Augmented Reality in Mobile Commerce Application

BY

LEE GUAN SOON

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS) INFORMATION SYSTEMS

ENGINEERING

Faculty of Information and Communication Technology (Perak Campus)

May 2020

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BIS (Hons) Information Systems Engineering
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DECLARATION OF ORIGINALITY

I declare that this report entitled "**Augmented Reality in Mobile Commerce Application**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature　　　:　　　　　　　soon

Name　　　　　:　　　　Lee Guan Soon

Date　　　　　:　　　　　31/8/2020

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Besides, I would like to thank my family member. None of this would happen without their unconditional love, support and continues encouragement through the course. Last but not least, I truly appreciate all that have helped me whether directly or indirectly to have this project done.

Abstract

In this project, an Android mobile commerce shopping application that is integrated with the Augmented Reality technology will be developed to resolve problems that is facing by current mobile commerce shopping application. The problems that is facing by current mobile commerce shopping application are the products that is selling in the mobile commerce application lack with a detailed visual representation that is view by the users. The integration of Augmented Reality technology in mobile commerce application is to increase the interaction and engagement of the users which will leading to a higher rate of purchasing the product.

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LIST OF ABBREVIATIONS

App   Application

AR   Augmented Reality

E-Commerce   Electronic Commerce

IDE   Integrated Development Environment

UI   User Interface

QR   Quick Response

M-Commerce   Mobile Commerce

API   Application Program Interface

AI   Artificial Intelligence

Chapter 1: Introduction

In this chapter, the background and motivation of research, contributions to the field, and the outline of the thesis are presented.

1.1 Problem Statement and Motivation

Existing mobile commerce application lacking a more details and realistic visualization on the products.

There are many existing commerce applications that is well known in the marketplace in Malaysia which are including Lazada and Shopee application. These commerce applications which is specializing in mobile shopping is only providing the 2D images of the products for the consumers. So, the consumers which is only can viewing on the 2D images of the products that is providing by the seller, consumer may not be able to understand the details of the products. This is because the consumer cannot visualize the products that there is intent to buy in a more detail's way or in the real-world environment by only surfing through those mobile commerce applications. This can result in the shopping experience of the users through the mobile commerce application become disappointed and may lead to the buyer not buying any products from the mobile commerce application. Besides, there are also lacking interactivity between the buyers with the mobile commerce application. This is because, most of the time, buyers just can search for the product they want to buy and understanding the details of the product by only swiping through the 2D images that is provided by the seller but without any on hand testing. So, this may lead to the products that bought by the buyer does not act as the buyer's expectation or does not fit on the buyer. This may be a blockage for the user to use the commerce application to buy the products again.

Existing mobile commerce application does not provide beauty try-on simulation on live video

The existing commerce applications that is well known in the marketplace in Malaysia which are including Lazada and Shopee application which is specializing in mobile shopping that is selling the makeup products does not provide the beauty try- on simulation on live video. When users want to buy some makeup products such as lipstick, they may be unable to know that the color of the lipstick is suitable on their face or not. So, this may be holding the users on buying those makeup products through

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these mobile commerce applications.

Existing mobile commerce application does not provide notification to the users when the wish listed products having promotion.

The existing commerce application does not provide notification to the users when the wish listed products having promotion. After the users had wish listed some item into their wish list, and during the promotion of the wish listed item that don't have any notification to notify the users that the wish listed products are undergoing a promotion. So, this is another blockage for the user to user the mobile commerce application to buy those makeup products. So, this may lead to the users miss the promotion period for the wish listed item and form a blockage for the users to buy the products from the existing commerce applications.

Existing mobile commerce application feedback system is too boring

The existing commerce application feedback system is too boring for the users want to give the feedback every time. For all the existing commerce application feedback system is only required user to click on the star and vote for the feedback. So, this may cause the users don't want to give feedback anymore on the existing commerce application.

Motivation

So, by integrating the Augmented Reality (AR) technology in the mobile commerce application, sellers can provide a better product details for their products which is including the 2D Images and the 3D Images of the products. Then, with the 3D Images that is provided by the seller about the products, buyers can enhance their view of the physical world by visualizing the products that the buyers are intent to buy in the real- world environment through the generated product image over users' view of the real world. With such improvement on the visualization of the products, users are will keep happy and curious about the product with the appealing and motivation features of the Augmented Reality which will lead the users to be more interesting to use the mobile commerce application. The interactivity of the users with the mobile commerce application will be improved and lead to a high possibly of purchasing the product. Besides, with the appealing and motivation features of the Augmented Reality can also help the users to understand more about the details of the products. This also

can help the buyer to understand whether the products are suiting their design style without going to the store and looks for the product. Moreover, through the integration of Augmented Reality technology, users are able to have a beauty try- on simulation on live video which can help the users to understand whether the color of the makeup products are suitable on their face or not.

1.2 Project Scope and Direction

The scope of my proposed project is to cover the integration of technology Augmented Reality with the commerce application in order to increase the interaction between the users and the commerce application. An Android Mobile application will be developed which is related to shopping through mobile commerce application with the augmented experience. This mobile commerce application is providing a marketplace for users to sell their products or buy products over here. Moreover, the sellers can provide better product details for their products which is including the 3D Images of the products. Then, with the 3D Images that is provided by the seller about the products, buyers can visualize the products in the real-world environment virtually along with the AR experience which can help the buyer understand the details of the products. This also can help the buyer to understand whether the products are suiting their design style without going to the store and looks for the product. The scope of the proposed project is also covering the feature which is a beauty try-on simulation on live video, track the face and facial features in precise detail. This can enable user to try on the makeup products which is including lipstick, blush, and brow on our mobile commerce application without going to the store. Users can keep trying out the lipstick until they are satisfied and add to their shopping cart. Besides, after the users had had added the items to the shopping cart, the users can further with the payment features in our proposed mobile application which can enable the users pay for the items that are added to the shopping cart and place order.

1.3 Project Objectives

1. **To develop a mobile commerce application with Augmented Reality technology.**

   Enable user to visualize the products in the real-world environment with the AR experience. All the products can be displayed in the real-world environment through the user device's camera. This can allow user to know the better details of the product without going to the store and looks for it. This can reduce the feeling of regret of the user after buying the products as the user can stimulate the products on real-world environment before decided to buy the products.

2. **To provide beauty try-on simulation on live video**

   User can simulation the makeup on their face through the user device's camera. This can allow users to select the best makeup product that is most suitable on their face before decided to buy makeup products.

3. **Enhance and Providing the Interesting Feedback system**

   User can provide the feedback system through their facial expression instead of the traditional giving star for the feedback.

4. **Enhance Wishlist System**

   When user add 1 item to their wish list, they can vote how much they favor about the product. So, when there is a promotion about the wish listed items, it will pop notification to remind the user

5. **Chat Bot System**

   To provide a chat bot system that will help the user to solve the problem. When users have faced the problem, can find chatbot system and the chat bot system will provide some solution.

1.4 Impact, Significance and Contributions

  The aims of this proposed mobile application are to develop a mobile commerce application that is integrating with Augmented Reality technology to improve the shopping experience of the user. Besides, this proposed mobile application is also providing the features of beauty try-on simulation on live video. With the capabilities of Augmented Reality technology to facial tracking, we have enhanced the feedback

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system from the traditional way which is filling the paper with pencil to a more interesting way that can make the user feel fun of doing it which is using the facial tracking and detect whether the customer is satisfied with the service. Moreover, we will be enhancing the wish list where when the custom wish list the item that they favor they are able to vote how much they favor about it. So, when there is a promotion that is related to the wish listed item, it will pop up the notification and announce the customer.

The proposed application will provide marketplace to user which will be having seller and buyer. First, this proposed application which is integrated with the Augmented Reality Technology will be contributed to seller which can let them provide the product with more details 3D Images and allow the product can be visualized in the real-world environment. This can help the seller to improve their sales.

Then for the buyers, buyers are able to visualize the products that is provided by the sellers and know more details about the product and display it in the real world environment with the capabilities of Augmented Reality in order to see whether the products are suit with the design of the buyer's living environment. Besides that, with the facial tracking that will be implemented in this proposed application, users are able to have a beauty try-on simulation on live video in order to select the makeup products that suits on their face without going to the store and test. This proposed application can improve the shopping experience and interactivity between the users and the application without going to the store to have a look on the product or testing.

1.5 Project Background

For this proposed mobile application project, the field that is mainly focusing on is the breakthrough innovative technology, which is Augmented Reality and mobile commerce, which is including Lazada, Shopee, AliExpress that providing marketplace to user selling and buying the good. Commerce can simply mean by the process of buying and selling of goods and services. In nowadays, E-Commerce are getting popular as everyone are preferring to shop through online instead of going to the store. But, in the branch of E-Commerce, there is Mobile Commerce which is a specific subgroup of E-Commerce that focus on the buying and selling of goods and services by using the wireless handheld devices such as cell phones and tablets (Investopedia, n.d.) instead of desktop and laptop computers. M-Commerce has a dramatic rise compared to E-commerce in popularity recently. This is because more and more consumers own

a smartphone, and there is more convenience compared to computers when looking to shop online. Smartphone can just launch the commerce application anytime and anywhere the consumer wants to. But, if users want to shop online with the computers, users must go to the place of the computers and wait for the computers to start-up. So, it's just takes a little time to shop online through commerce application instead of using computers. M-Commerce can be categorized by function as either shopping, banking payments all via mobile (Margaret Rouse, n.d.). These categories allow users to conduct commercial transactions online which including the purchases and sales of products, online banking and paying bills (Investopedia, n.d.). The online shopping market has reached the highest number of sales via M-Commerce. Based on the Figure 1.5.1, the statistic that is provided by Statista has providing the information on the share of mobile retail commerce sales as a percentage of total retail e-commerce sales worldwide from 2016 to 2021. In 2021, 72.9 percent of all retail e-commerce is expected to be generated via m-commerce, up from 58.9 percent in 2017. Emerging e-commerce markets in mobile-first economies are a large driver of this trend (Statista, 2019).
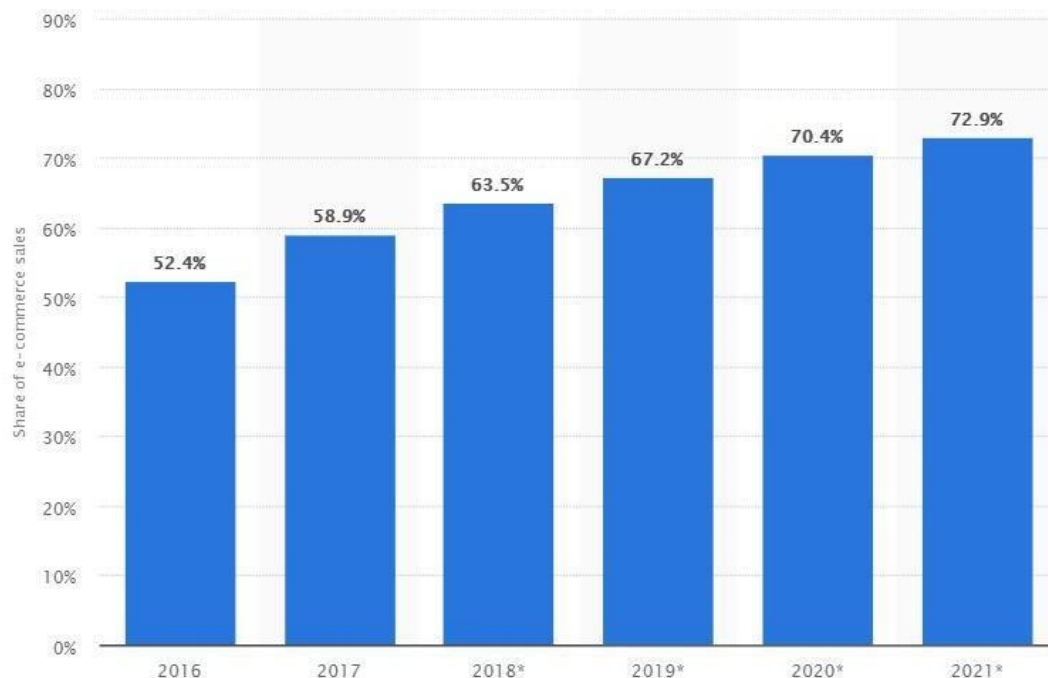
Figure1.5.1: Mobile retail commerce sales as percentage of retail e- commerce sales worldwide from 2016 to 2021

However, for the current commerce application, there is lacking a more details and realistic visualization on the products. Most of the commerce application which is

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including Lazada and Shopee application is only providing the 2D images of the products for the consumers. By viewing on the 2D images of the products that is providing by the seller, consumer may not be able to understand the details of the products. This is because the consumer cannot visualize the products in a detail's way or in the real-world environment. This can result in the shopping experience of the users through the commerce application become disappointed and may lead to the buyer not buying the products from the commerce application. Besides, there are also lacking interactivity between the buyers with the commerce application. This is because, most the time, buyers just search for the product they want to buy and swipe through the 2D images that is provided by the seller but without any on hand testing. So, this may lead to the products that bought by the buyer does not act as the buyer's expectation or does not fit on the buyer. This may be a blockage for the user to use the commerce application to buy the products again.

In fact, there are historical development of application in order to solve the problem I mentioned above which are the products are unable to visualize in a detail's way or in the real-world environment. Based on Figure 1.5.2, which is an Android application that can enable user to view the furniture in 3D and able to manipulate it in order to know more details of the sofa.

Figure 1.5.2: Screenshots of Swedish Home Deisgn 3D

But there are few problems with the application above. User is unable to conduct any purchase transaction. User is only able to manipulate the furniture, view the furniture and get more details of the furniture, but there are no the features of purchase

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transaction provided to the user. Then, the furniture is only visualized in the 3D way in the phone but not showing case in the real-world environment which can help the customer to determine whether the design is suiting the design of their living environment. So, this may also affect the experience of the user and turn down their decision on buying the items.

Then the other historical development of application in order to solve the problem of the buyers just search for the product they want to buy and swipe through the 2D images that is provided by the seller but without any on hand testing. Based on the Figure 1.5.3, which is an Android application (YouCam Makeup) can provide the users the beauty try-on simulation on live video through the camera of the user's device. Before the buyers decided to buy makeup products, buyers can simulation all the makeup on live video by using their smartphone without going to the store and try on the products. This can increase the interactive of the commerce application between the users and also increasing the shopping experience of the users.

Figure1.5.3: Beauty try on simulation on live video

But that is a problem on this android application too, there don't have any buying transaction feature on this application. So, after buyers try out the most suitable makeup on their faces, they are unable to carry out the buying transaction straight

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through this application. In order to solve all the problems that were mentioned above, our proposed mobile application is integrating with the technology of Augmented Reality. Augmented Reality (AR) has been a hot topic, as it is a breakthrough innovative technology which are mixing the virtual and actual reality. Augmented Reality integrate the user's environment in real time and overlays the virtual reality which is the new information on top of the user's environment in real time (Margaret Rouse, n.d.). By using Augmented Reality, the real-world experience and interaction between the users and the application can be enhanced by taking the capabilities of computer that can generate display, sound, text and effects (Techopedia.com, 2019). Augmented Reality is a technology that works on the computer vision-based algorithms in order to augment graphic on real worlds through the camera on user's device.

The proposed mobile application is focused on the problem that mentioned above. The products in the mobile commerce application can be visualize in the real-world environment by integrating with the technology of Augmented Reality. The shopping experience of buyers can be increase as the users is able to visualize all the products in the real-world environment and decided which products is more suitable to the design of their living environment and only make the purchase without going to the store. This proposed mobile application is also enable the user to provide a feature which is a beauty try-on simulation on live video, and to track the face and facial features in precise detail. This motivation can increase the interaction between the buyers and the commerce application. So, this will eventually avoid more carts of the buyers are being abandoned and lead to a high possibly that the buyers will purchasing the products. This is because the motivation on the commerce application allow the buyers determine whether the products, they want to buy are fitting their living environment or on the buyer since the Augmented Reality can provide a real- world visualization and a try on simulations on live video.

Chapter 2: Literature Review

2.1 Types of Augmented Reality

The evolution of Augmented Reality technology has created the most available and best fit for adoption of Augmented Reality in mobile application development for various purposes. So, there are types of Augmented Reality (JYOTI, 2019).

i.   Marker Based Augmented Reality

Marker Based Augmented Reality can be also known as Image Recognition based Augmented Reality (JYOTI, 2019). This type of Augmented Reality is scanning the unique marker by using the camera through our device. When the unique marker is scanned, it will be recognized and process, and trigger whether an object, text, or animation to appear on top of the marker by looking from our device. Tracking plays an important role in Marker Based Augmented Reality as the camera must be constantly tracking the marker to avoid distorting or stopping the augmented effects.

Figure2.1.1: Marker Based Augmented Reality

ii.   Marker-Less Augmented Reality

This style of Augmented Reality can be also known as Location-based Augmented Reality (JYOTI, 2019). It relies on reading the information that is gathered from a device's camera, GPS, digital compass and accelerometer while predicting where the user is focusing instead of using a marker or image cue to deploy the Augmented Reality animation. This type of application is mostly used to help travelers.

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iii.   <u>**Projection Augmented Reality**</u>

This is the simplest types of Augmented Reality which is make use of the visible light from the camera (JYOTI, 2019). This allows the form of Augmented Reality to use a technique called projection mapping which the projected image can directly mapped onto the physical objects (George White, (2018)).

iv.   <u>**Superimposition Based Augmented Reality**</u>

This category of Augmented Reality is just simply replacing the entire view with an augmented view of object (JYOTI, 2019). Object recognition may play an important role where replace the view of object with an augmented view.

Figure2.1.2: Superimposition Based Augmented Reality

2.2 Review on Similar Application

2.2.1 Review on Lazada Application

Lazada application is one of the well-known mobile commerce applications that are widely used in Southeast Asia. This mobile commerce applications are available for both Android and IOS. Lazada application is providing a wide range of products which included fashion, electronics, children's toys, and sports equipment. The home page for the Lazada application contains many information which is about customer care, track orders, login, register, goods categories, search engine, suggestion box, and at the bottom footer is additional information about Lazada. Lazada is also providing a large marketplace for sellers to sell their products while the buyer can buy the products in

this marketplace. Buyer can check the products which is needed to pay, ship, receive after confirming which products to buy.

Figure 2.2.1.1: Screenshots of Lazada app

Strength

- User-friendly and easy navigation of the application
- User can track the status of their buying's goods
- Can chat with the seller for further information
- User can upload the products and sell over Lazada application
- User can give rating for the seller
- Lazada provided customer service
- Provided QR code reader

Weakness

- Do not provide Augmented Reality features for user to view product virtually in real world environment
- The promotion banner makes the homepage looks messy

2.2.2 Review on Shopee Application

Shopee application is a mobile commerce application that providing an online marketplace to serve the users in Southeast Asia and Taiwan to buy and sell products online. Shopee application is also available for both Android and IOS. Shopee application is providing a wide range of products which included fashion, electronics, children's toys, and sports equipment. The home page for the Shopee application is containing many information which is about customer care, track orders, login, register, goods categories, search engine, suggestion box, and at the bottom footer is additional information about Shopee. Shopee is also providing a large marketplace for sellers to sell their product while the buyer can buy the products in this marketplace. Buyer can check the products which is needed to pay, ship, receive after confirming which products to buy.
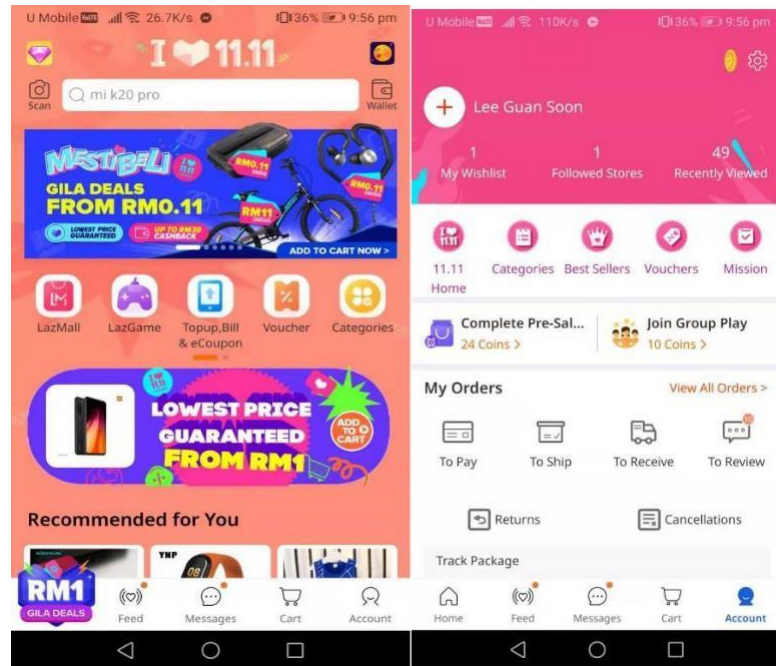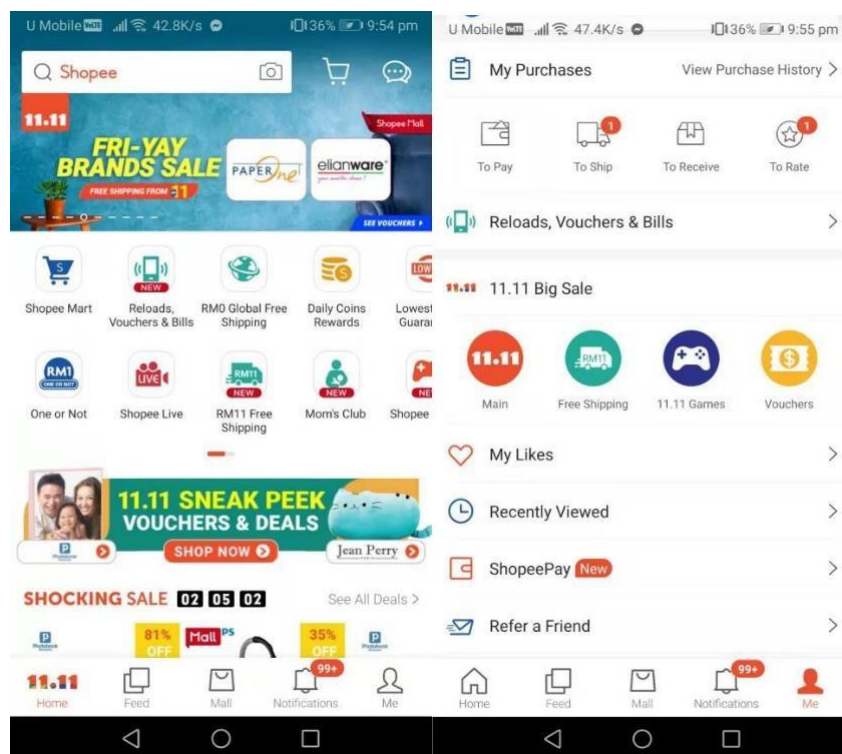

Figure 2.2.2.1: Screenshots of Shopee app

Strength

- User-friendly and easy navigation of the application
- User can track the status of their buying's goods
- Can chat with the seller for further information

- User can upload the products and sell over Shopee application
- User can give rating for the seller
- Lazada provided customer service

Weakness

- Do not provide Augmented Reality features for user to view product virtually in real world environment

2.2.3 Review on MakeupPlus Application

MakeupPlus application is a mobile commerce application which is cooperated with others make up shop to sell all the products that are related to makeup which includes lipstick, blush and brows. MakeupPlus application is integrated with the technology of Augmented Reality which provided the virtual makeup try-on. With this application, users can have a full virtual makeover from lipstick, contour and eyelashes, eyebrows and hair color, faux freckles and glitter in order to find a look that is favored by the users through the user phone's camera before decided to buy the products. MakeupPlus also provide the live virtual makeup try-on, which can try out the products instantly through the selfie-camera.
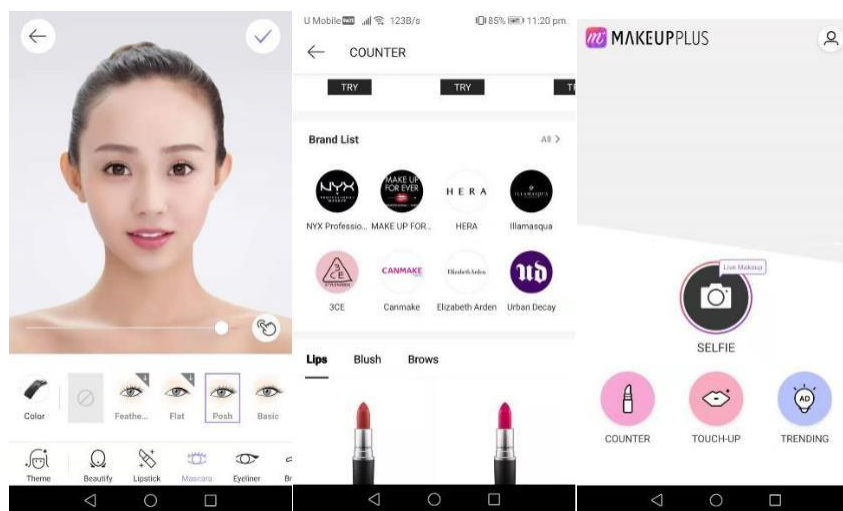
Figure 2.2.3.1: Screenshots of MakeupPlus app

Strength

- Enable user to try on the makeup before buying the products
- Able to share the product with their friends through social media
- Enable to snap a photo after trying out the makeup virtually

Weakness

- Don't have search engine to search the product
- Cannot sell the product through this application
- Must navigate to others shop during the buying process

2.2.4 Review on IKEA Catalogue

IKEA Catalogue is published at year 2013 by IKEA. This mobile application is containing over 300 pages and about 12,000 products which the categories included sofas, chairs and etc. IKEA Catalogue is integrated with the technology of Augmented Technology in their mobile application which can displaying their product through the user device's camera. By doing so, user just must tap on the 3D button in order to enter the AR mode. This can help the users to visualize the products in the real-world environment in order to design the products at their place.

Figure 2.2.4.1: Viewing the 3D product using Augmented Reality

Strength

- Have simply tutorial to access AR mode
- Easy and user-friendly navigation
- Products can view from different angles and perspective

Weakness

- Using marker-based tracking technology for AR to place the products
- Must print the marker to enable the AR to work

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- No purchase transaction

2.3   Comparison Between Similar Applications

	Lazada	Shopee	MakeupPlus	IkeaCatalogue	Proposed Application (sGsMarket)
Platform	Android, IOS	Android, IOS	Android, IOS	Android, IOS	Android
Augmented Reality feature	✖	✖	✔	✔	✔
Add product to wish list	✔	✔	✖	✔	✔
Shopping Cart	✔	✔	✖	✖	✔
ChatBot	✔	✔	✖	✖	✔
Perform purchasing	✔	✔	✖	✖	✔

Table 2.3.1: Table of comparisons between similar applications

sGsMarket is the proposed mobile application for the Final Year Project. sGsMarket is developed for Android platform. sGsMarket is integrated with Augmented Reality feature which can allows the user to overlay all the products within the market to the real-world environment. Then, it also allows the user to beauty live try-on simulation for the lipstick products. sGsMarket is providing the purchasing feature just like others mobile commerce application. Users can wish list their product in sGsMarket and when the product that is wish listed are having discount, it will be having a notification to notify the users.

Chapter 3: Proposed Method/Approach

3.1: Design Specifications

3.1.1 : Methodologies and General Work Procedures
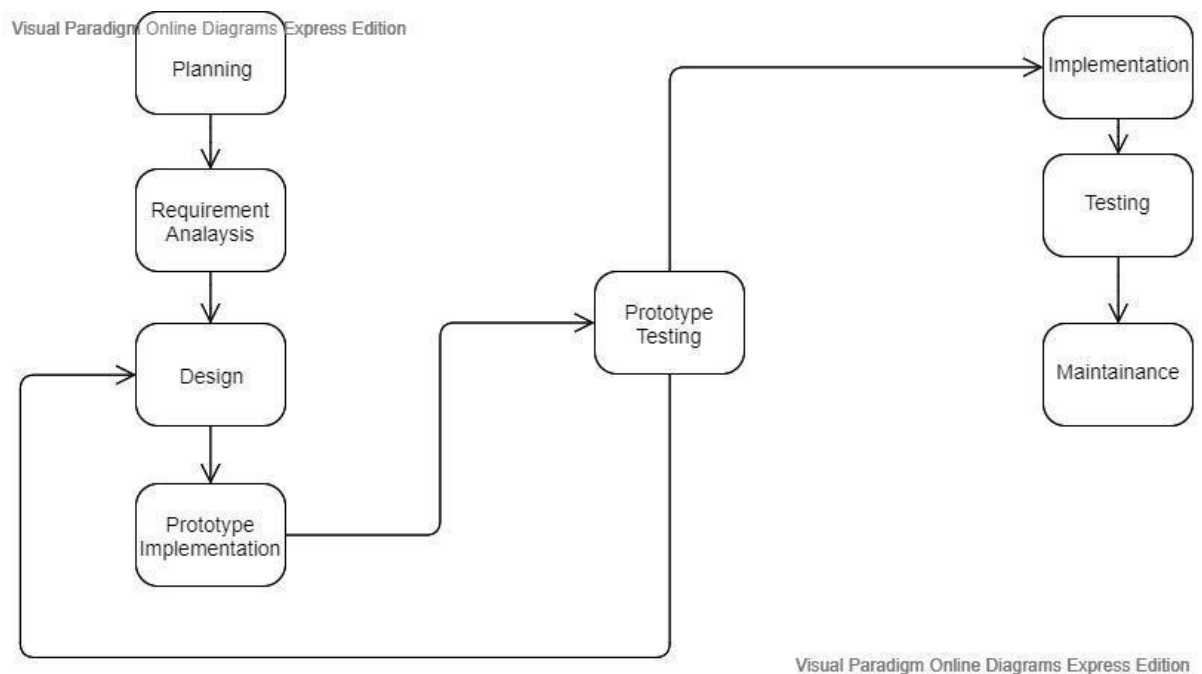
Figure 3.1.1.1: System Methodology for developing the mobile application

Figure 3.1.1.1 shows the methodology that is used to develop the proposed mobile application. During the planning stage, a set of plans is created to guide own self through the execution and closure phases of the project. Apart from that, the initial proposal is also evaluated to define the problem statement, project scope and come out with the project objectives. Plans are created will help own self to manage time, cost, quality, change, risk and issues.

Then, the second stage is requirements analysis which is gathering the initial requirement by referencing to the similar project and the historical development that is prior to the project. In the referencing process, strengths and weakness of those project will be examined then further recorded and analyzed.

In the design stage, all requirements gathered earlier will be transformed into a completed and detailed system design specification. Once, the design has no problem, we will get into next stage which is prototype implementation. Prototype

implementation is created quickly based on the design and tested at the further stage. Prototype Testing phases to evaluate whether our design diagram has problem. If there are any problem on our system design specification, we will be going back to the stages of design and study the requirements gathered carefully and come out with another design.

If everything has no problem, we will get into the implementation phase which completely developed of the application. After the application is fully developed, we will get into the testing phase to ensure all the classes work well together and to evaluate whether any problem is existing on our application. Then, we will deliver the application to end user. At the same time, we will be collecting the feedback from the end users and has a periodic maintenance on the application in order to eliminate others error that didn't reveal in the testing phase.

3.1.2 Tools to Use
<u>Android Studio</u>

Figure 3.1.2.1: Android Studio Logo

Android Studio is the official integrated development environment (IDE) that is used to create for the mobile application development. It is based on IntelliJ IDEA, a Java integrated development environment for software, and including rich code-editing, debugging testing, and profiling tools. Android Studio can be used to develop mobile applications with rich graphical user interface, shopping cart, add product, view product, login and more function that is related to commerce application. Android

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Studio is selected to develop the mobile application for the proposed project.

<u>Java</u>

Java is a programming language that is being used for building mobile applications using managed code that can be executed on the mobile devices. All the functionalities in the proposed project is created in Java programming classes.

<u>Firebase</u>

Firebase provides a real-time database and backend as a service. This service provides developers an API that allow the mobile application data to be synchronized across clients and stored in Firebase's cloud. Firebase is also providing the authentication services, storage etc.

<u>ARCore</u>

Figure 3.1.2.2: ARCore Logo

ARCore is a software development kit that is developed by Google that allows Augmented Reality applications to be built. ARCore provide motion tracking that allowing the phone to understand its position relative to the world. Then ARCore is also providing environmental understand in order to detect the size and location of all types of surface from a different perspective. Then, light estimation can allow the phone to estimate the environment's current lighting conditions (Google Developers, n.d.). ARCore is selected to develop the Augmented Reality features on our proposed project which is displaying the products in 3D and integrate it into the real-world environment. Besides, Augmented Faces is a subsystem of ARCore (Codelabs.developers.google.com, n.d.) which can enable us to develop the feature

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beauty try-on simulation on live video by tracking the motion of our face that is proposed in our project.

Node.js

Node.js is an open source server environment. It uses JavaScript on the server. Node.js uses an event-driven, non-blocking I/O models that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices. Node.js is use in this proposed final year project to implement a real time function which is to monitor the change of the data in the database and push the notification to the users by using FCM (Firebase Cloud Messaging).

3.1.3   User Requirements

Description	Minimum Requirement
Internet Connection	Required
Camera	Required
ARCore	Supported
Android Version	Android 8.0 or Higher

Table 3.1.3.1: User Requirements

Table 3.1.3.1 shows all the requirement needed by the user's device in order to use all the features in the proposed mobile application. Three of the requirements is also needed for the Augmented Reality features that is included in our proposed mobile application. Android version with 8.0 or higher and device that is supported ARCore is the necessary for the Augmented Reality features to work well.

3.1.4 Verification Plan

Input	Expected Output
Buyer enter username and password	Display Account with "username" not exists. Account invalid, please create an account to login
Seller enter username and password	Login fail, please try again
Admin enter username and password	Display Account with "username" not exists. Account invalid, please create an account to login

3.2: System Design / Overview

3.2.1: Block Diagram

Seller Block Diagram
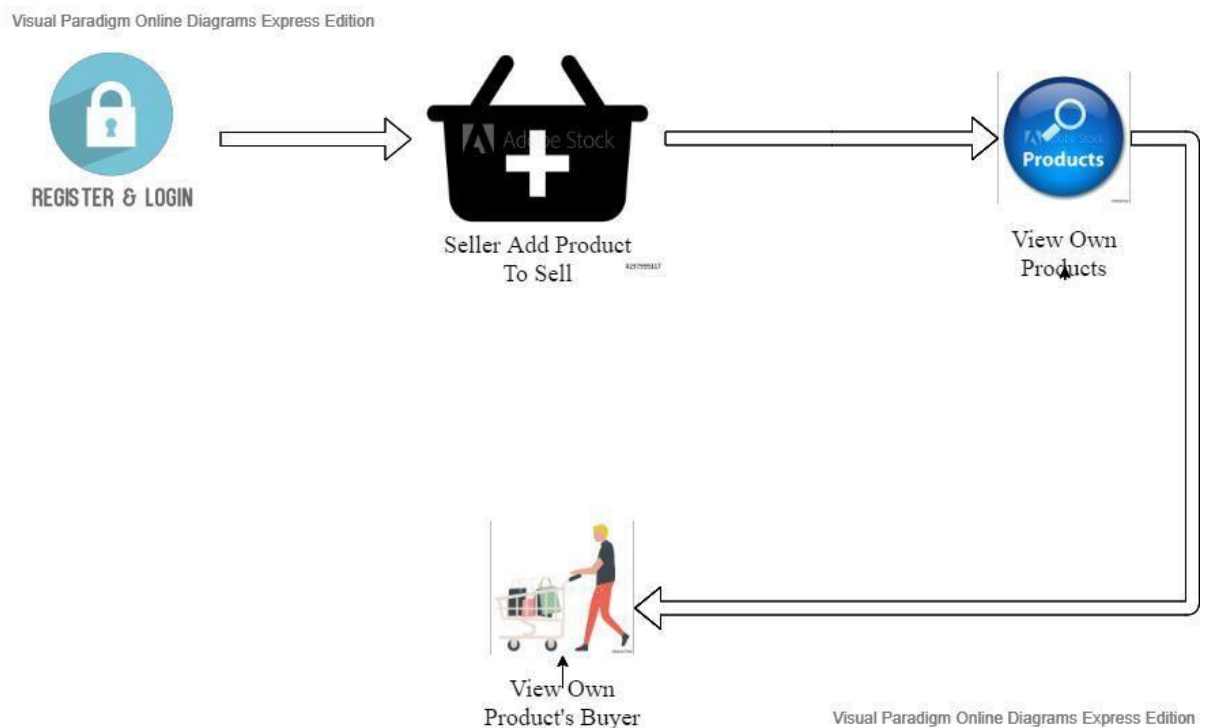
Figure3.2.1.1: Seller's Block Diagram

Figure 3.2.1.1 above shows the block diagram of the proposed mobile application for the seller's perspective. For the users who wants to sell products using

our proposed mobile application, the users will need to register and login as the sellers. Then, the users can add the product that they want to sell to our proposed mobile application. After the users upload the product that they want to sell to our proposed mobile application, they can view their uploaded products through our proposed mobile application. Lastly, if there is any buyers that buy the products from this seller, the seller can check that which buyer bought the product and also come with the all the information which are including buyer's information and also the product's details that the seller uploaded.

Buyer Block Diagram
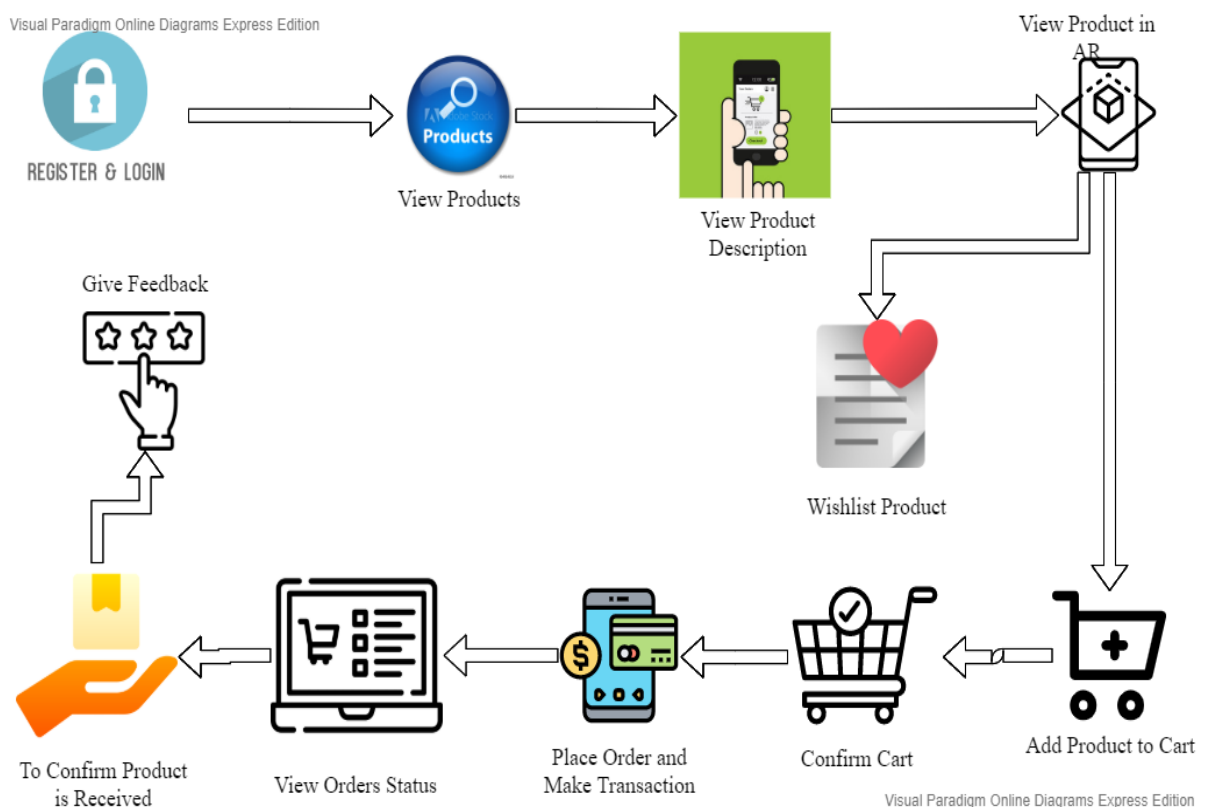
Figure3.2.1.2: Buyer's Block Diagram

Figure3.2.1.2 above shows the block diagram of the proposed mobile application for the buyer's perspective. Normal users that just wish to buy some products through our proposed mobile application, is also needed to register and login for further action. After the users register and login to our proposed mobile application, users can view all the products which is available that uploaded by all the sellers. After the users view all the products, when they decided to buy 1 of those products, users can click the image of the product and view the description of the product. Before the users

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wish to add the product to their cart or Wishlist the product, the users can view the product by using Augmented Reality view which can overlay the product to real world environment that can provide the users a more detail for the product that they are browsing. If the category of the product that the buyer browsing is lipstick, the users can try the lipstick on their face by using Augmented Reality feature which can enable the users to beauty try-on simulation on live video through their device. Then, if the users are satisfying with the product, they can simply add the product that they wish to buy into the cart or just wish list the product. By wish listing the product, if the product is having any discount, it will be notifying the users through notification. After that, users need to confirm the cart before proceeding to the further action. While the users have done with the confirmation of their cart, they can place order and make transaction through our proposed mobile application. Then, the users have to wait for the order status to be updated where their product will be shipped by the sellers and received by the users. If the users had received the product, the users will need to verify with it and users can choose to provide feedback to the product that they had received.

3.2.2 Use Case Diagram
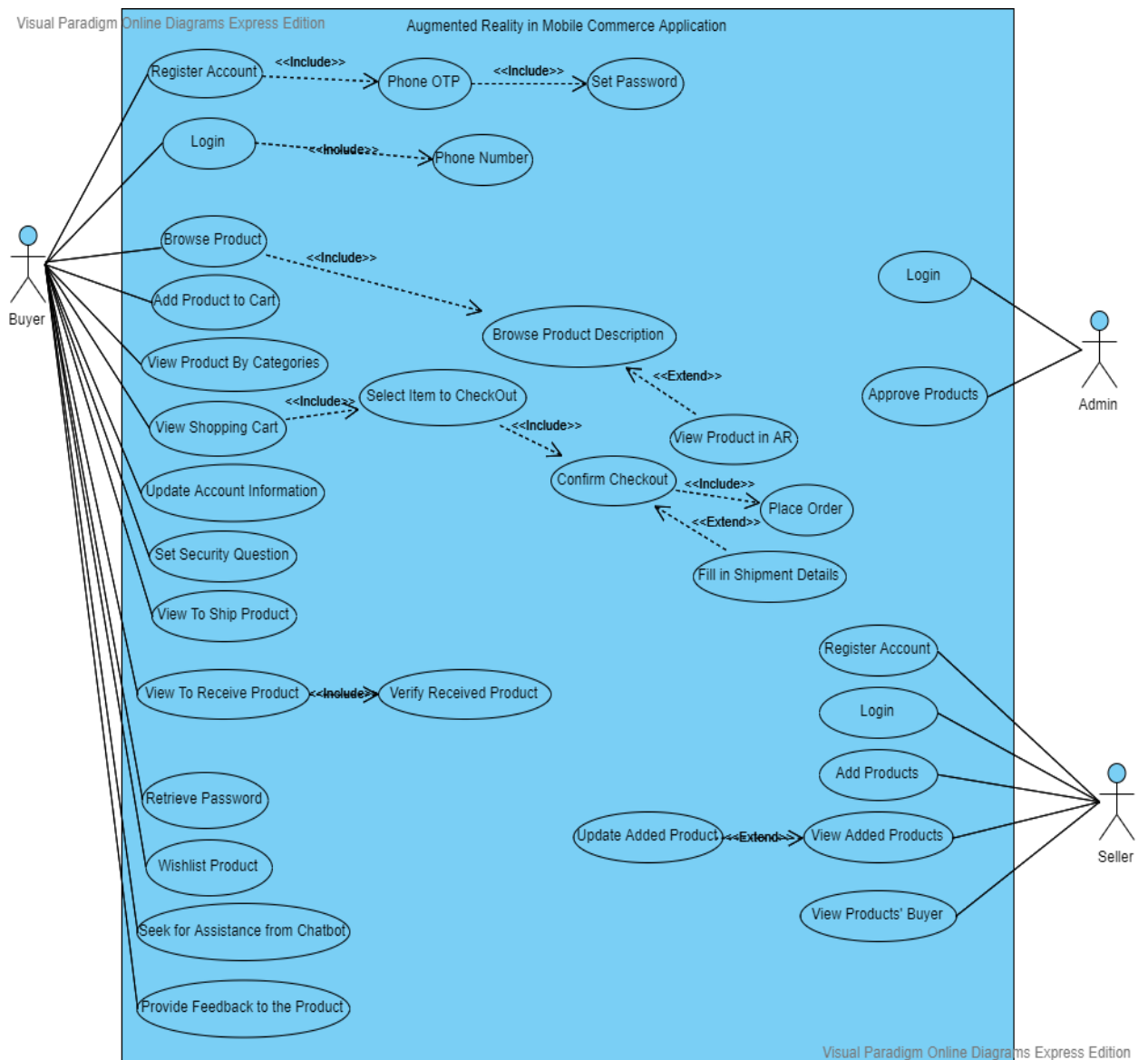
Figure3.2.2.1: Use Case Diagram for Proposed Mobile Application

From the Figure3.2.2.1, we can see that there are several numbers of function are provided for different roles are including Buyer, Admin and Seller.

Admin

1. Login

- Login is necessary function for the proposed mobile application even for the Admin. Admin has to login to the account first only can deal with the further action.

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2. Approve Products

- After the sellers uploaded their products to our proposed mobile application platform, it will be under the unapproved state and the buyer will not see the products. After the admin has approve the products that is uploaded by the seller, the buyers are only available to view the products that are uploaded by the seller.

Seller

1. Register Account

-   For the users that want to become a seller in our proposed mobile application, the users need to register the account for the seller. During the registration process, users must provide the information such as name, phone number, email address, password and the shop address. Users will automatically login to the proposed mobile application after the registration process is success.

2. Login

    -    If the seller wants to buy some products at our proposed mobile application platform, they need to be log out and log in as a buyer. So, if the sellers want to login into the seller's account, they need to relogging into their seller account for further action.

3. Add Products

-   After the sellers have register or log in into their account, the sellers can add the products that they wish to sell at our proposed mobile application platform. During this process, sellers need to provide the information about the products that they wish to sell which are including the product name, product description, product name, product image, and also the 3D Image which is for the buyer to view the product in AR view.

4. View Added Products

-   After the sellers has added the product that they wish to sell at our proposed mobile application platform, the sellers are able to view the products that are added to our proposed mobile application platform.

5. Update Added Products

-   The sellers are able to update the product which is added and belongs to them. They can update the details for the product which are including the product name, price, details and discount for the product.

6. View Products' Buyer

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- If there is a buyer that bought the product that is added by the seller, the seller can view the buyer that purchase the products that come with the buyer's information and the details of the products.

   Buyer

1. Register Account

- For new visitor that wish to buy product on the proposed mobile application, users must register for an account. Users will use the phone OTP method to register their account. After the users have register for the account, they need to set the password for their account. If the registration process is success, users will automatically login into the proposed mobile application.

2. Login

- The buyer can login their account through several method which are including phone & password, Google login and Facebook login. Login is a necessary function for the proposed mobile application in order to keep the user's information and enable the users to keep track their order and the shopping cart.

3. Browse Product

- Users can only browse all the products which are uploaded by the sellers and the products also must approved by the admin. If the users want to buy a product, users can view the product description with the photos that is already uploaded by the sellers or by the augmented reality view. If the users want to view the product in augmented reality view, they can just simply click the view AR button in the product description page.

4. Add Product to Cart

- Users can add the product that they want to buy into their cart in order to place order and make transaction.

5. View Product by Categories

- Users can view the product that is available by categories with a simply click on the categories that they wish to browse.

6. View Shopping Cart

   - After the users added the products that they wish to buy into their cart, the users can view their shopping cart. If the users want to place an order and make transaction, the users must select the product from their cart with the confirmation process then continue to the place order action. If the users never update his account information. Before the users place order and make transaction, users have to fill in their shipment details which

are including shipment address, phone number and also the shipment name. Then, before the user continue to the last step of placing order, users able to check the subtotal items and come with the total price of all the products that they want to buy.

7. Update Account Information

- Users can update their account information, which is including changing their profile picture, their profile name and the address.

8. Set Security Question

- Users can set the security question for later retrieving password purpose.

9. View to Ship Product

- After users place the order, users can check which products are waiting for the seller to ships.

10. View to receive Product

- After the products are shipped by the seller, users can check that which of the products are already in the state of to receive. After the product had received by the users, the users must verify that they had already receive the product.

11. Wishlist Product

- Users can Wishlist the product. After the users have wish listed the product, if there are any discount on the product, it will be notifying the users through the notification.

12. Seek for Assistance from Chatbot

- Users are able to ask some question through the chatbot which is including checking the order status of the product.

13. Provide Feedback to the Product

- After the users have verify their orders or product, they can further provide feedback to the product that they had received.

14. Retrieve Password

- If the users forget their password which will be leading to lose their account, users can choose to retrieve password by fill in their phone number which is the login id and answering the security that the users have set earlier.

3.2.3 Flow Chart

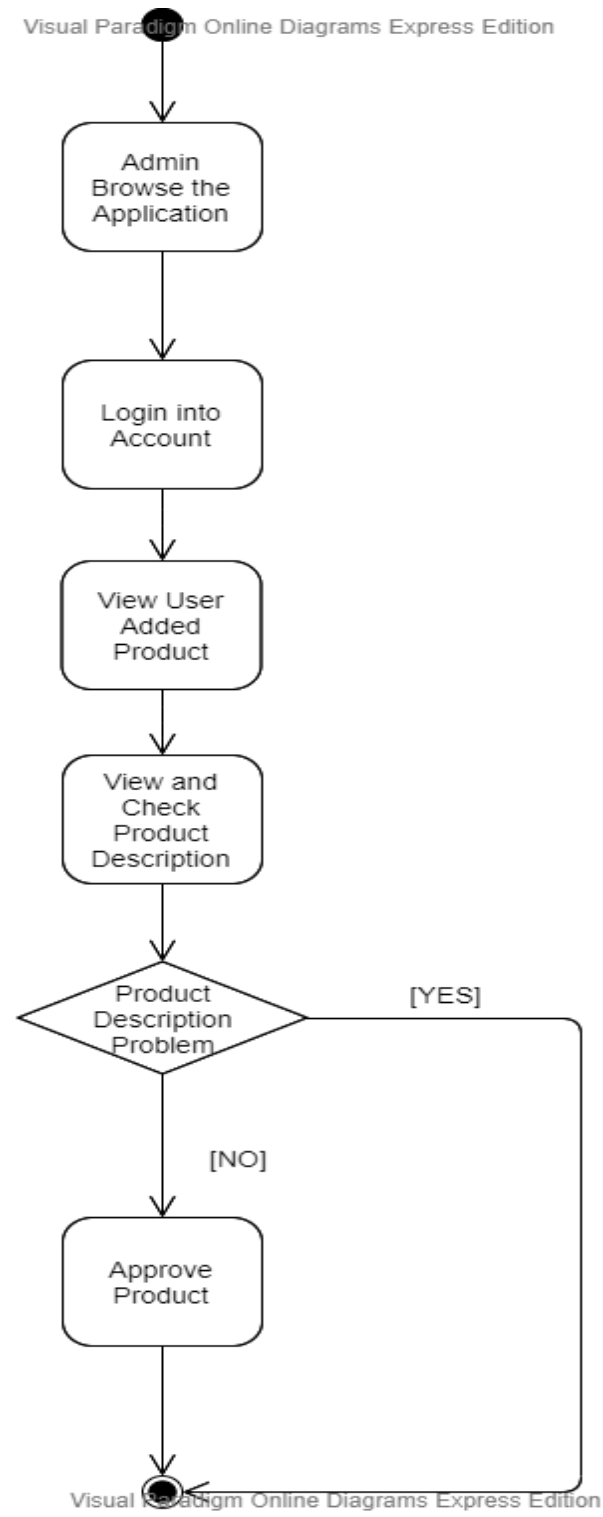**Admin Approve Seller's Product Process Flow Chart Diagram**

Figure 3.2.3.1: Flowchart for the Admin Approving Product Process

Figure 3.2.3.1 shows the flowchart diagram for the process that admin approving the products that is added by the seller to our proposed mobile application

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platform. After the seller added their products to our proposed mobile application platform, the buyer's will not able to see the products that are added if the products are not approved by the admin. So, for the products to view by the buyers, the products that are added by the sellers must be approved by the admin. So, for the admin to approve all the products that are added by the sellers, the admin must be login first. Then, the admin can view the products that are added by the user and haven't been approved. Next, the admin can click on the image of the products that are haven't been approved to view all the product description of the product. If the product description about the products don't have any problem, the admin can further to approve the products and finally the products that are added by the sellers to our proposed mobile application platform can be view by the buyers can further to the buying process.
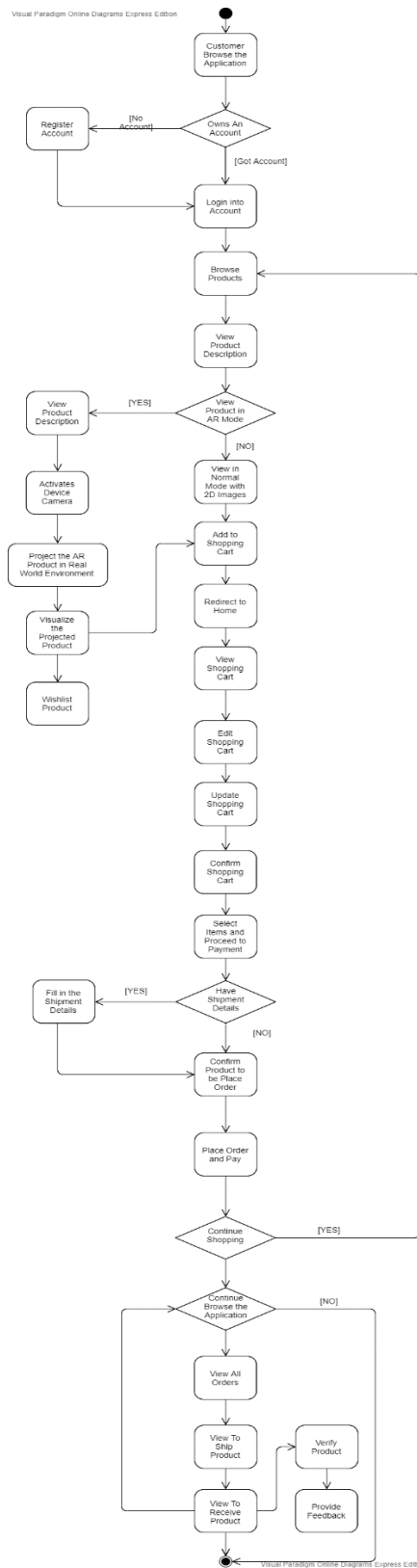
Buyer Buying Process Flow Chart Diagram

Figure 3.2.3.2: Flowchart for the Buyer Purchasing Process

Figure 3.2.3.2 shows the flowchart diagram for the process that buyers are

purchasing products at our proposed mobile application. For every customer that is first time using our proposed mobile application, they must register for an account for further action in our proposed mobile application. After users have register for an account, they can further proceed to browse all the products that are available in our proposed mobile application. When the users want to buy some product at our proposed mobile application, they can view the description of the product by clicking on the image of the product. Then, users can choose to view the product at normal mode which is 2D image of the product or in Augmented Reality view. In the Augmented Reality view, users must allow their device's camera permission on our proposed mobile application in order to view the 3D model of the product in the real-world environment. If the category for the product is makeup product, then the users will be able to use the Augmented feature to view the lipstick makeup on the face of the users which is extending the capability of beauty try-on live simulation. Then, users can choose to add the product into their shopping cart or wishlist the product. If the product is wish listed by the users, if the product is having any promotion, it will be notifying the users through the notification. After the users added to product into their shopping cart, users can go and check the product added at their shopping cart. At the shopping cart, the users still can further edit and confirm with the products for further checkout that added to the shopping cart. Only after that, users can proceed to checkout and payment. During the process of checkout, it will check that whether the users have the shipment information. If the users do not have any shipment information, it will unable proceed to payment, and it will request the users to fill in their shipment information. Then only after that, users are able proceed to payment and an order is placed. After an order is placed, users can view all the order that are being placed. In the "all orders", all the orders are categorized into to receive or to ship product. If the product that is bought by the buyer haven't been shipped by the seller, the order will be categorized into to receive product. Once the product that is bought by the buyer is shipped by the seller, the order will be categorized into the to ship product. After that, if the users had received the products, the users have to verify the product and the users are able to provide feedback to the product.

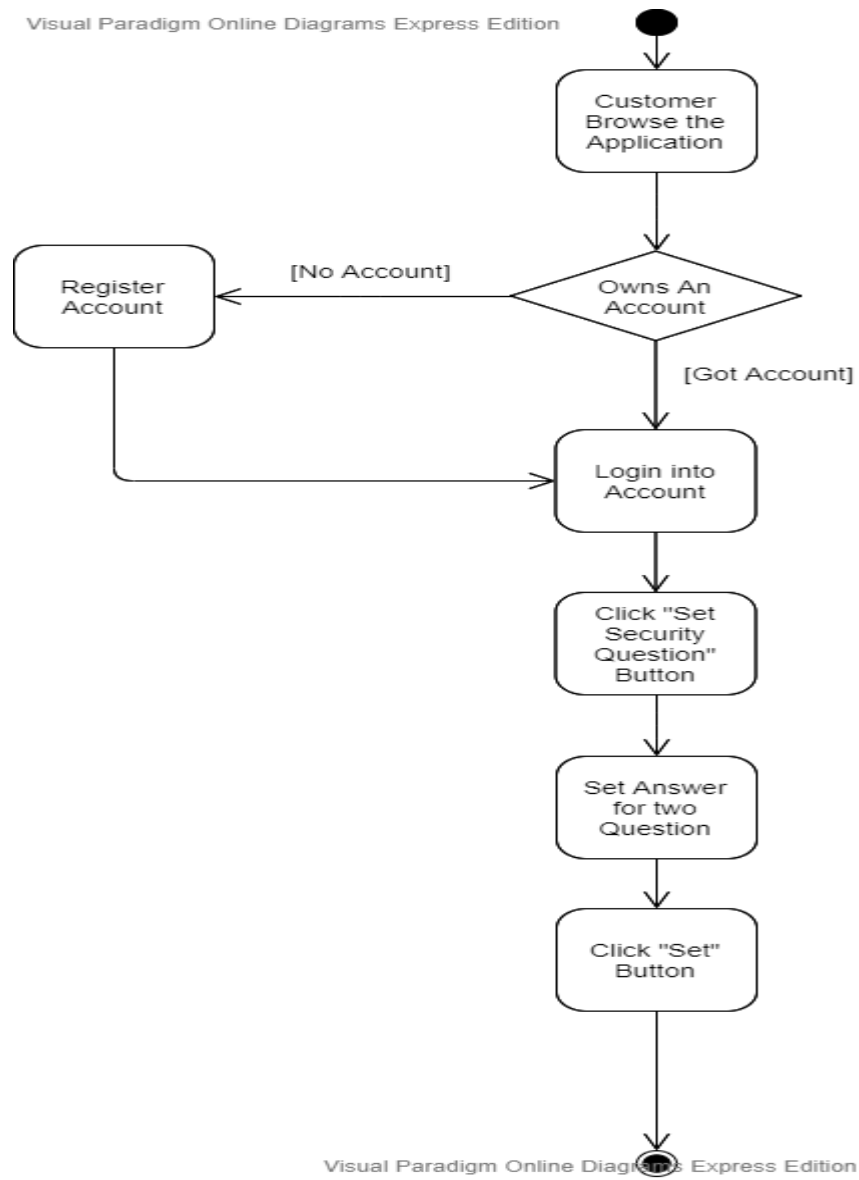**Buyer Setting Security Question Flow Chart Diagram**

Figure 3.2.3.3: Flowchart for the Buyer Setting Security Question Process

Figure 3.2.3.3 shows the flowchart diagram for the process that buyers are setting their security question at our proposed mobile application for later retrieving password purpose. First, the customer must login into their account first, before they can set their security question. The users can set their security by simply click on the "Set Security Question" button. Then, it will show 2 question for the users for the users to set the answer for the security question. After users have set the answer for the security question, the users can click the "Set" button and the answer for the security question is set and for later retrieving password purpose.
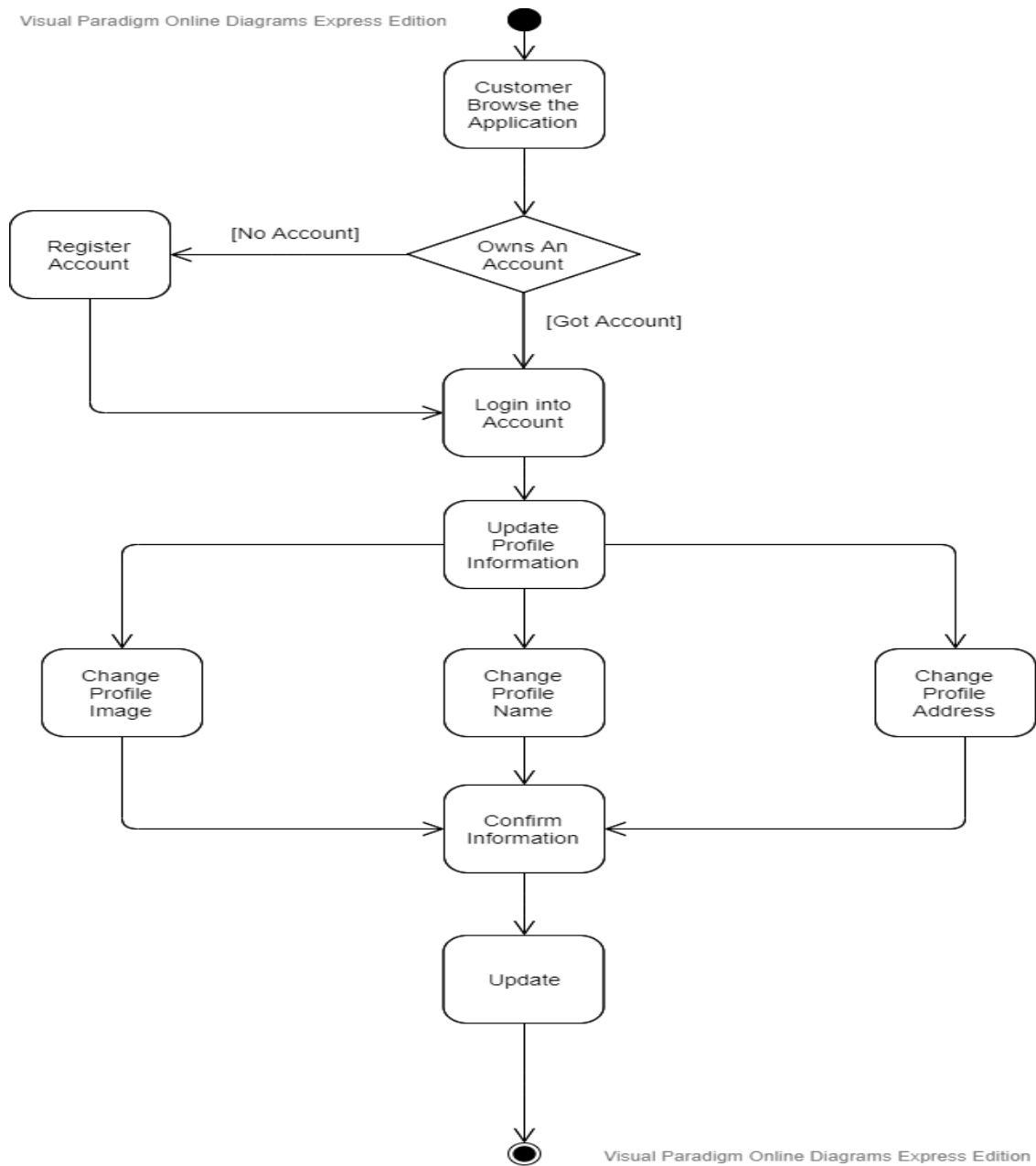
32

Buyer Updating Profile Information Flow Chart Diagram

Figure 3.2.3.4: Flowchart for the Buyer Updating Profile Information Process

Figure 3.2.3.4 shows the flowchart diagram for the process that customer updating their profile information. First, users have to login into their account only they can update the information for their profile. The users can fill in their profile name, the profile address and changing their profile image. After the users have change the profile information, users can confirm their information and finally click on the Update button to update all the profile information.

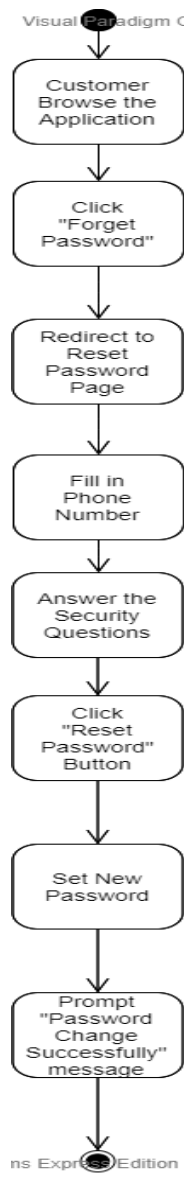**Buyer Resetting Password Flow Chart Diagram**

Figure 3.2.3.5: Flowchart for the Buyer Resetting Password Process

Figure 3.2.3.5 shows the flowchart diagram for the buyer that forget their password and the process of resetting password. If the users have forgotten their password, the users can click on the "Forget Password" text and it will redirect to the page for resetting the password. The users must fill in the information which is requested in order to reset their password which are including the phone number which is used as user id and answering the security question that had set earlier. If the users fill in all the information correctly, users can reset their password. If the users reset their

password successfully, it will be prompting a message which is "Password Change Successfully".

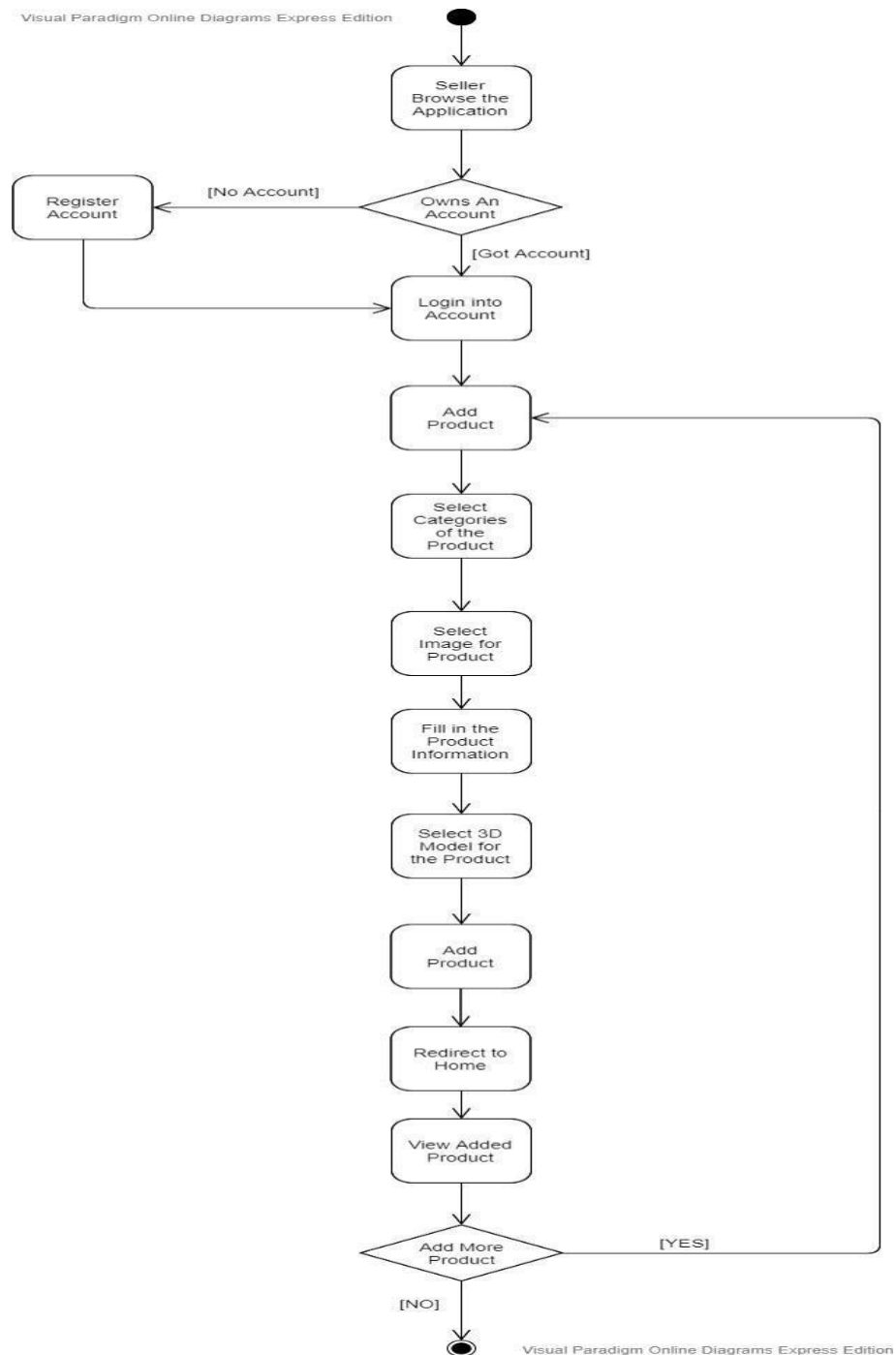**Seller Adding Product Process Flow Chart Diagram**

Figure 3.2.3.6: Flowchart for the Seller Adding Product Process

Figure 3.2.3.6 shows the flowchart diagram for the process of the sellers that

are adding their products to the proposed mobile application. First, if users want to become a seller at our proposed mobile application platform, they must register an account. After registered an account, sellers can proceed to login. Then, sellers can go to the page with the feature of adding products. After that, sellers must choose the category for the product that want to be added to our proposed mobile application platform. After that, sellers have to fill in the information about the product that want to add to our proposed mobile application platform which are including the product name, product description, product price, 2D image for the product and also the 3D model for the product if the users want to show the product in a better details way to the buyers. After the users confirm all the information, users can click add button then only the product will only be added to our proposed mobile application platform. After adding the product, sellers will redirect to the home which can view the products that are added by the seller own self. If the sellers want to add more product, they can proceed to the add product feature.

Seller Ship Product Process Flow Chart Diagram

Figure 3.2.3.7: Flowchart for the Seller Shipping Product Process

Figure 3.2.3.7 shows the flowchart diagram for the process of the sellers are shipping the products to their buyer. Sellers have to login into their account first, then the users can view their product's buyer. By clicking into the image of the product, sellers can view the product and their buyer's description. Then, after the sellers have confirmation all the information, sellers can ship the products to their buyers by clicking ship button.
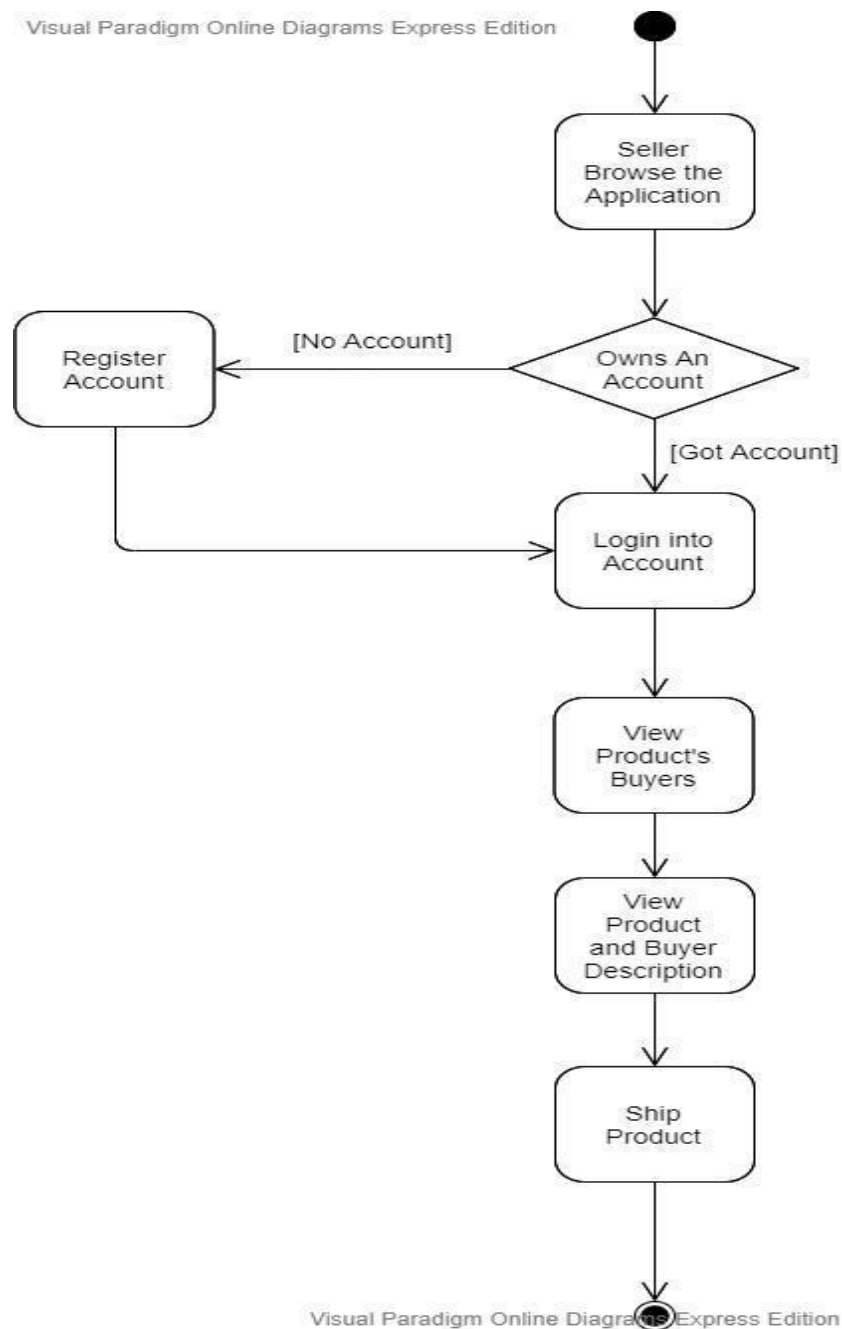
Seller Update Product Process Flow Chart Diagram
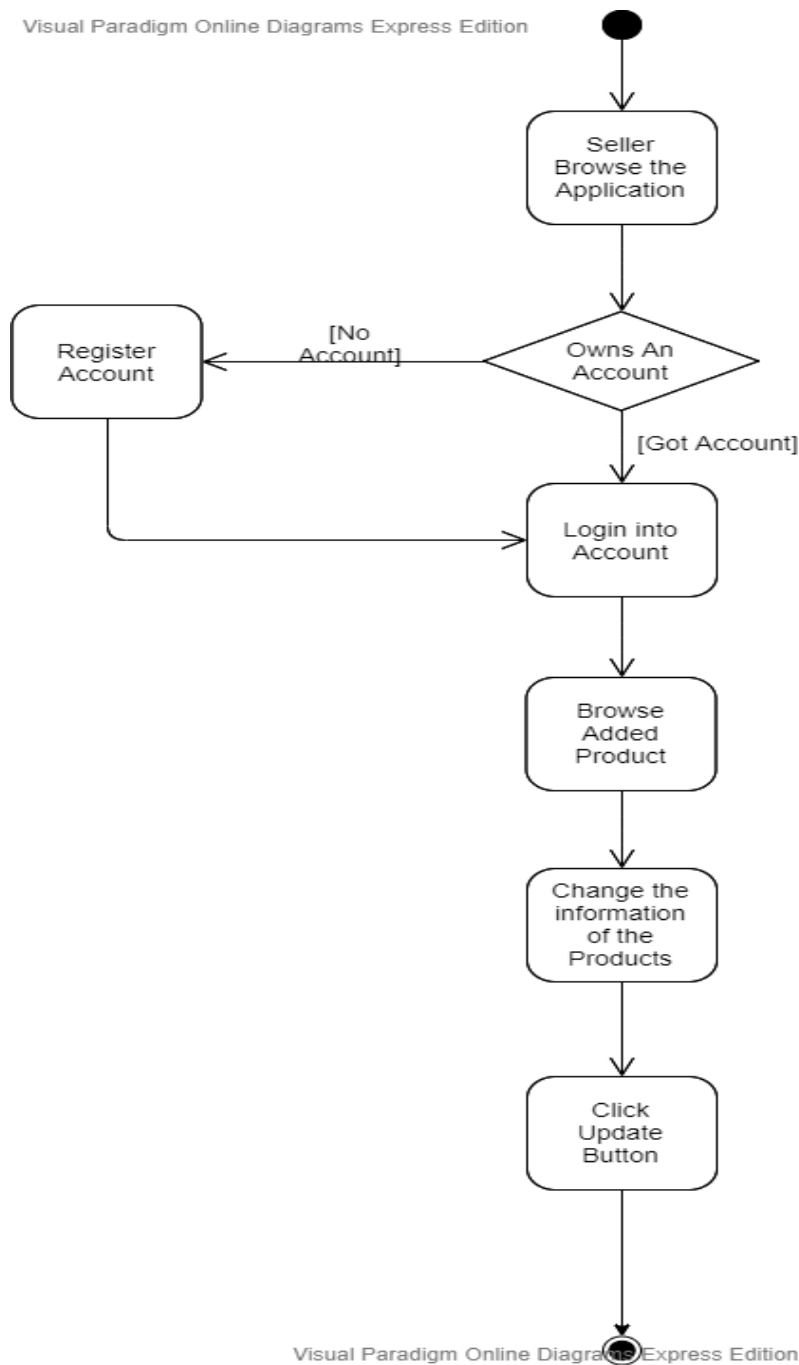
Figure 3.2.3.8: Flowchart for the Seller Update Product Process

Figure 3.2.3.8 shows the flowchart diagram for the process of the sellers are updating the products. Sellers have to login into their account first, then the users need to browse the added products in order to update the product. After the users have done any changes, the sellers need to click the "Update" button in order to save all the changes that had done to the product.

3.2.4 : Implementation Issues and Challenges

The current difficult issue and challenge in the implementation of the integration of Augmented Reality technology in commerce application is the display of the augmented reality model requires the rendering of 3D model. But there is impossible for us to create the 3D model own self and we only can search through the internet for the 3D model. However, not all 3D models are available on the Internet, we only can find limited 3D model through the Internet.

In my development of this proposed mobile application, the 3D models will be store into the Firebase which is a database that I used for my proposed project. But when I trying to create a function for sellers to add the 3D model to the Firebase own self. The challenge in the implementation arise. This is because the only format for the 3D model that can store into database and get directly is .sfb. However, the .sfb format 3D model only can get from .obj format 3D model and the sellers are unable to generate the .sfb format 3D model from the .obj format 3D model. So, during my implementation of the proposed mobile application, I will be assuming the sellers is good enough in programming which they are able to create the 3D model which is the .sfb format 3D model from the .obj 3D model own self and upload the .sfb format 3D model to the database.

The second difficult issue and challenge in this project is for the part of beauty try-on simulation on live video. Users have to provide the texture for the lipstick for the product, so that the buyers only can use this feature. But the texture has to match the face meshes of our face only the buyers are able to map the lipstick makeup to our lips correctly. The realistic of the lipstick make up on our face through the beauty try-on simulation on live video is depending on the texture that is provided are clear and perfect or not.

3.2.5 Timeline

For the previous semester, which is taking Final Year Project I, all the basic function for a commerce application will be finished. Besides, 1 of the objectives of that stated in my proposal which is viewing the products in Augmented Reality mode will be implemented. The leftover objectives will be implemented during Final Year Project II.
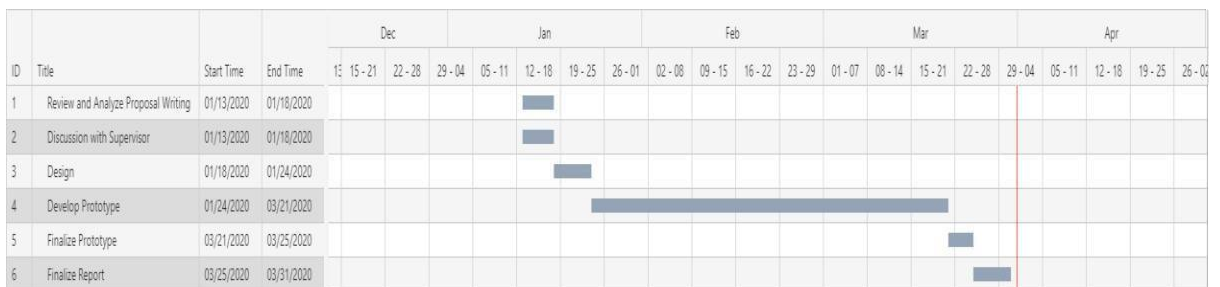
Figure 3.2.5.1: Gannt Chart for Final Year Project I

For the next semester, Final Year Project II will be taken, all the leftover objectives will be implemented during Final Year Project II.
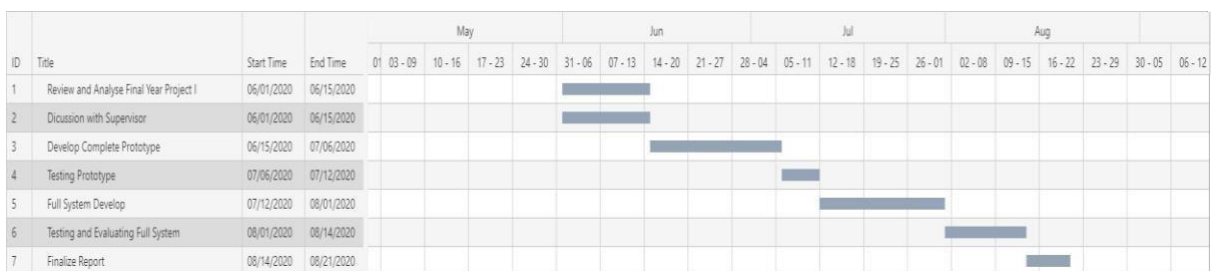

Figure 3.2.5.2: Gannt Chart for Final Year Project II

For the current semester, which is taking Final Year Project II, all the main functions which is related to the objective will be finished. Then, all the functions that is implemented within the proposed mobile application will be validate and test until there is no bugs.

Chapter 4: Preliminary Work

4.1 Admin

Figure 4.1.1: Admin Login Page

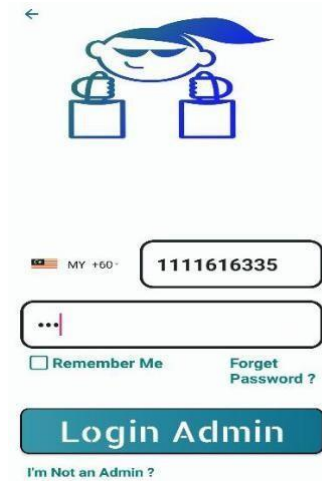Figure 4.1.1 shows the Admin Login Page which enable the Admin to login into the Admin Page.

Figure 4.1.2: Admin Home Page

Figure 4.1.2 shows the Admin Home Page which is showing the welcoming message to the Admin after the Admin has Login into his Admin account successfully.

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Figure 4.1.3: Admin Approve Products Page

Figure 4.1.3 shows the Admin Approve Page which is showing all the products that is added by the Seller on our proposed mobile application that haven't been approved. The products that haven't been approve will not show to the buyer.
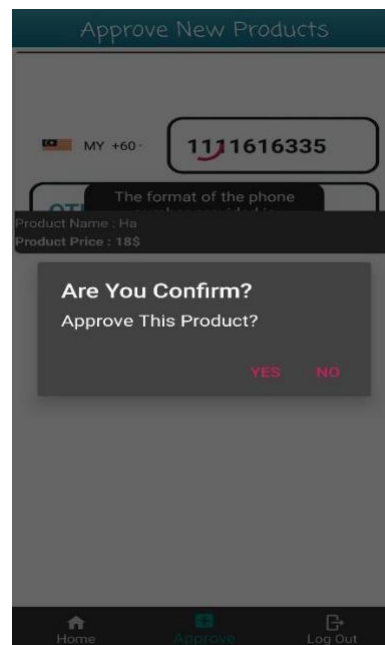

Figure 4.1.4: Admin Approve Products Function

Figure 4.1.4 shows the Admin Approve Function which enable the Admin to approve the products that is added by the seller to our proposed mobile application. Admin can either choose yes to approve the product or no to ignore the products that is

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added by the seller to our proposed mobile application.
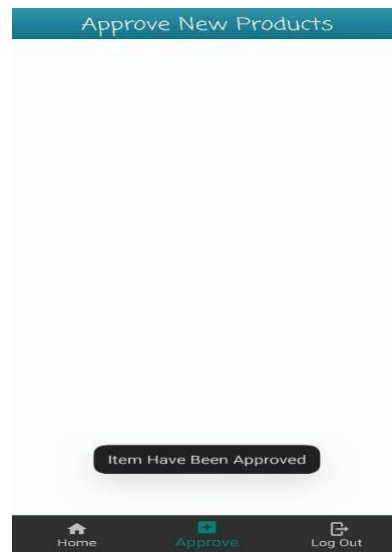
Figure 4.1.5: Products Approved

Figure 4.1.5 shows the products has been approved. After the products that is added by the seller to our proposed mobile application has been approved by the admin, the products will not be shown in the Approve Product Page and show to the admin. Now, since the product has been approved by the admin, the products that added by seller will be available and visible to the buyer.

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4.2 Seller

Figure 4.2.1: Sellers Register Page

Figure 4.2.1 shows the Sellers Register Page. Sellers must fill in all the necessary information in order to register an account as a Seller.

Figure 4.2.2: Sellers Login Page

Figure 4.2.2 shows the Sellers Login Page. Sellers type in their email and password in order to login their Seller account.

Figure 4.2.3: Sellers Home Page

Figure 4.2.3 shows the Sellers Home Page. After Seller has login into their Seller account successfully, they will be at the Seller Home Page. The Seller Home Page will be showing all the products that is added by the Seller to our proposed mobile application.

Figure 4.2.4: Sellers Add Product

Figure 4.2.4 shows the Sellers Add Product Page. Sellers can add product by simply clicking the add at the bottom navigation bar. Then, sellers must choose the

category of the product that the sellers want to add.
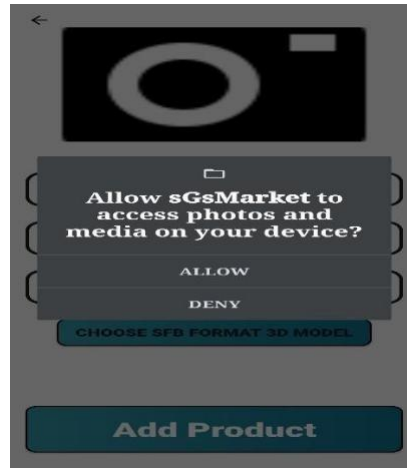
Figure 4.2.5: Allow External Storage Permission

Figure 4.2.5 shows the Allow External Storage Permission. When sellers want to select a picture from their device for the product they want to add. The sellers have to allow. the permission first.

Figure 4.2.6: Adding Product Details

Figure 4.2.6 shows the details of the product is added. Sellers must add all the required product details. For the SFB Format 3D model, sellers can choose either to select a 3D model or not to select. This SFB Format 3D model is for the product to display in the Augmented Reality View.
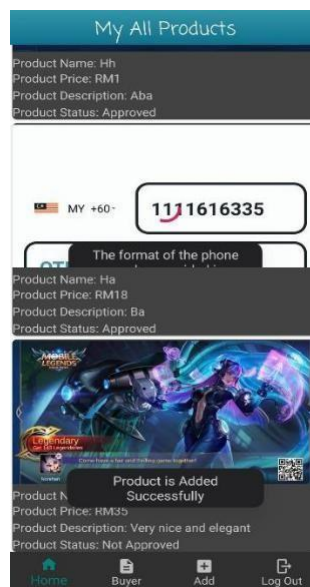
Figure 4.2.7: Added Product Successfully

Figure 4.2.7 shows the successfully of the product added to our proposed mobile application. After the product is added successfully, it will be showing at the seller's home page with the product status of Not Approved which means this product is still not approved by the admin and is unavailable and not visible by the buyers.
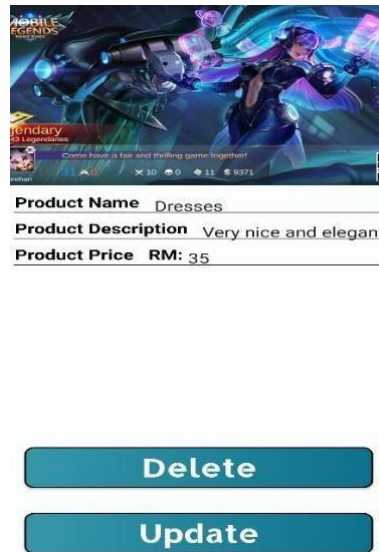
Figure 4.2.8: Maintain Product Added

Figure 4.2.8 shows the function of maintaining the product that is added by the sellers. By clicking the products show at the seller's homepage. Sellers can maintain the product by changing their product details or either delete the product that is added to our proposed mobile application

Figure 4.2.9: Viewing Product's Buyer

Figure 4.2.9 shows the page for the seller to view his product's buyer. Sellers

can view buyer information that buy the product that is added by the seller.
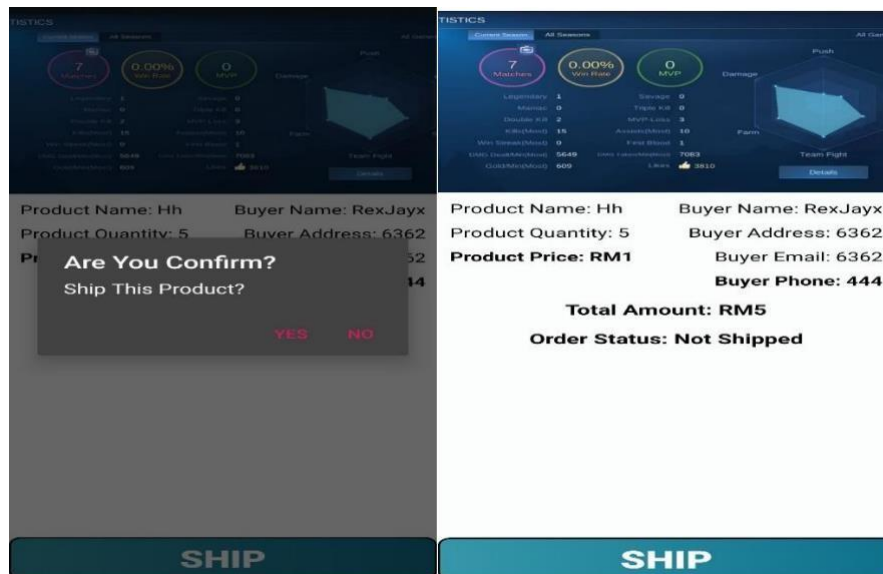
Figure 4.2.10: Buyer's Information and Order Status

Figure 4.2.10 shows the information for the buyer who buy the product that is added by the seller and the order status. Sellers can view buyer information that buy the product that is added by the seller and choose whether to ship the product or not by simply clicking on the ship button.

4.3 Buyer
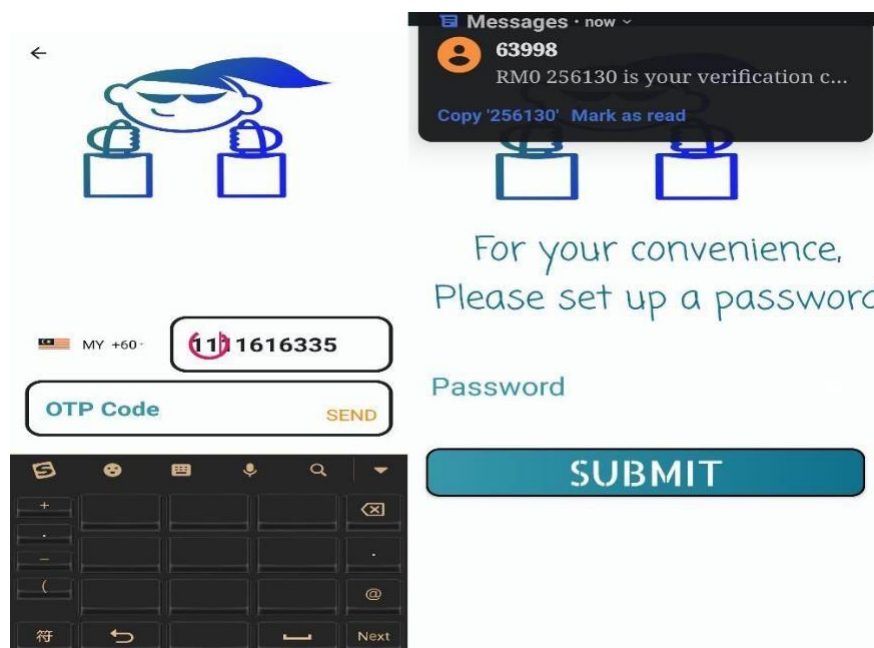
Figure 4.3.1: Buyer Register

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Figure 4.3.1 shows the users register account as a buyer. It is using the phone OTP function to register. So, after the user fill in their phone number, they will get the OTP code and redirect to the page to set up the password for the buyer account.
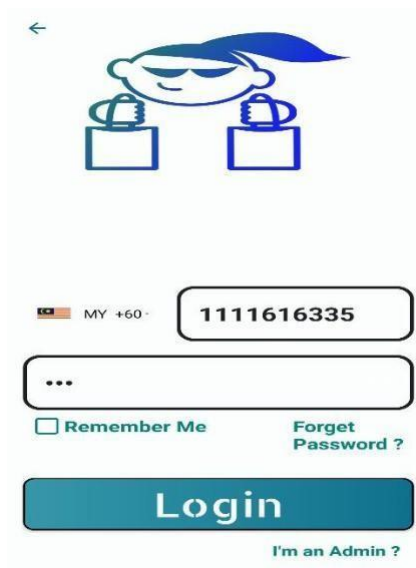
Figure 4.3.2: Buyer Login

Figure 4.3.2 shows the buyer login into their account. They will fill in their phone number and the password that had been set during register process.

Figure 4.3.3: Buyer Browse Products Page

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Figure 4.3.3 shows the page that the buyers can browse the products. After buyers have login successfully into their account. They will be redirect to the buyer's home page which is showing all the products that are added by the sellers. All the products shown in the page are approved by the admin and available.

Figure 4.3.4: Product Description in Normal Mode

Figure 4.3.4 shows the description of the product. Buyers can view the products of the description by simply clicking on the image of the product at the buyer's home page. If the seller does not upload the SFB format 3D model for the product, the Augmented Reality view for the product is not available. The product then can be added to the buyer's cart.

Figure 4.3.5: Product Description in Augmented Reality Mode

Figure 4.3.5 shows the product in the Augmented Reality mode. If the seller has uploaded the SFB format 3D model for the product, buyers are able to view the product in the Augmented Reality mode.
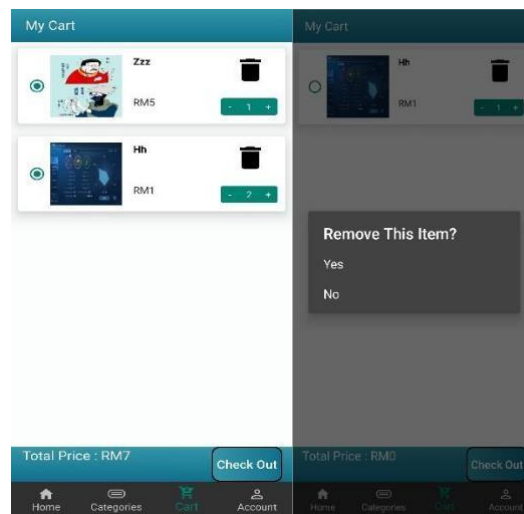
Figure 4.3.6: Buyer's Cart

Figure 4.3.6 shows the product that is added by the buyers into their cart. The buyer can select the product which is added to the cart and increase the product number and only proceed to checkout. If the buyers want to discard the product in their cart, buyers can simply click on the dustbin.

Figure 4.3.7: Buyer's Final Checkout

Figure 4.3.7 shows the final checkout for the products. The buyer can check their shipment information and the products and only place the final order.
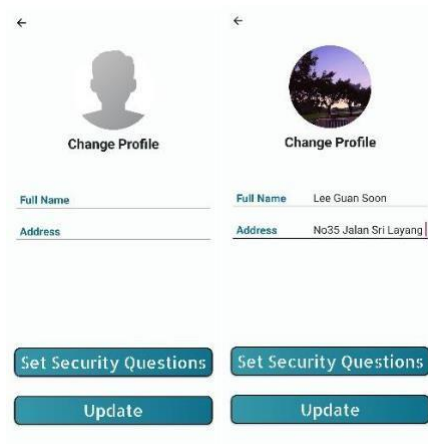
Figure 4.3.8: Update Profile Information

Figure 4.3.8 shows the function of buyer updating their profile information. Buyers can update their profile information by filling their Full Name, the shipment address and the profile picture.

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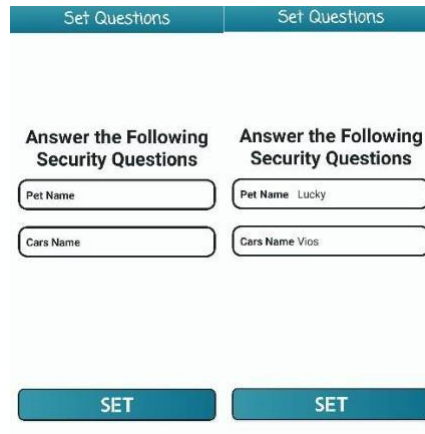
Figure 4.3.9: Set Security Question

Figure 4.3.9 shows buyer answering and setting the security question. The security question will be used for later resetting password purpose.

Figure 4.3.10: Product Search by Name

Figure 4.3.10 shows that the buyer can use search function to search for the product they want.
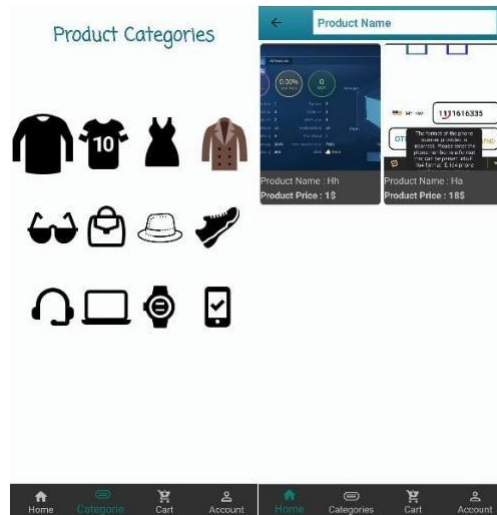
Figure 4.3.11: Product Search by Categories

Figure 4.3.11 shows that the buyer can search the products based on the categories.
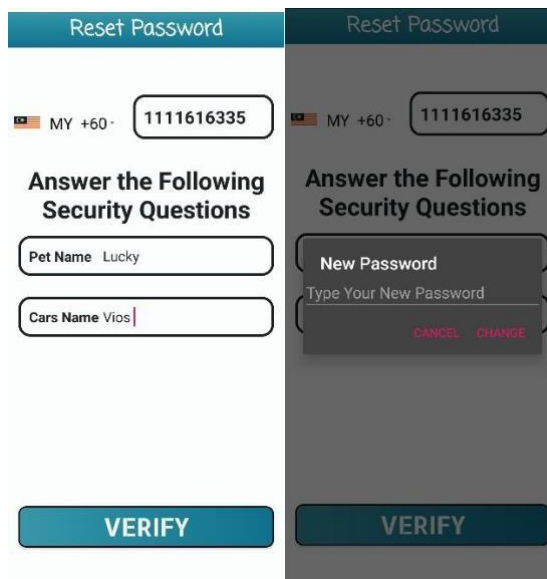
Figure 4.3.12: Reset Password

Figure 4.3.12 shows that the buyer can reset their password by answering the security question that had been set earlier if the buyer forgets their password.
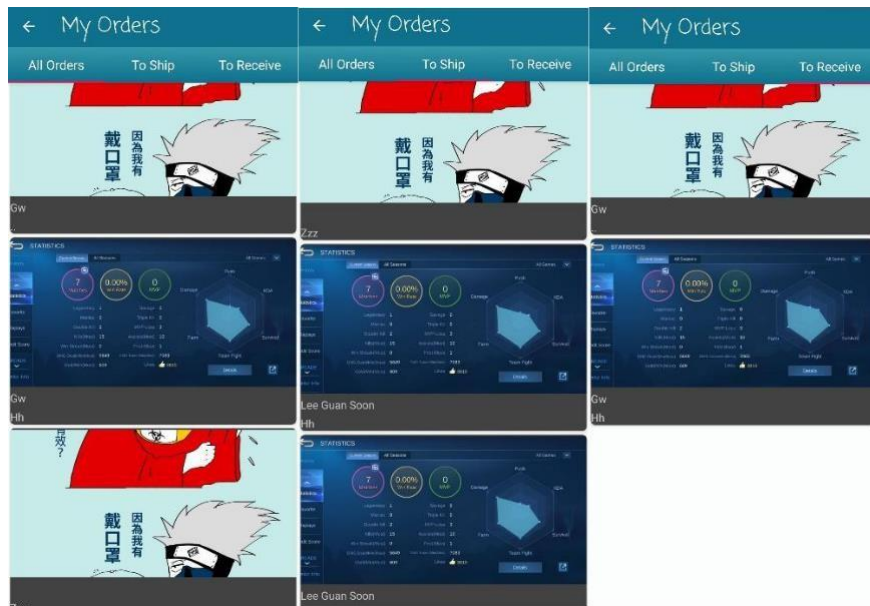
Figure 4.3.13: View Order Status

Figure 4.3.13 shows that the orders for the buyer. Buyer can view their all orders had been made. Buyer can also view for the orders that they had placed which is waiting for ship and which are waiting for receive.
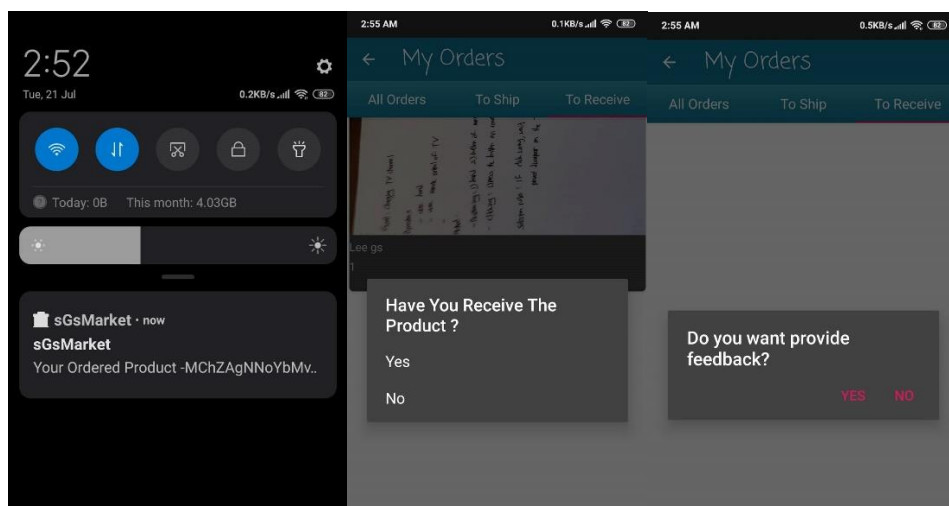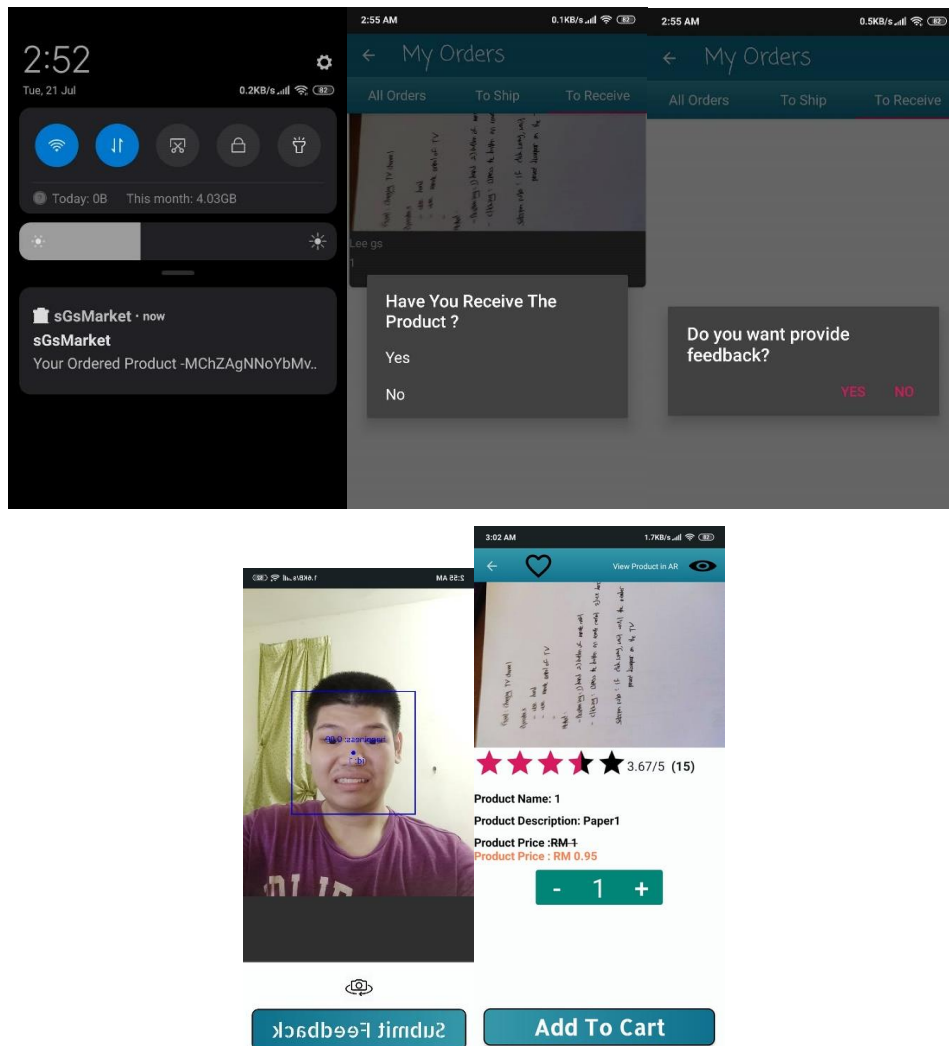
Figure 4.3.14: Verify Received Product and Provide Feedback

Figure 4.3.14 shows that when the seller has shipped out the product, that will be notifying the buyers through the notification. Then, when the buyers have received the product, the buyers have to verify with their product. After the buyers have verified the product, the buyers can provide feedback for the product. If the buyers want to provide feedback to the product, the buyers will redirect to snap a photo for the satisfaction of the buyers towards the product. It will be getting the probability of smiling from the users and convert it to the star rating for the product. Finally, the rating for the product from all the buyers will be showing at the product page to all the buyers.

Figure 4.3.15: Beauty Try-On Simulation on Live Video

Figure 4.3.15 shows that users are able to overlay the lipstick on their lips. If the product categories of the product are lipstick makeup, users are able to overlay the lipstick makeup on their lips instead of overlying the product to real world environment by using Augmented Reality feature.
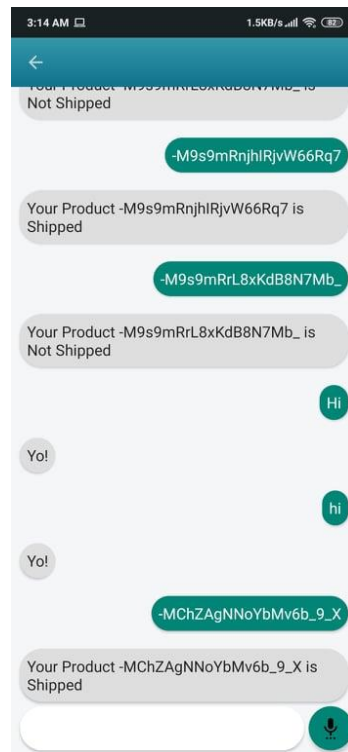
Figure 4.3.16: Chatbot System

Figure 4.3.16 shows the chatbot system. Users are able to ask the question and track the order status of their order through the chatbot system.

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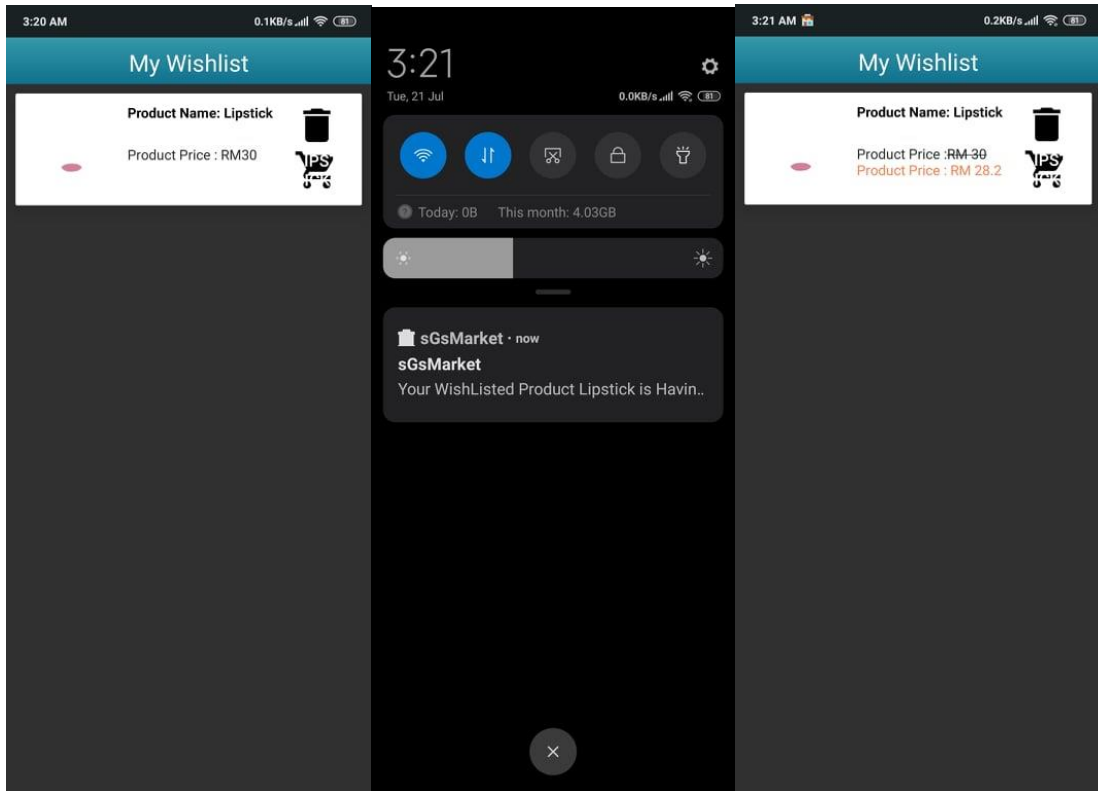
Figure 4.3.17: Wishlist of Product

Figure 4.3.17 shows that users can wish list the product and it will be showing at wish listed product page. Then, when the product is having discount, it will be notifying the users through the notification and the users will be redirect to "My Wishlist" page by clicking on the notification and the price of the product will be deduct according to the promotion of the seller give.

Chapter 5: Software Testing

5.1 Admin

5.1.1 Test Objective: Validate required fields when sign in

Actions	Output
Press "Login Admin" Button without fill in anything	System will display message "Please Fill in Your Password"
Press "Login Admin" Button after filling everything, but with wrong password	System will display message "Password Invalid"
Press "Login Admin" Button after filling everything correct	System will login the admin to the admin page

Table 5.1.1: System Validating Admin Login Possible Actions

From the test plan shown in the table above, system will validate every possible action when admin trying to login to the account. When the admin login the account without filling anything, the system will display the message "Please Fill in Your Password". Then, when admin login the account with wrong password, the system will display message "Password Invalid". Finally, when the admin login the account with every information required correctly, the system will login the admin to the admin page.
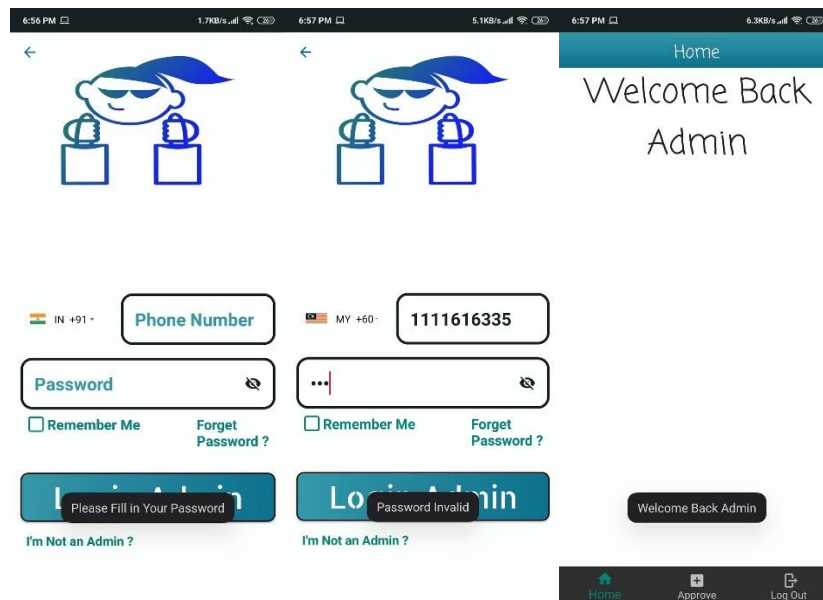
Figure 5.1.1: System check for every possible action of admin when login to the account

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5.1.2 Test Objective: Admin Approve Products of Sellers

Actions	Outputs
Click on the image of the product that is added by the sellers to the application	Dialog Box will appear with message "Approve This Product?" and comes with 2 choice which are "Yes" and "No".
Click "NO" on the dialog box that ask admin whether want to approve the product.	The dialog box will disappear, and nothing will be happened.
Click "YES" on the dialog box that ask admin whether want to approve the product.	The dialog box and the image of the product will disappear, the product is approved, and system will display message "Item Have Been Approved.

Table 5.1.2 Admin Approve Products of Sellers

From the test plan shown in the table above, admin will click on the image of the product in order to approve the product that Is added by the sellers to the application. A dialog box will appear and ask admin whether want to approve the product. If admin click "YES" the image of the product will disappear and the product will be approved. But, if the admin clicks "NO", the dialog box will disappear, and nothing will be happened.
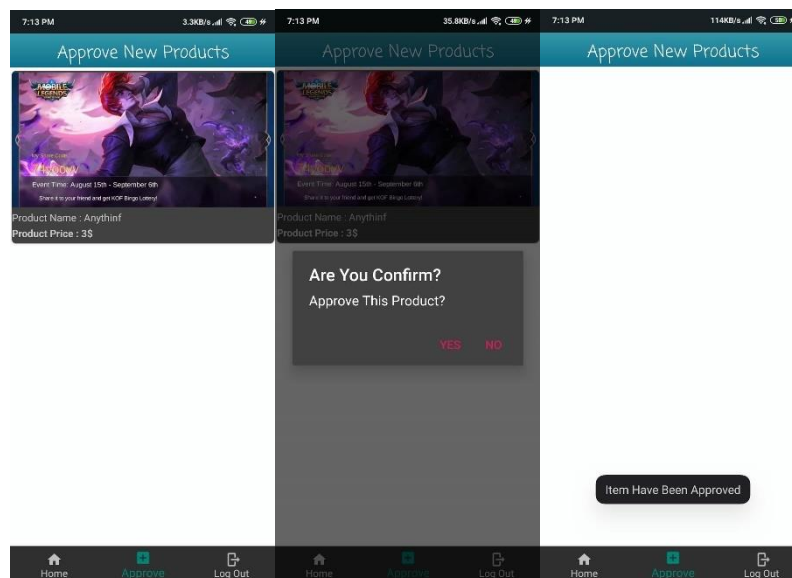
Figure 5.1.2: Admin Approve Products of Sellers

5.1.3 Test Objective: Admin Logout the Account

Actions	Output
Press "Log Out" Button at the bottom navigation bar	Dialog Box will appear with message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No"
Click "No" of the Dialog Box	Dialog Box will disappear, and nothing will be happened.
Click "Yes" of the Dialog Box	Admin will be logout from the account and redirect to the home page of the application

Table 5.1.3: Admin Logout from the account

From the test plan shown in the table above, admin will click on the "Log Out" Button at the bottom navigation bar in order to logout from the account. A dialog box will appear message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No". If admin click "YES" Admin will be logout from the account and redirect to the home page of the application. But, if the admin clicks "NO", the dialog box will disappear, and nothing will be happened.
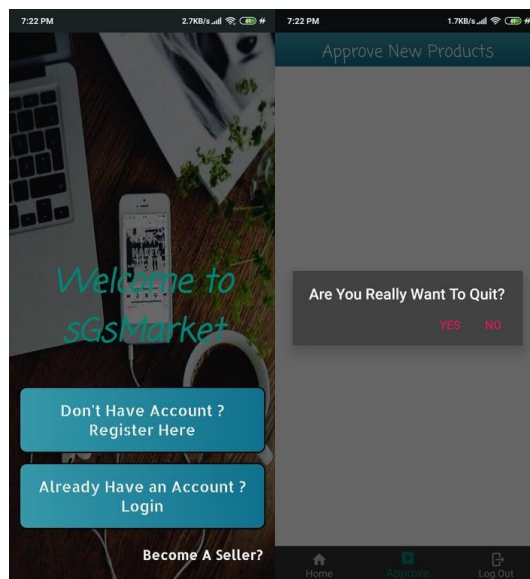
Figure 5.1.3: Admin Logout from the account

5.2 Seller

5.2.1 Test Objective: Validate Required Fields when Register Account

Actions	Output
Press "Register" Button without filling in required information	System will display message "Please Complete the Form".
Press "Register" Button after filling everything.	System will display message "Register Successfully" and redirect sellers to the seller page.
Press "Register" Button with the email address that is already existed	System will display message "Register Fail, Please Try Again".

Table 5.2.1: System Validate Required Fields when Register Account

From the test plan shown in the table above, system will validate every possible action when admin trying to register an account. When the seller clicks "Register" Button without filling in required information, system will display message "Please Complete the Form". Then, when the seller clicks the "Register" Button with the email address that is already existed, System will display message "Register Successfully" and redirect sellers to the seller page. Finally, when the seller clicks "Register" Button after filling everything, System will display message "Register Successfully" and redirect sellers to the seller page.
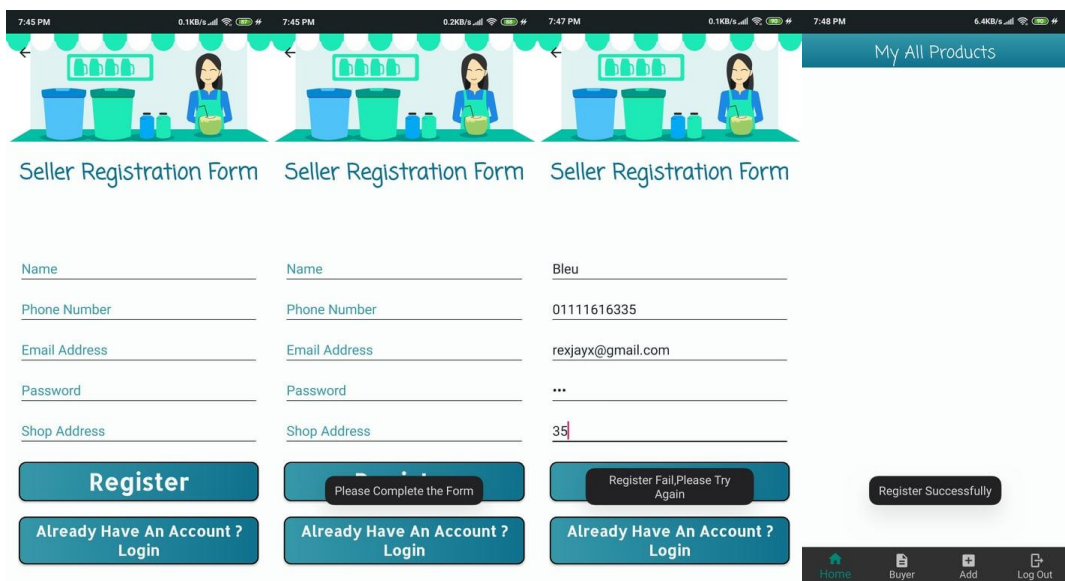
Figure 5.2.1: System Validate Required Fields when Register Account

5.2.2 Test Objective: Validate Required Fields when Sign In

Actions	Output
Press "Login" Button without fill in anything	System will display message "Please Complete the Form"
Press "Login Admin" Button after filling everything, but with wrong password	System will display message "Login Fail, Please Try Again"
Press "Login Admin" Button after filling everything correct	System will display message "Login Successfully" and login seller to the account

Table 5.2.2: Validate Required Fields when Sign In

From the test plan shown in the table above, system will validate every possible action when sellers trying to login to the account. When the seller login the account without filling anything, the system will display the message "Complete the Form". Then, when seller login the account with wrong password, the system will display message "Login Fail, Please Try Again". Finally, when the seller login the account with every information required correctly, the system will login the seller to the seller page.
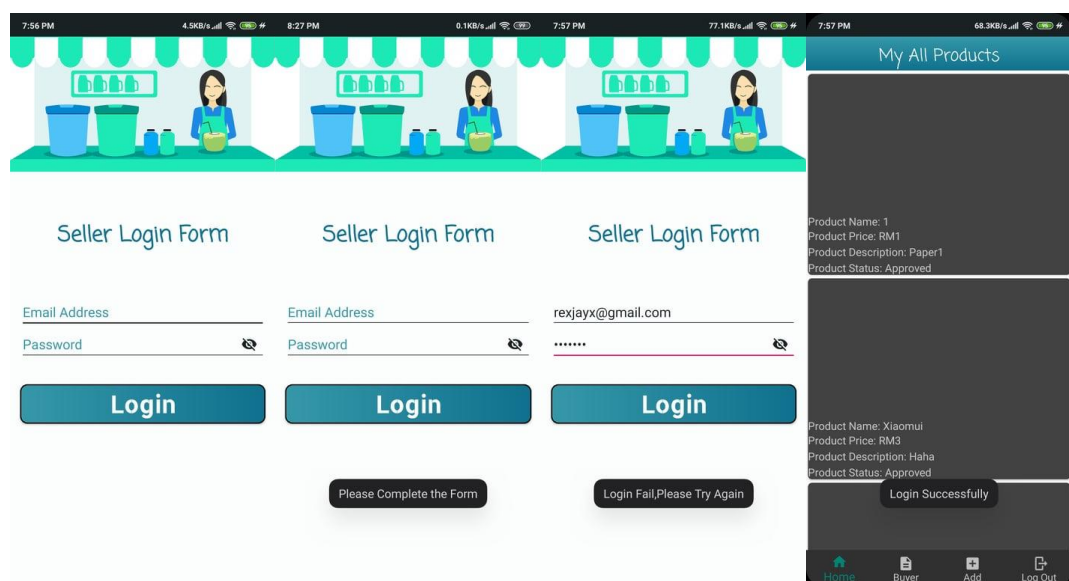
Figure 5.2.2: Validate Required Fields when Sign In

5.2.3 Test Objective: Seller Update Product Information

Actions	Output
Press the image of the product to view all the information of the product and update	System will redirect seller to the page that is showing all the information of the product and allow the seller to update the product.
Press "Update" Button without editing any information of the product	System will display message "Update Successfully" and remain all the information of the product
Press "Update" Button after removing all the information of the product	System will display message "Please Fill in the Product Information"
Press "Update" Button after editing the information of the product	System will display message "Update Successfully" and the information of the product will be updated

Table 5.2.3: Seller Update Product Information

From the test plan shown in the table above, seller will click on the image of the product at the homepage of the seller to view the information of the product. Then, if the sellers press "Update" Button without editing any information of the product, system will display message "Update Successfully" and remain all the information of the product. If the seller press "Update" Button after removing all the information of the product the system will display message "Please Fill in the Product Information". Finally, if the seller press "Update" Button after editing the information of the product, the system will display message "Update Successfully" and the information of the product will be updated.
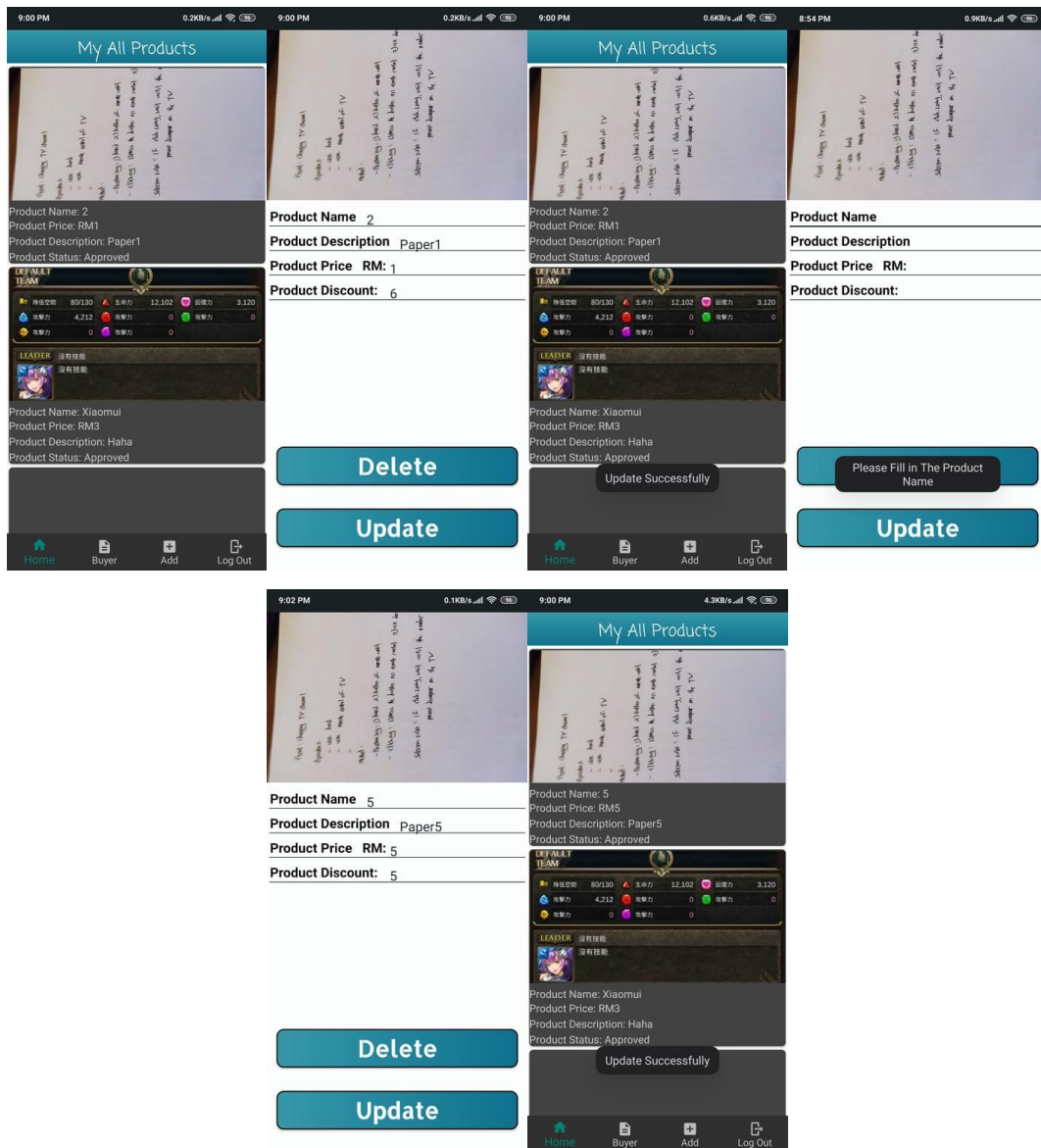
Figure 5.2.3: Seller Update Product Information

5.2.4 Test Objective: Seller Delete Product

Actions	Output
Press the image of the product to view all the information of the product and delete	System will redirect seller to the page that is showing all the information of the product and allow the seller to delete the product.
Seller press "Delete" Button	Dialog Box will appear with message "Delete This Product?" and comes with 2 choice which is "Yes" and "No"
Click "No" of the Dialog Box	Dialog Box will disappear, and nothing will be happened.
Click "Yes" of the Dialog Box	Product will be deleted, and seller will be redirected to the seller homepage.

Table 5.2.4: Seller Delete Product

From the test plan shown in the table above, seller will click on the image of the product at the homepage of the seller to view the information of the product. Then, if the sellers press "Delete" Button, Dialog Box will appear with message "Delete This Product?" and comes with 2 choice which is "Yes" and "No". If the seller clicks "No" of the Dialog Box, Dialog Box will disappear, and nothing will be happened. Finally, if the seller clicks "Yes" of the Dialog Box, Product will be deleted, and seller will be redirected to the seller homepage.

Figure 5.2.4: Seller Delete Product

5.2.5 Test Objective: Seller Ship Product to Buyer

Actions	Output
Seller press "Buyer" tab at the bottom navigation bar and press on the image of the product of his or her buyers	System will redirect seller to the page that is showing all the information of the product and buyer and allow the seller to ship the product.
Seller press "Ship" Button	Dialog Box will appear with message "Ship This Product?" and comes with 2 choice which is "Yes" and "No"
Click "No" of the Dialog Box	Dialog Box will disappear, and nothing will be happened.
Click "Yes" of the Dialog Box	Product will be shipped, and seller will be redirected to the seller homepage and system will display message "Ship Successfully"

Table 5.2.5: Seller Ship Product to Buyer

From the test plan shown in the table above, seller will click on the image of the product of his or her buyers to view the information of the product. Then, if the sellers press "Ship" Button, Dialog Box will appear with message "Ship This Product?" and comes with 2 choice which is "Yes" and "No". If the seller clicks "No" of the Dialog Box, Dialog Box will disappear, and nothing will be happened. Finally, if the seller clicks "Yes" of the Dialog Box, Product will be shipped, and seller will be redirected to the seller homepage and system will display message "Ship Successfully".
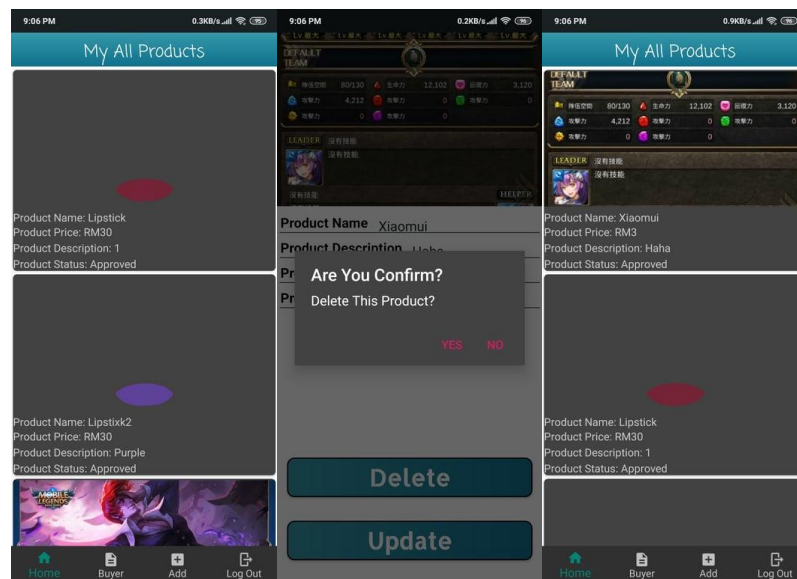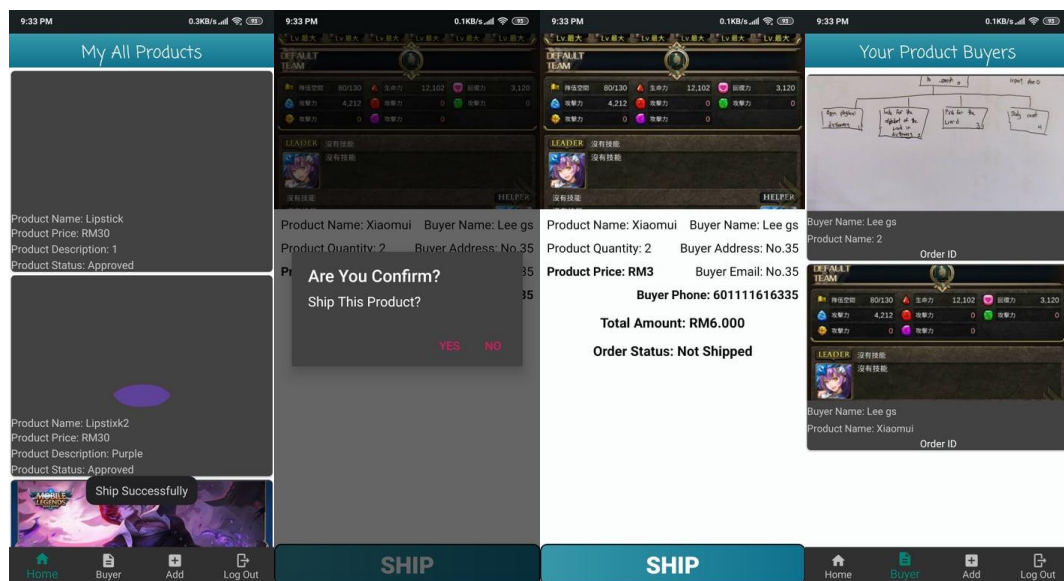

Figure 5.2.5: Seller Ship Product to Buyer

5.2.6 Test Objective: Seller Add Product

Actions	Output
Seller press "Add" tab at the bottom navigation bar and press on the categories of the product that the sellers want to add	System will redirect seller to the page that is showing the categories of the product and allow the sellers to click on it as the category of the product that seller want to add
Seller click "Add Product" without filling all the required information	System will not allow the seller to add the product
Seller click "Add Product" after filling all the required information	The product will be added successfully, and seller will be redirect to the seller homepage and able to view the product that is added. The system will display message "Product is Added Successfully".

Table 5.2.6: Seller Add Product

From the test plan shown in the table above, seller will click on the category of the product that the sellers want to add. Then, if the seller click "Add Product" Button without filling all the required information, system will not allow the sellers to add the product. Finally, if the sellers have filled all the required information for the product, the product will be added successfully, and seller will be redirect to the seller homepage. The system will also display message "Product is Added Successfully".
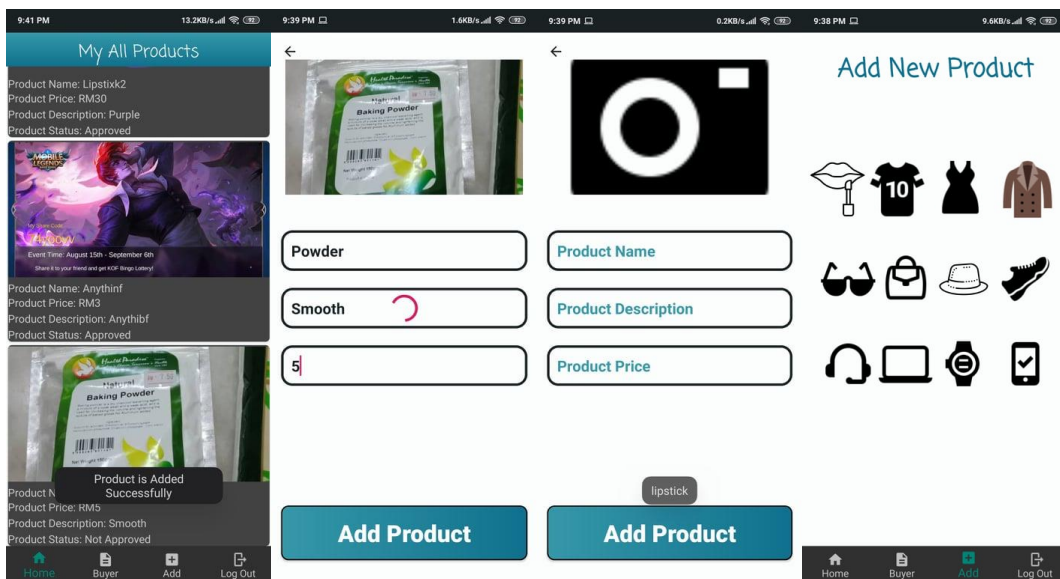
Figure 5.2.6: Seller Add Product

5.2.7 Test Objective: Seller Logout the Account

Actions	Output
Press "Log Out" Button at the bottom navigation bar	Dialog Box will appear with message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No"
Click "No" of the Dialog Box	Dialog Box will disappear, and nothing will be happened.
Click "Yes" of the Dialog Box	Seller will be logout from the account and redirect to the home page of the application

Table 5.2.7: Seller Logout from the account

From the test plan shown in the table above, seller will click on the "Log Out" Button at the bottom navigation bar in order to logout from the account. A dialog box will appear message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No". If seller click "YES" Admin will be logout from the account and redirect to the home page of the application. But, if the seller clicks "NO", the dialog box will disappear, and nothing will be happened.
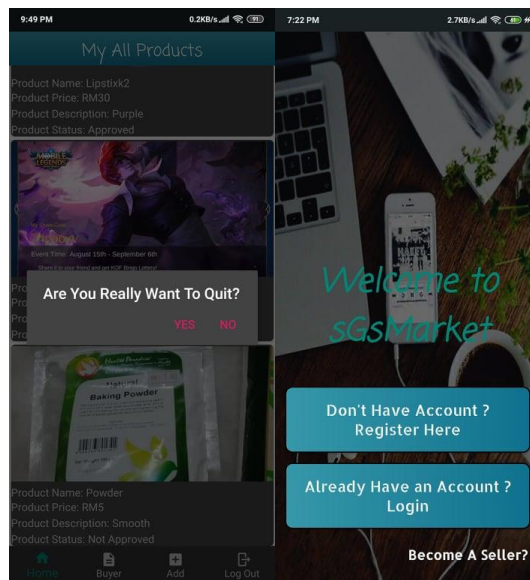
Figure 5.2.7: Seller Logout from the account

5.3 Buyer

5.3.1 Test Objective: Validate Required Fields When Buyer Register Account

Actions	Output
Press "Register" Button without filling any thing	System will display message "Enter Valid OTP Code"
Fill in Phone Number and click "SEND" at the OTP Code column	OTP Code will send as SMS to user device and auto fill in then redirect user to set up the password for their account
Register account with existed phone number	System will display message "The Phone Number is Existed, Proceed with the Login" and redirect user to the login page

Table 5.3.1: Validate Required Fields When Buyer Register Account

From the test plan shown in the table above, if buyer click "Register" Button without filling in anything, the system will display message "Enter Valid OTP Code". Then, if the buyer fill in the phone number and click "SEND" at the OTP Code column, the OTP Code will send as SMS to user device and auto fill in then redirect user to set up the password for their account. Finally, if the buyer register an account with the existed phone number, the system will display message "The Phone Number is Existed, Proceed with the Login" and redirect user to the login page.

Figure 5.3.1: Validate Required Fields When Buyer Register Account

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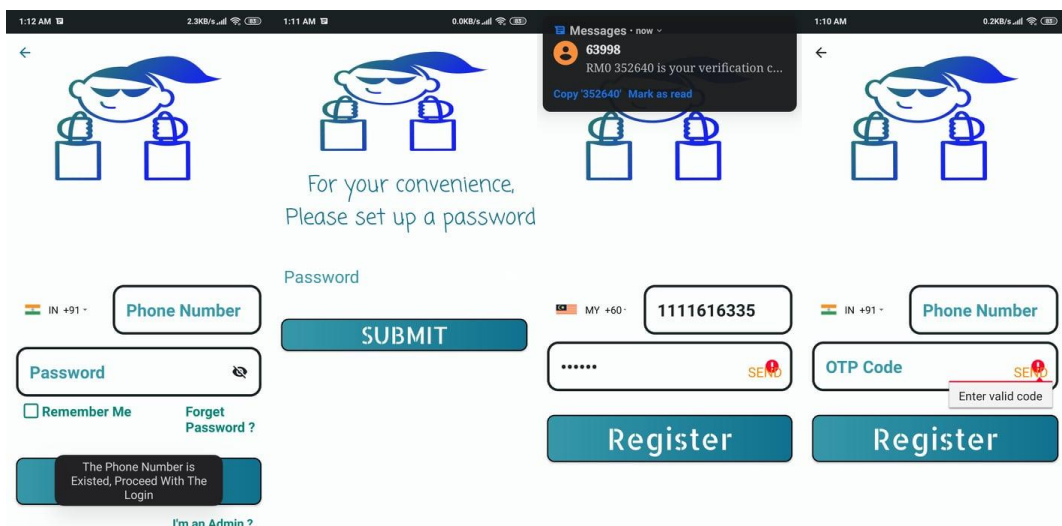
5.3.2 Test Objective: Validate Required Fields When Buyer Login

Actions	Output
Press "Login" Button without fill in anything	System will display message "Please Fill in Your Password"
Press "Login" Button after filling everything, but with wrong password	System will display message "Password Invalid"
Press "Login" Button after filling everything correctly	System will login the buyer to the account then redirect buyers to the buyer homepage and system will display message "Login Successfully".

Table 5.3.2: Validate Required Fields When Buyer Login Account

From the test plan shown in the table above, if the buyers click "Login" Button without filling anything, the system will display message "Please Fill in Your Password". Then, if the users click "Login" Button after filling everything, but with wrong password, the system will display message "Password Invalid". Finally, if the buyers click "Login" Button after filling everything correctly, the system will login the buyer to the account and system will display message "Login Successfully".
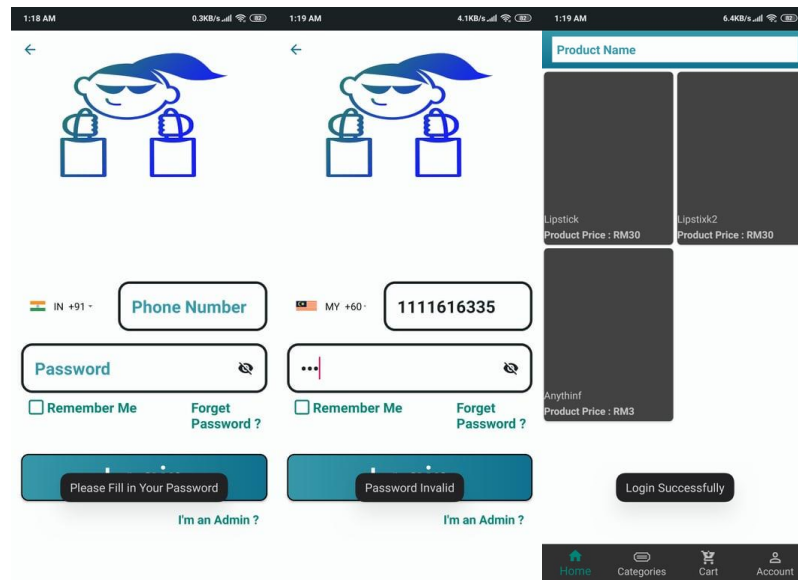
Figure 5.3.2: Validate Required Fields When Buyer Login Account

5.3.3 Test Objective: Buyer Add Product to Cart

Actions	Output
Click on the image of the product at the buyer homepage	System will redirect buyer to the page that showing all the information of the product
Press "Add To Cart" Button	Product will be added to cart, and system will redirect buyer to the homepage and display message "Item is Added to Cart List"
Press "Cart" at bottom navigation bar	Item that is added by the buyer to the cart list will be shown

Table 5.3.3: Buyer Add Product to Cart

From the test plan shown in the table above, when the buyers click on the image of the product at the buyer homepage, the system will redirect buyer to the page that showing all the information of the product. Then, when the buyer click "Add to Cart" Button, the product will be added to cart, and system will redirect buyer to the homepage and display message "Item is Added to Cart List". Finally, if the buyer want to check the product that has added to cart, buyer can click "Cart" at the bottom navigation bar, and the item that is added by the buyer to the cart list will be shown.

Figure 5.3.3: Buyer Add Product to Cart

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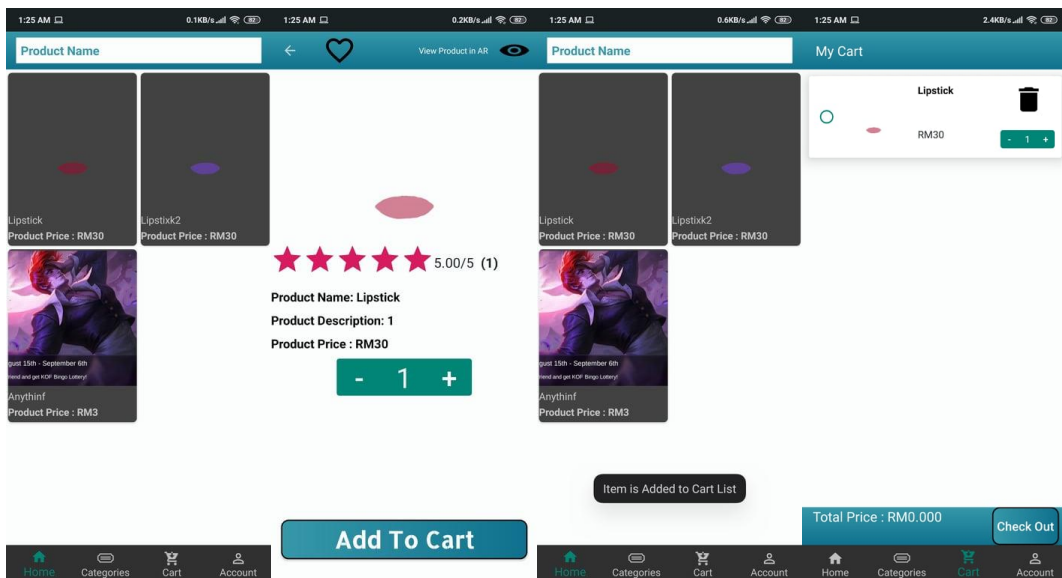
5.3.4 Test Objective: Buyer Wishlist Product

Actions	Output
Click on the image of the product at the buyer homepage	System will redirect buyer to the page that showing all the information of the product
Press the "Love" icon on the top left corner	Product will be wish listed and the system will display message "Product Wish Listed Successfully".
Press "Account" at bottom navigation bar and click on "My Wishlist" Button	Product that is wish listed by the buyer will be shown

Table 5.3.4: Buyer Wishlist Product

From the test plan shown in the table above, when the buyers click on the image of the product at the buyer homepage, the system will redirect buyer to the page that showing all the information of the product. Then, if the buyer click on the "Love" icon on the top left corner, the product will be wish listed and the system will display message "Product Wish Listed Successfully". Finally, when the buyer want to see the wish listed product, buyer can click the "Account" at bottom navigation bar and click on "My Wishlist" Button and the product that is wish listed by the buyer will be shown.
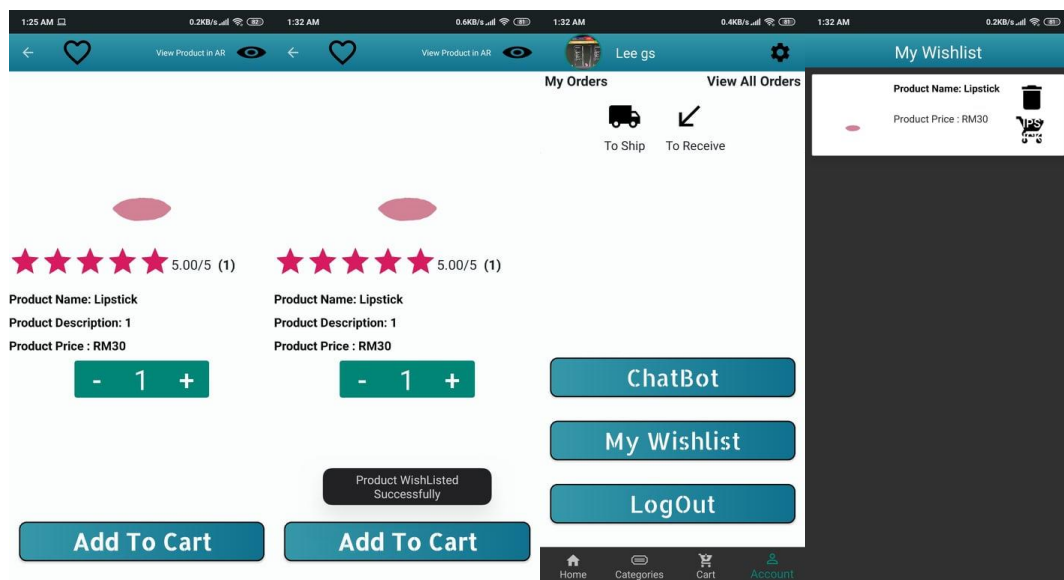
Figure 5.3.4: Buyer Wishlist Product

5.3.5 Test Objective: Buyer Search Product by Product Name

Actions	Output
At the buyer homepage, buyer click on the top "Product Name" column	System will redirect buyer to the page allow buyer to type in the product name in order to search for the product
Buyer fill in the product name and click "SEARCH" button	System will display all the products to the buyer according to the name that search by the buyer.

Table 5.3.5: Buyer Search Product by Product Name

From the test plan shown in the table above, when the buyers click on the top "Product Name" column at the homepage, the system will redirect buyer to the page that allow buyer to type in the product name in order to search for the product. Then, buyer fill in the product name and click "SEARCH" button, the system will display all the products to the buyer according to the name that search by the buyer.
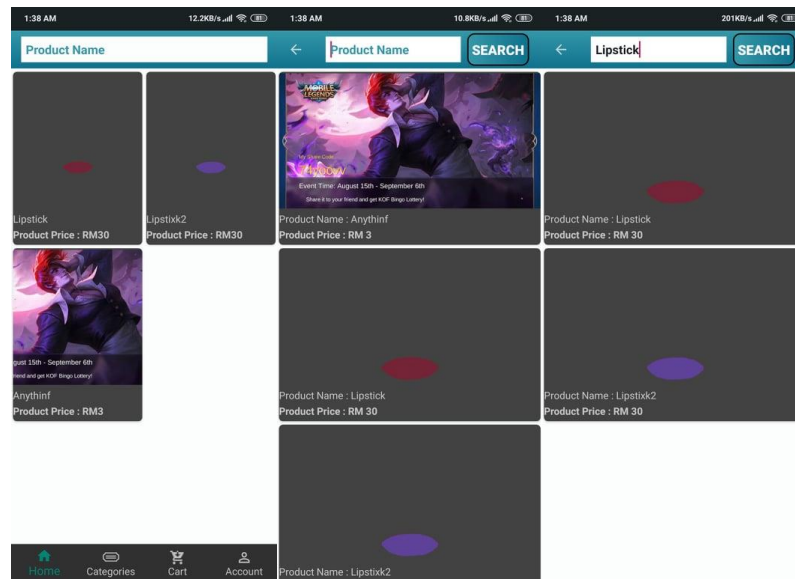
Figure 5.3.5: Buyer Search Product by Product Name

5.3.6 Test Objective: Buyer Search Product by Categories

Actions	Output
Buyer click on the "Categories" at the bottom navigation bar	System will redirect buyer to the page that can let the buyer to select the product categories that the category of the product buyer want to search
Buyer click on the product category	System will display all the products to the buyer according to the category of the product that is selected by the buyer

Table 5.3.6: Buyer Search Product by Categories

From the test plan shown in the table above, when the Buyer click on the "Categories" at the bottom navigation bar, the system will redirect buyer to the page that can let the buyer to select the product categories that the category of the product buyer want to search. Finally, after the buyer click on the product category, the system will display all the products to the buyer according to the category of the product that is selected by the buyer.
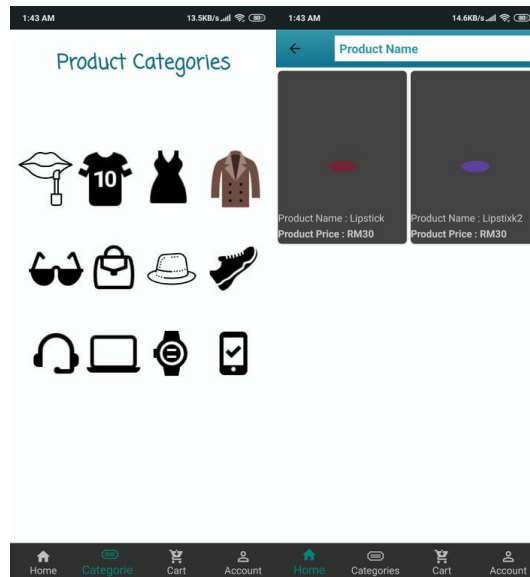
Figure 5.3.6: Buyer Search Product by Categories

5.3.7 Test Objective: Buyer Delete Product from Cart

Actions	Output
Buyer click on the "Cart" at the bottom navigation bar	System will redirect buyer to cart page and showing all the products in the buyer's cart
Buyer click on delete button beside the product image.	Dialog Box will appear will message "Remove This Item?" which comes with 2 choice "YES" and "NO".
Buyer click "NO" on dialog box	Dialog Box will disappear, and nothing will be happened.
Buyer click "YES" on dialog box	Product will be removed from buyer's cart and dialog box will be disappear.

Table 5.3.7: Buyer Delete Product from Cart

From the test plan shown in the table above, when the Buyer click on the "Cart" at the bottom navigation bar, the system will redirect buyer to the cart part and showing all the products in the buyer's cart. When buyer click on delete button beside the product image, dialog Box will appear will message "Remove This Item?" which comes with 2 choice "YES" and "NO". If, buyer click "NO" on dialog box, dialog Box will disappear, and nothing will be happened. Finally, if buyer click "YES" on dialog box, product will be removed from buyer's cart and dialog box will be disappear.

Figure 5.3.7: Buyer Delete Product from Cart

5.3.8 Test Objective: Buyer Delete Product from Wish List

Actions	Output
Buyer click on the "Account" at the bottom navigation bar	System will redirect buyer to account page
Buyer click on the "My Wishlist" button	System will redirect buyer to Wishlist page and showing all the products that wish listed by the buyer
Buyer click on delete button beside the product image.	Dialog Box will appear will message "Remove This Item?" which comes with 2 choice "YES" and "NO".
Buyer click "NO" on dialog box	Dialog Box will disappear, and nothing will be happened.
Buyer click "YES" on dialog box	Product will be removed from buyer's wish list and dialog box will be disappear.

Table 5.3.8: Buyer Delete Product from Wish List

From the test plan shown in the table above, when the Buyer click on the "Account" at the bottom navigation bar, the system will redirect buyer to the account page. Buyer then click on the "My Wishlist" button and system will redirect buyer to Wishlist page and showing all the products that wish listed by the buyer. Then, when buyer click on delete button beside the product image, dialog Box will appear will message "Remove This Item?" which comes with 2 choice "YES" and "NO". If, buyer click "NO" on dialog box, dialog Box will disappear, and nothing will be happened. Finally, if buyer click "YES" on dialog box, product will be removed from buyer's Wishlist and dialog box will be disappeared.
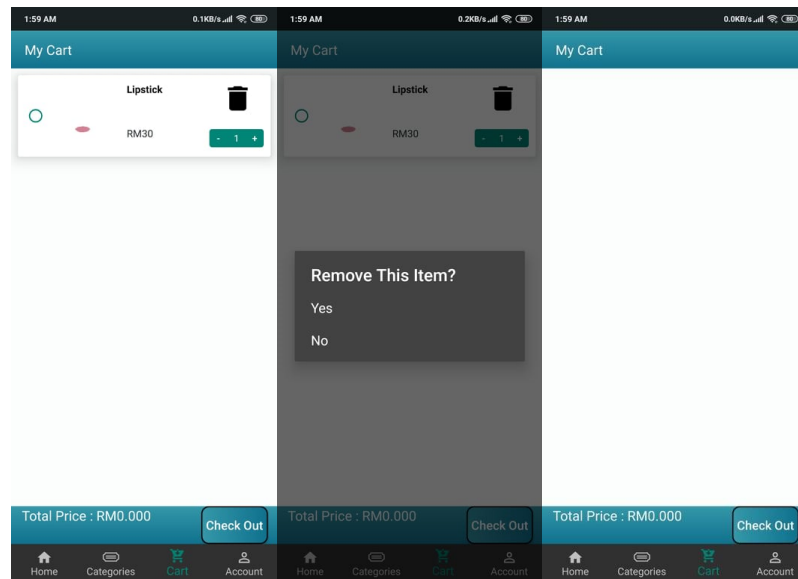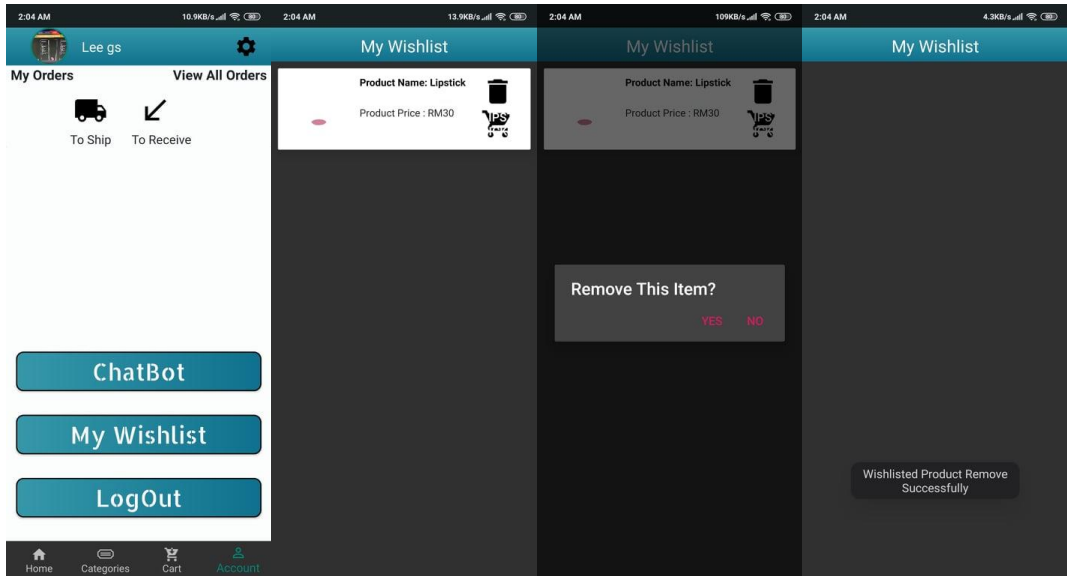
Figure 5.3.8: Buyer Delete Product from Wish List

5.3.9 Test Objective: Buyer Checkout Process

Actions	Output
Buyer click "Check Out" Button without items in the cart	System will display message "Cart Don't Have Any Item, Can't Proceed to the Next Step".
Buyer click "Check Out" Button with items in the cart and selected the product want to checkout	System will redirect buyer to the checkout page with all the checkout information
Buyer click "Place Order" Button	The order of the buyer will be placed, and the system will redirect buyer to the buyer homepage and display message "Final Order Placed Successfully"

Table 5.3.9: Buyer Checkout Process

From the test plan shown in the table above, when the buyer click on the "Check Out" Button without items in the cart, the system will display message "Cart Don't Have Any Item, Can't Proceed to the Next Step". Then, if the buyer click "Check Out" Button with items in the cart and selected the product want to check out, the system will redirect buyer to the checkout page with all the checkout information. Finally, when the buyer click on the "Place Order" Button, the order of the buyer will be placed, and the system will redirect buyer to the buyer homepage and display message "Final Order Placed Successfully"
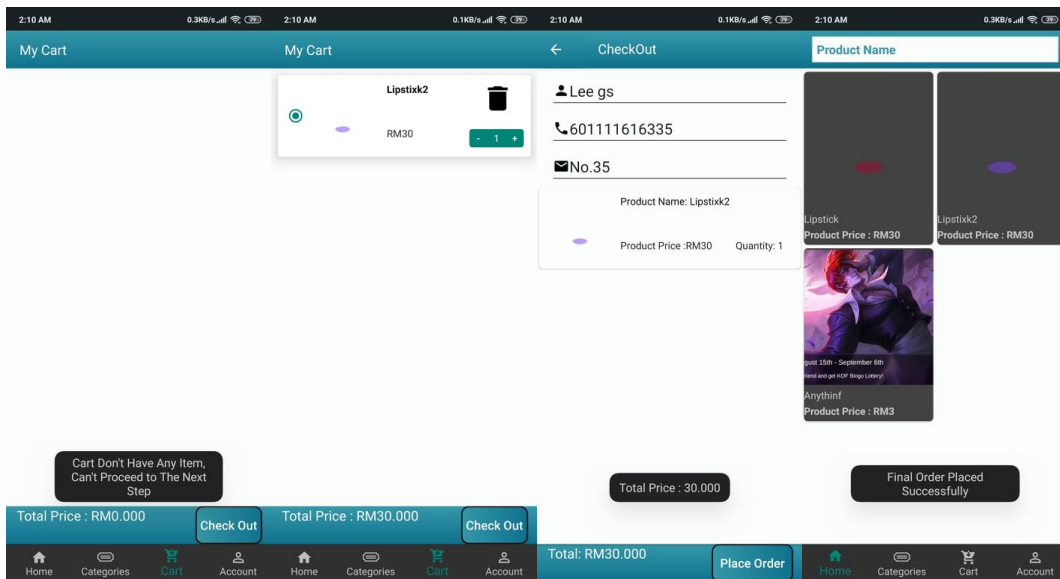
Figure 5.3.9: Buyer Checkout Process

5.3.10 Test Objective: Buyer Setting Process

Actions	Output
Buyer click "Account" Button on the bottom navigation bar	System will redirect buyer to account page
Buyer click "Setting" icon on the top right corner	System will redirect buyer to the setting page
Buyer click "Update" Button without filling in all the required information	System display message "Information is Mandatory"
Click "Change Profile"	Buyer able to select photo from device and crop the image and use it as profile picture
Buyer Click "Update" Button after filling all the information	Buyer's profile will be updated, and system redirect buyer to the buyer homepage and display message "Profile Updated Successfully".

Table 5.3.10: Buyer Setting Process

From the test plan shown in the table above, buyer click on the "Account" on the bottom navigation bar, system will redirect buyer to account page. Then, buyer click "Setting" icon on the top right corner, system will redirect buyer to the setting page. After that, when buyer click on the "Update" Button without finally in all the required information, system will display message "Information is Mandatory". When the buyer click on the "Change Profile", buyer is able to select photo from device and crop the

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image and use it as the profile picture. Finally, after buyer filling in all the required information and click "Update" button, buyer's profile will be updated, and the system will redirect the buyer to the buyer homepage and display message "Profile Updated Successfully".
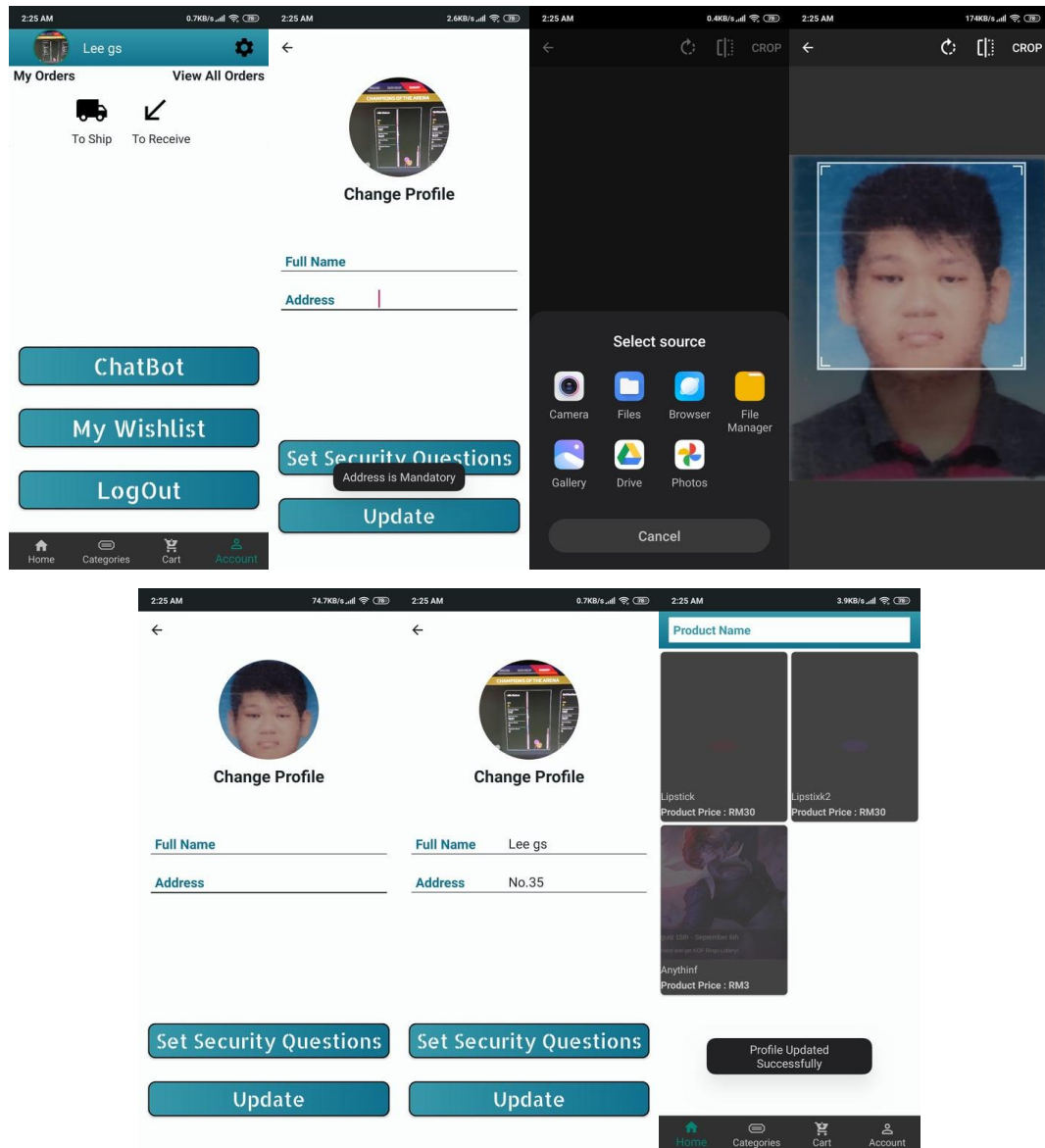
Figure 5.3.10: Buyer Setting Process

5.3.11 Test Objective: Buyer Set Security Question

Actions	Output
Buyer click "Set Security Questions" Button	System will redirect buyer to set security question page
Buyer click "SET" button without filling anything	System will display message "Please Fill in the Answer for Both of the Questions".
Buyer click "SET" Button after filling in all the required information	Security question is set, and system will redirect buyer to buyer homepage and display message "Security Questions Added Successfully"

Table 5.3.11: Buyer Set Security Question

From the test plan shown in the table above, buyer click on the "Set Security Questions" button, the system will redirect buyer to set security question page. Then, if buyer click "SET" button without filling anything, the system will display message "Please Fill in the Answer for Both of the Questions". Finally, if buyer click "SET" Button after filling in all the required information, the Security question is set, and system will redirect buyer to buyer homepage and display message "Security Questions Added Successfully"
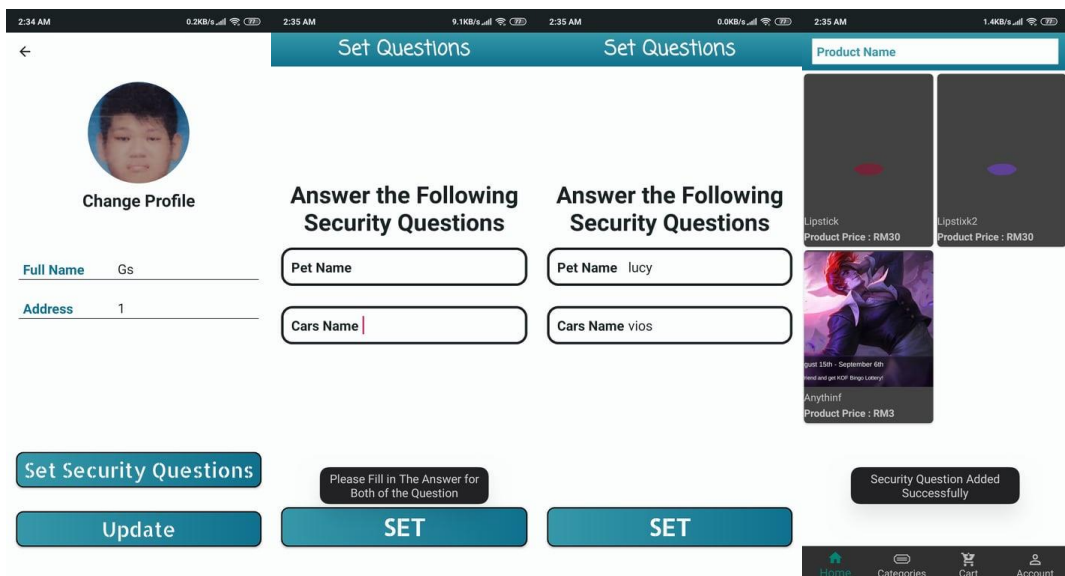
Figure 5.3.11: Buyer Set Security Question

5.3.12 Test Objective: Buyer Reset Password

Actions	Output
Buyer click on "Forget Password?" Button	System will redirect buyer to reset password page
Buyer click "VERIFY" button without filling anything	System will display message "Please Fill in the Form".
Buyer click "VERIFY" Button after filling in the wrong answer for the security question	System will display message "The Answer is Wrong".
Buyer click "VERIFY" Button after filling in the correct answer for the security question	A Dialog will appear to let the buyer to fill in the new password for the account
Buyer click "CHANGE" button after filling in the new password for the account	The new password for the account is set and the system will redirect buyer to the login page and display message "Password Changed Successfully".

Table 5.3.12: Buyer Reset Password

From the test plan shown in the table above, buyer click on the "Forget Password?" button and the system will redirect buyer to reset password page. Then, the buyer click "VERIFY" button without filling anything, the system will display message "Please Fill in the Form". If the buyer click "VERIFY" Button after filling in the wrong answer for the security question, the system will display message "The Answer is Wrong". Finally, if the buyer click "VERIFY" Button after filling in the correct answer for the security question, a dialog will appear to let the buyer to fill in the new password for the account. After that, buyer can click "CHANGE" button after filling in the new password for the account, the new password for the account is set and the system will redirect buyer to the login page and display message "Password Changed Successfully".
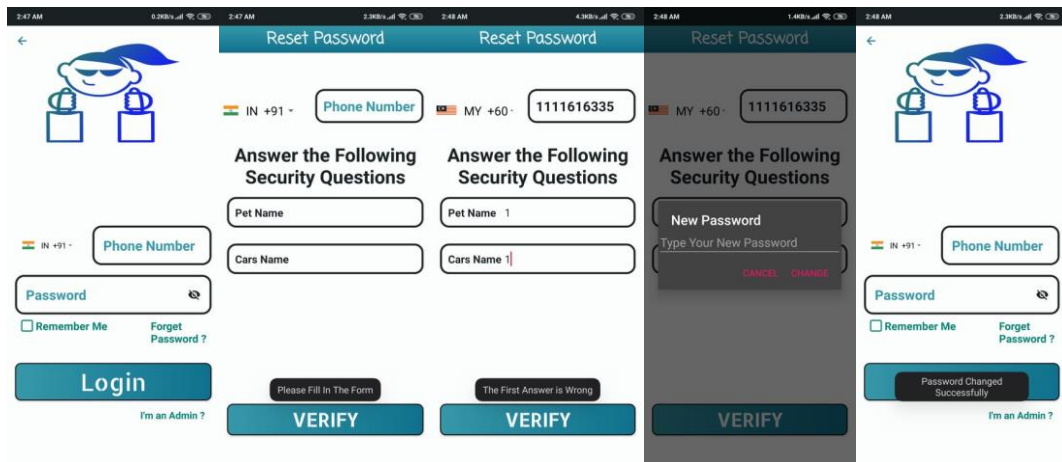
Figure 5.3.12: Buyer Reset Password

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5.3.13 Test Objective: Buyer Confirm Product Received and Provide Feedback

Buyer Click on the "View All Orders" on the top right corner	System will redirect buyer to the All Orders page
Buyer choose "To Receive" tab on the top navigation	System will redirect buyer to the to receive page and showing all the products that is shipped and waiting to receive by the buyer
Buyer click on the image of the product	Dialog Box appear with message "Have You Receive The Product? and comes with 2 choice, "YES" and "NO"
Click "NO" on dialog box	Dialog Box disappear and nothing will be happened
Click "YES" on dialog box	The product status will be updated as received and a new dialog box with message "Do you want to provide feedback" will appear
Click "NO" on provide feedback dialog box	Dialog Box disappear and nothing will be happened
Click "YES" on provide feedback dialog box	System will redirect user to capture an image of the buyer's facial expression to indicate the satisfaction to the product
Click "Submit Feedback" button	Facial Expression of buyer will be captured, and feedback will be provided, and the system will redirect buyer to buyer homepage and display message "Successful Submit Feedback"

Table 5.3.13: Buyer Confirm Product Received and Provide Feedback

From the test plan shown in the table above, buyer click on the "View All Orders" on the top right corner, system will redirect buyer to the All Orders page. Then buyer choose "To Receive" tab on the top navigation and system will redirect buyer to the to receive page and showing all the products that is shipped and waiting to receive by the buyer. Buyer can click on the image of the product, the Dialog Box appear with message "Have You Receive The Product? and comes with 2 choice, "YES" and "NO". If buyer Click "NO" on dialog box, dialog box disappear, and nothing will be happened. But if buyer Click "YES" on dialog box, the product status will be updated as received

and a new dialog box with message "Do you want to provide feedback" will appear. Then, if buyer click "NO" on provide feedback dialog box, the dialog Box disappear, and nothing will be happened. But if buyer click "YES" on provide feedback dialog box, the system will redirect user to capture an image of the buyer's facial expression to indicate the satisfaction to the product. Finally, when the buyer click "Submit Feedback" button, facial Expression of buyer will be captured and feedback will be provided, and the system will redirect buyer to buyer homepage and display message "Successful Submit Feedback"

Figure 5.3.13: Buyer Confirm Product Received and Provide Feedback

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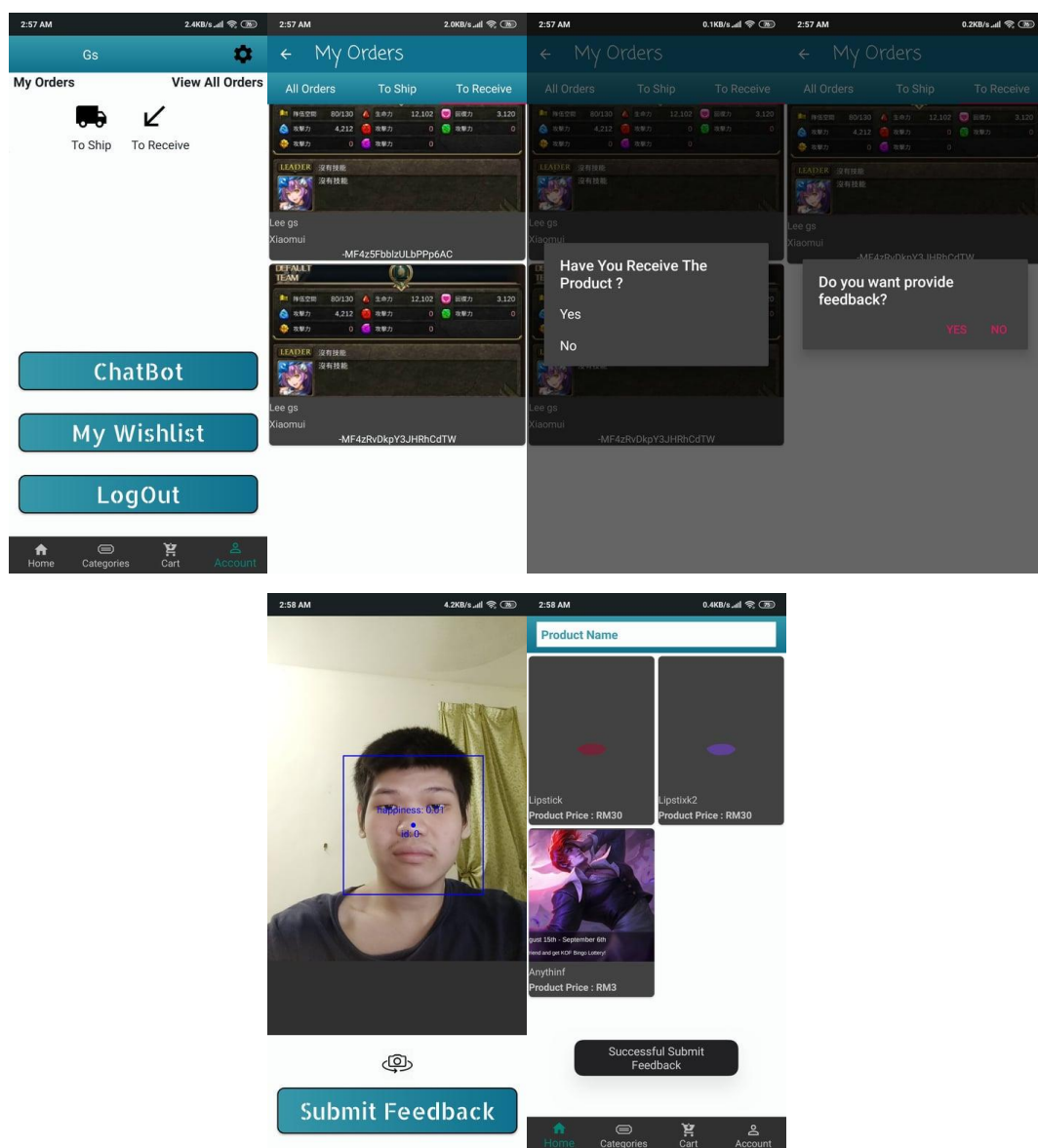
5.3.14 Test Objective: Chatbot Function

Buyer Click on the "ChatBot" button	System will redirect buyer to the chatbot page
Buyer click on the "Microphone" icon to speak	System will convert what the buyer say into words and send to the bot and bot will reply
Buyer type as word and click "Send" icon	The words will be sent, and bot will reply

Table 5.3.14: Chatbot Function

From the test plan shown in the table above, buyer click on the "ChatBot" button and the system will redirect buyer to the chatbot page. Then, the buyer can click on the "Microphone" icon to speak, the system will convert what the buyer say into words and send to the bot and bot will reply. Buyer also can type as word and click "Send" icon and the words will be sent, and bot will reply.
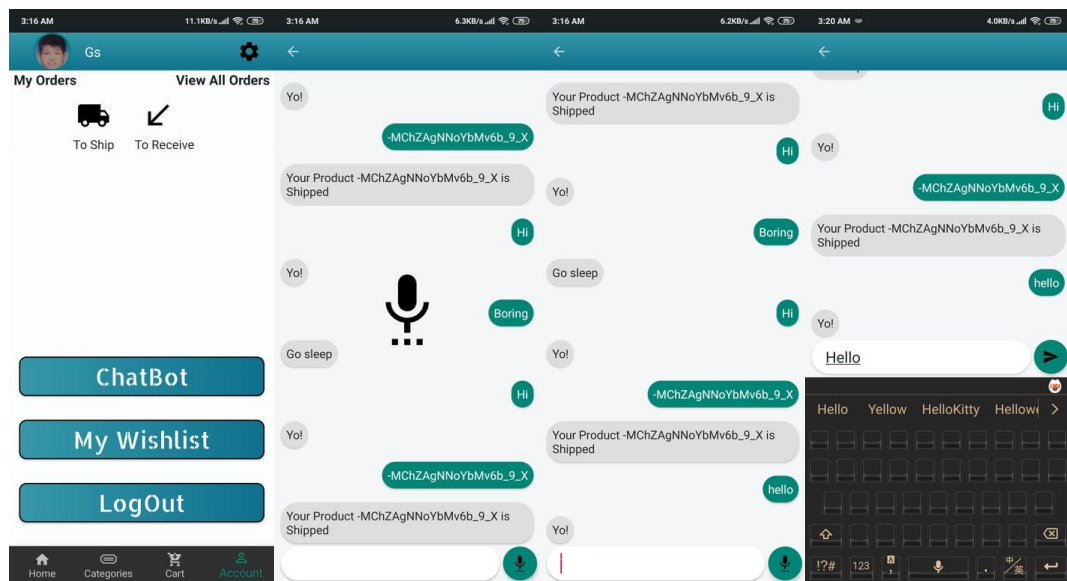
Figure 5.3.14: Chatbot Function

5.3.15 Test Objective: Beauty Try on Simulation on Live Video

Buyer select lipstick product and click on "View Product in AR" on the top right corner	System will redirect buyer device to open the front face camera. Then the lipstick will overlay on the lips of the users.

Table 5.3.15: Beauty Try on Simulation on Live Video

From the test plan shown in the table above, buyers select the lipstick product and click on the "View Product in AR" on the top right corner, the system will redirect buyer device to open the front face camera and the lipstick will overlay on the lips of the users.

Figure 5.3.15: Beauty Try on Simulation on Live Video

5.3.16 Test Objective: View Product in Augmented Reality Mode

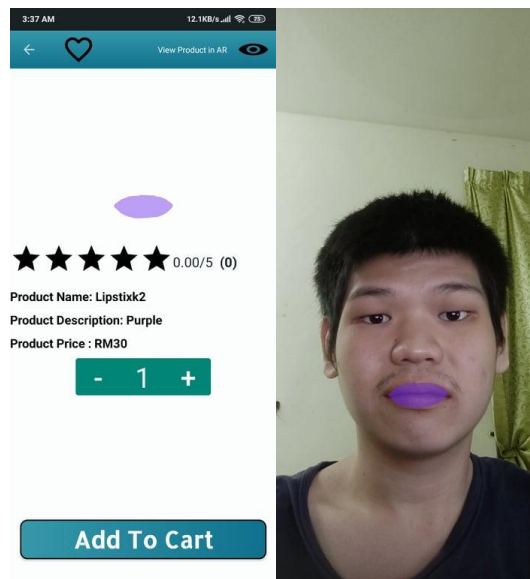| Actions	Output
Click on the image of the product	System will redirect buyer to the page that is showing all the information of the product
Click "View Product in AR" on the top right corner for the product that don't have 3D model	System will display message "AR Mode for this product is currently unavailable"
Click "View Product in AR" on the top right corner for the product that have 3D model	System will redirect user to view augmented reality page and overlay the product to the real-world environment

Table 5.3.16: View Product in Augmented Reality Mode

From the test plan shown in the table above, buyer will click on the image of the product and the system will redirect buyer to the page that is showing all the information of the product. Then, if the buyer click "View Product in AR" on the top right corner for the product that don't have 3D model, the system will display message "AR Mode for this product is currently unavailable". Finally, if the buyer click "View Product in AR" on the top right corner for the product that have 3D model, the system will redirect user to view augmented reality page and overlay the product to the real-world environment.
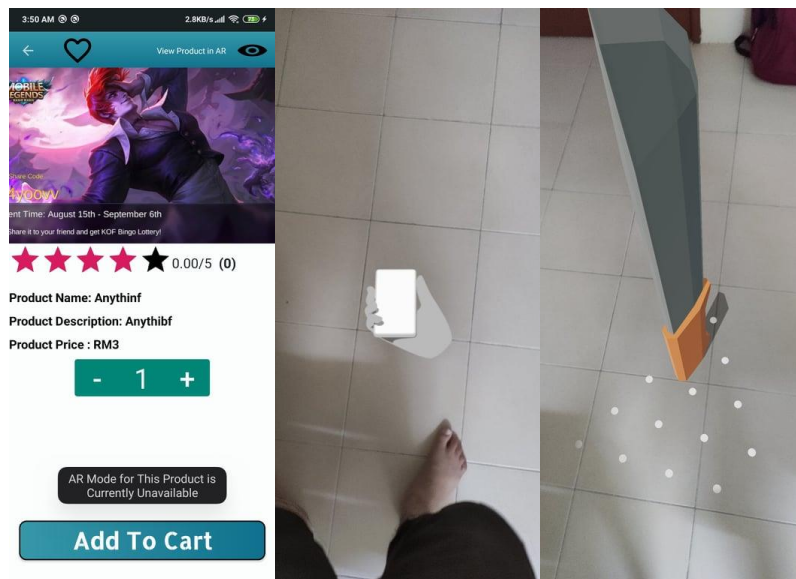
Figure 5.3.16: View Product in Augmented Reality Mode

5.3.17 Test Objective: Buyer Logout the Account

Actions	Output
Press "Log Out" Button at the account page	Dialog Box will appear with message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No"
Click "No" of the Dialog Box	Dialog Box will disappear, and nothing will be happened.
Click "Yes" of the Dialog Box	Buyer will be logout from the account and redirect to the home page of the application

Table 5.3.17: Buyer Logout from the account

From the test plan shown in the table above, buyer will click on the "Log Out" Button at account page in order to logout from the account. A dialog box will appear message "Are You Really Want To Quit? and comes with 2 choice which are "Yes" and "No". If buyer click "YES" Admin will be logout from the account and redirect to the home page of the application. But, if the seller clicks "NO", the dialog box will disappear, and nothing will be happened.
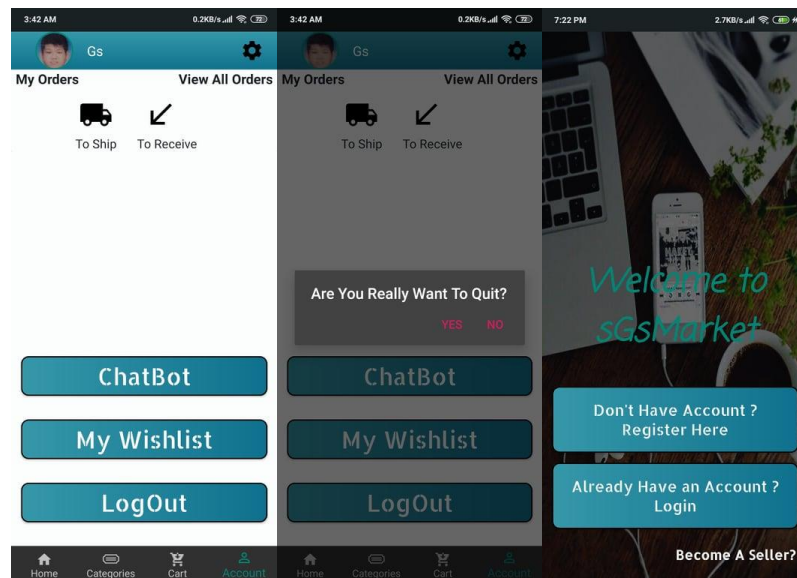
Figure 5.3.17: Buyer Logout from the account

5.3.18 Test Objective: Receive Notification when Wish Listed Product is Having Discount

Actions	Output
Buyer go to "My Wishlist" page	When the wish listed product is having discount, buyer will receive notification
Buyer click on the notification	System will redirect buyer to the "My Wishlist" page

Table 5.3.18: Receive Notification when Wish Listed Product is Having Discount

       From the test plan shown in the table above, if the product that is wish listed by the buyer is having discount, buyer will receive notification. Then, when the buyer click on the notification, the system will redirect buyer to the "My Wishlist" page.

Figure 5.3.18: Receive Notification when Wish Listed Product is Having Discount

Chapter 6: Discussions and Conclusion

6.1 Project Review

Mobile commerce application is a very important component in this modern generation days. Mobile commerce application has its ability to deliver E-Commerce capabilities to consumers. In almost all the mobile commerce application which is specializing in providing the m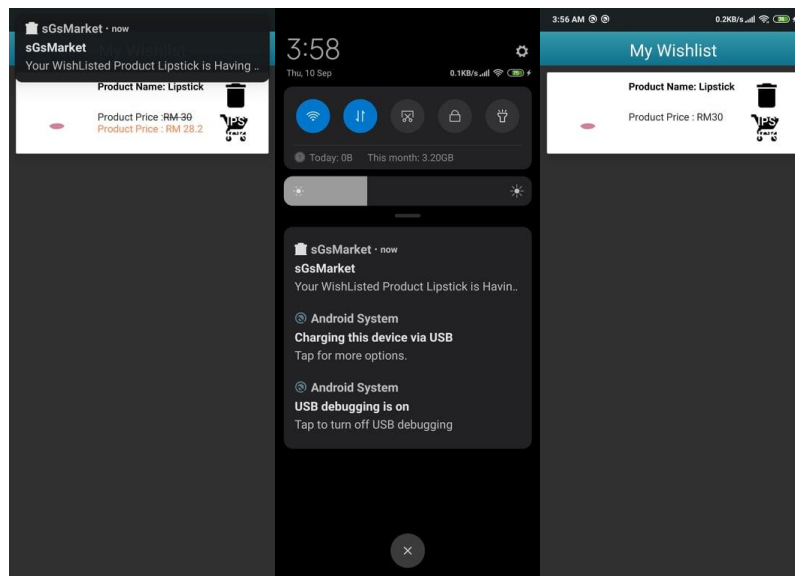obile shopping feature to the consumers, all the mobile commerce application is not able to let users have a better understanding of the details for the products. This is because for almost all the mobile commerce application, they cannot provide a more detailed and realistic visual representation of the products to the consumers but only some images for the products. So, by integrating Augmented Reality feature to mobile commerce application can take advantage on enhancing the view of the products by overlaying all the products to the real-world environment and let the consumers can have a better understanding of the products. Others than that, by integrating Augmented Reality features to mobile commerce application, it can allows the customers to try on those makeup products on live simulation which can let the consumers to have a better understanding of the makeup products on their face without going to the store and try all of them on the face.

6.2 System Strengths and Limitations

The strength of this proposed mobile application is that it is integrating with the Augmented Reality feature which can overlay all the product within the apps to the real-world environment where it can provide a better details of the product to the consumers and the consumers can have a better visual understanding for the products. Besides, based on the Augmented Reality feature, it is also allowing the consumers to try the lipstick makeup product on their face to see whether the lipstick is suitable for them before buying them. Moreover, it will be having a wish listing product feature that can allows the customer to wish list the product that they love to the buyer's wish list. When the products are having any promotion, it will be sending a notification to the buyers to notify them.

However, there are also limitations on the proposed mobile application. Some of the 3D model for the product is not realistic enough. Then, the lipstick is depending

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on the texture that is exported from the graphic software, so it will be lacks reality due to the lacking knowledge in graphic software.

6.3 Future Work

A detailed and more realistic visual representation of the product are essential in mobile commerce specifically for shopping products. So, the future improvement for this proposed mobile application can be trying to produce a higher quality and close to real product 3D models to be displayed can be made so that users can get the real scale and better view of the product.

6.4 Conclusion

In our proposed project, the problem which current commerce application facing are lacking a more detailed and visual representation for the products which enable the buyers have a better description of the products and resulting in the buyers cancel the orders and less purchases at the current commerce application. To solve this problem, the integration of Augmented Reality in commerce application is introduced. This is because, by integrating the Augmented Reality technology in commerce application can enable the buyers to view all the products in Augmented Reality mode which can have a better understanding of the description of the products. This can enhance the shopping experience of the buyers and increase the rate of the buyers purchasing products.

Besides, when the buyers want to buy some products which are related to beauty such as lipstick. They cannot have a better understanding of the beauty products have what effect on their face. So, we will be integrating the Augmented Reality technology with the commerce application which enable the user to have a beauty try-on simulation on live video to have a better understanding of the effect for the product on their face.

Lastly, this proposed project can benefit both the perspective which are sellers and buyers. Buyers can have a better understanding for the products and will increase rate of purchasing the products, and the sales of the sellers are able to increase.

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