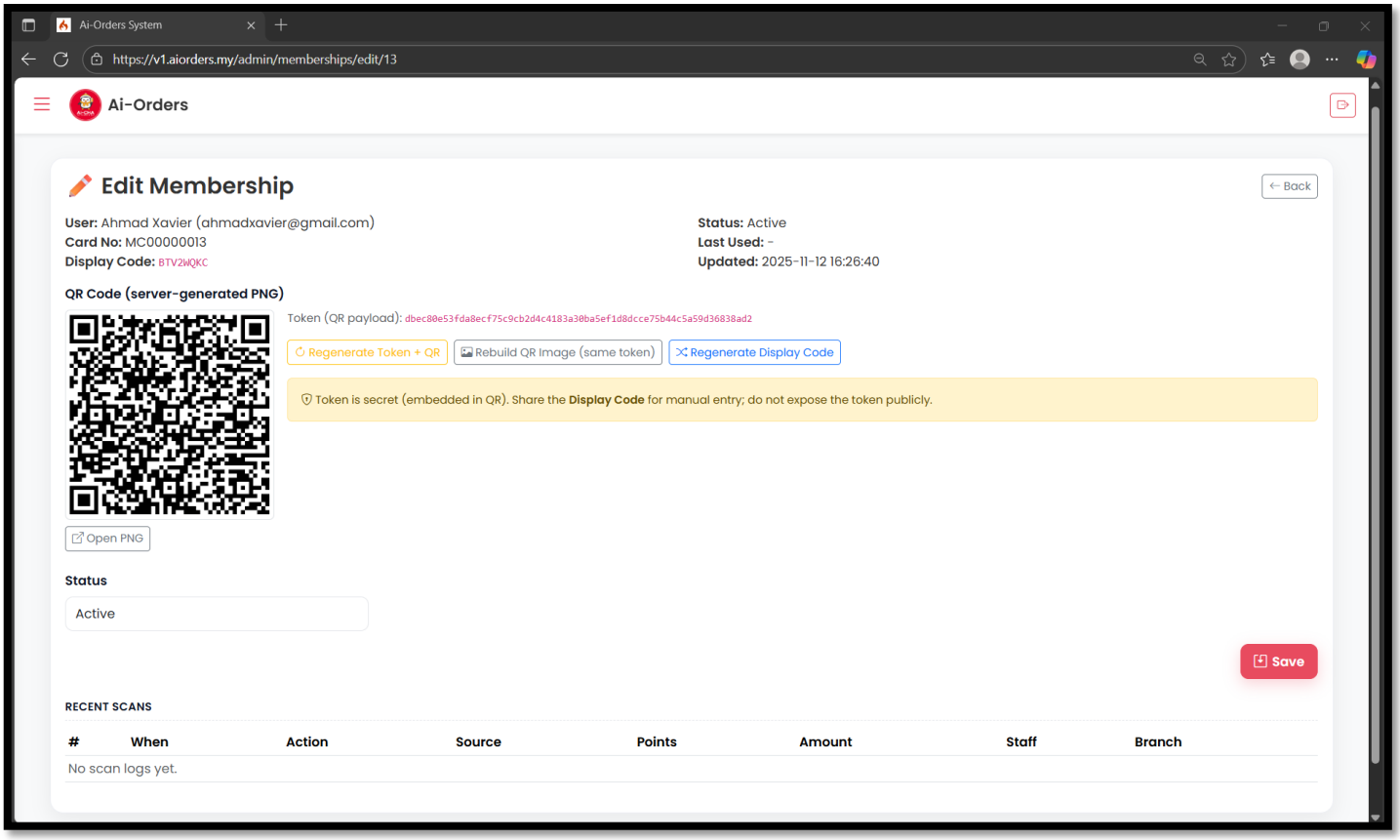
- Enter name, email, phone, password.

- Upload optional profile photo.
- Set role & branch.
- Activate/Deactivate account.

Membership Management

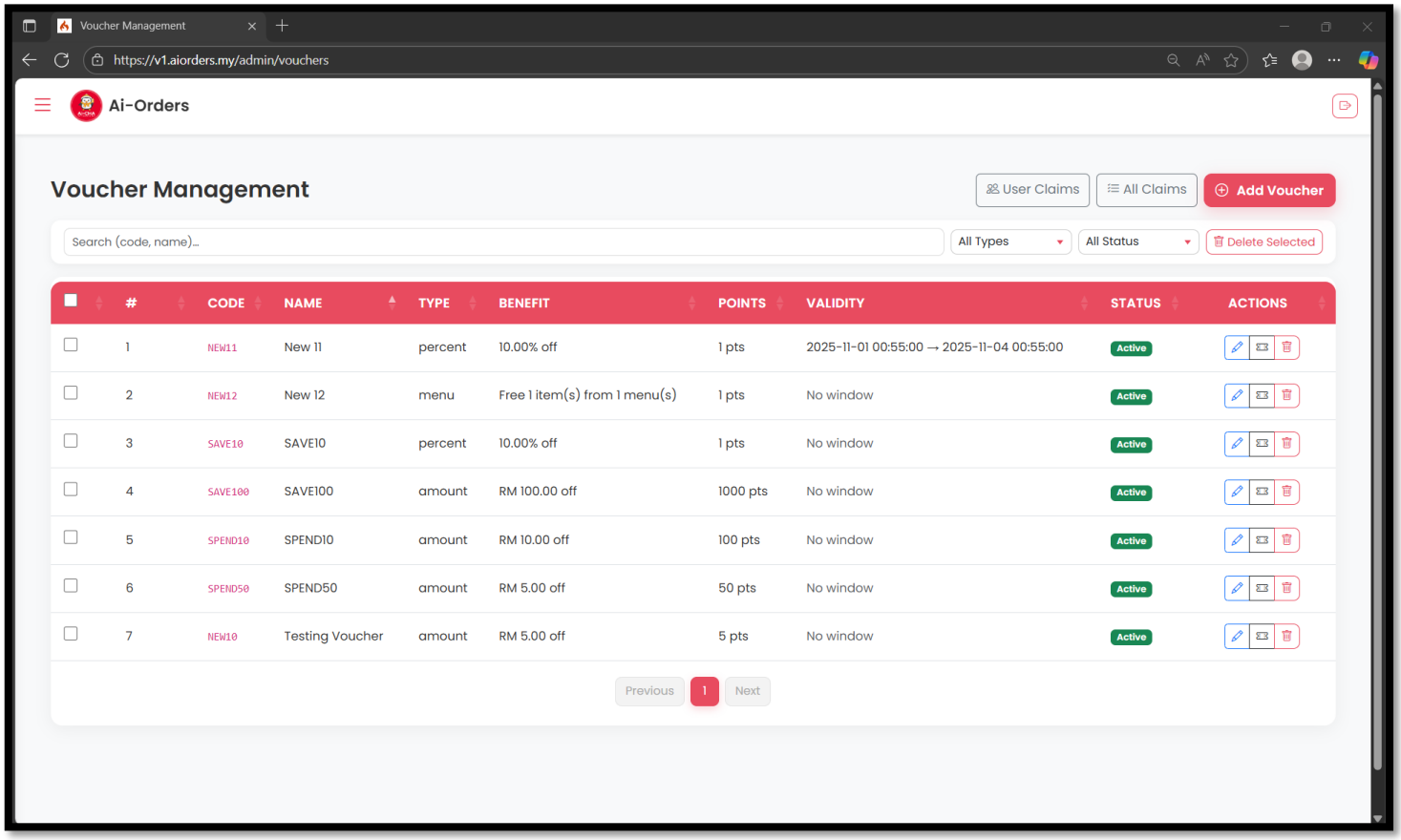


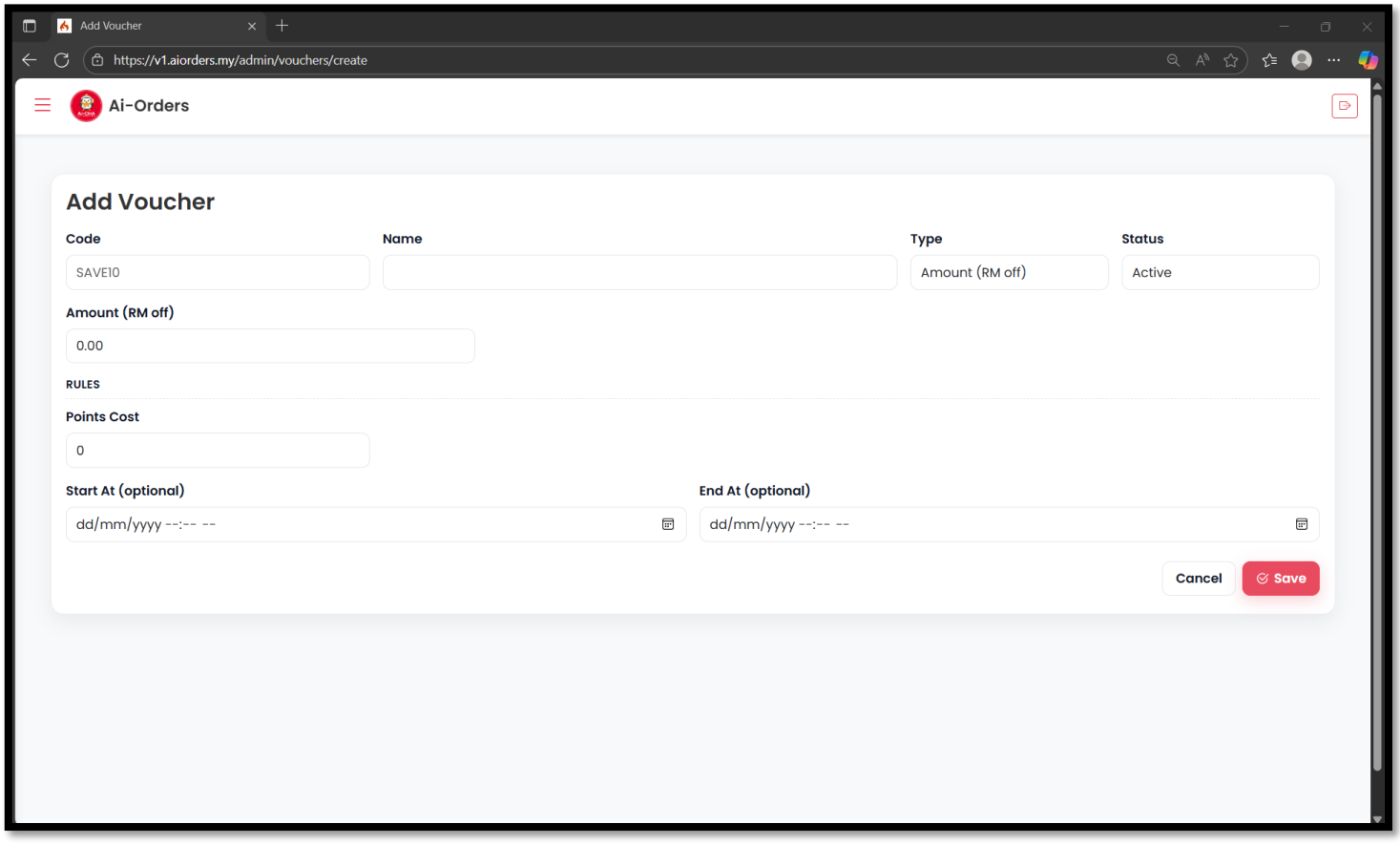


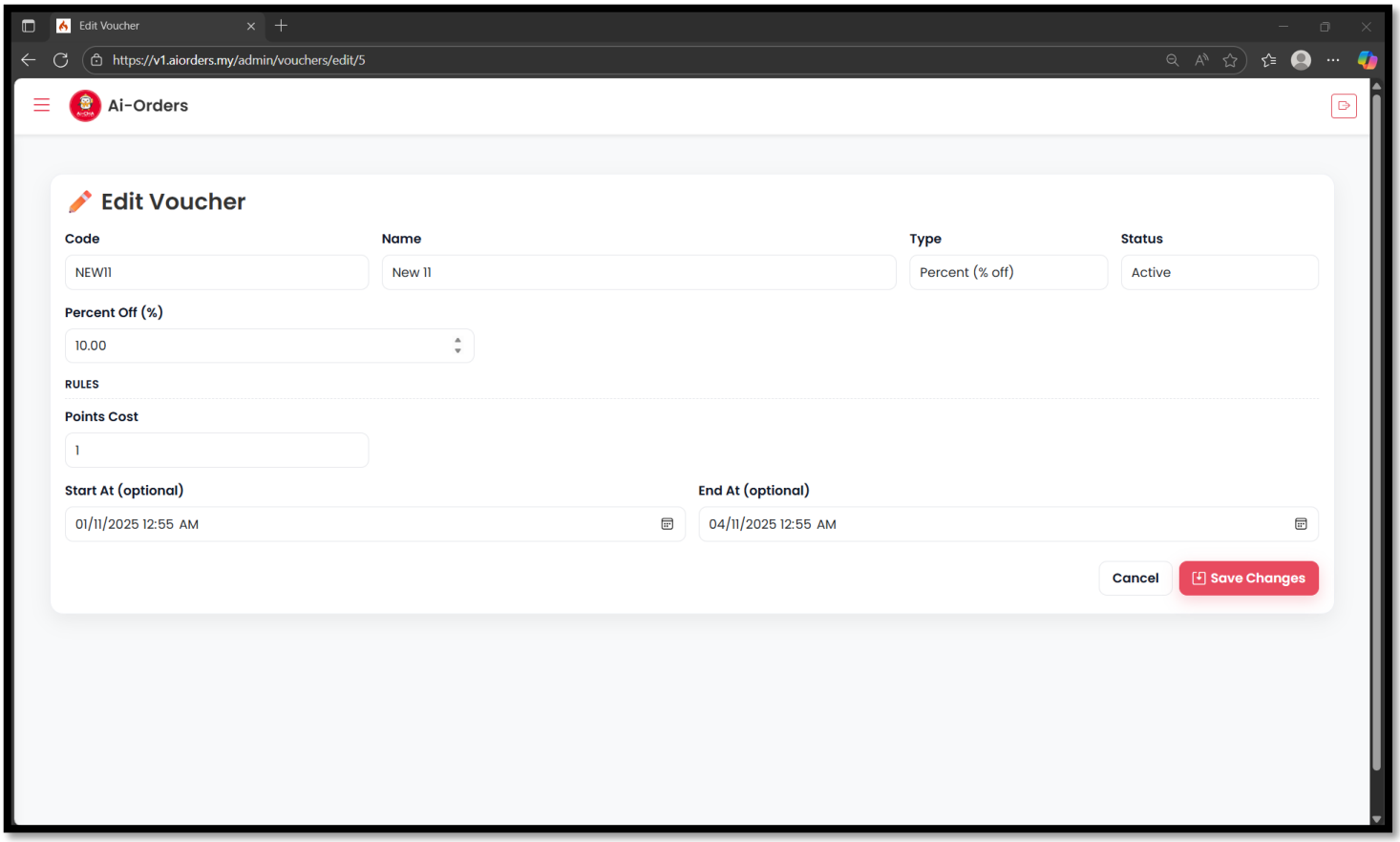


- View members (card number, display code, QR).
- Create new membership for customers.
- Edit or delete memberships.
- See last used date & QR scans.

Voucher Management

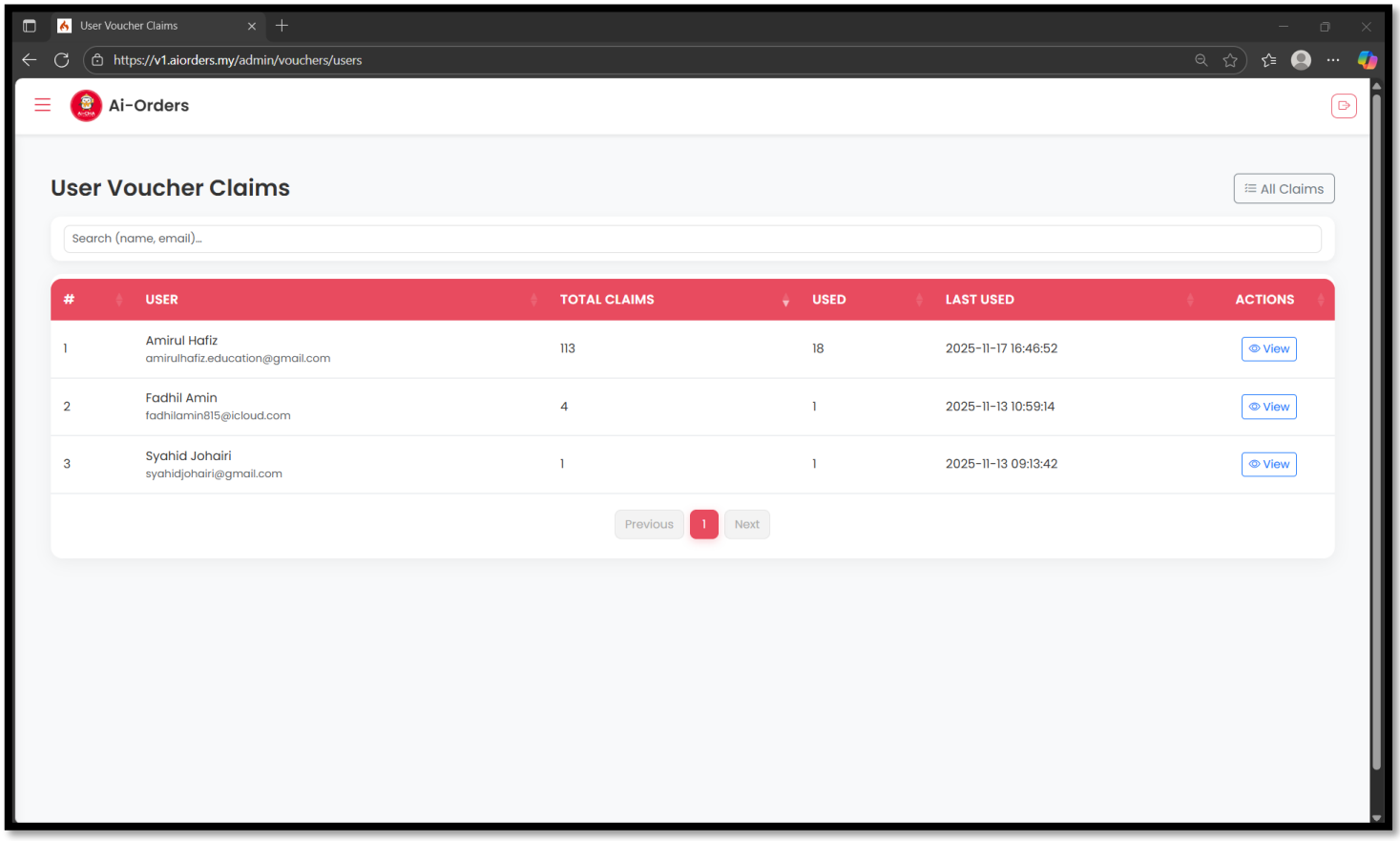


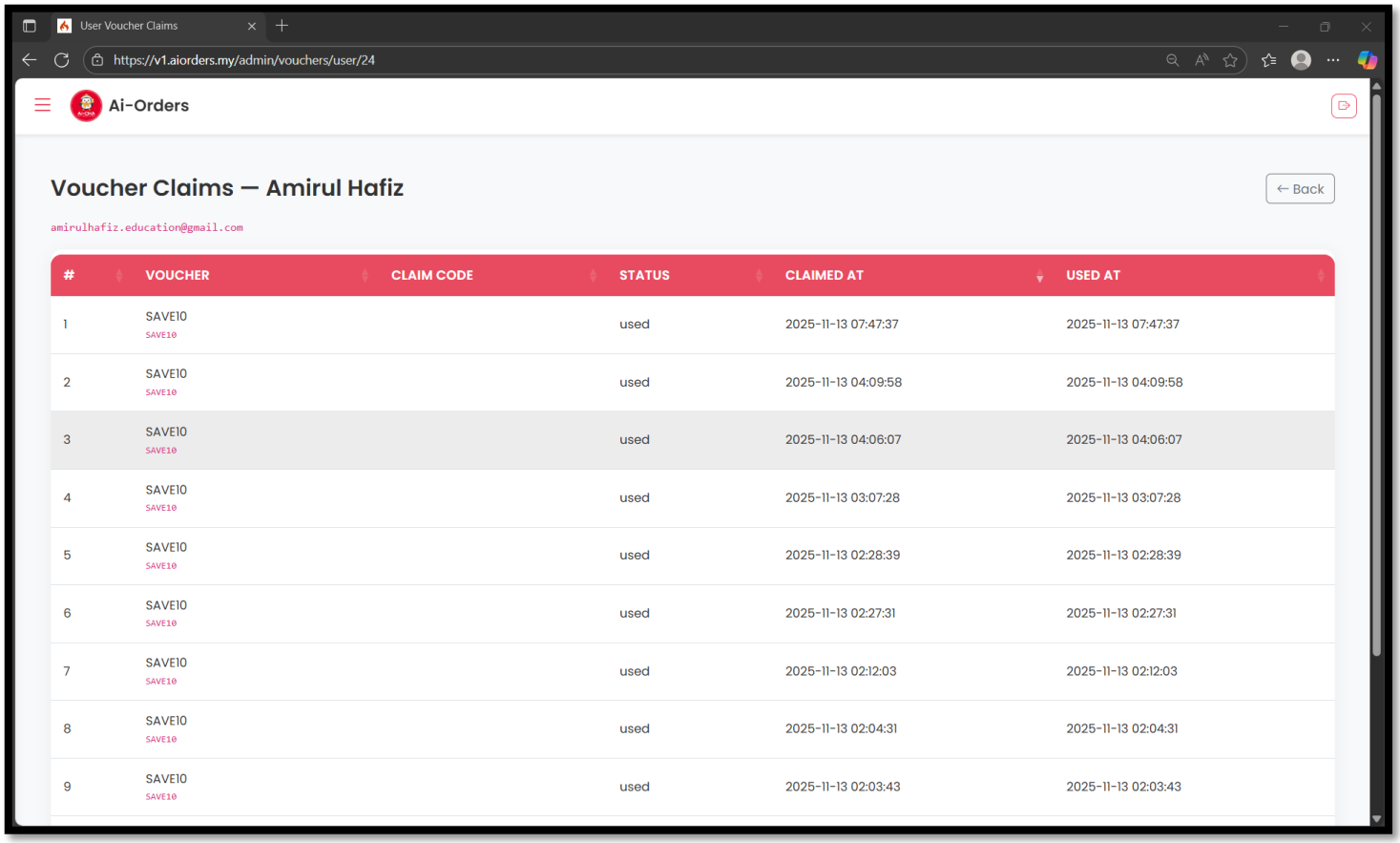


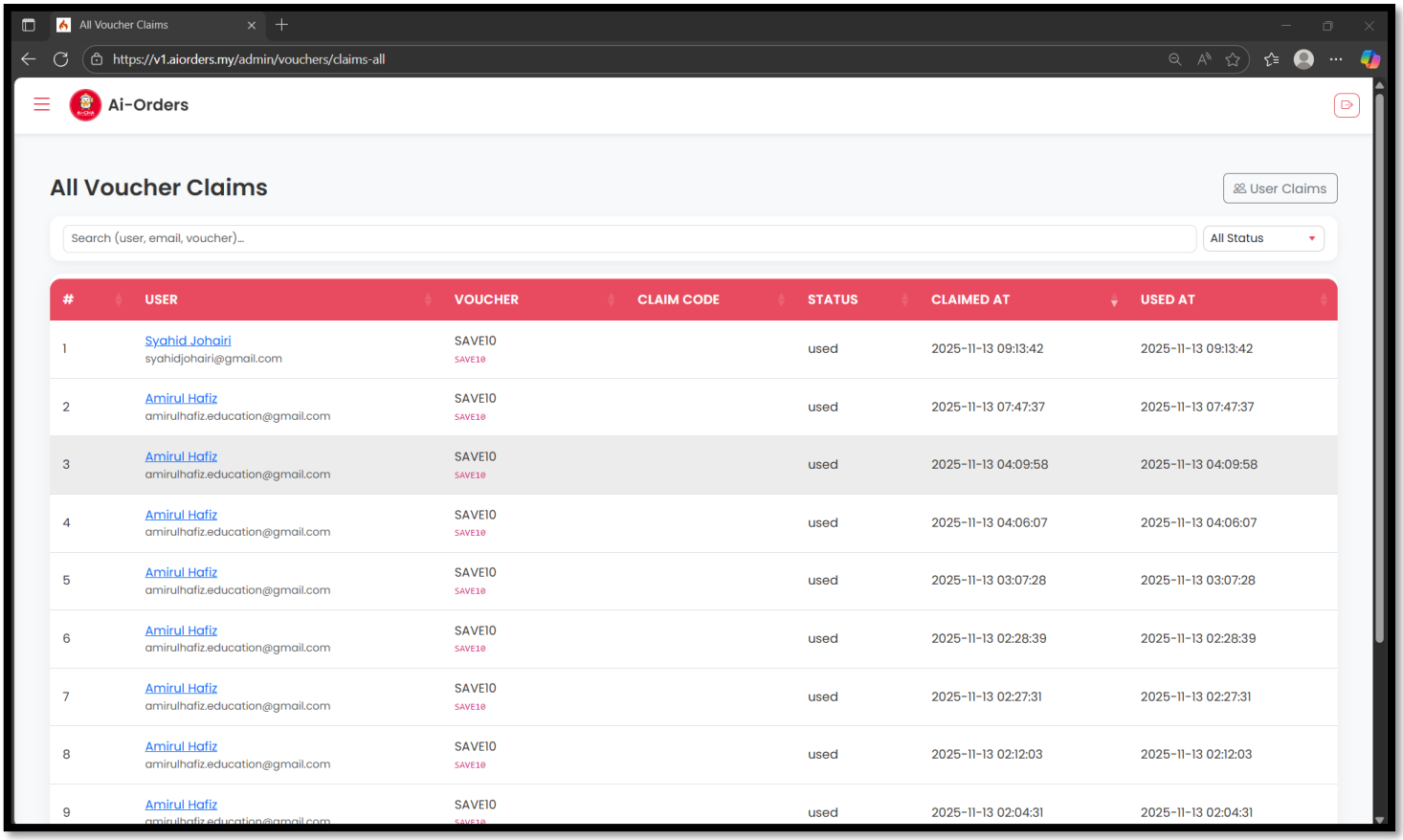


- View all vouchers with type (percent/amount/menu).
- Add, edit, or delete vouchers.
- View claims history.

User Voucher Claims

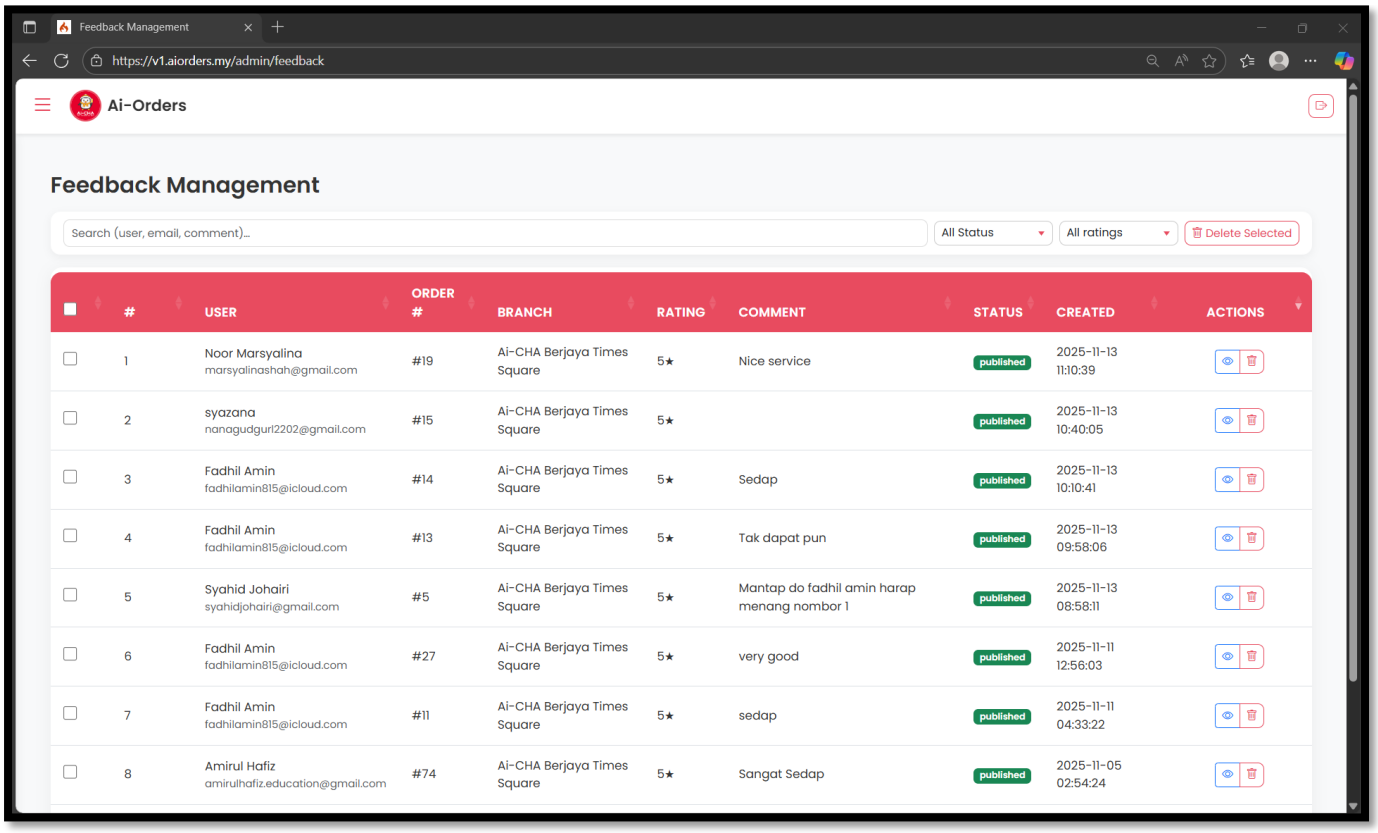


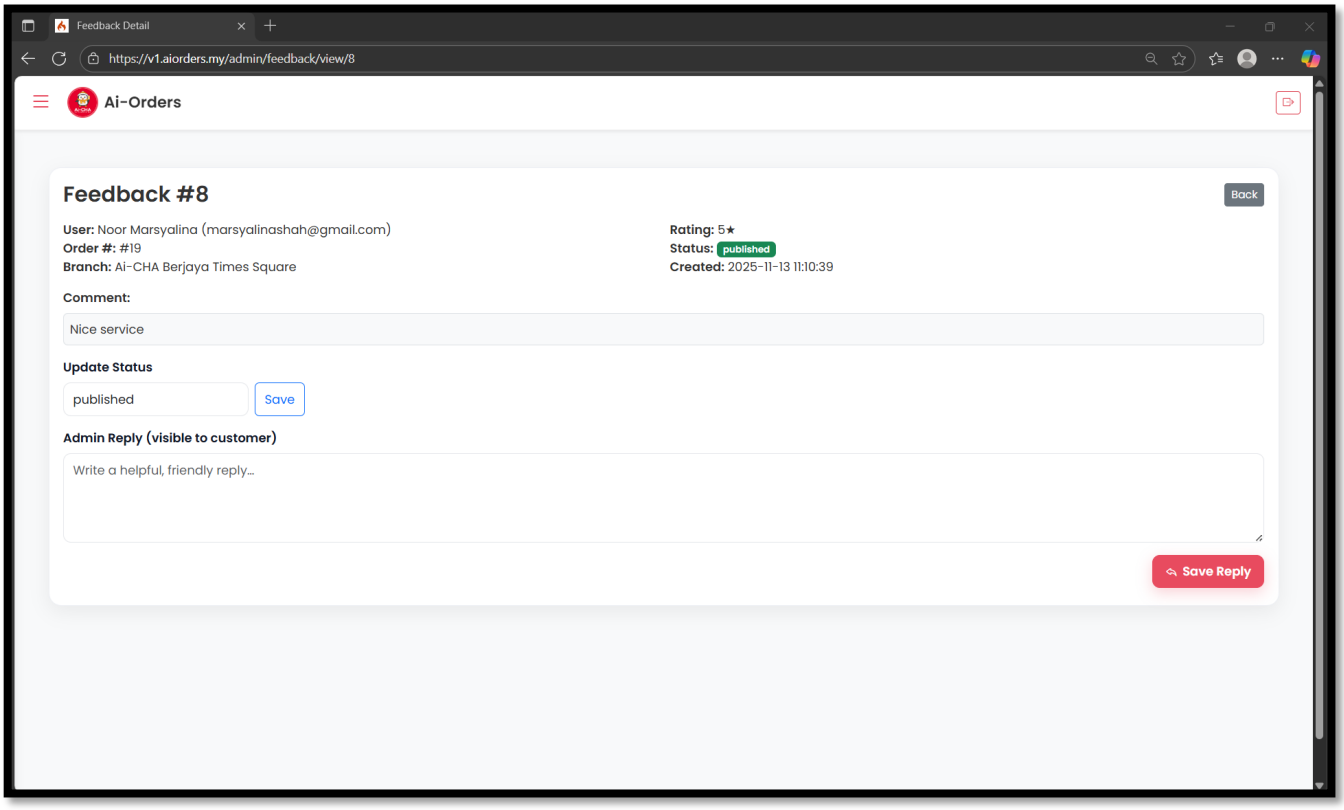




- Summary: total claimed, used, last usage.
- View detailed history per user.
- View all claims system-wide.

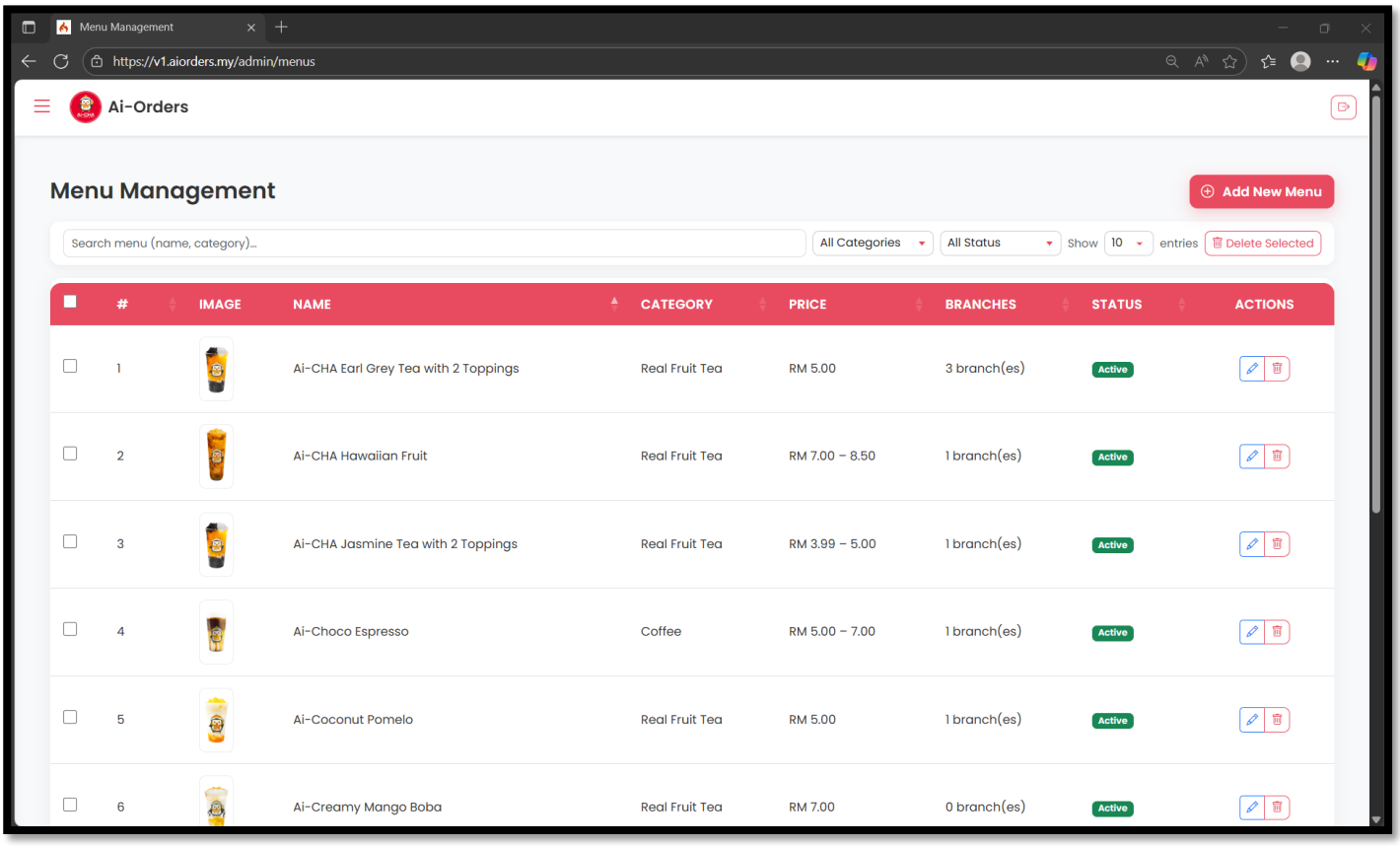
Feedback Management

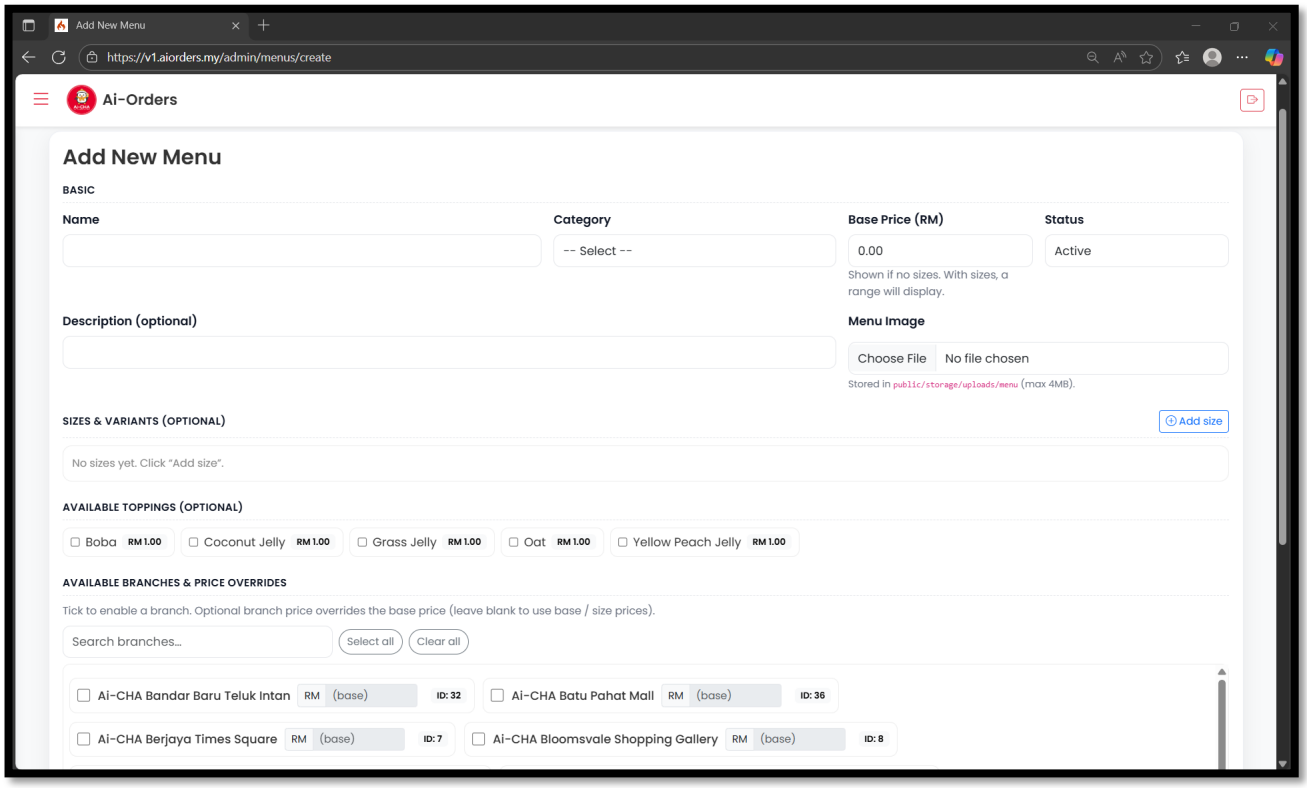


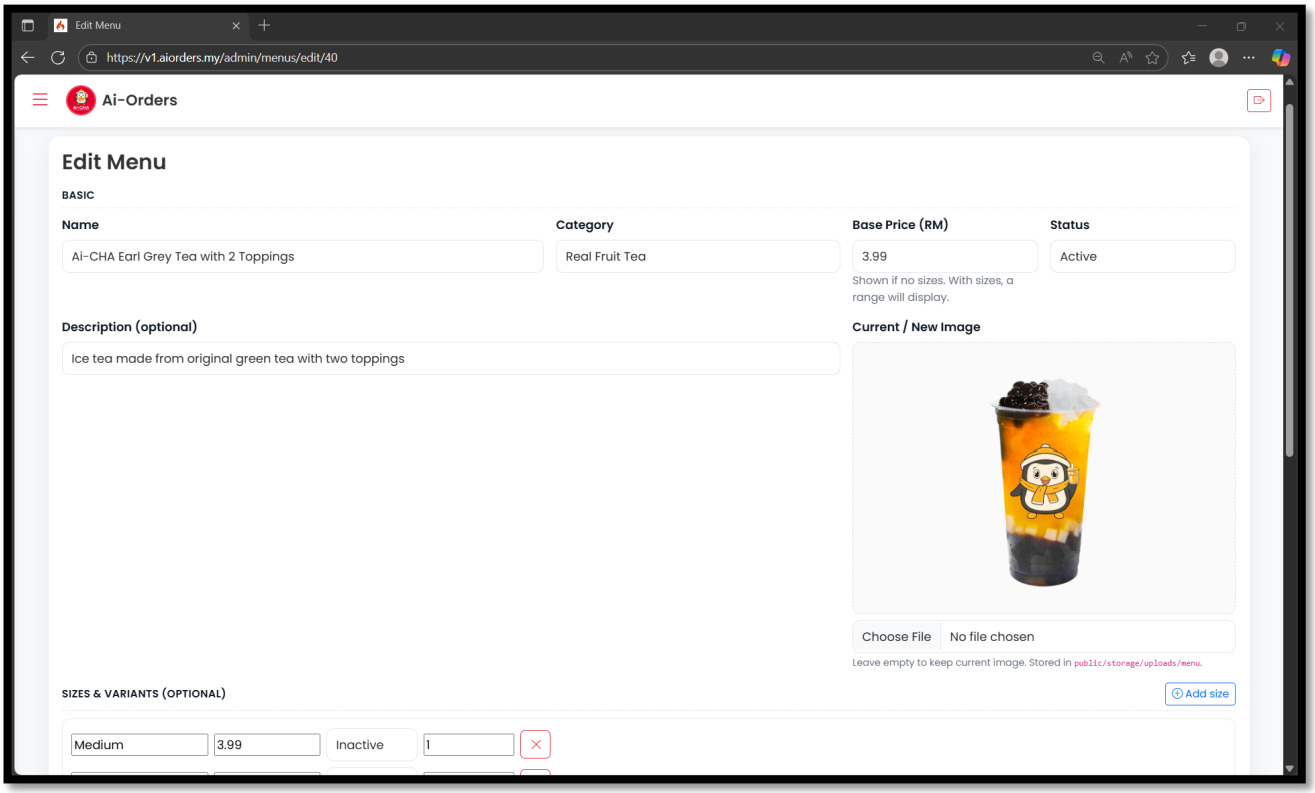


- View customer ratings and comments.
- Filter by rating/status.
- Reply to customers via Admin Reply.
- Publish or hide feedback.

Menu Management

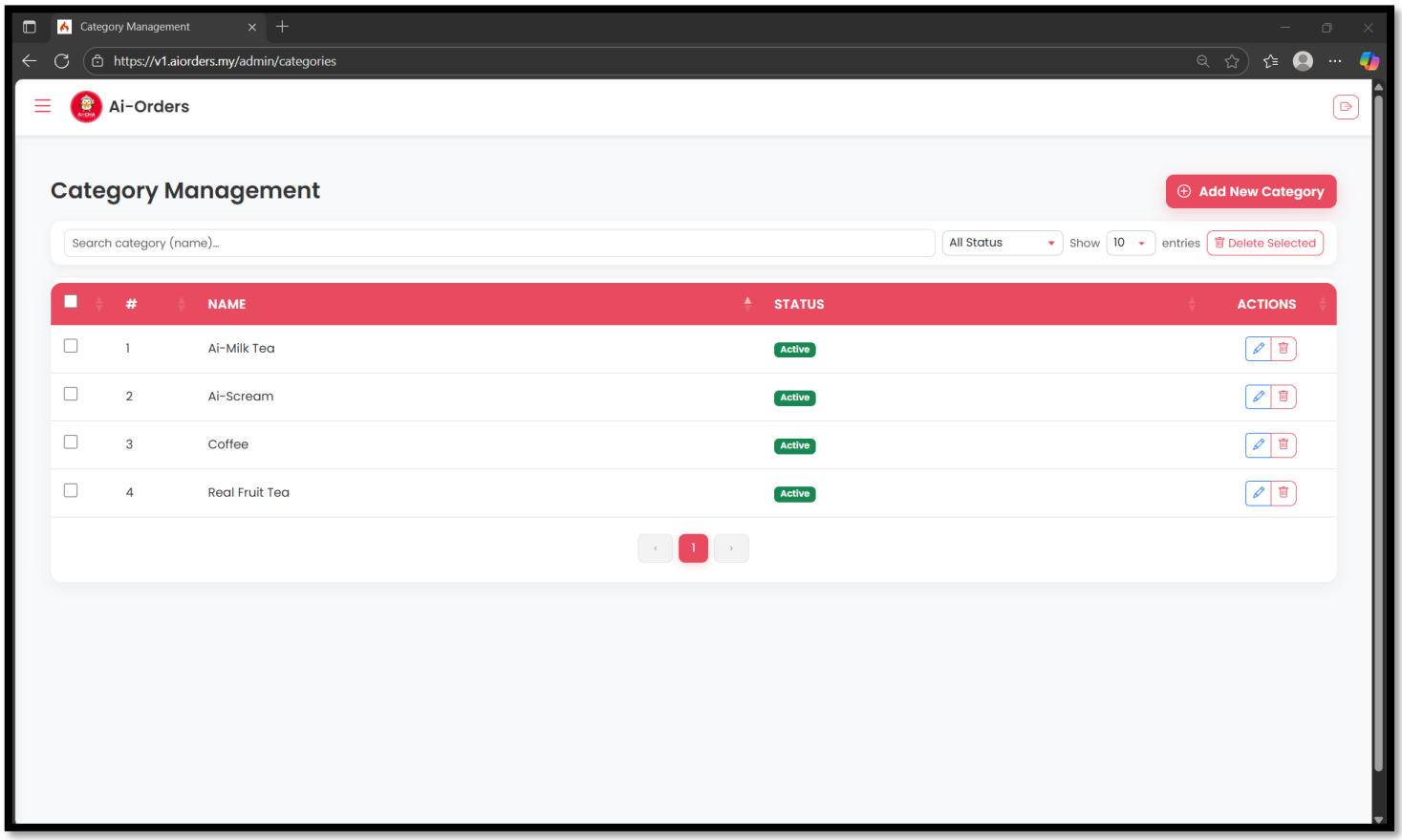


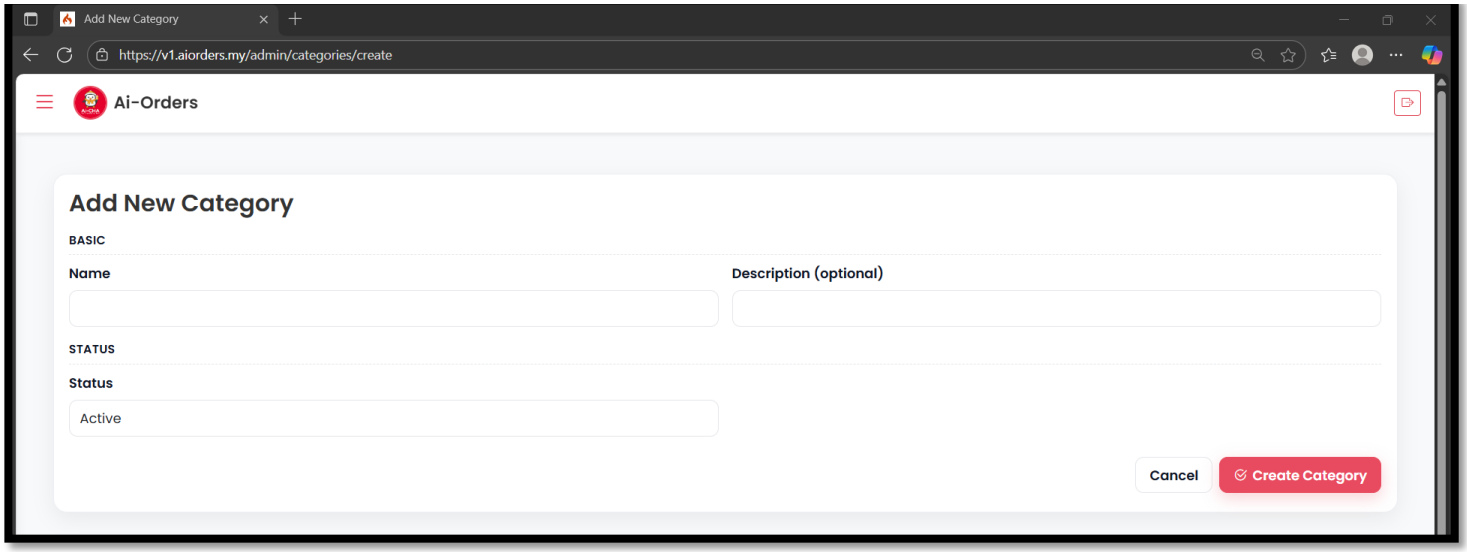


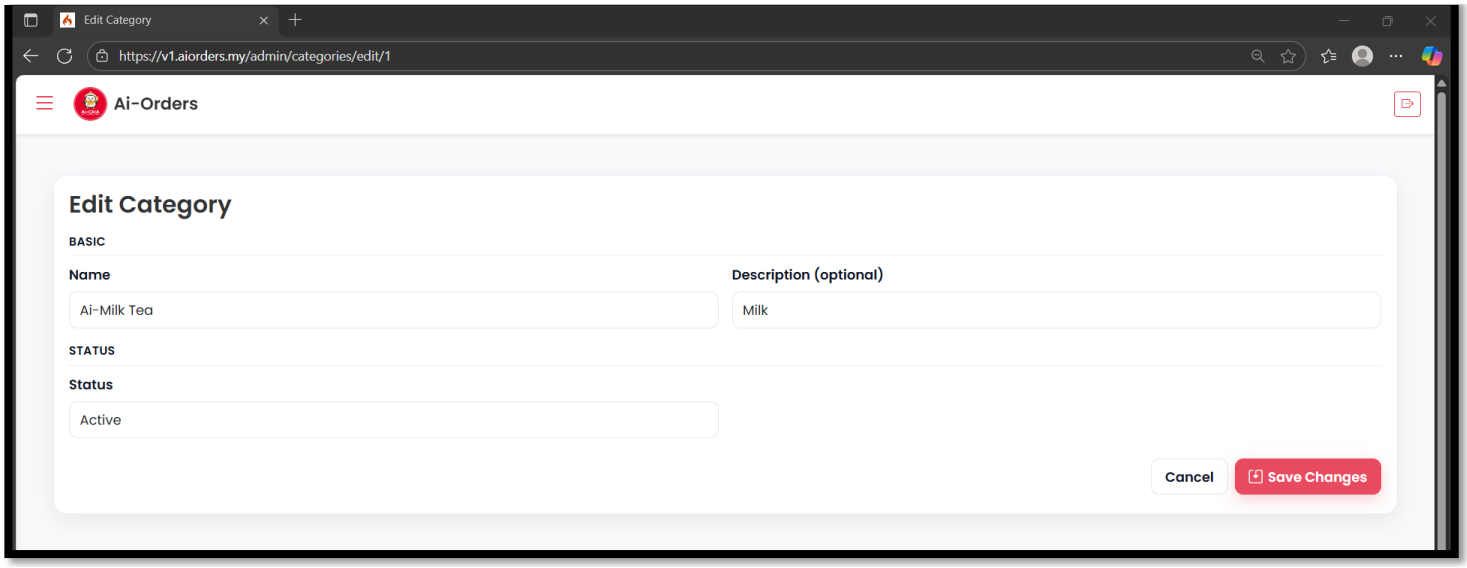


- View menu list with image, category, price.
- Add/edit/delete menu items.
- Manage variants, toppings & branch availability.

Category Management

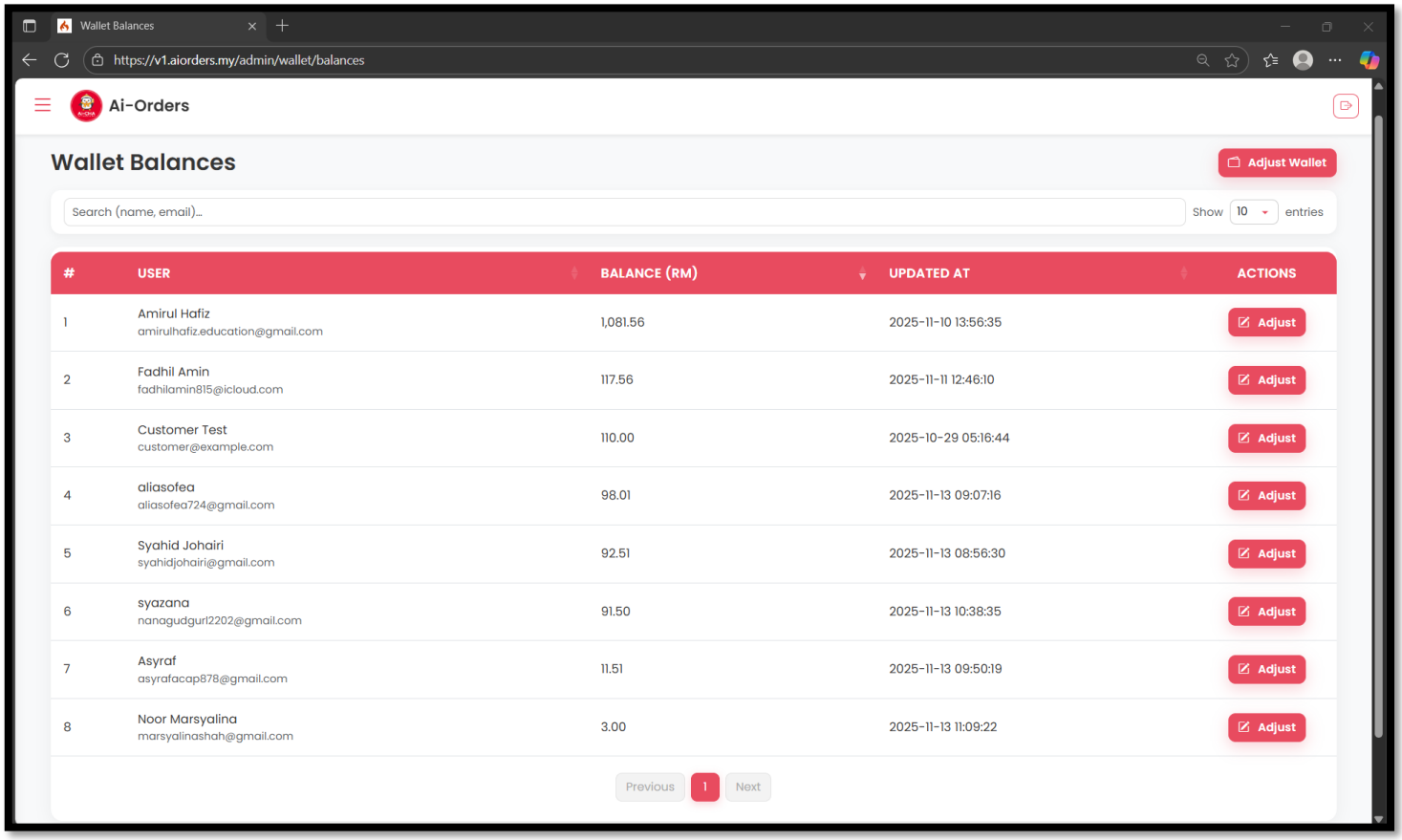


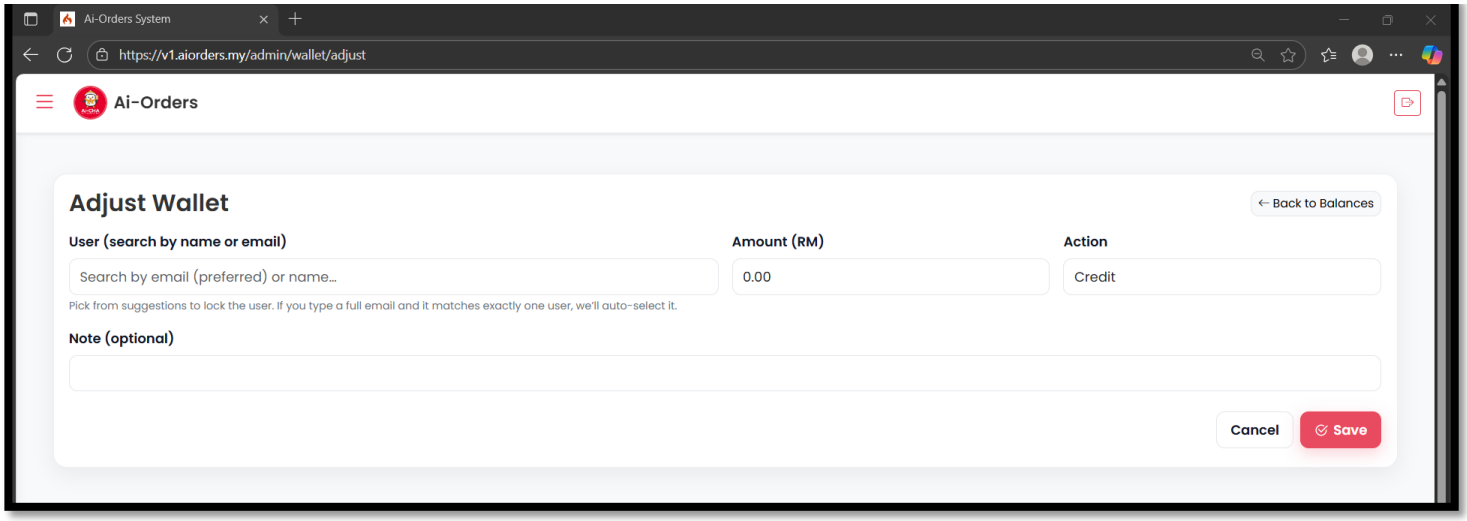


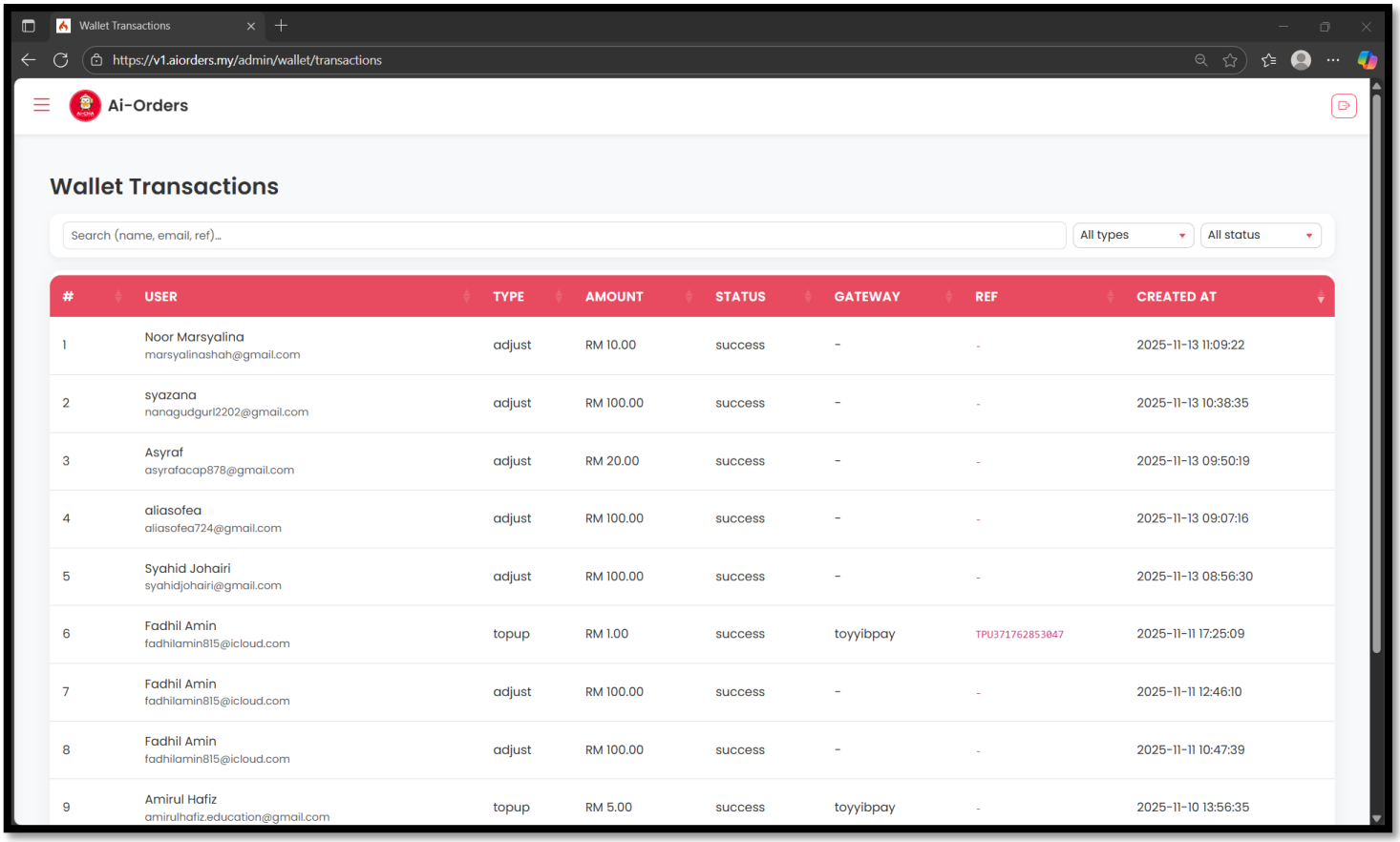


- Add/edit/delete categories.
- Set category status.

Wallet Management

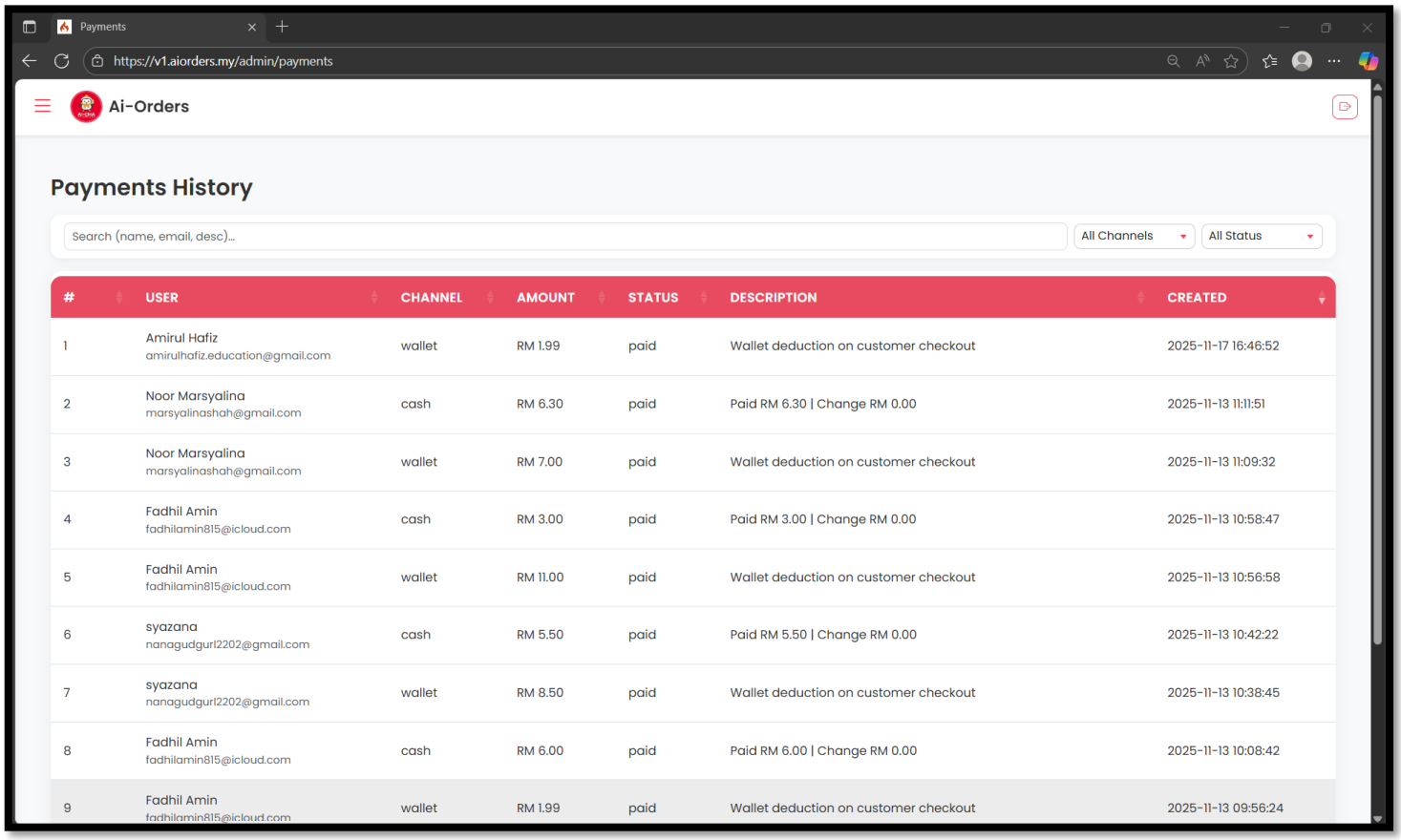






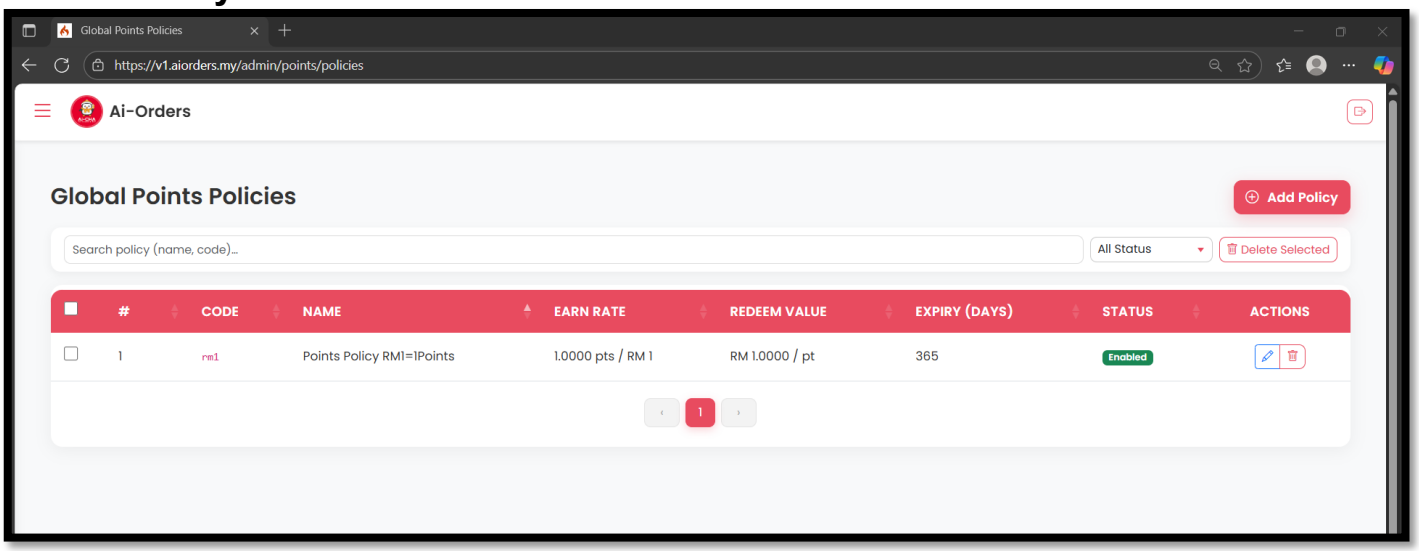
- View wallet balances of users.
- Adjust wallet (credit/debit)
- Add reason notes for auditing.
- View full wallet transaction logs.

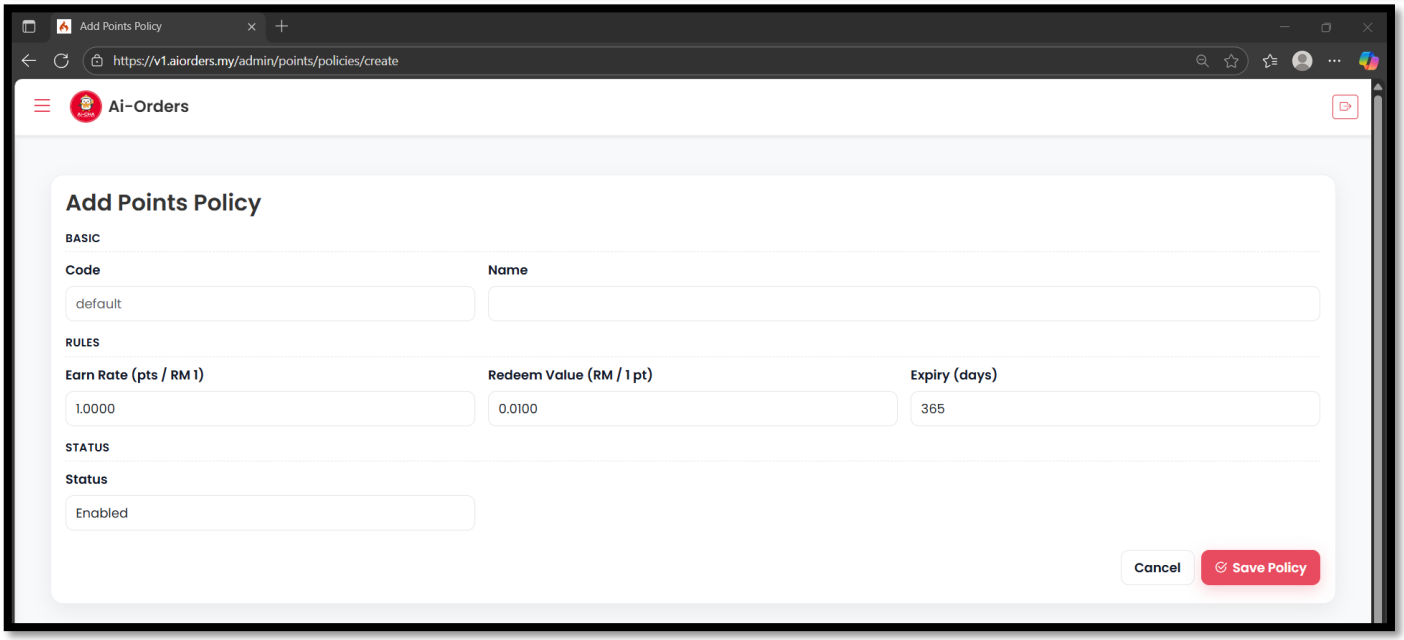
Payment History

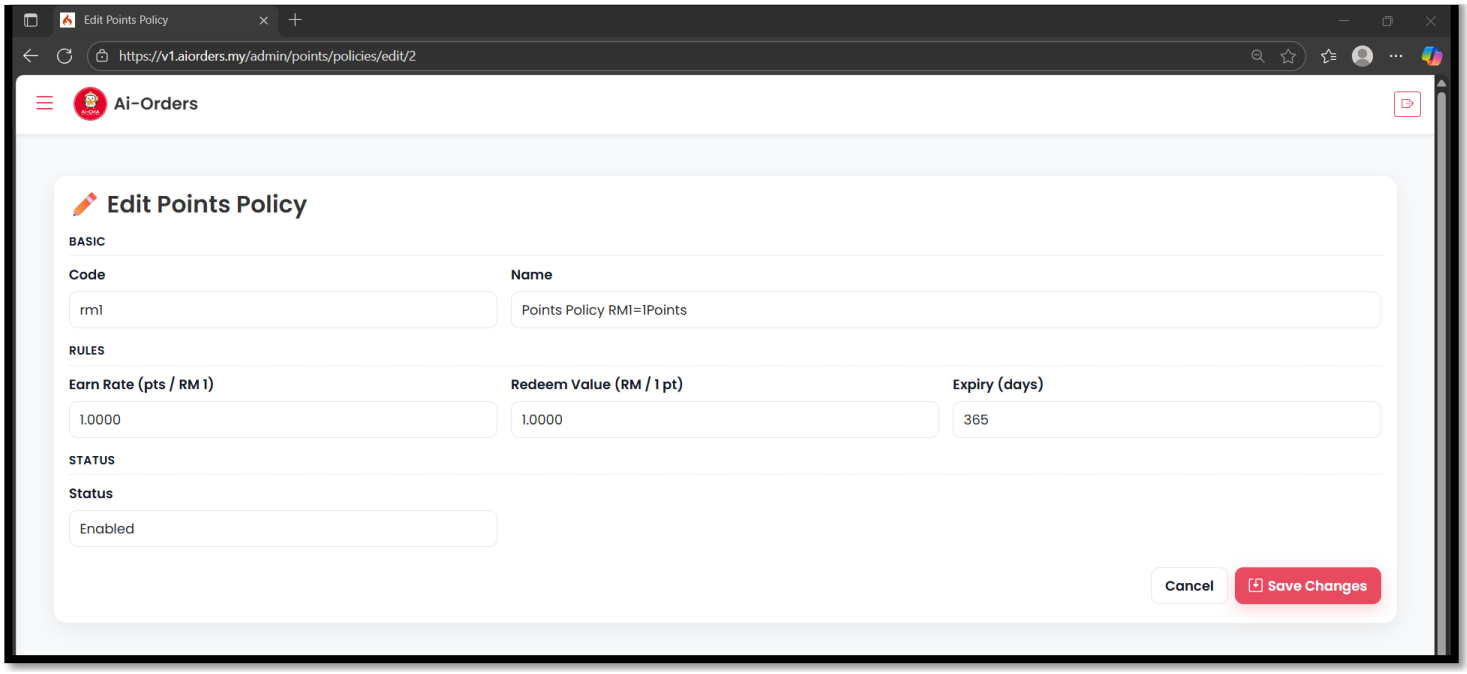


- View all payments (cash/wallet).
- Check status, timestamp & amount.
- Filter by method/status.

Points Policy

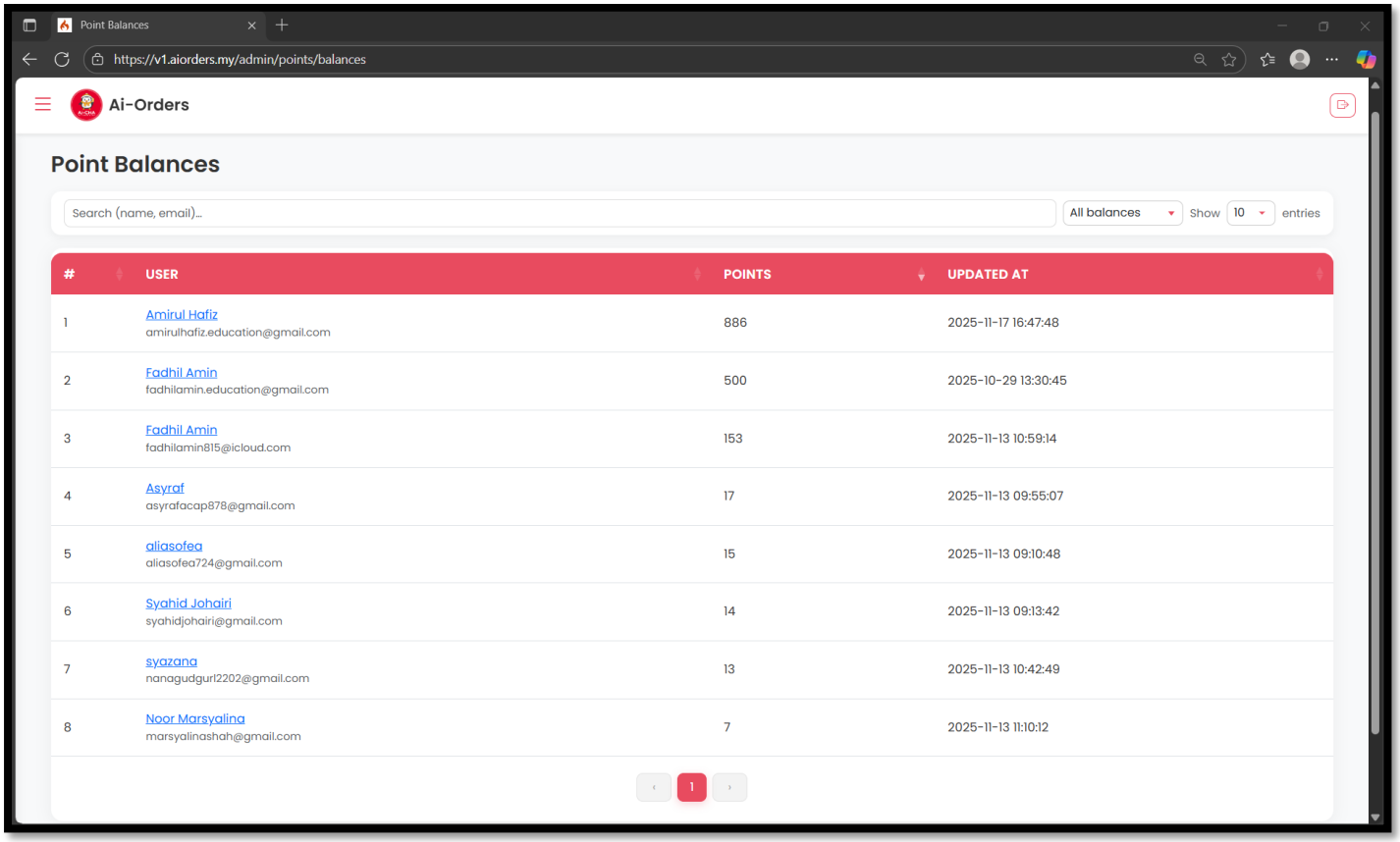


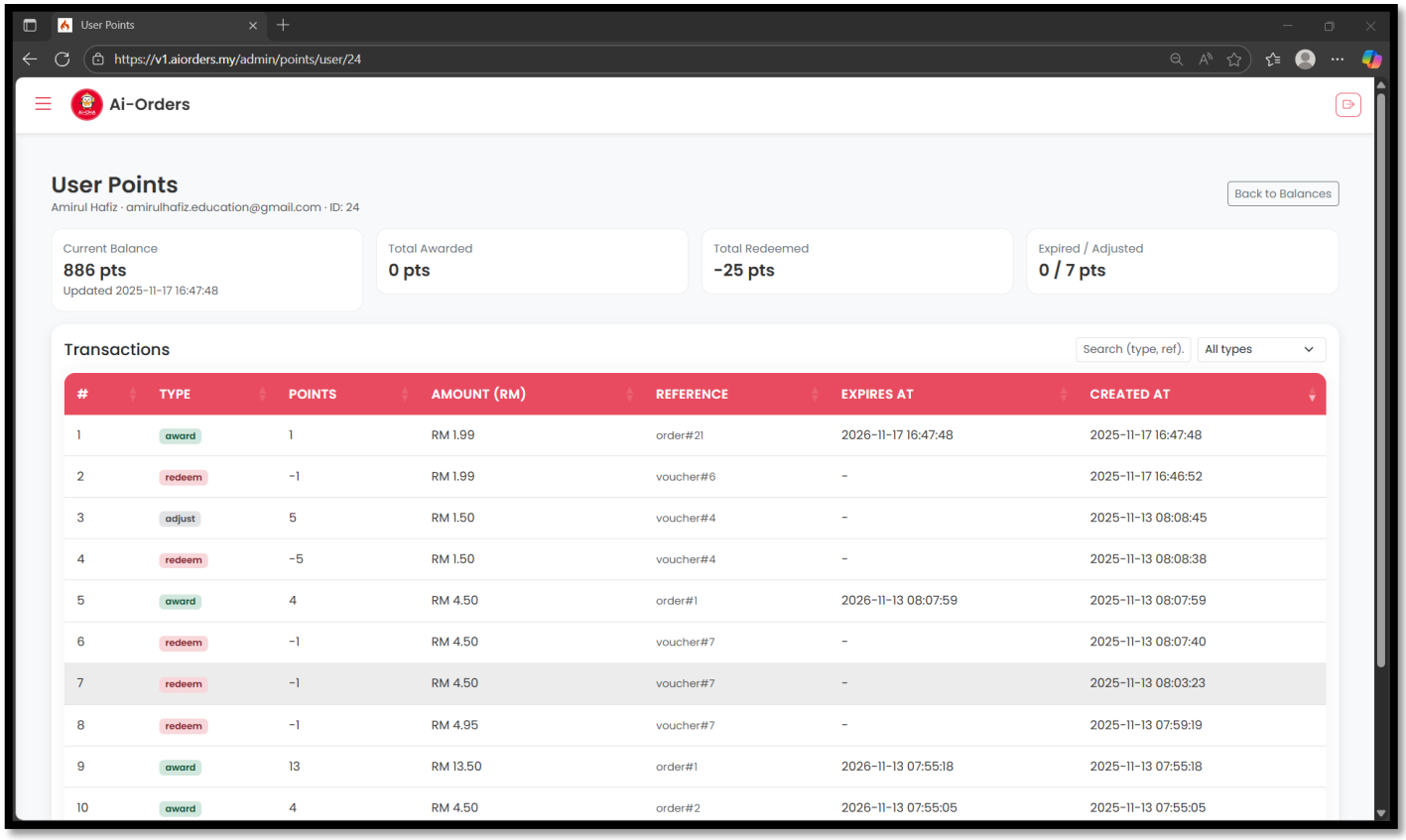


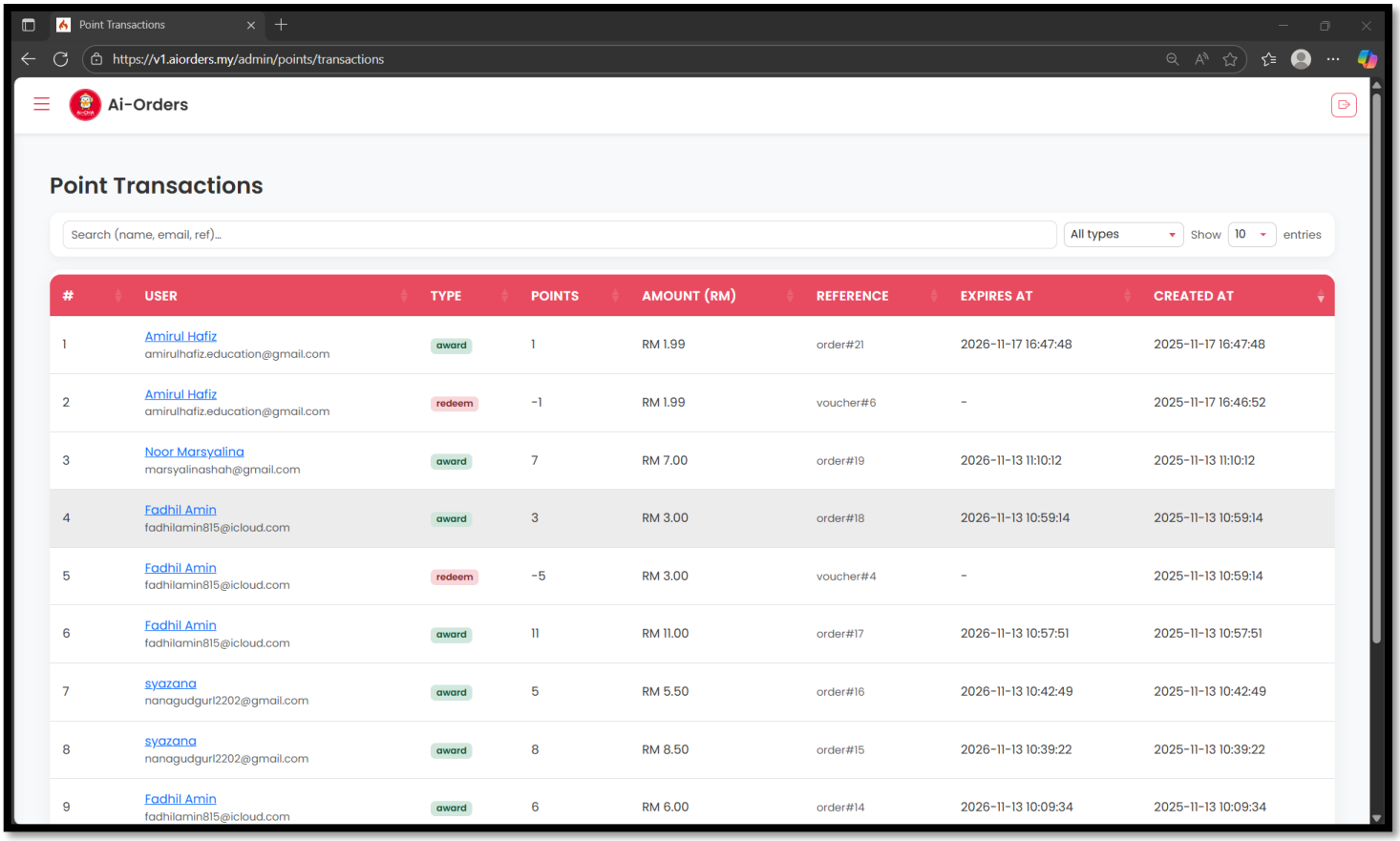


- Configure global earn/redeem rules.
- Edit or delete policies.
- Set points expiry.

Points Balance & Transactions

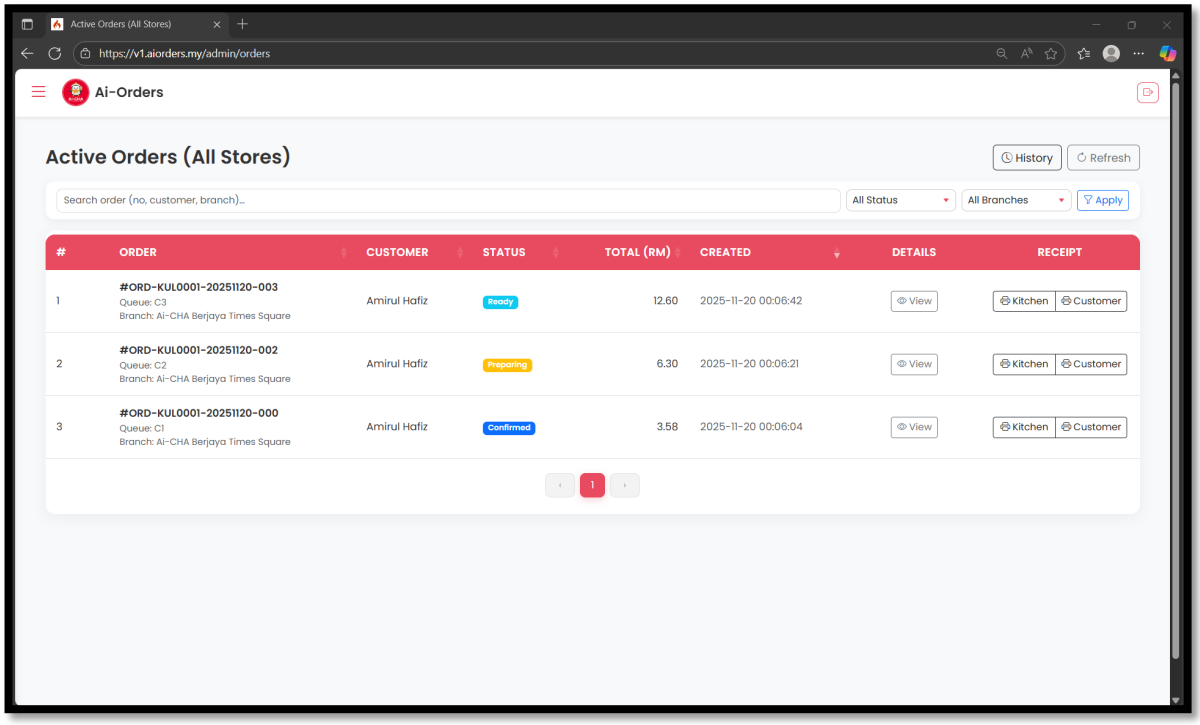


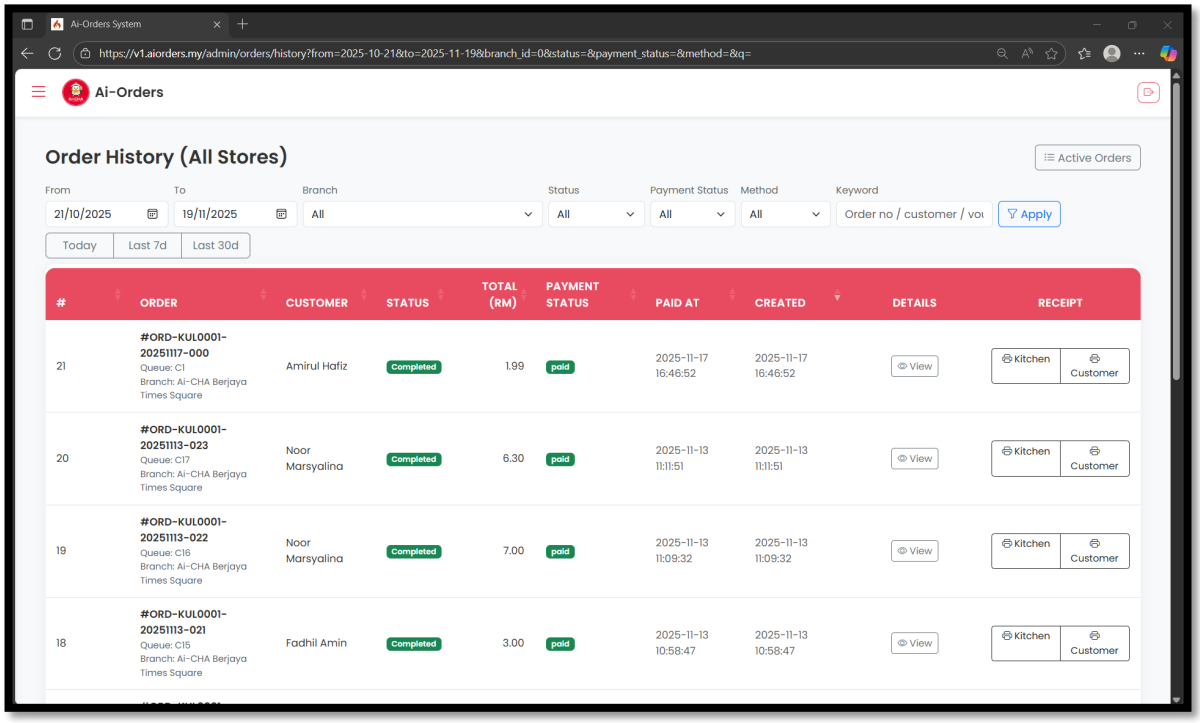




- View customer points balance.
- See detailed points history (earn, redeem, adjust).
- View global points transactions.

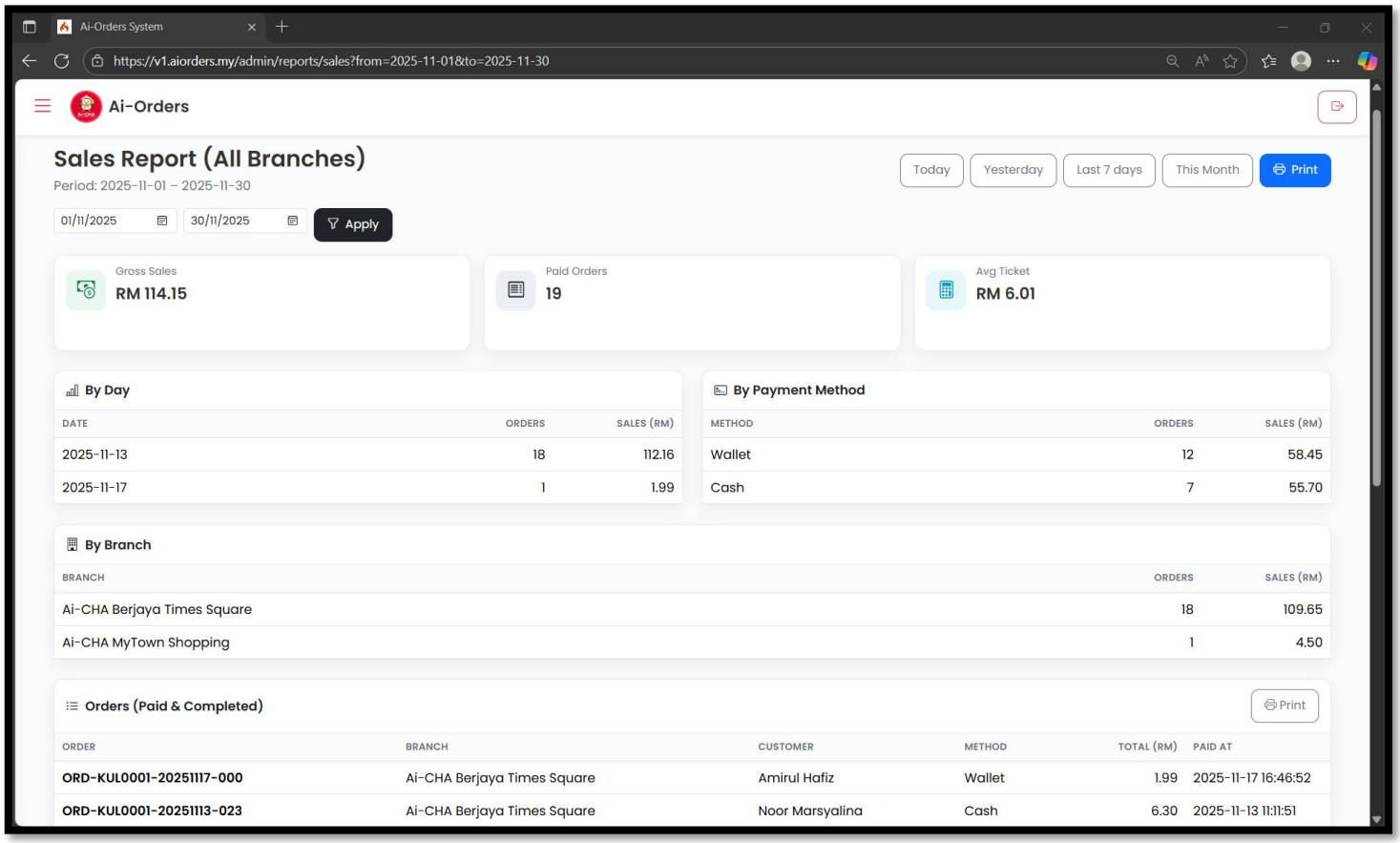
Admin Orders (All Branches)





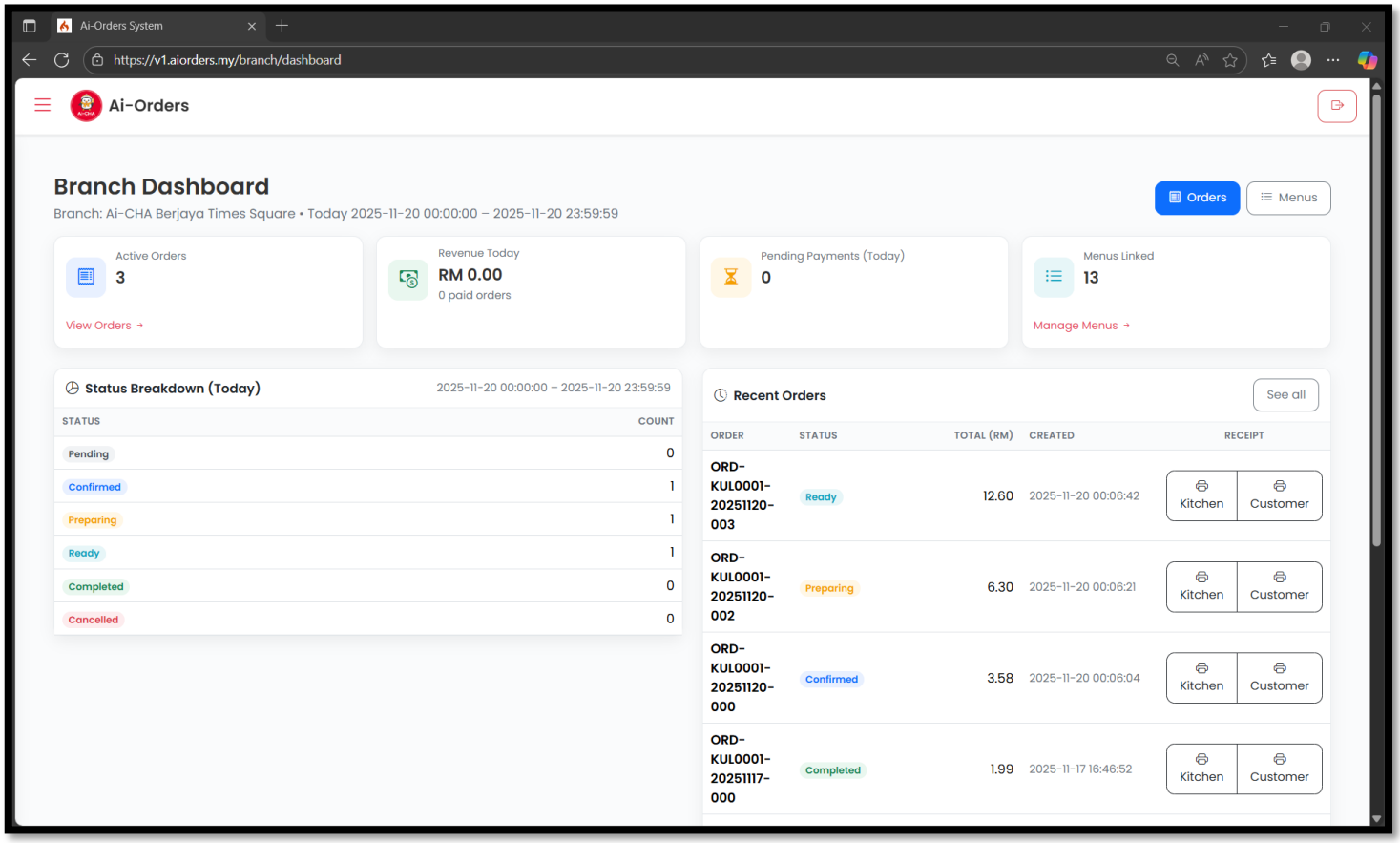
- View all active orders across outlets.
- Check order number, customer, status, amount.
- Print receipts (kitchen/customer).
- View order history with filter by date, branch & status.

Admin Sales Report (All Branches)



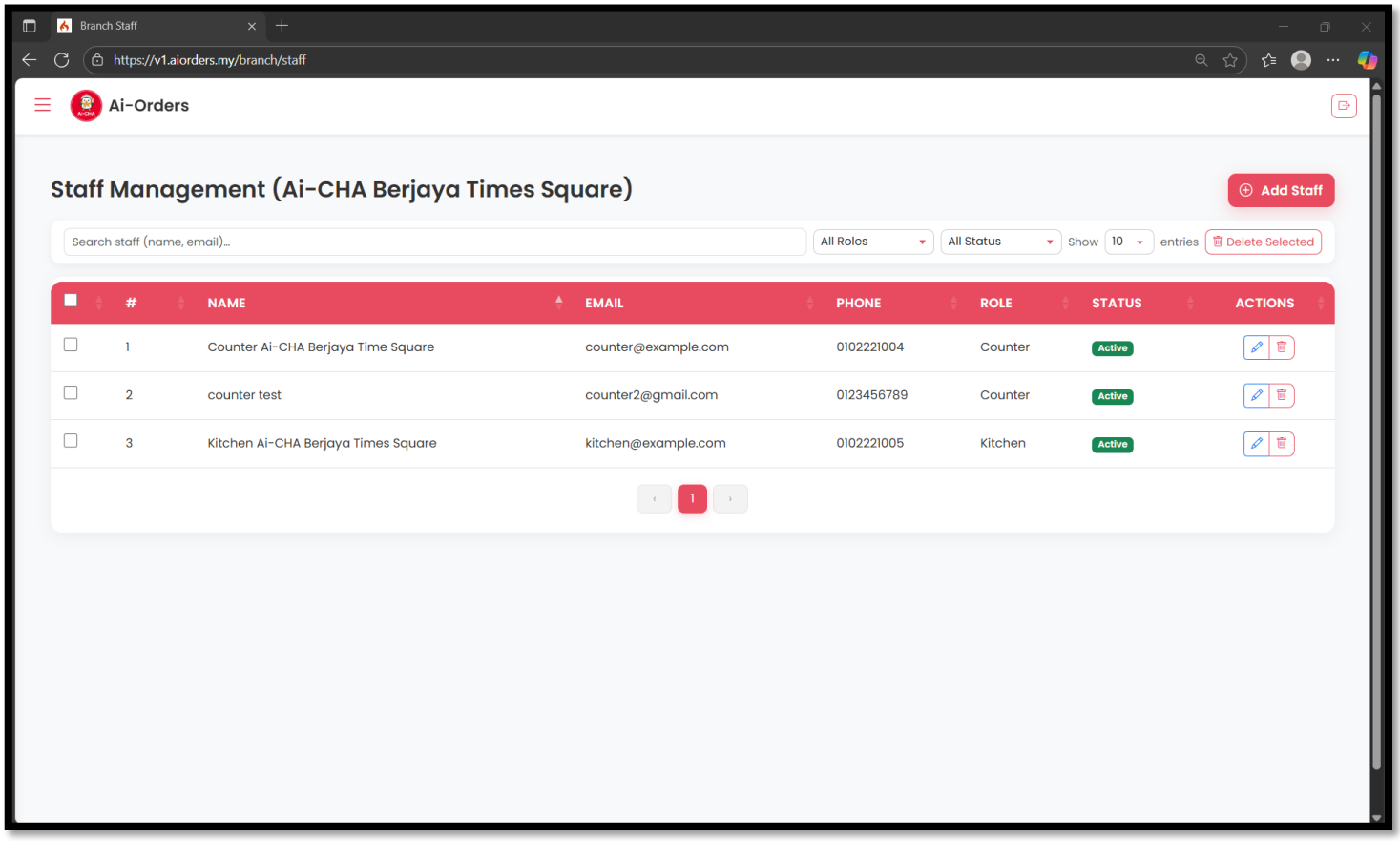
- Set date range.
- View total sales, paid orders, average ticket value.
- Breakdown by day, branch, payment method.
- Export/print reports.

PART B: BRANCH MODULE
Branch Dashboard



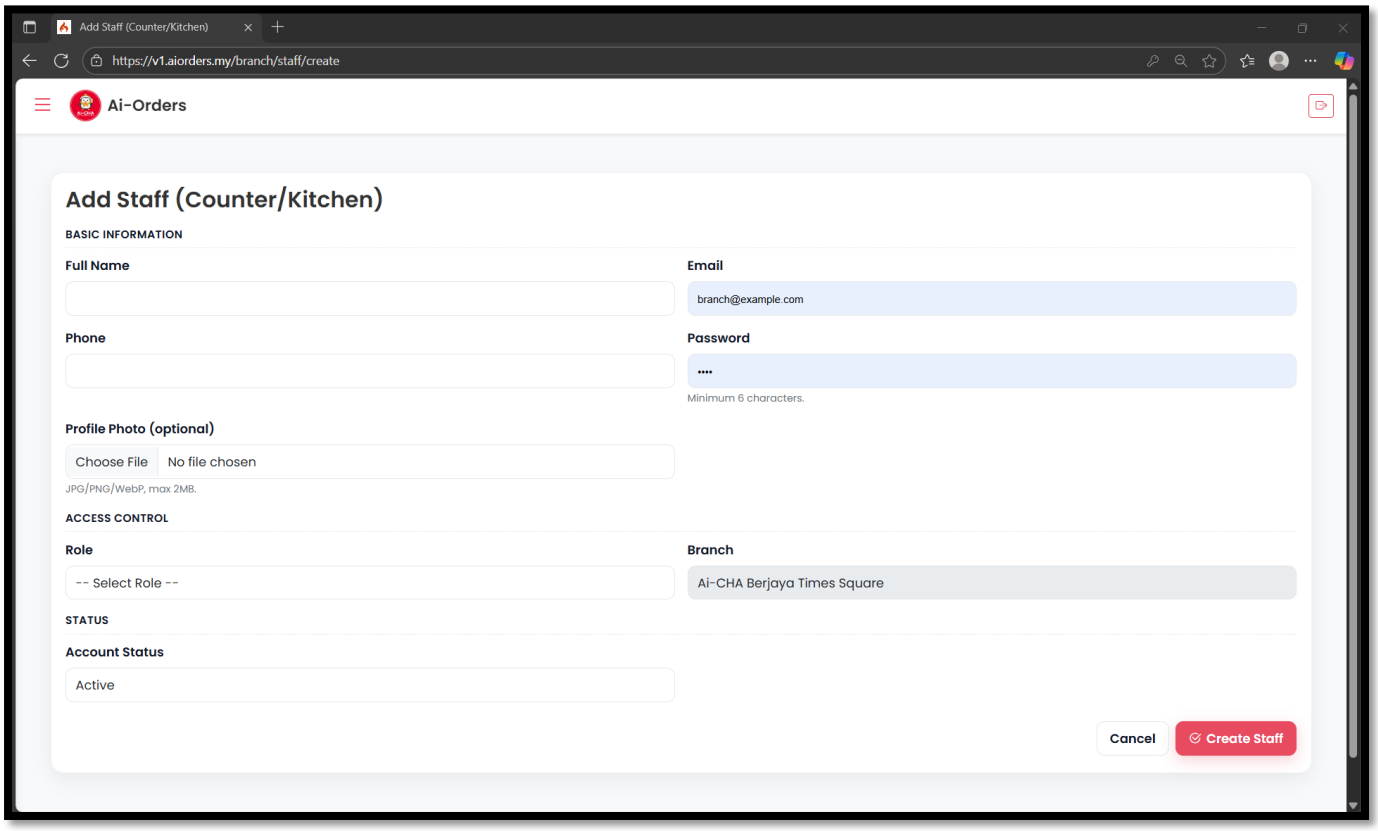
- View branch-specific sales & active orders.
- Quick access to menus & orders.
- Status breakdown & recent orders list.

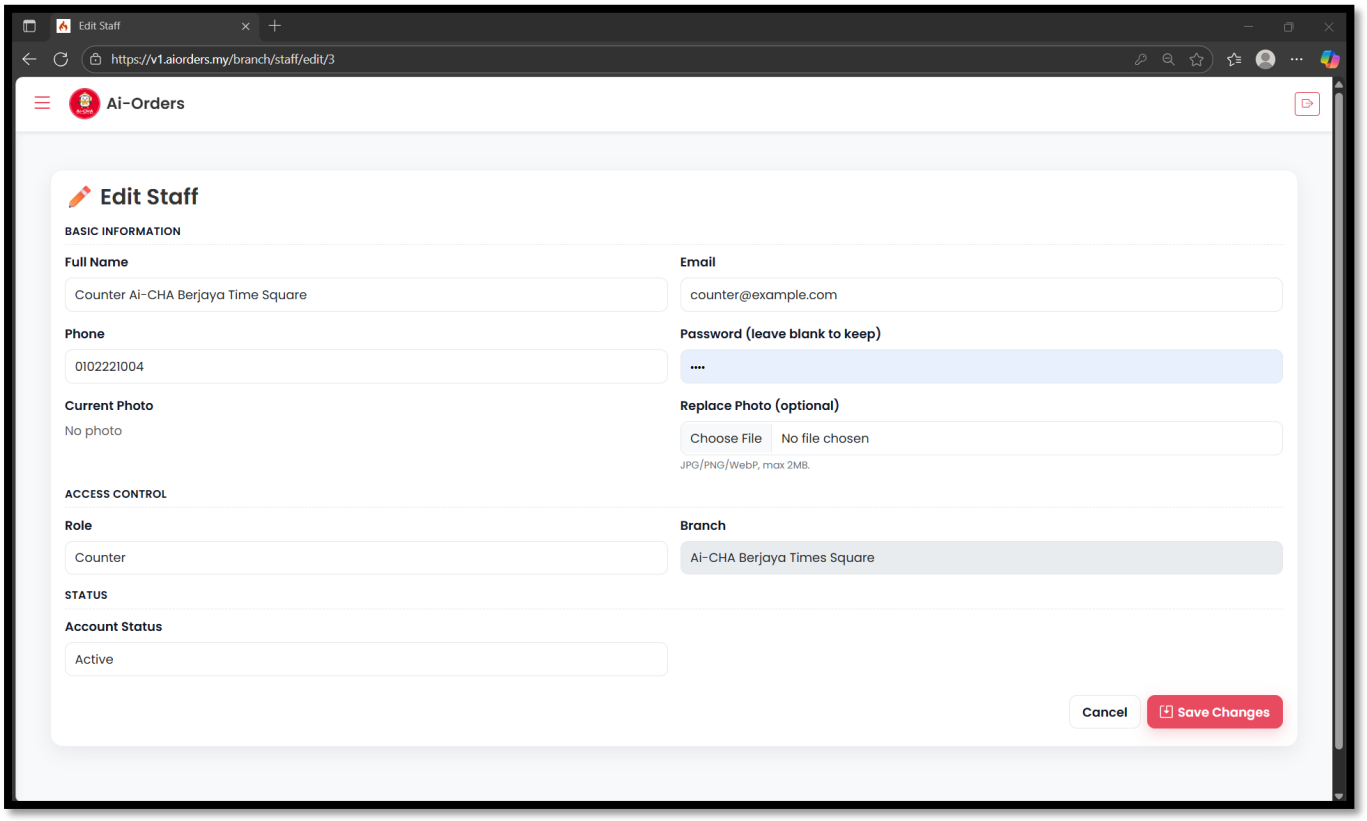
Branch Staff Management



- Add/edit/delete staff for the outlet.
- Filter by role/status.
- Bulk delete.

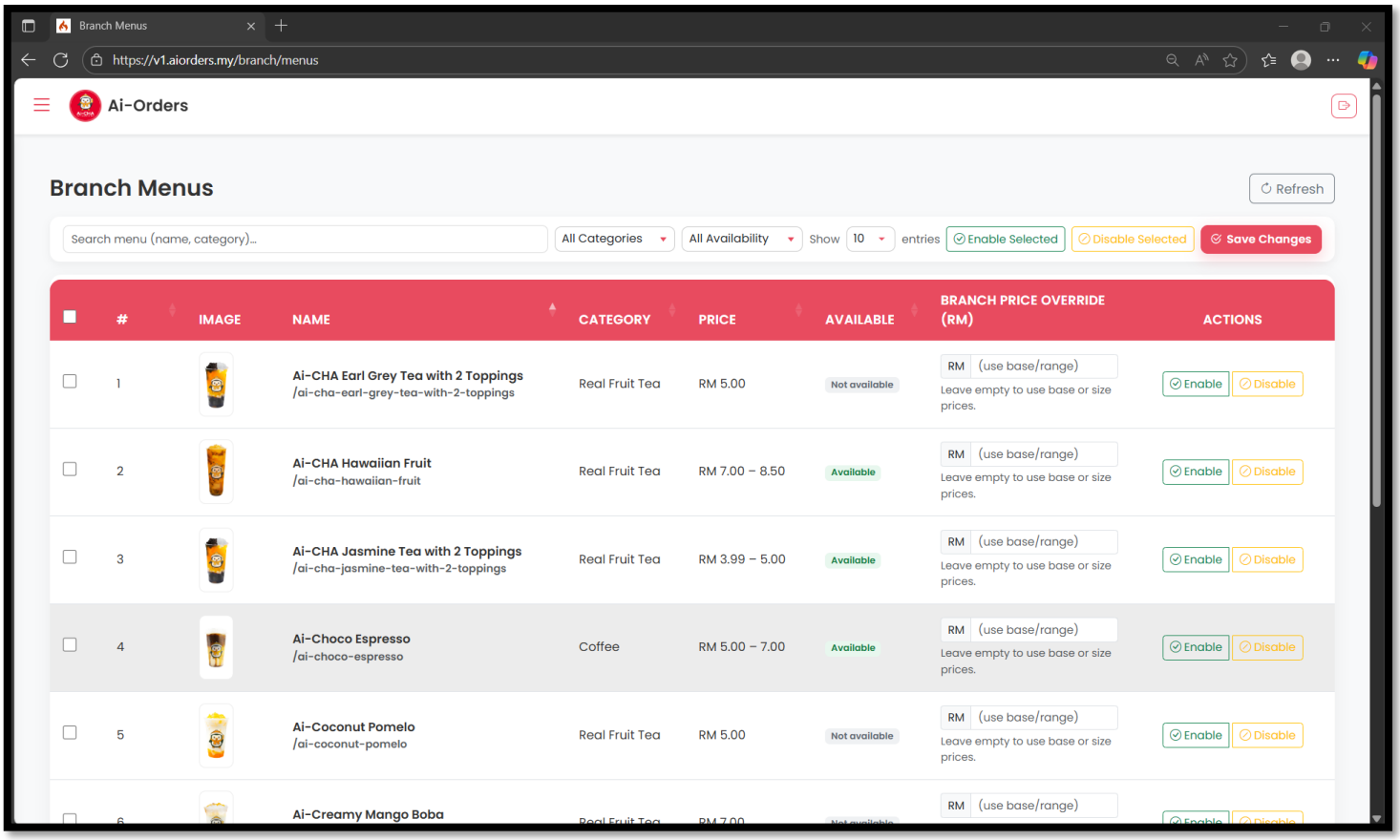
Branch Staff Management





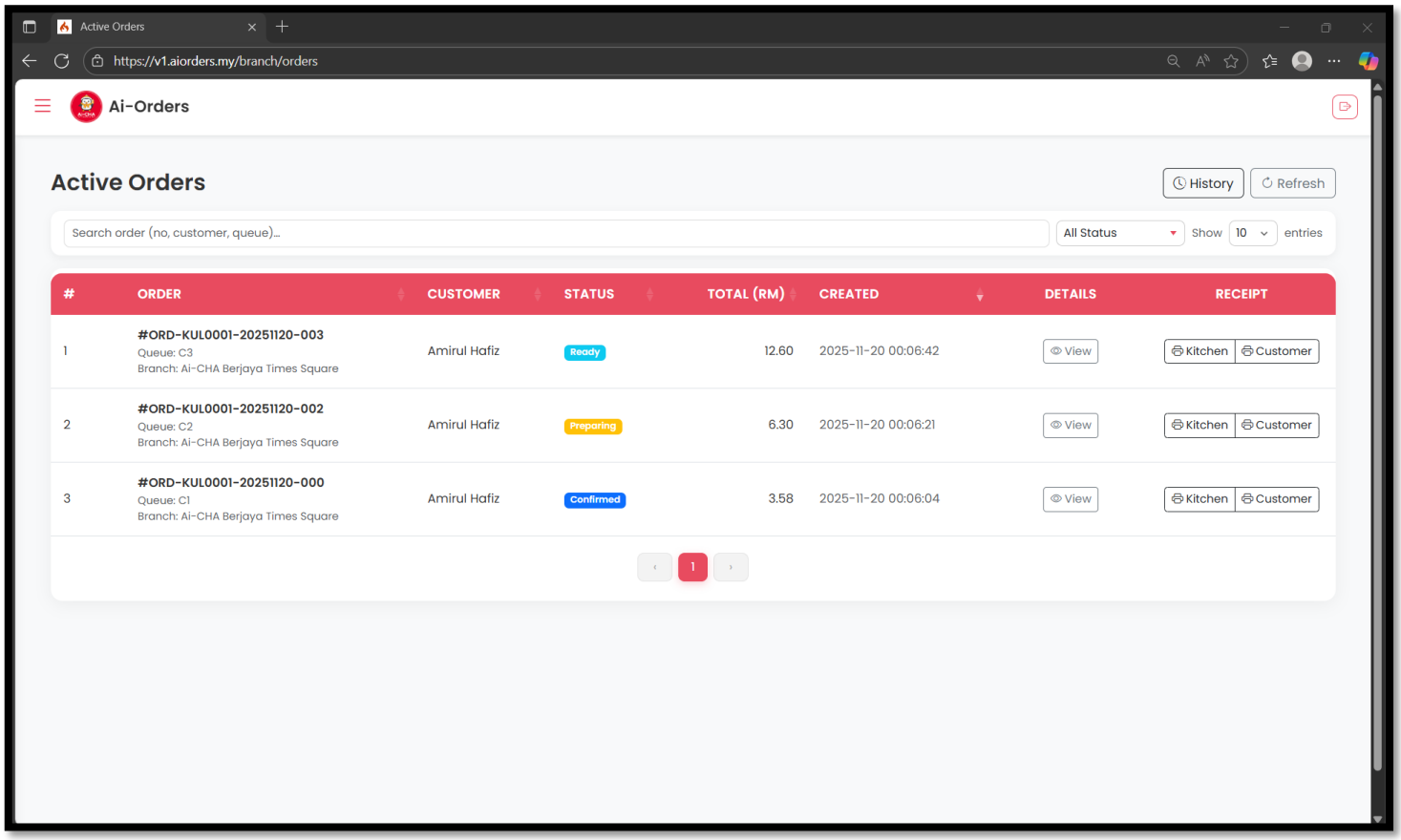
- Enter name, contact, password.
- Upload optional photo.
- Set role: Counter/Kitchen.
- Activate/Deactivate.

Branch Menu Settings



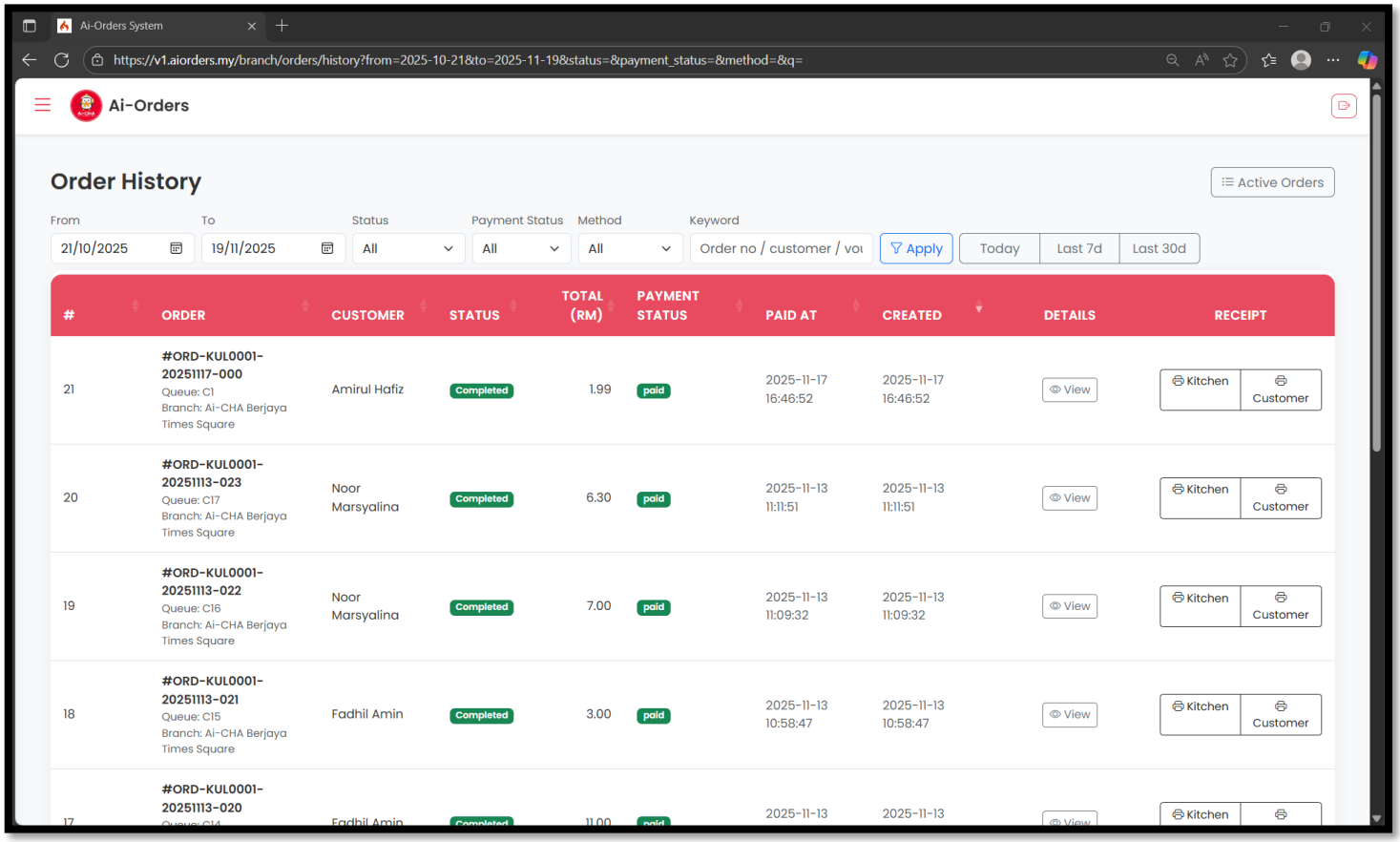
- Enable/disable menu items.
- Override prices for local branch.
- Bulk enable/disable.

Branch Active Orders



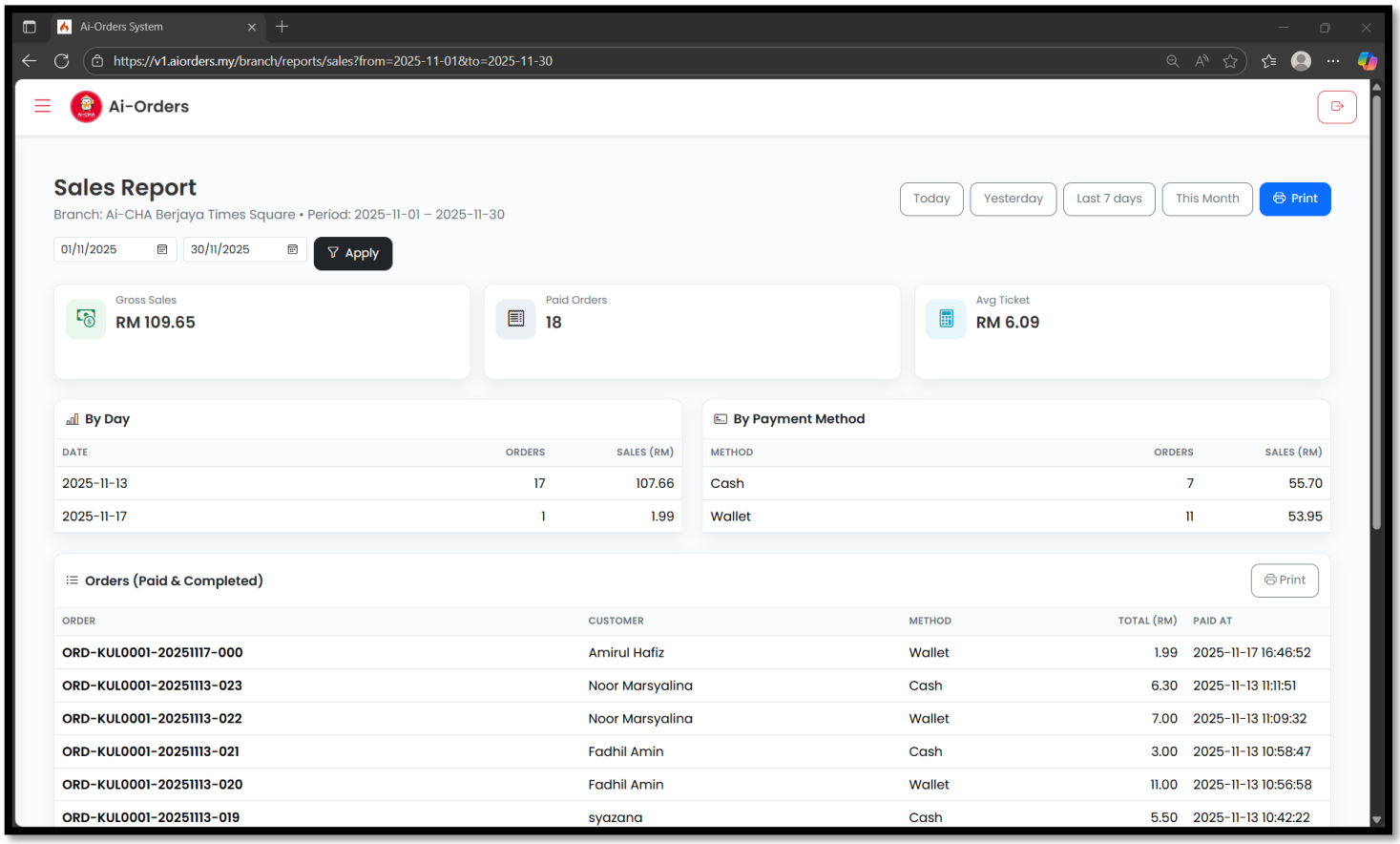
- View all in-progress orders.
- Filter by status/keywords.
- Print receipts.
- Open detailed order view.

Branch Order History



- Filter by date, status, payment method.
- Reprint receipts.
- View full order details.

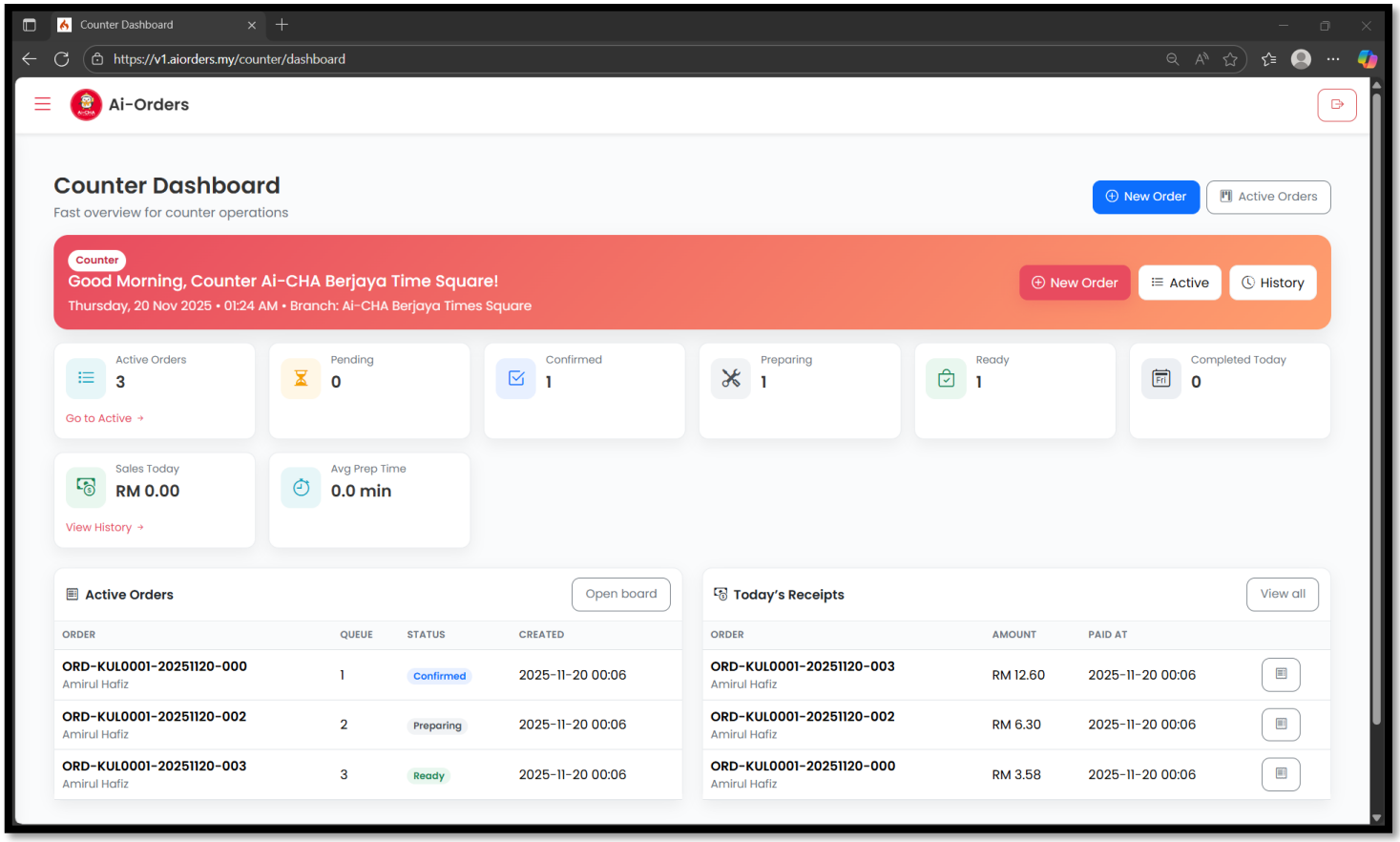
Branch Sales Report



- View sales KPIs (total sales, paid orders, ATV).
- Breakdown by day & payment method.
- Export/print report.

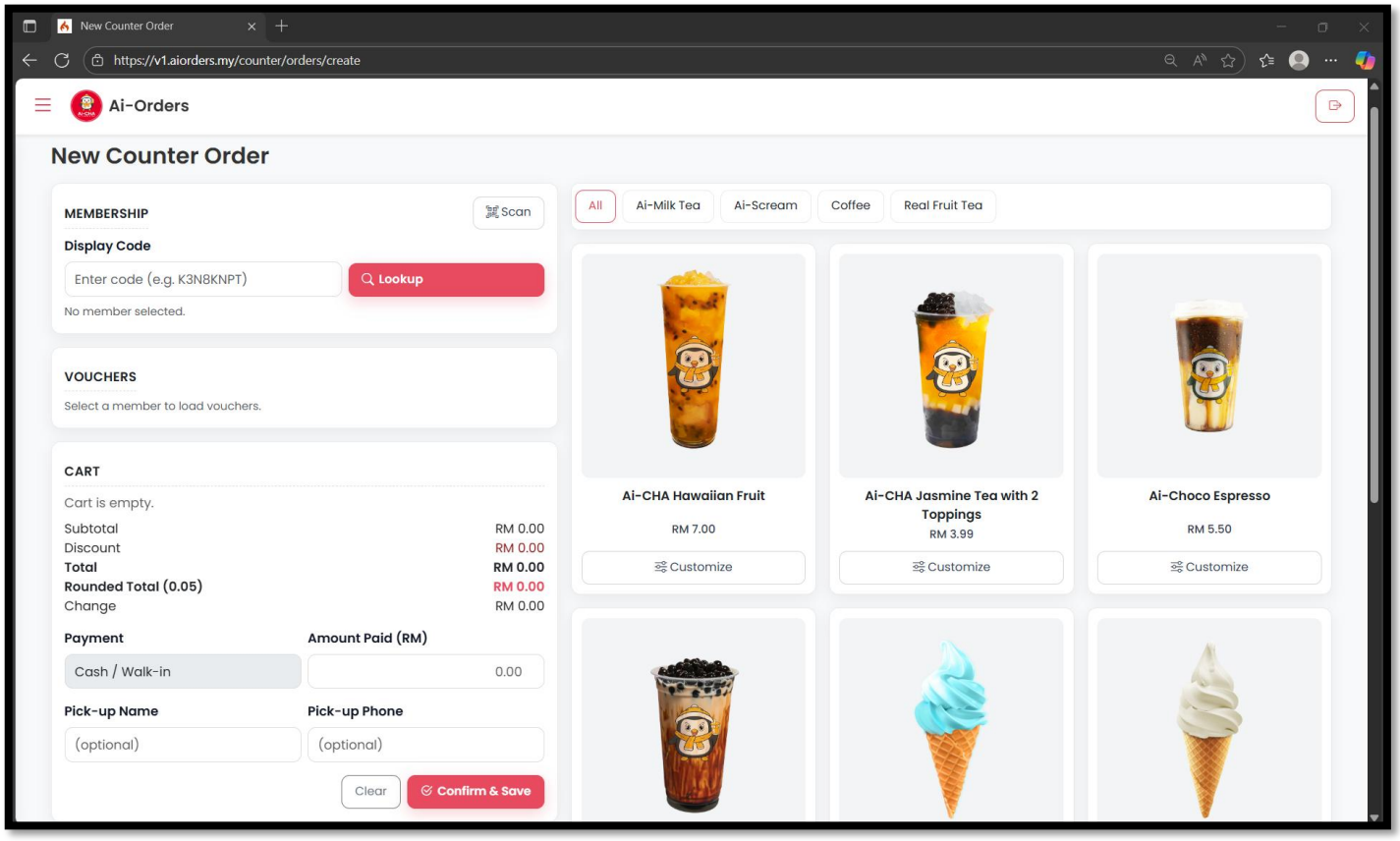
PART C: COUNTER MODULE (POS)

Counter Dashboard



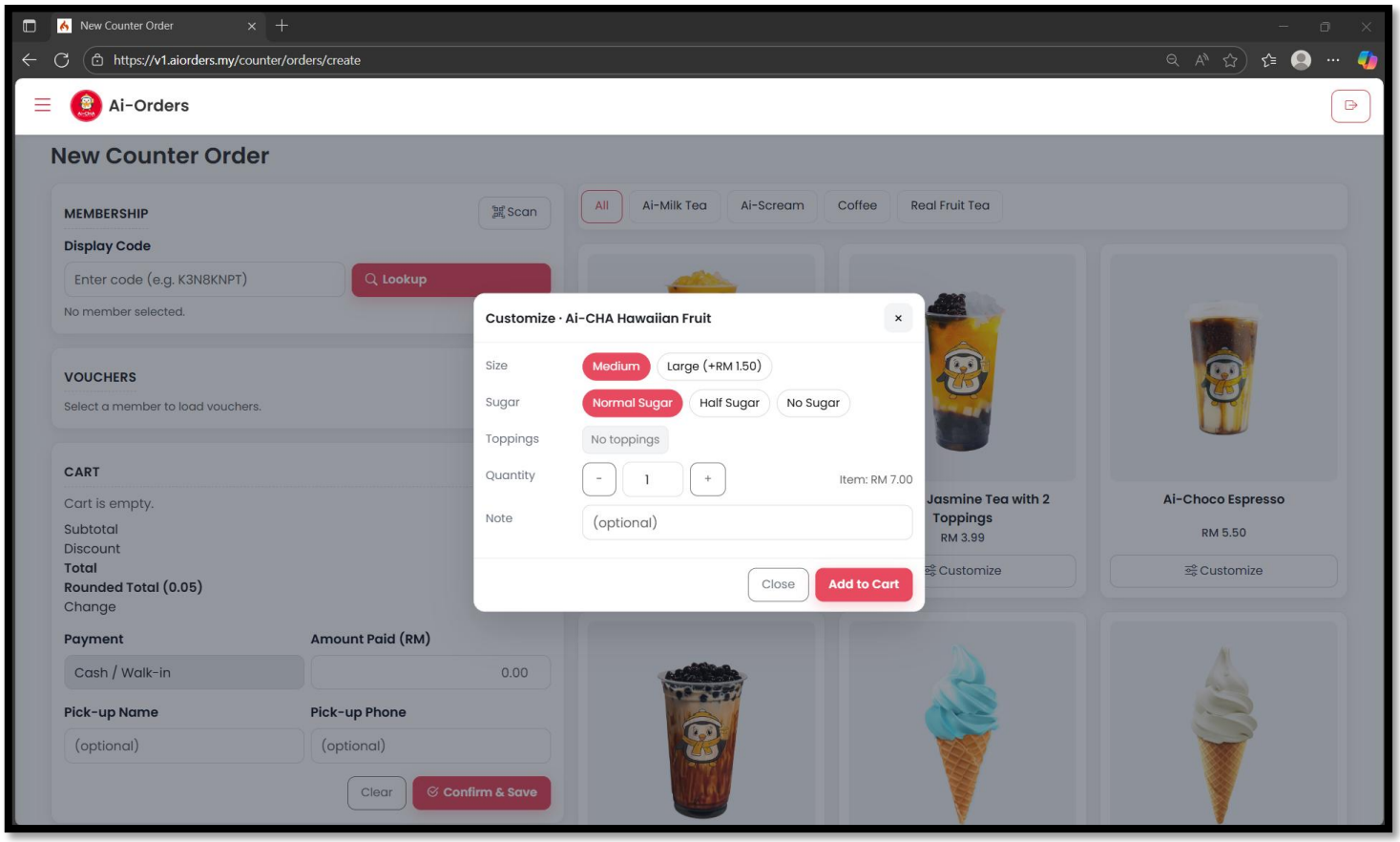
- Quick stats: active orders, sales today, prep time.
- Buttons: New Order, Active, History.
- Active orders + Today's receipts list.

New Counter Order



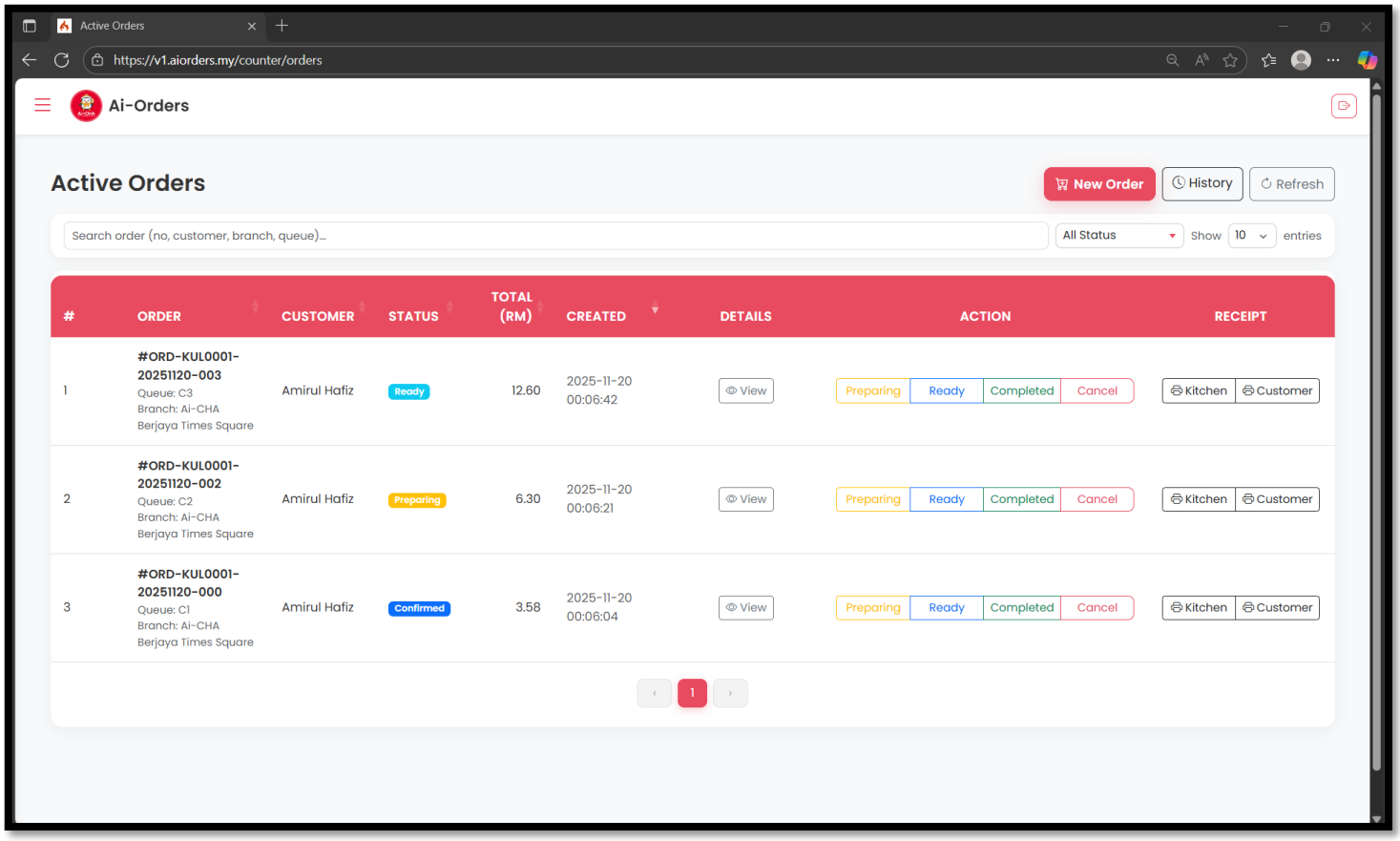
- Lookup/scan membership code.
- Apply vouchers.
- Add items from categories.
- Customise drinks.
- Select payment method (cash/wallet).
- Confirm & save order.

Item Customization



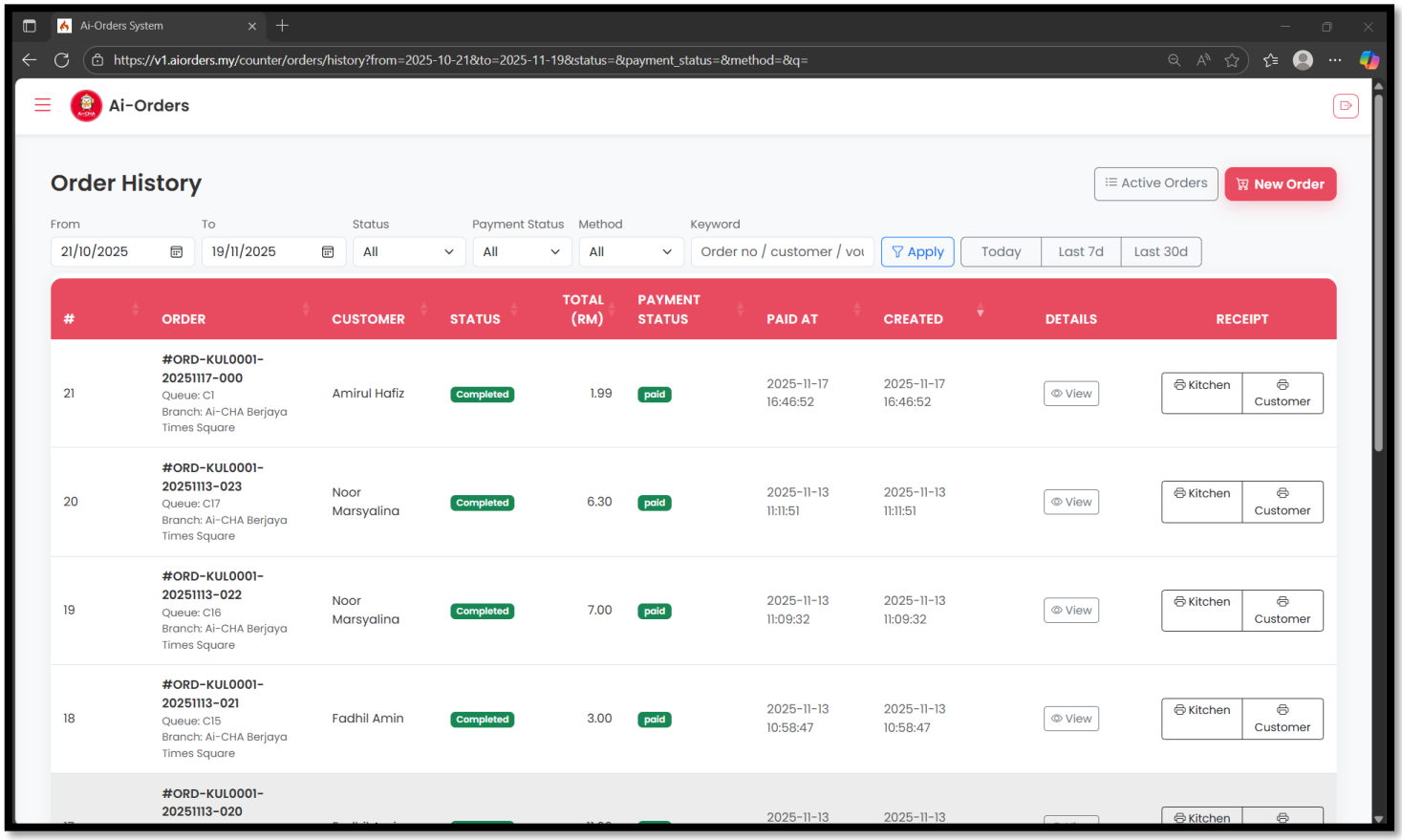
- Choose size, sugar level, toppings.
- Add notes.
- Adjust quantity.
- Add to cart

Counter Active Orders



- Update status (Preparing → Ready → Completed).
- Cancel orders if needed.
- Print kitchen/customer receipts.

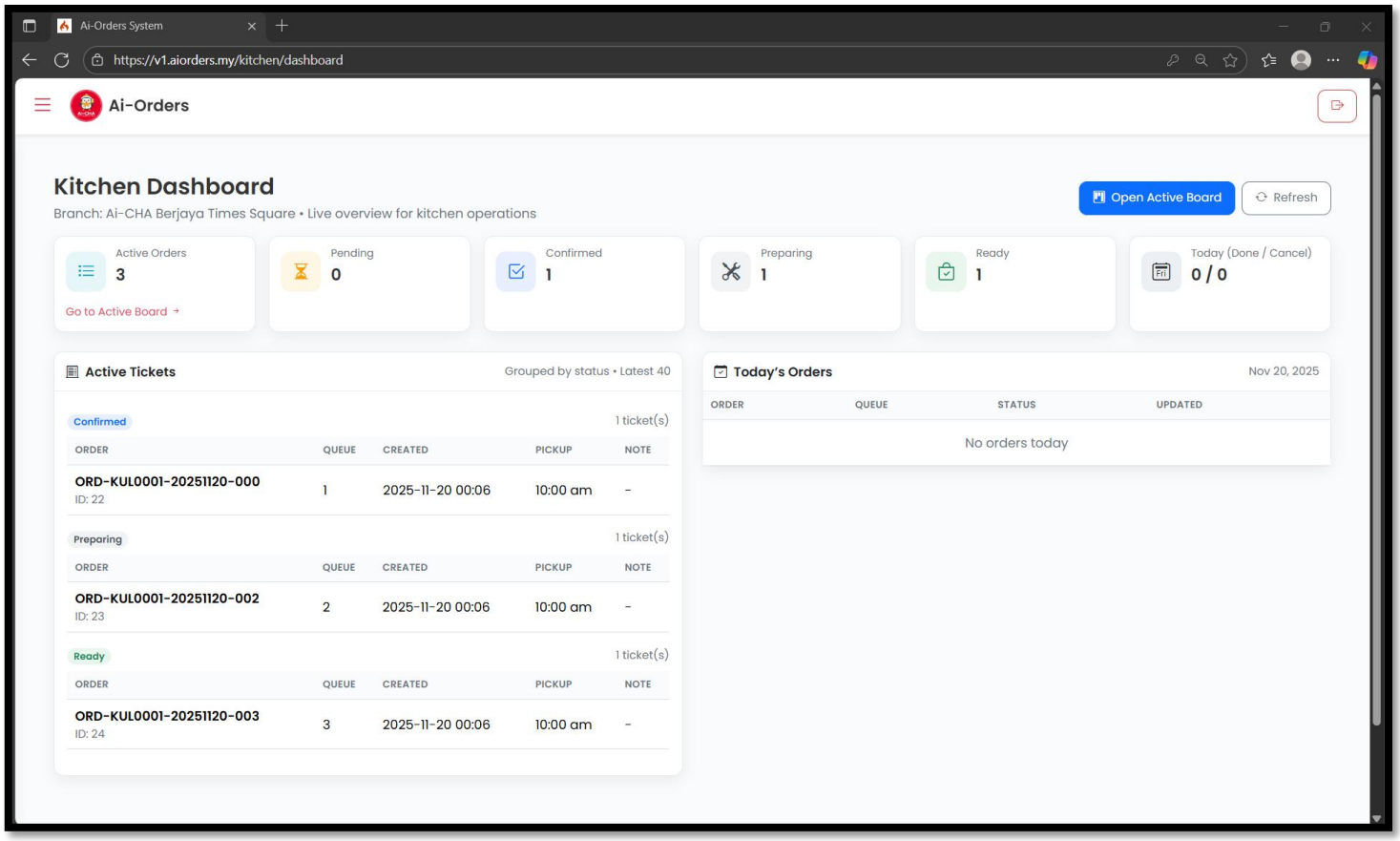
Counter Order History



- Filter by date, payment method, status.
- Reprint receipts.
- View full order details.

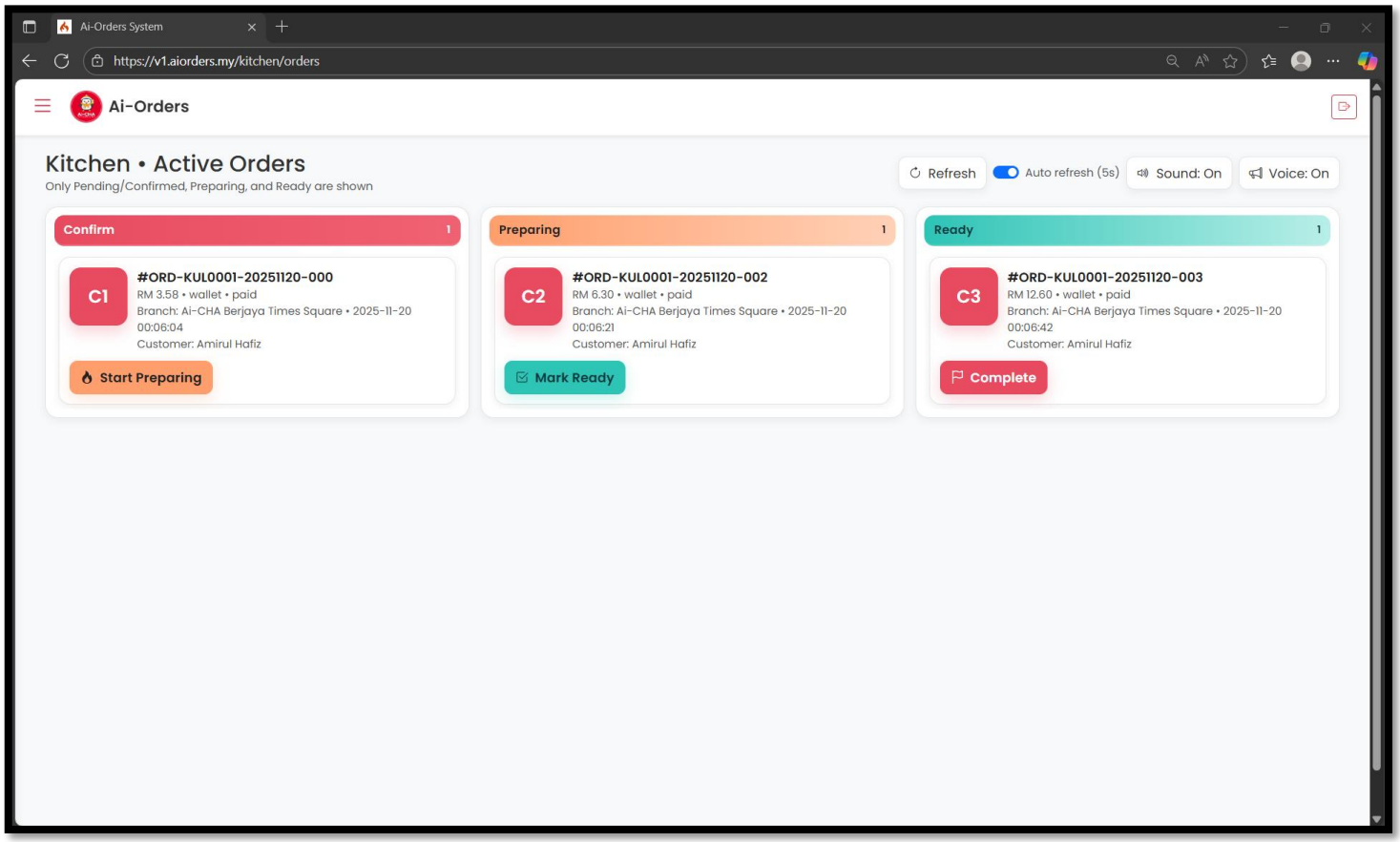
PART D: Kitchen Module

Kitchen Dashboard



- Shows active tickets: Confirmed, Preparing, Ready.
- View today's orders.
- Open full-screen kitchen board.

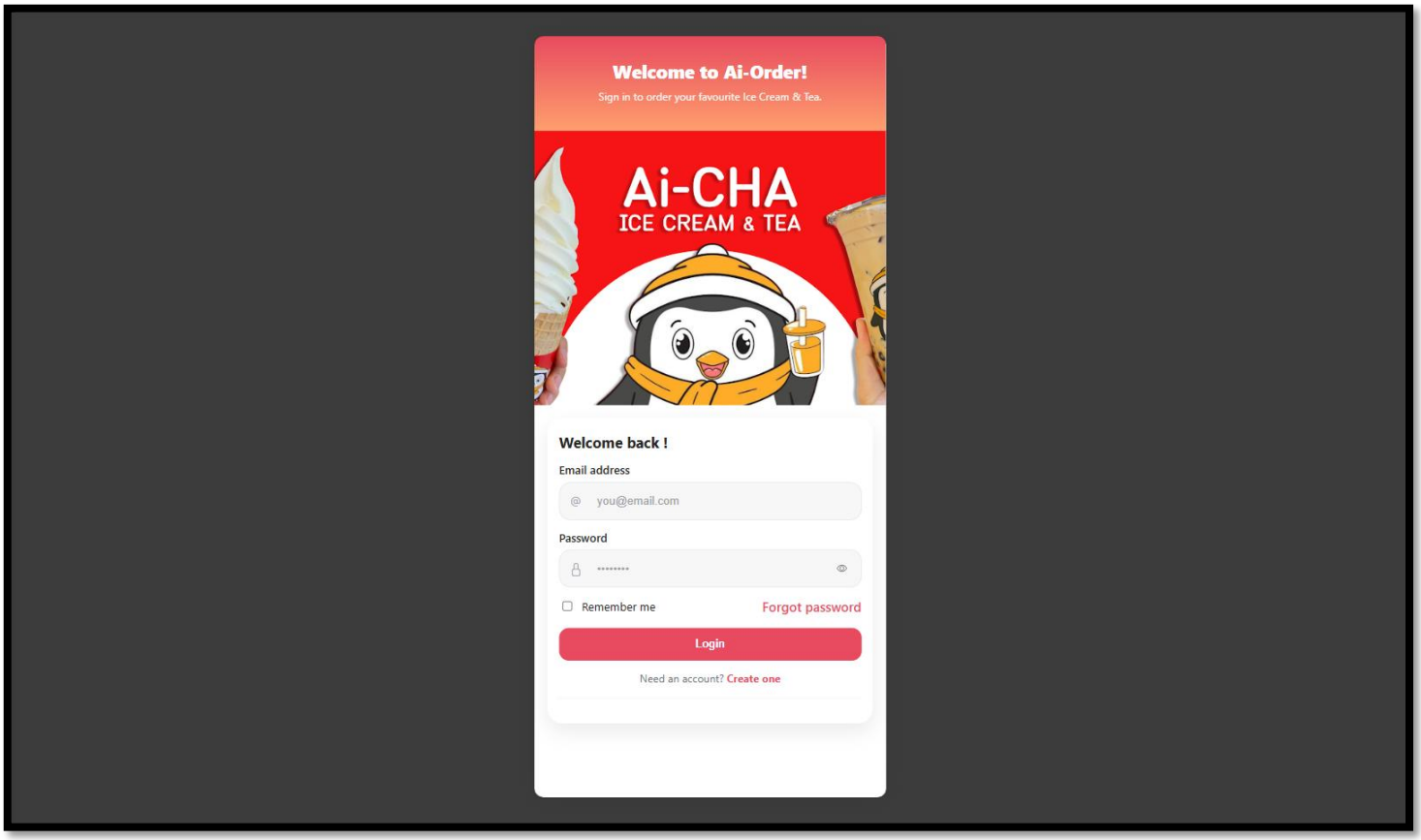
Kitchen Active Orders Board



- Kanban board grouped by status.
- Move tickets: Confirm → Preparing → Ready → Complete.
- Auto-refresh & sound alerts.
- Shows queue code, order number, items & timestamp.

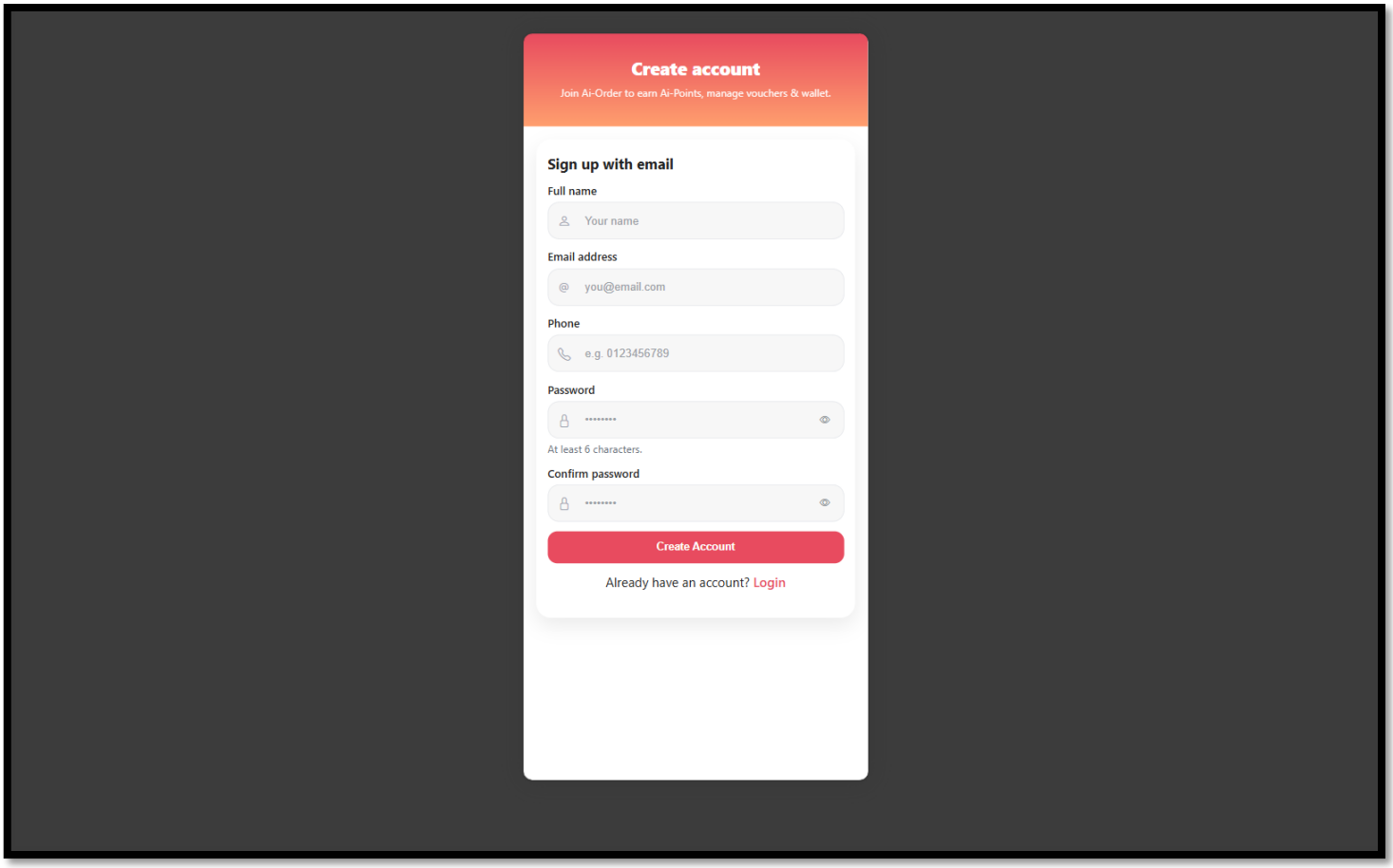
Ai-Orders Web App: Customer User Manual

Customer Login



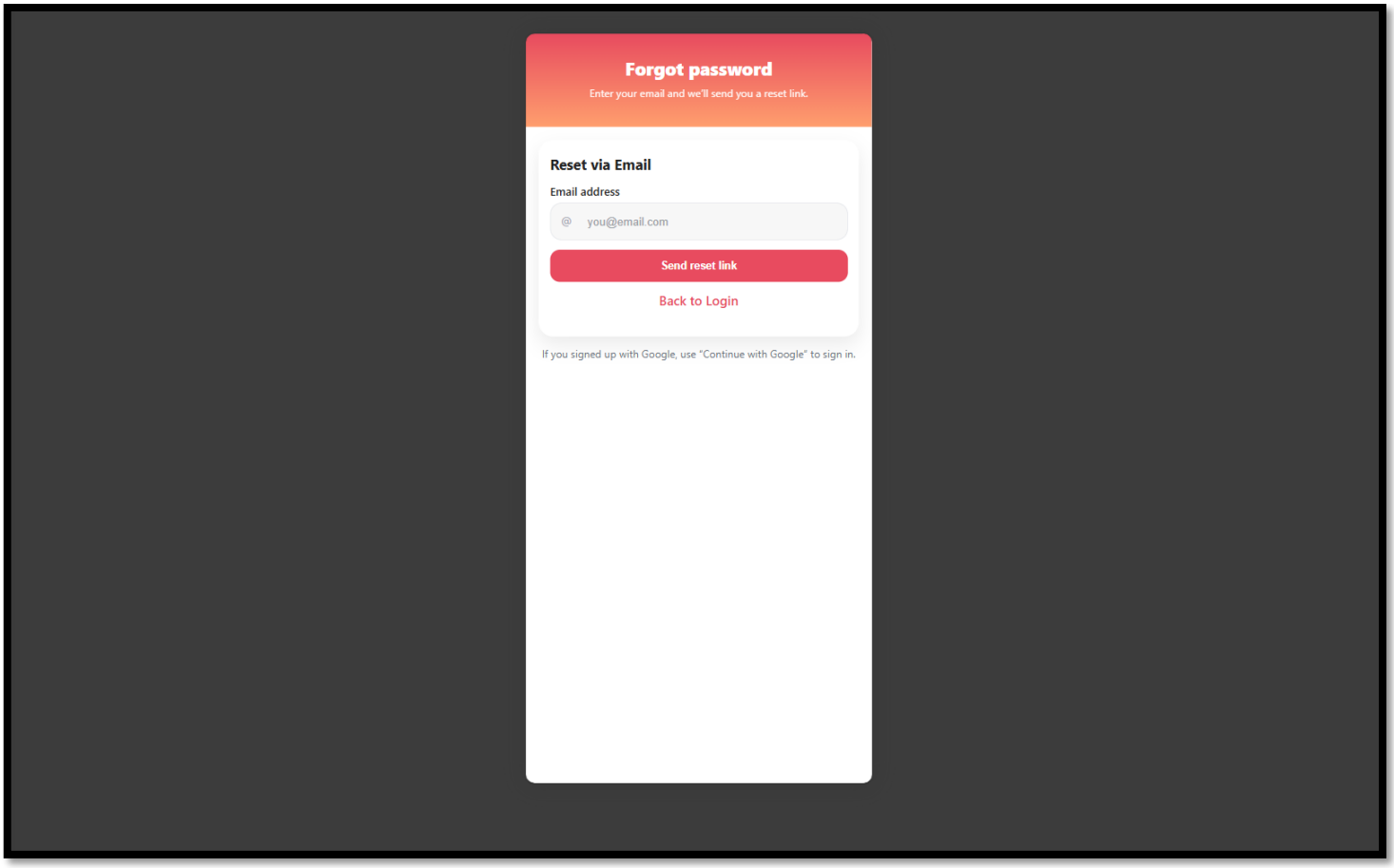
- Enter **email + password**.
- Use **Remember Me** for quick login.
- Click **Forgot Password** if needed.
- New users click **Create Account**.

Customer Registration



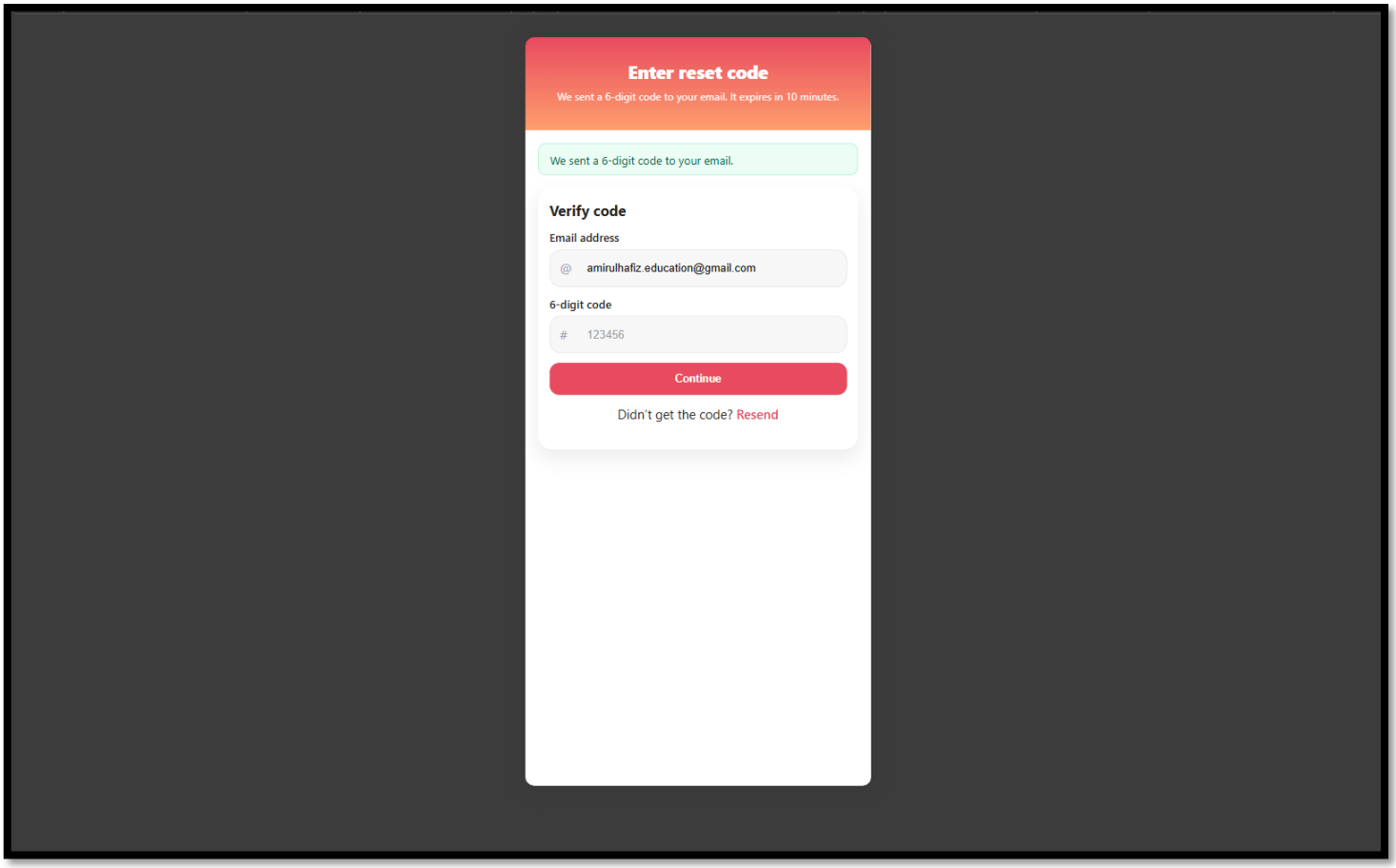
- Fill in: **Name, Email, Phone, Password, Confirm Password**.
- Toggle password visibility with eye icon.
- Press **Create Account** to register.
- Use **Login** link if already registered.

Forgot Password



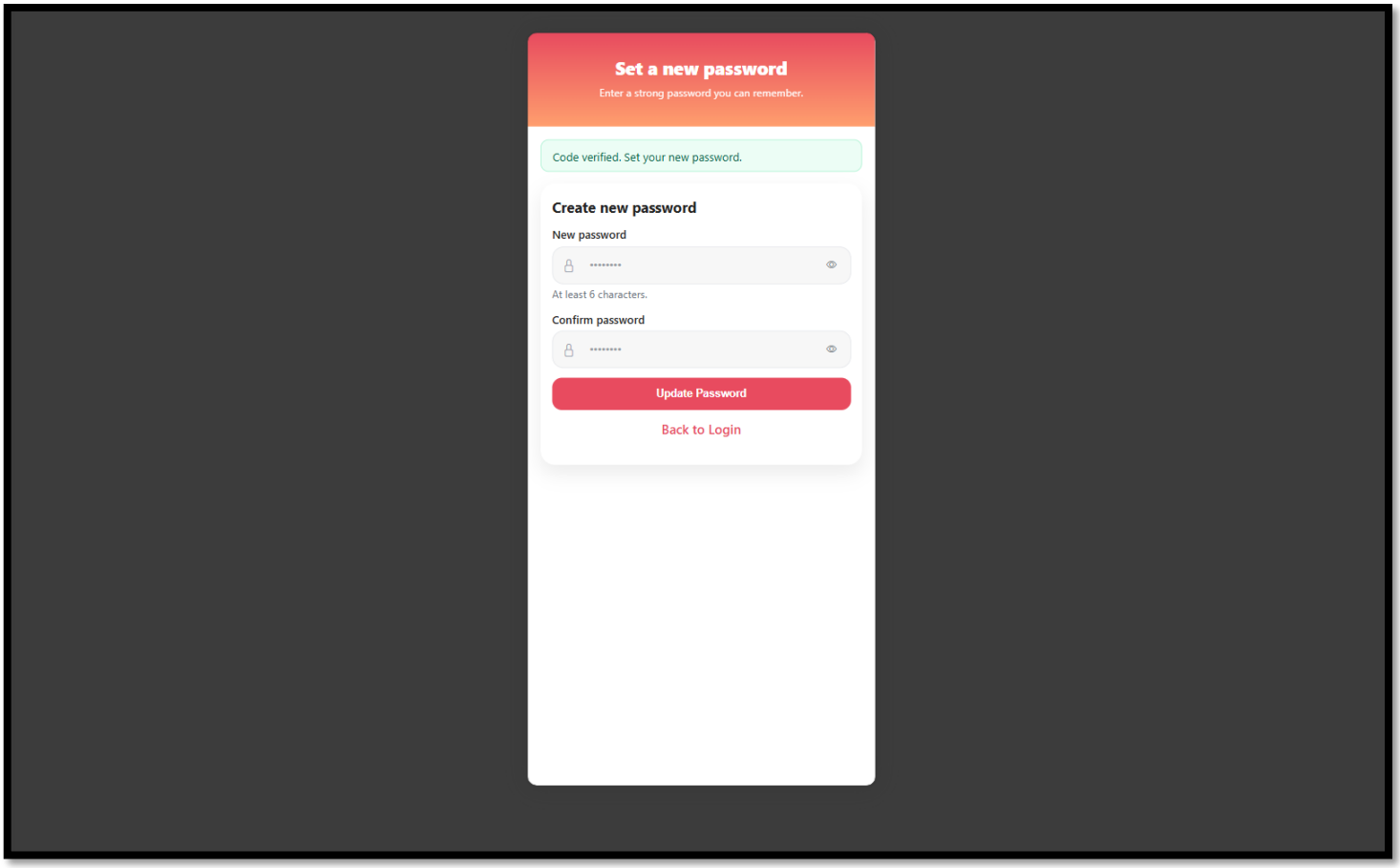
- Enter registered email.
- Click **Send reset link**.
- Use **Back to Login** if no longer needed.
- Note: Google-login users should sign in using Google.

Reset Code Verification



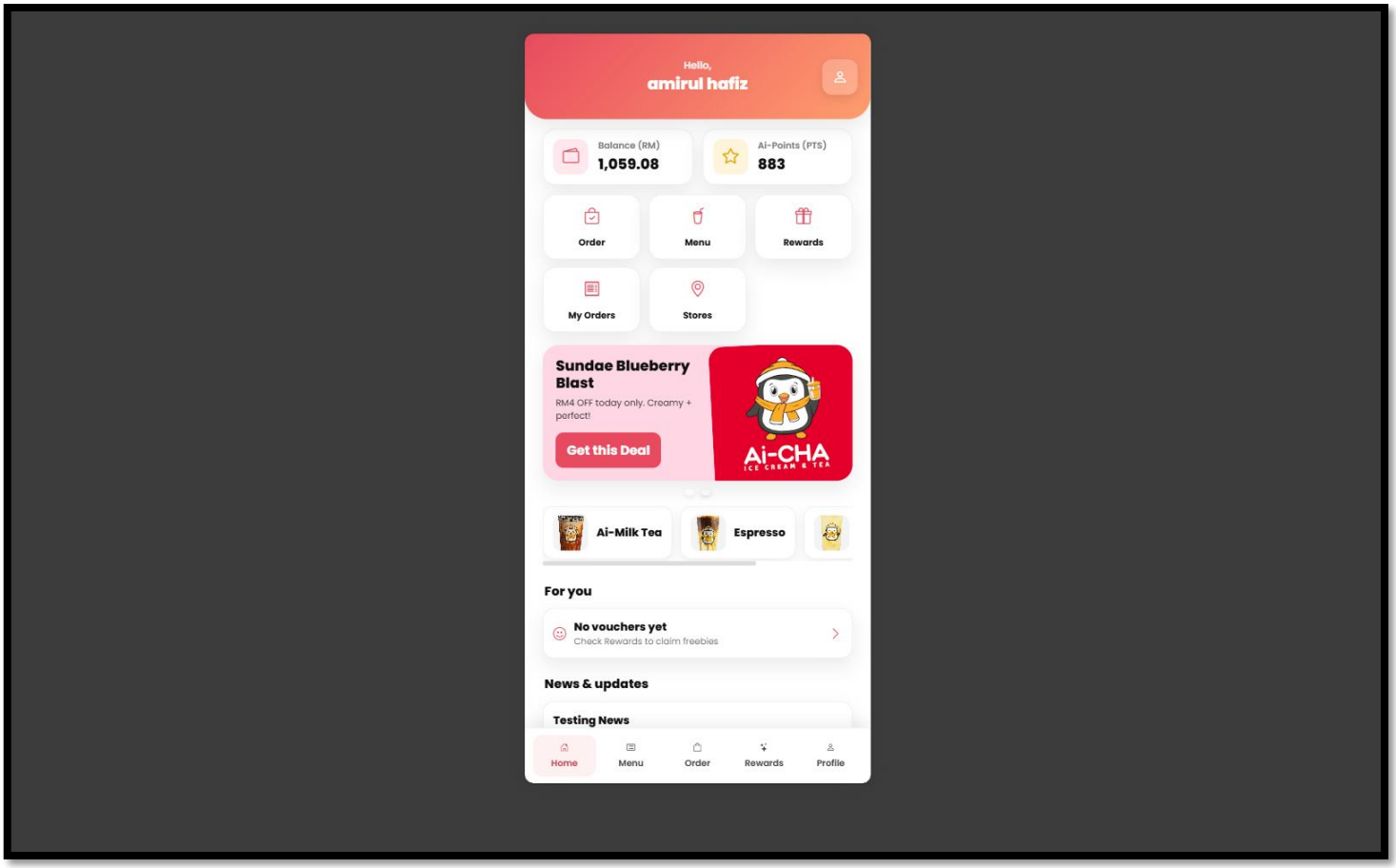
- System sends a **6-digit code** to email.
- Enter the code and press **Continue**.
- Click **Resend** if code not received.

Set New Password



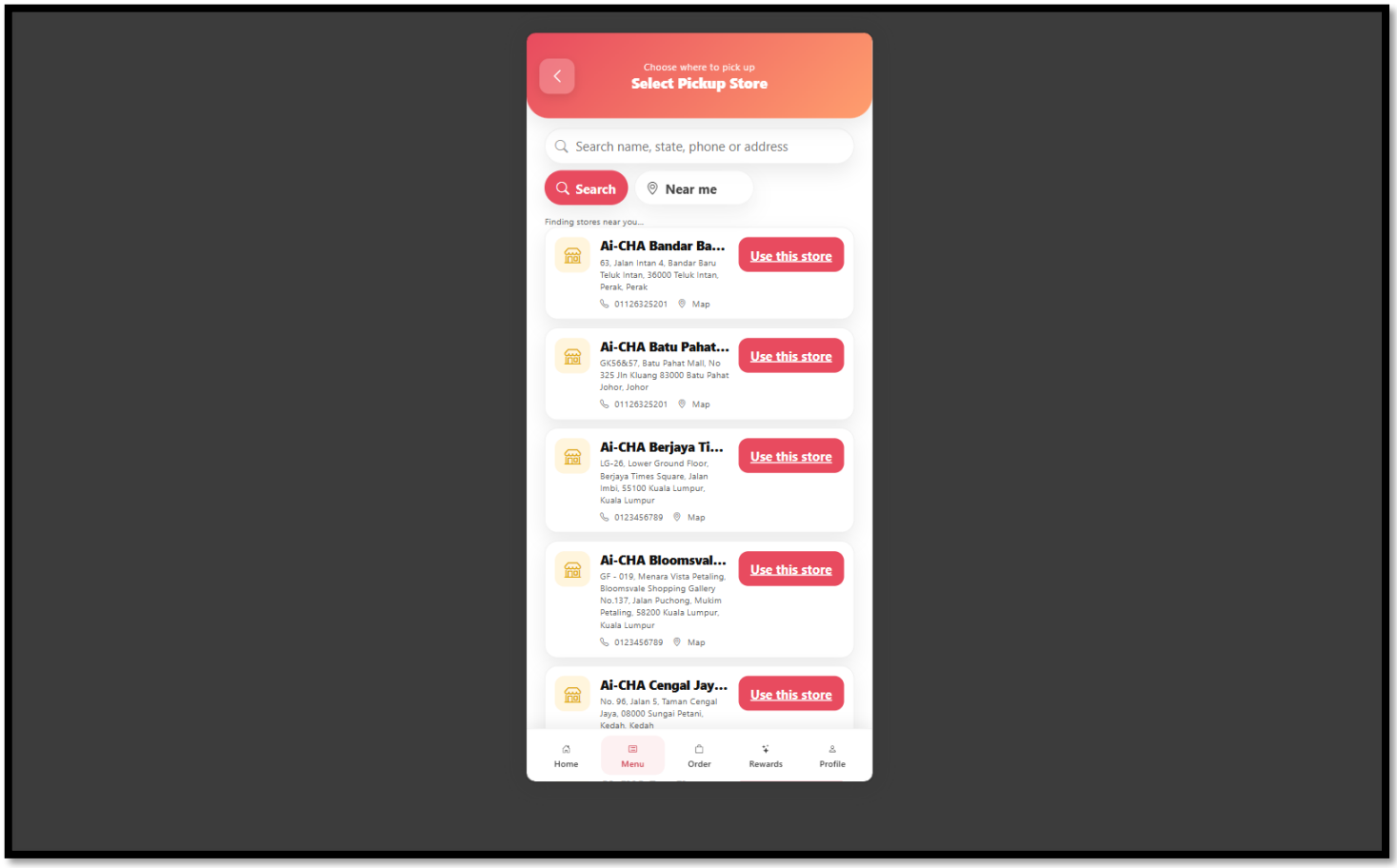
- Enter **new password** and **confirm password**.
- Click **Update Password**.
- Use **Back to Login** when done.

Home Dashboard



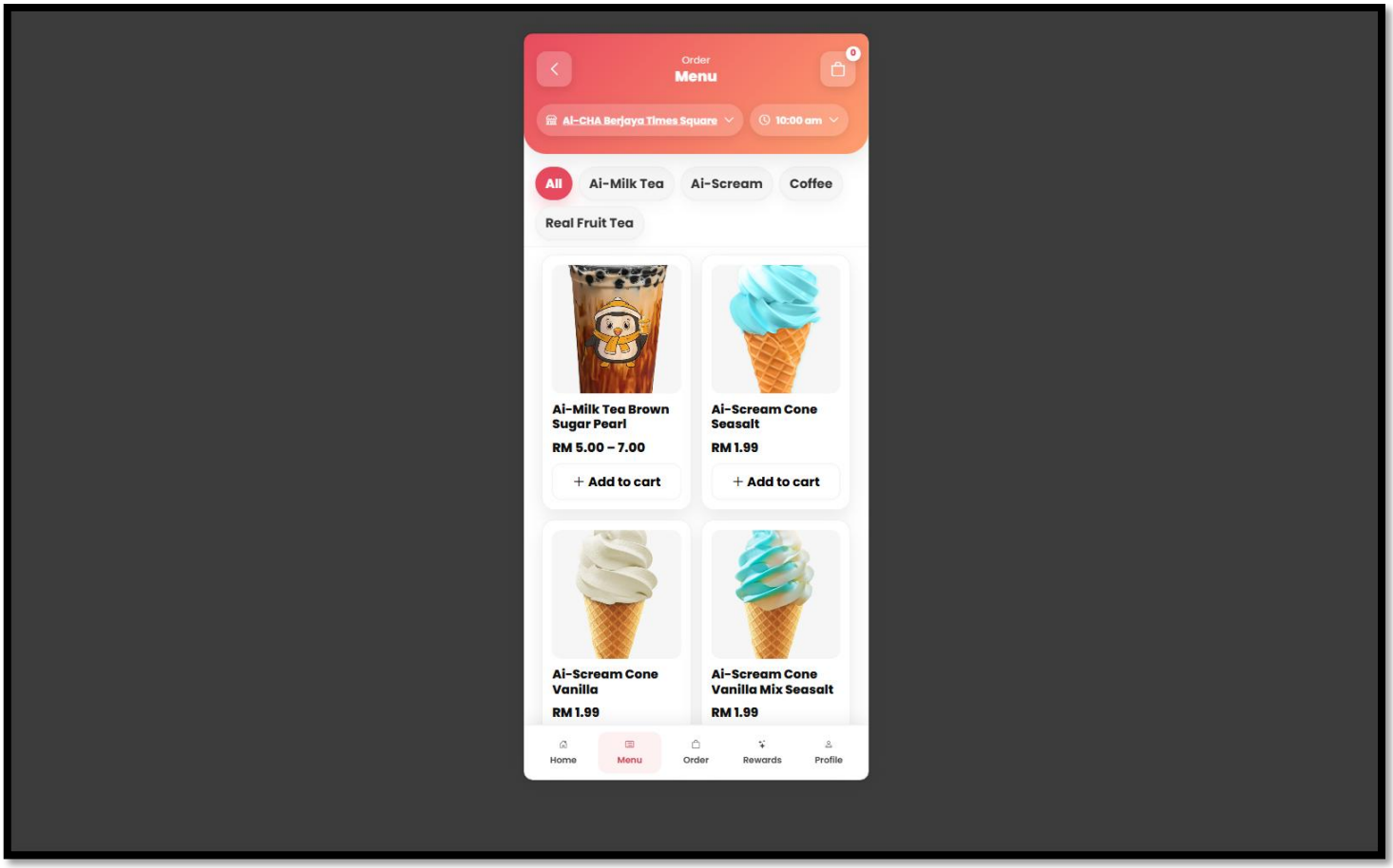
- Shows **Welcome message**.
- Quick overview:
  - **Wallet Balance**
  - **Ai-Points**
- Shortcuts:
  - **Order**
  - **Menu**
  - **Rewards**
  - **My Orders**
  - **Stores**
- Promotional banner for offers.
- “For You” section shows available vouchers.
- Bottom navigation: **Home, Menu, Order, Rewards, Profile**.

Pickup Store Selection



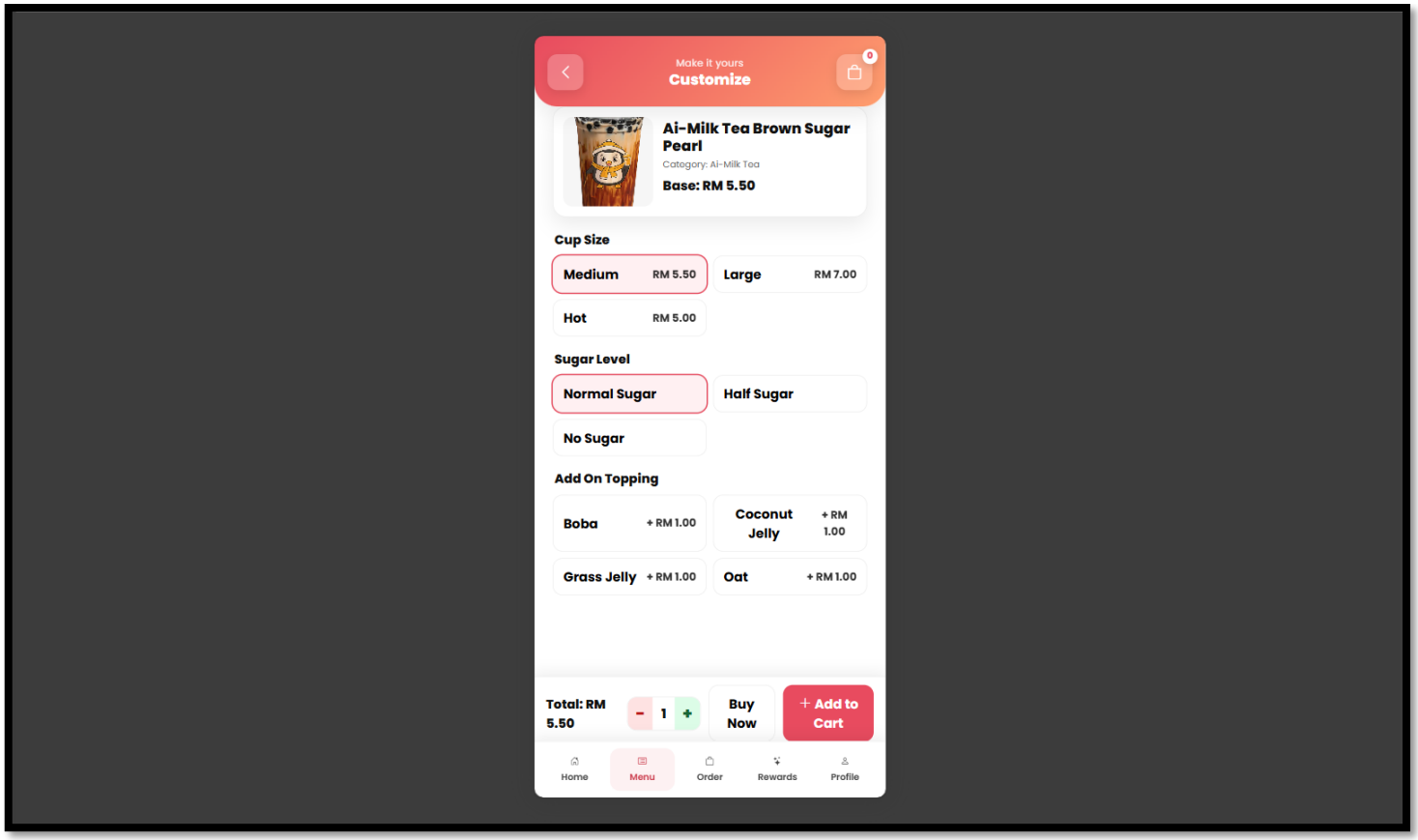
- Search stores by name, state, phone or address.
- Use **Near me** for nearby outlets.
- Each store card shows:
  - Name & address
  - Phone number
  - Map link
- Click **Use this store** to confirm branch.
- Bottom navigation stays visible.

Menu Browsing



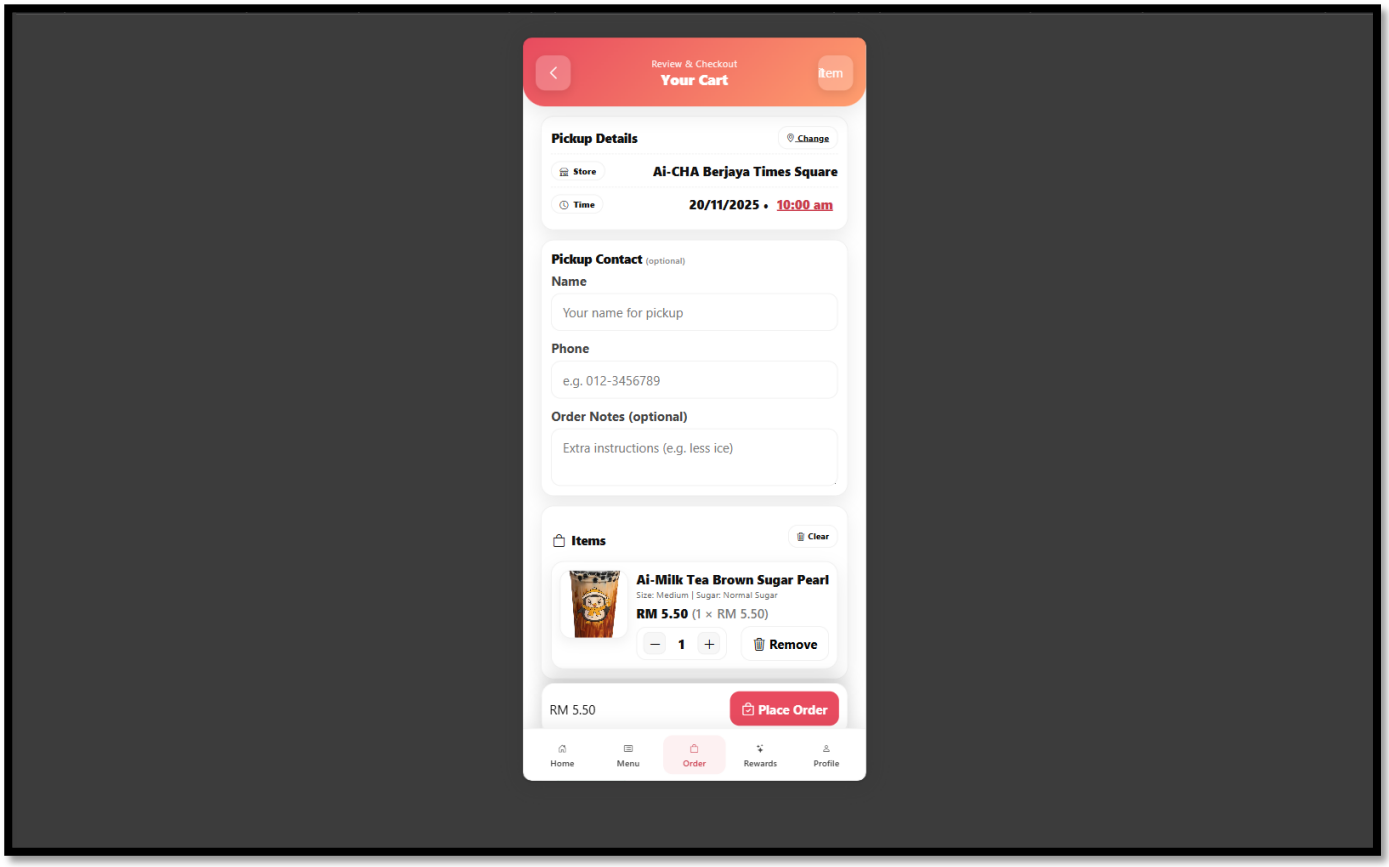
- Displays current store + pickup time.
- Category chips to filter menu (Ai-Milk Tea, Coffee, etc.).
- Each item card shows:
  - Image
  - Name
  - Price
- **Add to Cart** button
- Cart icon shows item count.

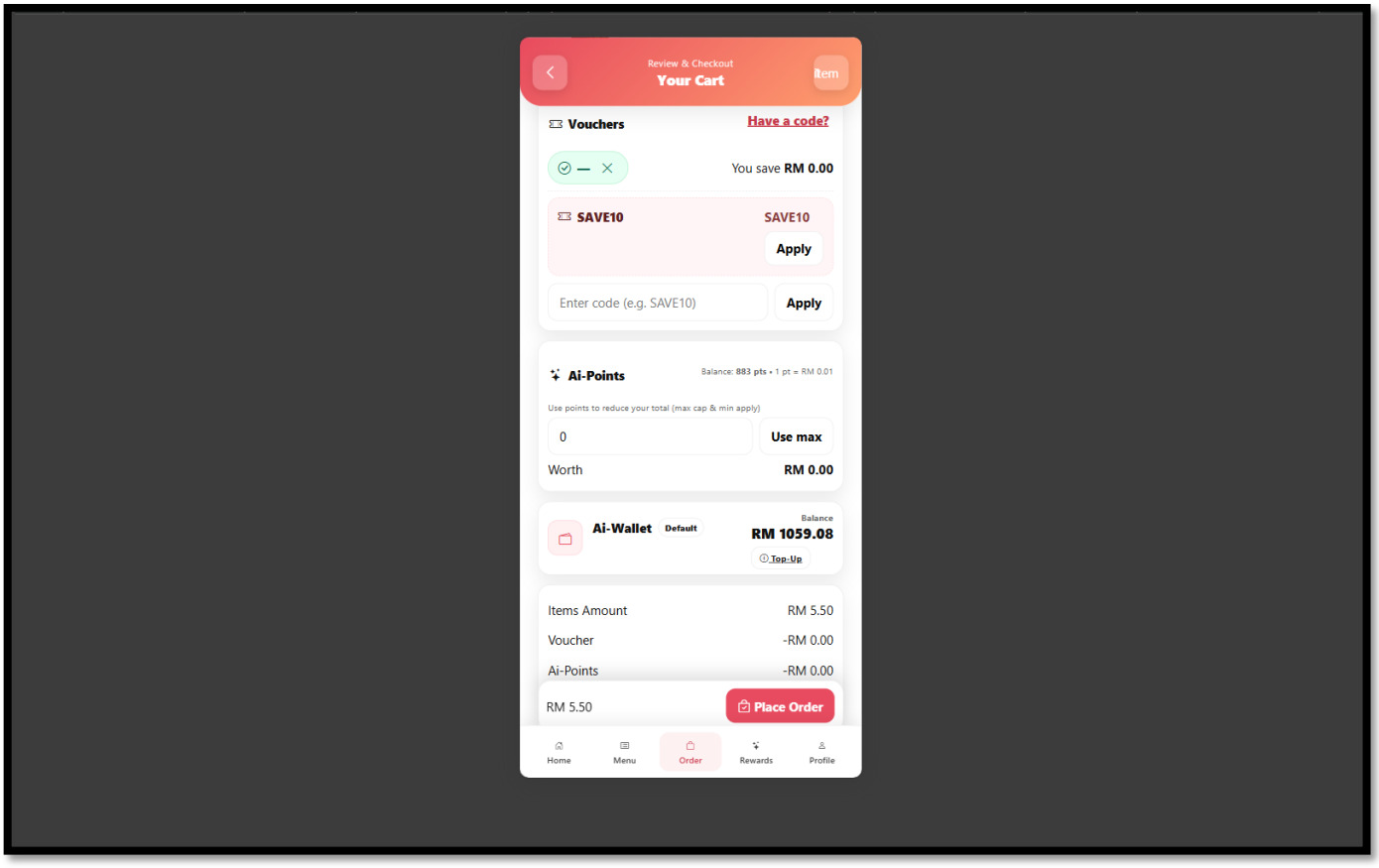
Drink Customization



- Shows drink image, name, base price.
- Selectable options:
  - **Size** (Medium, Large, Hot)
  - **Sugar Level** (Normal, Half, No Sugar)
  - **Toppings** (Boba, Jelly, Oat, etc.)
- Quantity selection.
- Choose **Buy Now** or **Add to Cart**.
- Price updates automatically.

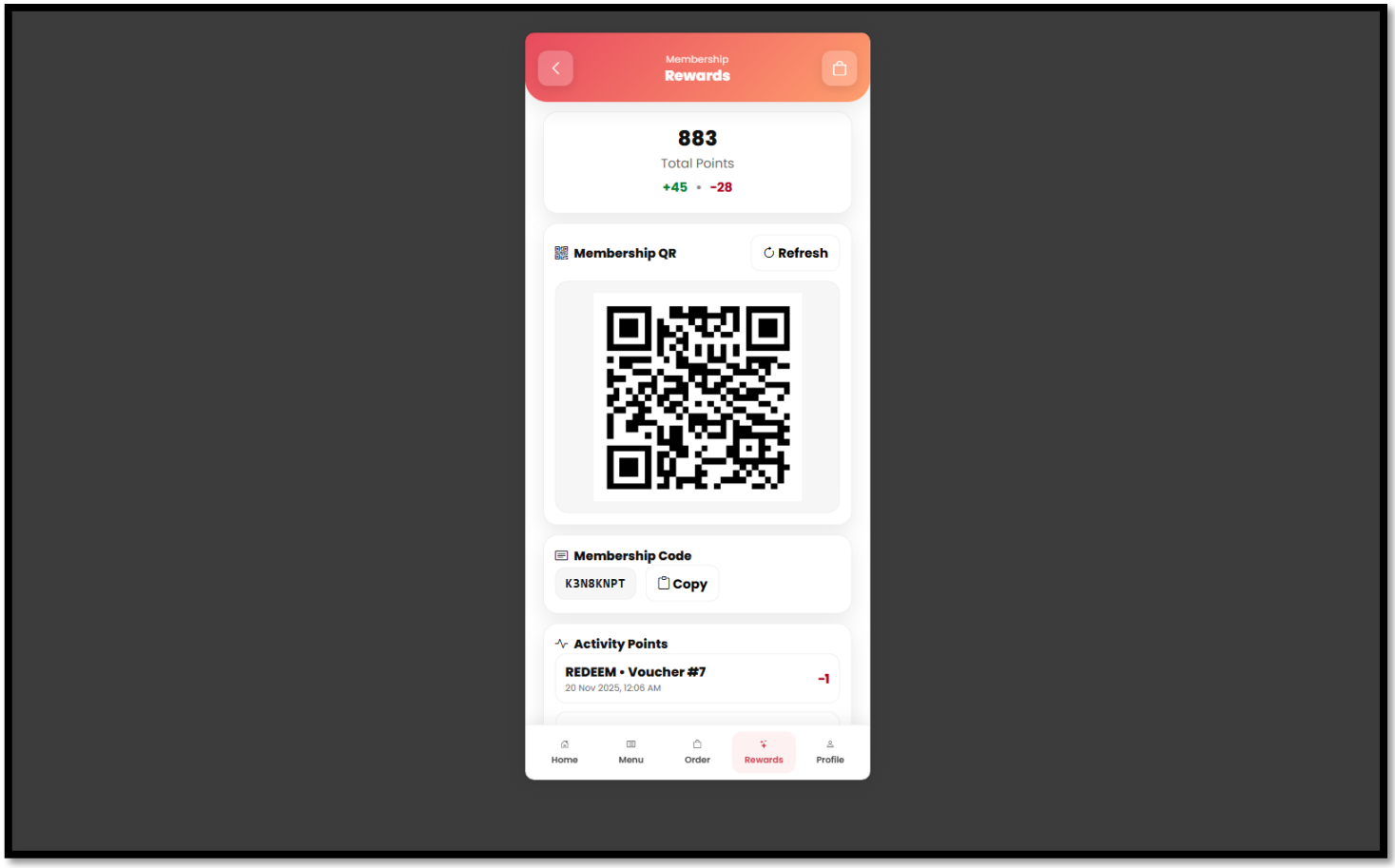
Cart and Checkout





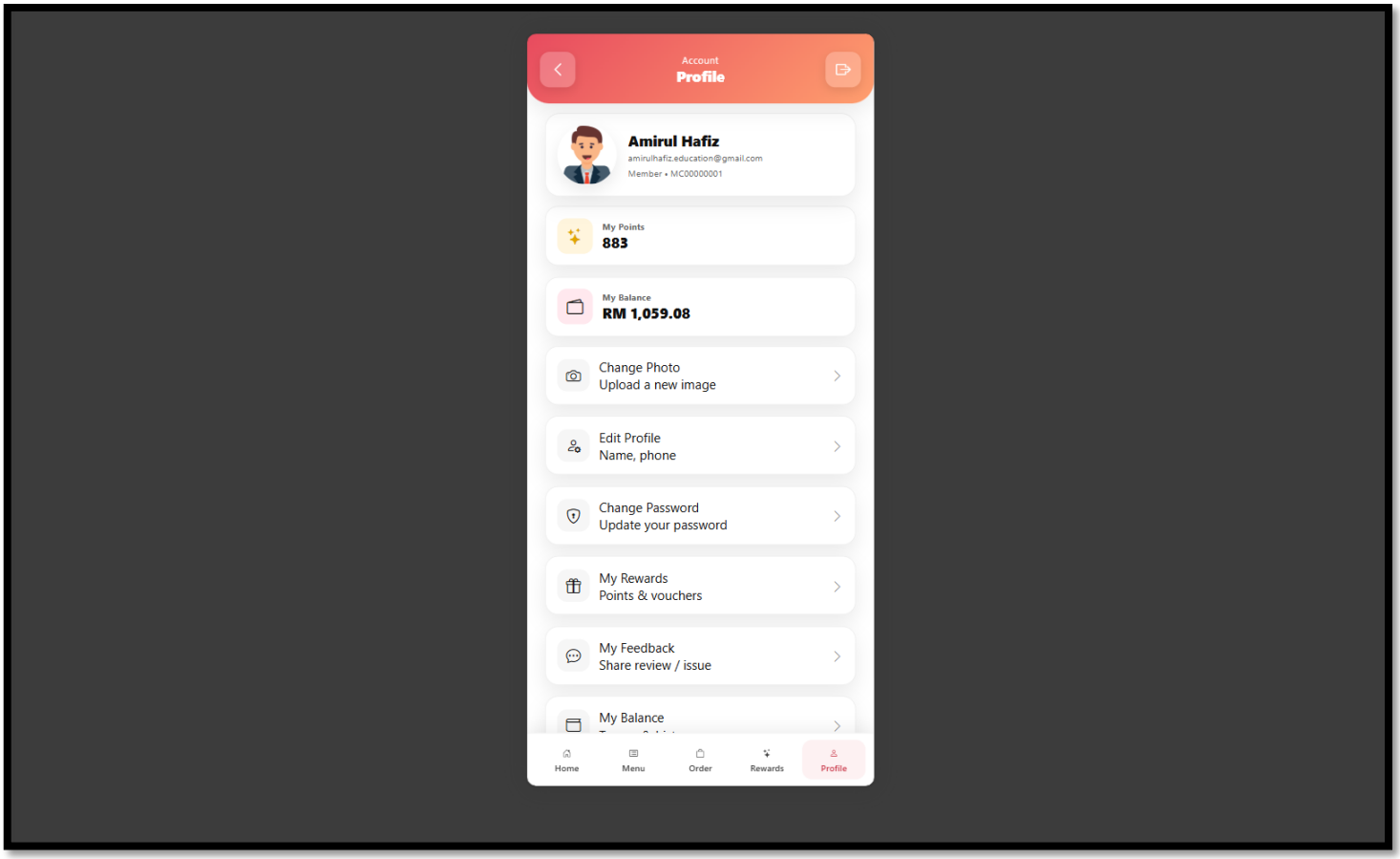
- View **Pickup Store** and **Pickup Time**.
- Add **Pickup Contact** (optional).
- Add **Order Notes** (optional).
- Edit or remove items (size, sugar, toppings).
- Discounts & payment:
  - Apply **vouchers**
  - Redeem **Ai-Points**
  - Use **Ai-Wallet** balance
- See full breakdown:
  - Item Total
  - Voucher Deduction
  - Points Deduction
  - Final Amount
- Click **Place Order** to confirm.

Membership Rewards



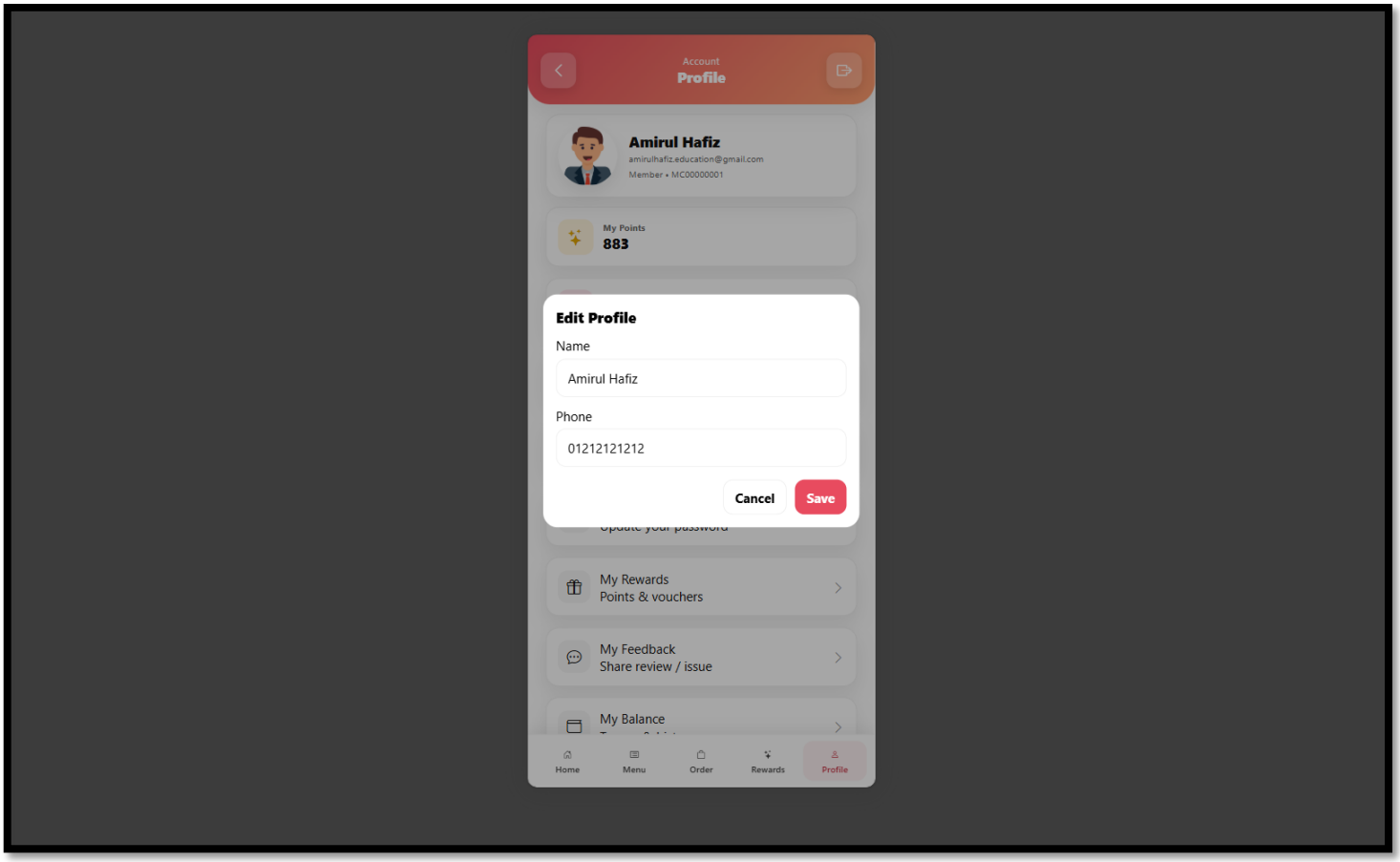
- View total points and recent activity.
- Large QR Code for scanning at counter.
- Refresh QR to regenerate.
- See Membership Code + Copy button.
- Points activity list with timestamps.

Profile Page



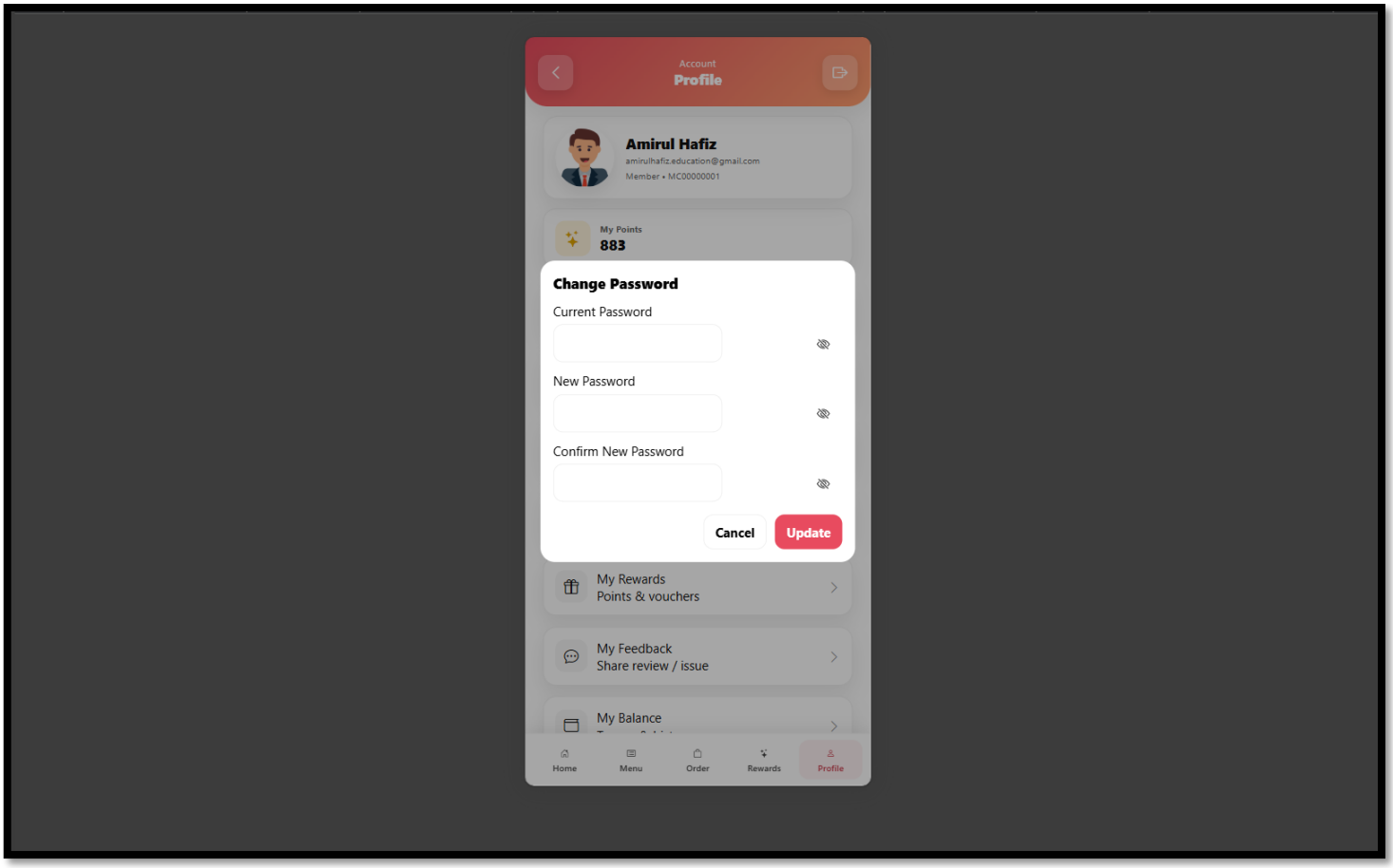
- View:
  - Avatar
  - Name
  - Email
  - Membership number
  - Points balance
  - Wallet balance
- Access shortcuts:
  - **Change Photo**
  - **Edit Profile**
  - **Change Password**
  - **My Rewards**
  - **My Feedback**
  - **My Balance**

Edit Profile



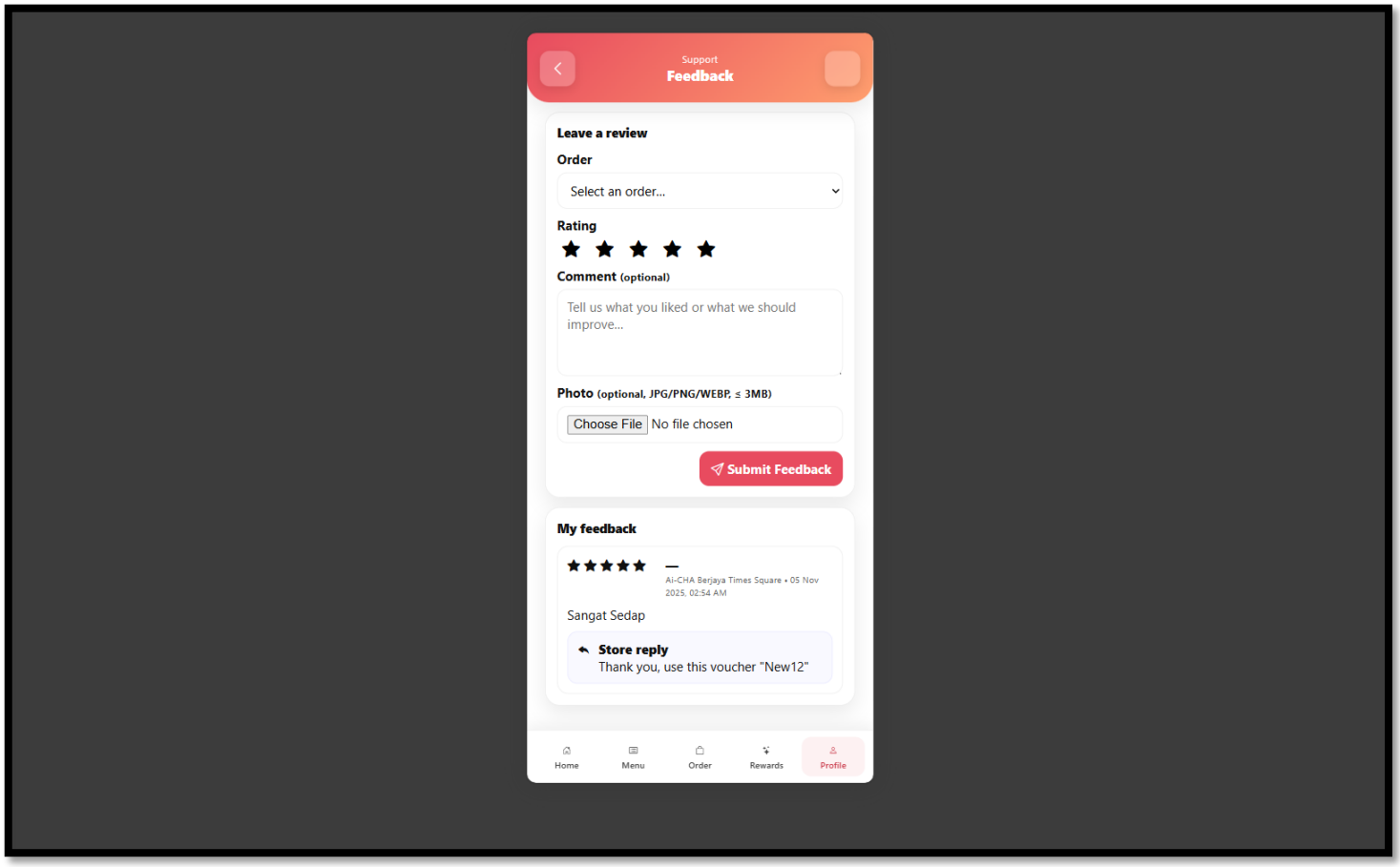
- Update Name and Phone.
- Email and membership number remain unchanged.
- Save or Cancel.

Change Password



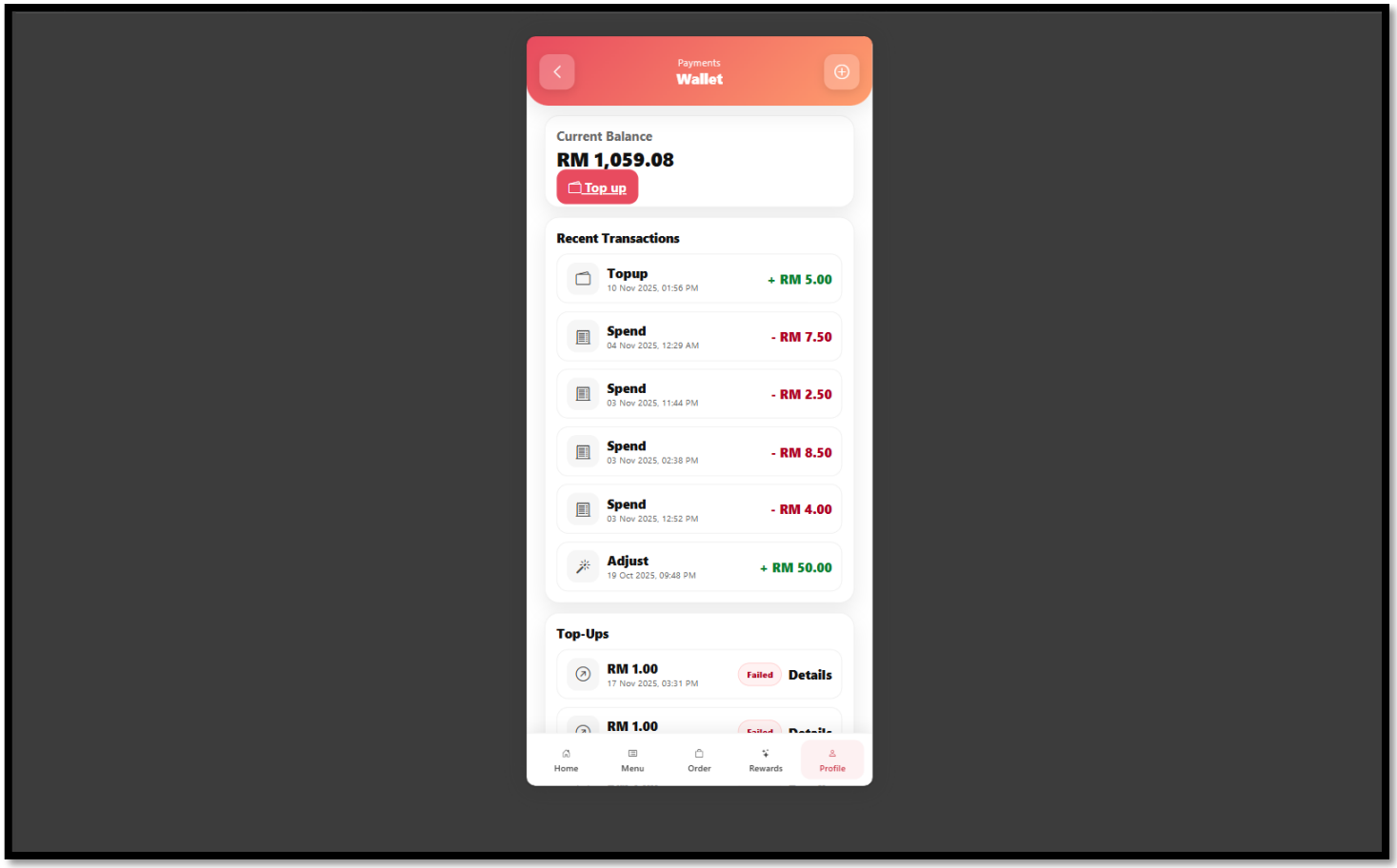
- Enter:
  - Current Password
  - New Password
- Confirm New Password
- Toggle visibility using eye icons.
- Click **Update** to save.

Customer Feedback



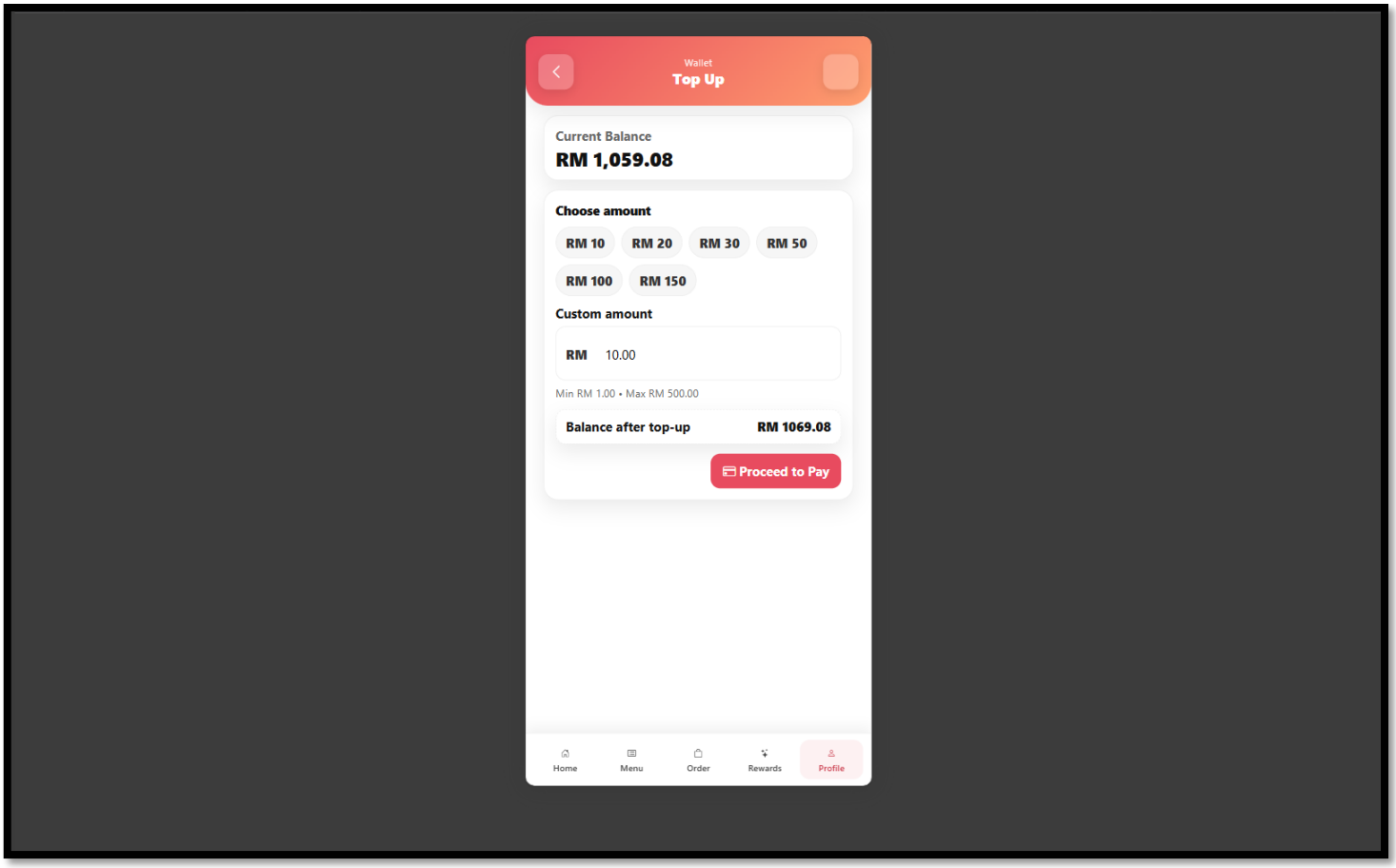
- Select an Order to review.
- Rate using stars.
- Write Comments (optional).
- Upload photo (optional).
- Submit feedback.
- View past reviews under My Feedback.
- View Store Replies for each review.

Wallet Overview



- Shows current **Wallet Balance**.
- **Top Up** button for adding credit.
- **Recent Transactions** list:
  - Top-ups
  - Spend
  - Adjust
- Shows amounts in green (credit) or red (debit).
- View top-up history under **Top-Ups** panel.

Customer Wallet Top-Up Interface



- View current balance.
- Choose preset amounts (RM10, RM20, RM30, etc.).
- Or enter **Custom Amount**.
- See **Balance After Top-up** preview.
- Click **Proceed to Pay** to open ToyyibPay.

Appendix C – Turnitin Result

turnitin Page 2 of 115 - AI Writing Overview Submission ID trn:oid:::3618:103847546

*% detected as AI

AI detection includes the possibility of false positives. Although some text in this submission is likely AI generated, scores below the 20% threshold are not surfaced because they have a higher likelihood of false positives.

Caution: Review required.

It is essential to understand the limitations of AI detection before making decisions about a student's work. We encourage you to learn more about Turnitin's AI detection capabilities before using the tool.

Disclaimer
Our AI writing assessment is designed to help educators identify text that might be prepared by a generative AI tool. Our AI writing assessment may not always be accurate (it may misidentify writing that is likely AI generated as AI generated and AI paraphrased or likely AI generated and AI paraphrased writing as only AI generated) so it should not be used as the sole basis for adverse actions against a student. It takes further scrutiny and human judgment in conjunction with an organization's application of its specific academic policies to determine whether any academic misconduct has occurred.

Frequently Asked Questions

How should I interpret Turnitin's AI writing percentage and false positives?
The percentage shown in the AI writing report is the amount of qualifying text within the submission that Turnitin's AI writing detection model determines was either likely AI-generated text from a large-language model or likely AI-generated text that was likely revised using an AI-paraphrase tool or word spinner.

False positives (incorrectly flagging human-written text as AI-generated) are a possibility in AI models.

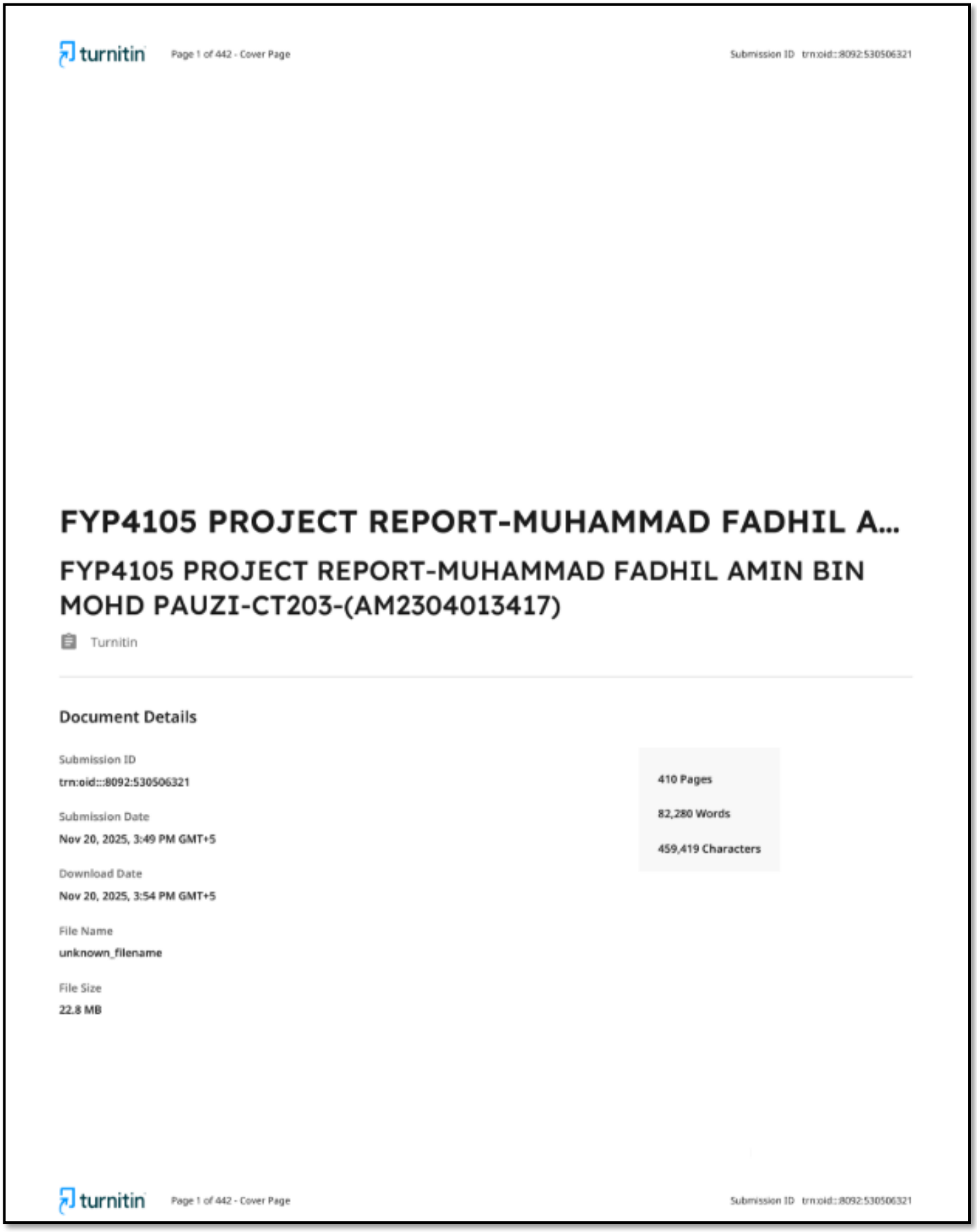
AI detection scores under 20%, which we do not surface in new reports, have a higher likelihood of false positives. To reduce the likelihood of misinterpretation, no score or highlights are attributed and are indicated with an asterisk in the report (*%).

The AI writing percentage should not be the sole basis to determine whether misconduct has occurred. The reviewer/instructor should use the percentage as a means to start a formative conversation with their student and/or use it to examine the submitted assignment in accordance with their school's policies.

What does 'qualifying text' mean?
Our model only processes qualifying text in the form of long-form writing. Long-form writing means individual sentences contained in paragraphs that make up a longer piece of written work, such as an essay, a dissertation, or an article, etc. Qualifying text that has been determined to be likely AI-generated will be highlighted in cyan in the submission, and likely AI-generated and then likely AI-paraphrased will be highlighted purple.

Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.

turnitin Page 2 of 115 - AI Writing Overview Submission ID trn:oid:::3618:103847546



turnitin Page 1 of 442 - Cover Page Submission ID trn:oid:::8092:530506321

FYP4105 PROJECT REPORT-MUHAMMAD FADHIL A...

FYP4105 PROJECT REPORT-MUHAMMAD FADHIL AMIN BIN MOHD PAUZI-CT203-(AM2304013417)

Turnitin

Document Details

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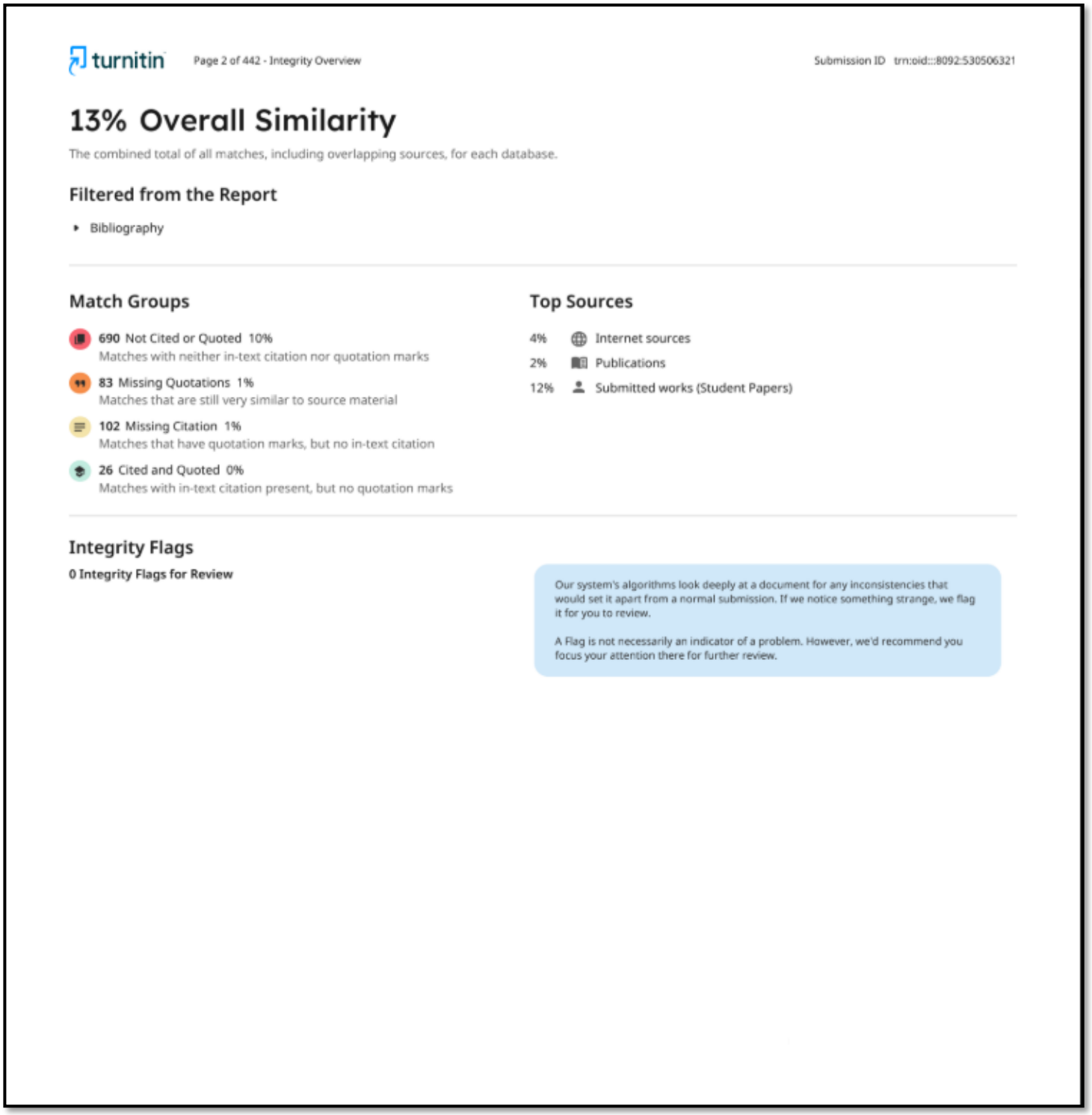
410 Pages

82,280 Words

459,419 Characters

turnitin Page 1 of 442 - Cover Page Submission ID trn:oid:::8092:530506321



turnitin Page 2 of 442 - Integrity Overview Submission ID trn:oid:::8092:530506321

13% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Filtered from the Report

- Bibliography

Match Groups

690 Not Cited or Quoted 10%
Matches with neither in-text citation nor quotation marks

83 Missing Quotations 1%
Matches that are still very similar to source material

102 Missing Citation 1%
Matches that have quotation marks, but no in-text citation

26 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

Top Sources

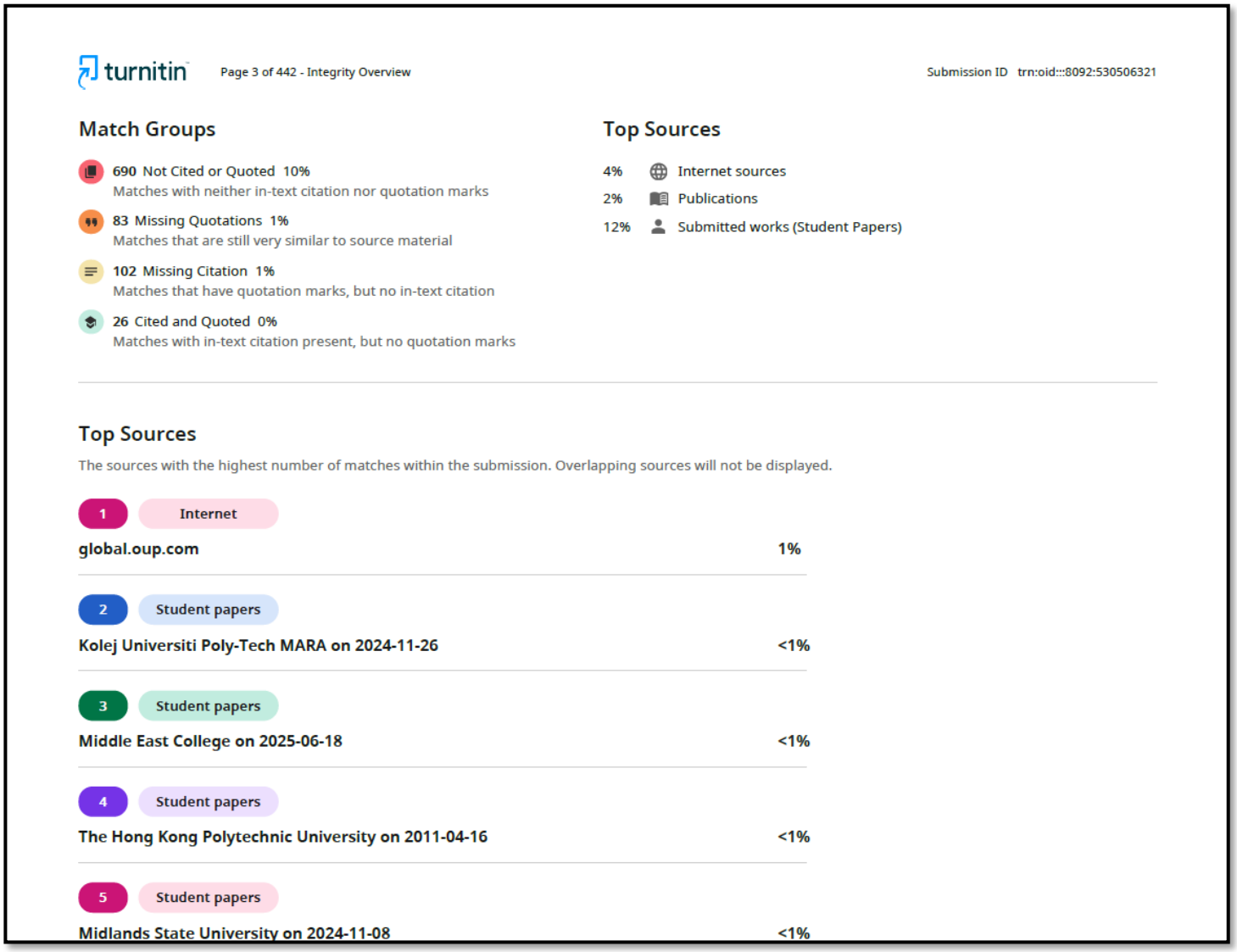
4% Internet sources
2% Publications
12% Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.



turnitin Page 3 of 442 - Integrity Overview Submission ID trn:oid:::8092:530506321

Match Groups

690 Not Cited or Quoted 10%
Matches with neither in-text citation nor quotation marks

83 Missing Quotations 1%
Matches that are still very similar to source material

102 Missing Citation 1%
Matches that have quotation marks, but no in-text citation

26 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

Top Sources

4% Internet sources
2% Publications
12% Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1 Internet
global.oup.com 1%

2 Student papers
Kolej Universiti Poly-Tech MARA on 2024-11-26 <1%

3 Student papers
Middle East College on 2025-06-18 <1%

4 Student papers
The Hong Kong Polytechnic University on 2011-04-16 <1%

5 Student papers
Midlands State University on 2024-11-08 <1%

11	Internet	
users.utcluj.ro		<1%
12	Internet	
ugspace.ug.edu.gh		<1%
13	Submitted works	
University of Southampton on 2023-09-04		<1%
14	Submitted works	
National School of Business Management NSBM, Sri Lanka on 2023-10-23		<1%
15	Internet	
slidetodoc.com		<1%
16	Submitted works	
INTI Universal Holdings SDM BHD on 2024-06-26		<1%
17	Submitted works	
Munster Technological University (MTU) on 2025-06-12		<1%
18	Submitted works	
Swinburne University of Technology on 2021-06-03		<1%
19	Submitted works	
UCL on 2024-08-21		<1%
20	Internet	
eprints.utar.edu.my		<1%
21	Submitted works	
Higher College of Technology on 2025-01-13		<1%
22	Publication	
Mansour, Ahmed Y. S.. "The Investigation of Seawater Intrusion of Coastal Aquife...		<1%
23	Internet	
journal.uib.ac.id		<1%
24	Submitted works	
American InterContinental University on 2024-05-21		<1%

25	Submitted works	
PSB Academy (ACP eSolutions) on 2022-10-03		<1%
26	Submitted works	
Universiti Sains Islam Malaysia on 2017-12-09		<1%
27	Submitted works	
University of Greenwich on 2023-11-29		<1%
28	Submitted works	
Anglia Ruskin University on 2025-05-09		<1%
29	Submitted works	
Auston Institute of Management and Technology on 2009-10-27		<1%
30	Submitted works	
Glasgow Caledonian University on 2013-04-11		<1%
31	Submitted works	
INTI Universal Holdings SDM BHD on 2024-09-01		<1%
32	Submitted works	
Middle East College on 2025-05-24		<1%
33	Submitted works	
NCC Education on 2024-05-15		<1%
34	Submitted works	
RDI Distance Learning on 2025-05-02		<1%
35	Submitted works	
Taylor's Education Group on 2019-06-12		<1%
36	Submitted works	
Universiti Sains Islam Malaysia on 2022-06-19		<1%
37	Submitted works	
Universiti Teknologi Malaysia on 2022-06-30		<1%
38	Submitted works	
University Tun Hussein Onn Malaysia on 2013-06-19		<1%

Introduction

39	Submitted works	
University of Nebraska at Omaha on 2024-05-06		<1%
40	Submitted works	
University of Warwick on 2017-08-31		<1%
41	Publication	
da Silva Pessoa, Gonçalo. "Distribuição de Conteúdos em Redes Veiculares Usand...		<1%
42	Submitted works	
i-CATS University College on 2025-02-20		<1%
43	Internet	
repository.mdx.ac.uk		<1%
44	Internet	
uir.unisa.ac.za		<1%
45	Submitted works	
universititeknologimara on 2025-02-02		<1%
46	Submitted works	
Asia Pacific University College of Technology and Innovation (UCTI) on 2024-07-31		<1%
47	Publication	
Maria Jesus Jerez-Jerez, Claudia Sevilla-Sevilla, Lidia Aguiar-Castillo. "The Role of A...		<1%
48	Submitted works	
University of Sunderland on 2023-05-05		<1%
49	Submitted works	
Victoria University on 2023-11-09		<1%
50	Submitted works	
universititeknologimara on 2025-07-08		<1%
51	Internet	
wiredspace.wits.ac.za		<1%
52	Submitted works	
HELP UNIVERSITY on 2024-02-29		<1%

Appendix D – Log Book

➢ Logbook FYP1

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

UNIVERSITI POLY-TECH MALAYSIA
UPTM

FACULTY OF COMPUTING & MULTIMEDIA (FCOM)

BUSINESS COMPUTING PROJECT 1

(FYP4094)

LOG BOOK

STUDENT'S NAME : MUHAMMAD FADHIL AMIN BIN MOHD PAUZI

ID NO. : AM2304013417

SUPERVISOR : MOHD NOOR AFIQ BIN RAMLEE

PROJECT TITLE : AI-ORDER: SMART ONLINE ORDERING APPS FOR AI-CHA ICE CREAM & TEA

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

Date/ Week		Agenda	Next Agenda	Signature (Supervisor / Coordinator)
20/05/2025	1	Received instruction from coordinator to begin finding project title, objectives, and problem statement.	Prepare proposed title and background for coordinator approval.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
22/05/2025	1	Coordinator approved the title: *Ai-Order*. Instructed to proceed with project proposal preparation.	Find a potential supervisor and explain the project idea and client.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
27/05/2025	2	Searched for supervisor; proposed title and real client (Ai-CHA) explained during discussion.	Supervisor to brainstorm and review project feasibility and idea.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
29/05/2025	2	Supervisor gave feedback and suggestions to improve system idea and scope.	Begin writing proposal content starting with background, objectives, and scope.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
03/06/2025	3	Sent first full proposal draft to supervisor for review. Received feedback for improvement.	Revise proposal based on comments.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
04/06/2025	3	Created questionnaire using Google Form. Got approval from coordinator.	Begin sharing form and collecting responses.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
05/06/2025	3	Submitted final version of proposal to supervisor after improvement.	Plan writing schedule for Chapter 1–5.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
12/06/2025	4	Meet supervisor physically to discuss how to write Chapter 1 to Chapter 5.	Start writing Chapter 1 and 2.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
13–19/06/2025	4	Continue writing Chapters 1–3. Keep collecting survey responses.	Begin writing Chapter 4 and plan for Chapter 5 content.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
20–26/06/2025	5	Complete Chapter 4 and start Chapter 5. Continue refining earlier chapters.	Finish entire report and prepare for supervisor submission.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
27/06/2025	6	Submit full Chapter 1–5 to supervisor for checking.	Begin preparing proposal slides for FYP1 presentation.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

30/06–04/07/2025	7	Present FYP1 proposal to panel.	Wait for feedback and prepare to correct report.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
05/07/2025	7	Do correction for entire report, recheck all chapters and make sure all good.	Make final touch-ups to report and compile all documents for submission.	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
09/07/2025	8	Submit full report, logbook, slides, and related documents as instructed.	-	MOHD NOOR AFIQ BIN RAMLEE Pensyarah Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia

➢ Logbook FYP2

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

UNIVERSITI POLY-TECH MALAYSIA
UPTM

FACULTY OF COMPUTING & MULTIMEDIA (FCOM)

BUSINESS COMPUTING PROJECT 2

(FYP4105)

LOG BOOK

STUDENT'S NAME	: MUHAMMAD FADHIL AMIN BIN MOHD PAUZI
ID NO.	: AM2304013417
SUPERVISOR	: MOHD NOOR AFIQ BIN RAMLEE
PROJECT TITLE	: AI-ORDER: SMART ONLINE ORDERING APPS FOR AI-CHA ICE CREAM & TEA

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

Date/ Week		Agenda	Next Agenda	Signature (Supervisor / Coordinator)
04-08/08/2025	1	Received instruction in FYP2 class regarding project continuation and final phase requirements.	Design database schema for multi-store POS system.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
11-15/08/2025	2	Completed database schema design for orders, menus, users, and transactions. Begin drafting front-end UI wireframes.	Start working on Flutter mobile app layout and navigation.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
18-22/08/2025	3	Developed basic UI for mobile apps (Menu Page, Cart Page, etc.). Integrated database with backend API.	Implement multi-store POS functionality and integrate wallet top-up feature.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
25-29/08/2025	4	Integrated wallet top-up feature using ToyyibPay. Started coding POS order functionality with menu-item selection and checkout.	Continue developing loyalty points and voucher redemption system.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
1-5/09/2025	5	Integrated loyalty points feature into POS system. Implemented voucher redemption flow.	Begin testing payment gateway and order status tracking.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
8-12/09/2025	6	Conducted testing for payment gateway (ToyyibPay) integration. Improved user interface based on feedback.	Prepare for the admin dashboard and user role management implementation.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

22-26/09/2025	7	Developed admin dashboard interface and started implementing user role management (Admin, Branch, Counter).	Continue improving POS system and implement advanced order status tracking.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
29/09-03/10/2025	8	Integrated advanced order status tracking (pending, confirmed, preparing, completed). Improved POS performance.	Focus on security measures and user authentication for admin and staff roles.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
6-10/10/2025	9	Completed user authentication and role-based access system. Enhanced security measures for sensitive data.	Start integrating order history and reporting features for admin users.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
13-17/10/2025	10	Integrated order history and reporting features in admin dashboard. Conducted initial testing of admin features.	Finalize POS system for mobile app, focusing on UI/UX improvements.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
20-24/10/2025	11	Completed mobile app POS system, focusing on improving user experience and order flow.	Test full POS functionality (order creation, payment, receipt generation).	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
27-31/10/2025	12	Conducted extensive testing for the full POS workflow. Identified and fixed issues related to payment processing and order status updates.	Prepare for final deployment and prepare for the final supervisor presentation.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
3-7/11/2025	13	Completed final debugging and optimization for the entire system. Prepared	Finalize reports and documentation.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia

CT203/BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN BUSINESS COMPUTING

		presentation materials for supervisor review.		
10-14/11/2025	14	Presented the completed system to the supervisor for feedback. Made final adjustments based on supervisor's suggestions.	Submit final report and presentation for evaluation.	DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia
17-20/11/2025	15	Submitted final report, slides, and documentation.		DR. MOHD NOOR AFIQ BIN RAMLEE Pensyarah Kanan Fakulti Pengkomputeran & Multimedia Universiti Poly-Tech Malaysia 29/10/25

References

1. Acceldata. (2024, November 12). *Referential integrity: Why it's vital for databases*. https://www.acceldata.io/blog/referential-integrity-why-its-vital-for-databases
2. Acceldata. (2024, November 21). *Metadata example: Types, applications, and importance in data management*. https://www.acceldata.io/blog/metadata-example-types-applications-and-importance-in-data-management
3. Ai-CHA Ice Cream & Tea. (2024). *Ai-CHA Ice Cream & Tea - Malaysia*. https://aichamy.com/
4. Adjust. (2023, June 12). *Mobile app loyalty programs*. https://www.adjust.com/blog/mobile-app-loyalty-programs/
5. Agilemania. (2025). *Risk management in software engineering*. Agilemania. https://agilemania.com/risk-management-in-software-engineering
6. Al-Kilidar, H., Singh, M., & Al-Alshaikh, M. (2021). Managing Requirements in Mobile App Development: Challenges and Practices. International Journal of Advanced Computer Science and Applications, 12(3), 302–308. https://doi.org/10.14569/IJACSA.2021.0120337
7. Arkon Data. (2023, July 6). *A comprehensive guide to understanding data dictionaries*. https://blog.arkondata.com/guide-to-understanding-data-dictionaries
8. Apptunix. (2023, May 25). *The role of AI in food delivery mobile applications: Examples and real case studies inside*. https://www.apptunix.com/blog/the-role-of-ai-in-food-delivery-mobile-applications-examples-and-real-case-studies-inside/
9. Atlassian. (2024). *Waterfall methodology*. https://www.atlassian.com/agile/project-management/waterfall-methodology
10. Alsmadi, I. (2023). Techniques for Requirements Engineering and Agile Project Analysis. Journal of Information Systems and Technology Management, 20(1), 45–59. https://doi.org/10.4301/S1807-17752023000100004
11. Alharthi, M., Ameen, A., & Isaac, O. (2021). The impact of mobile application usage on consumer satisfaction in the food and beverage industry. Journal of Business and Retail Management Research, 15(4), 45–54. https://doi.org/10.24052/JBRMR/V15IS04/ART-05
12. Baeldung. (2023, May 16). *What is an entity relationship diagram?* https://www.baeldung.com/cs/erd
13. Bhatt, S. (2021). *Project management methodology: A comprehensive guide to Waterfall & Agile*. Oxford University Press. https://www.oup.com
14. BrowserStack. (2024). *Software testing strategies and approaches*. BrowserStack. https://www.browserstack.com/guide/software-testing-strategies-and-approaches
15. BrowserStack. (2025). *What is software testing: Definition, types and best practices*. BrowserStack. https://www.browserstack.com/guide/what-is-software-testing
16. BrowserStack. (2025). *Types of testing: Different types of software testing in detail*. BrowserStack. https://www.browserstack.com/guide/types-of-testing
17. BrowserStack. (2024). *User acceptance testing (UAT) checklist*. BrowserStack. https://www.browserstack.com/guide/user-acceptance-testing-checklist

18. Buchanan, R. (2021). *Designing for User Experience*. Academic Press.
19. BugBug. (2025). *QA vs UAT testing: Exploring the differences*. BugBug. https://bugbug.io/blog/software-testing/qa-vs-uat/
20. CodeIgniter Foundation. (2025). *CodeIgniter4 user guide (Version 4.6.3).* CodeIgniter. https://codeigniter4.github.io/userguide/index.html
21. CodeIgniter Foundation. (2025). *Welcome to CodeIgniter4.* CodeIgniter. https://codeigniter.com/user_guide/intro/index.html
22. Dayak Daily. (2023, June 6). *Starbucks Malaysia makes loyalty more rewarding with revamped flexible programme*. https://dayakdaily.com/starbucks-malaysia-makes-loyalty-more-rewarding-with-revamped-flexible-programme/
23. Dribbble. (n.d.). *Admin interface*. https://dribbble.com/tags/admin-interface
24. Farris, R., Alshamrani, M., & Abbas, A. (2022). Software Design Practices in Agile and Traditional Methodologies: A Comparative Review. Journal of Software Engineering and Applications, 15(4), 91–104. https://doi.org/10.4236/jsea.2022.154006
25. Figma. (2024). *Figma Design Tool*. https://www.figma.com
26. FIUU. (2023). *ShopBack Pay launches at ZUS Coffee to enhance payment convenience and rewards powered by FIUU payment gateway*. https://fiuu.com/newsroom/detail/shopback-pay-launches-at-zus-coffee-to-enhance-payment-convenience-and-rewards-powered-by-fiuu-payment-gateway
27. Garrett, J. J. (2021). *The Elements of User Experience: User-Centered Design for the Web*. Pearson Education.
28. GeeksforGeeks. (2024). *Functional vs Non-Functional Requirements*. https://www.geeksforgeeks.org/functional-vs-non-functional-requirements/
29. Google Firebase. (2024). *Firebase Firestore*. https://firebase.google.com
30. Gonzalez, A., & Gutierrez, R. (2023). Business Process Modeling for Digital Transformation. Journal of Business Technology and Process Management, 12(1), 44–59.
31. Hayes, R. (2022). *Visual Studio Code: The essential tool for developers*. *Web Dev Insights*. https://www.webdevinsights.com/vs-code
32. Hebb, N. (n.d.). *What is a flow chart?* Breezetree.com. Retrieved November 17, 2024, from https://www.breezetree.com/articles/what-is-a-flow-chart
33. HyperTest. (2024). *Top unit testing tools for effective testing in 2025*. HyperTest. https://www.hypertest.co/unit-testing/most-popular-unit-testing-tools
34. IBM. (n.d.). *What is unit testing?* IBM Think. https://www.ibm.com/think/topics/unit-testing
35. IBM. (n.d.). *What is integration testing?* IBM Think. https://www.ibm.com/think/topics/integration-testing
36. IBM. (n.d.). *What is software testing?* IBM Think. https://www.ibm.com/think/topics/software-testing
37. Institute of Project Management. (2020). *Work breakdown structure (WBS): A comprehensive guide*. Institute of Project Management. https://instituteprojectmanagement.com/blog/work-breakdown-structure/

38. Intelligent DS. (2022, April 1). *What is referential integrity and why do you need it?* https://intelligent-ds.com/blog/what-is-referential-integrity
39. Itransition. (2024). *Software development risks: Types & mitigation strategies*. Itransition. https://www.itransition.com/software-development/risks
40. Johnson, J. (2021). *Designing with the User in Mind: Best Practices in UI/UX Design*. Wiley.
41. Khan, R. A., & Sulaiman, R. (2023). Software Testing Strategies for Mobile Applications: Comparative Analysis and Industry Adoption. International Journal of Computer Science and Information Security, 21(1), 37–45. https://www.ijcsis.com/
42. Krug, S. (2021). *Don't Make Me Think: A Common-Sense Approach to Web Usability*. New Riders.
43. Krysik, A. (2023). System design and architecture in software development. *Journal of Software Engineering*, *29*(4), 57–69. https://www.journalofsoftwareengineering.com/articles/29/4/57-69
44. Kumar, A., & Raj, S. (2021). Stakeholder-Centered Mobile App Development for Retail Businesses. International Journal of Computer Applications, 183(29), 1–7.
45. Kumar, R., Singh, A., & Verma, D. (2023). Analyzing digital order management systems in modern retail outlets: A case-based approach. Journal of Retail Technology, 19(2), 88–96.
46. Kharel, A., Subedi, S., & Acharya, S. (2022). Analysis of user behavior and expectations in digital food ordering platforms. International Journal of Computer Applications, 184(16), 25–31. https://doi.org/10.5120/ijca2022912546
47. Lakshman, D., & Faiz, F. (2021). *The impact of customer loyalty programs on customer retention in the retail industry*. *ResearchGate*. https://www.researchgate.net/publication/356986047_The_Impact_of_Customer_Loyalty_Programs_on_Customer_Retention_in_the_Retail_Industry
48. LambdaTest. (2023). *Integration testing tutorial: A comprehensive guide with examples*. LambdaTest. https://www.lambdatest.com/learning-hub/integration-testing
49. Lucidchart. (2023, August 10). *Database design basics: ER diagrams and relationships*. https://www.lucidchart.com/pages/database-diagram/database-design
50. Lee, S. Y. (2025, June 20). *Ai-CHA Malaysia celebrates its 300th store with KL activation*. Marketing-Interactive. https://www.marketing-interactive.com/ai-cha-malaysia-celebrates-its-300th-store-with-kl-activation
51. Lee, H. J., & Lim, S. Y. (2022). Enhancing operational efficiency through mobile point-of-sale integration in quick-service restaurants. International Journal of Hospitality Systems, 11(1), 33–47.
52. Leung, L., Liang, D., & Ng, C. (2022). *The impact of mobile app customization and loyalty programs on customer retention: A Starbucks case study*. *International Journal of Hospitality Management, 44*(3), 225–238. https://www.ijhm.com
53. Ling, G. M., Tiep, H. S., & Er, N. Z. (2021). *Customer satisfaction towards mobile food delivery apps during COVID-19 pandemic*. *SSRN*. https://ssrn.com/abstract=3938778
54. Lucidchart. (2023). *Functional vs Non-Functional Requirements: A Comprehensive Guide*. https://www.lucidchart.com

55. Meta. (2024). *React.js*. https://reactjs.org
56. MockFlow. (n.d.). *Admin dashboard wireframe example for mobile app*. https://mockflow.com/wireframe-examples/admin-dashboard-wireframe-example-for-mobile-app
57. Microsoft. (2024). *Visual Studio Code*. https://code.visualstudio.com
58. Mponela, U., Shereef, K., & Tawarish, M. (2024). *Online food ordering system*. *ResearchGate*. https://www.researchgate.net/publication/378293405_Online_Food_Ordering_System
59. Muneer, A., Habib, M., & Mahmood, T. (2021). Requirement Engineering Practices for Small Software Development Firms. International Journal of Computer Applications, 183(25), 25–31. https://doi.org/10.5120/ijca2021921094
60. Munoz, D., & Dumas, M. (2022). BPMN for Modern Application Development: Leveraging Workflow Notation in Mobile and Web Systems. International Journal of Software Engineering & Applications, 14(3), 61–74. https://doi.org/10.5121/ijsea.2022.14304
61. NCR. (n.d.). *Self-service order & pay*. https://ncr.co.il/en/selfserv-order-pay/
62. Nguyen, T., & Lim, K. (2021). Enhancing mobile app usability for customer loyalty: A study on F&B applications in Southeast Asia. Journal of Mobile Commerce, 15(2), 112–124.
63. Node.js Foundation. (2024). *Node.js*. https://nodejs.org
64. Norman, D. A. (2021). *The Design of Everyday Things: Revised and Expanded Edition*. Basic Books.
65. Nielsen, J., & Molich, R. (2021). *Usability Engineering: An Introduction to Usability Testing*. Springer.
66. Object Management Group. (2022). Business Process Model and Notation (BPMN) specification. https://www.omg.org/spec/BPMN/
67. Oracle. (2024). *MySQL 8.0 reference manual.* Oracle Corporation. https://dev.mysql.com/doc/refman/8.0/en/
68. Parker, R. (2021). *Why Flutter is the future of mobile development*. *Mobile Development Journal, 15*(2), 34–40. https://www.mobiledevjournal.com/flutter
69. Patel, S., & Desai, V. (2023). Mobile ordering systems and customer flow management in the beverage retail sector. International Journal of Contemporary Hospitality Management, 35(3), 512–527.
70. Pressman, R. S., & Maxim, B. R. (2021). Software Engineering: A Practitioner's Approach (9th ed.). McGraw-Hill Education.
71. Project Management Institute. (n.d.). *What is project management?* Project Management Institute. https://www.pmi.org/about/what-is-project-management
72. Project Management Institute. (2021). *A guide to the project management body of knowledge (PMBOK® guide)* (7th ed.). Project Management Institute.
73. ProjectManager.com. (2025). *Gantt chart guide with definitions & examples*. ProjectManager. https://www.projectmanager.com/guides/gantt-chart
74. ProjectManager.com. (2025). *Risk management process: Steps & examples*. ProjectManager. https://www.projectmanager.com/blog/risk-management-process-steps
75. Raj, R., & Tolety, V. (2022). Observational research in food service operations: Bridging the gap between customer experience and technology. Journal of Operations Research in Services, 14(1), 22–

29.

76. Ramli, M. N., Abdullah, M. S., & Rosli, N. S. (2021). Application of Google Forms for data collection in academic research: A practical guide. Journal of Social Science Research, 18(2), 55–60. https://doi.org/10.26480/jssr.02.2021.55.60
77. Redgate. (2023, June 13). *Top 12 database design principles in 2023*. https://www.red-gate.com/blog/database-design-principles
78. Saffer, D. (2021). *Microinteractions: Designing with Details*. O'Reilly Media. https://www.oreilly.com/library/view/microinteractions-designing-with/9781491956919/
79. Shneiderman, B., Plaisant, C., Cohen, M., & Jacobs, S. (2022). *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Pearson Education.
80. SoftComply. (2024). *Integrating risk management into the software development lifecycle (SDLC)*. SoftComply. https://softcomply.com/integrating-risk-management-sdlc-guide/
81. Sommerville, I. (2021). *Software engineering* (10th ed.). Addison-Wesley. https://www.pearson.com
82. Sommerville, I. (2022). Software Engineering (11th ed.). Pearson Education. https://www.pearson.com
83. Somé, A. K., Tan, C. Y., & Abdullah, M. F. (2023). Smart ordering systems for small food and beverage enterprises: Enhancing operations with mobile technology. International Journal of Information Systems and Technology, 5(1), 45–59.
84. Starbucks Malaysia. (2024). *Official Website*. https://www.starbucks.com.my
85. Sutherland, J. (2023). *Figma for UI/UX design: An overview*. *Design Fundamentals*. https://www.designfundamentals.com/figma
86. Tada. (2023, June 8). *Scaling loyalty programs with AI-powered loyalty platforms*. https://blog.usetada.com/en/scaling-loyalty-programs-with-ai-powered-loyalty-platforms
87. Tan, S. (2022). *A comprehensive review of mobile ordering systems: Case studies of Tealive and competitors in the Malaysian market*. *International Journal of Hospitality and Tourism Management, 23*(1), 45–59. https://www.ijhtm.com
88. Taipalus, T. (2024). Database management system performance comparisons: A systematic literature review. *Journal of Systems and Software*. https://doi.org/10.1016/j.jss.2023.111886
89. Tealive Malaysia. (2024). *Official Website*. https://tealive.com.my
90. TechTarget. (2023). *What is requirements gathering?*. https://www.techtarget.com
91. Techtarget. (2024). *What is integration testing (I&T)?* TechTarget SearchSoftwareQuality. https://www.techtarget.com/searchsoftwarequality/definition/integration-testing
92. TestGrid. (2024). *User acceptance testing (UAT): Meaning, definition, process*. TestGrid. https://testgrid.io/blog/user-acceptance-testing-uat/
93. Tiwari, R., & Bansal, P. (2021). *Enhancing customer engagement through mobile apps: A study of Starbucks Mobile App*. *Journal of Digital Marketing, 18*(2), 142–158. https://www.jdigitalmarketing.com
94. ToyyibPay. (2024). *Payment Gateway Solutions*. https://www.toyyibpay.com
95. Trevipay. (2023, June 6). *POS integration: The key to streamlining your business operations*. https://www.trevipay.com/resource-center/blog/pos-integration/

96. U.S. Geological Survey. (2025, February 27). *Data dictionaries*. https://www.usgs.gov/data-management/data-dictionaries
97. Vertabelo. (2024, February 5). *Relational database design: Entities, attributes, and relationships*. https://vertabelo.com/blog/relational-database-design-entities-and-relationships/
98. Vulcan Post. (2021). *ZUS Coffee: Malaysia's tech-driven coffee chain*. https://vulcanpost.com/829133/zus-coffee-malaysia-tech-driven-coffee-chain-app/
99. Vlink Info. (2024). *What is software testing & why it matters*. Vlink. https://vlinkinfo.com/blog/what-is-software-testing
100. White, S. A., & Miers, D. (2021). BPMN modeling and reference guide: Understanding and using BPMN. Future Strategies Inc.
101. W3Schools. (n.d.). *HTML semantic elements.* W3Schools.com. https://www.w3schools.com/html/html5_semantic_elements.asp
102. WorkBreakdownStructure.com. (n.d.). *What is a work breakdown structure (WBS)?* WorkBreakdownStructure.com. https://www.workbreakdownstructure.com/
103. XenonStack. (2024). *Unit testing techniques and best practices: Ultimate guide*. XenonStack. https://www.xenonstack.com/insights/what-is-unit-testing
104. Zerrouki, A., & CSS-Tricks Team. (2024). *A complete guide to Flexbox.* CSS-Tricks. https://css-tricks.com/snippets/css/a-guide-to-flexbox/
105. ZUS Coffee. (2024). *Official Website of ZUS Coffee*. https://www.zuscoffee.com.my/

Links

1. **Project Source Code (GitHub Link)-**
   https://github.com/f4dhil4min/FYP-Ai-Orders-POS-and-Loyalty-System

2. **Demonstration Video (YouTube Link)-**
   i. POS System Demo - https://youtu.be/6oHW0AEib9M
   ii. Web App Demo - https://youtu.be/cfTpzmVrx44
   iii. Wallet Top-up Demo - https://youtube.com/shorts/zdY0JCWiq1g

3. **Ai-Orders System (Direct Link)-**
   i. POS System - https://v1.aiorders.my/login
   ii. Web App - https://v1.aiorders.my/app/login