



Faculty of Computer Science and Information Technology

***UNIMAS Marketplace Application with
AI Chatbot Integration***

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UNIMAS MARKETPLACE APPLICATION WITH AI CHATBOT INTEGRATION

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ABSTRACT

The UNIMAS E-Marketplace is a mobile application made specifically to facilitate peer-to-peer transactions within the University Malaysia Sarawak (UNIMAS) community. It overcomes the constraints of existing social networking platforms by providing a secure, efficient, and student-centric digital marketplace. Key features include real-time in-app messaging, AI-powered chatbot help for 24-hour support, QR code and cash-on-delivery payment options, and a sales/purchase history tracker. Developed with cutting-edge technologies such as Flutter, Firebase, Cloudinary and Dialogflow, the application ensures scalability, usability, and solid security via UNIMAS email authentication. The UNIMAS E-Marketplace promotes entrepreneurship and sustainable resource sharing, which not only improves campus connectivity and affordability but also corresponds with the university's objective of driving innovation and community participation.

Keywords: E-Marketplace application, UNIMAS Marketplace, AI Chatbot, Peer-to-Peer Transaction, QR Code Payment, Cash on Delivery (COD), In-App Communication

ABSTRAK

Aplikasi Mudah Alih E-Pasaran UNIMAS direka khusus untuk memudahkan transaksi sesama rakan dalam komuniti Universiti Malaysia Sarawak (UNIMAS). Aplikasi ini membantu mengatasi kekangan platform media sosial yang sedia ada dengan menyediakan pasaran digital yang selamat, cekap, dan berfokus kepada pelajar. Ciri-ciri utama termasuk peme sejan dalam aplikasi secara nyata, bot perbualan AI untuk sokongan 24 jam, pilihan pembayaran melalui kod QR dan tunai semasa penghantaran, serta penjejak rekod jualan atau pembelian. Aplikasi ini diciptakan dengan menggunakan teknologi terkini seperti Flutter, Laravel, dan Dialogflow, bagi memastikan ia memiliki keupayaan untuk berkembang, kebolehgunaan, dan keselamatan yang kukuh melalui pengesahan e-mel UNIMAS. E-Pasaran UNIMAS mempromosikan keusahawanan dan perkongsian sumber secara lestari, yang bukan sahaja mampu meningkatkan keterhubungan dan kebolehan mampuan dalam kampus bahkan juga sejajar dengan objektif universiti untuk memacu inovasi dan penyertaan komuniti.

Kata Kunci: Aplikasi Mudah Alih E-Pasaran, E-Pasaran UNIMAS, Bot Perbualan AI, Transaksi Sesama Rakan, Pembayaran melalui Kod QR, Tunai Semasa Penghantaran, Komunikasi dalam Aplikasi

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LIST OF ABBREVIATIONS

Abbreviations

UNIMAS

FYP

AI

COD

QR Code

UI/UX

FAQs

Full Form

Universiti Malaysia Sarawak

Final Year Project

Artificial Intelligence

Cash on Delivery

Quick Response Code

User Interface/User Experience

Frequently Asked Questions

Chapter 1: Introduction

1.1 Project Title

UNIMAS Marketplace Application with AI Chatbot Integration

1.2 Background

Today's business practice has undergone significant transformation in marketing strategy and sales tactics (Algarni et al., 2012). The growth of business-to-business trade has led in the creation of numerous "eMarketplaces" (Wei et al., 2007). A marketplace is a digital platform that connects numerous enterprises to a huge user base, analogous to a massive virtual shopping mall. People currently prefer online markets not only for convenience, but also for a wider assortment, lower prices, an easier access to information. However, university students frequently lack a particular platform geared to their specific needs, instead relying on general social media channels, which can lead to inefficiencies and communication difficulties. This issue also occurred at the University of Malaysia Sarawak (UNIMAS), where student commonly use messaging apps such as WhatsApp and Telegram to purchase, sell, or trade products ranging from textbooks and apparel to meals and services. These platforms, while widely utilised, are not designed for effective marketplace transactions, resulting in challenges such as delayed responses, misunderstandings, and difficulties tracking item availability as users must manually update the information. Additionally, since social media staff must be highly trained to efficiently address every query and complaint that customers have, social media marketing may not always be simple to use or cost-effective (Prenaj, 2016).

Recognising these challenges, the UNIMAS Marketplace Application strives to meet UNIMAS students' specific needs by providing a specialised mobile platform for peer-to-peer transactions. The application will provide a user-friendly and secure environment for students to easily list, explore, and purchase items within their university community, thus enhancing access to affordable goods and services on campus. Moreover, the platform will be integrated features like in-app chatting, a real-time AI chatbot, and a secure payment choice, all of which simplify the transaction process and promote a better feeling of community among students. This dedicated marketplace will not only provide a dependable route for transactions, but it will also allow students to earn side income and make cost-effective purchases, encouraging a more connected, supportive and resourceful campus environment.

1.3 Problem Statement

UNIMAS students currently face challenges in buying, selling, and trading items due to the reliance on social media apps like WhatsApp and Telegram, which lack structured transaction capabilities and real-time updates. This disorganization leads to communication delays, outdated listings, and security risks associated with informal payment methods. According to Thakur et al. (2019), the dangers of social media go beyond simply damaging a company's reputation and image, but also present significant cyber security risks, which may result in vast data breaches, compliance violations, and substantial revenue losses due to fraud and counterfeit activities.

To address these challenges, a dedicated marketplace app tailored for UNIMAS students was proposed. The app will streamline transactions through secure QR code-based payment and Cash on Delivery (COD) options, reducing the risk of fraud and enhancing user trust. Utilizing a relational database for efficient data management, real-time communication through in-app messaging, and integrated AI chatbot for support, this solution will improve the overall peer-to-peer exchange experience on campus, making it easier for students to access affordable goods and services while fostering a sense of community.

1.4 Objectives

The aim of this project is to create a dedicated marketplace mobile application for UNIMAS students, providing a secure, efficient, and supportive platform for peer-to-peer buying, selling, and trading of items and services. This application seeks to empower students by facilitating side income opportunities, improving access to affordable goods, and fostering a sense of community within the university. Through this app, UNIMAS can benefit from the system by cultivating a more connected and resourceful campus environment, where students actively engage in sustainable practices, such as reusing and reselling items within their community. To achieve this, the project objectives are as follows:

- i. To empower UNIMAS students by developing a mobile application that enables them to buy, sell, and trade items, and services, creating a secure, campus-specific marketplace that encourages a culture of sustainable resource sharing and supports students' financial well-being.

- ii. To generate additional income opportunities for students through a dedicated platform, where they can sell various items, such as textbooks and printing services, contributing to students' financial independence and aligning with UNIMAS's commitment to supporting student entrepreneurship.
- iii. To streamline and enhance transaction efficiency by implementing in-app communication and real-time AI chatbot support, fostering transparency in peer-to-peer transactions and reducing the need for university involvement while improving student access to reliable support and communication tools.

1.5 Scope

The scope of the UNIMAS Marketplace Application project centres on developing a secure, user-friendly mobile app exclusively for the University Malaysia Sarawak (UNIMAS) community, addressing the specific needs of students for efficient, on-campus buying, selling, and trading of items. The project will include a robust registration and authentication system to ensure that the access is restricted solely to UNIMAS students, providing a safe, closed marketplace environment. Due to the increasing frequency of data breaches and identity theft, along with the widespread reliance on technology to store and share sensitive data, the need for enhanced security and authentication measures has never been more urgent (Bissada & Olmsted, 2017). Moreover, key marketplace functionalities will allow students to list various items and services, such as textbooks, clothing, food, and printing services, organized by categories for easy browsing and equipped with search filters to quickly locate items of interest. Each listing will contain detailed item descriptions, pricing, and availability status to minimize misunderstandings and support informed purchasing decisions. Zhu et al. (2019) suggest that information quality can influence the consumers' perception and comprehension of the reliability and accuracy of the information.

Furthermore, in-app communication is a priority, with dedicated messaging feature enabling secure, real-time conversations between buyers and sellers. To further enhance the user experience, a built-in AI chatbot will provide 24/7 assistance, guiding users through the app, answering frequently asked questions, and resolving common queries, thus improving the app's accessibility and usability. By embodying customer-centricity, these chatbots enable businesses to deliver continuous and efficient service around the clock (Waladi et al., 2024). Next, to facilitate secure and convenient transactions, the app will support multiple payment

options, including QR code payments and Cash on Delivery (COD), allowing users to choose the method that best suits their needs. QR code-based payment is not only hassle-free but also more secure as they leverage the security features of the payees' mobile carriers an apps, rather than those of the merchants' websites (Miraz & Haikel-Elsabeh, 2019). Similarly, COD option allows customers to mitigate concerns about potential fraud, such as undelivered goods or empty packages, providing them with a sense of security and trust in their purchases (Alfarizi & Sari, 2023)

1.6 Methodology

For this project, we will follow the Waterfall methodology, a structured ad sequential approach where each phase must be completed before moving to the next and there is no overlapping in the phases (Senarath, 2021). The Waterfall model ensures thorough documentation and systematic development, which is beneficial for the UNIMAS Marketplace Application as it provides clear stages for building and testing the app's functionality. The methodology is divided into 6 phases which is Requirement Analysis, System Design, Implementation, Integration and Testing, Deployment, and Maintenance.

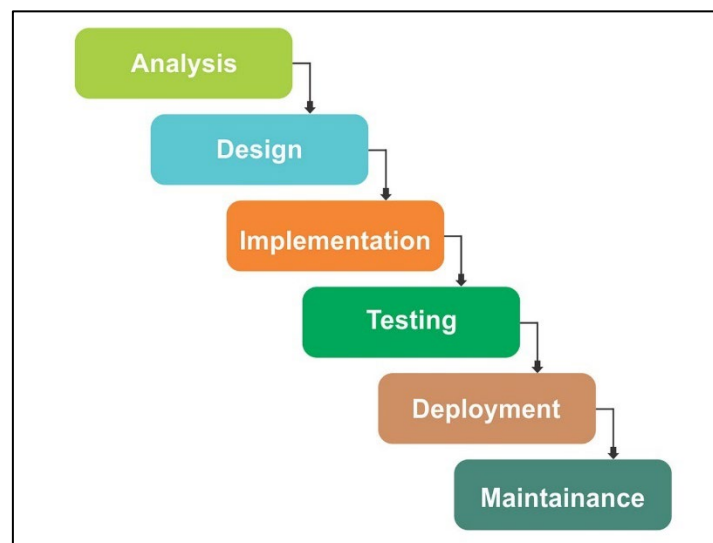


Figure 1.1: Waterfall Methodology

In the Requirement Analysis phase, the detailed requirement from UNIMAS students and stakeholders will be gathered in order to understand the key features and functionalities needed in the marketplace app. This includes user authentication, item listing capabilities, in-app messaging, secure payment options, and AI chatbot integration. Following this, the System Design phase will outline the app's interface, database, and architecture, creating a detailed

blueprint to guide the development process. In the Implementation phase, core components like user registration, item listing, payment processing, and communication features will be developed to ensure the alignment with the design specifications. Once the development is complete, the next phase will involve Integration and Testing, where each module will undergo rigorous testing to verify functionality and security. Integration and user acceptance testing will follow to confirm a seamless and user-friendly experience. With testing complete, the application will be deployed for live use, allowing UNIMAS students to access the app in a production environment. Finally, the Maintenance phase will ensure the app remains functional and up to date, with regular updates and improvements based on user feedback and performance monitoring. The Waterfall model provides a clear and sequential approach, ideally suited to building a secure, user-focused marketplace tailored to UNIMAS students' need.

1.7 Significance of Project

The UNIMAS Marketplace Application is significant as it enhances accessibility for students to buy, sell, and trade items, addressing the challenges of finding affordable goods on campus. It promotes sustainable practices by encouraging the reuse and resale of items, fostering a culture of resource sharing. Other than that, the app also empowers students financially by providing the opportunities for side income and entrepreneurship. With integrated features like in-app messaging and rating system, it improves communication and trust between users while streamlining secure transactions, thereby fostering confidence in online exchanges (Zhu et al., 2019). These features indicate the platform's competence and benevolence, akin to how e-marketplaces build trust through user-friendly interfaces and dispute resolution mechanisms (Zhu et al., 2019). Overall, this project strengthens the campus community, supports students' welfare, and aligns with UNIMAS's mission to enhance students' life through innovative solutions.

1.8 Project Schedule

Throughout year four of study, this project is divided into two sections: Final Year Project 1 (FYP 1) and Final Year Project 2 (FYP 2). FYP 1 must be completed between October 10, 2024 (Week 1) and January 12, 2025 (Week 13), whereas FYP 2 is scheduled for completion in Semester 2, from March 17, 2025 (Week 1) to June 23, 2025 (Week 14). The project schedule can be referred to in Appendix B.

1.9 Expected Outcome

The UNIMAS Marketplace is anticipated to provide students with a safe, user-friendly platform for buying, selling, and trading goods and services within their campus community. Through features like in-app messaging, AI chatbot support, and QR-based payments, the app fosters efficient and trustworthy transaction while encouraging sustainable practices through resource sharing. By providing opportunities for side income, the app supports student entrepreneurship and financial independence, as students gain not only practical business experience but also essential skills in business organization, planning, and management, which are crucial for their financial success (Eshpulatovich, 2024). However, the proposed application has a constraint in its payment method, as it does not involve a payment gateway. Buyers and sellers must communicate directly via in-app chat to complete the payment process.

1.10 Project Outline

The report is divided into three main chapters, each with a specific function that guides the development and understanding of the project. Started with Chapter 1: Introduction. This chapter lays the groundwork for the entire project. Its purpose is to give a comprehensive introduction, starting with the project's background and motivation, which helps the readers understand why the project is necessary. It clearly outlines the problem being addressed and sets measurable objectives to guide the development process. This chapter also defines the scope, specifying what the project will and will not cover, explains the chosen methodology to ensure a systematic approach. Additionally, it discusses the project's significance, highlighting its potential impact and benefits. The project schedule provides a structured timeline for the work, while the expected outcomes summarize what the system aims to achieve. Overall, this chapter establishes the context and direction for the project.

Chapter 2: Literature Review provides a critical examination of existing research and technologies related to the project. The purpose of this chapter is to understand the current landscape of solutions and technologies, which helps in justifying the need for the proposed project. It includes a review of similar systems or applications, analysing their strengths and weaknesses to identify gaps that the project aims to fill. By comparing existing solutions and discussing relevant tools and technologies, this chapter lays the theoretical foundation for the system design and implementation. It also explains the rationale for selecting specific technologies and outlines how the proposed system will offer unique improvements, making a strong case for the project's innovation and relevance.

Next, Chapter 3: Requirement Analysis & System Design. In this chapter, the identified needs and objectives will be translated into system specifications. Its purpose is to ensure that all functional and non-functional requirements are well defined and aligned with user needs. This chapter provides a detailed breakdown of what the system must do, as well as the performance and security standards it must meet. It also specifies hardware and software requirements necessary for system development. The system design section includes diagrams and models, such as data flow diagrams, entity-relationship diagrams (ERD), and user interface mock-ups, which serve as a blueprint for the implementation phase. By providing a clear and structured design, this chapter ensures that the system will be developed efficiently and will function as intended, addressing all requirements outlined earlier.

In Chapter 4: Implementation, the focus shifts to the deployment of the proposed application based on the designs and specifications outlined in the previous chapter. The purpose of this chapter is to explain the tools and technologies used, the step-by-step development process, and the modularity of the proposed application. This chapter will also be demonstrating the system functionalities by providing a walkthrough of the key features and interfaces of the proposed application.

Furthermore, Chapter 5: Testing, where in this chapter the evaluation on the proposed application will be done. This chapter has its focus on verifying whether the developed application meets its functional and non-functional requirements. It discusses the types of testing conducted, such as functional testing to validate each feature against specified requirement, and non-functional testing to assess performance, usability, and reliability. Apart from that, in this chapter, test cases are designed and executed to identify potential issues and confirm the system's readiness for deployment. Thus, this chapter ensures the quality, stability, and the effectiveness of the developed application.

Finally, Chapter 5: Conclusion and Future Work. This chapter summarizes the significant outcomes and achievements of the proposed project, concluding its development. It delineates prospective advancement and future trajectories for system improvement.

Chapter 2: Background Study

2.1 Introduction

In this chapter, three applications with similar features to the proposed UNIMAS E-Marketplace integrated with AI Chatbot will be discussed. The chosen applications are Facebook Marketplace, Carousell, and Shopee. These applications were chosen for review in order to assess its functionality and identify any issues that may exist. Following the review of these existing applications, a comparison will be made between them and the proposed solution. Finally, a summary of the chapter's key point will be provided.

2.2 Review of Similar Applications

This section will provide an analysis of several similar applications – Facebook Marketplace, Carousell, and Shopee – as a detailed background examination of the proposed application is critical for contextualizing the topic (Pramonojati et al., 2020). The major goal of this evaluation is to demonstrate our understanding of the proposed application, evaluate the features available in current e-marketplaces, and identify the issues users have on these platforms. This enables a comparative review of existing applications and emerging advancements, emphasizing the proposed application's uniqueness and ability to address common difficulties encountered by most present e-marketplaces.

The selected applications will be evaluated based on the following criteria which is the UI/UX design, application target market, payment methods, login credentials, communication tools used, AI Chatbot for 24/7 assistance, and sales or purchase history tracking. These requirements serve as benchmarks since enticing people demands an application or website to be simple in design, easy to navigate, and provide clear and up-to-date information in all components (Wihardja & Mochammad Haldi Widiyanto, 2023). Furthermore, implementing appropriate risk management methods is critical in protecting critical components such as user and financial data in order to prevent online behaviours that represent substantial hazards (Qurtubi et al., 2022). Evaluating these criteria will enhances user satisfaction by improving trust, transaction safety, and overall experience. Trust-building measures like seller verification and dispute resolution will strengthen brand reliability, drive long-term success, and boost transaction volumes by encouraging users to engage confidently (Yaragani, 2023).

2.2.1 Facebook Marketplace

Facebook marketplace is a widely used e-commerce platform that enables users to buy, sell, and trade items locally (Facebook Marketplace, 2024). It functions as a dynamic online marketplace where the user can take advantage of the Facebook's social qualities and user network to facilitate communication and make business deal with one another. Both buyers and sellers can utilize this platform whether to purchase or selling items. Therefore, this overview will look at the features of the platform and how they benefit both parties.

Facebook marketplace is a platform that offers the buyers a wide range of products selection, including new and pre-owned items in numerous categories, such as electronic, apparel, home decoration, cars, and many more. It also embedded with search filtering section that help to streamline buyers' item searching process as they are allowed to narrow down their search based on categories, price range, item condition, and location (Facebook Help Centre, 2024). Moreover, as the platform come with the location-based filtering, it aids simplicity to the buyers during item browsing as the item's listings displayed in the Facebook Marketplace main page is the items available near to their set location. Next, communication is hassle free for the user of Facebook Marketplace as it is integrated with the Facebook Messenger. This enables customers to speak with vendors directly to inquire further on the product details, negotiate prices, arrange logistics for pickup or delivery, and more directly within the platform. Facebook Marketplace also simplifies access by using existing Facebook login credentials, eliminating the need for additional account creation. This integration enhances user convenience, particularly for active Facebook users. In addition, the user interface (UI) is clean and intuitive, making it easy to navigate, list items, or browse products. Sellers can quickly upload item images, write descriptions, set prices, and specify their location to attract local buyers. Furthermore, thanks to Facebook's enormous global user base, retailers have a better opportunity to promote their wares to local potential consumers.

Despite this simplicity, professional sellers may find the platform limiting due to the absence of inventory management tools or analytic dashboards. The lacks in advanced tools like order history summaries or sales analytics cause difficulty for professional's sellers to monitor performance and scale their businesses. While the platform does not feature built-in payment gateways, which might leave consumers vulnerable to dangers like fraud or deceptive listings, it allows flexibility for buyers and sellers to decide on payment methods, such as bank transfers, PayPal, or Cash on Delivery (COD). This gives users control over how transactions are conducted, though it requires manual coordination. In addition, Facebook Marketplace also

utilizes AI-driven product recommendations based on user activity, search history, and location. These AI features personalize the browsing experience by displaying relevant products that align with user preferences. However, the platform does not include AI chatbots or automated assistance features to facilitate inquiries or provide support.

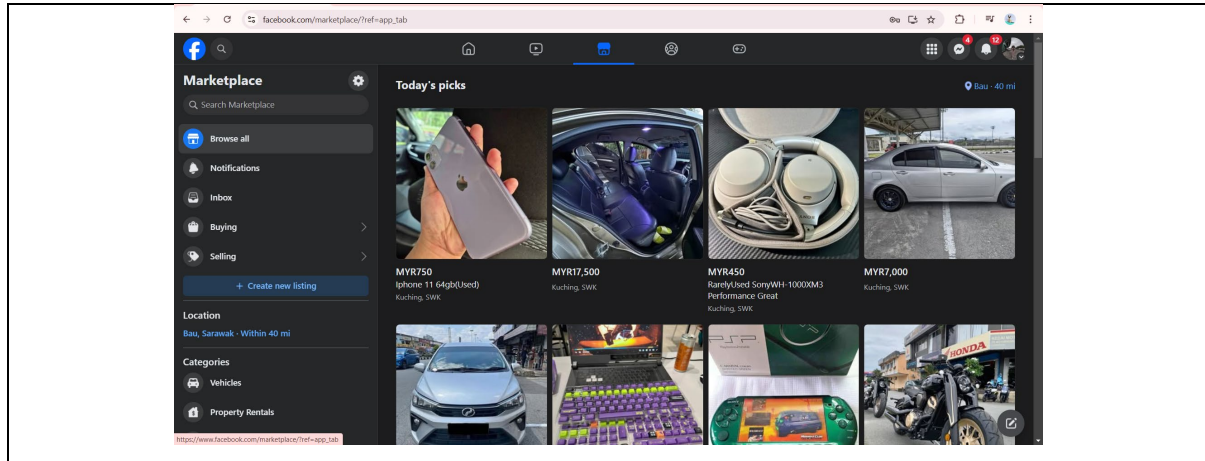


Figure 2.1: Facebook Marketplace Main Page

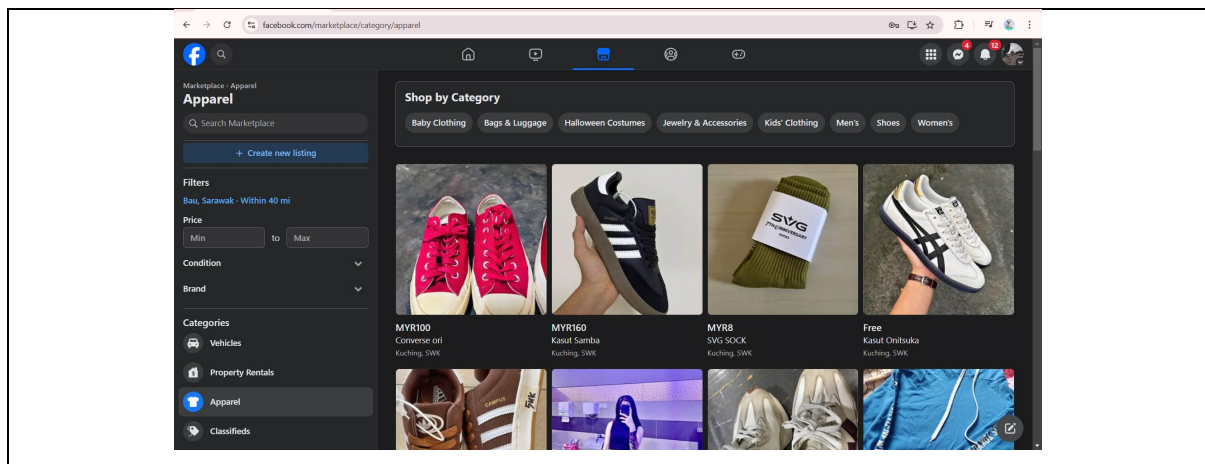


Figure 2.2: Facebook Marketplace Search Filtering

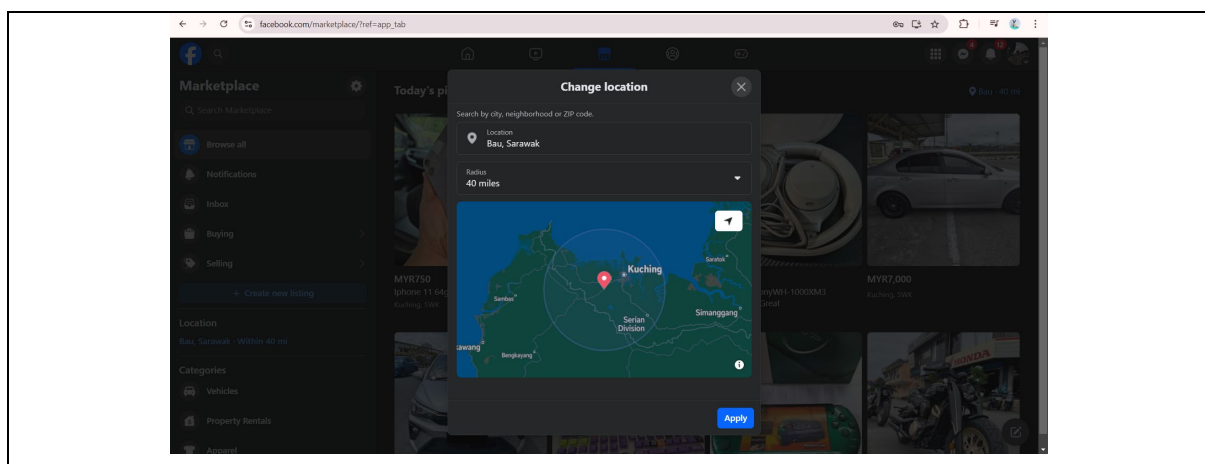


Figure 2.3: Facebook Marketplace Location Based Filtering

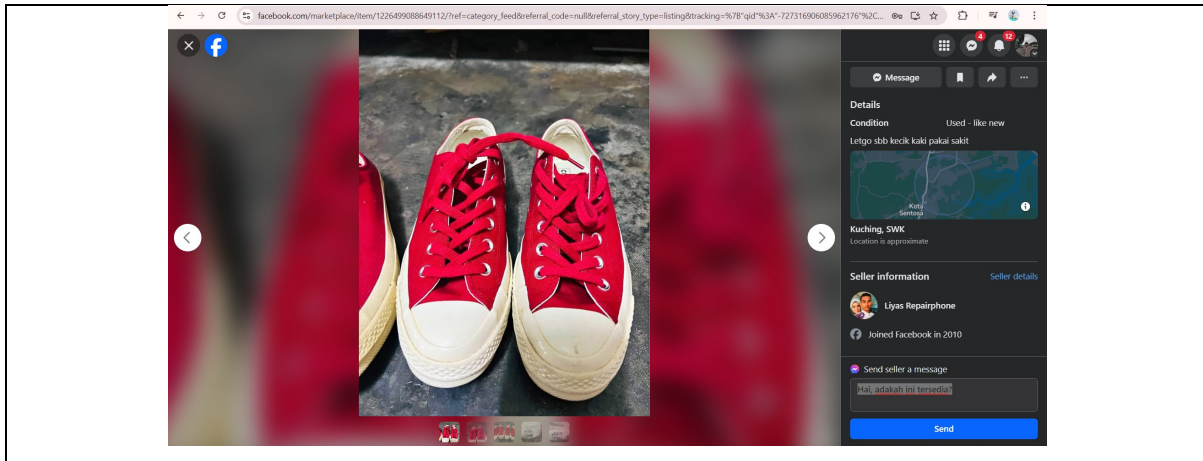


Figure 2.4: Communication through integrated Facebook Messenger

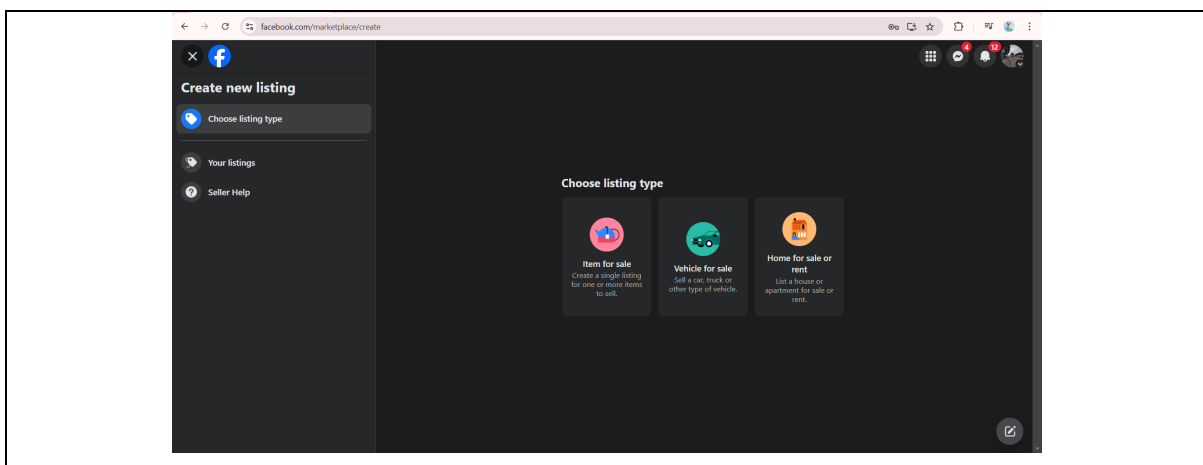


Figure 2.5: Facebook Marketplace Create New Listing Page

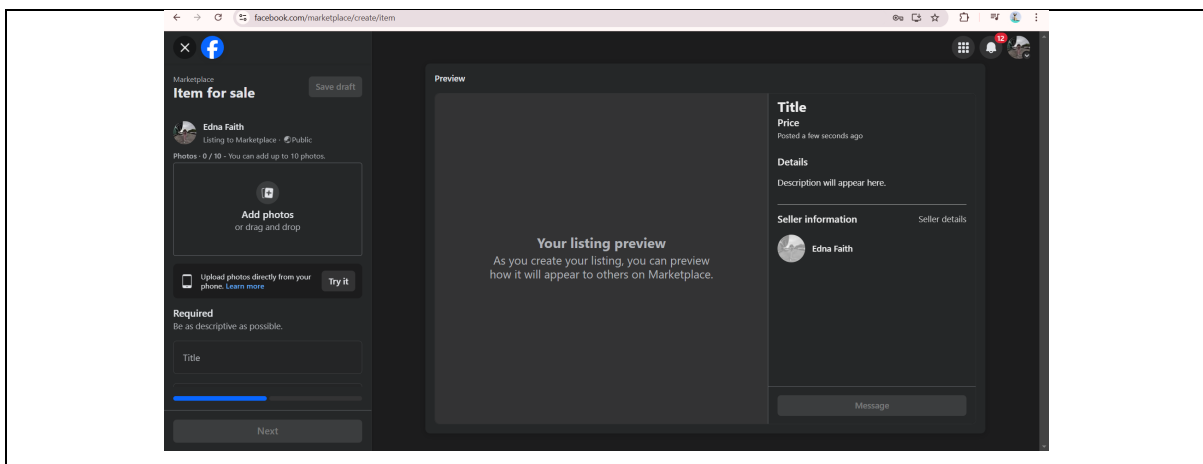


Figure 2.6: Facebook Marketplace Create New Listing Details

Strengths:

- Worldwide user base that opens more opportunities for sellers to promote their products to an extensive variety of potential purchases.
- User-friendly interface.

- Real-time communication between suppliers and buyers through the integration with Facebook Messenger, ensuring effective interactions.
- Budget friendly business platform for individual and small-scale vendors with no listing fee.
- Transparent and secure transaction as users can view potential buyers or sellers' personal profiles.

Weaknesses:

- Absence of integrated payment options causing reliance on external arrangements and increased transaction risks.
- Limited advanced seller capabilities such as inventory tracking, analytics dashboards, and automatic payment collection.
- Lack of buyer protection, leaving users vulnerable to potential fraud.
- Increased privacy concerns as some users may be reluctant to share personal information for transactions purposes.

2.2.2 Carousell

Carousell is a Singapore-based marketplace that effortlessly links consumers and companies via smartphone and web platforms. This app next expanded its presence across several countries, particularly in Southeast Asia, Hong Kong, Taiwan, and beyond. It is purposefully designed to enable the exchange of both new and used things within local circles (About Carousell Group, 2020). The platforms effectively meet the needs of both buyers and sellers.

Firstly, for buyers' side, Carousell (Carousell Malaysia, 2024) offers a user-friendly interface with item listing in a well-organized category such as electronics, fashion, home goods, vehicles and many more. It also integrates with searching tools and item filtering features which enable the users to narrow down their search based on numerous parameter such as price, location and item condition. Notably, the app has a direct price negotiation function, which allows consumers to request the price that they desire for items directly within the app itself. Furthermore, communication becomes easier thanks to the integrated in-app chat feature. This benefits purchasers because it eliminates the need for connection via external communication channels. To further enhance user experience, Carousell has begun leveraging AI-powered chatbots in select regions. These chatbots assist users by automating responses to frequently asked questions, such as inquiries about product availability, delivery timelines, and

payment methods (Carousell Help Centre, 2021). Additionally, payment methods on Carousell vary based on regional availability and buyer-seller agreements (Payments, shipping & post-purchase support, 2024). While Carousell does not offer a fully integrated global payment gateway, it supports Carousell Protection in selected regions. Under this system, payments are held securely in escrow until the buyer confirms receiving the item, ensuring added transaction security. In regions where Carousell Protection is unavailable, users typically rely on manual payment methods such as Cash on Delivery (COD), bank transfers, or third-party services like PayNow, PayLah!, or PayPal. This flexibility empowers users to choose their preferred transaction method but requires additional coordination, which may increase risks for both parties.

Next, from the perspective of the seller, Carousell is an easy-to-use platform for listing products with no upfront costs. Casual sellers and those looking to declutter will benefit from this. Besides, seller can swiftly create listings simply by uploading the item's photos, creating a description, and establishing a price. Not only that, but bulk listings are also offered by Carousell, which is absolutely advantageous for organizations or suppliers who oversee big inventory as it permits the creation and administration of numerous listings simultaneously rather than one by one which is time consuming. As for the communication, the integrated in-app messaging feature allows sellers to engage with clients directly in order to answer on any of the customers' inquiries and pricing negotiation. With the help of AI- chatbot, seller is now able to provide better service while maintaining efficiency as quick replies to common buyer queries can be facilitate and next helps in streamline communication and reduce response time. Besides, seller may also be able to increase their market present by investing in premium features offered by Carousell such as promoted listings or banners to expand their audience reach. However, for professional sellers who need such capability, Carousell's lack of sophisticated tools for inventory management and sales statistics may be a drawback.

Aside from that, Carousell also focus on creating a sense of community through user reviews and ratings, which next resulting in foster rapport between buyers and sellers. Credibility is further increased by verified accounts and badges. In order to provide a more customized user experience, the platform also integrates AI-driven suggestions and personalized feeds to enhance user experience by displaying relevant product listings based on browsing history, preferences and location.

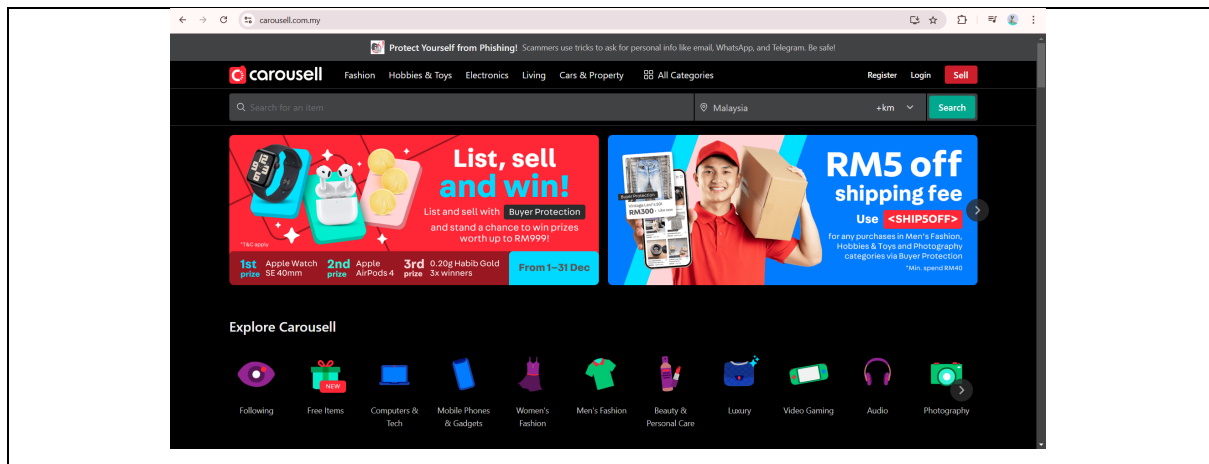


Figure 2.7: Carousell Main Page

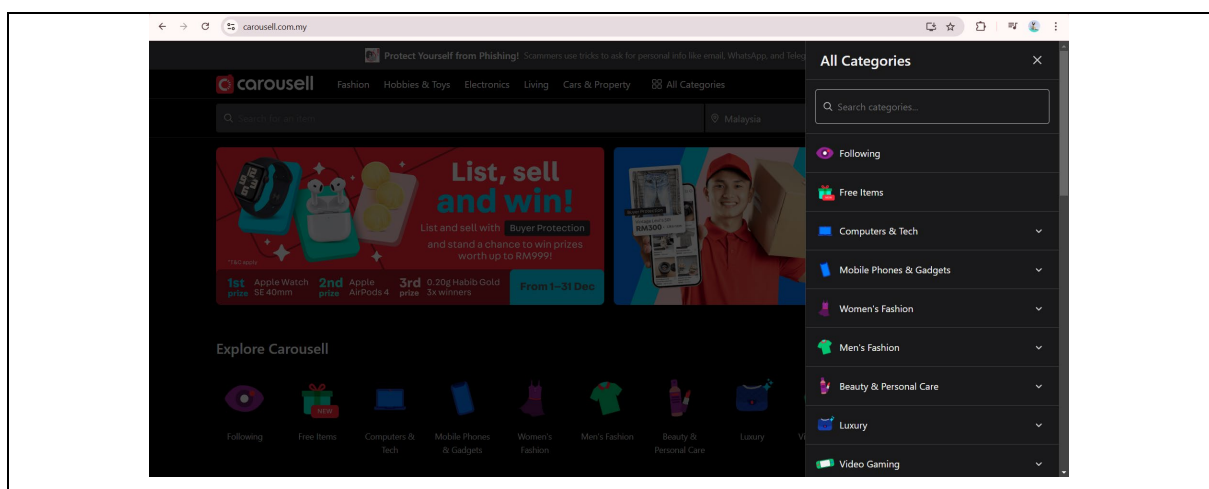


Figure 2.8: Carousell Search Filtering

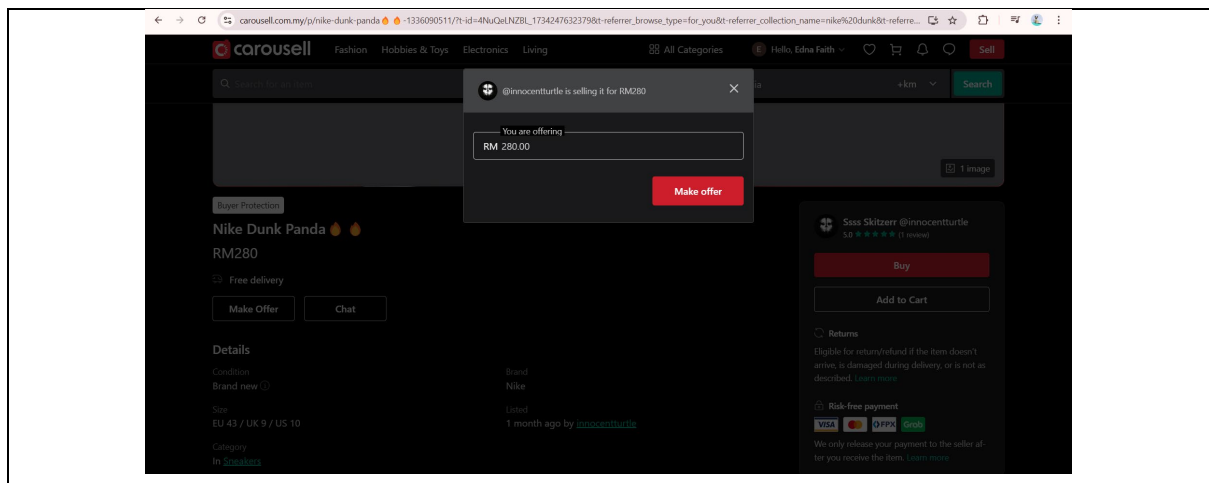


Figure 2.9: Carousell Direct Price Negotiation Feature

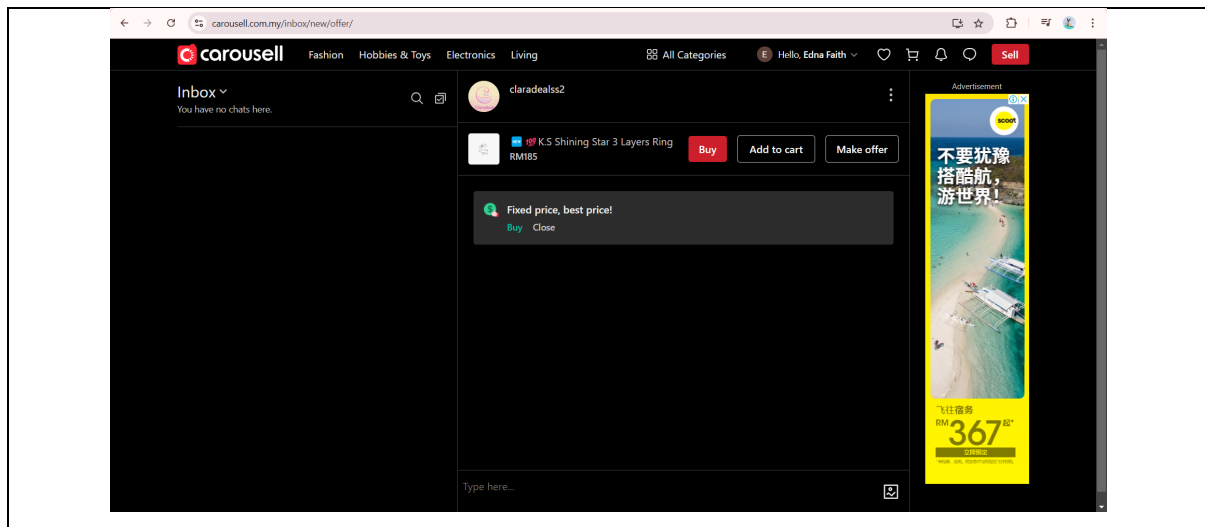


Figure 2.10: Carousell In-App Chat

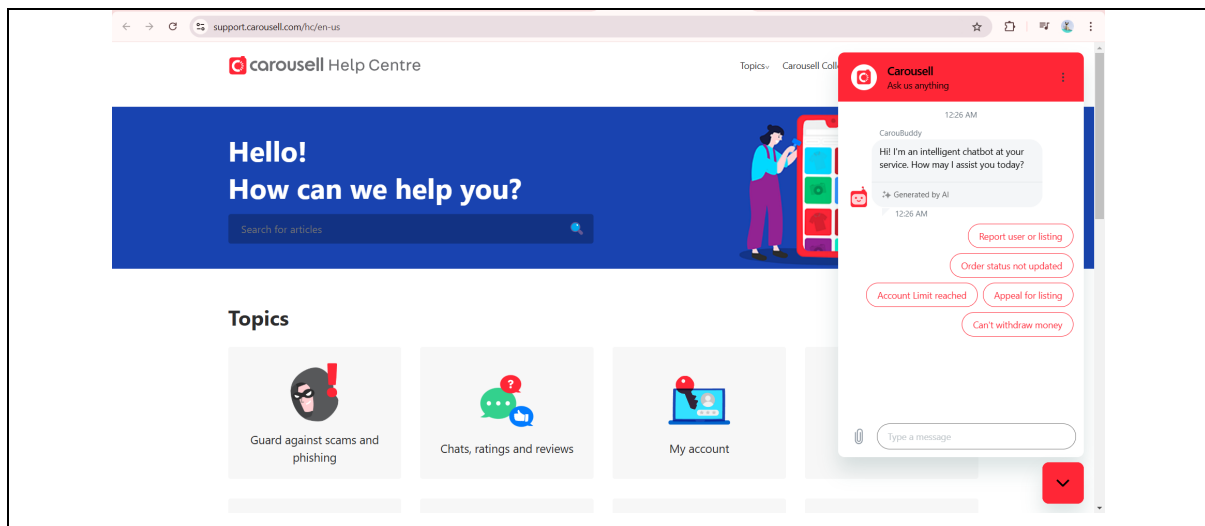


Figure 2.11: Carousell AI Chatbot for 24/7 Customer Support

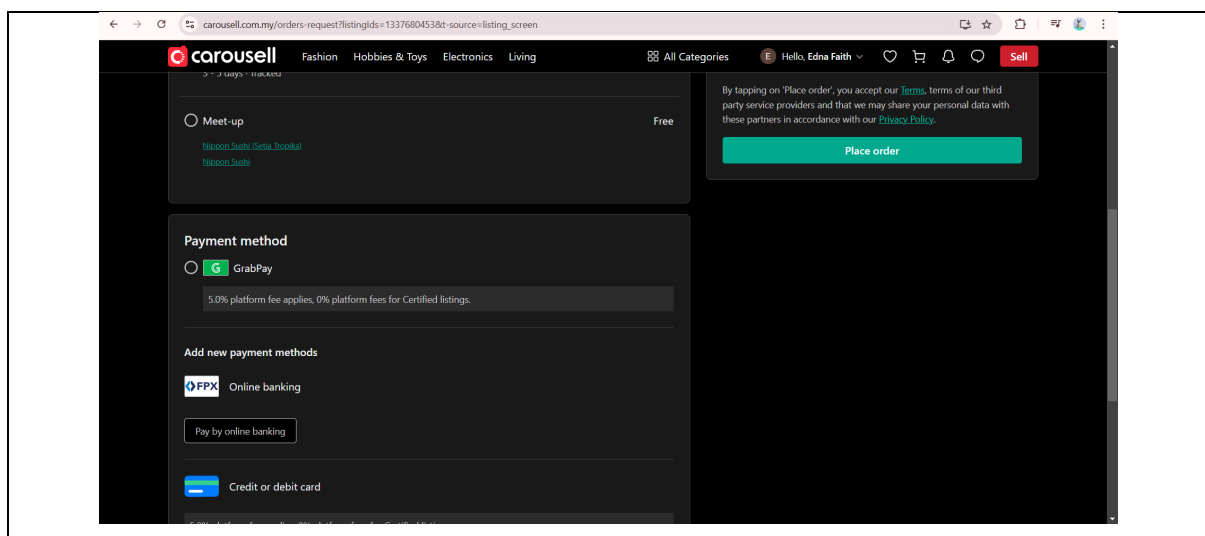


Figure 2.12: Carousell's Payment Method

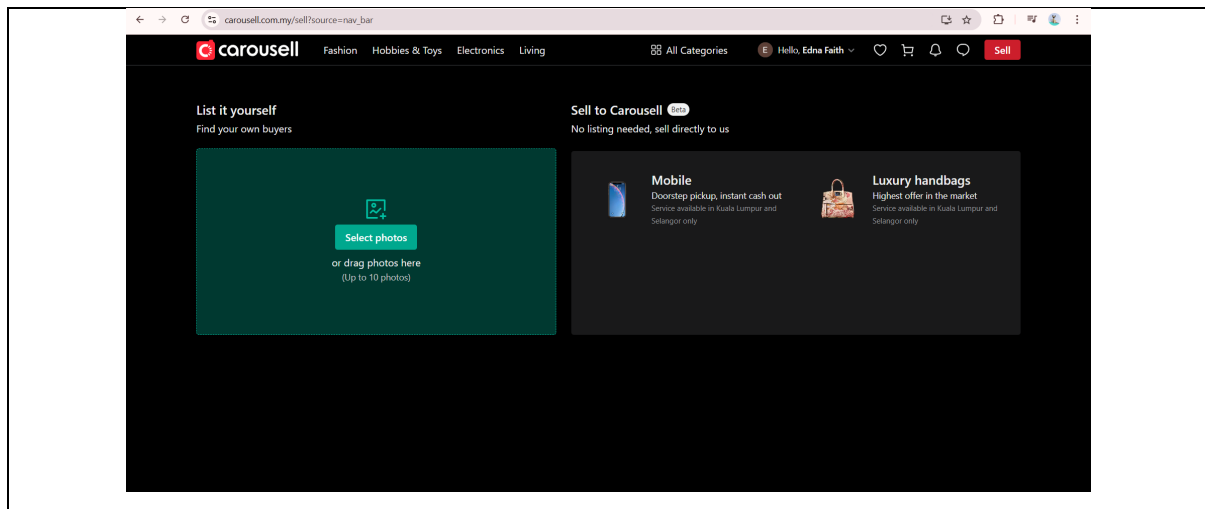


Figure 2.13: Carousell Create New Item Listing Page

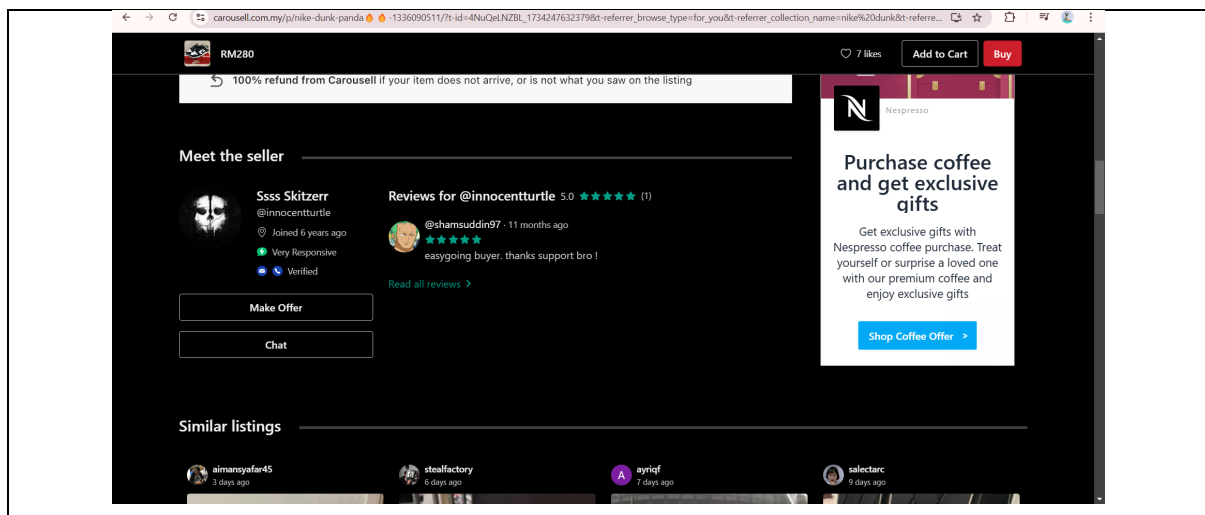


Figure 2.14: Carousell Review and Rating

Strengths:

- User friendly interface design which ensures both buyers and sellers will have a smooth experience when using the app.
- Local community focus. For instance, location-based search and filtering boost local purchases.
- Free listings feature which make the app more accessible to casual users.
- In-app messaging integration simplifies buyer-seller communications.
- Optional premium services such as promoted listings reveals sellers to a higher visibility to the potential buyers.

Weaknesses:

- Limited buyer protection which causing most transaction lack of safeguard against fraud and item misrepresentation.
- Inconsistent payment features where in app payment and escrow services are only available in certain region.
- Lack of advanced seller tools such as built in inventory tracking or extensive analytics for professional sellers.

2.2.3 Shopee

Shopee is a Singaporean multinational technology company that specializes in e-commerce that was founded in 2015, and it has been recognized as the largest e-commerce platform in Southeast Asia as of 2023. This platform facilitates both business-to-consumer (B2C) and consumer-to-consumer (C2C) interactions. It offers a marketplace environment that prioritizes cost-effectiveness, accessibility, and user comfort for both buyers and sellers.

Shopee offers a wide range of products to meet the needs of customers, including digital goods, fashion items, groceries, and electronics, among many other things ([New to Shopee], 2023). Due to the variety of products available to customers, Shopee has grown into a one-stop store for daily needs. Besides, Shopee strategically prioritizes regional markets like Malaysia, Singapore, Indonesia, and the Philippines, where it integrates specialized features to meet the demands of certain regions. For buyers, Shopee guarantees a flawless purchasing experience for users with its intuitive interface design (Shopee Malaysia, 2024). For example, the platform offers customers comprehensive search filters, easy navigation, and personalized recommendations. The platform's search features allow users to narrow their options by product category, price range, seller ratings, and more. The application then features a built-in live chat capability, known as Shopee Webchat, in order to help buyers and sellers communicate more effectively. Through this live chat, buyers can further ask sellers about the products or make pre-purchase queries (Seller Education Hub, 2024). In addition, it has also introduced AI-powered chatbots to further improve customer service. These chatbots assist buyers by providing instant responses to frequently asked questions (FAQs), such as product availability, order status, refund policies, and shipping inquiries (Chatbot Terms of Service, 2024). Not only that, but it also offers its consumers round-the-clock customer service via live agent chat and online contact ([Customer Service], 2023), allowing them to ask any queries they may have

about any problems they had with the platform. Moreover, the platform improves customer trust even further by providing a range of secure payment methods, including credit cards, e-wallets, online banks, and Cash-on-Delivery (COD), which is an important option for buyers in places where digital payment is unusual. This platform also has the Shopee Guarantee feature that was integrated within Shopee Supported Logistics (SSL) channels which help to ensure the payment security by holding the payment until the buyer confirms receipt of the merchandise for orders made under integrated channels ([Order Protection], 2023). This provides customers with an even greater sense of security during their purchase. Not only that, but customers can also use the notification page to monitor their past purchases and track their orders. Customers gain from this since they can monitor the thing they bought and be prepared to accept it when it is shipped.

From the sellers' perspective, Shopee makes selling easy with its mobile-friendly platform and specific tools. Through the in-app messaging platform, vendors may engage directly with customers and respond right away to it, which next will assist to build the trust of the client. Shopee's AI chatbot also aids sellers by automating responses to repetitive inquiries from buyers, such as stock availability and delivery timelines. Next, by putting money in escrow until delivery confirmation, the safe payment infrastructure also ensures a swift and secure transactions. Additionally, as Shopee primarily targets Southeast Asia, this platform provides sellers with access to an expansive user base and opportunities for both domestic and international sales. Besides, in order to support sellers in keeping track on their sales and stock levels in real time, it also connected with an advanced sales tracker that provides insights into order performance, inventory control, and pricing strategies. Furthermore, Shopee offers its merchants 24/7 support, training resources, and tools such as the Shopee Seller Center, which allows sellers to manage their marketing and product listings. Finally, the easy interface design makes it easier to organize marketing campaigns, add items, and evaluate performance metrics.

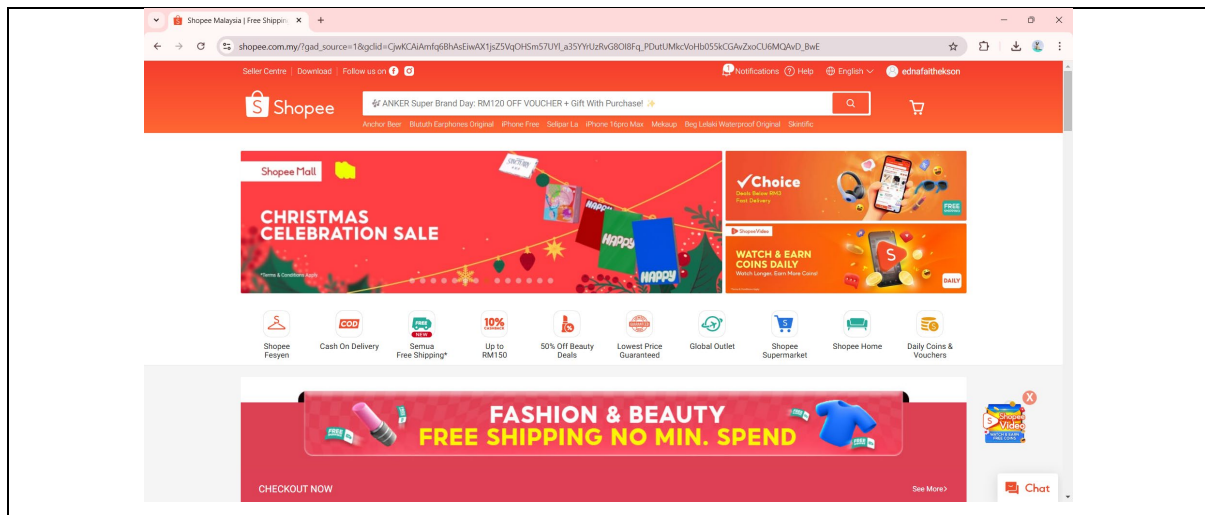


Figure 2.15: Shopee's Home Page

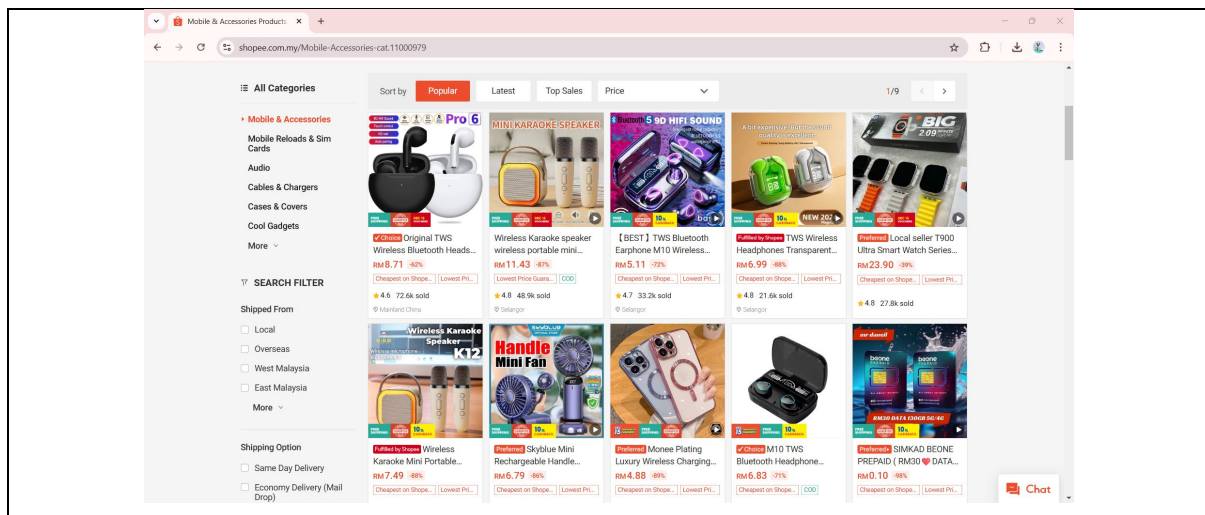


Figure 2.16: Shopee Search Filter Feature

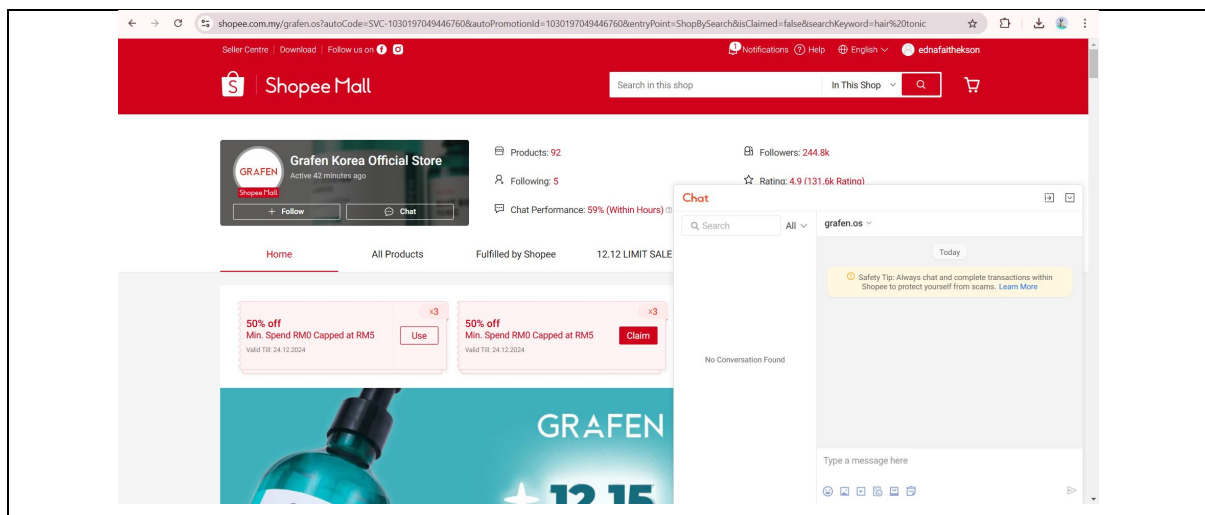


Figure 2.17: Shopee In-App Chat Feature

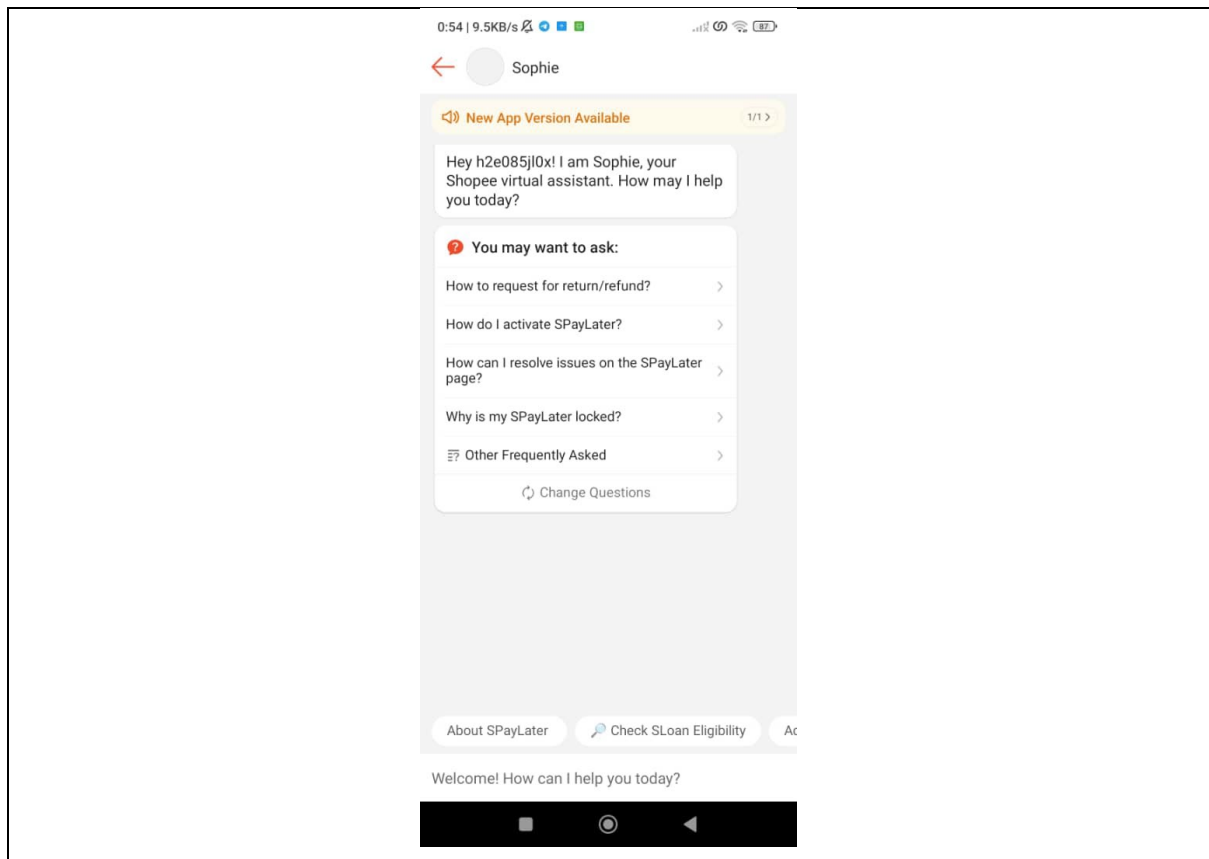


Figure 2.18: Shopee AI Chatbot

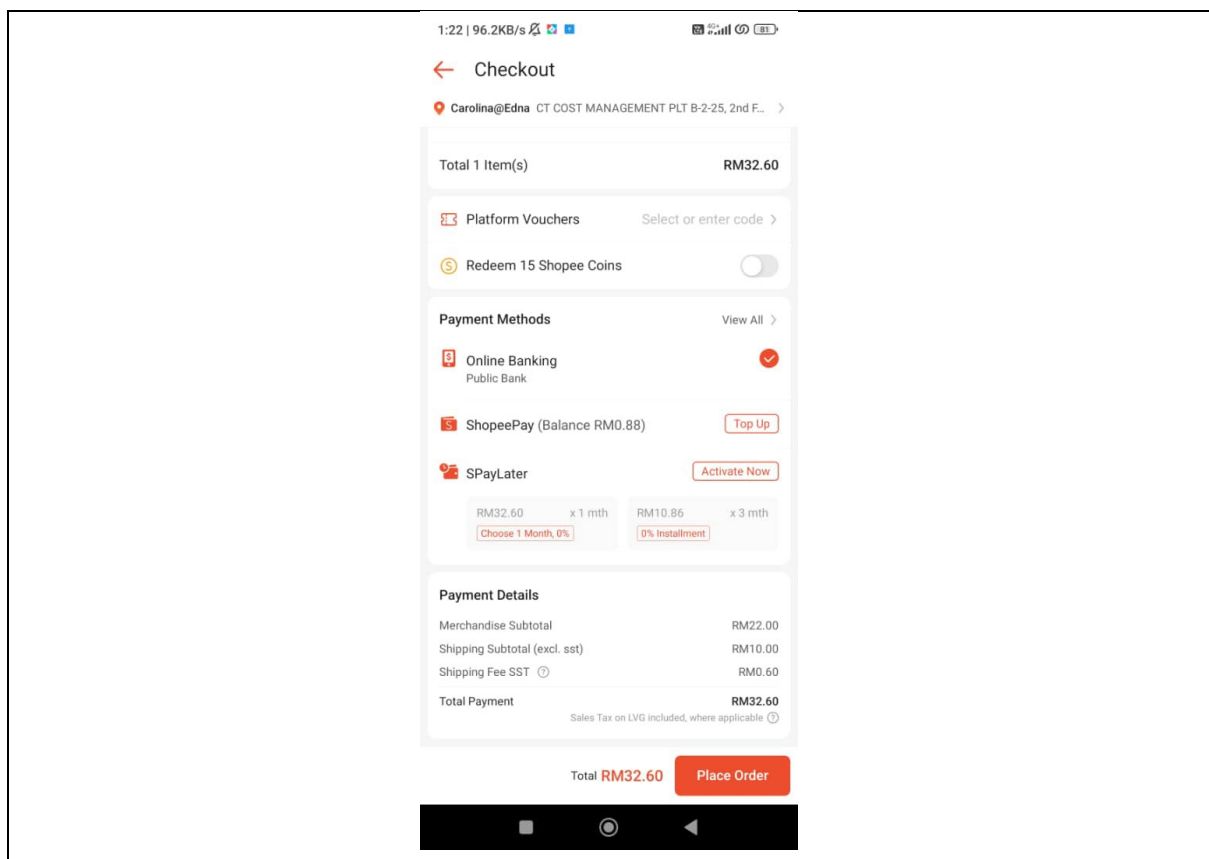


Figure 2.19: Shopee Payment Method Options

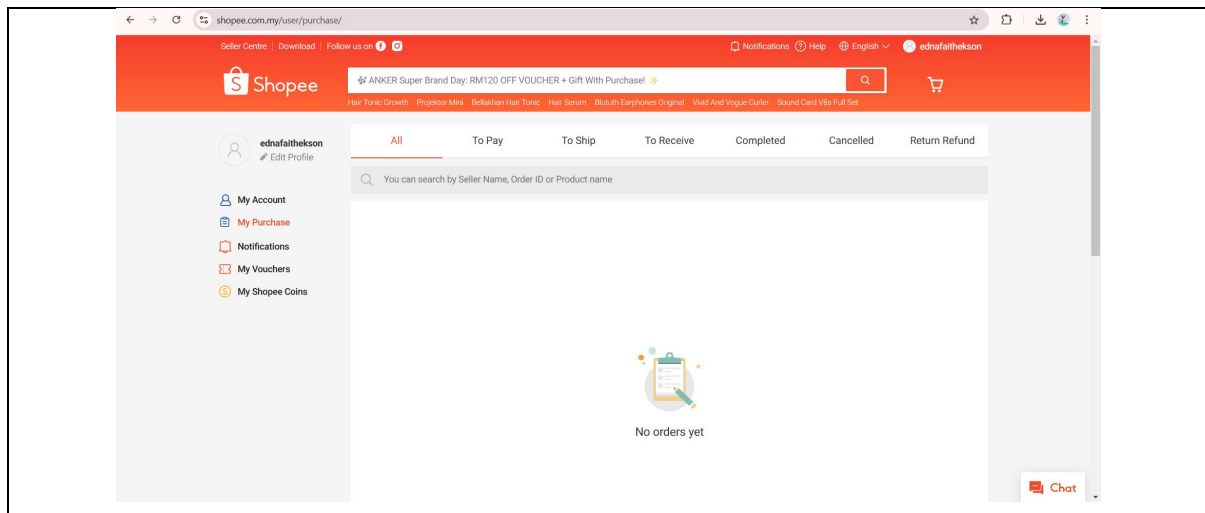


Figure 2.20: Shopee Buyer's Purchase Tracker

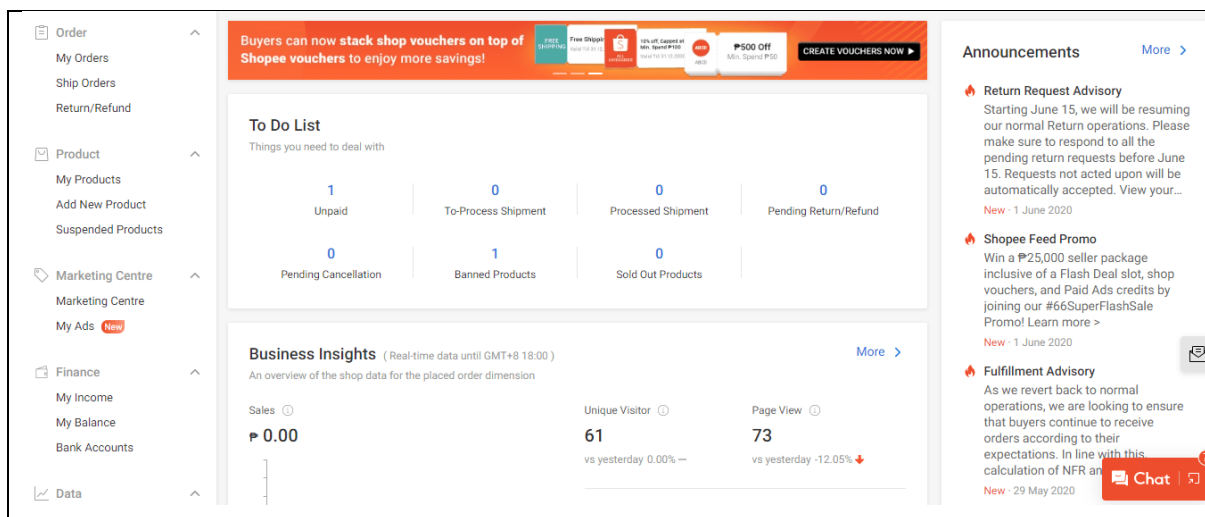


Figure 2.21: Shopee Seller's Sales Tracker

Strengths:

- Broad regional reach, which exposing sellers to millions of active users.
- User friendly interface that ensures a smooth experience for both buyers and sellers.
- Secure payment application, especially with the Shopee Guarantee feature that holds payment securely until the buyer confirms receipt.
- Flexible payment alternatives such as online banking, e-wallet, and Cash on Delivery (COD).
- Strong communication tools with the integrated in-app chat that enables seamless and direct communication between buyers and sellers.
- Promotional campaigns that drive user engagement through features like flash sales, discounts, and vouchers.

Weaknesses:

- Delays in item delivery might happen due to several factors such shipping deadline, stock availability and many more.
- Product quality issue such as damage product, fake item, or incorrect item was received by the customers.
- High competition with the other similar ecommerce platforms such as Lazada and Amazon.
- Regional limitation as its operations is largely confined to Southeast Asia and Taiwan.

2.2.5 Comparative Analysis

Table 2.1: Similar Existing Application and Proposed Application Comparison

Application Features	Similar Existing Application			Proposed Application
	<i>Facebook Marketplace</i>	<i>Carousell</i>	<i>Shopee</i>	UNIMAS E-Marketplace integrated with AI Chatbot
Target Market	Local buyers and sellers	Local and Regional buyers and sellers, primarily in Southeast Asia	Regional buyers and sellers, targeting Southeast Asia	University communities at University Malaysia Sarawak (UNIMAS)
Communication Tools	Integrated with Facebook Messenger for real-time communication	In-app Chat feature	In-app Chat feature	In-app Chat feature
AI Chatbot for 24/7 Assistance	No chatbot or formal support	AI chatbot for certain regions, otherwise	AI-driven Chatbot and 24/7 customer support (Live	Integrated AI-Chatbot for FAQ and continuous user support

		relies on basic in-app chat	Agent and Internet call)	
Payment Method	Rely on third-party solutions (Credit card, Debit card, PayPal, and Cash on Delivery (COD))	In-app payment in certain regions, Cash on Delivery (COD), and third-party payments.	Multiple secure payment options, including ShopeePay, COD, E-wallets, Online Banking, S-Pay Later, Credit/Debit Card,	Secure QR code payments and Cash on Delivery (COD)
Login Credentials	User existing Facebook account	Email or social media login	Email, social media, or mobile Login	University email (UNIMAS-only)
UI/UX Design	User-friendly interface	User-friendly interface	User-friendly interface	User-friendly, student-centric interface
Sales or Purchase History Tracker	No history tracker	No history tracker	Integrated purchase or sales history tracker	Simple sales and purchase history tracker

Based on the comparative analysis table above, comparison between three similar existing application (Facebook Marketplace, Carousell, Shopee) and the proposed application (UNIMAS E-Marketplace integrated with AI Chatbot) has been made. This comparison is based on seven selected features which is the target market, communication tools, 24/7 assistance, payment method, login credential, UI/UX design, and sales or purchase history tracker. All these features are crucial for the development of an E-Marketplace as it help to determine selection for both the design and functionality of an application. Wihardja & Widiyanto (2023) state that the functionality and design of an e-commerce website have a

significant impact on its success and the website's approach might either encourage or deter people from making an online purchase.

In E-Marketplace, a target market is a specified group of people to whom a company wishes to sell its products or services. Choosing an E-Marketplace application's target market is one of the essential variables that might influence the efficiency of a marketing plan (Pradiptarini, 2011). This is because it allows the developer to determine the prospective consumers who will use the program and then devise a plan to satisfy those users' aims and needs. The target market for each application varies based on its aim. According to the comparison in the table above, all three existing applications are target either local markets, where activities take place within the home country, or regional markets, where activities take place outside the home country but within the proximate home regional boundaries (Banalieva & Santoro, 2009). Local markets seek a local, specific clientele, usually inside a neighbourhood, town, or city. Local marketers can learn a lot about their customers and make swift decisions. In contrast, a regional market focuses on a bigger area, such as a state or several neighboring cities, which may necessitate many production units and a sophisticated distribution network. Knowing the audience's demographic is essential for developing efficient marketing tactics that appeal to clients (Chen, 2023). Thus, the proposed UNIMAS E-Marketplace's target market will be local, with a focus on UNIMAS communities alone. This is because the application's goal is to provide a safe environment for peer-to-peer transactions inside the university community. By focusing solely on the UNIMAS communities, the application may provide a secure platform for UNIMAS students and staff to simply sell or acquire things and services that meet their needs, as the selling and buying process takes place only on campus.

Next, the communication tools utilized in the applications or applications. According to Grace et al. (2018), communication is at the heart of e-commerce, and interpersonal communication is one of the aspects that influence an individual's purchasing choice. Effective communication may develop trust and loyalty with customers, improve customer service, and lay a solid platform for corporate growth. For example, by providing an outstanding buying experience to the consumer, purchasers can boost the rate of customer retention, which will have a beneficial impact on their business income. A review of similar applications revealed that two (Carousell and Shopee) of the applications have an in-app chat function, while the other (Facebook Marketplace) does not, but it has integrated a messaging application to facilitate communication between buyers and sellers. This shown that a communication tool is

a key component that any application must have. As a result, the planned UNIMAS E-marketplace will include in-app chat capability, allowing buyers and sellers to successfully communicate within the program without having to leave it. Kiatruangkrai et al. (2010) stated that real-time communication channels are important in an ecommerce application. This will enhance client retention because buyers can simply contact merchants with questions about items or services.

Moreover, the integration of AI-powered chatbots has become increasingly significant in e-commerce applications, offering a competitive advantage by providing 24/7 customer assistance to users. As customer expectations for immediate support have grown over the years, timely and efficient customer service plays a crucial role in enhancing user satisfaction and loyalty (Smith & Clinton, 2015). AI chatbots offer an innovative solution by delivering real-time assistance to customers at any time of the day or night. For instance, customers can use AI chat services to ask inquiries about products and services, as well as get help with technical issues (Prasad et al., 2024). Unlike traditional support systems such as live agents and internet calls, which are cost-intensive and resource-heavy, AI-powered chatbots streamline operations by reducing the workload of human support teams while maintaining consistent service quality (Maruthi et al., 2024). In the comparison made above, it is shown that both Carousell and Shopee provide AI-powered chatbots to assist users. Shopee's AI chatbot offers robust 24/7 support, efficiently addressing user inquiries related to orders, payments, and product information. Similarly, Carousell has implemented an AI chatbot to streamline communication, but its availability is still limited to certain regions, reducing its accessibility for all users. On the other hand, Facebook Marketplace does not feature an AI chatbot, relying instead on external messaging tools like Facebook Messenger, which may not guarantee the same level of responsiveness or automation. Considering the effectiveness and growing significance of AI-powered customer support, the proposed UNIMAS E-Marketplace will include an AI chatbot for 24/7 assistance. This feature will provide the UNIMAS community with real-time and reliable support at all hours of the day. By adopting AI technology, the platform ensures a seamless and user-friendly experience while meeting modern e-commerce standards.

Furthermore, the process of selling and acquiring always includes a payment procedure to complete the transactions, and businesses must choose the appropriate payment methods to fulfil the needs of both them and their consumers (Peterson & Howard, 2012). Payment can take several forms, including cash, credit/debit cards, online transfers, and so on, therefore the formation of an e-commerce payment market is not necessary under unconstrained market

conditions (Lin, 2017). Thus, ecommerce users can choose from a variety of payment options based on their preferences and convenience. For example, based on the comparison above, each of the assessed applications provides distinct payment methods, highlighting its respective strengths and weaknesses. Facebook Marketplace relies heavily on external payment methods such as cash on delivery, bank transfers, and PayPal. This flexibility enables buyers and sellers to agree on a preferred payment method. However, the lack of an integrated payment gateway creates substantial security risks because transactions occur outside of the site, leaving customers open to scams, incomplete payments, and disputes. Carousell, on the other hand, allows external payment methods such as Facebook Marketplace, but it also offers an extra secure option through its Carousell Protection function, which holds money until the purchasers confirm receipt. Unfortunately, this service is only available in some regions, leaving consumers in unsupported countries to rely on external payment methods and face the same security challenges as Facebook Marketplace. Shopee, on the other hand, provides its users with external payment methods while also offering a more complete and safe payment alternative through its integrated payment application, ShopeePay. Furthermore, using the Shopee Guarantee features, it may ensure that payments are only released after buyer confirmation, hence increasing confidence. To solve these deficiencies, the suggested solution will combine QR-code-based payment with COD. QR code-based transactions are regarded to be one of the finest ways to speed up information sharing and flow (Eren, 2022). It is a tool for identity verification, safe online transactions, and bank account management that offers both security and convenience (Bhattacharya & Singla, 2024). Even though QR code payment is not an escrow payment like Carousell Protection or Shopee Guarantees, it is a secure payment method because sellers can only receive payment after buyers scan the QR code provided, usually after receiving the products or services during an in-person meeting. This can assist lower the risk of fraud and ensure the transaction runs smoothly.

Similar to other websites or applications, user registration and login are always required. Login credentials are critical for cybersecurity as they protect users' private information from illegal access and cyber-attacks. The most common authentication approach used on the Internet is a login credential that combines user identity (ID) and password (Katuk et al., 2013), with email and social media logins among the most popular. As indicated in the comparison table above, all three examined applications used email addresses and social network accounts as login credentials. This is owing to its convenient and simple login method, which allows users to sign up and log in in a matter of minutes without having to generate and

remember a new username and password. Thus, the proposed UNIMAS E-Marketplace application would employ email as login credentials to simplify the sign-up and log-in process, and the email address used for the login is limited to UNIMAS's unique email address alone. This ensures that only UNIMAS communities may register and log into the application.

The interface design of an application is undoubtedly one of the factors that influence its first positive impression. This is because purchasing and selling items or services in the e-marketplace is more of an interaction between humans and computers, and one company's ability to sustain customer service and provide value to clients is dependent on offering a well-designed application (Sudiana et al., 2021). A simple and easy-to-use interface can enhance user retention because consumers can quickly access and use the website. A strong navigation application with clear category taxonomy and intuitive menus allows users to rapidly find the products they are looking for. For example, integrating the product filtering option allows consumers to reduce their selection and easily find the product they desire. In the comparison above, all three reviewed applications provided a user-friendly design that made it easy for users to access and utilize their application, from both sellers' and buyers' perspectives, with an easy listing procedure for sellers and a product filtering tool for buyers. As a result, the suggested application will have a user-friendly interface design that is minimalist and easy to use, with the product and services separated separately, as it has been discovered that a well-designed website may provide a pleasant user experience (Saetang, 2017). Furthermore, it will be student-centric, with the product or service given expressly to meet the demands of the students, thereby improving the quality of their campus experience.

Lastly, a sales or purchase history tracker. An ecommerce history tracker is a technology that allows buyers to track their previous purchases while sellers track their sales. This tracker requires its own part in an application that serves both sellers and buyers. After comparing the three assessed applications, it is clear that Facebook Marketplace and Carousell do not give a history tracker, however Shopee does. According to Ngoata et al. (2023), creating a user-friendly tracking application can boost customer happiness, loyalty, referrals, and company performance by delivering convenience, time savings, and cost savings. This makes Shopee a better application because users can retrieve their purchases and total spending, while merchants may profit from the sales tracker by analyzing their sales and conducting performance analysis, which will help them devise a strategy to enhance their sales. Using historical data analysis, merchants can improve sales forecasting accuracy and aid in the formulation of e-commerce sales and marketing strategies (Akshara & Jain, 2024). Thus,

UNIMAS E-Marketplace will have a simple sales and purchase history tracker for both vendors and buyers to assure seamless operation and customer satisfaction. For example, buyers will have a history section where they may record all of their purchase history, including the date, time, item list, and total amount of a single transaction. Meanwhile, sellers will want a dashboard to track their sales in order to analyze performance and improve sales.

2.3 Review of Tools and Related Technologies

- **Flutter**

Flutter is a free and open-source UI software kit developed by Google that allows developers to create cross-platform applications for Android, iOS, the web, Windows, MacOS, and Linux with a single codebase (Flutter - Build Apps for Any Screen, 2024). The proposed UNIMAS E-marketplace application's frontend will be created with Flutter due to its cross-platform capabilities, allowing it to reach a bigger audience of UNIMAS staff and students that utilize a variety of devices. Furthermore, Flutter reduces development time and costs by using a single codebase, allowing the developer to focus on the user experience rather than maintaining many platform-specific codebases. This is crucial because the UNIMAS E-Marketplace application requires a visually appealing and responsive interface to keep users interested. Furthermore, the extensive widget library provided by Flutter can be utilised to create a user-friendly interface that meets market demands. This ensures a consistent user interface across multiple devices.

- **Firebase**

Firebase is a cloud-based Backend-as-a-Service (Baas) platform developed by Google that provides a comprehensive suite of tools for building and managing web and mobile applications (Igboagu, 2025). It includes features such as a real-time database, user authentication, cloud storage, hosting, and serverless functions – all integrated into one platform. For the proposed UNIMAS E-Marketplace application, Firebase will serve as the backend solution due to its ability to handle real-time data updates, secure user access, and automated backend processes. This is essential for managing live product listings, transactions, and communication between users. Furthermore, Firebase Authentication features also ensure that only verified UNIMAS community can access

into the application, maintaining a secure and trustworthy environment. Therefore, these features make Firebase a scalable and efficient backend choice for the proposed UNIMAS E-Marketplace application.

- **Cloudinary**

Cloudinary is a cloud-based image and video management service that enables developers to upload, store, manipulate, and deliver media files efficiently across various platforms (Pokar, 2022). It supports automatic image optimisation, responsive delivery, and powerful transformation tools that help maintain high performance and visual quality across devices. Therefore, the proposed UNIMAS E-Marketplace will be utilised this tool to manage images uploaded by the users. This ensures that the images are delivered in the right format and resolution based on the user's device, improving load times, and overall user experience.

- **Dialogflow**

Dialogflow is Google's natural language understanding platform that allows developers to create conversational agents (chatbots) that can interpret and reply to user input in natural language (Dialogflow, 2024). It integrates with a variety of messaging platforms and may be tailored to offer unique responses based on user requests. As a result, the proposed UNIMAS E-Marketplace will benefit from this platform's ability to construct an AI-powered chatbot to automate customer support that is available around the clock. With Dialogflow, the chatbot will be able to answer frequently asked questions like product availability, payment methods, order tracking, and much more. Dialogflow would then assist the suggested application enhance its overall efficiency by automating responses and ensuring users always have access to real-time support.

- **AI Chatbot**

AI chatbots are applications or user interfaces that use machine learning (ML) and natural language processing (NLP) to have conversations that mimic those of a human (AI Chatbot, 2024). In addition to offering users automated service around-the-clock, this AI chatbot will be incorporated into the proposed application to help users with a variety of tasks, including product searches, order tracking, payment inquiries, and many more. Dialogflow will be used in the development of an AI chatbot because of its machine learning capabilities, which enable it to get better over time. AI chatbot

integration will lower operating costs, improve response times, and guarantee continuous availability—all of which are essential for a flawless purchasing experience with the proposed e-marketplace app.

2.4 Proposed Application

The suggested application, UNIMAS E-Marketplace application combined with AI Chatbot, is an ecommerce application designed expressly to meet the demands of the UNIMAS community. This application tackles the constraints noted in the examined similar programs, which include Facebook Marketplace, Carousell, and Shopee, by integrating their benefits while also offering unique features that will improve the user experience.

Unlike generic e-marketplace that serve a broad local or regional audience, UNIMAS E-Marketplace focusses exclusively on the UNIMAS community. It is ensuring a safe and trusted environment for peer-to-peer transactions by ensuring only verified UNIMAS students and staff are allowed to use the application. This can be done by requesting for UNIMAS email verification during the user's registration process. Through this, the platform will be able to eliminates unauthorized users and creates a more secure space for buying and selling on campus. Furthermore, to ensure a positive user's first impression towards the application, it will have a clean and minimalist user-friendly design that is easy to navigate. To make it more unique, the interface will be student-centric, with listings tailored directly to the needs of the school community. To increase user satisfaction, the app will incorporate a sales and purchase history tracker. This tracker will assist both buyers and sellers, who can be UNIMAS students or staff, in tracking their expenses and profits, accordingly. In addition, the app will include an in-app chat feature, allowing buyers and sellers to communicate directly within the app. This will make it easier to communicate with one another using different applications. In terms of payment methods, UNIMAS E-Marketplace will use QR code payments and cash on delivery (COD), which ensures a more secure and user-friendly platform for money exchange during the purchasing process, where the payment is only made when the items or services is successfully received by the customer. Finally, the proposed application's main highlight is the 24/7 help provided by an AI-powered chatbot. This AI Chatbot will provide customers with real-time assistance day and night, minimizing reliance on manual support applications and ultimately increasing customer satisfaction with the app.

Thus, the proposed UNIMAS E-Marketplace integrated with AI Chatbot will only serve the UNIMAS community with login credentials via the UNIMAS unique address, have a simple and minimalist interface, include a sales and purchase tracker, integrated in-app chat functionality, secure payment via QR and COD, around-the-clock customer support, and be integrated with an AI-Powered Chatbot. This app will not only address the flaws of existing platforms, but will also provide a safe, efficient, and resourceful environment designed particularly for UNIMAS students. This platform will enable students to engage in sustainable resource sharing practices, increase financial opportunities, and build a stronger, more connected campus community.

2.5 Summary

This chapter examines existing applications related to e-marketplace websites or applications with the objective of determining how these platforms meet the demands of University Malaysia Sarawak (UNIMAS) communities. The chapter discusses three existing platforms that provide similar services to the proposed UNIMAS E-Marketplace integrated with AI Chatbot application. A comparison was done between these applications and the proposed solution based on the specified feature, which was used as the comparison benchmark. In addition, this chapter includes a discussion of the tools and technologies used in application development. The chapter conclude by determining and discussing how the proposed application works, as well as stating the features it will have.

Chapter 3: Requirement Analysis & System Design

3.1 Introduction

This chapter will gather user requirements for the system, which will then guide the application design. User requirements for the application will be gathered using a questionnaire, and the subsequent data will be analysed. Based on the findings, the researcher will develop the application design, encompassing the application process flow, database, and user interface. All of these designs will be developed using tools including activity diagrams, use case diagrams, entity relationship diagrams (ERD), and wireframe diagrams. Furthermore, in this chapter, the researcher will ascertain the minimum requirements for operating the program, covering both software and hardware specifications. Consequently, this chapter will ascertain the application's design and the minimal requirements for its operation based on the information gathered and analysed from the questionnaire.

3.2 User Requirement Specification/Requirement Analysis

The user requirements specification must be analysed and established prior to application design to ensure that the developed application meets their needs. This method will guarantee that the newly developed application functions in accordance with user expectations.

3.2.1 Questionnaires and Findings Gathered

For this project, the research instrument that will be utilised in order to collect the users' need for the proposed application, UniMASket: UNIMAS E-Marketplace integrated with AI Chatbot, is through the questionnaire. The questionnaire created consists of 5 parts: Demographic information, buying and selling preferences, features and functionalities, accessibility and platform expectations, and user feedback and suggestions. This questionnaire employed both quantitative (5-point Likert scale and closed-ended questions) and qualitative (open-ended questions) methods in order to collect users' feedback on the necessity of the proposed application. This questionnaire was then distributed and made available to the UNIMAS Community for one week, and the respondent are expected to answer all the questions in the questionnaire. The data collected next will be further evaluated, and the findings will be documented in this sub chapter. Thus, in this sub chapter, the gathered findings will be discussed and used to identify the users' requirements, challenges faced, as well as the hardware and software requirements for the proposed application.

3.2.1.1. Website

In this subchapter, the findings for the website requirements will be discussed. The website requirements are determined based on the questionnaire Section C: Features and Functionalities, and Section D: Accessibility and Platform Expectations. The data is collected from a total of 51 respondents that came from different demographics information.

Features and Functionalities

For the application features and functionality, the questionnaire has utilised 5-scale Likert method (where 1=not important and 5=Very Important), focusing on six main areas: user authentication through UNIMAS email, in-app chat, AI powered chatbot for quick assistance, QR code payment and Cash on Delivery payment method, sales and purchase history tracking, and simple and intuitive user interface. One open-ended question is also included to solicit user's suggestions for additional functions that will help improve their experience with the future developed application.

Table 3.1: Percentage Score for the proposed application features and functionality

Features and Functionality	Percentage score of the 5-scale Likert (1=Not Important, 5=Very Important) (%)				
	1	2	3	4	5
User Authentication through UNIMAS email	6.0	20.0	12.0	20.0	42.0
In-app chat for seamless communication	0	2.0	4.0	26.0	68.0
AI-powered chatbot for quick assistance	2.0	6.0	8.0	30.0	54.0
QR code payment and Cash on Delivery payment method	0	0	0	16.0	84.0
Sales and purchase history tracking	0	0	2.0	18.0	80.0
Simple and intuitive user interface	0	0	2.0	18.0	80.0

Table 3 1

Based on the data gathered, it is revealed that 62% of respondents regarded the “User Authentication through UNIMAS Email” function as important (ratings of 4 and 5), with 42% recognizing it as “Very Important”. However, 26% of the respondents evaluated this feature as “Not Important” (rating of 1 or 2). Thus, from this result, it can be stated that while a majority realize the benefit of secure authentication, where the application only permits UNIMAS community to access, there is also a large minority may not fully understand its necessity for securing the platform.

Next, the “In-App Chat for seamless communication”. This feature has gotten amazing positive feedback, with 94% of the respondent rating it as “Very Important” and “Important”. This result shows the requirement of real-time communication tools to support a seamless interaction between buyers and sellers, making it one of an essential component of the proposed application.

Moreover, the “AI-powered chatbot for quick assistance” was also highly valued, with 84% of the respondents identifying it as “Important” or “Very Important”. A majority (54%) rated it as “Very Important”, emphasizing the demand for innovative AI features to boost user experience. This aligns well with UniMASket’s objective of using AI to provide efficient and quick customer assistance.

The “QR code payment and Cash on Delivery (COD) payment methods” were also favourably accepted by the respondents. An amazing 84% of respondents ranked this feature as “Very Important”, while the remaining 16% assessed it as “Important”. Besides, they stated that there is not a single respondent has rated this feature below “3”, highlighting the importance of having secure and convenient payment methods to meet varied consumer needs.

Similarly, “Sales and Purchase history tracking” feature received a great support, with 98% of the respondents rating it as “Important” or “Very Important”. Of these, 80% of the respondents considered it “Very Important”. This suggests that people place a high priority on transparency and the opportunity to monitor their transactions. Alongside this, the demand for a straightforward and intuitive user interface was similarly strong, with identical support level (98% “Important” or “Very Important”). This highlights the necessity of ensuring that the platform is easy to access and visually appealing.

Table 3.2: Open-ended question responses for the features and functionality

Open-ended Question	: What other functionalities would enhance your experience with a campus-focused marketplace?
Answers (Based on themes)	i. Enhanced Search - Category filters for items like textbooks and electronics. ii. Feedback and Ratings - Customer reviews and a rating system for sellers and products. iii. Safety Features - Report button for fraudulent activities. iv. Community Features - Live selling and a campus jobs board.

The open-ended responses reveal that users value features that enhance usability, safety, and community engagement. The most frequently mentioned suggestion includes category filters, customer reviews, and a report button. Additionally, innovative features like live selling and a campus jobs board highlight the desire for a more interactive and multifunctional platform.

Accessibility and Platform Expectations

The survey for application accessibility and expectations consisted of two closed-ended questions and one 5-point Likert scale ranging from never (1) to always (5). This section's findings will serve to highlight user behaviour, device usage trends, and potential connectivity difficulties that should be addressed throughout development.

Table 3.3: Data collected for Accessibility and Platform Expectations

Question 1: How would you prefer to access the application?	
Mobile Application	90%
Web Browser	10%
Question 2: What devices do you use most often for online transaction?	

Smartphone	94%
Laptop/PC	2%
Tablet	4%

Question 3: How often do you experience connectivity issues on campus that could affect app usage? (5-scale Likert measurement)

1 (Never)	12%
2 (Rarely)	20%
3 (Sometimes)	20%
4 (Often)	22%
5 (Always)	26%

Question 1 reveals that the vast majority of respondents (90%) prefer to use UniMASket using a mobile application, with only 10% choosing a web browser. The strong need for mobile access highlights the importance of developing a mobile-first solution. This is because users prefer to interact with the platform using their smartphones. Therefore, it is critical to have a seamless and user-friendly mobile application.

Question 2 reveals that an even larger proportion of respondents (94%) reported using smartphones as their preferred device for online shopping, with laptops/PCs (2%) and tablets (4%) being used infrequently. This underscores the importance of smartphones in users' transactional behaviors, as well as the need to adapt the platform for mobile devices. To improve usability, the app should use responsive design and mobile-specific features like camera integration for QR code payment.

Question 3, which queried users about connectivity issues on campus, revealed that a substantial percentage (48%) of respondents commonly experience connectivity issues, with scores of 22% for "Often" and 26% for "Always". This indicates that nearly half of the users would have difficulty accessing the app owing to unpredictable internet connectivity around campus. To address this, UniMASket should have a lightweight app design and be optimized for low-bandwidth settings in order to maintain usability in unexpected network conditions.

3.2.1.2 Product

The following section will analyse the questionnaire findings regarding product needs to discover the rationale for users' demand for the proposed application. The product analysis is based on data obtained from the responses of 51 participants to the questionnaire for Section A: Demographic Information, Section B: Purchasing and Selling Preferences, and Section E: User Feedback and Suggestions.

Demographic Information

This section employed four closed-ended questions to gather respondents' demographic information, including gender, college residential status, specific residence, frequency of participation in buying and selling activities within the UNIMAS community, and motivations for utilizing a campus-based marketplace. This analysis investigates user traits, purchasing or selling behaviours, and motives to enhance the design and functionality of the proposed application.

Table 3.4: Demographic Information

Question 1: What is your gender?	
Male	26%
Female	74%
Question 2: Are you a college residential?	
Yes	50%
No	50%
Question 3: Which college are you in?	
Allamanda	8%
Cempaka	2%
Tun Ahmad Zaidi	2%
Rafflesia	20%
Kenanga	2%
Seroja	2%
Sakura	10%
Dahlia	2%
Non-Residential	50%

Question 4: How frequently do you engage in buying/selling activities within the UNIMAS community?

Daily	10%
Weekly	24%
Monthly	6%
Rarely	34%
Never	26%

Question 5: What motivates you to buy or sell items in a campus-based marketplace?

Convenience of location	62%
Trust within the community	44%
Affordability of items	66%
Ease of communication with buyers/sellers	44%
Availability of unique or second-hand items	42%

The demographic data indicates that 74% of respondents identified as female, while 26% identified as male. The gender distribution suggests that female consumers could be a significant demographic for the marketplace, which potentially impacting marketing methods and the choice of product categories to cater to their interests. Next, an even split was noted in residential status, with 50% of respondents residing in college accommodation and 50% being non-residential. This balance indicates the marketplace should cater equally to both groups. Features like flexible delivery or meeting locations could help non-residential users, while on-campus pickup alternatives could be advantageous for college residents. Furthermore, among the residential respondents, Rafflesia (20%) and Sakura (10%) had the most representation, followed by Allamanda (8%). Other colleges including Cempaka, Kenanga, Seroja, Dahlia, and Tun Ahmad Zaidi each accounted for 2% only. These findings suggest that promotional efforts should target Rafflesia and Sakura residents more actively.

Moreover, when the respondents were asked about their engagement in purchasing or selling activities within the UNIMAS community, 10% respondents reported daily activity, 24% weekly, and 6% monthly. However, a notable 34% reported they rarely participate, and 26% revealed they never engage in such activities. This shows that while there is a continuous base of active users, a considerable chunk of the community may require greater incentives or awareness efforts to join. Finally, as for the motivations for using a campus-based marketplace, it is observed that affordability of items (66%) was the most popular driver, followed closely

by convenience of location (62%). These results underline the need of maintaining a cost-effective platform and exploiting geolocation features to support campus-specific transactions. Trust within the community and ease of contact with buyers and sellers (both at 44%) further underline the requirement of secure communication tools and verified user profiles to foster confidence and streamline interactions. Additionally, 42% of respondents indicated interest in obtaining used or second-hand items, showing a demand for niche and sustainable solutions that might be marketed through specialised categories or featured listings.

Buying and Selling Preferences

Four closed-ended questions were used to collect the respondents' buying and selling preferences, highlighting current platform usage, popular product categories, communication preferences, and challenges encountered. These findings will help refine the design and features of UniMASket, ensuring the proposed application addresses user needs effectively.

Table 3.5: Buying and Selling Preferences

Question 1: Which platforms do you currently use for buying/selling items?	
Facebook Marketplace	32%
Carousell	22%
Shopee	88%
WhatsApp Chat	60%
Telegram Chat	32%
Others	10%
Question 2: What type of items are you most interested in buying/selling?	
Books and Stationery	46%
Clothing and Accesories	66%
Health and Beauty Products (e.g., skincare, fitness gear)	60%
Food and Beverages	62%
Rental Vehicles (e.g., bicycles, motorcycles, car rentals)	26%
Services (e.g., printing, fetching)	28%
Question 3: How do you typically communicate with buyers or sellers?	
Messaging apps (e.g., WhatsApp, Telegram, Messenger)	100%

Email	2%
In person	20%
Others	4%

Question 4: What challenges do you face when using current buying/selling platforms?

Difficulty finding reliable buyers/sellers	70%
Lack of a secure payment method	36%
Poor communication tools	38%

Respondents reported using a variety of sites for their buying and selling activities. Shopee became the most popular platform, with 88% of respondents using it, followed by WhatsApp Chat (60%), Facebook Marketplace (32%), and Telegram Chat (32%). Carousell was used by 22%, with 10% relying on other sites such as TikTok shop. This underscores Shopee's popularity for online purchases due to its established e-commerce features and the widespread use of messaging apps such as WhatsApp and Telegram for direct communication. UniMASket should strive to combine the tremendous features of e-commerce platforms with the ease of communication provided by messaging applications to create a consistent user experience.

Furthermore, clothing and accessories were the most popular things traded, with 66% of respondents expressing interest. Food and beverages were followed by health and beauty items (62% and 60%, respectively). Books and stationery were chosen by 46% of respondents, with services (28%) and rental vehicles (26%) showing moderate demand. These preferences indicate that UniMASket should prioritize creating well-structured categories for often traded items such as clothes, food, and beauty products, while also accepting specific categories such as services and rentals in order to reach a larger audience.

Additionally, 100% of respondents said they rely on messaging apps like WhatsApp, Telegram, and Messenger to communicate with buyers and sellers. Only 20% prefer in-person interactions, and only 2% use email. This emphasizes the importance of integrating dependable and user-friendly in-app chat functionality into UniMASket.

Finally, the questionnaire identified certain difficulties connected to existing platforms. 70% of respondents indicated difficulty locating reliable buyers and sellers as their most pressing worry. This highlights the importance of UniMASket incorporating trust-building elements like user ratings and reviews to instil a sense of security in its users. In addition, insufficient communication tools (38%) and a lack of secure payment mechanisms (36%) were

significant issues. To solve them, UniMASket should include safe payment options, such as QR code payments, and make sure the in-app chat is robust and user-friendly.

User Feedback and Suggestion

This section utilising both closed and opened-ended questions in order to collect the user feedback and suggestion for the proposed application. Through this section, respondents' valuable insights on their primary concerns, likelihood of recommendations, willingness to participate in testing, and additional suggestion will be gathered and further analysed.

Table 3.6: User Feedback and Suggestion

Question 1: What are your primary concerns about using a campus-based marketplace?	
Security and privacy	20%
Transaction reliability	16%
Ease of use	14%
Quality of items being sold	38%
Difficulty communicating with buyers or sellers	10%
Question 2: How likely are you to recommend this platform to others?	
1 (Extremely Unlikely)	2%
2 (Unlikely)	0%
3 (Neutral)	10%
4 (Likely)	40%
5 (Very Likely)	48%
Question 3: Would you participate in user testing or provide feedback during the development process?	
Yes	38%
No	14%
Maybe	48%
Question 4: Any additional suggestions or comments? (Open-Ended Question)	
- Provide tools where user can see location to detect seller, delivery, and buyer.	

- *Sustainability Initiatives & Green Campus Program which encourage sustainable student behaviour by rewarding users for trading, recycling, or choosing eco-friendly products. By doing so, the students will receive rewards such as discounts or recognition.*
 - *User Reviews and Ratings: Allow users to rate and review sellers and buyers to build trust within the community.*
-

Respondents raised several major concerns about adopting a campus-based marketplace. The most crucial factor was the quality of the item being sold, which was pointed out by 38% of respondents, demonstrating the need for thorough quality assurance techniques. This might include detailed product descriptions and high-quality images to maintain transparency. Security and privacy were concerns for 20% of users, indicating a need for services such as secure login to protect personal information. Transaction reliability (16%) and ease of use (14%) were also identified as major concerns, emphasizing the importance of intuitive user interface design and dependable payment processes. Finally, 10% of respondents had difficulty engaging with buyers or sellers, emphasizing the need for a seamless in-app chat option.

The survey also focuses on analysing the respondents' ability to promote the application to others. The majority of respondents were positive about the platform, with 48% "Very Likely" and 40% "Likely" to recommend UniMASket to other people. Only 2% were "Extremely Unlikely," with 10% remaining neutral. This strong endorsement demonstrates high user interest and the potential for word-of-mouth promotion. Aside from that, user involvement in the development process appears promising, with 38% of respondents willing to participate in user testing or provide feedback, and another 48% indicating they might do so. This indicates an excellent chance to engage customers early on, gain valuable insights, and build a user-centric platform through regular testing and feedback sessions.

Furthermore, the open-ended responses included constructive suggestions for further features. The user emphasized the importance of geolocation technologies in determining the locations of both sellers and buyers and tracking delivery. Some also argued for implementing sustainable measures, such as awards for trading, recycling, or purchasing eco-friendly products, which align with UNIMAS's green campus goals. To encourage environmentally conscious behaviour, rewards could include discounts or recognition. Aside from that, another

proposal was to implement a user rating and review system to foster trust and accountability within the community.

3.3 System Requirement Specification

In this sub chapter, the researcher will define the detailed requirements for the proposed application, which will serve as the blueprint for the development process. This sub chapter will be divided into two parts which is functional requirements and non-functional requirements. The first part (Functional Requirements) will provide a clear understanding of what the proposed system should do, meanwhile, for the second part (non-functional requirements), the behavioural properties of the system management will be discussed.

Based on the questionnaire results, the suggested application, UniMASket, must provide a reliable and secure online buying platform that only serves the UNIMAS community, especially students. This application should employ UNIMAS email authentication to safeguard user data and prevent unauthorized access. Since this application is exclusively available to the UNIMAS community, it will next serve to meet the users' requirement for a convenient medium for the buying and selling process. This is because the transaction will only take place on campus, making the purchasing and selling process more convenient because neither buyers nor sellers would have to travel far to obtain or deliver products or services.

Next, this application ought to include in-app communication options to ensure that the buyer and seller can communicate seamlessly. Furthermore, as needed, the application will provide users with round-the-clock assistance via an AI-powered chatbot. This chatbot will respond quickly to customer inquiries, such as frequently asked questions (FAQs), improving the user experience and reducing delays. Furthermore, users desire a secure payment method. To achieve this criterion, the system will have two payment methods: QR code payment and cash-on-delivery. These two payment methods ensure that payment is only made or received after the purchasers receive and are satisfied with the product during their in-person meet. The user also emphasized the significance of having access to a sales and purchase history tracking capability. As a result, this application will offer a dashboard or page for both sellers and purchasers to track and review their previous transactions. Finally, the program must be easy to navigate and utilize. For example, while item listings are categorised to help buyers quickly find items of interest, the application will also give an easy-to-use interface for sellers to create

new product or service listings. This is to meet the user's requirements for a simple and straightforward user interface.

3.3.1 Functional Requirement

3.3.1.1 User Authentication

The application will implement a secure authentication system where the users is required to register and log in using only with their UNIMAS email address. This is to ensures that only those who are from UNIMAS community can access into the application, maintaining it exclusively and safety.

3.3.1.2 User Management

The application will include a user management system to maintain and organize user profiles. Each user will have a profile which displays all their essentials details, including their transaction history, reviews, and ratings. This feature will also enable users to update their accounts information and change their passwords.

3.3.1.3 Real-Time Communications

The application will also feature an in-app chat system to facilitates seamless communication between buyers and sellers. This tool will enable users to ask questions, negotiates prices, discuss on the meet-up location, and finalize transactions efficiently. Notifications will alert users of new messages or updates, ensuring they never miss important interactions.

3.3.1.4 AI Chatbot Integration

The application will integrate an AI-powered chatbot to provide round-the-clock assistance. The chatbot will handle frequently asked questions, and guide the users in navigating the app. This feature aims to enhance user satisfaction by delivering quick and reliable assistance without the need for human intervention.

3.3.1.5 Payment Method

The application will support QR code-based payments for secure and instant transactions, and also Cash on Delivery (COD) option for users who prefer in-person payment. This feature will be adding flexibility and convenience to the platform.

3.3.1.6 Transaction History

The application will maintain a detailed record of each user's sales and purchases. This feature allows the users to view their transaction history, including item details, dates, and amounts. This next will benefit the users as it helps them to track their activities and manage their finances effectively.

3.3.1.7 User Interface (UI)

The proposed application will have a simple and intuitive interface designed for ease of use. A mobile-first approach will ensure the app performs seamlessly on smartphones, with responsive designs catering to various screen sizes. This user-friendly user interface will make the users able to navigate the application easily.

3.3.1.8 Search and Filters

The search functionality will enable the users to quickly find items that they need. With the addition of category filters such as textbooks, clothing, and services, this will make it is easier for the users to locate and explore more related specific products. This feature will ensure a more personalised and efficient browsing experience.

3.3.1.9 Notification

The notification features will also be integrated into the application. This application will send notification in order to keep users informed on the new messages, new listings, and order updates. These timely alerts will ensure that the users stayed updated on the latest activities without the need for checking the app continuously.

3.3.2 Non-Functional Requirements

In this sub-chapter, the non-functional requirements of the proposed system are outlined to determine the operational and quality attributes of the system. This is to ensure that the proposed application can operates effectively and efficiently. Therefore, in this section, the researcher is going to explain how the system should perform focusing on two aspects: Integration and User-Friendliness.

3.3.2.1 Integration

Integration is crucial for the success of UniMASket application as it ensures that all components are able to work cohesively in order to provide a seamless user experience.

i. User Authentication Integration

The application must ensure that the user authentication is secure and reliable by focusing on validating UNIMAS community members. The registration and login processes will use email domain verification to confirm that users have a valid UNIMAS email address (ending with @unimas.my). Through this, the application will be able to add its security level by restricting access to authorised users.

ii. AI Chatbot Integration

This AI Chatbot functions as a virtual assistant embedded within the platform. The chatbot needs to closely integrate with the main application to handle user queries by providing instant answers to frequently asked questions, and guide users to specific features such as product listings, transaction history, or payment options.

iii. In-App Communication Integration

The in-app communication feature must be designed to provide a seamless and efficient interaction between buyers and sellers. It should provide a reliable messaging system that ensures messages are delivered in real-time without delays.

iv. Transaction History Integration

The transaction history feature must be accurate and comprehensive, and able to allow the users to easily track their sales and purchases. This integration ensures that the dashboards or history page provide detailed records, including product names, transaction dates, payment methods, and order statuses. The application also needs to present the data in an organized and easily navigable format, so that the users can quickly retrieve their past transaction information.

3.3.2.2 User Friendly

An application that is user friendly will ensure that all users, regardless of their technical expertise, can efficiently use the platform.

i. Intuitive Interface

The application design should prioritize simplicity through clear navigation and uniform layouts. For example, the menus and options should be organized logically. This allows users to easily locate features such as product categories, chat, and history

transactions. Moreover, by having a consistent interface design, it will help to shorten the learning curve as users can predict where to find a specific action.

ii. Ease of Use

Both buyers and sellers should be able to use and navigate the application effortlessly. For instance, the product categories need to be well structured and easy for the buyers to find. Not only that, the process of adding items to the cart and completing the checkout process should also be simplified by only requiring a few steps to complete. This will help in reducing the hassle during the checkout process. Moreover, as for the seller's part, the application needs to provide a simple and straightforward process for creating a new products or service listings, including prompts for key details like images, descriptions, and pricing.

iii. Accessibility to Features

The AI chatbot should be clearly visible and easy to find and next offering users immediate assistance without the need to leave from the current page. Furthermore, the buttons and forms must also be well-labelled with clear instructions to prevent confusion.

3.4 Software Requirement Specification

Table 3.7: Software requirements specification

Software	Description
Flutter	Framework for cross-platform app development.
Firebase	Backend platform for managing data, user authentication, and hosting app content, and running backend logic.
Cloudinary	Service for handling images and media.
Dialogflow	For creating and managing the AI chatbot.

3.5 Hardware Requirement Specification

Table 3.8: Hardware requirements specification

Hardware	Specification	Description
Processor	Quad-Core 1.8 GHz or higher	Ensures the mobile devices can efficiently run the application without lagging.
RAM	2 GB or higher	Provides sufficient memory for the app to run smoothly, even with multitasking.
Storage	50MB of free internal storage (app installation) + additional space for cached data (100MB)	Allow installation of the app and sufficient space for temporary data storage.
Operating System	Android 9 (pie) or later	Ensures compatibility with modern smartphones for Android platforms.
Display	Minimum resolution: 1280 x 720 pixels	Ensures a clear and user-friendly interface for interacting with the application.
Graphics (GPU)	Integrated GPU supporting OpenGL ES 3.0 or higher	Ensures smooth rendering of visuals, especially for interactive elements, for example, the chatbot.
Network	4G LTE or Wi-Fi	Provides reliable connectivity for real-time transactions, notifications, and chatbot assistance.
Camera	Minimum 8 MP	Enables users to upload clear images of items for sale.

3.6 System Design

Based on the system requirements specification (functional and non-functional), software requirements specification, and hardware specifications, this sub-chapter will come up with the system design using a use case diagram to visually illustrate user interactions with the system.

3.6.1 Use Case Diagrams

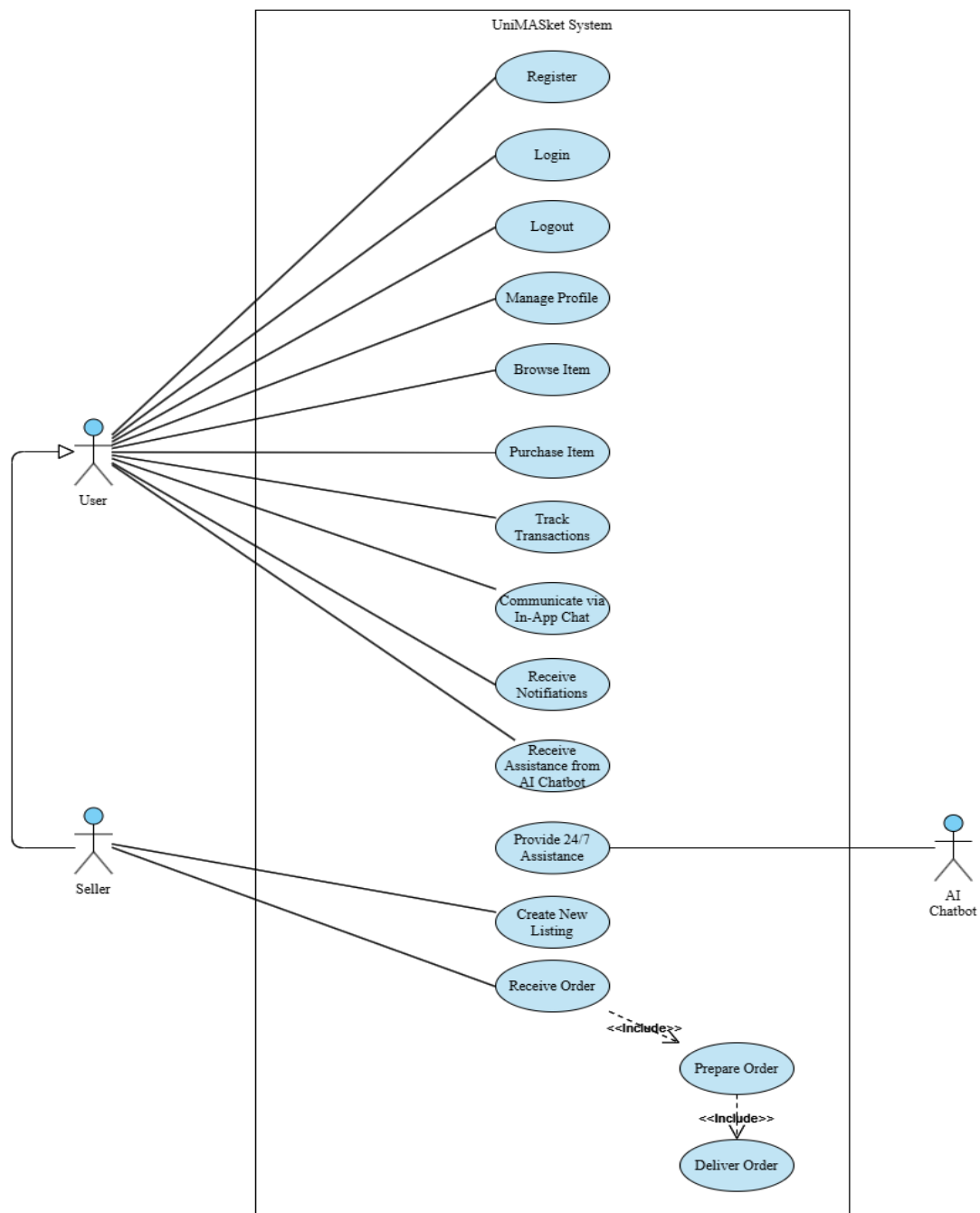


Figure 3.1: Use Case Diagram

Table 3.9: Use Case for Register

Use Case Name	Register
Actor	User
Summary Description	User register account by using their UNIMAS email and providing necessary information.
Pre-Condition	User is not registered.
Post-Condition	User become a registered user.
Basic Path	1. Open the application 2. User clicks “Sign Up” option 3. User input their UNIMAS email and other personal information. 4. Click on “Sign Up” button. 5. System validates the email address and other information. 6. System creates a new user account.
Alternative Path	3a. Entered non UNIMAS email 3b. Incomplete information

Table 3.10: Use Case for Login

Use Case Name	Login
Actor	User
Summary Description	User log into the application.
Pre-Condition	User has a registered account.
Post-Condition	User gains access to account specific functionalities.
Basic Path	1. Open the application. 2. User clicks “Login” option. 3. Enter valid credentials (emails and password) 4. Click on “Log In” button. 5. The system verifies the credentials and grants access.
Alternative Path	3a. Invalid credentials

Table 3.11: Use Case for Logout

Use Case Name	Logout
Actor	User
Summary Description	User logs out from the application.
Pre-Condition	User is logged into their account.
Post-Condition	User's session terminated.
Basic Path	1. User clicks the "Logout" button. 2. System ends the session. 3. System redirects the user to the login page.
Alternative Path	-

Table 3.12: Use Case for Manage Profile

Use Case Name	Manage Profile
Actor	User
Summary Description	User updates their profile information.
Pre-Condition	User is logged into their account.
Post-Condition	Profile details are updated.
Basic Path	1. User navigates to the "Profile" section. 2. User updates their profile information. 3. User clicks "Update" button. 4. System validates the input. 5. System saves the changes and displays a confirmation message.
Alternative Path	2a. Invalid input such as incorrect phone number format.

Table 3.13: Use Case for Browse Item

Use Case Name	Browse Item
Actor	User
Summary Description	User browses items available on the application.
Pre-Condition	User must be logged in.
Post-Condition	User views a list of items.

Basic Path	1. Open the application. 2. System displays a list of available items. 3. Users selects an item to view details.
Alternative Path	-

Table 3.14: Use Case for Purchase Item

Use Case Name	Purchase Item
Actor	User
Summary Description	User selects and purchases an item.
Pre-Condition	User must be logged in.
Post-Condition	Purchase transaction is recorded.
Basic Path	1. User selects an item to purchase. 2. User adds the item to the cart. 3. User proceeds to checkout. 4. User selects payment method. 5. User confirms their order. 6. System notify the seller.
Alternative Path	4a. No delivery location is entered.

Table 3.15: Use Case for Track Transaction

Use Case Name	Track Transactions
Actor	User
Summary Description	User tracks their transaction history (purchase or sales history).
Pre-Condition	User must be logged in.
Post-Condition	User views transaction records.
Basic Path	1. User navigates to the “Transaction History” section. 2. System displays a list of past transactions. 3. User selects a transaction to view details.
Alternative Path	2a. Past transaction does not exist.

Table 3.16: Use Case for Communicate via In-App Chat

Use Case Name	Communicate via In-App Chat
Actor	User
Summary Description	Users communicate with seller.
Pre-Condition	User must be logged in.
Post-Condition	Message are sent and received.
Basic Path	1. User selects “Chat” option. 2. User chooses a seller. 3. User types and sends a message. 4. Recipient responds, and the system updates the chat interface.
Alternative Path	4a. Recipient is offline and currently not available.

Table 3.17: Use Case for Receive Notification

Use Case Name	Receive Notification
Actor	User
Summary Description	System sends alerts regarding transactions or updates.
Pre-Condition	User must be logged in.
Post-Condition	Notifications are displayed.
Basic Path	1. System triggers a notification. 2. User receives the notification in the app.
Alternative Path	-

Table 3.18: Use Case for Receive Assistance from AI Chatbot

Use Case Name	Receive Assistance from AI Chatbot
Actor	User
Summary Description	AI Chatbot provides assistance for queries or issues.
Pre-Condition	Chatbot feature is enabled.
Post-Condition	User queries are resolved.
Basic Path	1. User opens the chatbot. 2. User types a query.

	3. Chatbot provides a solution.
Alternative Path	3a. Unresolved issue

Table 3.19: Use Case for provide 24/7 Assistance

Use Case Name	Provide 24/7 Assistance
Actor	AI Chatbot
Summary Description	AI chatbot offers support for user issues.
Pre-Condition	AI feature must be active.
Post-Condition	Issues are addressed promptly.
Basic Path	1. User activates the chatbot feature. 2. User types a query or selects a topic. 3. Chatbot analyses the query and provides relevant responses or solutions. 4. If the issue is resolved, the chatbot closes the session.
Alternative Path	3a. Chatbot cannot resolves the query

Table 3.20: Use Case for Create New Listing

Use Case Name	Create New Listing
Actor	Seller
Summary Description	Sellers create and list new items for sale.
Pre-Condition	Seller must have a registered account.
Post-Condition	New item is listed on the application.
Basic Path	1. Seller navigates to the “Sell” section. 2. Seller inputs the item details (e.g., item name, price, category, condition, quantity, description, images). 3. System validates the input details. 4. System saves the listing and displays a success message.
Alternative Path	2a. Invalid input

Table 3.21: Use Case for Receive Order

Use Case Name	Receive Order
Actor	Seller
Summary Description	Sellers receive notifications about orders.
Pre-Condition	An item must have been purchased.
Post-Condition	Sales details is recorded.
Basic Path	1. System notifies the seller about the order. 2. Seller navigates to the “Orders” section. 3. Seller views the order details (e.g., item, quantity, payment method).
Alternative Path	-

Table 3.22: Use Case for Prepare Order

Use Case Name	Prepare Order
Actor	Seller
Summary Description	Sellers prepare items for delivery.
Pre-Condition	An order must exist.
Post-Condition	Items are ready for delivery.
Basic Path	1. Seller views the order details in the “Orders” section. 2. Seller prepare the items. 3. Seller marks the item as “Ready for delivery”. 4. System updates the order status.
Alternative Path	2a. Insufficient stock 3a. User choose “Self-Pick-up” option.

Table 3.23: Use Case for Deliver Order

Use Case Name	Deliver Order
Actor	Seller
Summary Description	Seller delivers the items to buyers.
Pre-Condition	Order is prepared.
Post-Condition	Item is delivered.

Basic Path	1. Seller directly delivers the items. 2. Buyer receives the items, and the system marks the order as “Completed”.
Alternative Path	1a. Delivery fails.

3.6.2 Sequence Diagram

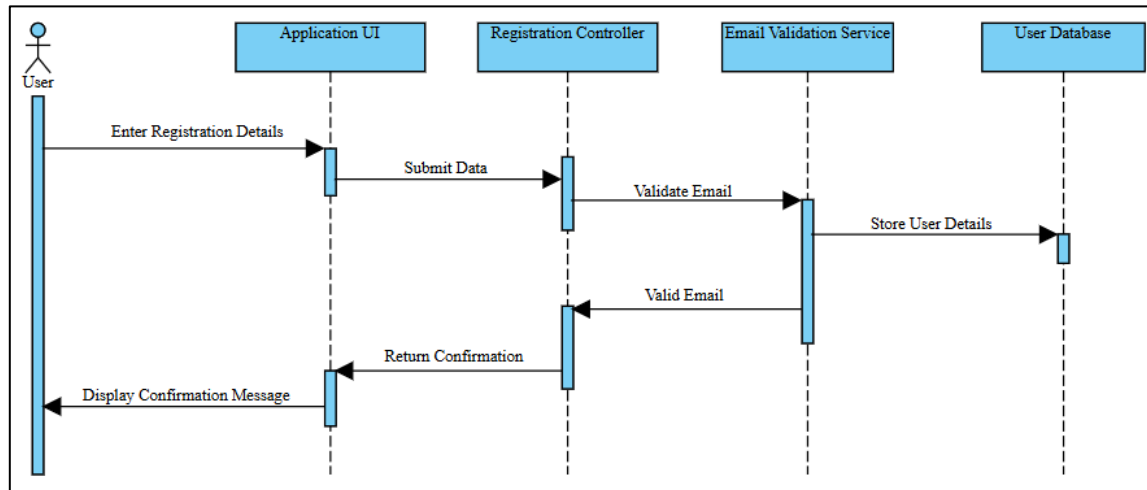


Figure 3.2: Register Sequence Diagram

The sequence diagram above illustrates the user registration process. The user begins by entering their registration details through the application UI, which then submits the data to the Registration Controller. The Registration Controller next validates the provided email by interacting with the Email Validation Service. Upon receiving a confirmation of a valid email, the user's details are stored in the User Database. Finally, a confirmation message is sent back to the Application UI, which is displayed to the user, completing the registration process. This ensures that only users with verified email addresses are successfully registered.

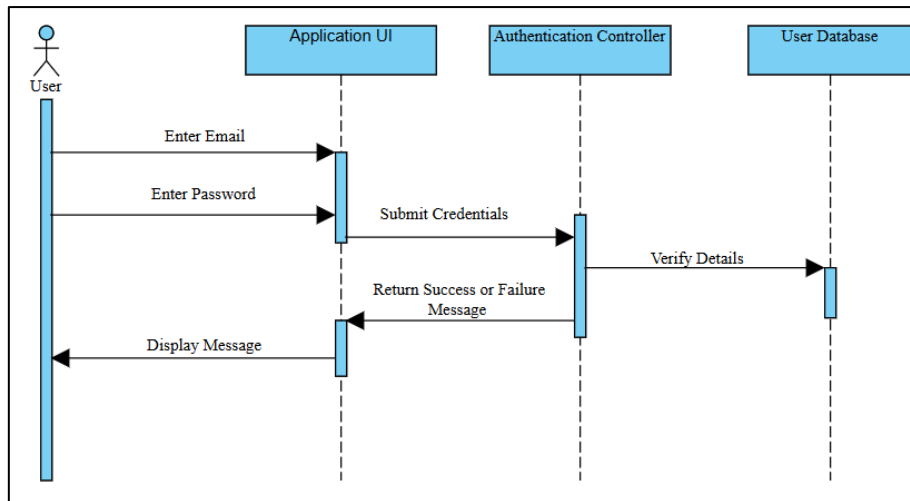


Figure 3.3: Login Sequence Diagram

This sequence diagram depicts the user authentication process during their login. The process begins when the user enters their email and password into the Application UI. These credentials are next submitted to the Authenticator Controller, which verifies the details by interacting with the User Database. If the credentials match an existing user record, the Authenticator Controller returns a success message to the Application UI; otherwise, it returns a failure message. The Application UI then displays the appropriate message to the user, completing the authentication process. This flow ensures that only users with valid credentials can access the system.

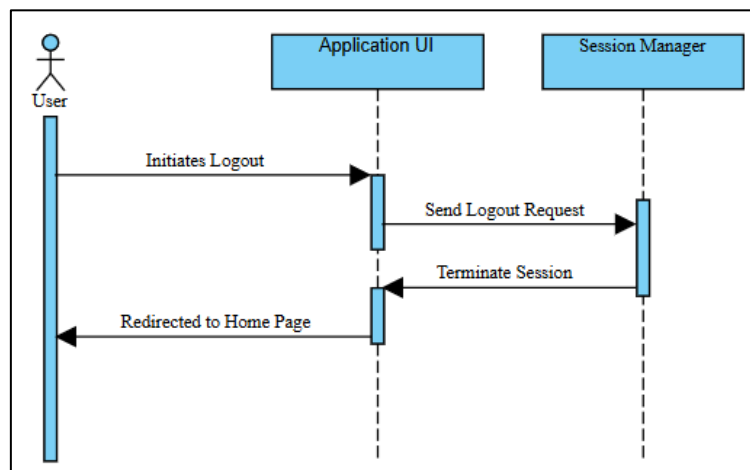


Figure 3.4: Logout Sequence Diagram

The sequence diagram shows the user logout process. The process starts when the user initiates a logout action through the Application UI. The Application UI next sends a logout request to the Session Manager, which handles session management. The Session Manager processes the

request by terminating the user's session. After successfully ending the session, a confirmation is sent back to the Application UI, which redirects the user to the home page. This process ensures that the user session is properly closed, maintaining system security and preventing unauthorised access.

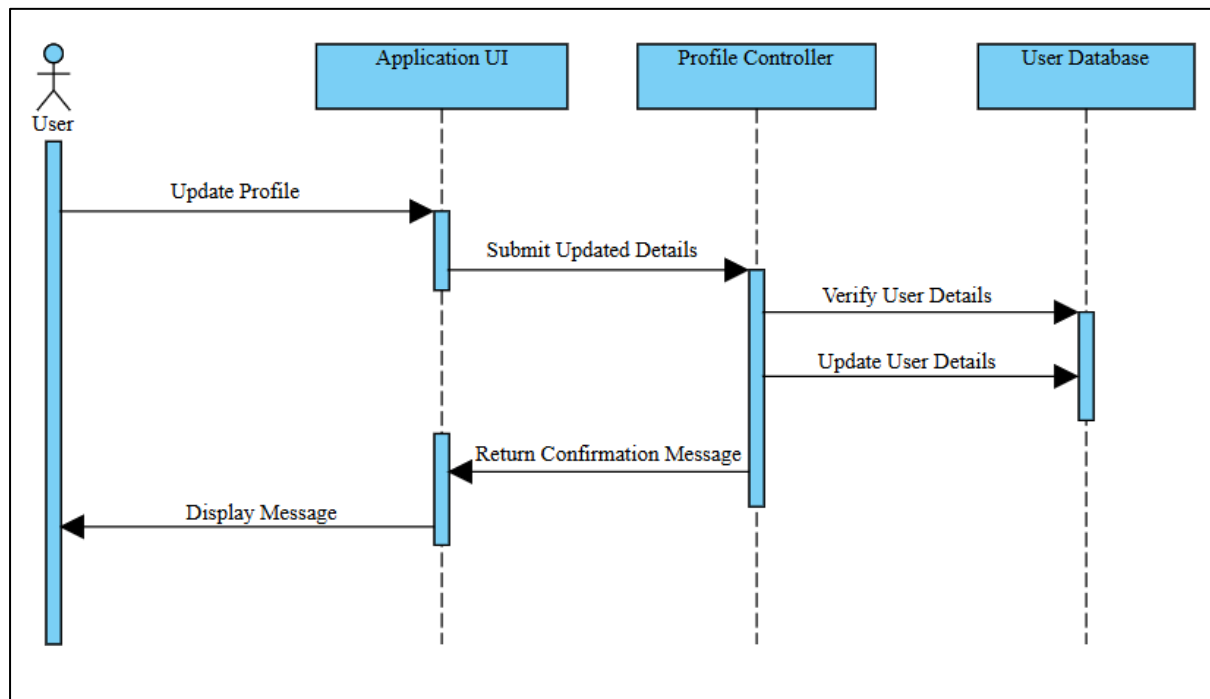


Figure 3.5: Manage Profile Sequence Diagram

Figure 3.5 illustrates the sequence diagram for the process of updating a user's profile. The user initiated the process by submitting updated profile information through the Application UI, which forwards the details to the Profile Controller. The Profile Controller verifies the information with the User Database, and if valid, updates the database with the new details. A confirmation message is then sent back to the Application UI, which displays it to the user, indicating a successful update. This process ensures data accuracy and provides feedback to the user.

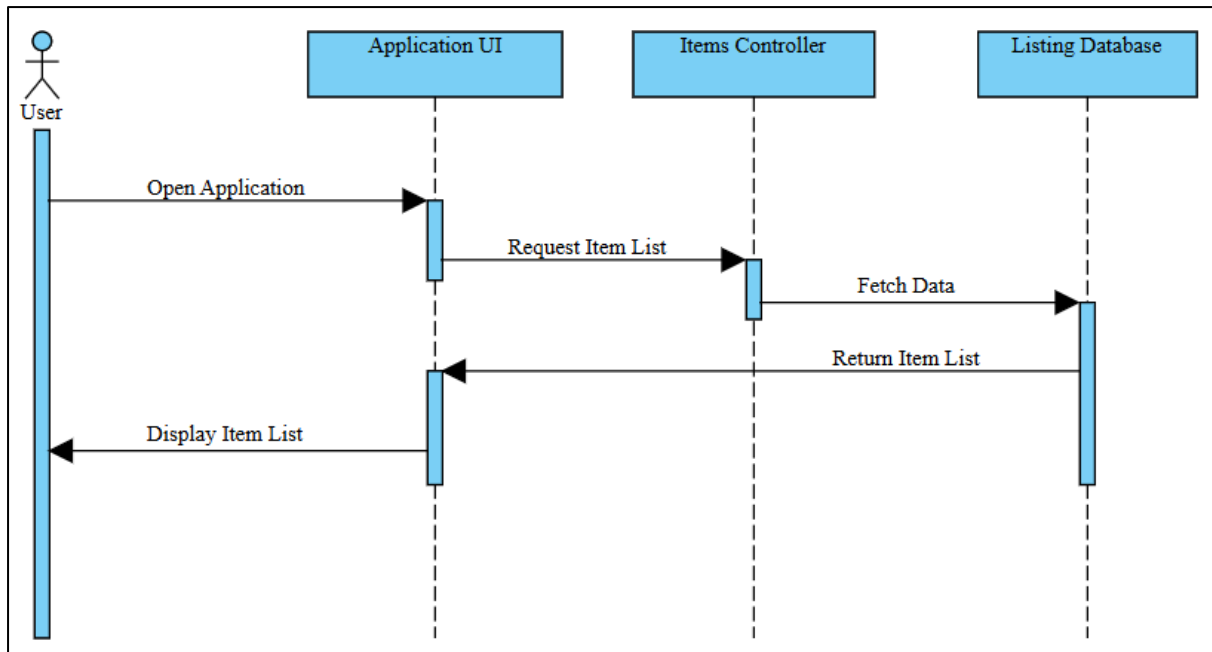


Figure 3.6: Browse Items Sequence Diagram

The above sequence diagram depicts the process of retrieving and displaying items list. The user opens the application, which sends a request to the Items Controller for the item list. The Items Controller fetches the required data from the Listing Database and returns the items list. Lastly, the Application UI displays the retrieved item list to the user. This process ensures seamless data retrieval and display.

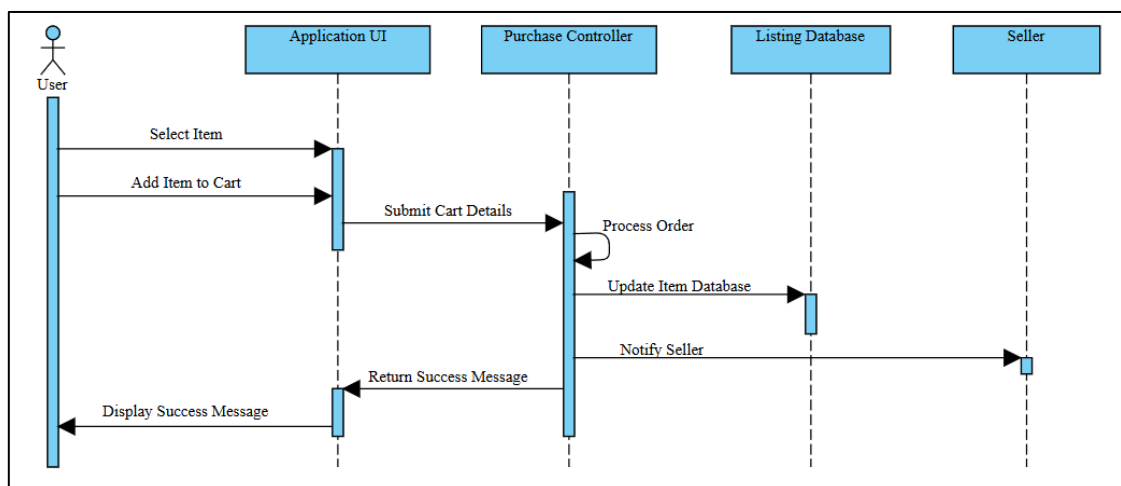


Figure 3.7: Purchase Item Sequence Diagram

Figure 3.7 illustrates the process of adding an item to the cart and completing a purchase. The user selects an item and adds it to the cart through the Application UI. The cart details are then

submitted to the Purchase Controller, which processes the order by updating the item database in the Listing Database. Once the database is updated, the seller is notified about the order. Finally, a success message is returned to the Application UI and displayed to the user, confirming the successful completion of the purchase.

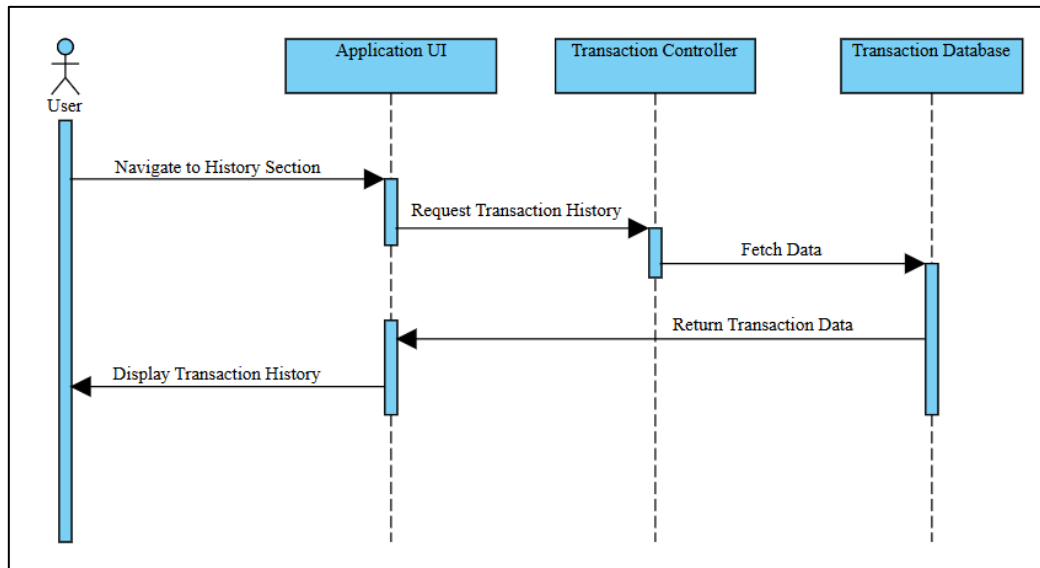


Figure 3.8: Track Transactions Sequence Diagram

Figure 3.8 depicts the sequence diagram for a user accessing their transaction history. The user starts by navigating to the "History" section through the Application UI. The Application UI then submits a request to the Transaction Controller to retrieve the transaction history. The Transaction Controller handles this request by retrieving the necessary information from the Transaction Database. Once the data is retrieved, it is returned to the Transaction Controller, which then sends it to the Application UI. Finally, the Application UI displays the user's transaction history.

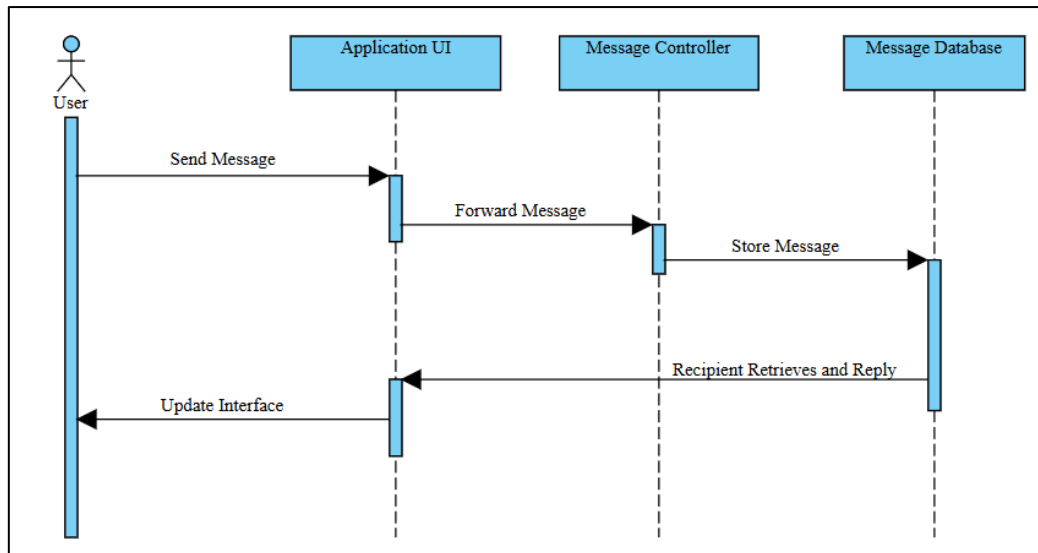


Figure 3.9: Communicate via In-App Chat Sequence Diagram

This sequence diagram illustrates the process of sending and managing messages via the In-App Chat feature. The user initiates the process by sending a message through the Application UI. The Application UI forwards the message to the Message Controller, which is responsible for handling the message flow. The Message Controller stores the message in the Message Database. Once stored, the recipient retrieves the message and sends a reply. The reply is processed similarly, and the Application UI updates the interface to reflect the message's status, ensuring the user sees the latest message interactions.

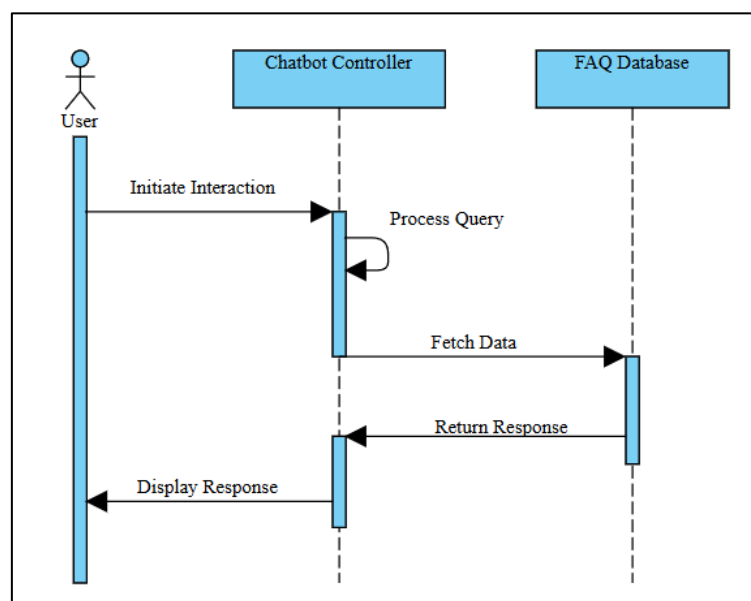


Figure 3.10: Receive Assistance from AI Chatbot Sequence Diagram

This sequence diagram illustrates the interaction process between a user, a chatbot controller, and an FAQ database. Initially, the user initiates an interaction with the chatbot. The chatbot controller processes the user's query and checks if the information required is available in the FAQ database. The controller then fetches the relevant data from the database and processes it to generate a response. Finally, the chatbot displays the appropriate response to the user, completing the interaction cycle.

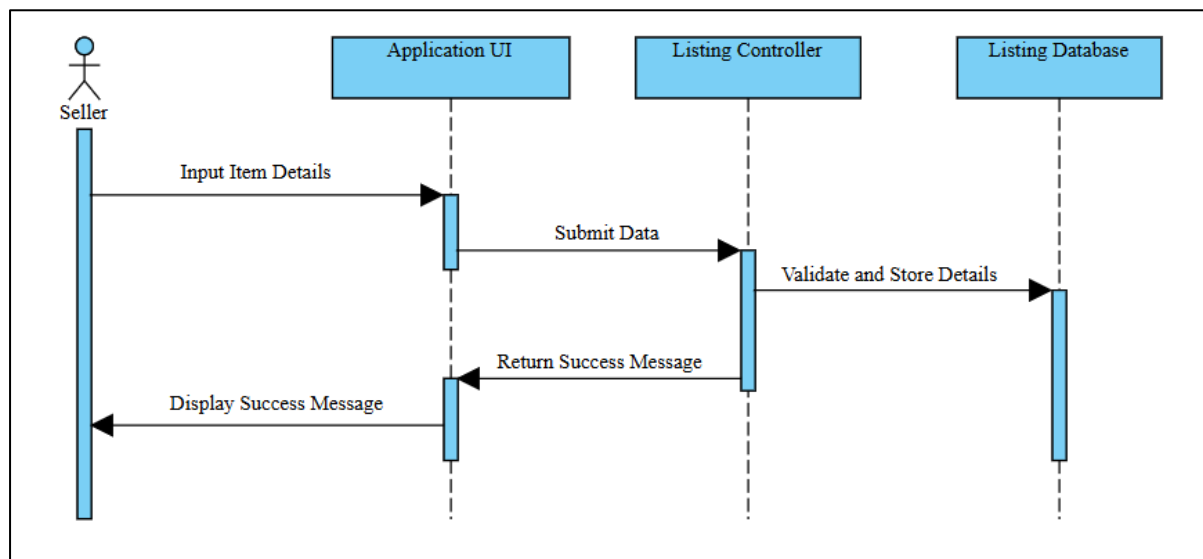


Figure 3.11: Create New Listing Sequence Diagram

This sequence diagram represents the process of a seller listing an item in an application. The seller begins by inputting item details through the Application UI. The Application UI forwards the submitted data to the Listing Controller, which validates the information and stores it in the Listing Database. Once the data is successfully stored, the Listing Controller sends a success message back to the Application UI, which then displays a success message to the seller, indicating the completion of the process.

3.6.3 Activity Diagram

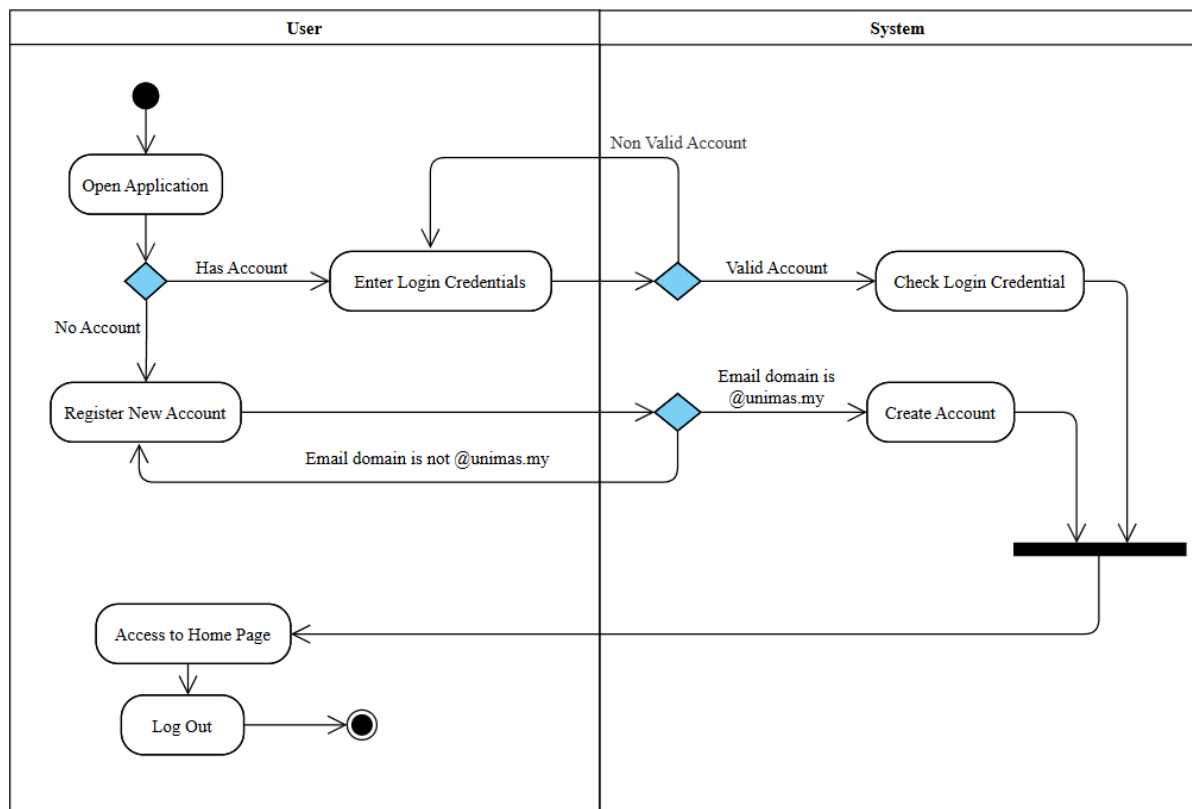


Figure 3.12: Login and Register Account Activity Diagram

Figure 3.12 shows the user's login and register new account process flow. In this process, the user is needed to either log into their existing account or register a new account. If the user chooses to login, they need to provide their login credentials which next will be validate by the system to ensure the input details are accurate. Meanwhile, if the user decides to register a new account, the system will request the user to provide their details, such as username, email address and password. This details next will be verify by the system to make sure that the email domain is @unimas.my before proceeding with the account creation. Both sub-processes will be ended when the user is able to access to the home page.

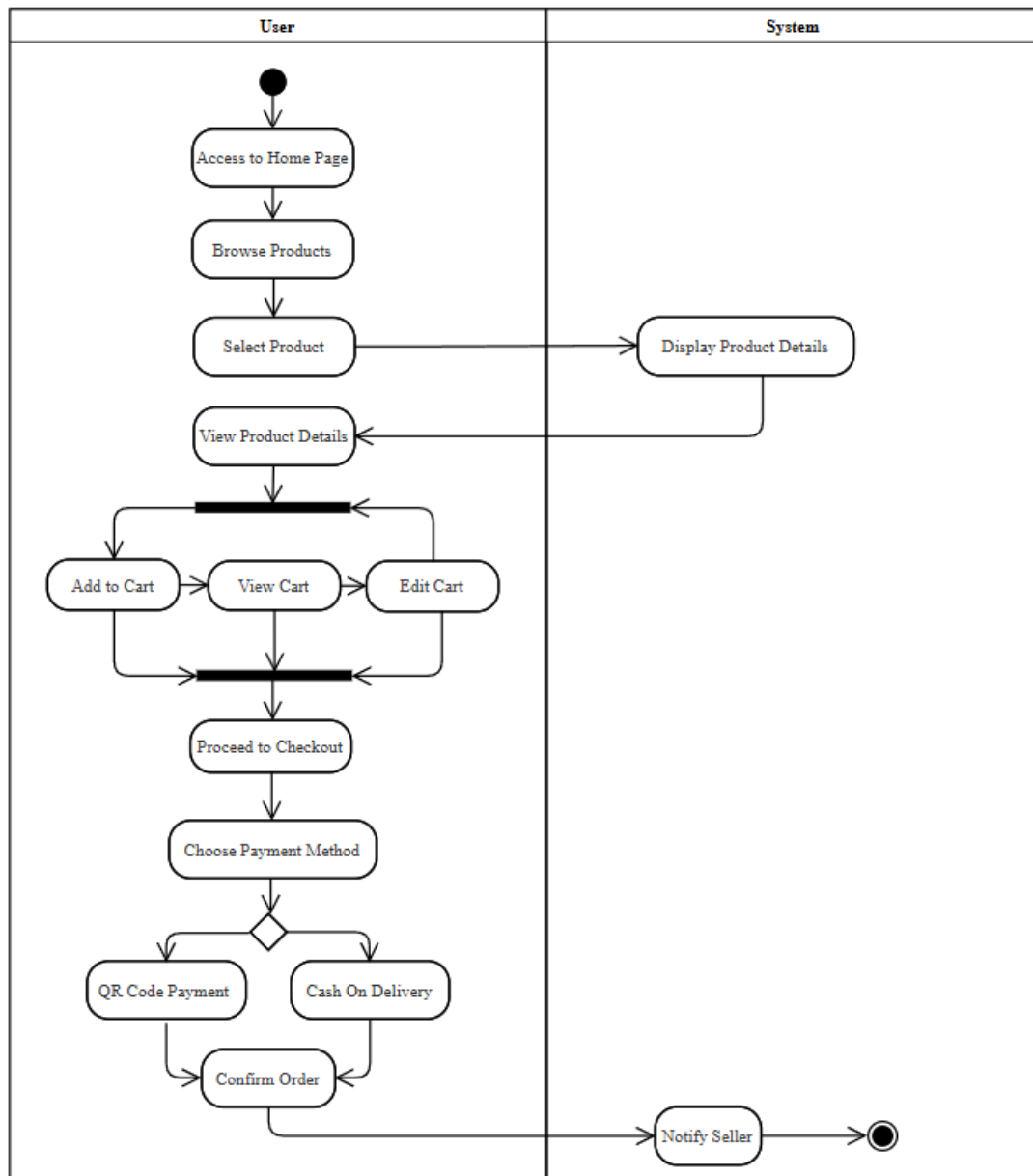


Figure 3.13: Purchase Products Activity Diagram

Figure 3.13 depicted the process of the user purchasing a product. The process began with the user accessing the home page. From here, the consumer can browse the products and select those that interest them. The system, on the other hand, will display all of the product details to the user for them to review and make decisions. Users will be able to add, view, and edit items in their cart before proceeding to the checkout. During the checkout procedure, the user must select the applicable payment method and finally confirm their order. This process will end when the system notifies the sellers of the incoming order.

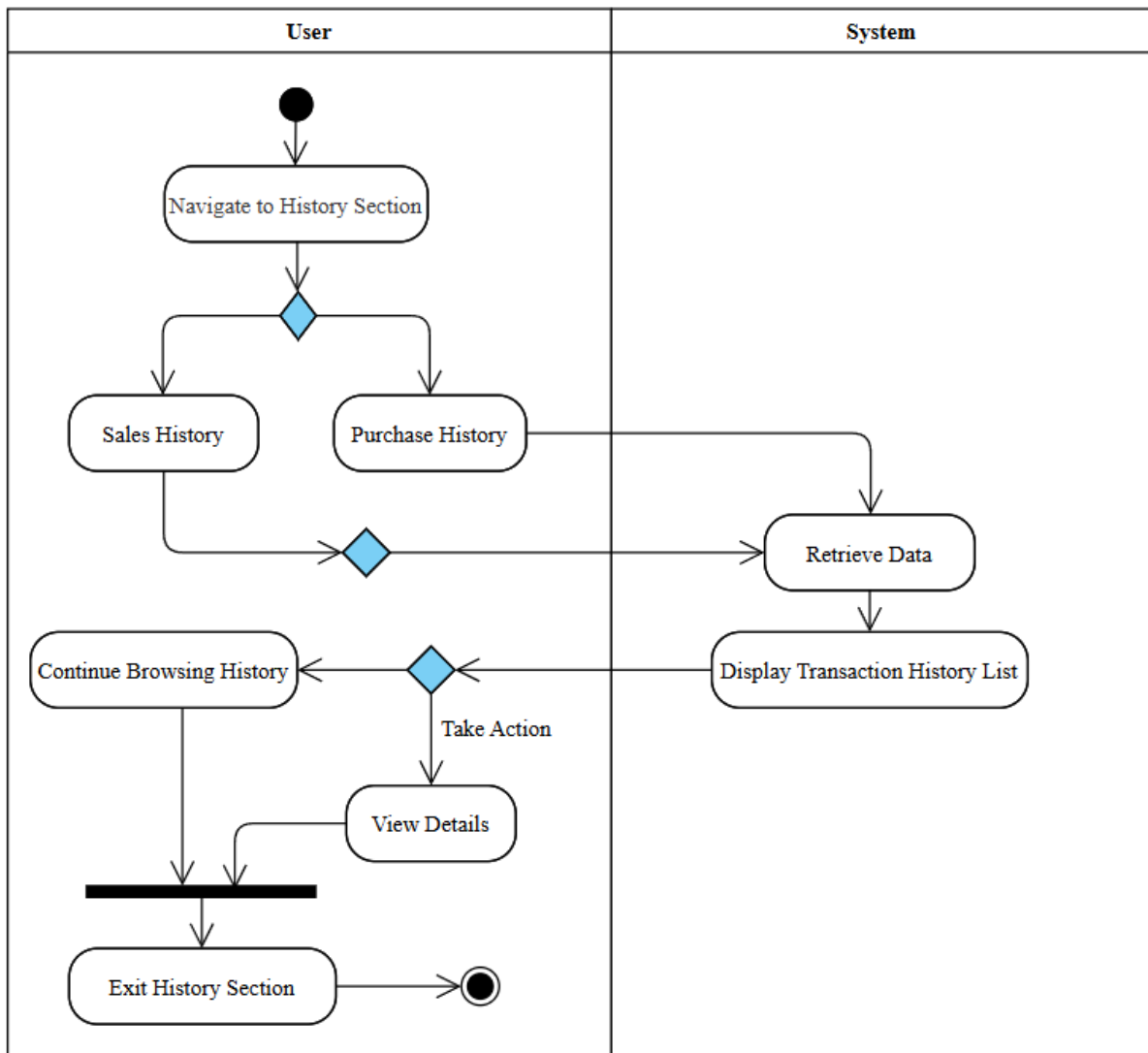


Figure 3.14: View Sales and Purchase History Activity Diagram

Figure 3.14 portrays the process of reviewing sales and purchase history. The process will begin when the user navigates to the History section. Next, the user must choose whether to view sales or purchase history. The flow continues, with the system retrieving all relevant data and displaying the transaction history list accordingly. The user will have to determine whether or not to proceed with further action, such as reviewing the transaction details. This process terminates when the user exits the history section.

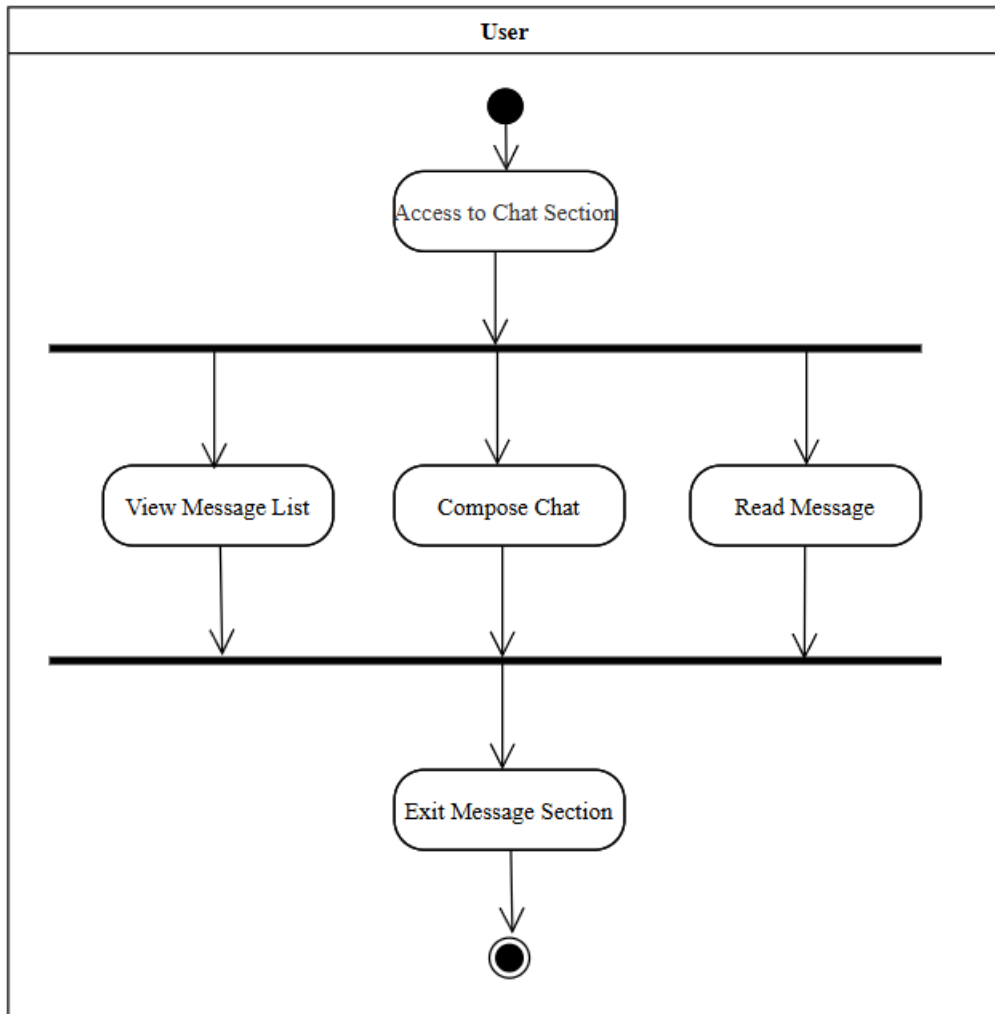


Figure 3.15: In-App Message Activity Diagram

Figure 3.15 illustrates the process flow for the in-app messaging application. The process began when the user accessed the chat section. This chat feature will then allow the user to view, compose, and read messages. This flow terminates when the user exits the message section.

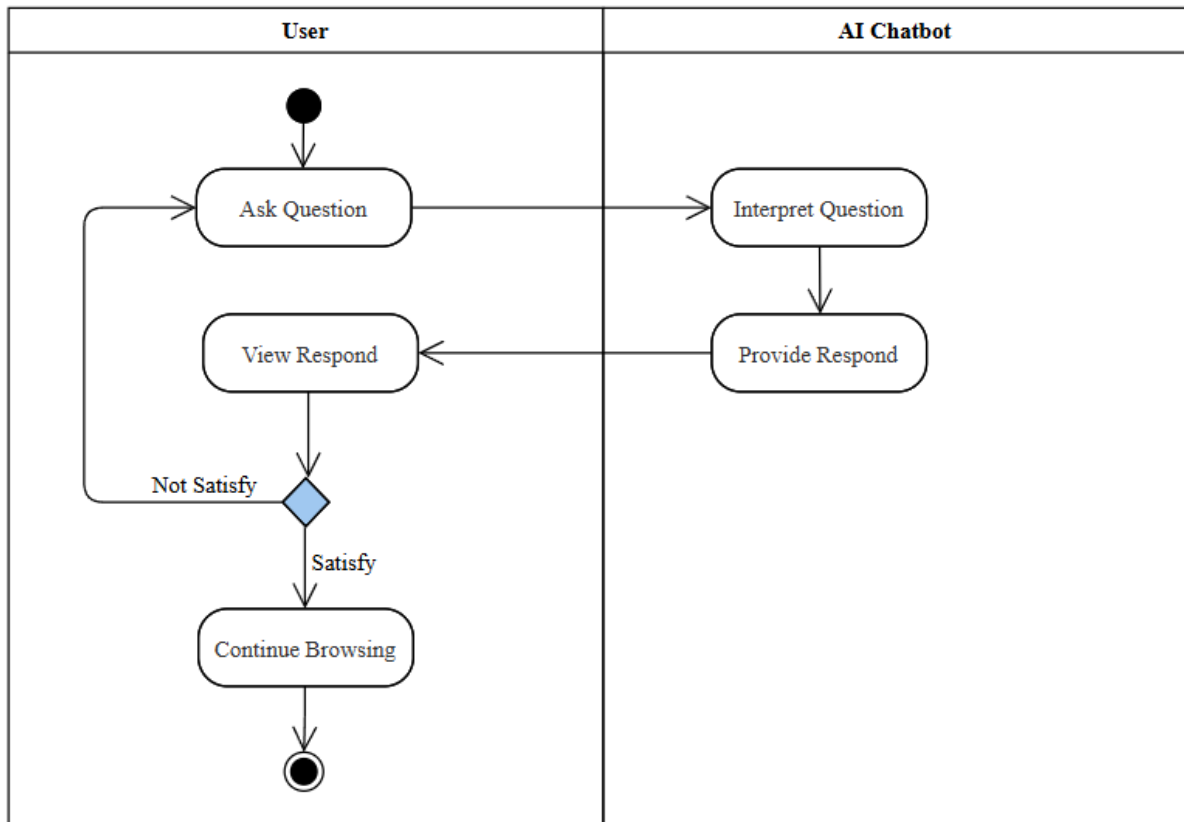


Figure 3.16: Real Time Assistance through AI Chatbot Activity Diagram

Figure 3.16 illustrates the process of providing real-time support using the AI Chatbot. The process begins with the user asking inquiries to the AI chatbot. The chatbot will next interpret the question and deliver appropriate responses for users to read and decide whether the solution provided answers their inquiries. Users are free to continue asking questions until they are satisfied with the answer provided by the chatbot. This process ends when the user is satisfied with the answer and continues browsing.

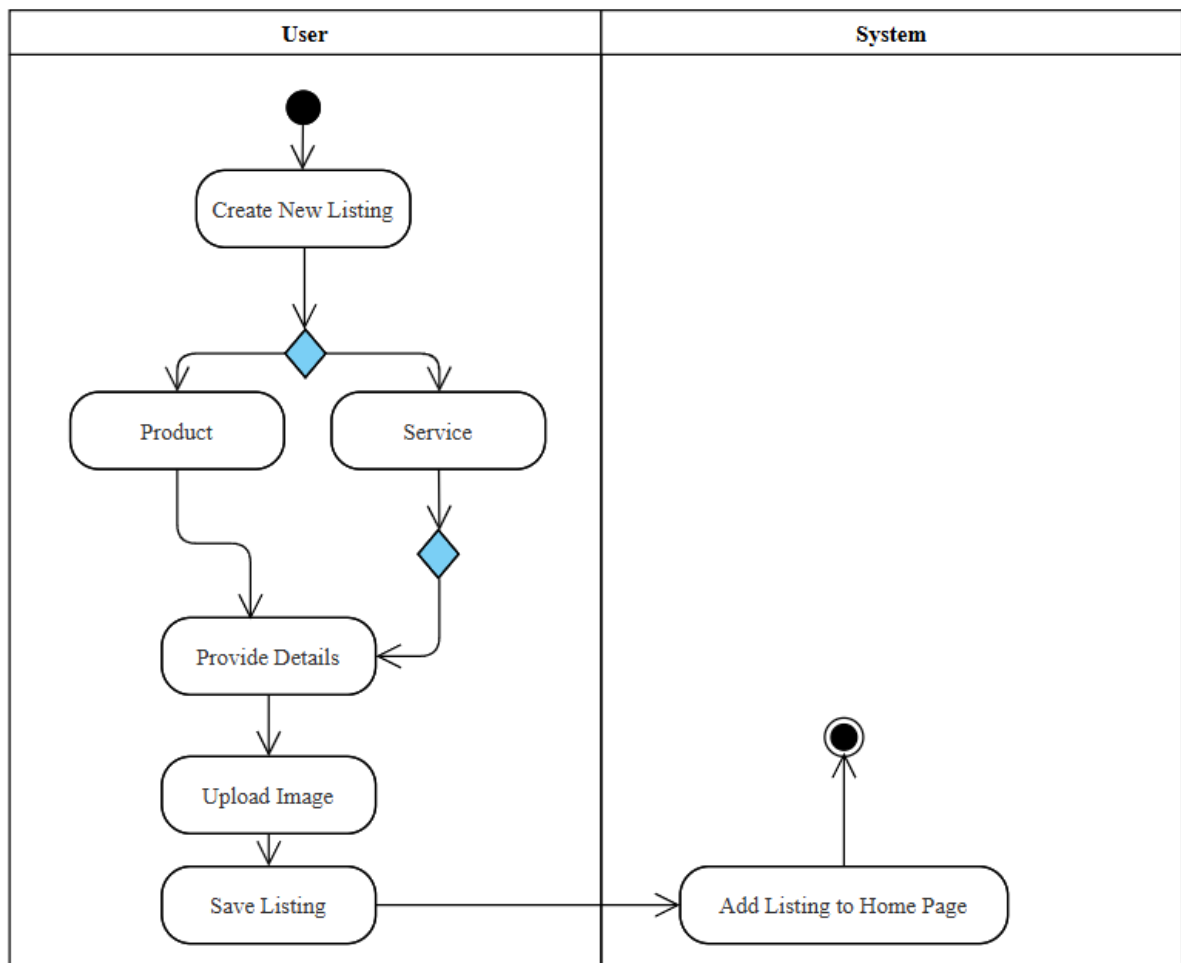


Figure 3.17: Create New Listing Activity Diagram

Figure 3.17 represents the flow on how to create a new products or services listings. The flow begins when the user clicks on the Create New Listing section. Next, the user must decide which categories to include (product or service). After making their choices, the user must enter the product or service details and upload images before clicking the save button. The process ends when the system successfully adds the listing on the home page.

3.6.4 Database Design

3.6.4.1 Entity Relationship Diagram

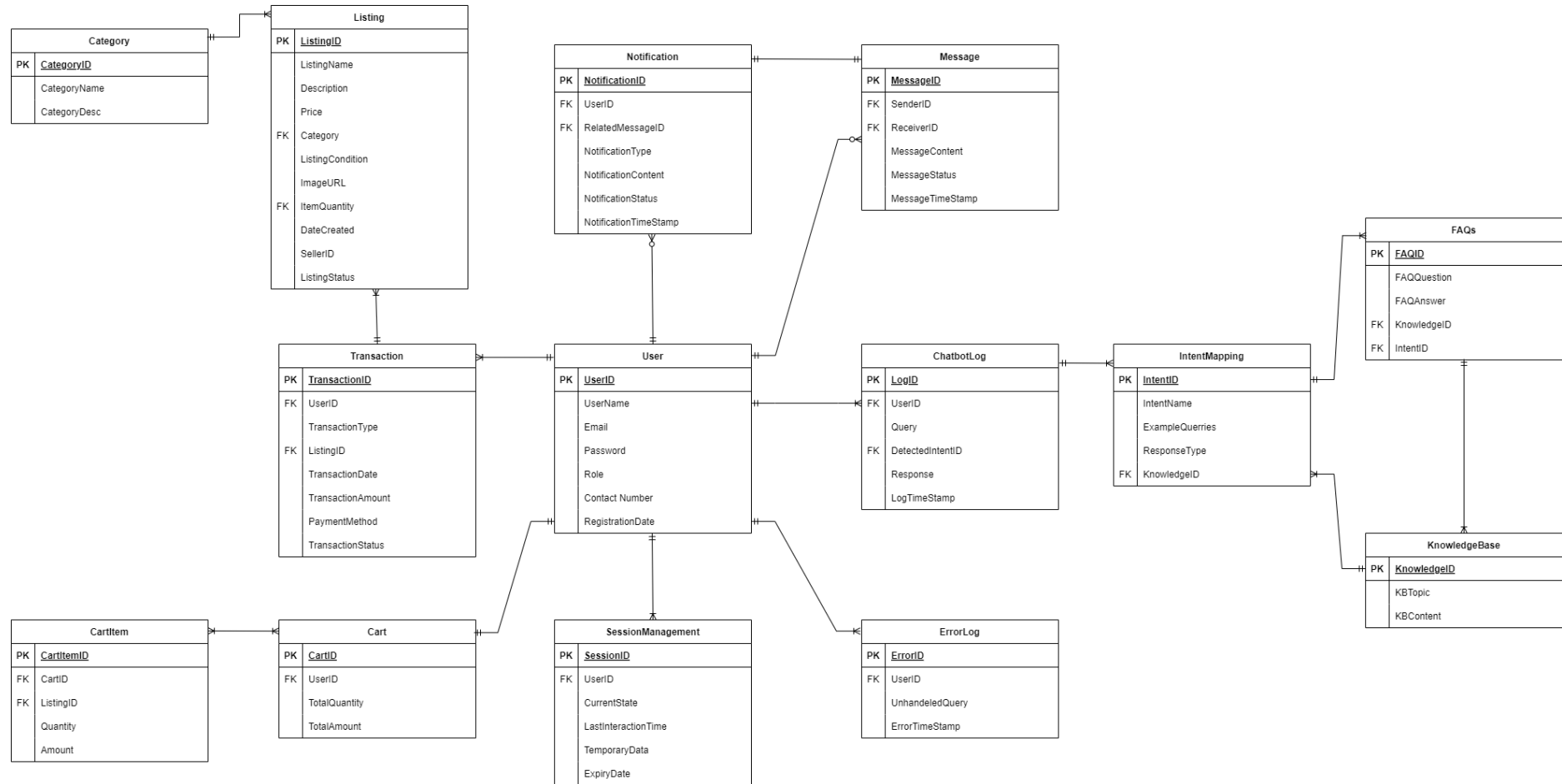


Figure 3.18: UniMASket Entity Relationship Diagram

3.6.4.2 Normalization of Tables

Table: User

Primary Key: UserID

UserID	UserName	Email	Password	Role	ContactNumber	RegistrationDate
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Table: Message

Primary Key: MessageID

Foreign Key:

- SenderID references User (UserID)
- ReceiverID references User (UserID)

MessageID	SenderID	ReceiverID	MessageContent	MessageStatus	MessageTimeStamp
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Table: Notification

Primary Key: NotificationID

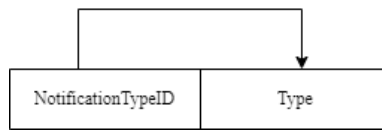
Foreign Key:

- UserID references User (UserID)
- RelatedMessageID references Message (MessageID)
- NotificationTypeID references NotificationType (NotificationTypeID)
- NotificationStatusID references NotificationStatus (NotificationStatusID)

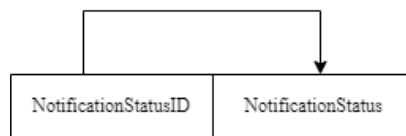
NotificationID	UserID	RelatedMessageID	NotificationTypeID	NotificationContent	NotificationStatusID	NotificationTimeStamp
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Table: NotificationType

Primary Key: NotificationTypeID

**Table: NotificationStatus**

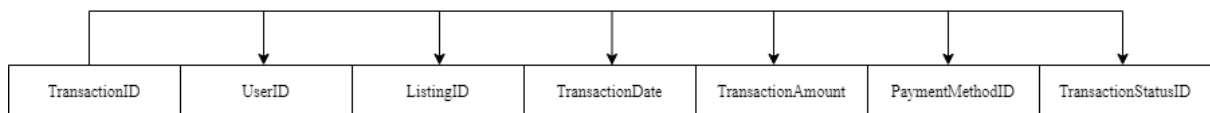
Primary Key: NotificationStatusID

**Table: Transaction**

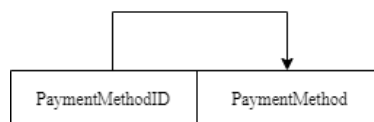
Primary Key: NotificationStatusID

Foreign Key:

- PaymentMethodID references PaymentMethod (PaymentMethodID)
- TransactionStatusID references TransactionStatus (TransactionStatusID)

**Table: PaymentMethod**

Primary Key: PaymentMethodID

**Table: TransactionStatus**

Primary Key: TransactionStatusID

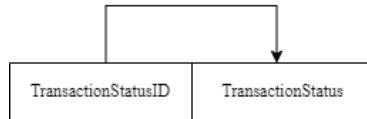


Table: Listing

Primary Key: ListingID

Foreign Key:

- CategoryID references Category (CategoryID)
- SellerID references User (UserID)

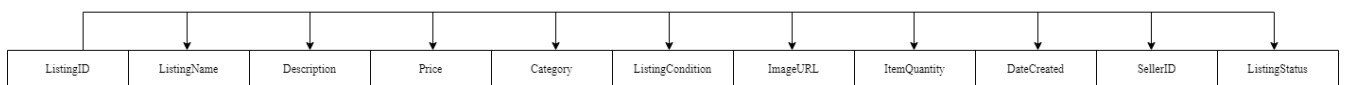


Table: Category

Primary Key: CategoryID

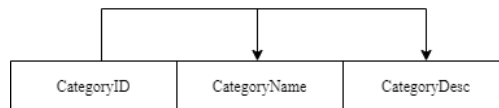


Table: Cart

Primary Key: CartID

Foreign Key:

- UserID references User (UserID)

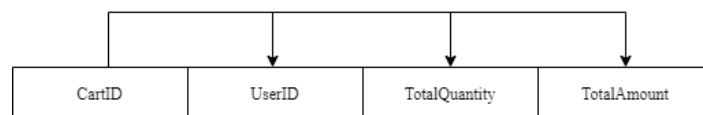


Table: CartItem

Primary Key: CartItemID

Foreign Key:

- CartID references Cart (CartID)
- ListingID references Listing (ListingID)



Table: SessionManagement

Primary Key: SessionID

Foreign Key:

- UserID references User (UserID)

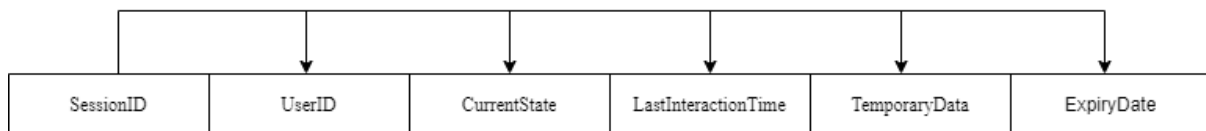


Table: ErrorLog

Primary Key: ErrorID

Foreign Key:

- UserID references User (UserID)

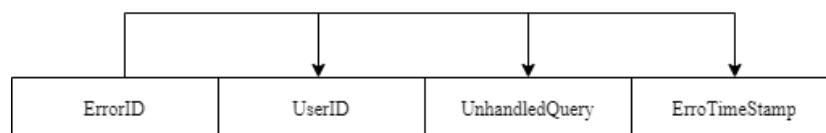


Table: ChatBotLog

Primary Key: LogID

Foreign Key:

- UserID references User (UserID)
- DetectedIntentID references IntentMapping (IntentID)

LogID	UserID	Query	DetectedIntentID	Response	LogTimeStamp
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Table: IntentMapping

Primary Key: IntentID

Foreign Key:

- KnowledgeID references KnowledgeBase (KnowledgeID)

IntentID	IntentName	ExampleQueries	ResponseType	KnowledgeID
----------	------------	----------------	--------------	-------------

Table: KnowledgeBase

Primary Key: KnowledgeID

KnowledgeID	KBTopic	KBContent
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Table: FAQs

Primary Key: FAQID

Foreign Key:

- KnowledgeID references KnowledgeBase (KnowledgeID)
- IntentID references IntentMapping (IntentID)

FAQID	FAQQuestion	FAQAnswer	KnowledgeID	IntentID
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3.6.4.3 Data Dictionary

Data Dictionary: User

Field Name	Data Type	Description
UserID	Integer (PK)	Unique identifier for the user.
UserName	Varchar	Name of the user
Email	Varchar	Email address of the user
Password	Varchar	Encrypted password for authentication
Role	Varchar	Role of the user (e.g., Buyer, Seller)
ContactNumber	Varchar	Contact number of the user
RegistrationDate	DateTime	Date of user registration

Data Dictionary: Message

Field Name	Data Type	Description
MessageID	Integer (PK)	Unique identifier for the message
SenderID	Integer (FK)	References UserID in the User table
ReceiverID	Integer (FK)	References UserID in the User table
MessageContent	Text	Content of the message
MessageStatus	Varchar	Status of the message (e.g., Sent, Delivered, Read)
MessageTimeStamp	DateTime	Timestamp of when the message was sent

Data Dictionary: Notification

Field Name	Data Type	Description
NotificationID	Integer (PK)	Unique identifier for the notification
UserID	Integer (FK)	References UserID in the User table
RelateMessageID	Integer (FK)	References MessageID in the Message table
NotificationTypeID	Integer (FK)	References NotificationTypeID in the NotificationType table
NotificationContent	Text	Content of the notification
NotificationStatusID	Integer (FK)	References NotificationStatusID in the NotificationStatus table

NotificationTimeStamp	DateTime	Timestamp of when the notification was created
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Data Dictionary: NotificationType

Field Name	Data Type	Description
NotificationTypeID	Integer (PK)	Unique identifier for the type of notification
Type	Varchar	Type of notification (e.g., New Message, Listing Update)

Data Dictionary: NotificationStatus

Field Name	Data Type	Description
NotificationStatusID	Integer (PK)	Unique identifier for the notification status
NotificationStatus	Varchar	Status of the notification (e.g., Unread, Read, Delete)

Data Dictionary: Transaction

Field Name	Data Type	Description
TransactionID	Integer (PK)	Unique identifier for the transaction
UserID	Integer (FK)	References UserID in the User table
TransactionType	Varchar	Type of transaction (e.g., Purchase, Sale)
ListingID	Integer (FK)	References ListingID in the Listing table
TransactionDate	DateTime	Date and time of the transaction
TransactionAmount	Decimal	Total amount of the transaction
PaymentMethodID	Integer (FK)	References PaymentMethodID in the PaymentMethod table
TransactionStatusID	Integer (FK)	References TransactionStatusID in the TransactionStatus table

Data Dictionary: PaymentMethod

Field Name	Data Type	Description
PaymentMethodID	Integer (PK)	Unique identifier for the payment method

PaymentMethod	Varchar	Method used for payment (e.g., QR code, COD)
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Data Dictionary: TransactionStatus

Field Name	Data Type	Description
TransactionStatusID	Integer (PK)	Unique identifier for the transaction status
TransactionStatus	Varchar	Status of the transaction (e.g., Pending, Complete)

Data Dictionary: Listing

Field Name	Data Type	Description
ListingID	Integer (PK)	Unique identifier for the listing
ListingName	Varchar	Name of the listing
Description	Text	Detailed description of the listing
Price	Decimal	Price of the listed item
CategoryID	Integer (FK)	References CategoryID I the Category table
ListingCondition	Varchar	Condition of the listing (e.g., New, Used-Like New, Used-good)
ImageURL	Varchar	URL of the item's image
ItemQuantity	Integer	Quantity of the item available
DateCreated	DateTime	Date when the listing was created
SellerID	Integer (FK)	References UserID in the User table
ListingStatus	Varchar	Condition of the listing (e.g., Active, Inactive)

Data Dictionary: Category

Field Name	Data Type	Description
CategoryID	Integer (PK)	Unique identifier for the category
CategoryName	Varchar	Name of the category
CategoryDesc	Varchar	Description of the category

Data Dictionary: Cart

Field Name	Data Type	Description
CartID	Integer (PK)	Unique identifier for the cart
UserID	Integer (FK)	References UserID in the User table
TotalQuantity	Integer	Total number of items in the cart
TotalAmount	Decimal	Total amount of the items in the cart

Data Dictionary: CartItem

Field Name	Data Type	Description
CartItemID	Integer (PK)	Unique identifier for the cart item
CartID	Integer (FK)	References CartID in the Cart table
ListingID	Integer (FK)	References ListingID in the Listing table
Quantity	Integer	Quantity of the item in the cart
Amount	Decimal	Total cost of the item in the cart

Data Dictionary: SessionManagement

Field Name	Data Type	Description
SessionID	Integer (PK)	Unique identifier for the session
UserID	Integer (FK)	References UserID in the User table
CurrentState	Varchar	Current state of the user session
LastInteractionTime	DateTime	Last interaction time in the session
TemporaryData	Text	Temporary data stored during the session
ExpiryDate	DateTime	Expiration date of the session

Data Dictionary: ErrorLog

Field Name	Data Type	Description
ErrorID	Integer (PK)	Unique identifier for the error log
UserID	Integer (FK)	References UserID in the User table
UnhandledQuery	Text	Query that was not handled by the system
ErrorTimeStamp	DateTime	Timestamp when the error occurred

Data Dictionary: ChatBotLog

Field Name	Data Type	Description
LogID	Integer (PK)	Unique identifier for the chatbot log entry
UserID	Integer (FK)	References UserID in the User table
Query	Text	User query to the chatbot
DetectedIntentID	Integer (FK)	References IntentID in the IntentMapping table
Response	Text	Response from the chatbot
LogTimeStamp	DateTime	Timestamp of the chatbot interaction

Data Dictionary: IntentMapping

Field Name	Data Type	Description
IntentID	Integer (PK)	Unique identifier for the intent
IntentName	Varchar	Name of the intent (e.g., FAQ Query)
ExampleQueries	Text	Example queries related to the intent
ResponseType	Varchar	Type of responses (e.g., Text, Redirect)
KnowledgeID	Integer (FK)	References KnowledgeID in the KnowledgeBase table

Data Dictionary: KnowledgeBase

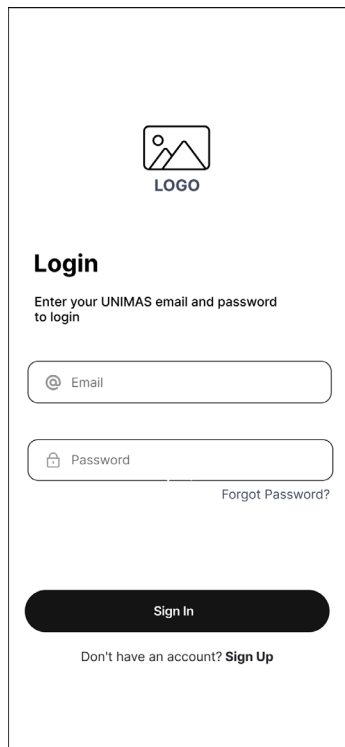
Field Name	Data Type	Description
KnowledgeID	Integer (PK)	Unique identifier for the knowledge base
KBTopic	Varchar	Topic of the knowledge base entry
KBContent	Text	Content of the knowledge base entry

Data Dictionary: FAQs

Field Name	Data Type	Description
FAQID	Integer (PK)	Unique identifier for the FAQ entry
FAQQuestion	Text	Question in the FAQ
FAQAnswer	Text	Answer in the FAQ

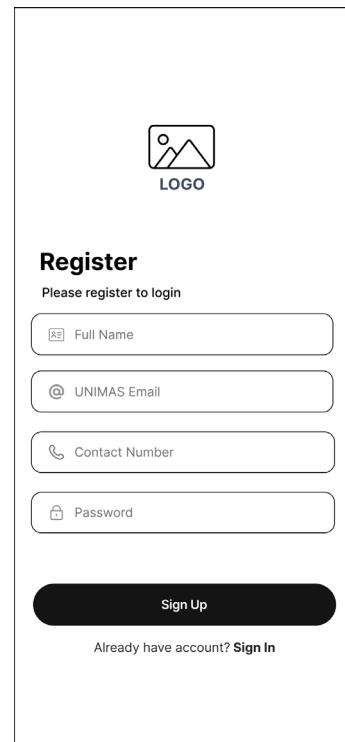
KnowledgeID	Integer (FK)	References KnowledgeID in the KnowledgeBase table
IntentID	Integer (FK)	References IntentID in the IntentMapping table

3.7 User Interface Design



The login page wireframe features a central logo at the top, consisting of a square icon with a stylized mountain and a circle, labeled "LOGO". Below the logo is the heading "Login" in bold. Underneath the heading is the instruction "Enter your UNIMAS email and password to login". The form includes two input fields: "Email" with an email icon and "Password" with a lock icon. A "Forgot Password?" link is positioned to the right of the password field. At the bottom, there is a large, dark, rounded button labeled "Sign In". Below the button is the text "Don't have an account? Sign Up".

Figure 3.19: Login Page Wireframe



The register page wireframe features a central logo at the top, consisting of a square icon with a stylized mountain and a circle, labeled "LOGO". Below the logo is the heading "Register" in bold. Underneath the heading is the instruction "Please register to login". The form includes four input fields: "Full Name" with a person icon, "UNIMAS Email" with an email icon, "Contact Number" with a phone icon, and "Password" with a lock icon. At the bottom, there is a large, dark, rounded button labeled "Sign Up". Below the button is the text "Already have account? Sign In".

Figure 3.20: Register Wireframe

Figures 3.19 and 3.20 show the wireframes for the login and registration pages, respectively. Both of these wireframes include the proposed application logo, input boxes for users to provide the relevant information, and a clickable button labelled "Sign in" for the Login page and "Sign Up" for the registration page. Below the button, there is a statement and a redirected link, which the user can click to prompt them to "Sign Up" if they do not have an account or "Sign In" if they already have one.

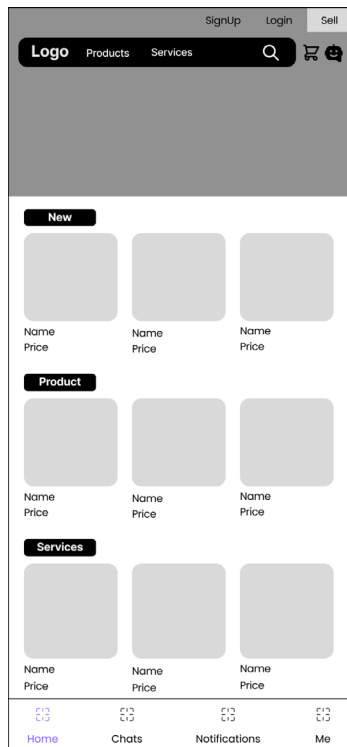


Figure 3.21: Home Page Wireframe

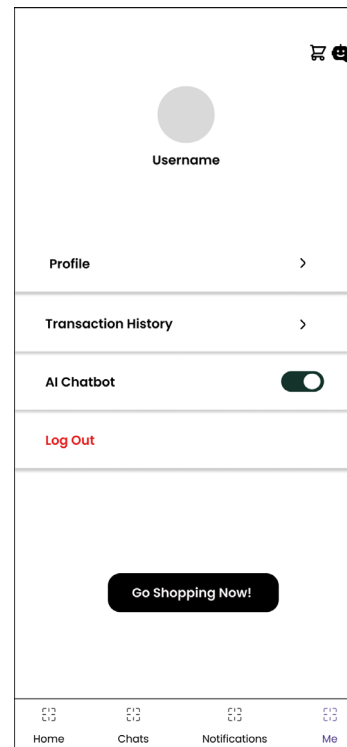


Figure 3.22: Manage Profile Wireframe

Figure 3.21 shows the wireframe for the Home Page, whereas Figure 3.2 depicts the wireframe for the Manage Profile page. According to the Home Page wireframe, there will be clickable "Sign Up", "Login", and "Sell" words at the top of the page. A search bar will appear underneath this word, allowing the user to immediately search for their preferred product or service, as well as a clickable purchasing cart and AI Chatbot icon. The central section of the home page will display a list of items divided into three categories: "New", "Product", and "Services".

Meanwhile, in Manage Profile, a user profile photo will appear at the top of the page alongside their username. The middle section of this page will provide options for profile, transaction history, an enable/disable button for the AI chatbot, and logout. Below this option, there will be a clickable "Go Shopping Now" button that, when pressed, will take the user to the home page. Lastly, at the bottom of these two pages (Home Page and Manage Profile), there is a bottom navigation bar with the options "Home", "Chats", "Notification", and "Me".

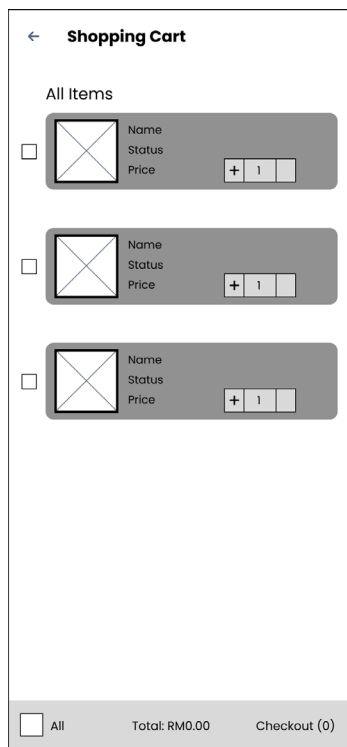


Figure 3.23: Shopping Cart Wireframe

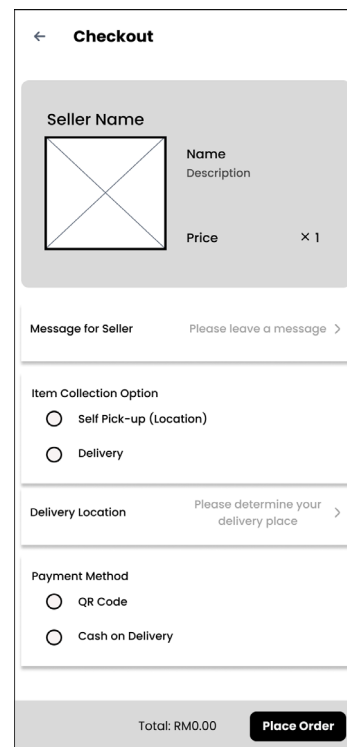


Figure 3.24: Checkout Wireframe

Figure 3.23 represents the Shopping Cart wireframe, whereas Figure 3.24 shows the Checkout Page wireframe. The Shopping Cart page shows a list of the products or services added by the user. Each item contains information such as a name, status, price, and a quantity editor. There is a checkbox next to each item for selection. The "Select All" checkbox at the bottom allows the user to select all items at once. The page also includes the total price and number of the selected items, as well as a "Checkout" button.

Figure 3.24 Checkout Page displays information about the items picked from the Shopping Cart, such as the seller's name, item name, description, price, and quantity. It includes options with radio buttons for selecting item collection and payment methods. Users can also message the seller, set a delivery address, and see the total price of the selected items. At the bottom, there is a "Place Order" option to complete the purchase.

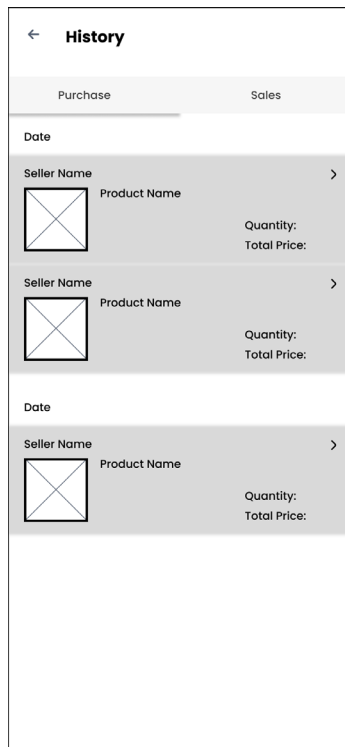


Figure 3.25: Purchase History Wireframe

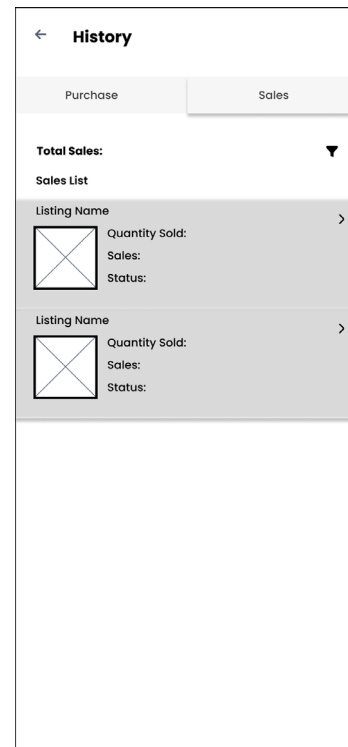


Figure 3.26: Sales History Wireframe

Figures 3.25 and 3.26 illustrate the transaction history, with Figure 3.25 focused on Purchase History and Figure 3.26 on Sales History. Both pages share similar structures, featuring a list of past transactions. Each entry in the list contains details and is clickable for more information about the respective transaction.

In the Purchase History (Figure 3.25), each entry displays the seller's name, product name, quantity purchased, and total price. This section is tailored for users to review their completed purchases.

Meanwhile, the Sales History (Figure 3.26) is designed for sellers. Each entry includes the item name, quantity sold, total sales for the item, and its current availability status. At the top of the page, there is a Total Sales section summarizing overall earnings. Additionally, a Filter option is provided on the right side, allowing sellers to sort sales based on specific months.

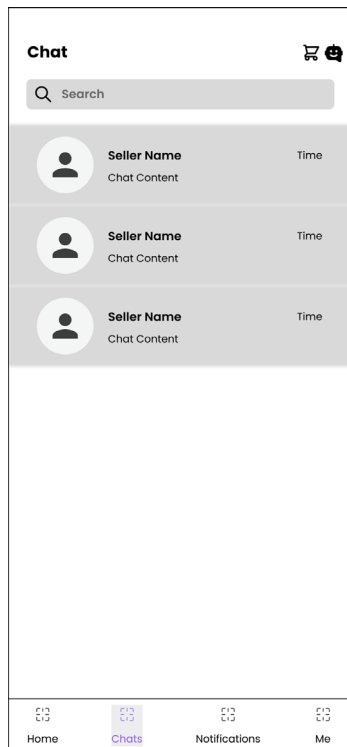


Figure 3.27: In-App Chat Wireframe

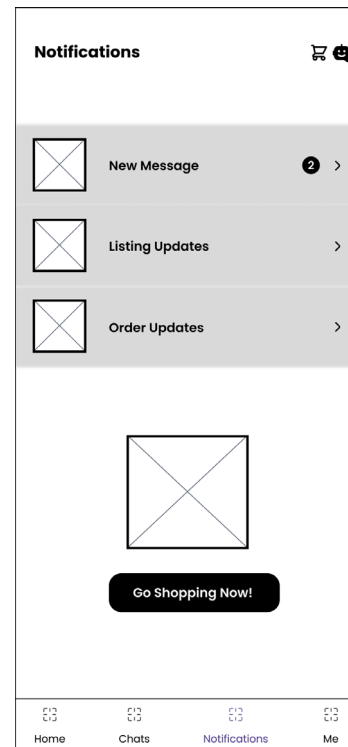


Figure 3.28: Notifications Wireframe Figure

Figure 3.27 shows the wireframe for the In-App Chat section. This page includes the page name, a clickable shopping cart icon, and a clickable AI chatbot icon at the top. Below these elements is a search bar, followed by a list of chats that are clickable for viewing detailed chat records. At the bottom of the page, a navigation bar provides quick access to "Home," "Chat," "Notifications," and "Me" options.

Figure 3.28 illustrates the wireframe for the Notification Page, which is divided into three main sections: "New Message," "Listing Updates," and "Order Updates." Each section displays a notification badge with the number of new notifications. "New Message" notifications are triggered when a buyer or seller sends a new message. "Listing Updates" notifications appear when a new item listing is created. Meanwhile, "Order Updates" notify users about changes to the status of their purchased items. The page also features a clickable image and button labelled "Go Shopping Now," which redirects users to the home page when clicked.

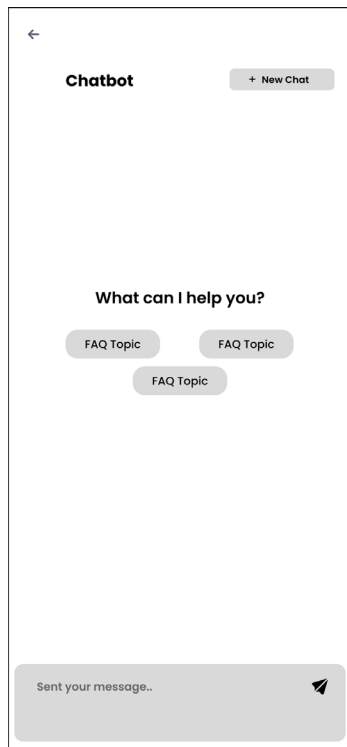


Figure 3.29: AI Chatbot Wireframe

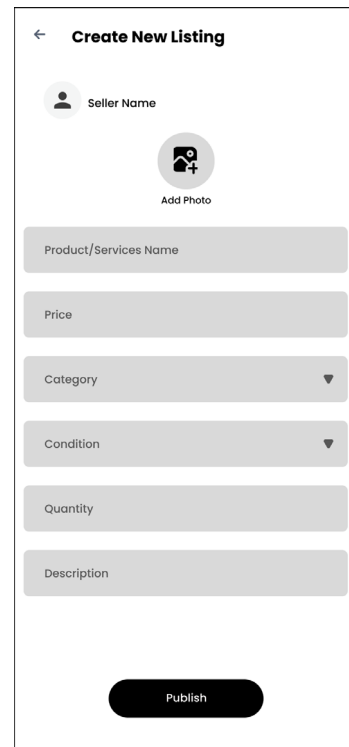


Figure 3.30: Create New Listing Wireframe

Figure 3.29 depicts the wireframe for the AI Chatbot section. At the top right of the page, there is a "New Chat" button that allows users to terminate the current session and start a new one. The page includes an initiated chat by the AI Chatbot in the center, along with recommended FAQ topics that users can click on for assistance with common issues. At the bottom, a chat box enables users to type queries, and a plane icon triggers the chatbot to process the input and provide answers.

Figure 3.30 illustrates the wireframe for the Create New Listing page. This page is designed for sellers to input item details using multiple text boxes and selection fields. Sellers must provide all required information about the items they wish to list. At the bottom, a "Publish" button saves the details to the database and adds the new item to the listings.

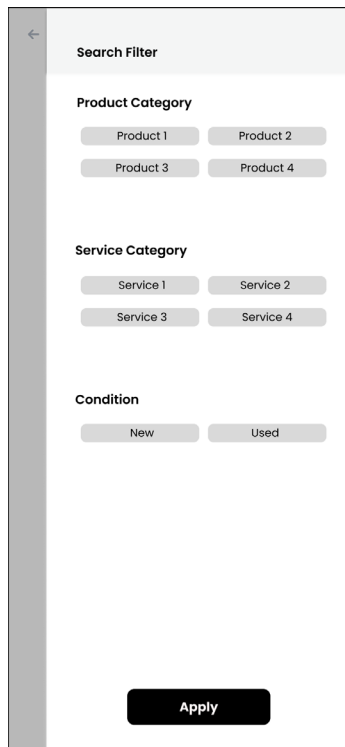


Figure 3.31: Search Filter Wireframe

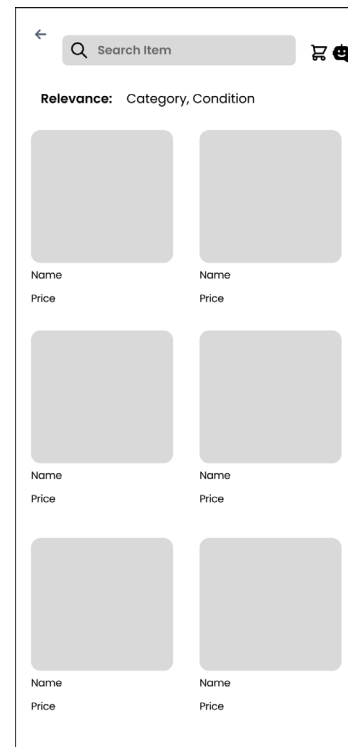


Figure 3.32: Filter Applied Wireframe

Figure 3.31 shows the wireframe for the Search Filter page. This page includes three filter categories to help users narrow down search results: Product Category, Service Category, and Condition. The Product and Service Category filters offer multiple sub-options available in the application, while the Condition filter allows users to choose between new or used items. At the bottom, a clickable "Apply" button applies the selected filters and redirects users to the Filter Applied page, as shown in Figure 3.32.

Figure 3.32 illustrates the Filter Applied page. This page displays a list of items relevant to the filters selected by the user, together with their name and price. At the top of the page, the selected category and condition are shown for reference.

3.8 Summary

Chapter 3 documents the requirement analysis and system architecture for the proposed UniMARket: UNIMAS E-Marketplace integrated with AI Chatbot. Questionnaires were used to identify user requirements, encompassing important features including secure user identification, seamless in-app communication, AI chatbot integration, sales and purchase history tracking, and transaction management. The system requirements were divided into functional and non-functional categories. Functional requirements defined the core process, such as item listing, browsing, and purchasing, and were supported by an activity diagram. Non-functional requirements, on the other hand, addressed system integration and usability concerns, ensuring that the system meets operational and user expectations. The software requirements described the development tools and technologies, whilst the hardware requirements focused on the minimum needs for mobile devices to operate the application smoothly. The system design part gave a thorough description of the architecture, including use case diagrams, database designs (ERD, normalization, and data dictionary), and user interface wireframes. These design components are intended to assure the application's efficiency, dependability, and user friendliness. In conclusion, this chapter provides a solid foundation for implementing UniMASket by addressing user demands, specifying system requirements, and offering a clear design architecture.

Chapter 4: Implementation

4.1 Introduction

This chapter aims to discuss the implementation of the proposed application, *UniMASket: UNIMAS Marketplace Application with AI chatbot Integration* in both physical and logical design. All the implementations mentioned in the next subsections are based on the proposed design stated in the previous chapter and some changes has been done especially for the design part as per needed. In order to meet the user requirement, there will be multiple different steps involved in building the application, configuring the database, and user interface design. To support a structured development process, the *UniMASket* application will be decomposed into a few key modules, and each module will be developed to serve specific function within the application for improving the overall system functionality and user experience.

4.2 Required Components

The proposed mobile application, *UniMASKET* utilises Flutter for building the mobile interface and Firebase for backend service, including user authentication and real-time data storage. Dialogflow is also integrated for the AI chatbot functionality, enabling interactive customer support. These components collectively will provide a seamless and efficient marketplace experience.

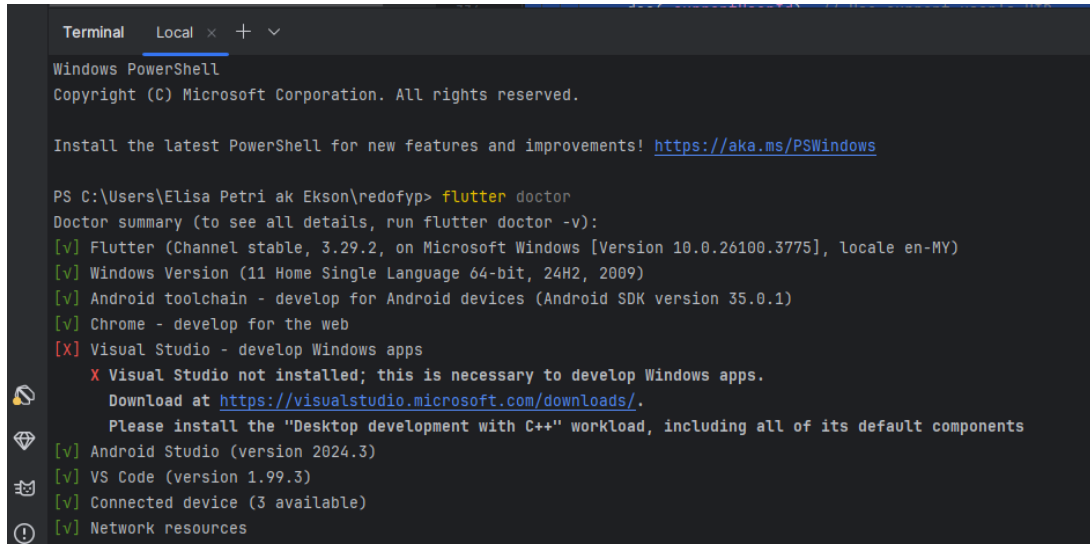
4.2.1 Flutter

Flutter is an open-source UI framework developed by Google for building natively compiled applications across multiple platforms, including mobile, web, and desktop, from a single codebase. For *UniMASket* application, Flutter will be used to create the frontend of the application in order to provide a rich and responsive user interface (UI).

Firstly, Flutter installation and environment setup are required before the project. Below are the key steps to setting up Flutter:

1. Download and install Flutter from the Flutter Website (<https://docs.flutter.dev/get-started/install>), where there will be multiple development platform to be select based on you need. This will provide the necessary tools to build and compile Flutter apps.
2. As this *UniMASket* project is focused on Android development, Android Studio will be installed.
3. In terminal or command prompt., verify the installation by running *flutter doctor*. This will check for any missing dependencies or configurations.

4. Create a new Flutter project by running `flutter create projectName`. This will generate the basic structure for the Flutter application.
5. Lastly, run the application on an emulator or device by entering the command `flutter run`.



```

Terminal Local x + v
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Elisa Petri ak Ekson\redofyp> flutter doctor
Doctor summary (to see all details, run flutter doctor -v):
[v] Flutter (Channel stable, 3.29.2, on Microsoft Windows [Version 10.0.26100.3775], locale en-MY)
[v] Windows Version (11 Home Single Language 64-bit, 24H2, 2009)
[v] Android toolchain - develop for Android devices (Android SDK version 35.0.1)
[v] Chrome - develop for the web
[X] Visual Studio - develop Windows apps
    X Visual Studio not installed; this is necessary to develop Windows apps.
      Download at https://visualstudio.microsoft.com/downloads/.
      Please install the "Desktop development with C++" workload, including all of its default components
[v] Android Studio (version 2024.3)
[v] VS Code (version 1.99.3)
[v] Connected device (3 available)
[v] Network resources
  
```

Figure 4.1: Flutter environment setup

4.2.2 Firebase

Firebase is a Backend-as-a-Service (BaaS) platform that provides a suite of cloud-based services such as authentication, real-time databases, hosting, and cloud storage. Firebase will serve as the backend service for *UniMASket* to manage user data and ensure the smooth functioning of real-time chat interactions. Firebase's Realtime Database will store user information, orders, and marketplace transactions, while Firebase Authentication will handle the login and registration process for users.

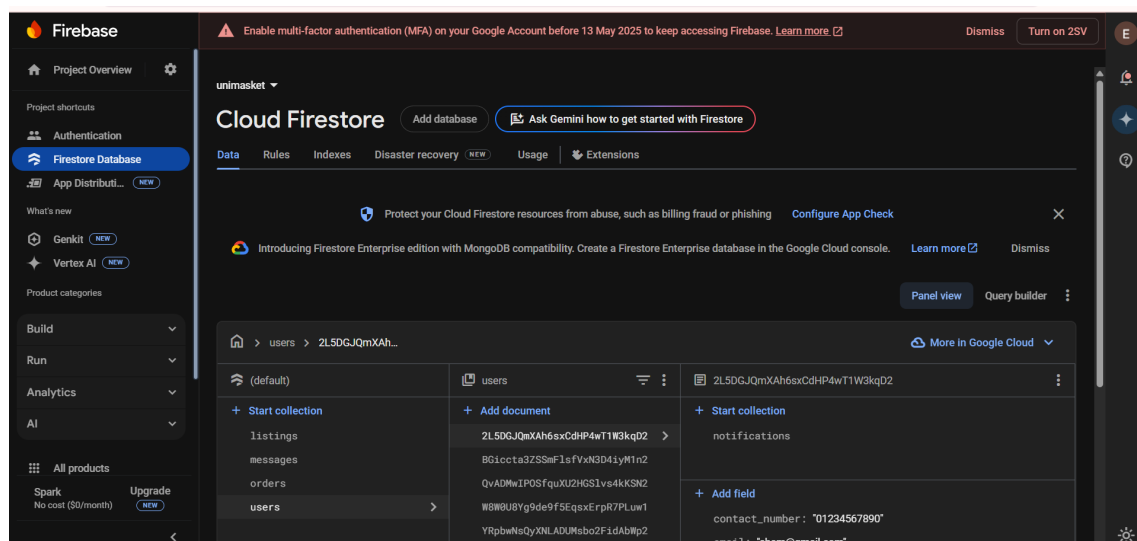


Figure 4.2: Interface for Firebase Database

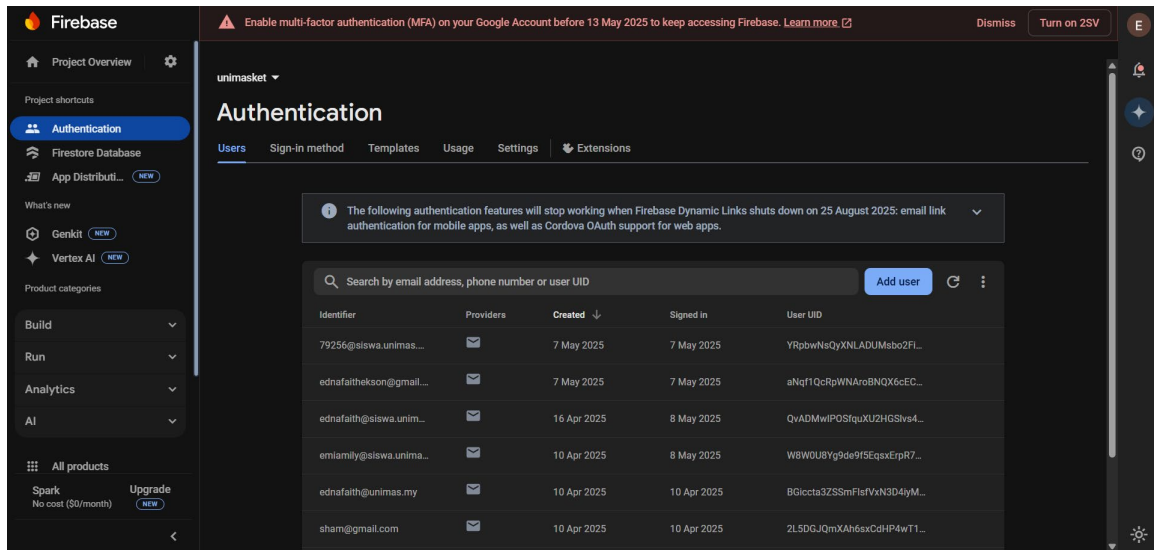


Figure 4.3: Interface for Firebase authentication service

Firebase can be implemented by just a few steps as listed below:

1. Use a Google account to sign in to the Firebase (<https://firebase.google.com/>). Click “Go to Console” to continue.
2. Next, click “Add project”.
3. Enter the project name and continue to the next step.
4. Enable the Google Analytics for the project.
5. Choose “Default Account for Firebase” to configure Google Analytics.
6. Choose a Web Project to be implemented in Flutter project.
7. Lastly, register the app and follow the configuration process.

4.2.3 DialogFlow

Dialogflow will be used to enable the AI chatbot functionality in *UniMASket* application. It will help the users to navigate the marketplace, answer questions, and provide real time customer support. The AI chatbot will aiding users by answering frequently asked questions, helping with product searches, and guiding users through the purchasing process. Dialogflow will be integrated into Flutter app using Google Cloud services for API access and authentication, and the chatbot interaction next will be handled directly through Google Cloud’s infrastructure. Dialogflow can be implemented in Flutter by following these steps:

1. Sign in to Dialogflow Console using your Google Cloud account.

2. In the Dialogflow Console, click on Create Agent and provide a name, language, and time zone for your agent.
3. Create Intent for different user queries by defining training phrases and corresponding responses.
4. Go to the Google Cloud Console, select your project, and enable the Dialogflow API for the project.
5. In the Google Cloud Console, navigate to IAM & Admin, and click Service Accounts. Create a service account and download the Service Account JSON key for authentication.
6. Use the downloaded service account JSON key to authenticate your application with Dialogflow.

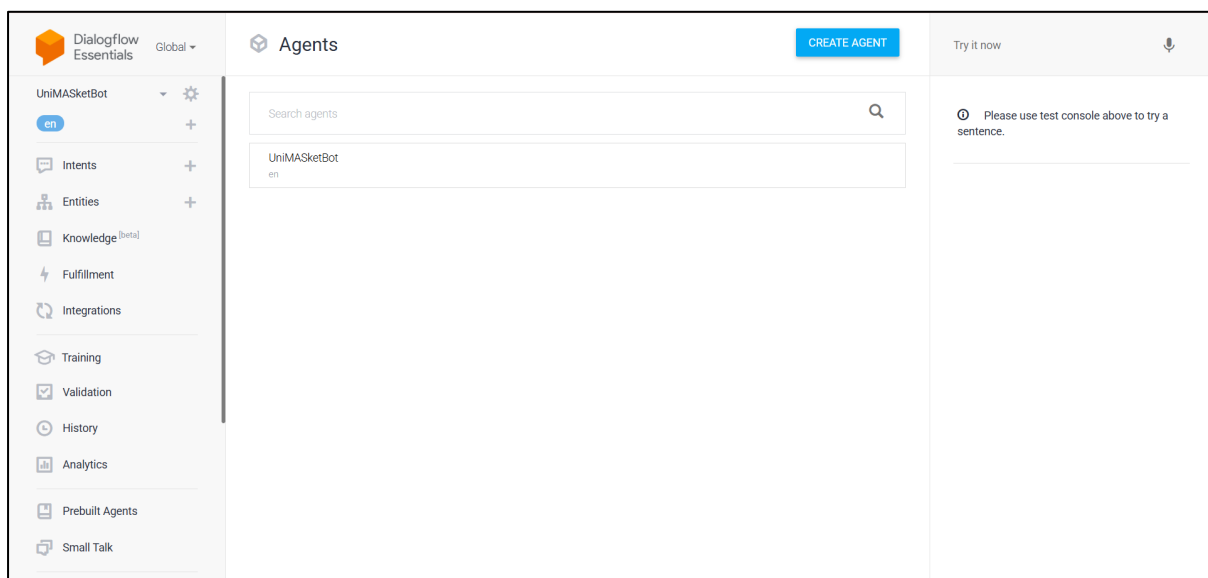


Figure 4.4: Interface for Dialogflow console

4.2.4 Cloudinary

Cloudinary is a cloud-based media management platform that offers services for uploading, storing, optimising, and delivery images and videos. For the UniMASke application, Cloudinary will be used to manage all the images uploaded within the app, including the product and service listings, user profile photos, and media shared through the chat module. Cloudinary will be integrated into the Flutter project by using its API service. All images that uploaded by users will be stored in Cloudinary's cloud storage, and the system will return a secure image URL that can be used throughout the application interface. Cloudinary can be implemented by just a few steps as listed below:

1. Sign up and log in to Cloudinary (https://cloudinary.com/users/register_free), then create a new project.
2. Retrieve the cloud name, API key, and upload preset from the dashboard.
3. Set up the Flutter project with the required HTTP package for API calls.
4. Configure the application to upload images to Cloudinary using the provided credentials.
5. Once successfully uploaded, the image URL will be retrieved and can be used in the application as needed.

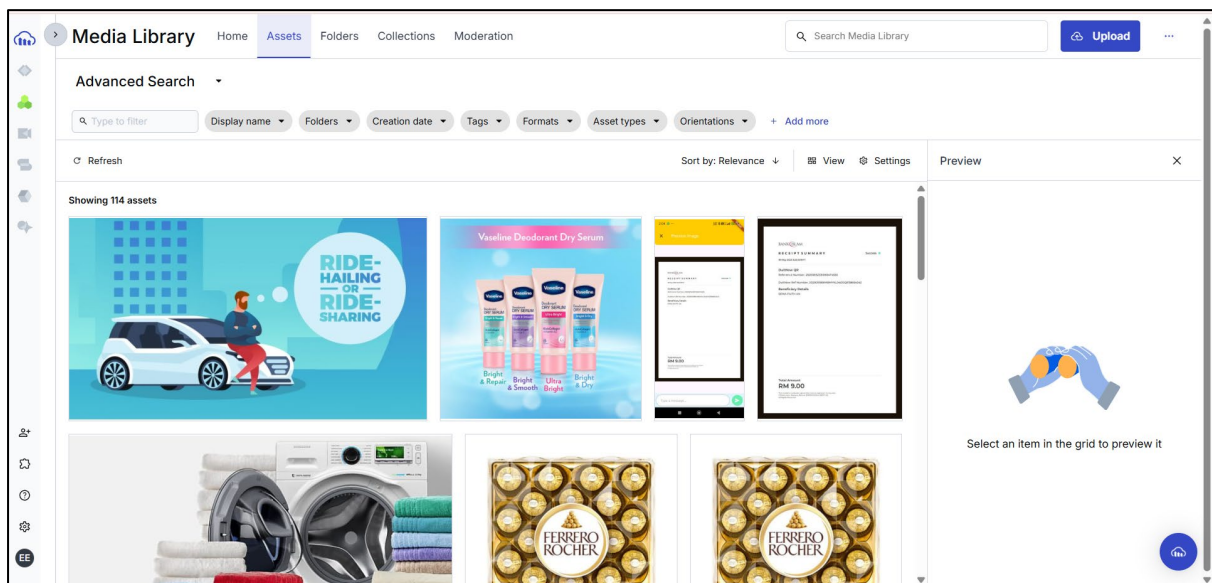


Figure 4.5: Interface for Cloudinary Media Library

4.3 UniMASket Walkthroughs

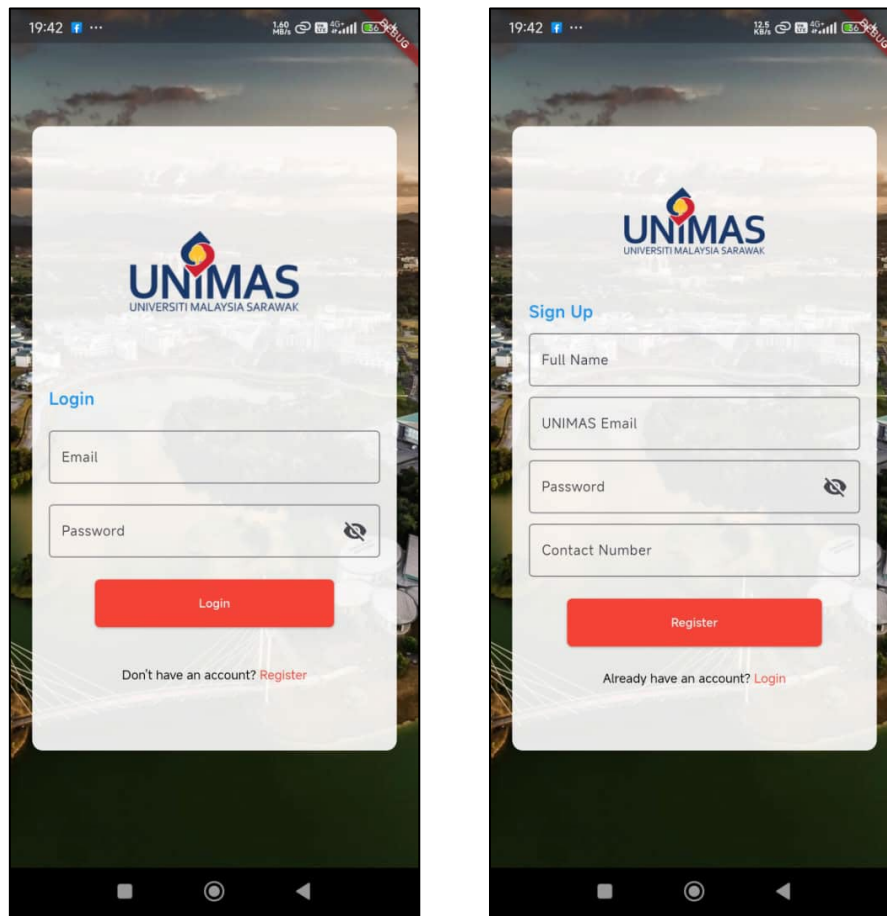


Figure 4.6: Login and Sign-Up Screens

Figure 4.6 illustrates the user interfaces for the login and sign-up pages. Users are required to sign up before proceeding to the homepage. New users must provide their details, including full name, UNIMAS email address, password, and contact number on the sign-up page. Error messages will appear if the user's input does not meet the specified requirements. Once the user's input is valid and the 'Register' button is clicked, the application will automatically send an email verification link to the provided email address. Upon successful verification, users will be redirected to the login page, where they will need to enter their UNIMAS email and password. Similar to the sign-up page, error messages will display if the user's input is invalid. Additionally, if the email entered on the login page is not yet registered, users will be directed to the sign-up page.

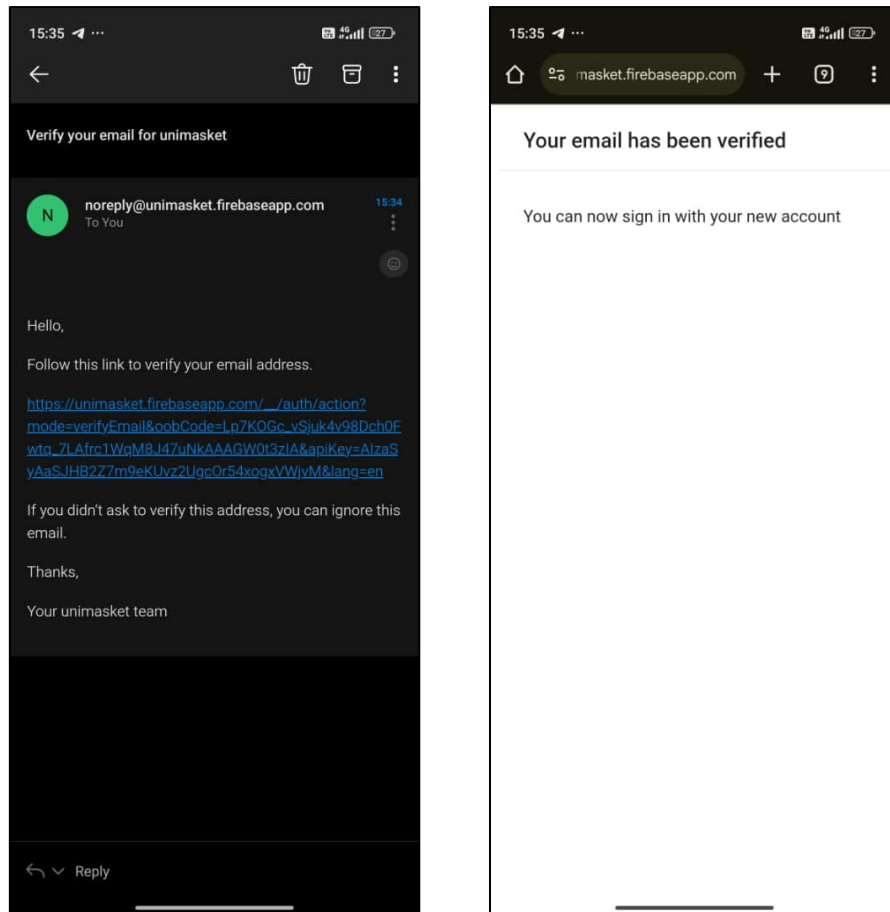


Figure 4.7: Email verification for new user

Figure 4.7 shows the email verification from a new user's inbox, where the new users are required to verify their email before they are allowed to continue to use their login credentials.

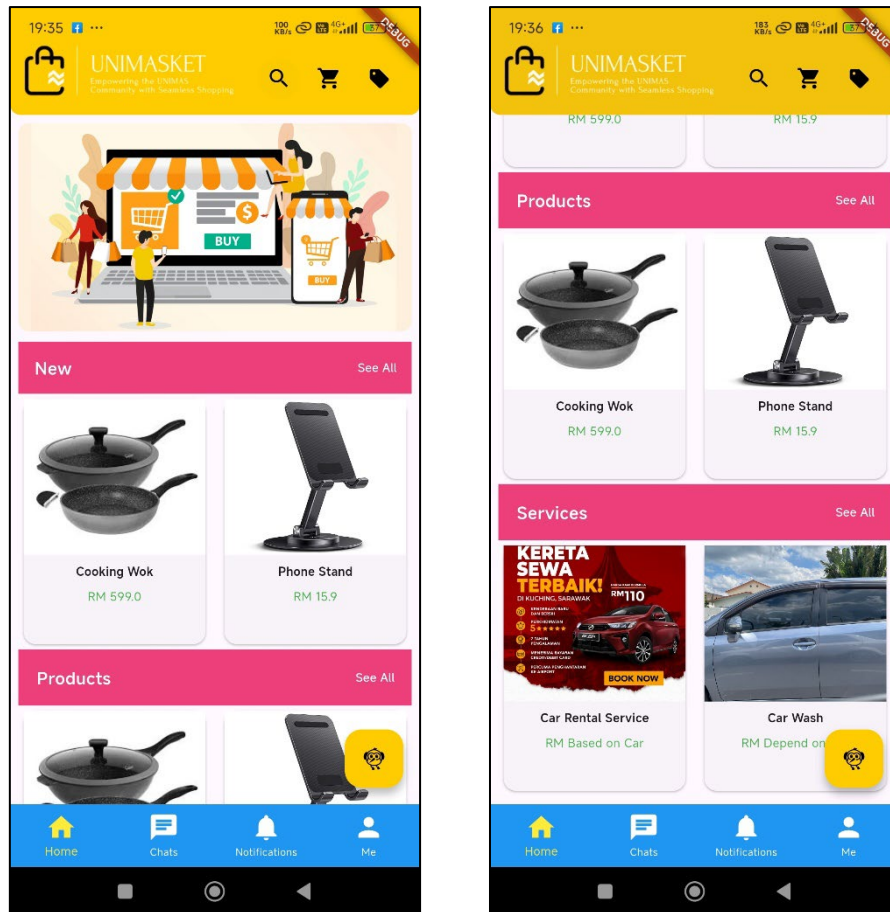


Figure 4.8: Home page for registered user

Figure 4.8 displays the homepage for registered users. Users can view listings categorized into three sections which is New, Products, and Services. Each section will showcase the two most recent listings together with their image, name, and price, within that category. A clickable "See All" link is also available for each category, which, when clicked, will redirect the user to a page displaying all listings in the selected category. Additionally, there are three clickable buttons on the app bar, each corresponding to different functionalities which is direct search for listings, viewing the cart, and creating a new sell listing. A floating AI chatbot button is also present, where when the user clicking it, it will enable users to interact with the AI chatbot. Lastly, the bottom navigation bar features four clickable icons, each leading to a specific page which is Home, Chats, Notifications, and Me.

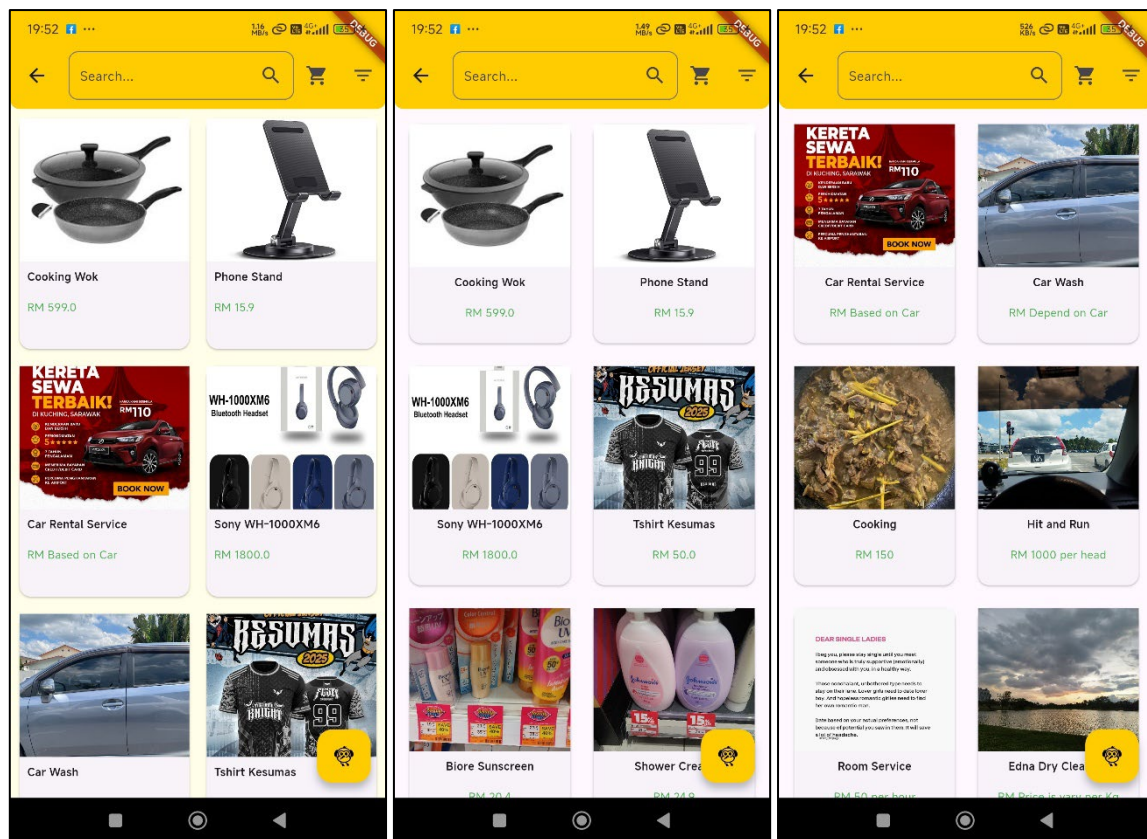


Figure 4.9: View all page for each category

Figure 4.9 illustrates the "View All" screen for each category. Each screen will display listings, along with their image, name, and price, organized by category: New, Products, and Services. The app bar on this page will feature a search bar, a cart button, and a filter button. Each of these elements will perform specific functions, such as searching for listings by name, viewing the cart, and filtering listings based on the user's selected options. Additionally, a floating AI chatbot button will be available, which, when clicked, enables the user to interact with the AI chatbot.

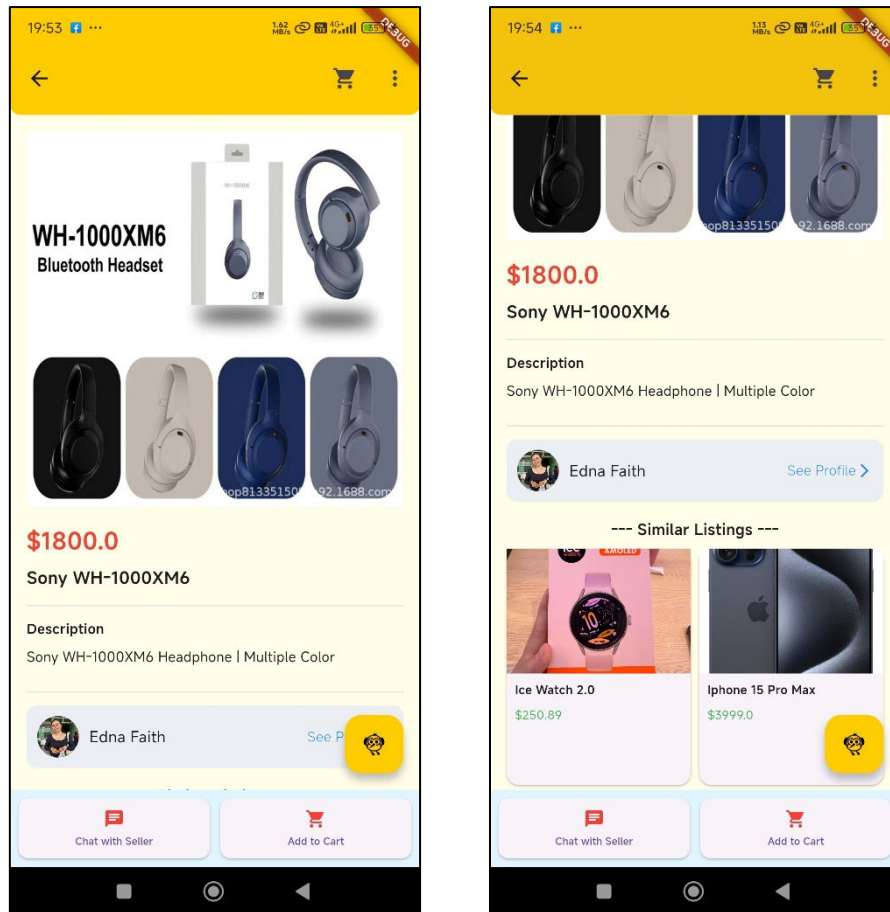


Figure 4.10: View listing details page

Figure 4.10 shows the "View Listing Details" page. This page displays detailed information about the product or service, including its image, price, name, description, and the seller's profile. The seller's profile will have a clickable link in the respective container, which, when clicked, will redirect the user to the seller's profile page. Additionally, a list of similar listings will be shown if available. At the bottom of the page, two clickable buttons, labelled "Chat with Seller" and "Add to Cart," will provide their respective functionalities: allowing users to chat with the seller of the currently displayed listing and adding the listing to the cart. Same as the other pages, a floating AI chatbot will be present, enabling the user to interact with the AI chatbot.

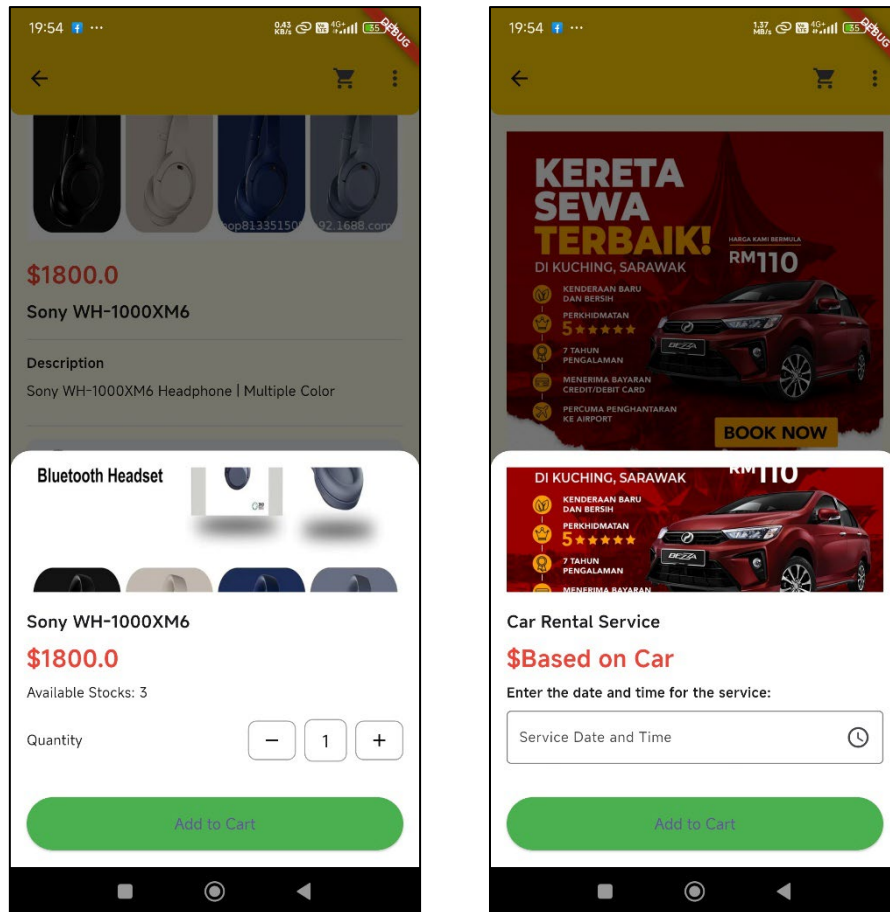


Figure 4.11: Add to cart slide up panel

Figure 4.11 displays the slide-up panel for adding listings to the cart. Each product and service category will have a specific slide-up panel with distinct requirements for adding items to the cart. For product listings, the user will need to input the desired quantity of the product and then proceed to add it to the cart by clicking the "Add to Cart" button. An error message will be displayed if the entered quantity exceeds the available stock. For service listings, the user will be required to select a service date and time. If the user attempts to click the "Add to Cart" button without selecting a date and time, an error dialog will appear.

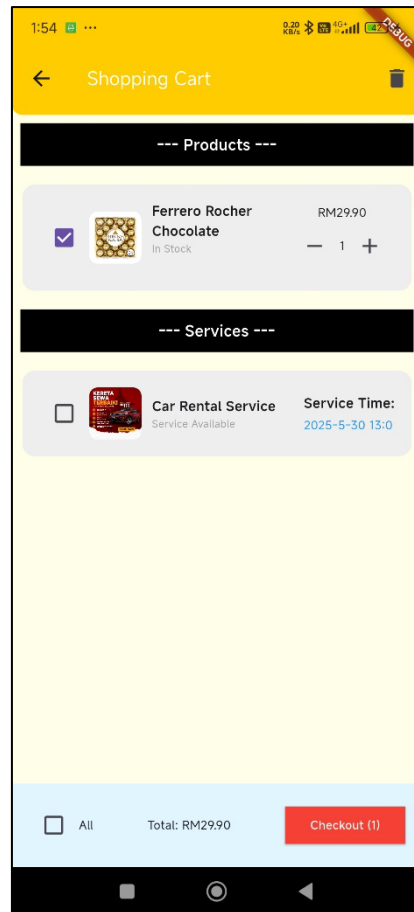


Figure 4.12: Shopping Cart Page

Figure 4.12 illustrates the shopping cart page. This page displays the listings added to the cart by the user, categorized into two sections: Products and Services. At the bottom of the page, there will be a box that allows the user to select all listings, view the total price for the selected items, and a clickable "Checkout" button along with the number of selected listings beside it. Additionally, at the top of the page, there will be a trash can icon that appears when any listing is selected. This icon enables the user to delete the selected listing.

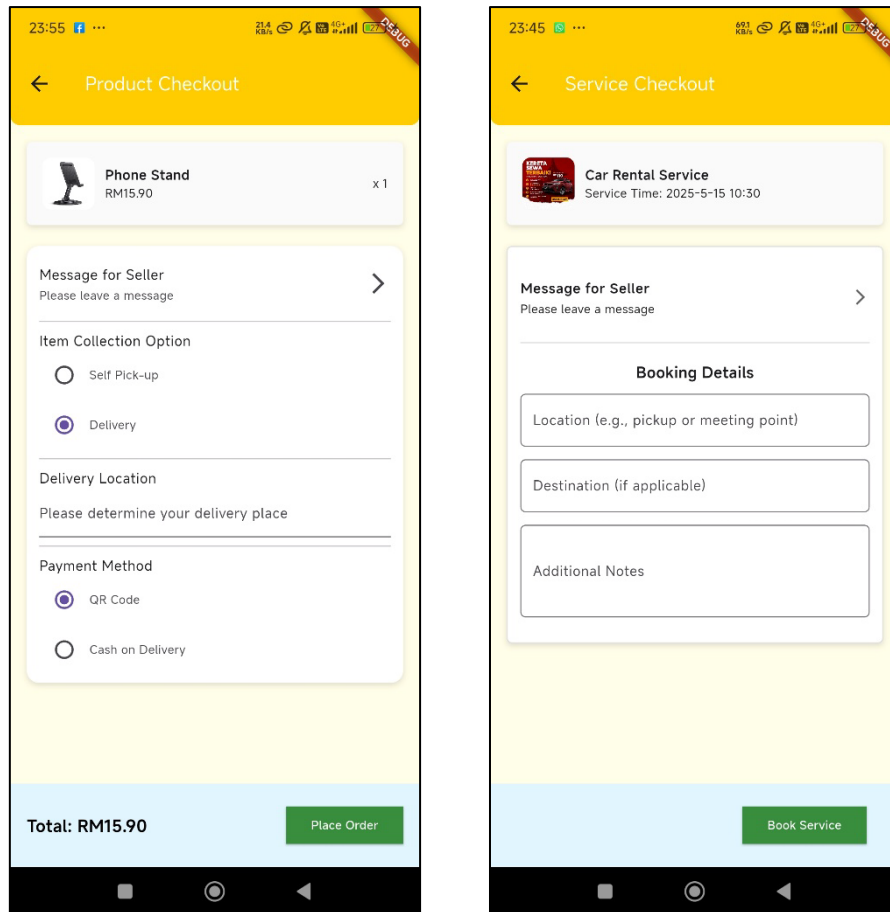


Figure 4.13: Checkout Page for product and service

Figure 4.13 shows the checkout page for both products and services, where both pages display the checkout details but have different interfaces for further user input. On the product checkout screen, the user can leave a message for the seller, select their preferred item collection option, and choose a payment method. If the user selects "delivery" as the collection option, they will be prompted to enter their preferred delivery location. At the bottom of the product checkout page, there will be a preview of the total price for the checkout and a "Place Order" button, which allows the user to proceed with placing the order once clicked.

Meanwhile, on the service checkout screen, the user can leave a message for the seller and provide additional booking details, such as the location for pickup or meet-up, destination (if applicable to the booking), and any additional notes. At the bottom of the service checkout page, there will be a "Book Service" button, which allows the booking details to be sent to the seller once clicked.

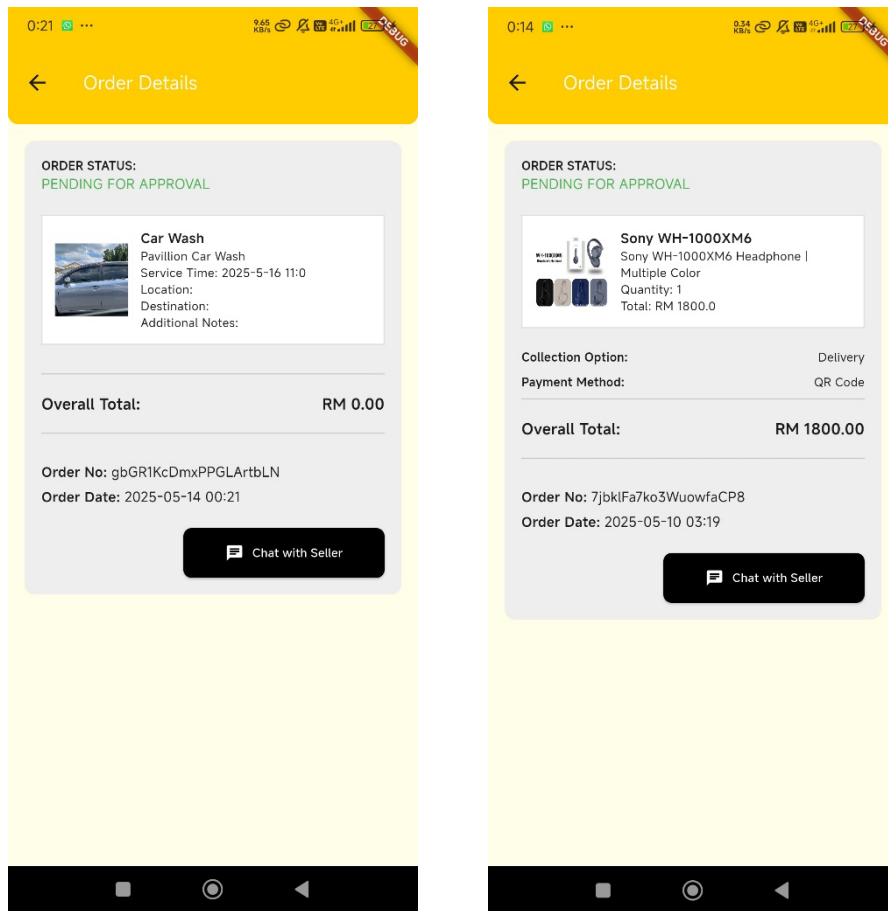


Figure 4.14: Successfully place order and book service page

Figure 4.14 displays the order details page once an order or service has been successfully placed or booked. This page shows the order details, including the order status, product or service details, collection method and payment method (for products only), the overall order total, order number, order date, and a "Chat with Seller" button. By default, the order status will be set to "Pending for Approval" once the order or booking is made.

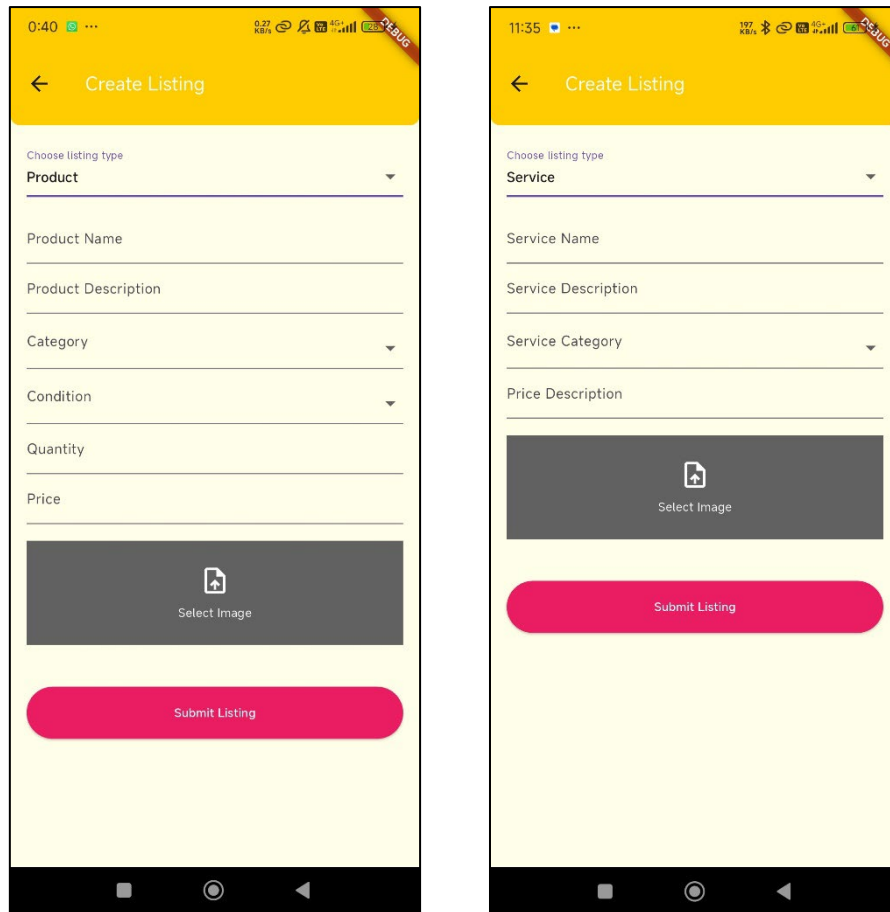


Figure 4.15: Create Listing Page

Figure 4.15 illustrates the "Create Listing" page, where the user can create a new listing (either a product or a service). The user is required to fill in all the necessary information before they can submit the listing. The required information differs for product and service listings. If the user selects "Product" as the listing type, they must input the product name, description, category, condition, quantity, price, and image. If the user selects "Service" as the listing type, they need to input the service name, description, category, price description, and image. Error messages will appear if any of the required fields are left empty when the "Submit Listing" button is clicked.

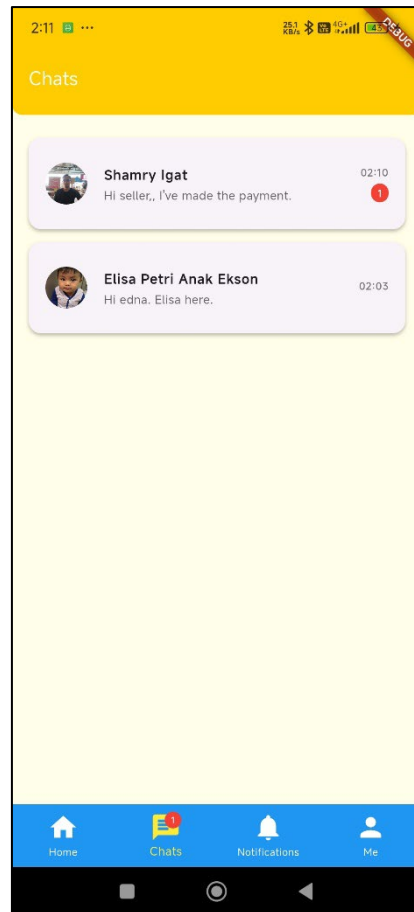


Figure 4.16: Chats Page

Figure 4.16 shows the Chats page, where all chat conversations between the current user and other users are recorded. Each conversation will be listed in a container, with each container displaying the other user's profile image, full name, the last chat content, and the time the last message was sent. Additionally, at the bottom of the page, there is a bottom navigation bar with icons for Home, Chats (currently active), Notifications, and Me. Clicking on any of these icons will navigate the user to the corresponding page.

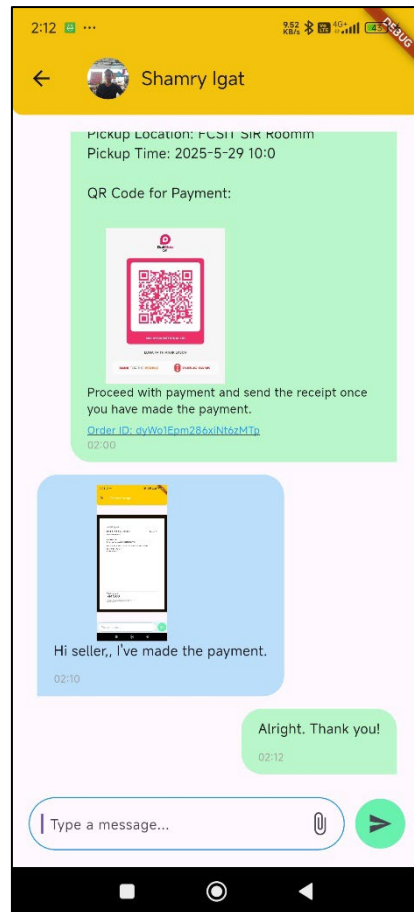


Figure 4.17: Chat Details Page

Figure 4.17 displays the chat details page. At the top of the page, in the app bar, there will be the profile image and full name of the person the current user is having the conversation with. The body content of the page will display a list of chat messages exchanged between the current user and the other user. At the bottom of the page, there will be a text field where the user can input their message. On the right side of the text field, there is a paperclip icon, which, when clicked, allows the user to select and attach an image. Additionally, at the far right of the bottom of the page, there is a paper plane icon. Once clicked, this icon sends the message, and the message will be displayed in the chat list.

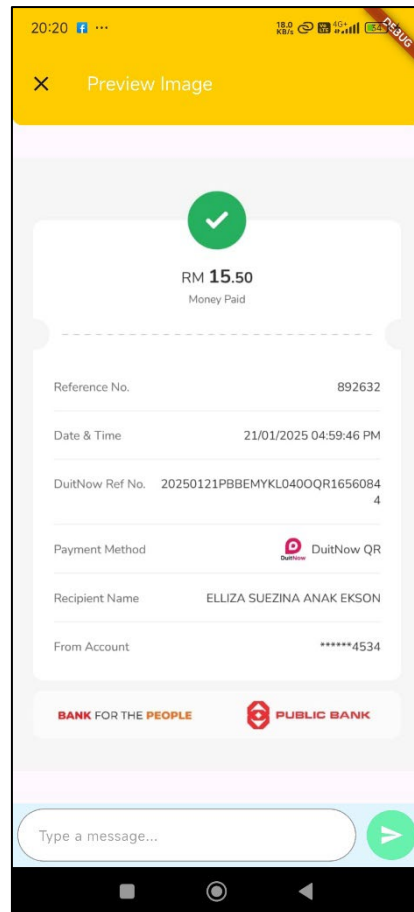


Figure 4.18: Preview Image page

Figure 4.18 shows the preview image page when the user wants to attach an image in their chat. On this page, there is an ‘X’ button at the top left corner, which allows the user to discard the attached media and message. At the bottom of the page, there is a text field where the user can input a message if needed. Aligned with the text field on the far right of the bottom of the page, there is a paper plane button. When clicked, this button sends the image along with the message to the other user, and the content will be displayed in the chat list.

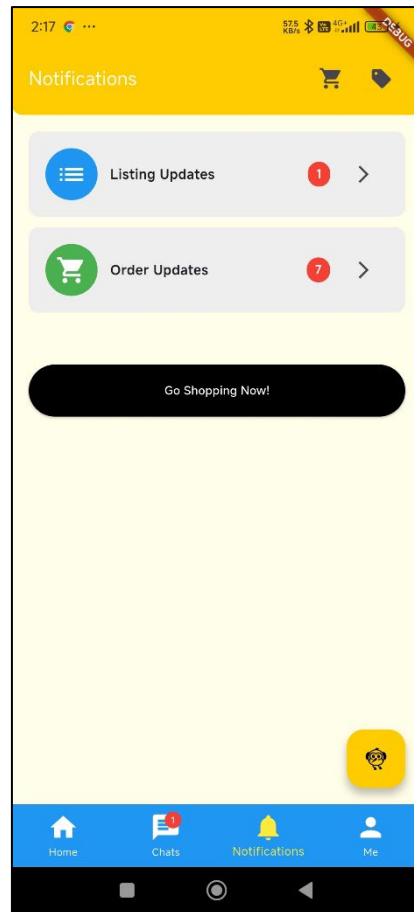


Figure 4.19: Notifications Page

Figure 4.19 illustrates the notifications page, where users are notified of any updates related to listings or orders. Each update has its own container, displaying the number of incoming notifications that have not been seen yet. Below each container, there is a "Go Shopping Now" button, which, when clicked, redirects the user to the home page. Furthermore, there is also a floating AI chatbot button, which allows the user to interact with the AI chatbot. At the app bar, there are icons for the cart and creating a listing. Each button, when clicked, performs its respective function: viewing the cart or creating a new sell listing. Lastly, at the bottom of the page, there is a bottom navigation bar with icons for Home, Chats, Notifications (currently active), and Me. Clicking on any of these icons will navigate the user to the corresponding page.

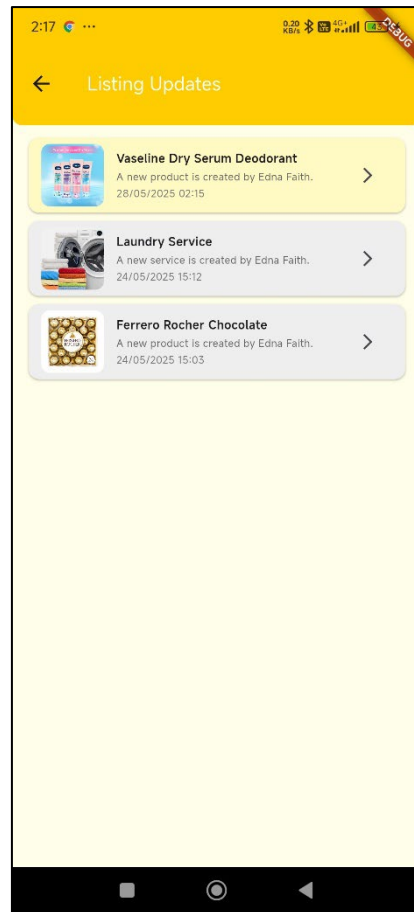


Figure 4.20: Listing Updates List Page

Figure 4.20 illustrates the Listing Updates List page, which displays notifications whenever a new listing is created. These notifications are coloured red to indicate that they have not been seen by the user. When the user clicks on the notification, its colour will change to grey, and the user will be redirected to the listing details page, where the details of the listing are displayed.

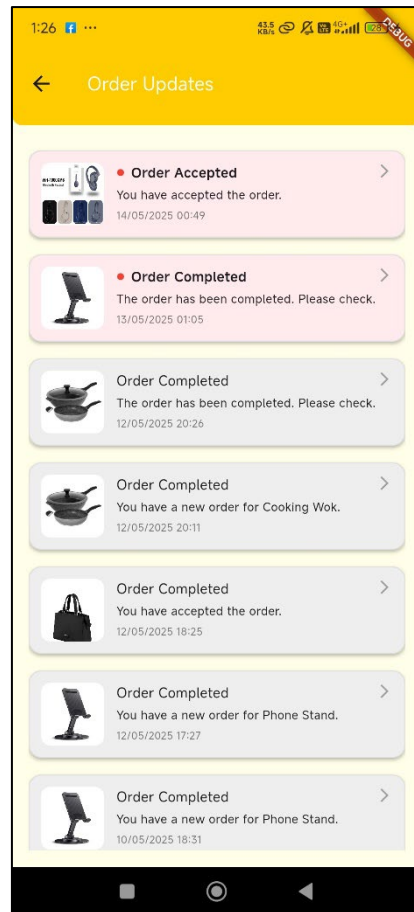


Figure 4.21: Order Updates List Page

Figure 4.21 illustrates the Order Updates List page, which displays a list of notifications whenever there is a new update regarding the order status. This page keeps the user informed about the status of their orders. Each notification is displayed in a container, which includes the product or service image, status, notification message, and the date and time of the notification. The container will be coloured red if the notification has not yet been seen by the user and will change to grey once clicked. Each notification, when clicked, will direct the user to the corresponding page based on the order status.

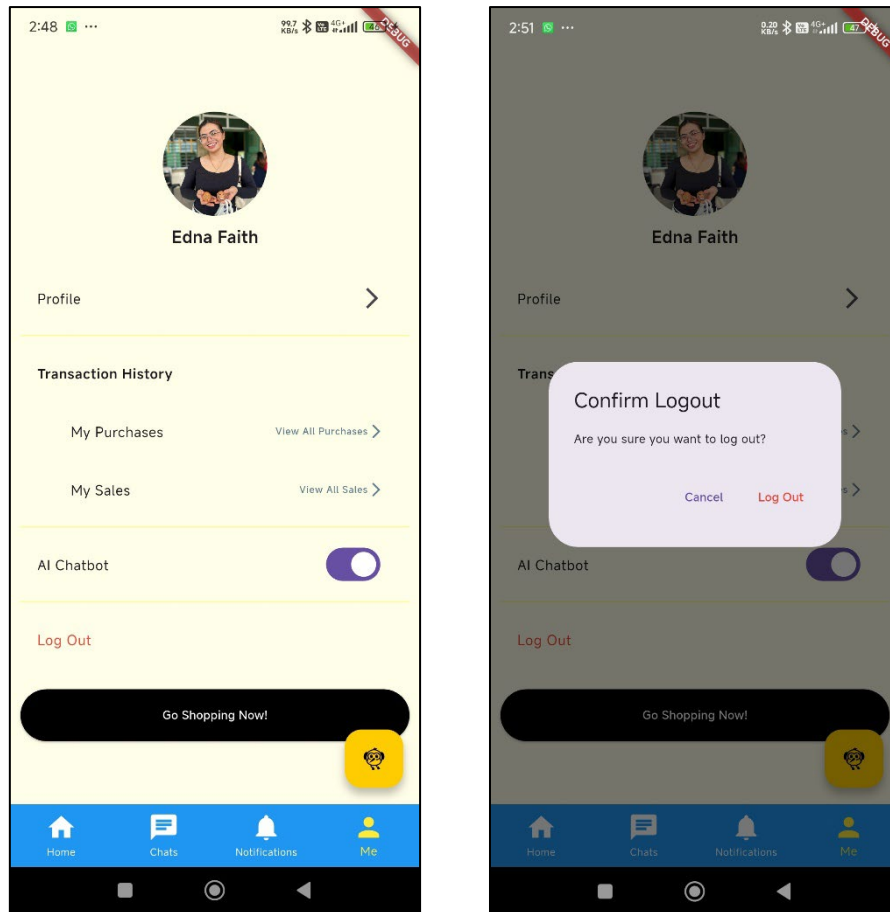


Figure 4.22: Me page

Figure 4.22 illustrates the "Me" page, which displays the user's profile information, including their profile picture, full name, and a clickable list tile that allows the user to access their profile details when clicked. Below the profile section, there are two options for the user to view their transaction history: "My Purchases" and "My Sales," each with a corresponding button to view all purchases or sales history and updates. Furthermore, there is a toggle switch for the "AI Chatbot," which allows the user to enable or disable the chatbot feature. Other than that, below the chatbot toggle, there is a "Log Out" option in red, which, when clicked, logs the user out of their account and redirects them to the login page. The page also features a "Go Shopping Now" button, which leads the user to the home page once clicked. Lastly, at the bottom of the page is a navigation bar with icons for Home, Chats, Notifications, and Me, with the "Me" tab currently active.

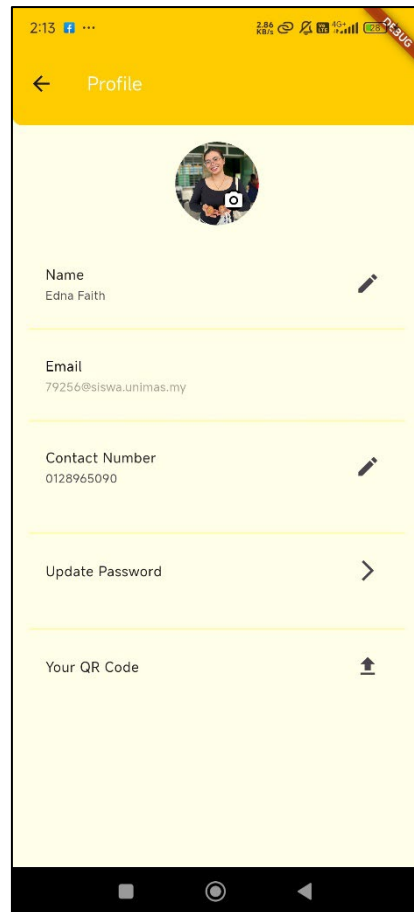


Figure 4.23: User's Profile Page

Figure 4.23 showcases the user profile page, where users can view and update their personal details as needed. The page features the user's profile image, which can be easily edited by clicking on the image icon. Below the profile image, users can edit their name and contact number by clicking the edit icon, allowing them to make changes as required. The email address, however, is non-editable, as it must be a verified UNIMAS email address, making it permanent. Additionally, the page allows users to update their password and upload a QR code. The QR code is only necessary if the user is a seller or has created any listings within the app.

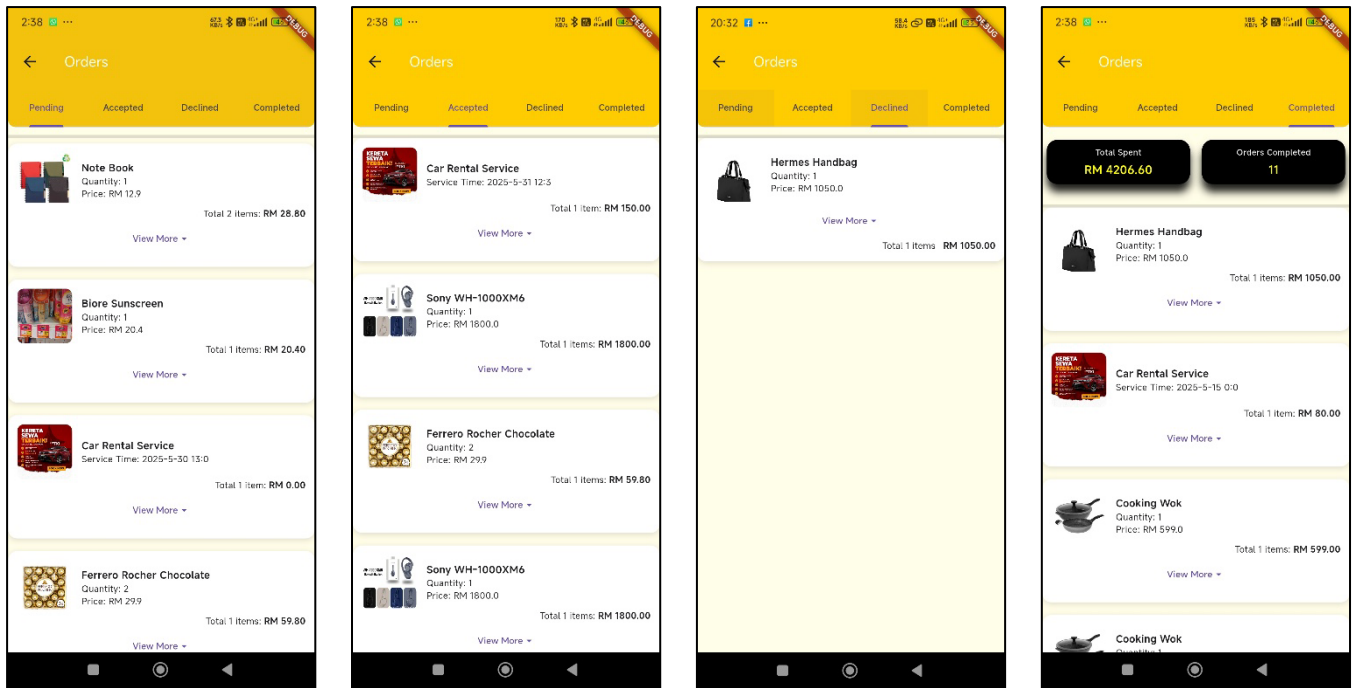


Figure 4.24: My Purchases Tracker Page

Figure 4.24 displays the purchase tracker page, which allows users to monitor the status and history of all their purchases. The page contains four tabs which is Pending, Accepted, Declined, and Completed. Each tab displays a list of the user's purchase listings according to their status. When the user clicks "View More" on any listing, further details about the purchase are shown. In the "Completed" tab, two containers are placed between the tab and the purchase listings. These containers track the user's total spending and the number of completed purchases. Through this page, the users are enabled to track their transactions and expenses easily.

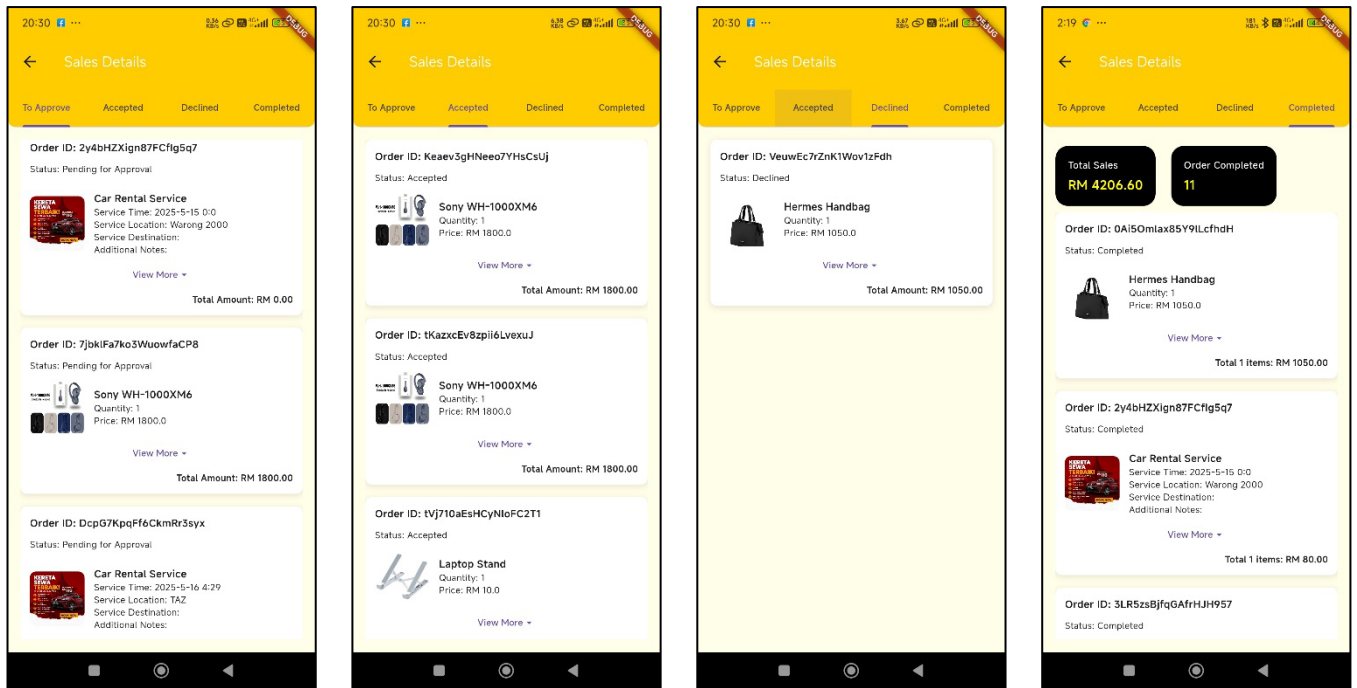


Figure 4.25: Sales Tracker Page

Figure 4.25 illustrates the sales tracker for the seller's side, where sellers can approve or decline orders and track all their sales. The page consists of four tabs: To Approve, Accepted, Declined, and Completed. Each tab displays a list of orders based on their status. When the seller clicks the "View More" button on a sales listing, further order details are displayed, and the seller can choose to approve or decline orders in the "To Approve" tab. The seller is required to provide additional information when clicking either the approve or decline button. Furthermore, in the "Completed" tab, there are two containers at the top of the page, which display the seller's total sales and the number of completed sales. This page enables the seller to easily track all their sales and income.

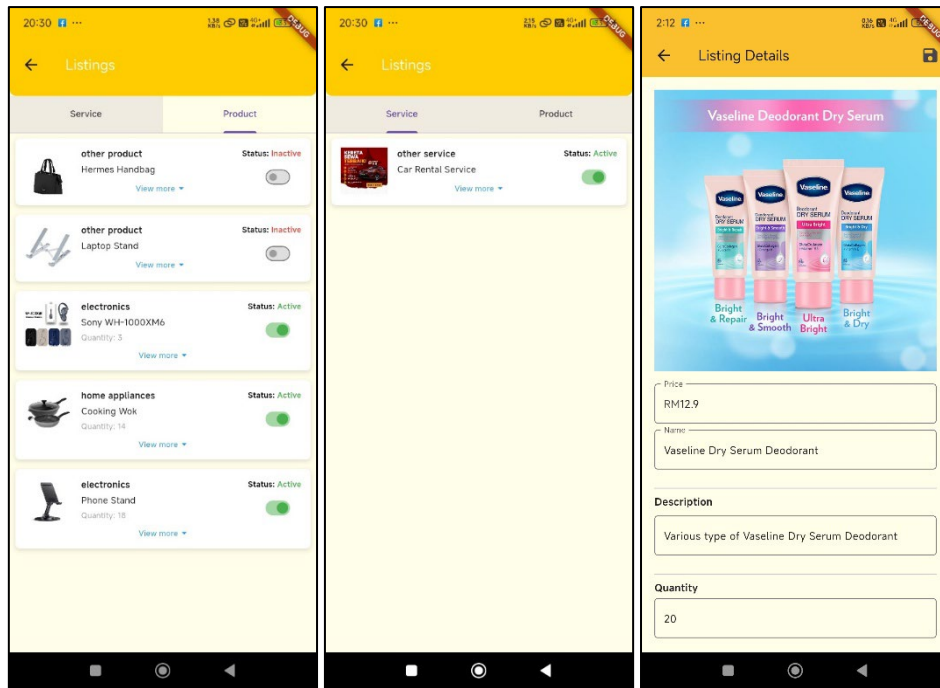


Figure 4.26: Listing Lists Page

Figure 4.26 displays the list of listings created by the user. The page consists of two tabs: Service and Product, with each tab displaying the respective lists of services and products. Moreover, this page allows the user to change the status of each listing to either active or inactive. The active/inactive function ensures that services or products that are unavailable are removed from the home page. Other than that, when the user clicks "View More" on any listing, further details about the list will be shown and the user next are allowed to make modification on the details. Through this page, the user can effectively manage the listings they have created, both for services and products.

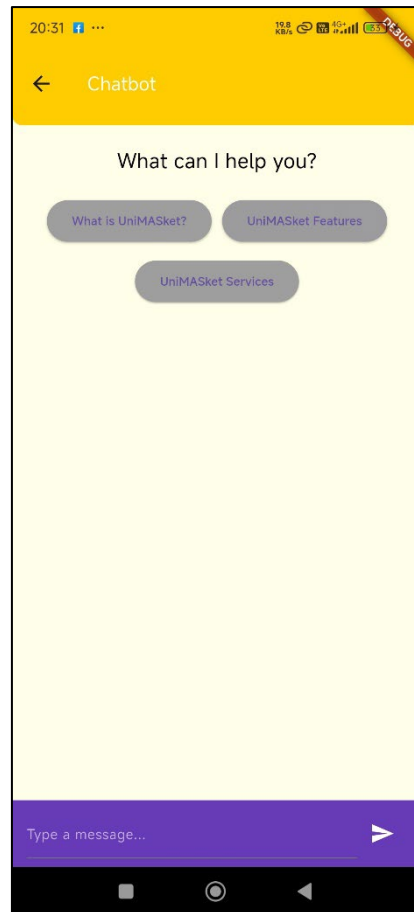


Figure 4.27: AI Chatbot Interface

Figure 4.27 shows the interface of the AI chatbot. On this page, the user can prompt a question, and the chatbot will respond based on the inquiry. Other than that, there is a list of frequently asked topics, which the user can click on if the topic matches their question. The chatbot's primary function is to guide users on how to navigate and use the *UniMASket* app.

4.4 Discussion

The development of the *UniMASket* application was structured using a modular approach, where the system was divided into several key components. This modular design played a critical role in ensuring that each feature was independently manageable, testable, and reusable. Each of these modules will serve a specific purpose and next contributed to the overall functionality of UNIMAS student marketplace platform.

The *UniMASket* application is decomposed into 12 modules, which is the Login, Register, Home Page, Listing Management, Shopping Cart, Checkout, Chat, Notification, User Profile, Transactions History, AI Chatbot, and Logout. The first 2 module which is Login and Register, are responsible for handling user authentication and account creation. These modules play a crucial role in ensuring only authorised user can access to the application, and only users with UNIMAS email address are allowed to create a new account. By separating these functionalities into dedicated modules, it becomes easier to manage user access and security.

The next module is Home Page, where this module act as the main interface of the application. This module provides registered users with access to all primary features including browsing item listings, viewing categories such as New, Products, and Services, and using quick action buttons for search, cart, and listing creation. This module is designed to give users a smooth navigation experience and serves as the starting point for all user actions within the application.

Furthermore, the Listing Management module. This module enables the users to create, edit, and deactivate product or service listings. Each listings requires specific details such as listing name, description, category, condition (for products), quantity, price and image before it can be published. Users can also update these details at any time in order to keep their listings accurate and up to date. Not only that, but users are also able to toggle the status of their listings between active and inactive, allowing them to control which listings are visible to others on the application. This module plays a vital role in ensuring that seller can keep their product or service offerings up to date and relevant.

Moreover, the Shopping Cart module provides users with the ability to manage items they intended to purchase or book. Items in the cart are divided into two categories which is products and services. This module allows users to select specific items, update quantities, or remove items before proceeding to checkout. The cart page also displays total price calculations and support item selection for efficient batch checkout.

The Checkout module next is designed to handle the process of placing an order for product or booking a service. It allows users to review their order details and input any further necessary information before proceeding with order and booking. This module helps to ensure a complete and clear checkout process tailored to the type of item.

Next, the Chat module. This module facilitates direct communication between buyers and sellers, where user is able to send messages, attach images, and view chat history within a dedicated chat interface. This module plays an important role in supporting negotiations, clarifications, and updates between users, especially before confirming transactions and order payments. Integrating chat as a separate module allows a real-time interaction while also keeping communication records organised and accessible.

Other than that, the Notification module that is used to inform users of updates related to their orders and new listings. Notification is divided into two categories which is listing updates, and order updates. Each notification is displayed in a container that highlights unread updates and redirects the user to the relevant page when it is clicked. This module enhances user awareness and keeps them informed on the real-time updates.

The User Profile modules next allow users to view and manage their personal information such as full name, contact number and profile image. It also includes functions for changing passwords, uploading QR codes for sellers, and toggling chatbot assistance. The module is important for maintaining user identity, and its separation allows personalisation features to be managed efficiently.

Moreover, the Transaction History module. This module is split into two parts which is My Purchases and My Sales. This module enables the users to track and manage their previous orders and sales. Each transaction is categorised into tabs such as Pending /To Approved, Accepted, Declined, and Completed. Each tab is functioning to give user clear visibility of their transaction statuses. In addition, the module also displays total spending and sales metrics, which is a very helpful features for users to keep monitoring their activities within the app.

The AI Chatbot module, on the other hand, integrates an AI-powered chatbot that provides the users with automated assistance within the application. It allows users to received real-time responses to frequently asked questions, which help to guide them through the platform's features and offers support for common issues. The chatbot plays a vital role in ensuring the users to receive a quick and efficient help, thereby enhancing their overall experience.

Lastly, the Logout module. This module ensures a secure process for users to exit their accounts within the application. By logging out, users can safely terminate their session, ensuring that all sensitive data is cleared from the application. This functionality is essential for safeguarding user privacy and securing personal information, especially when using public or shared devices. The separation of the logout feature into its own module guarantees that users can easily and reliably sign out of their accounts while maintaining a high level of security at all times.

In conclusion, the modular breakdown of *UniMASket* supports a structured development process and ensures each feature is independently functional and easy to manage. This design not only improves the maintainability and scalability, but it also sets a strong foundation for the testing phase in the next chapter, where each of these modules will be evaluated based on their usability, functionality, and user satisfaction.

4.5 Conclusion

In conclusion, the implementation phase of the *UniMASket* application has been accomplished by developing and integrating all the core modules necessary to support a functional and user-friendly e-marketplace for UNIMAS community. Using Flutter as the frontend framework, the development of a responsive mobile interface was enabled, whereas Firebase provided reliable backend services for real-time management and user authentication. The integration of Dialogflow further enhanced the application by introducing an AI chatbot that is capable of guiding users and answering frequently asked questions.

All of the module, including the login, registration, listing creation, shopping cart, checkout, chat, notifications, and transaction tracking, was implemented based on the proposed design and contributes to the overall functionality and reliability of the application. The modular development approach ensured that each feature was independently manageable and scalable, making the system is easier to maintain and expand in the future.

Additionally, this implementation stage also provides a solid foundation for the next phase of the project. Chapter 5 will focus on testing the application in order to evaluate the system functionality, performance, and user satisfaction. The outcomes from the testing phase will validate the effectiveness of the implementation features and highlight opportunity for further refinement.

Chapter 5: Testing

5.1 Introduction

This chapter emphasizes on the testing phase of the proposed application, *UniMASket: UNIMAS Marketplace Application with AI chatbot Integration* and it is one of the most crucial phases in the Waterfall Methodology. This chapter will make sure that all the functional requirements and objectives of the *UniMASket* app are fulfilled through the functional testing, where well-defined test cases are used to verify that each feature of the application performs as expected before it is released to the public.

5.2 Functional Testing

Functional testing provides the feedback, confirmation, and motivation that a quality assurance team need to produce successful software product. It will involves testing each function in *UniMASket* to ensure it works correctly. The testing will be done based on the 12 modules that make up the core features of the application, where each modules has its own set of test cases designed to validate its specific functionality. Below is the list of the 12 modules.

- Register
- Login
- Home Page
- Listing Management
- Shopping Cart
- Checkout
- Chat
- Notifications
- User Profile
- Transaction History
- AI Chatbot
- Logout

5.2.1 Test Cases

A test case is a set of actions performed on a system to determine if it satisfies software requirement and functions correctly. Test case was the fundamental building block of the testing process (Almog & Heart, 2009). Test cases are crucial in development process because it ensure an application functions as expected, helping in identifying errors, and help maintaining the application quality before releasing it to the market.

Table 5.1: Test case for user registration

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Register Module		Pre- Requirement	User is not registered.	
Test Title	User Register				
Objective	To test whether only user with UNIMAS email address is allowed to register.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU01	User register with valid UNIMAS email address.	1. Launch the application. 2. Press register, and fill in the full name, valid UNIMAS email address, password, and contact number. 3. Press register button.	User with valid UNIMAS email address should be able to register, and a verification link is sent to their corresponding email for further verification.	As expected.	Pass
TU02	User register with non UNIMAS email address.	1. Launch the application. 2. Press register, and fill in the full name, non-	User is unable to register the account. An error message “Please enter a valid email	As expected.	Pass

		UNIMAS email address, password, and contact number. 3. Press register button.	address (@unimas.my or @siswa.unimas.my) will be shown below the text field.		
TU03	User register without inputting any data	1. Launch the application. 2. Press register and leave every text field empty. 3. Press register button.	User unable to register their account. An error message will appear, stating that the text field cannot be empty.	As expected.	Pass
TU04	User register with invalid password and contact number.	1. Launch the application. 2. Press register and enter invalid password and contact number. 3. Press register button.	User unable to register their account. An error message will appear below the text field, stating the requirements that need to be fulfilled for that particular field.	As expected.	Pass

Table 5.2: Test case for user login

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Login Module		Pre- Requirement	User is registered.	
Test Title	User Login				
Objective	To test whether the user is directed to the correct page after login.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU05	User login with valid credentials	1. Launch the application. 2. Press login and fill in the UMIMAS email address and password. 3. Press login button.	User able to log in and has the access to home page.	As expected.	Pass
TU06	User login with invalid credentials	1. Launch the application. 2. Press login and fill in the text field with invalid credentials. 3. Press login button.	User is unable to log in, and error message appears stating “Invalid email or password”.	As expected.	Pass

TU07	User login with unverified UNIMAS email address	1. Launch the application. 2. Press login and fill in the email field with unverified UNIMAS email address. 3. Press login button.	User is unable to log in. A dialog box will appear stating that “Email is not verified” and ask the user to check their email inbox for verification link.	As expected.	Pass
TU08	User login with non-registered credentials	1. Launch the application. 2. Press login and fill in the email field with valid but not yet registered UNIMAS email address. 3. Press login button.	User is unable to log in	As expected.	Pass

Table 5.3: Test case for View Home Page

Part A: Project Information			
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration	Designed by	Edna Faith Anak Ekson
Module Name	Home Page Module	Pre- Requirement	User is login.
Test Title	Home Page		

Objective		To test whether the user is able to access to home page after successfully login.			
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU09	User browses through product and services available under the Home tab, after they successfully login.	1. Launch the application. 2. Press login and fill in the UMIMAS email address and password. 3. Press login button.	After login successfully, user will be able to access to home page and view the products and services available under the Home tab based on 3 categories (New, Products, Services).	As expected.	Pass
TU10	User clicks the search icon on the app bar and search items based on name.	1. Click the search icon on the app bar. 2. Enter the name of the item that they want to search for in the search bar.	A list of items is displayed based on the user’s input.	As expected.	Pass
TU11	User clicks the cart icon on the app bar and be navigated to their own shopping cart.	1. Click the cart icon on the app bar.	User will be navigated to their shopping cart.	As expected.	Pass

TU12	User clicks the sell icon on the app bar and be navigated to create listing page.	1. Click the sell icon on the app bar.	User will be navigated to the create listing page.	As expected.	Pass
TU13	User clicks the “See All” label in each listing category (New, Products, Services) to view items within that category.	1. Click the “See All” label for the New category. 2. Click the “See All” label for the Products category. 3. Click the “See All” label for the Services category.	User will be directed to a page displaying all the items under the selected category.	As expected.	Pass
TU14	User clicks the floating AI button and communicates with the AI Chatbot.	1. Click the floating AI Chatbot button.	User will be directed to the Chatbot page and ask question to the AI Chatbot.	As expected.	Pass
TU15	User clicks on the available item displayed and view its details.	1. Click on any available item displayed on the home page.	User will be navigated to the item details page, where all relevant information for the selected item is displayed.	As expected.	Pass

Table 5.4: Test case for Filtering Item

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Home Page Module		Pre- Requirement	User is login.	
Test Title	Filtering Item				
Objective	To test whether the user is able to filter item correctly based on selected criteria and view the filtered result accurately.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU16	User filters items based on name.	1. Click on the “See All” label for any category on the home page (may refer to test case TU13). 2. Click on the search bar or search icon. 3. Enter the desired item name.	User is able to enter the name of the desired item in the search bar and view a list of items displayed based on their input.	As expected.	Pass
TU17	User filters items based on selected criteria	1. Click on the “See All” label for any category on	The filter options panel appears, and the user is able	As expected.	Pass

		the home page (may refer to test case TU13). - Click on the filter icon on the app bar. - Select the filter options based on the desired criteria. - Click apply filter.	to select the desired filtering criteria. Once the user clicks Apply Filter, a list of items matching the selected filter criteria will be displayed.		
TU18	User clicks on the filtered item and view its details.	1. Click on a filtered item displayed.	User will be navigated to the item details page, where all relevant information for the selected item is displayed.	As expected.	Pass

Table 5.5: Test case for Create New Listing

Part A: Project Information			
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration	Designed by	Edna Faith Anak Ekson
Module Name	Listing Management Module	Pre- Requirement	User is login.
Test Title	Listing Creation		

Objective		To test whether the user is able to create new listing.			
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU19	User creates a new listing with valid input.	1. Click on the “Sell” icon on the home page app bar. 2. Select the type of listing to create (product or service). 3. Enter the required details on the create listing page. 4. Click the “Submit Listing” button.	User is directed to the listing creation page, and able to select the listing type, entered the required details, and successfully create listing after clicking the “Submit Listing”	As expected.	Pass
TU20	User attempt to create a new listing with some required fields left empty.	1. Click on the “Sell” icon on the home page app bar. 2. Click the “Submit Listing” button without filling in all required fields	Missing input fields will be highlighted in red, and an appropriate error message will be displayed below each field with missing values.	As expected.	Pass

Table 5.6: Test case for Manage Listing Created

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Listing Management Module		Pre- Requirement	User is login and has at least created one listing.	
Test Title	Listing Management				
Objective	To test whether the user is able to view and manage their previously created listings.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU21	User views all the listings (both products and services) that they have created.	1. Click on the “Me” option in the bottom navigation bar. 2. Click “My Sales” under the transaction history option. 3. Click on “Listings” option.	User is directed to the page displaying all their previously created listings, categorised under Service and Product tab.	As expected.	Pass

		4. Select either the Service or Product tab under the listings page.			
TU22	User changes the status of the listings.	1. Perform the test procedure outlined in TU19. 2. Click on the status toggle.	The listing status (active or inactive) will be changed accordingly. If the listing is set to “inactive”, it will be removed from the available items displayed on the home page. If the listing is set to “active”, it will be displayed again.	As expected.	Pass
TU23	User updates the details of the listings.	1. Perform the test procedure outlined in TU19. 2. Click “View More" on any of the listing. 3. Click the “Edit” button located in the app bar. 4. Update the listing’s details.	User is able to successfully update the listing’s details.	As expected.	Pass

		5. Click the “Save” button in the app bar to apply changes.			
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Table 5.7: Test case for Shopping Cart Page

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Shopping Cart Module		Pre- Requirement	User is login.	
Test Title	Shopping Cart Page				
Objective	To test whether the user is able to view and manage their shopping cart.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU24	User accesses their shopping cart and views the items added to it.	1. Click on the “Cart” icon on the Home page app bar.	User able to view all items added to the cart, categorised under Products and Services.	As expected.	Pass

TU25	User edits the quantity of an item under “Product” category.	1. Click on the “Cart” icon on the Home page app bar. 2. Click the plus or minus button in the quantity section for the desired product.	User can successfully change the quantity of the product to the desired amount.	As expected.	Pass
TU26	User attempts to increase the product quantity beyond the available stock.	1. Click on the “Cart” icon on the Home page app bar. 2. Click the plus button in the quantity section repeatedly until the quantity exceeds the available stock.	An appropriate message is displayed within the product container, indicating the maximum available quantity for that specific product.	As expected.	Pass
TU27	User edits the service time for an item under the Service category.	1. Click on the “Cart” icon on the Home page app bar. 2. Click on the service time highlighted in blue. 3. Select the desired date and time. 4. Click “Ok” to confirm.	A date and time picker appears and allowing the user to select the desired service date and time. The selected date and time are then successfully updated in the cart page for that specific service.	As expected.	Pass

TU28	User removes items from the shopping cart.	1. Click on the “Cart” icon on the Home page app bar. 2. Select any item(s) from the shopping cart page. 3. Click the “Trash Bin” icon on the app bar.	The selected item(s) are successfully removed from the shopping cart.	As expected.	Pass
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Table 5.8: Test case for Checkout Page

Part A: Project Information						
Project Name		UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by Edna Faith Anak Ekson		
Module Name		Checkout Module		Pre- Requirement User is login and there is at least one item inside the Shopping Cart.		
Test Title		Checkout Page				
Objective		To test whether the user is able to checkout items and view checkout details before proceeding with ordering and booking				
Part 2: Test Case						
Test Case ID	Test Case Description		Test Procedure	Expected Result	Actual Result	Pass/Fail

TU29	User selects any products or services to proceed to checkout.	1. Click on the “Cart” icon on the Home page app bar. 2. Select any item(s) from the Products or Services category. 1. Click the “Checkout” button.	The total price of the selected items is calculated and displayed at the bottom of the shopping cart page. When the “Checkout” button is clicked, the user is directed to the checkout page.	As expected.	Pass
TU30	User attempt to checkout without selecting any items.	1. Click on the “Cart” icon on the Home page app bar. 2. Click on the “Checkout” button without selecting any items.	An error message will pop up, prompting the user to select items before proceeding to checkout.	As expected.	Pass
TU31	User attempts to checkout items from both Products and Services categories simultaneously.	1. Click on the “Cart” icon on the Home page app bar. 2. Select items from both Products and Services category. 3. Click the “Checkout” button.	A dialog box will pop up displaying an appropriate error message stating that the user can only checkout items from the same category.	As expected.	Pass

TU32	User checkout item(s) under Products category.	1. Click on the “Cart” icon on the Home page app bar. 2. Select item(s) under Products category. 3. Click the “Checkout” button. 4. Select the item collection option and payment method. 5. Click the “Place Order” button.	User successfully places an order for the selected product(s) and is directed to the order details page.	As expected.	Pass
TU33	User selects “Delivery” as the item collection option and attempts to place an order without entering the delivery address.	1. Click on the “Cart” icon on the Home page app bar. 2. Select item(s) under Products category. 3. Click the “Checkout” button. 4. Select the “Delivery” option for the item collection.	User is unable to place the order, and an appropriate error message is displayed under the delivery address field.	As expected.	Pass

		5. Click the “Place Order” button without entering the delivery address.			
TU34	User checkout item(s) under Service category.	1. Click on the “Cart” icon on the Home page app bar. 2. Select item(s) under Services category. 3. Click the “Checkout” button. 4. Fill in the Booking Details field if applicable. 5. Click the “Book Service” button.	User successfully books the selected service(s) and is directed to the order details page.	As expected.	Pass

Table 5.9: Test case for Chat Page

Part A: Project Information			
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration	Designed by	Edna Faith Anak Ekson
Module Name	Chat Module	Pre- Requirement	User is login.

Test Title	Chat Page				
Objective	To test whether the user is able to use all the functionalities in chat page.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU35	User views the list of chats with other users on the Chats page.	1. Click the “Chats” icon on the bottom navigation bar.	User is able to view a list of chats between themselves and other users.	As expected.	Pass
TU36	User views the chat details.	1. Click the “Chats” icon on the bottom navigation bar. 2. Click on any chat listed on the Chats page.	User is able to view all chat details and history with the selected contact.	As expected.	Pass
TU37	User sends a message to another user.	1. Click the “Chats” icon on the bottom navigation bar. 2. Click on any chat listed on the Chats page. 3. Enter a message into the text field at the bottom of the chat page. 4. Click the “Send” button.	User is able to successfully send a message to the selected contact.	As expected.	Pass

TU38	User attaches an image to the message being sent.	1. Click the “Chats” icon on the bottom navigation bar. 2. Click on any chat listed on the Chats page 3. Click the paperclip icon inside the text field. 4. Select an image from gallery. 5. Enter a message into the text field, if applicable. 6. Click the “Send” button.	User is able to select and preview the image, then send it with or without a message to the selected contact.	As expected.	Pass
TU39	User deletes a message within the chat details.	1. Click the “Chats” icon on the bottom navigation bar. 2. Click on any chat listed on the Chats page. 3. Tap and hold the message to be deleted. 4. Click “Delete” in the dialog box.	A confirmation dialog box appears asking the user to confirm deletion. The user can successfully delete the selected message upon clicking the “Delete” button.	As expected.	Pass

Table 5.10: Test case for Notification Page

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Notifications Module		Pre- Requirement	User is registered.	
Test Title	Notifications Page				
Objective	To test whether the user is able to view notifications related to new listing and order updates.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU40	User views notification categories (Listing Updates and Order Updates) on the Notification page.	1. Click the “Notification” icon on the bottom navigation bar. 2. Select the desired notification category.	User is able to view all notifications based on the selected category (Listing Updates or Order Updates).	As expected.	Pass
TU41	User views notifications under Listing Updates.	1. Click the “Notification” icon on the bottom navigation bar. 2. Click “Listing Updates”	User is able to receive notifications and view a list of updates on newly created listings.	As expected.	Pass

TU42	User views notifications under Order Updates.	1. Click the “Notification” icon on the bottom navigation bar. 2. Click “Order Updates”	User is able to receive notifications and be informed of all updates or status changes related to orders placed (buyer) and received (seller).	As expected.	Pass
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Table 5.11: Test case for View and Manage User Profile

Part A: Project Information					
Project Name		UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson
Module Name		User Profile Module		Pre- Requirement	User is registered.
Test Title		View and Manage User Profile			
Objective		To test whether the user can view and manage their profile details.			
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU43	User views their personal information.	1. Click the “Me” icon on the bottom navigation bar.	User is able to view their personal data, including	As expected.	Pass

		2. Click “Profile”.	profile image, name, email, contact number, and QR code.		
TU44	User edits their personal information.	1. Click the “Me” icon on the bottom navigation bar. 2. Click “Profile”. 3. Click “Edit Icon” next to the personal detail they want to update. 4. Enter the new information. 5. Click “Save”	User is able to successfully update their personal data, including profile image, name, contact number, and QR code.	As expected.	Pass
TU45	User updates their password.	1. Click the “Me” icon on the bottom navigation bar. 2. Click “Profile”. 3. Click “Update Password” on the Profile page. 4. Enter Old password. 5. Enter the New Password and confirm it by entering it again. 6. Click “Update”	User is able to successfully change their password.	As expected.	Pass

Table 5.12: Test case for Tracking Purchase Transaction

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Transaction History Module		Pre- Requirement	User is registered and has made at least one order or booking.	
Test Title	Track Purchase Transactions				
Objective	To test whether the user can view their purchase order and track their purchase transaction.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU46	User views all their purchase orders and tracks them by order status tabs (Pending, Accepted, Declined, Completed).	1. Click the “Me” icon on the bottom navigation bar. 2. Click “My Purchases” on the Me page.	User is able to view and track all their purchase orders categorised by status tabs (Pending, Accepted, Declined, Completed).	As expected.	Pass
TU47	User views the purchase order details.	1. Perform steps 1 until 2 outlined in TU45. 2. Click on any status tab (Pending, Accepted, Declined, Completed).	User is able to view the details of the selected purchase order.	As expected.	Pass

		3. Click “View More” on the desired orders.			
TU48	User updates the purchase order status and notifies the seller once the order is received.	1. Perform steps 1 until 2 outlined in TU45. 2. Click on the “Accepted” tab. 3. Click “View More” on the order that has been received. 4. Click “Order Received” button. 5. Click “Yes” on the order received confirmation dialog box.	User is able to click the “Order Received” button, update the order status, and notify the seller through the notification page.	As expected.	Pass
TU49	User tracks their total amount spent and the total number of completed orders.	1. Perform steps 1 until 2 outlined in TU45. 2. Click on the “Completed” tab.	User is able to view and track their total amount spent and the number of completed orders.	As expected.	Pass

Table 5.13: Test case for Tracking Sales

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	Transaction History Module		Pre- Requirement	User is registered and has created at least one listing.	
Test Title	Track Sales				
Objective	To test whether the user can track their sales.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU50	User views all the orders received and tracks the order categories by order status tab (To Approve, Accepted, Declined, Completed).	1. Click the “Me” icon on the bottom navigation bar. 2. Click “My Sales” on the Me page. 3. Click “Sales” on My Sales page. 4. Navigate through each tab to view all the orders based on their current status.	User is able to view and track all their orders categorised by status tabs (To Approve, Accepted, Declined, Completed).	As expected.	Pass

TU51	User views the order details.	4. Perform steps 1 until 3 outlined in the TU49. 5. Click on any status tab (To Approve, Accepted, Declined, Completed). 6. Click “View More” on the desired orders.	User is able to views the details of the order.	As expected.	Pass
TU52	User accepts an order received under the Products category.	1. Perform steps 1 until 3 outlined in the TU49. 2. Click on the “To Approve” tab. 3. Click “View More” on the desired order that belong to Products category. 4. Click the “Accept” button. 5. Enter the required information, such as pickup location and time, in the appropriate fields in the dialog box. 6. Click “Send”	User is able to accept the order received under the Products category, enter the required information, and, once the “Send” button is clicked, all the details (pickup location, time, and QR code if the payment method is selected as QR code) will be sent to the buyer via chat, and the buyer is also notified of the order update through a notification.	As expected.	Pass

TU53	User accepts an order received under the Services category.	1. Perform steps 1 until 3 outlined in the TU49. 2. Click on “To Approved” tab. 3. Click “View More” on the desired order that belongs to Services category. 4. Enter seller notes, if applicable, and the order total. 5. Click the “Accept” button.	User is able to record notes on the service details for future reference, along with the order total. Once the “Accept” button is clicked, a message containing the service time and total price is sent to the buyer via chat, and the buyer is also notified of the order update through a notification.	As expected.	Pass
TU54	User declines the order received (for both Products and Services).	1. Perform steps 1 until 3 outlined in the TU49. 2. Click on “To Approve” tab. 3. Click “View More” on the desired order. 4. Click the “Decline” button. 5. Enter the reason for declining the order.	User is able to decline the order and enter a reason for declining. Once the “Send” button is clicked, the reason for declining the order is sent to the buyer via chat, and the buyer is notified of the order update through a notification.	As expected.	Pass

		6. Click “Send”			
TU55	User tracks their total sales and the total number of completed orders.	1. Perform steps 1 until 3 outlined in the TU49. 2. Click on “Completed” tab.	User is able to view the total sales and the number of completed orders.	As expected.	Pass

Table 5.14: Test case for Assistance from AI Chatbot

Part A: Project Information					
Project Name	UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by	Edna Faith Anak Ekson	
Module Name	AI Chatbot Module		Pre- Requirement	User is login and enable the AI chatbot.	
Test Title	Receive Assistance from AI Chatbot				
Objective	To test whether the user is able to receive assistance from AI Chatbot.				
Part 2: Test Case					
Test Case ID	Test Case Description	Test Procedure	Expected Result	Actual Result	Pass/Fail
TU56	User enables the AI chatbot.	1. Click the “Me” icon on the bottom navigation bar. 2. Toggle the button beside the AI Chatbot label.	User is able to enable and disable the AI chatbot functionality.	As expected.	Pass

TU57	User receives assistance from the AI chatbot.	1. Click the floating “AI Chatbot” button. 2. Select a pre-built FAQ topic or enter a question in the text field. 3. Click the airplane icon to submit the query.	The AI chatbot is able to respond to the queries, and the user receives assistance on how to use the application.	As expected.	Pass
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Table 5.15: Test case for Logout

Part A: Project Information						
Project Name		UniMASket: UNIMAS Marketplace Application with AI Chatbot Integration		Designed by Edna Faith Anak Ekson		
Module Name		Logout Module		Pre- Requirement User is login.		
Test Title		Logout				
Objective		To test whether the user is able to logout of the application.				
Part 2: Test Case						
Test Case ID	Test Case Description		Test Procedure	Expected Result	Actual Result	Pass/Fail

TU58	User logout of the application.	1. Click the “Me” icon on the bottom navigation bar. 2. Click “Log Out”	User able to log out of the application and directed to the login page.	As expected.	Pass
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5.4 Non-Functional Testing

Non-functional testing is equally important as functional testing, and it is a testing of a software application for its non-functional requirement (Samra, 2013). Instead of reviewing the system's functionality, it evaluates the *UniMASket*'s performance and usability. Non-functional testing involves testing the application's response time, reliability, scalability, and other non-functional aspects. Furthermore, this testing also evaluates the application's security measures, and the overall user experience.

For this non-functional testing, a questionnaire was provided in order to evaluate the UniMASket application's usability, performance, and reliability. The questionnaire consists of five main sections: demographic information, usability testing, performance testing, reliability testing, and user feedback. It employs both quantitative methods (using a 5-point Likert scale and close-ended questions) and qualitative methods (open-ended questions) to collect user feedback on their experience while navigating the UniMASket app. Users are required to complete the questionnaire while interacting with the application, and they are expected to answer all questions provided. The collected data will then be analysed, and the findings will be documented in this sub-chapter. These findings will help assess user perceptions of the app, identify key areas for improvement, and evaluate the application's readiness for real-world use.

5.4.1 Findings Analysis

The following sections will analyse the questionnaire findings regarding the usability, performance, and reliability of the UniMASket application, with a particular focus on how well the system meets its non-functional requirements and supports the overall project objectives. This analysis is based on the data obtained from 21 users' responses and is structured into five sections: Section A covers the demographic information to understand the user background; Section B to D is to evaluate the application's usability, performance, and reliability; Section E captures the feedback from users.

5.4.1.1 User Demographics

This section employed four closed-ended questions to gather the user's demographics information, including gender, college residential status, specific residence, and their experience in buying and selling items/services within the UNIMAS community. This analysis helps to verify the relevance of the app to its intended users and provides context for interpreting the usability, performance, and reliability testing.

Table 5.16: Demographic Information

Question 1: What is your gender?	
Male	47.6%
Female	52.4%
Question 2: Are you a college residential?	
Yes	66.7%
No	33.3%
Question 3: Which college are you in?	
Cempaka	9.5%
Rafflesia	38.1%
Sakura	19%
Non-Residential	33.3%
Question 4: Have you ever bought or sold items/services within the UNIMAS community?	
Yes	61.9%
No	38.1%

The demographic data indicated that there is a relatively balanced on the gender distribution, with 52.4% are female, and 47.6% are male users. This balance suggests that the app is designed and evaluated with inclusivity in mind. It supports the project objective of empowering all students, regardless of their gender, and next promote equal access to peer-to-peer opportunities.

Furthermore, it is also found that the majority of the respondents with 66.7% live in UNIMAS residential colleges (Rafflesia:38.1%, Sakura:19%, Cempake:9.5%), while the remaining 33.3% are non-residential students. Based on these results, it is shown that the majority respondents tested live on campus, which aligns well with *UniMASket's* target audience. Since campus resident are more likely to engage in local item purchases such as textbooks and daily essentials, this finding supports the project objective by ensuring the app serves the community it was designed for.

Lastly, 61.9% of respondents reported having experience in buying and selling within the UNIMAS community, meaning most are already engaged in informal student commerce. This highlights the need for a formal and secure platform like *UniMASket*. It directly supports

the project objective by validating existing peer-to-peer trading behaviour and demonstrating that the app can enhance and formalise this process.

5.4.1.2 Usability Testing

For the usability testing, the questionnaire has utilised 5-point Likert scale (where 1=Strongly Disagree and 5=Strongly Agree) in order to evaluate the user experience, especially focusing on the app's ease of use and user interface.

Table 5.17: Usability Testing Results

Usability Testing	Percentage score of the 5-scale Likert (1=Strongly Disagree, 5=Strongly Agree) (%)				
	1	2	3	4	5
The app was easy to navigate.	0	0	0	19	81
The user interface was visually appealing and consistent.	0	0	0	19	81
I was able to complete basic tasks (e.g., register, login, browse, add to cart) without help.	0	0	0	9.5	90.5
The AI chatbot was easy to interact with and provided helpful responses.	0	0	0	38.1	61.9
The layout, button labels, and icons were clear and understandable.	0	0	0	14.3	85.7
I did not experience any confusion or difficulty while using the app.	0	0	9.5	19	71.4

Based on the results obtained in Table 5.17, it is shown that the usability testing results show overwhelmingly positive responses. This indicates that the *UniMASket* app is well-received by its intended users. Firstly, a total of 81% of the respondents strongly agreed, and 19% agreed that the app was easy to navigate. The same percentage also found for the user

interface is visually appealing and consistent. These findings show that the usability and inclusivity were considered in the app's design, which next further supports the project's objective of empowering UNIMAS students through user-friendly platform for buying, selling, and trading.

Moreover, 90.5% respondents strongly agreed that they were able to complete basic tasks such as registration, login, browsing, and adding items to the cart without any assistance. This reflects the app's efficiency in enabling independent student engagement, aligning with the project's objectives, which aim to promote student financial well-being and ease of access to marketplace features.

As for the support features, 61.9% respondents strongly agreed and 38.1% agreed that the AI chatbot was easy to interact with and provided helpful responses. This demonstrates how effectively the chatbot works to provide real-time support, which supports the objective of streamlining transactions and reducing the need for external help.

Furthermore, 85.7% of respondents are strongly agreed and 14.3% agreed that the layout, button labels, and icons were clear and understandable. Besides, it is also found that 71.4% strongly agreed and 19% agreed that they experienced no confusion or difficulty while using the app, while 9.5% selected a neutral response. Although a small portion of respondents remained neutral, there is no respondents reported any disagreement, which indicating that overall, the app was generally perceived as clear and easy to use. This suggests that a high level of usability, which aligns with the *UniMASket* app objectives – ensuring that the app is not only functional but also accessible and comfortable to use for a diverse student population. These results also highlight that there is still a minor room for improvement in the future, particularly in guiding new users or enhancing onboarding experience.

5.4.1.3 Performance Testing

The performance testing employed 5-point Likert scale as well (where 1=Strongly Disagree and 5=Strongly Agree), focusing on the user experience related to the app's speed, responsiveness, and stability.

Table 5.18: Performance Testing Results

Performance Testing	Percentage score of the 5-scale Likert (1=Strongly Disagree, 5=Strongly Agree) (%)				
	1	2	3	4	5
The app loaded quickly when launched.	0	0	0	14.3	85.7
There were no noticeable delays while browsing, chatting, or checking out.	0	0	4.8	19	76.2
The app remained responsive even when switching between features.	0	0	0	14.3	85.7
I did not encounter any freezing or crashing while using the app.	0	0	0	9.5	90.5
The search and filter functions responded accurately and quickly.	0	0	4.8	9.5	85.7

The performance testing results illustrates in Table 5.18 indicate a highly positive user experience, with the majority of the respondents agreeing that the *UniMASket* app delivers a smooth and efficient user experience. It is identified that 85.7% of respondents strongly agreed and 14.3% agreed that the app loaded quickly upon launch, and an equal percentage also reported that the app remained responsive when switching between features. This highlights the app's fast load time and consistent responsiveness, which are crucial in order to maintain user engagement and satisfaction. Additionally, 90.5% of respondents strongly agreed that they did not encounter any freezing or crashing during usage, and this result demonstrating that the app is reliable and technically stable.

When it came to the key functions like browsing, chatting, and checking out, 76.2% strongly agreed and 19% agreed that there were no noticeable delays, with only a small 4.8% of the respondents selecting a neutral response. Similarly, 85.7% strongly agreed and 9.5% agreed that the search filter features responded accurately and quickly, with just 4.8%

remaining neutral. These results indicate that the app performs well under typical usage scenarios, offering a responsive and dependable environment for users.

This high level of performance directly supports the objective of the project, which focuses on streamlining and enhancing transaction efficiency through responsive features. Not only that, but the speed and stability of the app also contribute to the project's objectives by helping in generating additional income opportunities for students and at the same time ensuring that students (both sellers and buyers) can conduct transactions quickly, reliably, and without frustration. This is because, when an app run smoothly, users are more likely to use it frequently and confidently, which next increasing their chances of listing items, responding to buyers, and completing successful transactions. In turn, this creates a more active and trustworthy marketplace environment that supports student entrepreneurship and promotes sustainable financial practices within the UNIMAS community.

5.4.1.2 Reliability Testing

The reliability testing also use a 5-point Likert scale (where 1=Strongly Disagree and 5=Strongly Agree) to evaluate the users' experience on the reliability and integration of key features in the *UniMASket* app.

Table 5.19: Reliability Testing Results

Performance Testing	Percentage score of the 5-scale Likert (1=Strongly Disagree, 5=Strongly Agree) (%)				
	1	2	3	4	5
The registration and login process using a UNIMAS email was secure and worked as expected.	0	0	4.8	4.8	90.5
Real-time messaging and notifications worked as expected.	0	0	0	23.8	76.2
The transaction history displayed accurate and clearly organized records of my past transactions.	0	0	0	14.3	85.7

The AI chatbot helped me navigate through the app and locate features such as product listings, checkout, or transaction history.	0	0	0	38.1	61.9
My actions (e.g., editing profile, adding listings) were saved correctly.	0	0	0	14.3	85.7

According to the respondents' responses on the app reliability and integration of key features in table 5.19, it is observed that the results were also highly positive. This indicates that the app's core functionalities operated as expected and consistently delivered accurate outputs. It is shown that a total of 90.5% of respondents are strongly agreed that the registration and login process using UNIMAS email was secure and worked as expected, while the only 4.8% voted "4" and the remaining 4.8% choose neutral response. This results further supports the application's role in providing a secure, campus-specific platform, which directly aligns with the project's objectives where it aims to empower UNIMAS students through a dedicated and trusted marketplace environment.

Next, it is also recorded that 76.2% strongly agreed and 23.8% agreed that the real-time messaging and notifications functioned properly, and this indicates a reliable in app-communication. This real-time responsiveness strengthens the project's objective by facilitating efficient, transparent peer-to-peer transactions without the need for external communication tools like WhatsApp or Telegram. Besides that, 85.7% voted strongly agree that their transaction history was accurately recorded and clearly presented, which next resulting in the building user trust and transparency, where this is one of the keys to encouraging consistent buying and selling behaviours within the platform.

Furthermore, the AI chatbot feature also demonstrated a solid performance, with 61.9% of the respondents strongly agreeing and the remaining 38.1% agreeing that it helped them navigate the app and locate key features like product listings, checkout, transaction history and so on. This shows the successful integration of real-time virtual assistance, which next contributing to the main objective by offering accessible support and minimising friction in the user journey.

Lastly, the results shown that 85.7% respondents strongly agreed and 14.3% agreed that their actions such as profile edits and listing additions were saved correctly, which further proves that the app is reliable and works well when users perform common tasks they need to do regularly.

To sum up, these results show that the *UniMASket* app is not only functional but also highly reliable and well-integrated, which supports all three project objectives. It does empower students with a trusted platform, encourages entrepreneurial engagement through seamless selling and listing, and ensures smooth, transparent, and efficient transaction processes through stable system performance.

5.4.1.2 User Feedback

In this subsection, respondents' personal opinions and suggestions regarding their experience using the app during the session were gathered, analysed, and documented in Table 5.5. The questionnaire employed a 5-point Likert scale (where 1 = Strongly Disagree and 5 = Strongly Agree) to evaluate the app's best features. It also included closed-ended Yes/No questions to assess whether the app could help students generate income by selling items or services on campus, and whether features like the AI chatbot or in-app chat made the transaction process smoother or more convenient. In addition, three open-ended questions were included to gather respondent suggestions for further improvements, comparisons with similar existing apps they have used, and their confidence level in continuing to use the *UniMASket* app in the future.

Table 5.20: Percentage Score for User Opinions on App Features and Usefulness

Question 1: What features do you think worked best in the app?	
User registration and login	52.4%
Product/service listing	61.9%
Shopping cart and checkout process	85.7%
In-app chat	19%
AI chatbot support	47.6%
Notifications	23.8%
Transaction history	47.6%
User profile management	57.1%
Overall navigation and design	71.4%

Question 2: Do you think this app would help you (or other students) generate income by selling items or services on campus?

Yes	100%
No	0%

Question 3: Did the AI chatbot and in-app chat make your transaction experience smoother or more convenient?

Yes	90.5%
No	9.5%

Based on the results in Table 5.20, respondents highlighted several key features that contributed positively to their experience with the *UniMASket* app. The shopping cart and checkout process received the highest approval, with 85.7% of respondents selecting it as a top-performing feature. This shows that the app is effective in supporting smooth and efficient transactions, which aligns with the project's aim to provide a secure and supportive platform for peer-to-peer selling and buying among students.

Next, the overall navigation and design was also highly rated (71.4%), indicating that the app is user-friendly and accessible, which helps in empowering students to confidently use the platform. Features like product/service listing (61.9%), user profile management (57.1%), and user registration/login (52.4%) also received favourable responses, reflecting the app's ability to offer a well-integrated marketplace experience tailored to the UNIMAS community.

Moreover, although features such as the in-app chat (19%) and notification (23.8%) received lower scores, they are still contributing to the overall communication and usability of the app. These features may benefit from further improvements in order to enhance user engagement and responsiveness.

As for the "Yes" or "No" question on whether the app could help students generate income by selling items or services on campus, the results showed a perfect score (100%) for "Yes", indicating that all respondents agreed the app has strong potential to support students in generating income. This finding strongly supports the project's objective of enabling students to explore side-income opportunities and promoting student entrepreneurship within the university environment.

Furthermore, 90.5% of respondents agreed that the AI chatbot or in-app chat made the transaction process smoother and more convenient, while only a small percentage (9.5%) disagreed. This highlights the value of real-time assistance and in-app communication in improving the overall transaction experience and reducing dependence on external support, while also indicating some room for further improvement in user assistance features.

Table 5.21: User Feedback on App Improvements, Comparisons, and Continued Use

Question 4: What improvements would you suggest to make the app easier or more enjoyable to use?

- v. UI/UX Improvement
 - Suggestions included increasing font size, adding clearer navigation like return to homepage button and add clear instruction on where to click for selling.
 - vi. Chatbot Enhancement
 - Improving AI chatbot clarity and making it more advanced.
 - vii. Feature Additions
 - Features such as “Biometric Login”, and “Password recovery feature”
-

Question 5: Have you used similar e-marketplace apps before? How does this one compare?

- Easier and more suitable for students
 - Better impression on the chatbot
 - Focused on UNIMAS students only
-

Question 6: Do you feel confident in continuing to use this app in the future for buying or selling? Why or why not?

All responses were positive with reasons such as:

- Ease of use
 - Trusted community (UNIMAS-only users)
 - Secure transactions
 - Direct communication
 - Student convenience
 - Order tracking and confidence in sellers
-

Referring to the analysis of respondents’ feedback from the open-ended questions regarding suggested improvements, comparisons with similar apps, and their confidence in

continuing to use the UniMASket app—several key insights were identified. Respondents indicated the need for improvements in UI/UX, such as clearer navigation, larger font sizes, and more accessible selling features. These suggestions highlight the importance of creating a more intuitive and student-friendly platform that enables smooth buying and selling experiences. Not only that, but respondents also expressed the need to enhance the AI chatbot and implement features like biometric login and password recovery. This reflects respondents' expectations for a more efficient, secure, and responsive system that aligns with modern app standards.

Moreover, when compared to other e-marketplace platforms, respondents found UniMASket more suitable for students, particularly due to its UNIMAS-exclusive focus and better chatbot support. This underscores the app's strength in fostering a trusted environment and encouraging active engagement within the campus community.

Finally, all respondents expressed confidence in continuing to use the UniMASket app in the future, citing ease of use, platform reliability, and its relevance to student needs. These findings reinforce the project's aim of promoting student entrepreneurship, supporting side-income opportunities, and building a secure, campus-specific peer-to-peer marketplace within UNIMAS.

5.5 Summary

This chapter outlines the testing processes of the *UniMASket* application. The functional testing focusses on providing suitable input while verifying and comparing the output with the actual results and expected results, while non-functional testing, on the other hand, is used to test the overall readiness of the app by evaluating the application's overall readiness through its performance, reliability and usability. This chapter highlighted the importance of comprehensive testing in ensuring a high-quality, reliable, and user-friendly application.

Chapter 6: Conclusion and Future Works

6.1 Introduction

This chapter presents the overall summary of the project, including its achievement, limitations encountered during the project, and the recommended areas for further development or research. This chapters reflects on how the objectives sets at the beginning of the project have been address and discusses the significance of the results in relation to the problem statement. It also outlines the potential areas for further research and improvements that could enhance the application's functionality, performance, and user experience.

6.2 Project Achievement

UniMASket: UNIMAS Marketplace Application with AI chatbot Integration has been successfully developed to solve the problems faced, which are clearly stated in Chapter 1. Through the design, development, and testing of the *UniMASket* app, the challenges faced by UNIMAS students in peer-to-peer transactions were effectively addressed. The table below summarises each objective together with the corresponding accomplishment.

Table 6.1: UniMASket's objectives and achievement

Objectives	Achievements
To empower UNIMAS students by developing a mobile application that enables them to buy, sell, and trade items, and services, creating a secure, campus-specific marketplace that encourages a culture of sustainable resource sharing and supports students' financial well-being.	<i>UniMASket</i> , a secure and user-friendly mobile app tailored for UNIMAS students is successfully developed, and it able to facilitate buying, selling and trading within a campus-focused marketplace that promotes sustainability and financial support.
To generate additional income opportunities for students through a dedicated platform, where they can sell various items, such as textbooks and printing services, contributing to students' financial independence and aligning with UNIMAS's commitment to supporting student entrepreneurship.	The <i>UniMASket</i> application enabled students to list and sell a wide range of items and services, including textbooks and printing, and able to create a new income stream and encouraging entrepreneurship among the UNIMAS student community.

To streamline and enhance transaction efficiency by implementing in-app communication and real-time AI chatbot support, fostering transparency in peer-to-peer transactions and reducing the need for university involvement while improving student access to reliable support and communication tools.	The <i>UniMASket</i> application is integrated with a real-time in-app messaging and AI chatbot features, enhancing the communication, transparency, and support within the app, and thereby improving transaction efficiency and minimising reliance on university mediation.
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6.3 Limitation and Constraints

The *UniMASket* app has successfully fulfilled all the objectives and user requirements during its development. However, there are still a few inevitable limitations exist that may affect the project's scope and outcomes.

One of the limitations is the compatibility of platform and device. The app was developed and deployed exclusively on the Android platform using Firebase, with no versions currently available for iOS. Although Flutter, a cross-platform development framework was used in this project, the UniMASket application is still limited to Android due to the practical deployment constraints. Each mobile operating system (Android and iOS) is optimised for its own specific APIs and programming languages, making cross-platform deployment become more complex (Samra, 2013). Releasing an app on iOS requires access to a macOS environment, an Apple developer account, and additional configuration steps, which were outside the scope or resources of this project. Thus, this limits the access for users who own Apple devices and potentially excluding a portion of the UNIMAS student population, thereby reducing the overall reach and effectiveness of the app within the university community.

Next, network dependency. *UniMASket* application function with the need of the internet connectivity, which cause the app is unavailable or limited in a low-network environment. For example, the real-time features like messaging and AI chatbot require a stable internet connection. But due to this limitation, the app performance will degrade due to the poor connectivity. David (2021) states that when operating on a slow or unreliable network, mobile apps that rely entirely or partially on network access frequently experience performance problems, unexpected behavior, and communication delays, which ultimately make the program unusable.

Another limitation is on the AI chatbot. The AI chatbot is built on an intent and knowledge-based system using the FAQ documents, thus, limiting it to predefined questions and answers. This caused the AI chatbot is unable to handle a complex, ambiguous, or out-of-scope queries, and lacks the ability to learn or adapt automatically from interactions. Freire et al. (2024) highlighted in their study that intent-based systems frequently frustrate users who have to rewrite their queries in order to meet the chatbot's constrained scope since they are unable to adapt to changing user needs and struggle with the atypical conversation patterns.

Lastly, the constraints in the payment system. The *UniMASket* app payment system currently limited to QR code and Cash on Delivery (COD) only and does not support for credit or debit card payments or any other popular digital wallets. This lack of adaptability may impair user convenience and prevent adoption toward the application. This is because restricted payment methods, including the absence of credit/debit card and digital wallet options, act as a barrier to adoption and reduce user satisfaction (Johnson et al., 2018).

6.4 Future Works

Although the *UniMASket* app has been developed based on the survey obtained by the appropriate respondents, there is still room for further improvement and possible features in order to make the app better.

Firstly, future development of UniMASket app should focus on expanding the app beyond the Android platform by creating versions for the IOS devices. This would make the app able to reach a bigger audience regardless of their preferred device or operating system.

Next, the future work should also focus in enhancing the AI chatbot functionality by integrating advanced natural language processing and machine learning techniques. This will make the AI chatbot could better understand a more complex and ambiguous queries, as well as learn and adapt from user interactions over time, which next able to provides more effective and personalised support.

Furthermore, expanding the application's payment system by including more options such as credit and debit card payments, and popular digital wallets like S-Pay Global, E-wallets, GrabPay or PayPal. This will significantly increase user convenience and flexibility on the payment's options.

Moreover, developing offline functionality or caching features which would allow users to browse through listings and prepare transactions even without a stable internet connection.

This enhancement would greatly help in improving the app's usability, especially in areas with poor connection coverage.

Lastly, add user ratings and reviews feature where its application would allow the buyers and sellers to rate each other and leave reviews. This additional feature will help in building user trust and encourage a more positive user behaviour within the community.

6.5 Conclusion

In conclusion, the development of the *UniMASket: UNIMAS Marketplace Application with AI chatbot Integration* represent a significant step towards addressing the challenges faced by UNIMAS students in peer-to-peer transactions. The application has successfully provided a secure, efficient, and user-friendly platform tailored to the campus community by enhancing the communication, payment security, and overall marketplace experience. While there are still some limitations remain, the project lays a strong foundation for future improvements that will broaden accessibility, enhance AI support, expand the payment options, and next further fostering a safer and more convenient environment for student commerce.

REFERENCES

- About Carousell Group. (2020, September 7). Carousell Press. <https://press.carousell.com/carousell-group/>
- AI Chatbot. (2024). Google Cloud. <https://cloud.google.com/use-cases/ai-chatbot?hl=en>
- Alfarizi, & Sari, R. K. (2023). Adoption Of Cash on Delivery (COD) Payment System in Shopee Marketplace Transaction. *Procedia Computer Science*, 227, 110–118. <https://doi.org/10.1016/j.procs.2023.10.508>
- Algarni, F., Cheung, Y., & Lee, V. C. S. (2012). The Relationship between Complementary Services and Service System Value Creation: A Case Study of eMarketplaces in Saudi Arabia. *2012 Seventh International Conference on Knowledge, Information and Creativity Support Systems*, 211–215. <https://doi.org/10.1109/kicss.2012.16>
- Attar, R. W., Almusharraf, A., Alfawaz, A., & Hajli, N. (2022). New Trends in E-Commerce Research: Linking Social Commerce and Sharing Commerce: A Applicationatic Literature Review. *Sustainability*, 14(23), 16024. <https://doi.org/10.3390/su142316024>
- Banalieva, E. R., & Santoro, M. D. (2009). Local, regional, or global? Geographic orientation and relative financial performance of emerging market multinational enterprises. *European Management Journal*, 27(5), 344–355. <https://doi.org/10.1016/j.emj.2009.04.001>
- Bhattacharya, S., & Singla, B. (2024). The Role of QR Code Technology in Revolutionizing Banking. *Journal of Computers, Mechanical and Management*, 3(3), 36–45. <https://doi.org/10.57159/gadl.jcmm.3.3.240121>
- Bissada, A., & Olmsted, A. (2017). *Mobile multi-factor authentication*. <https://doi.org/10.23919/icitst.2017.8356383>
- Carousell Help Centre. (2021). Carousell.com. <https://support.carousell.com/hc/en-us>
- Carousell Malaysia. (2024). Carousell. <https://www.carousell.com.my/>
- Chatbot Terms of Service | Shopee MY Help Center. (2024). Shopee.com.my. <https://help.shopee.com.my/portal/4/article/158160-Chatbot-Terms-of-Service>

Chen, L. (2023). Effective Strategies for Attracting and Engaging Target Audiences in Today's Competitive Market. *Journal of Education Humanities and Social Sciences*, 16, 141–147. <https://doi.org/10.54097/ehss.v16i.9587>

David, S. A., Ravikumar, S., Ahamed, M. N., & Ramesh, R. (2021). Network Variability Impacts Mobile Application Performance. *Turkish Journal of Computer and Mathematics Education*, 12(9), 203-205

Dialogflow. (2024). Google Cloud. <https://cloud.google.com/dialogflow/docs>

Eren, B. A. (2022). QR code m-payment from a customer experience perspective. *Journal of Financial Services Marketing*, 29(1), 106–121. <https://doi.org/10.1057/s41264-022-00186-5>

Erickson, J. (2024, August 29). *MySQL: Understanding What It Is and How It's Used*. Oracle.com; Oracle. <https://www.oracle.com/my/mysql/what-is-mysql/>

Eshpulatovich, N. S. (2024). WAYS OF COMMERCIALIZATION OF YOUTH STUDENTS' ENTREPRENEURSHIP PROJECTS AND INCREASING BUSINESS INCUBATOR ACTIVITY IN THE CONDITION OF GIVING FINANCIAL INDEPENDENCE TO EDUCATIONAL INSTITUTIONS. *Open Access Repository*, 11(1), 41–48. <https://oarepo.org/index.php/oa/article/view/4047>

Facebook Marketplace: Buy and sell new or pre-loved unique goods, local and nationwide | Facebook Marketplace. (2024). Facebook.com. <https://www.facebook.com/marketplace/learn-more/>

Flutter - Build apps for any screen. (2024). Flutter.dev. <https://flutter.dev/>

Freire, S. K., Wang, C., & Niforatos, E. (2024). *Conversational Assistants in Knowledge-Intensive Contexts: An Evaluation of LLM- versus Intent-based Systems*. <http://arxiv.org/abs/2402.04955>

Grace, M., Maala, O., Novenario, J., & Muya, G. (2018). COMMUNICATION TOOLS OF E-COMMERCE: THE CASE OF LAZADA. *Journal of Arts and Sciences*, 3(1). <https://lpulaguna.edu.ph/wp-content/uploads/2018/12/2-COMMUNICATION-TOOLS.pdf>

How Marketplace works | Facebook Help Centre. (2024). Facebook.com. <https://www.facebook.com/help/1889067784738765/>

- Igboagu, I. (2025, February 17). *What is Backend as a Service (BaaS)? Beginner's Guide*. FreeCodeCamp.org. <https://www.freecodecamp.org/news/backend-as-a-service-beginners-guide/>
- Johnson, V. L., Kiser, A., Washington, R., & Torres, R. (2018). Limitations to the rapid adoption of M-payment services: Understanding the impact of privacy risk on M-Payment services. *Computers in Human Behavior*, 79, 111–122. <https://doi.org/10.1016/j.chb.2017.10.035>
- Katuk, N., Halim, M. S., Tahir, H. Mohd., Ahmad, A., & Yusof, S. M. (2013). Behavioral Analysis of Students' Login Credentials Management in Mobile Environment. *Journal of Industrial and Intelligent Information*, 1(3), 132–138. <https://doi.org/10.12720/jiii.1.3.132-138>
- Kiatruangkrai, P., Phusayangkul, P., Viniyakul, S., Prompoon, N., & Kanongchaiyos, P. (2010). Design and Development of Real-Time Communication Content Management Application for E-Commerce. <https://doi.org/10.1109/isdpe.2010.24>
- Lin, C. (2017). The Evolution of E-Commerce Payment. *Technology and Investment*, 08(01), 56–66. <https://doi.org/10.4236/ti.2017.81005>
- Maruthi, B. P., Prasad, D., & Niveditha, B. (2024). Chatbot in Ecommerce. *Advances in Computational Intelligence and Robotics*, 256–279. <https://doi.org/10.4018/979-8-3693-1830-0.ch015>
- Miraz, M. H., & Haikel-Elsabeh, M. (2019). Analysis of Users' Behaviour and Adoption Trends of Social Media Payment Platforms. *ArXiv (Cornell University)*, 197–202. <https://doi.org/10.1109/iccece46942.2019.8941991>
- Ngoata, D. S., Sambilla, J. J., & Nwiyoh, G. C. (2024). Evaluation of the Effect of Tracking Application Quality on Customer Satisfaction: Evidence from Logistics Companies in Cameroon. *Data: Journal of Information Applications and Management*, 2(4), 72–89. <https://doi.org/10.61978/data.v2i1>
- Payments, shipping & post-purchase support – Carousell Help Centre. (2024). Carousell.com. <https://support.carousell.com/hc/en-us/categories/360002281154-Payments-shipping-post-purchase-support>
- Peterson, D., & Howard, C. (2012). Electronic Payment Applications Evaluation. *International Journal of Strategic Information Technology and Applications*, 3(1), 66–80. <https://doi.org/10.4018/jsita.2012010105>

Pokar, H. (2022, August 12). *IT Outsourcing Company*. Bigscal - Software Development Company. <https://www.bigscal.com/blogs/cloud/what-is-cloudinary/>

Pradiptarini, C. (2011). Social media marketing: Measuring its effectiveness and identifying the target market. *UW-L Journal of Undergraduate Research*, 14(2), 2.

Prasad, K. V. S., Xavier, L. A., Jain, S., Raju Subba, Mittal, S., & Nilesh Anute. (2024). AI-Driven Chatbots for E-Commerce Customer Support. 2022 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI). <https://doi.org/10.1109/accai61061.2024.10602261>

Prenaj, B. (2016, November). *Social media as marketing tool for SMEs: Opportunities and challenges*. ResearchGate. https://www.researchgate.net/publication/310607745_Social_media_as_marketing_tool_for_SMEs_opportunities_and_challenges

Saetang, S. (2017). *The E-Commerce strategies responding to the UX design*. <https://doi.org/10.1109/umedia.2017.8074086>

Samra, H. S. (2013). Study on Non Functional Software Testing. *International Journal of Computers & Technology*, 4(1). www.cirworld.com

Seller Education Hub. (2024). Shopee.com.my. <https://seller.shopee.com.my/edu/article/16117/contact-shopee-customer-service>

Seller Education Hub. (2024). Shopee.com.my. <https://seller.shopee.com.my/edu/article/20165/about-shopee-seller-chat>

Senarath, U. (2021). Waterfall Methodology, Prototyping and Agile Development. *Waterfall Methodology, Prototyping and Agile Development*. <https://doi.org/10.13140/RG.2.2.17918.72001>

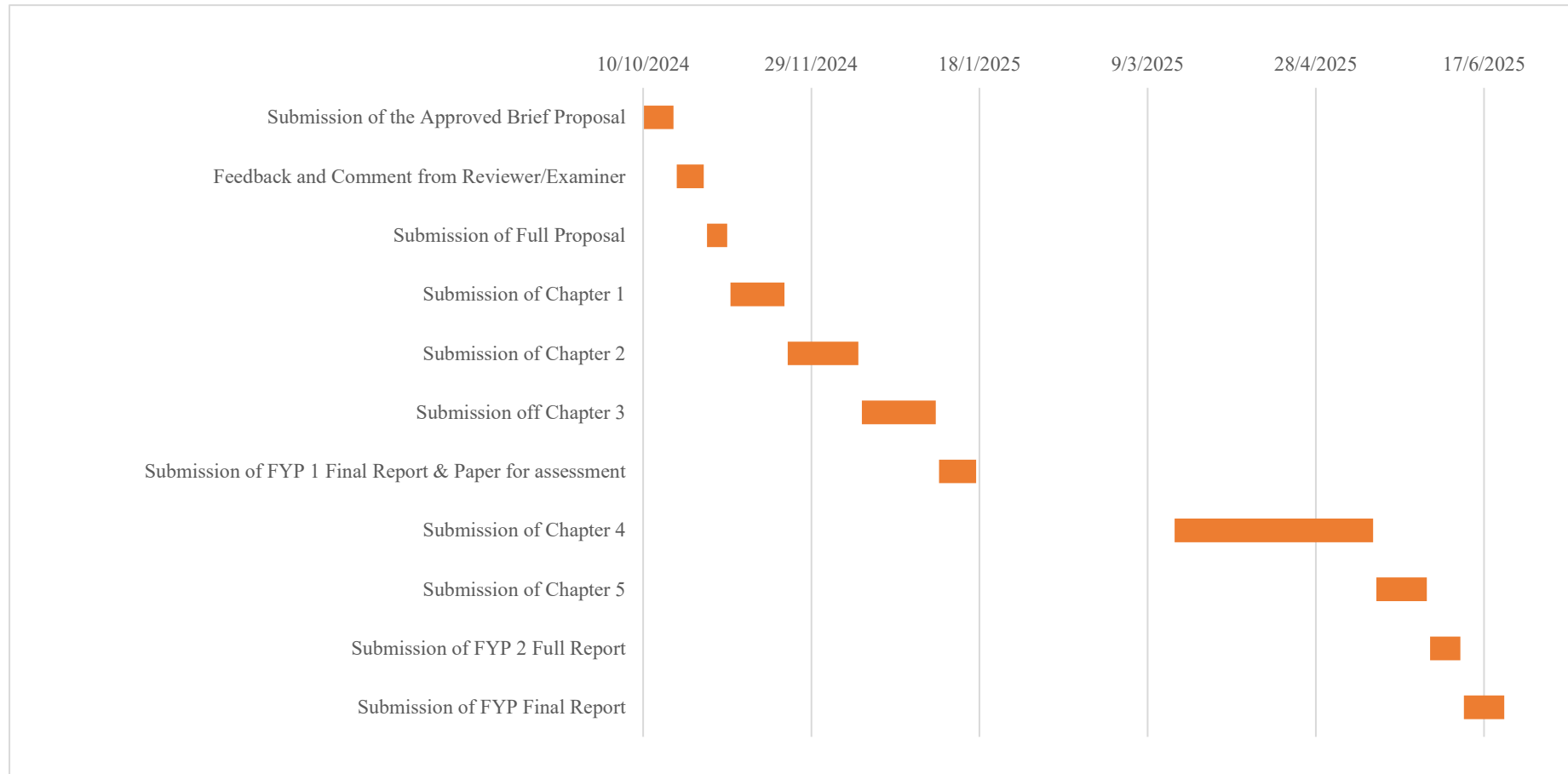
Shopee Malaysia, (2024). Shopee.com.my. https://shopee.com.my/?gad_source=1&gclid=CjwKCAiA9vS6BhA9EiwAJpnXw_DTP-3pZhPhhL7vBeIdkqv3RFYU8Ib4ls9EFZqx7DxeUdyXpttIGxoCIZ0QAvD_BwE&is_from_signup=true

Smith, A. D., & Clinton, S. R. (2015). ECommerce AND ITS IMPACT ON EXPECTATIONS OF CUSTOMER SERVICE AND QUALITY CONTROL. *ADVANCES IN BUSINESS AND MANAGEMENT*, 1.

- Sudiana, N., Chandra, Y. U., & Angela, L. (2021). Key Success Factors for a Better User Experience in E-Commerce Website. *2022 International Conference on Information Management and Technology (ICIMTech)*, 13, 512–516. <https://doi.org/10.1109/icimtech53080.2021.9535076>
- Thakur, K., Thaier Hayajneh, & Tseng, J. (2019). Cyber Security in Social Media: Challenges and the Way Forward. *IT Professional*, 21(2), 41–49. <https://doi.org/10.1109/mitp.2018.2881373>
- Waladi, C., Lamarti, M. S., & Khaldi, M. (2024). *Transforming Customer Experiences with Customer-Centric AI-Powered Chatbots in the Fourth Industrial Revolution*. 1–5. <https://doi.org/10.1109/mscc62288.2024.10697060>
- Wei, T., Kan, J., & Zhang Zi-gang. (2007). *Supply Chain Coordination Study Based on Retailers' Inventory Transshipment via eMarketplace*. 32, 1019–1024. <https://doi.org/10.1109/icmse.2007.4421979>
- what-is-aws. (2024). Amazon Web Services, Inc. <https://aws.amazon.com/what-is-aws/>
- Wihardja, C. E., & Mochammad Haldi Widiyanto. (2023). *E-Commerce Website: A Applicationatic Literature Review*. 648–652. <https://doi.org/10.1109/icimcis60089.2023.10349018>
- Zhu, W., Mou, J., & Benyoucef, M. (2019). Exploring purchase intention in cross-border E-commerce: A three stage model. *Journal of Retailing and Consumer Services*, 51, 320–330. <https://doi.org/10.1016/j.jretconser.2019.07.004>
- [Customer Service] How do I contact Shopee Customer Service? (Chat) | Shopee MY Help Center. (2023). [Shopee.com.my. https://help.shopee.com.my/portal/4/article/78961-\[Customer-Service\]-How-do-I-contact-Shopee-Customer-Service-\(Chat\)](https://help.shopee.com.my/portal/4/article/78961-[Customer-Service]-How-do-I-contact-Shopee-Customer-Service-(Chat))
- [New to Shopee] What is Shopee? | Shopee MY Help Center. (2023). [Shopee.com.my. https://help.shopee.com.my/portal/4/article/78546-\[New-to-Shopee\]-What-is-Shopee](https://help.shopee.com.my/portal/4/article/78546-[New-to-Shopee]-What-is-Shopee)
- [Order Protection] What is Shopee Guarantee? | Shopee MY Help Center. (2023). [Shopee.com.my. https://help.shopee.com.my/portal/4/article/78775-\[Order-Protection\]-What-is-Shopee-Guarantee](https://help.shopee.com.my/portal/4/article/78775-[Order-Protection]-What-is-Shopee-Guarantee)

APPENDIXES

APPENDIX A: Project Schedule



APPENDIX B: Questionnaire (Requirement Analysis)

1/11/25, 4:42 PM

UniMASket: UNIMAS E-Marketplace Integrate with AI Chatbot

UniMASket: *UNIMAS E-Marketplace Integrate with AI Chatbot*

Hello! My name is **Edna Faith Anak Ekson**. I am a final year student pursuing a **Bachelor of Computer Science (Information Systems)** at the Faculty of Computer Science and Information Technology (FCSIT), University Malaysia Sarawak (UNIMAS). For my final year project, I'm going to develop

UniMASket: an E-Marketplace integrate with AI Chatbot specializes for the UNIMAS community.

The goal of this project is to create an e-marketplace mobile application integrated with a real-time AI Chatbot for UNIMAS community, providing a secure, efficient, and supportive platform for peer to peer buying and selling of items and services. This application seeks to empower students by facilitating side income opportunities, improving access to affordable goods, and fostering sense of community within the university. Thus, this survey is conduct in order to understands the needs of students, enhancing the app's usability, and ensure the app developed will able to provides the most relevant features for the campus environment.

The survey is divided into five (5) sections:

- **Section A: Demographic Information**
- **Section B: Current Practices and Preferences**
- **Section C: Features and Functionalities**
- **Section D: Accessibility and Platform Expectations**
- **Section E: User Feedback and Suggestions**

The survey will take approximately 5-15 minutes to complete. The responses will be documented and presented as part of my project. Please note that all responses will remain **CONFIDENTIAL** and will not be shared and only used for academic purposes.

Your feedback is invaluable and will play a significant role in shaping the development of this project. If you have any questions or need further clarification, please feel free to contact me at **79256@siswa.unimas.my**

Thank you!

* Indicates required question

Section A: Demographic Information

Please provide your personal information

1. 1. What is your gender? *

Mark only one oval.

- ☐ Male
☐ Female

2. 2. Are you a college residential? *

Mark only one oval.

- ☐ Yes
☐ No

3. 3. Which college are you in? *

Mark only one oval.

- ☐ Allamanda
☐ Cempaka
☐ Tun Ahmad Zaidi
☐ Rafflesia
☐ Kenanga
☐ Seroja
☐ Sakura
☐ Dahlia
☐ Non-Residential

4. 4. How frequently do you engage in buying/selling activities within the UNIMAS community? *

Mark only one oval.

- ☐ Daily
☐ Weekly
☐ Monthly
☐ Rarely
☐ Never

5. 5. What motivates you to buy or sell items in a campus-based marketplace? *

Tick all that apply.

- ☐ Convenience of location
☐ Trust within the community
☐ Affordability of items
☐ Ease of communication with buyers/sellers
☐ Availability of unique or second-hand items
☐ Other: _____

Section B: Buying and Selling Preferences

6. 1. Which platforms do you currently use for buying/selling items? (Select all that apply) *

Tick all that apply.

- ☐ Facebook Marketplace
☐ Carousell
☐ Shopee
☐ WhatsApp Chat
☐ Telegram Chat
☐ Other: _____

7. 2. What type of items are you most interested in buying/selling? *

Tick all that apply.

- ☐ Books and Stationery
- ☐ Clothing and Accesories
- ☐ Health and Beauty Products (e.g., skincare, fitness gear)
- ☐ Food and Beverages
- ☐ Rental Vehicles (e.g., bicycles, motorcycles, car rentals)
- ☐ Services (e.g., printing, fetching)
- ☐ Other: _____

8. 3. How do you typically communicate with buyers or sellers? *

Tick all that apply.

- ☐ Messaging apps (e.g., WhatsApp, Telegram, Messenger)
- ☐ Email
- ☐ In person
- ☐ Other: _____

9. 4. What challenges do you face when using current buying/selling platforms? *

Tick all that apply.

- ☐ Difficulty finding reliable buyers/sellers
- ☐ Lack of a secure payment method
- ☐ Poor communication tools
- ☐ Other: _____

Section C: Features and Functionalities

For question one (1) until six (6), please rate the importance of the following features in a UNIMAS-specific marketplace on a scale of 1 to 5, where **1=Not Important** and **5=Very Important**.

10. 1. User Authentication through UNIMAS email *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

11. 2. In-app chat for seamless communication *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

12. 3. AI-powered chatbot for quick assistance *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

13. 4. QR code payment and Cash on Delivery payment method *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

14. 5. Sales and purchase history tracking *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

15. 6. Simple and intuitive user interface *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

16. 7. What other functionalities would enhance your experience with a campus-focused marketplace?

Section D: Accessibility and Platform Expectations

17. 1. How would you prefer to access the application? *

Mark only one oval.

- ☐ Mobile app
- ☐ Web browser
- ☐ Other: _____

18. 2. What devices do you use most often for online transactions? *

Mark only one oval.

- ☐ Smartphone
- ☐ Laptop/PC
- ☐ Tablet
- ☐ Other: _____

19. 3. How often do you experience connectivity issues on campus that could affect app usage? *

Mark only one oval.

- 1 2 3 4 5
- Never ☐ ☐ ☐ ☐ ☐ Always

Section E: User Feedback and Suggestions

20. 1. What are your primary concerns about using a campus-based marketplace? *

Mark only one oval.

- ☐ Security and privacy
- ☐ Transaction reliability
- ☐ Ease of use
- ☐ Quality of items being sold
- ☐ Difficulty communicating with buyers or sellers
- ☐ Other: _____

21. 2. How likely are you to recommend this platform to others? *

Mark only one oval.

1 2 3 4 5

Extr ☐ ☐ ☐ ☐ ☐ Very Likely

22. 3. Would you participate in user testing or provide feedback during the development process? *

Mark only one oval.

☐ Yes

☐ No

☐ Maybe

23. 4. Any additional suggestions or comments?

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APPENDIX C: Questionnaire (Non-Functional User Testing)

6/18/25, 3:48 AM

UniMASket: UNIMAS E-Marketplace Integrate with AI Chatbot

UniMASket: *UNIMAS E-Marketplace Integrate with AI Chatbot*

Hello! My name is **Edna Faith Anak Ekson**. I am a final year student pursuing a **Bachelor of Computer Science (Information Systems)** at the Faculty of Computer Science and Information Technology (FCSIT), University Malaysia Sarawak (UNIMAS). For my final year project, I'm going to develop ***UniMASket: an E-Marketplace integrate with AI Chatbot specializes for the UNIMAS community.***

The goal of this project is to create an e-marketplace mobile application integrated with a real-time AI Chatbot for UNIMAS community, providing a secure, efficient, and supportive platform for peer to peer buying and selling of items and services. This application seeks to empower students by facilitating side income opportunities, improving access to affordable goods, and fostering sense of community within the university. Thus, this survey is conducted to evaluate the app's non-functional aspects, including usability, performance, and reliability, from the user's perspective. It helps identify real-world issues, assess user satisfaction, and gather feedback for future improvements to ensure the application effectively meets the needs of the UNIMAS community.

The survey is divided into five (5) sections:

- **Section A: Demographic Information**
- **Section B: Usability Testing**
- **Section C: Performance Testing**
- **Section D: Reliability Testing**
- **Section E: Feedback**

The survey will take approximately 5-15 minutes to complete. The responses will be documented and presented as part of my project. Please note that all responses will remain **CONFIDENTIAL** and will not be shared and only used for academic purposes.

Your feedback is invaluable and will play a significant role in shaping the development of this project. If you have any questions or need further clarification, please feel free to contact me at **79256@siswa.unimas.my**

Thank you!

* Indicates required question

Section A: Demographic Information

Please provide your personal information

1. 1. What is your gender? *

Mark only one oval.

- ☐ Male
☐ Female

2. 2. Are you a college residential? *

Mark only one oval.

- ☐ Yes
☐ No

3. 3. Which college are you in? *

Mark only one oval.

- ☐ Allamanda
☐ Cempaka
☐ Tun Ahmad Zaidi
☐ Rafflesia
☐ Kenanga
☐ Seroja
☐ Sakura
☐ Dahlia
☐ Non-Residential

4. 4. Have you ever bought or sold items/services within the UNIMAS community?

Mark only one oval.

- ☐ Yes
☐ No

Section B: Usability Testing

Please read the statement carefully and select the option that best represents your experience regarding the **ease of use and user interface** of the UniMASket application on a scale of 1 to 5, where **1=Strongly Disagree** and **5=Strongly Agree**

5. 1. The app was easy to navigate. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

6. 2. The user interface was visually appealing and consistent. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

7. 3. I was able to complete basic tasks (e.g., register, login, browse, add to cart) without help. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

8. 4. The AI chatbot was easy to interact with and provided helpful responses. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

9. 5. The layout, button labels, and icons were clear and understandable. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

10. 6. I did not experience any confusion or difficulty while using the app. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

Section B: Performance Testing

Please read the statement carefully and select the option that best represents your experience regarding the **speed, responsiveness, and stability** of the UniMASket application on a scale of 1 to 5, where **1=Strongly Disagree** and **5=Strongly Agree**

11. 1. The app loaded quickly when launched. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

12. 2. There were no noticeable delays while browsing, chatting, or checking out. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

13. 3. The app remained responsive even when switching between features. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

14. 4. I did not encounter any freezing or crashing while using the app. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

15. 5. The search and filter functions responded accurately and quickly. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

Section C: Reliability Testing

Please read the statement carefully and select the option that best represents your experience

regarding the **reliability and integration of key features** in the UniMASket application on a scale of 1 to 5,

where **1=Strongly Disagree** and **5=Strongly Agree**

16. 1. The registration and login process using a UNIMAS email was secure and worked as expected. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

17. 2. Real-time messaging and notifications worked as expected. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

18. 3. The transaction history displayed accurate and clearly organized records of my past transactions. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

19. 4. The AI chatbot helped me navigate through the app and locate features such as product listings, checkout, or transaction history. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

20. 5. My actions (e.g., editing profile, adding listings) were saved correctly. *

Mark only one oval.

1	2	3	4	5
☐	☐	☐	☐	☐

Section D: Feedback

The following questions are intended to gather your personal opinions and suggestions based on your experience using the UniMASket application during this session. Your feedback is valuable and will help improve the app's usability, features, and overall performance. Please answer as honestly and thoroughly as possible.

21. 1. What features do you think worked best in the app? *

(You may select more than one option.)

Tick all that apply.

- ☐ User registration and login
- ☐ Product/service listing
- ☐ Shopping cart and checkout process
- ☐ In-app chat
- ☐ AI chatbot support
- ☐ Notifications
- ☐ Transaction history
- ☐ User profile management
- ☐ Overall navigation and design
- ☐ Other: _____

22. 2. Do you think this app would help you (or other students) generate income by selling items or services on campus?

Mark only one oval.

- ☐ Yes
- ☐ No

23. 3. Did the AI chatbot or in-app chat make your transaction experience smoother or more convenient? *

Mark only one oval.

☐ Yes

☐ No

24. 4. What improvements would you suggest to make the app easier or more enjoyable to use? *

25. 5. Have you used any similar e-marketplace apps before? If yes, how does this one compare? *

26. 6. Do you feel confident in continuing to use this app in the future for buying or selling? Why or why not? *

APPENDIX D: Source Code Link

Link: <https://gitfront.io/r/EdnaEkson/GbSoRDpGJHhx/unimasket/>

