

**DEPARTMENT OF INFORMATION AND COMMUNICATION
TECHNOLOGY**

**DIPLOMA IN INFORMATION TECHNOLOGY
(DIGITAL TECHNOLOGY)**

DFT50114: INTEGRATED PROJECT

**MAJUHOME AR FURNITURE PLACER APPS
(MAJUHOME AR)**

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1.0 ABSTRACT

MAJUHOME AR is an app that use augmented reality technology that allows users to visualize their furniture in 3d real space. Traditionally, users must visualize furniture in a physical space, such as floor plans or through 2D images. This project aims to develop an AR-based mobile application that enables users to visualize 3d furniture in their physical space, using computer vision algorithms and accurate 3D modeling. Then, to let users visit our MajuHome Concept virtual furniture showroom by phone in a 3D scene is so one of the aims. Another from that, this project aims to save users' room design images in local storage after finish designing it and can access the images via gallery. This app employed an agile development methodology to ensure efficient development and iterative improvements. By using Unity, the app will be developed using C# programming. The outcome of this application is to deliver an immersive experience to users, enabling them to effortlessly visualize furniture in a 3D real space.

MAJUHOME AR ialah aplikasi yang menggunakan teknologi realiti tambahan yang membolehkan pengguna memvisualisasikan perabot mereka dalam ruang sebenar 3d. Secara tradisinya, pengguna mesti menggambarkan perabot dalam ruang fizikal, seperti pelan lantai atau melalui imej 2D. Projek ini bertujuan untuk membangunkan aplikasi mudah alih berasaskan AR yang membolehkan pengguna memvisualisasikan perabot 3d dalam ruang fizikal mereka, menggunakan algoritma penglihatan komputer dan pemodelan 3D yang tepat. Kemudian, untuk membenarkan pengguna melawat bilik pameran perabot maya MajuHome Concept kami melalui telefon dalam adegan 3D adalah salah satu matlamatnya. Satu lagi daripada itu, projek ini bertujuan untuk menyimpan imej reka bentuk bilik pengguna dalam storan tempatan selepas selesai mereka bentuk dan boleh mengakses imej melalui galeri. Aplikasi ini menggunakan metodologi pembangunan tangkas untuk memastikan pembangunan yang cekap dan penambahbaikan berulang. Dengan menggunakan Unity, aplikasi akan dibangunkan menggunakan pengaturcaraan C#. Hasil daripada aplikasi ini adalah untuk menyampaikan pengalaman yang mengasyikkan kepada pengguna, membolehkan mereka memvisualisasikan perabot dalam ruang sebenar 3D dengan mudah.

2.0 PROJECT PLAN

2.1 Problem Statement

The problem statements of the project are as follows:

- i. Limited inconvenience and time-consuming
Conventional furniture shopping requires physical store visits and consumes considerable time, making it less convenient for busy customers.

- ii. Inability to save the customized room design
Customers are unable to save their room design in local storage after designed with the furniture in 3D real space. So, the customer cannot create multiple versions of room design for future reference.

- iii. Traditional methods of visualizing furniture
Customers need to go to physical store to see the exact size of the furniture. They can only imagine the furniture that got in the furniture store to place in their house.

2.2 Objective

The objectives of the project are as follows:

- i. To let users visit our MajuHome Concept virtual furniture showroom by phone in a 3D scene.
- ii. To save users' room design in local storage after finish designing it and can access the images via gallery.
- iii. To develop an AR-based mobile application that enables users to visualize furniture in their physical space, using computer vision algorithms and accurate 3D modeling.

2.3 Scope

2.3.1 User Scope

End-users (customer):

- i. To visualize furniture in their homes using augmented reality technology.
- ii. To save their virtual room designs in gallery.
- iii. To browse and select furniture from MajuHome Concept's product catalog.
- iv. To select multiple furniture in the selection for view in AR.
- v. To view furniture in a MajuHome Concept's virtual showroom.
- vi. To rotate the 3D model of furniture in 360-degree view.
- vii. To exit from the MAJUHOME AR application.

2.3.2 System Scope

- i. Provide a product catalog with a wide selection of furniture.
- ii. Provide augmented reality technology to visualize furniture in user's home.
- iii. Provide a virtual room design tool for users to create and save design of their room design.
- iv. Provide multiple selection for users to choose and view in AR.
- v. Provide a virtual showroom for user to view the furniture.
- vi. Provide a scene for user to rotate the 3D model of furniture.
- vii. Provide an exit button to let user exit from MAJUHOME AR application.

2.4 Literature Review

According to **Table 2.4.1**, it compares existing AR applications available for download on Google Play and the Appstore.

Table 2.4.1: Existing AR app Comparison

Project	IKEA Place	Roomle	Homestyler
Link Resources	https://www.ikea.com/us/en/customer-service/ikea-place/	https://www.roomle.com/en/home	https://www.homestyler.com/
Programming Language Used	Swift, ARKit	HTML5, JavaScript	HTML5, WebGL
Hardware	iOS Devices with A9 Processor or Later	iOS and Android Devices	iOS and Android Devices
Software	IKEA Place App	Roomle App	Homestyler App
Advantages	Wide Selection of IKEA Furniture, Realistic 3D Models, Accurate Room Measurements	Real-time 3D Rendering, Customizable Furniture and Materials, Easy-to-Use Interface	Wide Selection of Furniture and Decor, Realistic 3D Rendering, Easy-to-Use Interface
Disadvantages	Limited Furniture Catalog, Limited Room Customization	Limited Room Customization, Limited Catalog of Furniture	Limited Customization of Room Dimensions, Limited Rendering Quality
Features	a) Includes 3D and true-to-scale models of everything from sofas and armchairs to footstools and coffee tables. b) Gives user an accurate impression of the furniture's size, design and functionality in user's home so user can stop wondering and start doing. c) Share user's 'place' with social apps like WhatsApp or Instagram	a) Features an expansive canvas, ruler, undo buttons, and wall and opening settings, accessed through a red plus sign, with no furniture catalog, requiring users to manually move objects to the desired location, and adjust their parameters in the working canvas. b) Customization of product color or material in 3D quality. c) Present products in a new dimension with interactive features such as zoom and 360 rotations.	a) 3D furniture to help user in finding a suitable design for the floor plan. b) Shareable DIY projects c) Upload pictures of user room to use as templates

From the literature reviews that we have performed, we have found some weaknesses that might become an advantage to our project. Some weaknesses are limited or outdated designs. Their apps may have limited or outdated design options, which may make it difficult for users to accurately visualize their space. Hence, for this project, we will add a wider range of design options to meet the needs of the user.

Weakness for the Ikea Place app is that the app only support iOS devices which makes the Android device's users cannot use the application. So, we will make an app that support Android devices so that the user can gain experience and expose to AR technology.

The weakness of the Roomle web-based application is that user need to pay monthly subscription to start using the application. This will make user loss interest in the application because they cannot get any insight of the application without paying. Our application will be free so that user can experience it and give their feedback so that we can improve more in the future.

Lastly, the Homestyler application does not allow user to freely move around while arranging their furniture, the application only use static photo that the user took or the one that they provide for the user to insert and arrange their furniture. To make it our advantages, our application can allow user to move around while arranging their furniture.

2.5 Methodology

The methodology of this project is Agile. The justification of choosing the methodology is that it is suitable for a small project, fast development timeline, it gives higher customer satisfaction due to involvement of clients for the entire duration of project and it gives a flexible timeline. According to **Figure 2.5.1**, it shows Software Development Life Cycle (SDLC) of agile methodology.

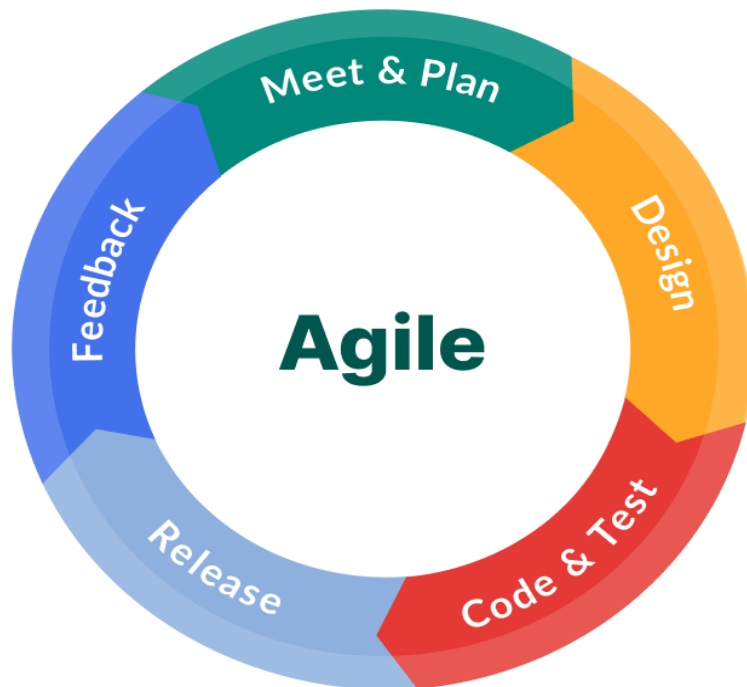


Figure 2.5.1: Agile Methodology

According to **Table 2.5.2**, it shows breakdown activities of Software Development Life Cycle (SDLC) of agile methodology.

Table 2.5.2: Agile Methodology Phases

No.	Phase	Activities
1	Meet & Plan	1. Brainstorm for project idea 2. Meet client to perform fact finding and gather requirement 3. Conduct preliminary investigation 4. Analyze preliminary investigation outcome
2	Design	1. User Story Mapping 2. Sprint Planning 3. Sprint Review 4. Sprint Retrospective
3	Code & Test	1. Coding 2. Code Reviews 3. Integration Testing 4. User Acceptance Testing (UAT)
4	Release	1. Release Planning 2. Quality Assurance (QA) 3. User Documentation 4. Deployment 5. User Support
5	Feedback	1. User Feedback Collection 2. Feedback Analysis 3. Issue Tracking 4. Communication

2.6 Gantt Chart

According to **Table 2.6.1**, it shows a table that lists tasks completed over a period of time in relation to the time planned for the task.

Table 2.6.1: Project Gantt Chart

Sprint	Task Name	Week	Start Date	End Date	Duration
Sprint 1	Meet & Plan		19 June 2023	1 July 2023	14 days
	a) Completing Project Proposal	Week 1			
	b) Enhance the User Interface Design	Week 2			
	c) Present the project to our supervisor				
	d) Meet Client				
	e) Research Add Function				
	Design	Week 3	2 July 2023	8 July 2023	7 days
	a) Write Coding in Unity				
	b) Design User Interface				
	Code & Testing	Week 4	9 July 2023	15 July 2023	7 days
	a) Export the app package				
	b) Test the application in Android Phone				
	c) User Interface Enhancement				

Sprint 2	Design a) Redesign User Interface b) Write coding in Unity	Week 5	16 July 2023	22 July 2023	7 days
	Code & Testing a) Testing the application	Week 5	16 July 2023	22 July 2023	7 days
	Release a) Finalizing Documentation b) Project Deployment	Week 6	23 July 2023	29 July 2023	7 days
	Feedback a) Receive feedback from client	Week 6	23 July 2023	29 July	7 days
	Project Implementation a) Presentation and Demo b) Complete the Logbook	Week 7	30 July 2023	6 August 2023	8 days

3.0 REQUIREMENT SPECIFICATION

3.1 Functional Requirement

The functional requirements of the project are as follows:

- i. The application must provide the catalog of furniture items, including various types of hall cabinet, lounge chair, sofas, wardrobe, and other home furniture.
- ii. The application must allow users to view and interact with virtual furniture pieces layered on the real-world environment using their device's camera.
- iii. The application must allow users to save their room design image to gallery.

3.2 Non-Functional Requirement

The non-functional requirements of the project are as follows:

- i. Performance
The rendering of AR furniture should be smooth and responsive, delivering a seamless user experience with low latency.
- ii. Availability
The AR home furniture app should be accessible at all times, even when the device is not connected to the internet.
- iii. Usability. The user interface of the AR home furniture app should be simple and straightforward to use, allowing users to interact with virtual furniture with ease.

3.3 Hardware and Software Requirement

According to **Table 3.3.1**, it shows that lists of hardware that require for develop a AR home furniture app.

Table 3.3.1: Required Hardware

No	Hardware	Requirement
1.	Computer or Laptop	a) Processor: Quad-core processor (2.0 GHz or higher) b) RAM: Minimum 8 GB RAM (16 GB or higher recommended for smoother performance) c) Storage: SSD with at least 256 GB available space (faster storage helps with compilation and loading times) d) Graphics Card: A dedicated GPU with support for OpenGL 3.0 or higher (for better rendering and performance)
2.	Display	a) Monitor: At least a Full HD (1080p) monitor (larger screens can be helpful for multitasking)
3.	Smartphone	a) For testing and debugging the AR home furniture app, it needs AR-capable devices. Consider using the latest smartphones with AR Core (for Android) or ARKit (for iOS) support. These AR frameworks enable this app to work with the device's camera, motion sensors, and AR capabilities.
4.	Cables and Adapters	a) USB cables and adapters for connecting the AR-capable devices to the development computer for testing and debugging.

According to **Table 3.3.2**, it shows that lists of software that require for develop a AR home furniture app.

Table 3.3.2: Required Software

No	Software	Requirement
1.	Unity Game Engine	a) AR Package: The Unity AR Core package makes use of Google's AR Core technology for Android AR experiences.
2.	Canva	a) It is useful for optimizing images, textures, and other visual assets used in the AR app.
3.	Microsoft Word	a) It is a project management tool of our team choice to help with documentation and collaboration.
4.	Lunapic.com	a) It is a website that can remove the background of the images automatically.
5.	Blender	a) To create 3D models of furniture items or other AR content. b) Unity supports various 3D file formats, such as .fbx and .obj, so can import the 3D models into the Unity project.
6.	Microsoft Visual Studio 2022	a) This is the software to let us create the C# script in our Unity project for certain function.

3.4 System Configuration

- a) Download the MAJUHOME apk file

User need to download the apk file from this link

(<https://github.com/vincent092911/MAJUHOME-AR-App>)

- b) User need to touch the word “view code”

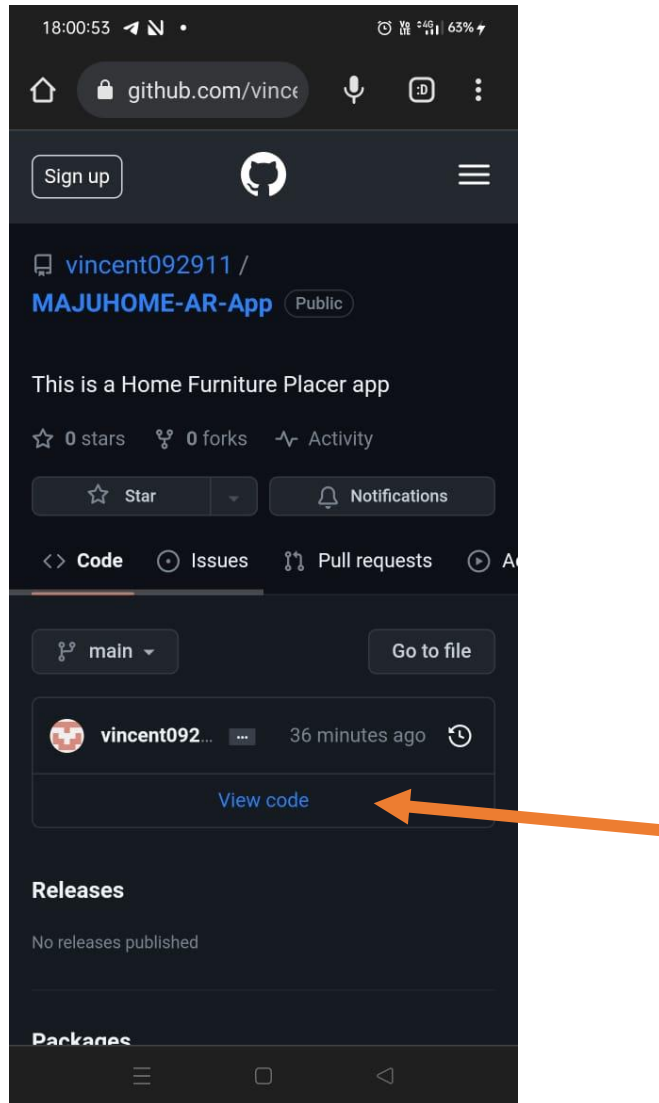


Figure 3.4.1: Git hub link website

- c) User need to touch the word “MAJUHOME AR Apk file”

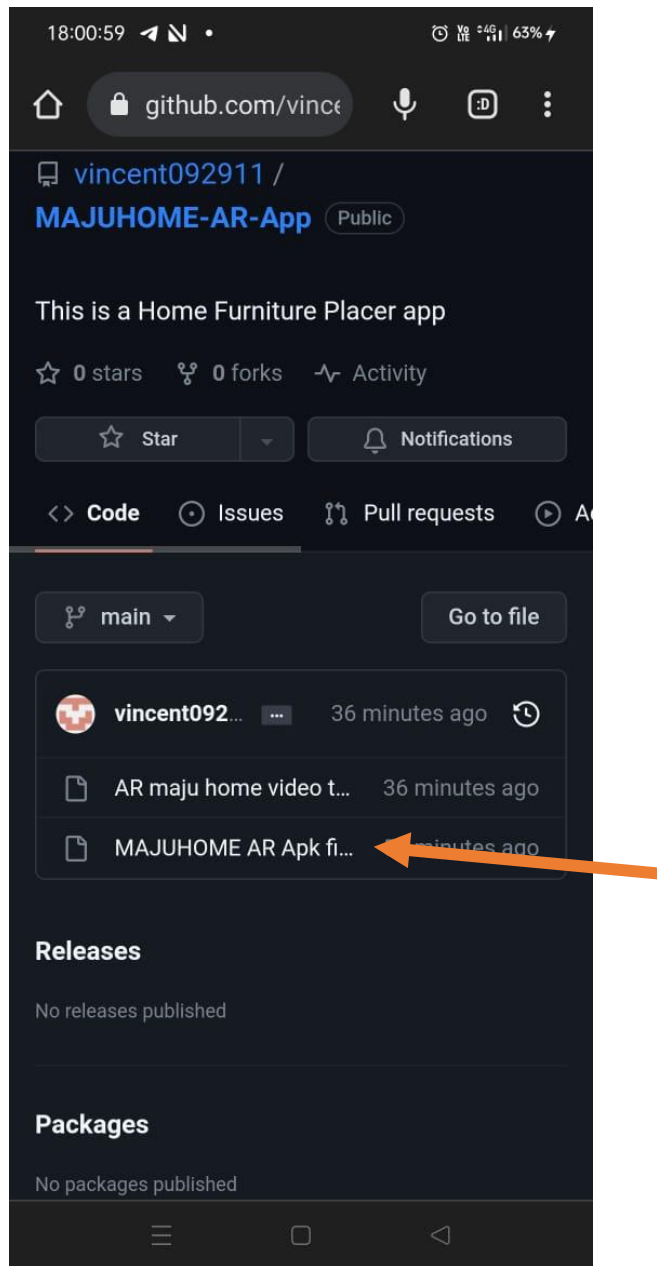


Figure 3.4.2: Git hub folder

d) User need to touch on word “view raw”

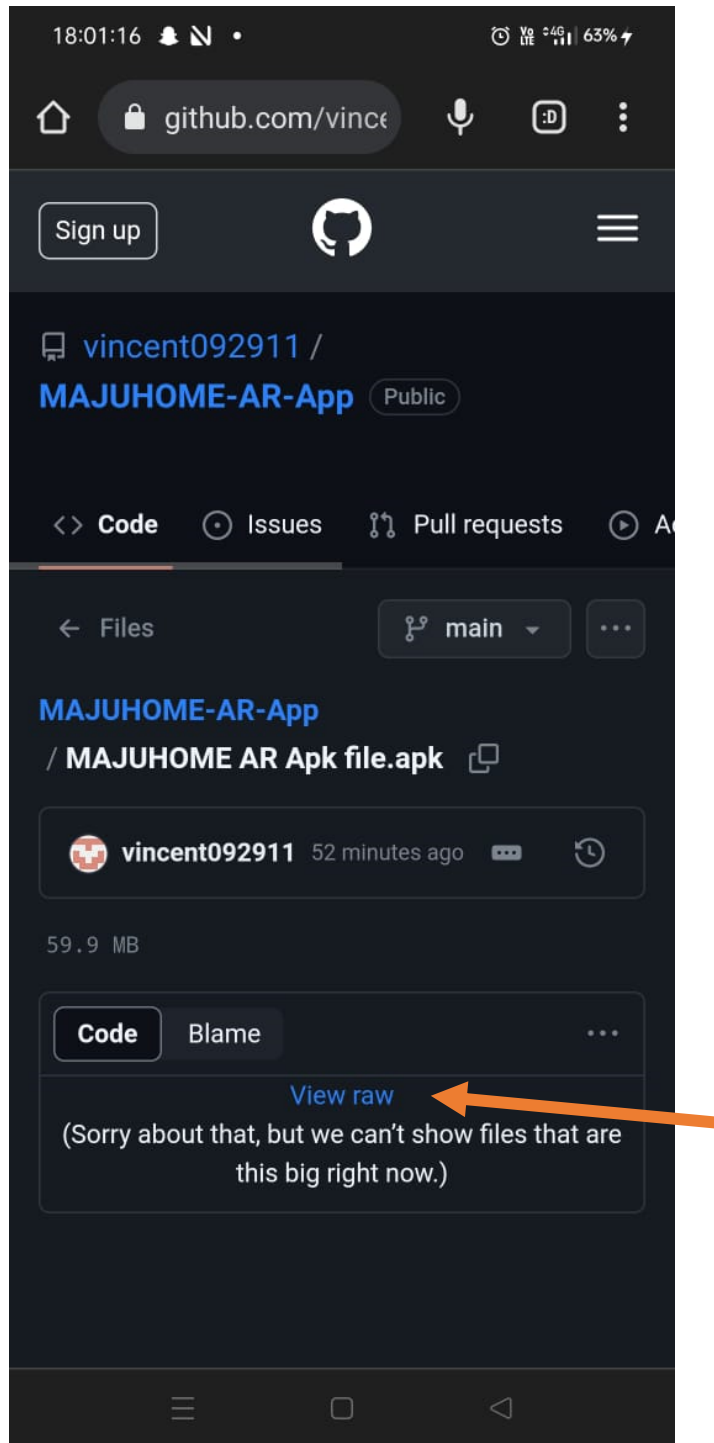


Figure 3.4.3: Git hub folder

e) User need to touch on icon 3 dots details and touch on “View” word

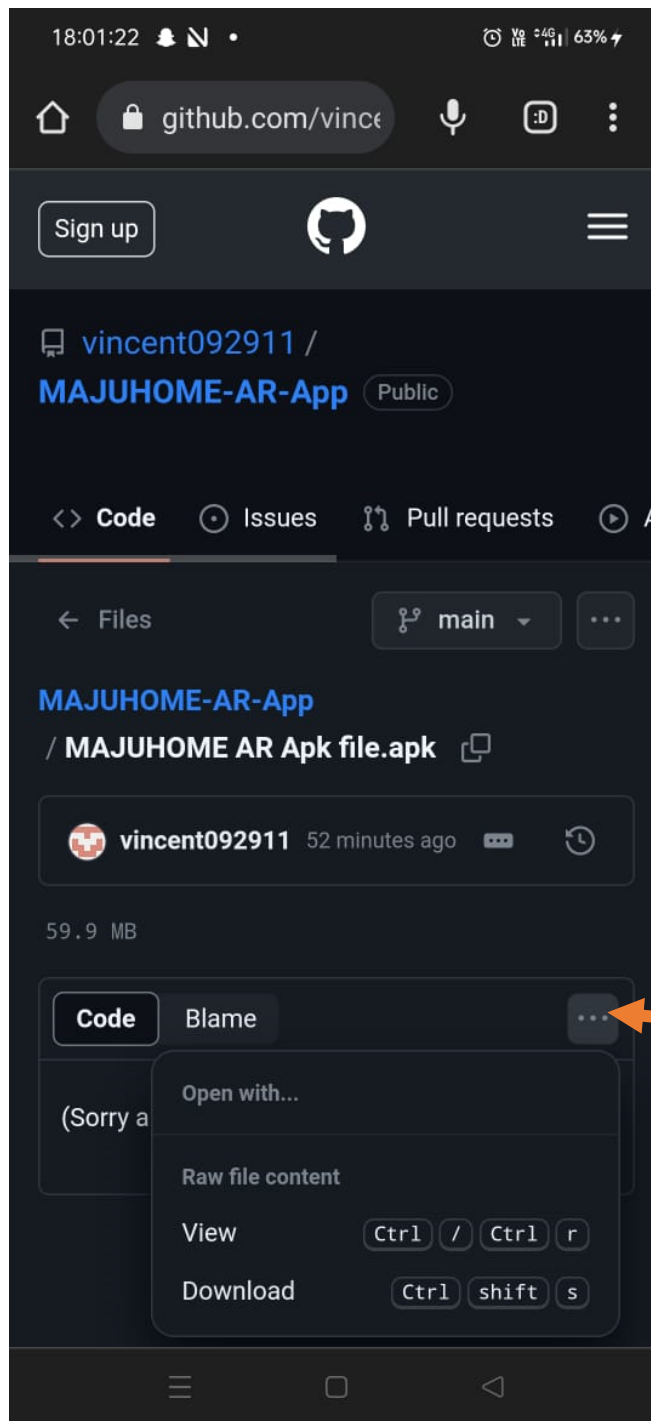


Figure 3.4.4: Git hub folder

- f) User can choose their download apk file location and touch Download button

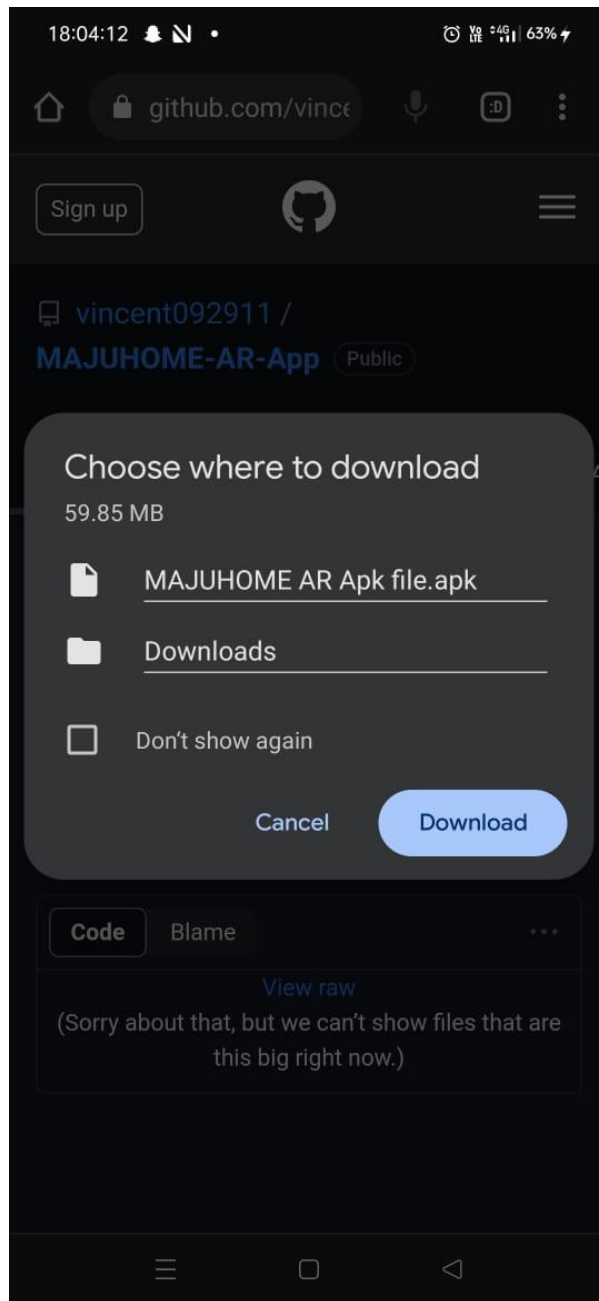


Figure 3.4.5: Store location in phone

g) User need to touch the “Download Anyway” button

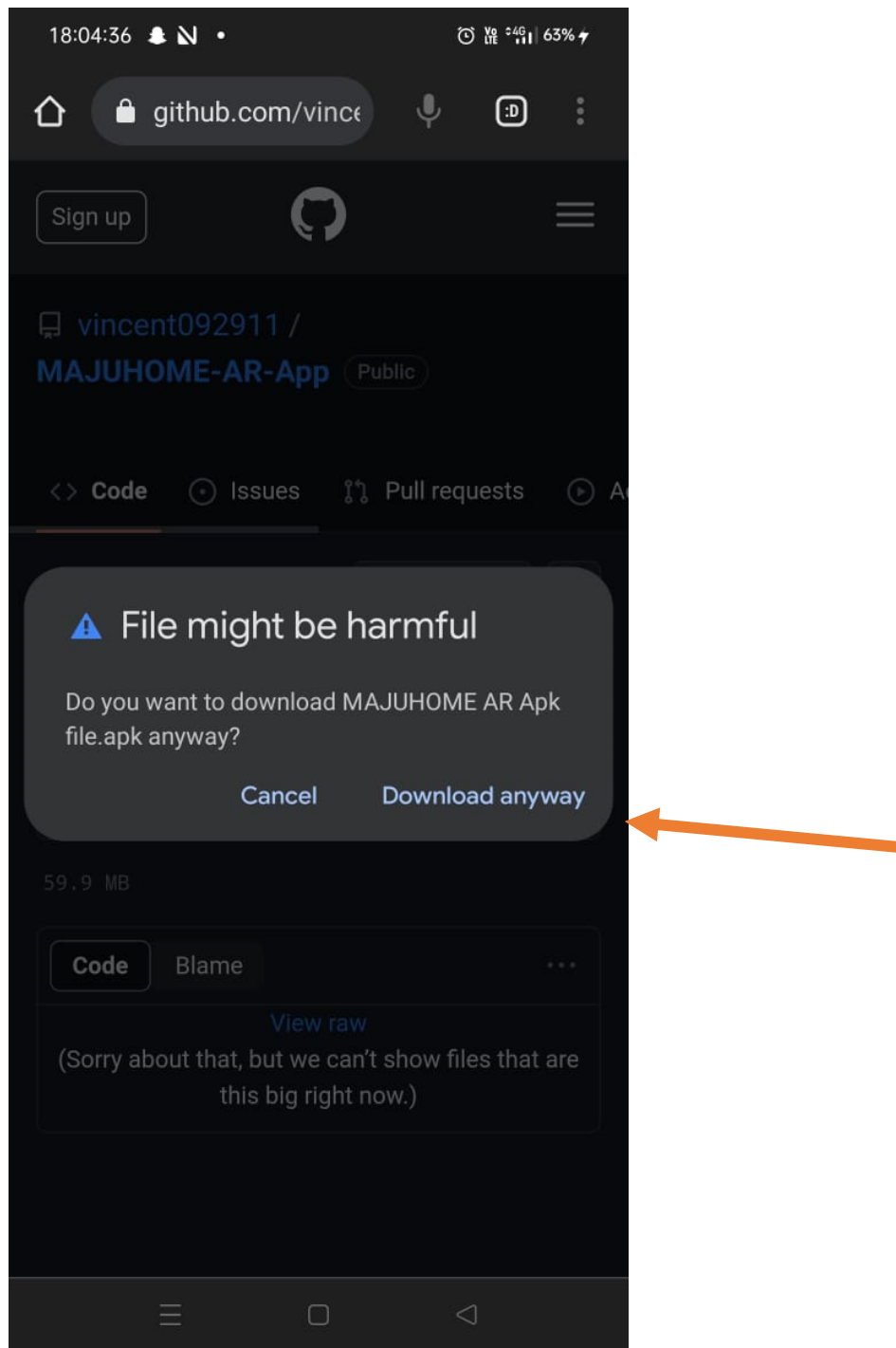


Figure 3.4.6: Warning from phone

h) Then, it will notify after the apk file successfully installed in phone and user need to touch on “Open” button

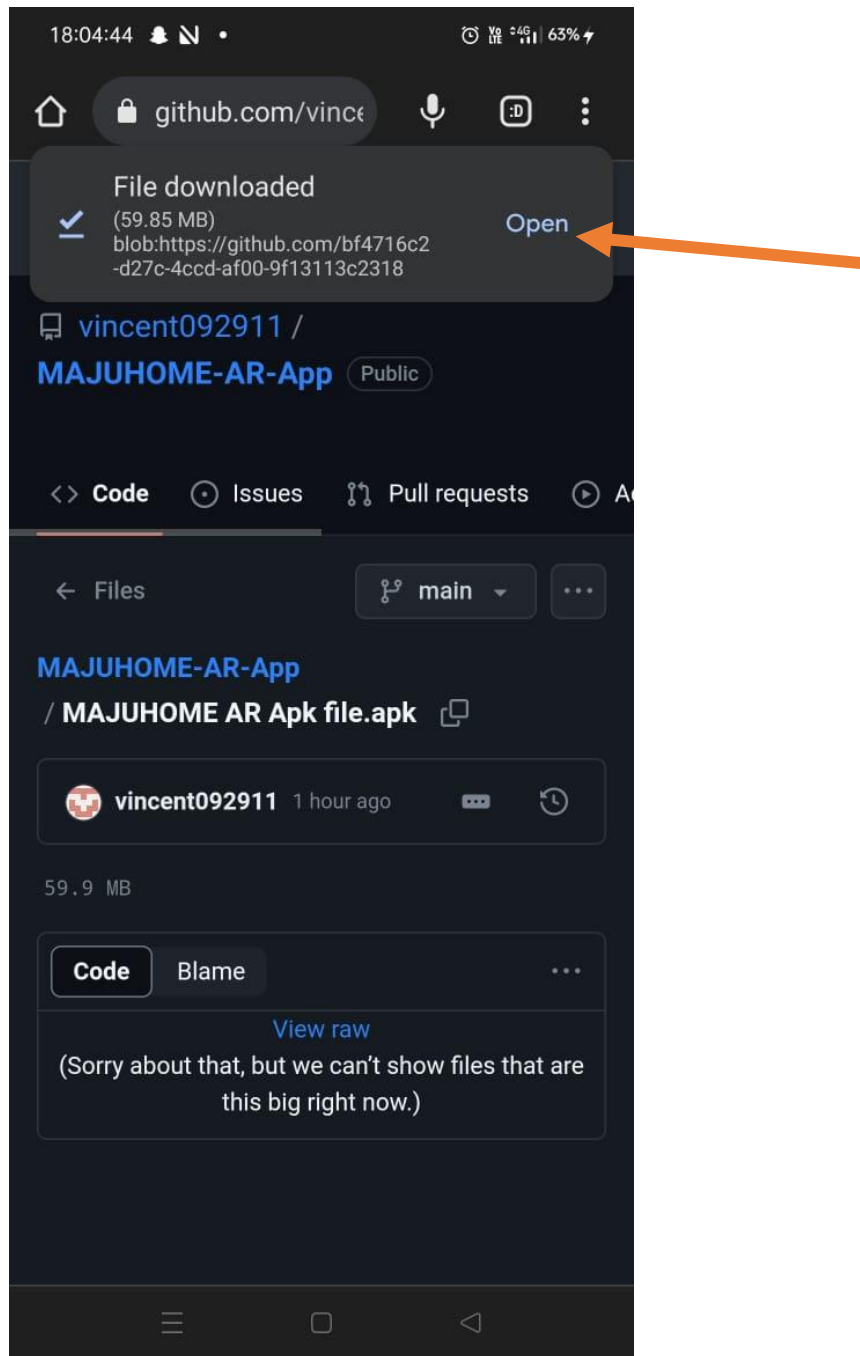


Figure 3.4.7: Notification phone

i) User need to touch on “INSTALL” button

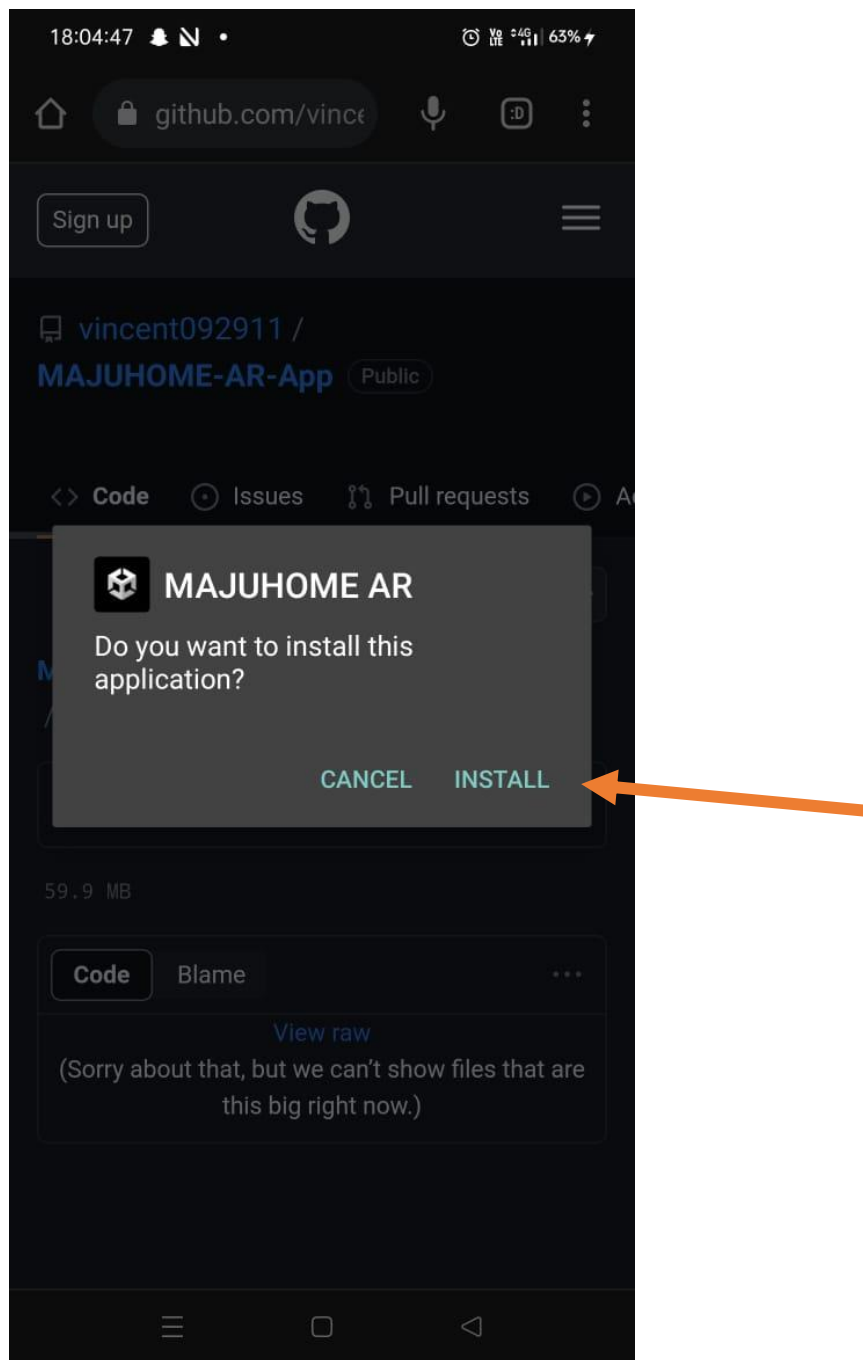


Figure 3.4.8: Install MAJUHOME AR app notification

j) User need to touch on “Open” button

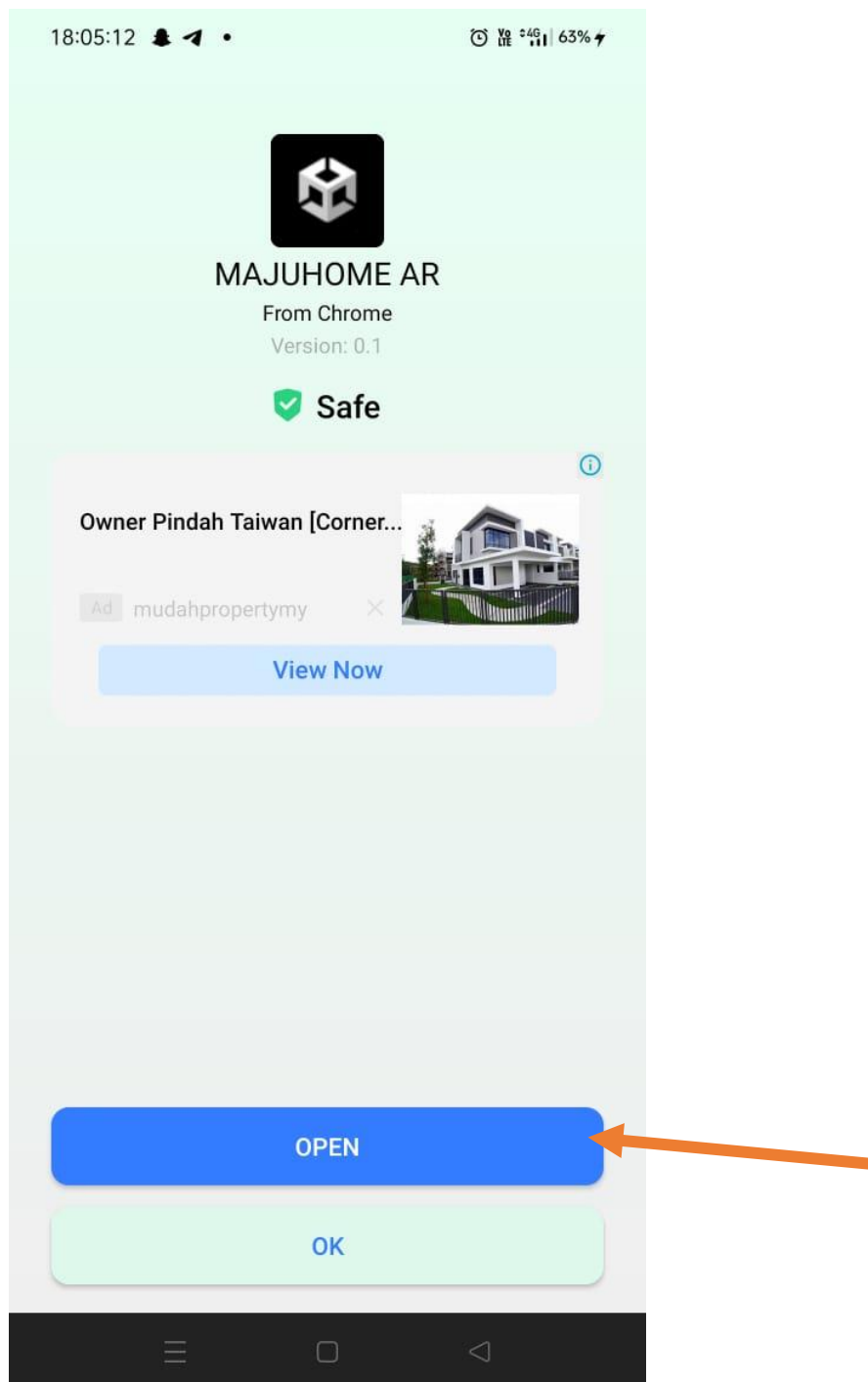


Figure 3.4.9: Open app site

k) Lastly, user can see the app opened

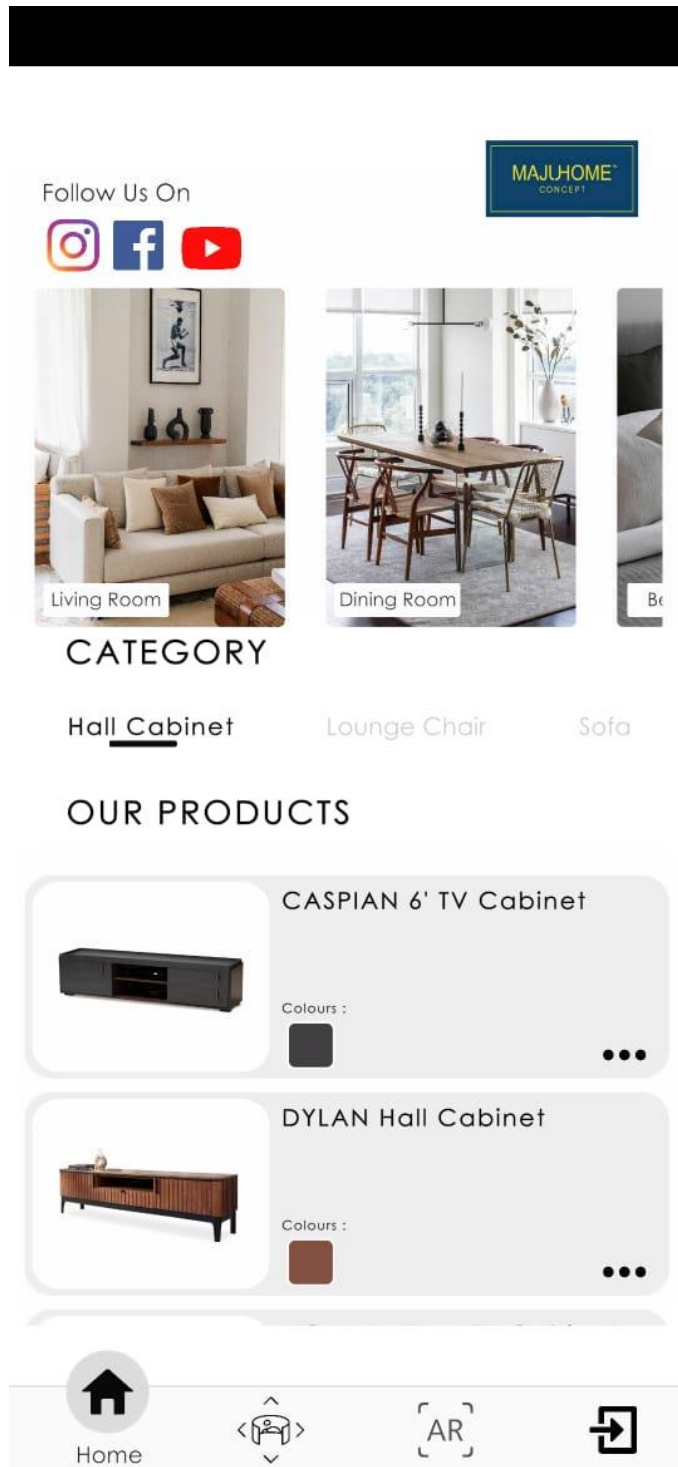


Figure 3.4.10: Interface application

3.5 Security Requirement

The security measures of the project are as follows:

i. Offline Functionality and Data Privacy

This app works independently without requiring an internet connection. It does not collect or transmit any user data over the internet. So, users can enjoy all the features of the app without needing to create an account or provide any personal information.

ii. No Authentication Requirements

As an offline standalone app, there is no need for user authentication or login. Users can freely access all app features without any registration process.

iii. Regular Security Checks and Updates

Our app is subjected to frequent security checks and code reviews in order to discover and fix any potential security risks. We provide regular updates to improve the app's security and assure its resilience to emerging attacks.

4.0 FINAL DESIGN

4.1 Logical Design

4.1.1 Context Diagram

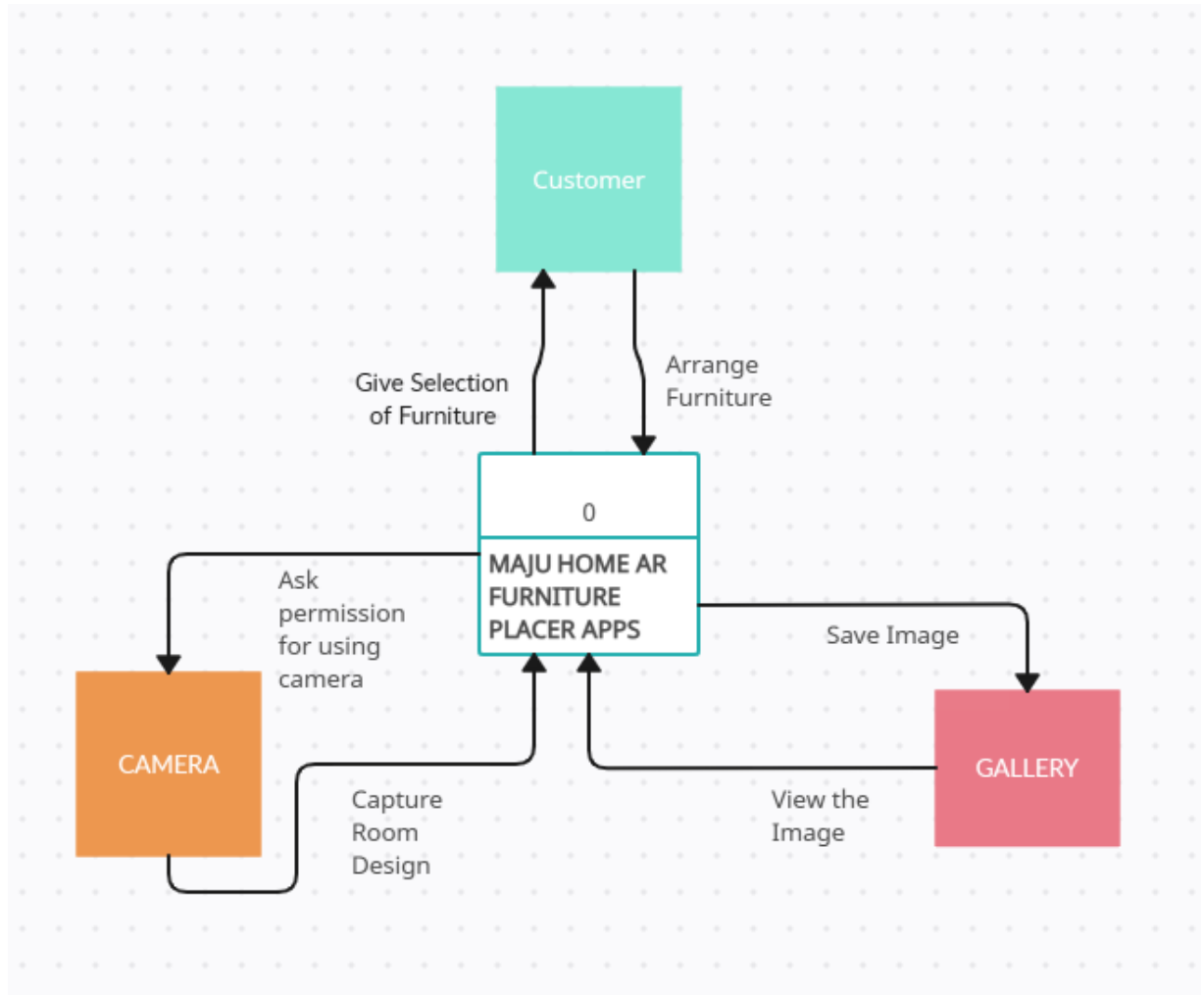


Figure 4.1.1.1: MAJUHOME AR Context Diagram

4.1.2 Diagram 0

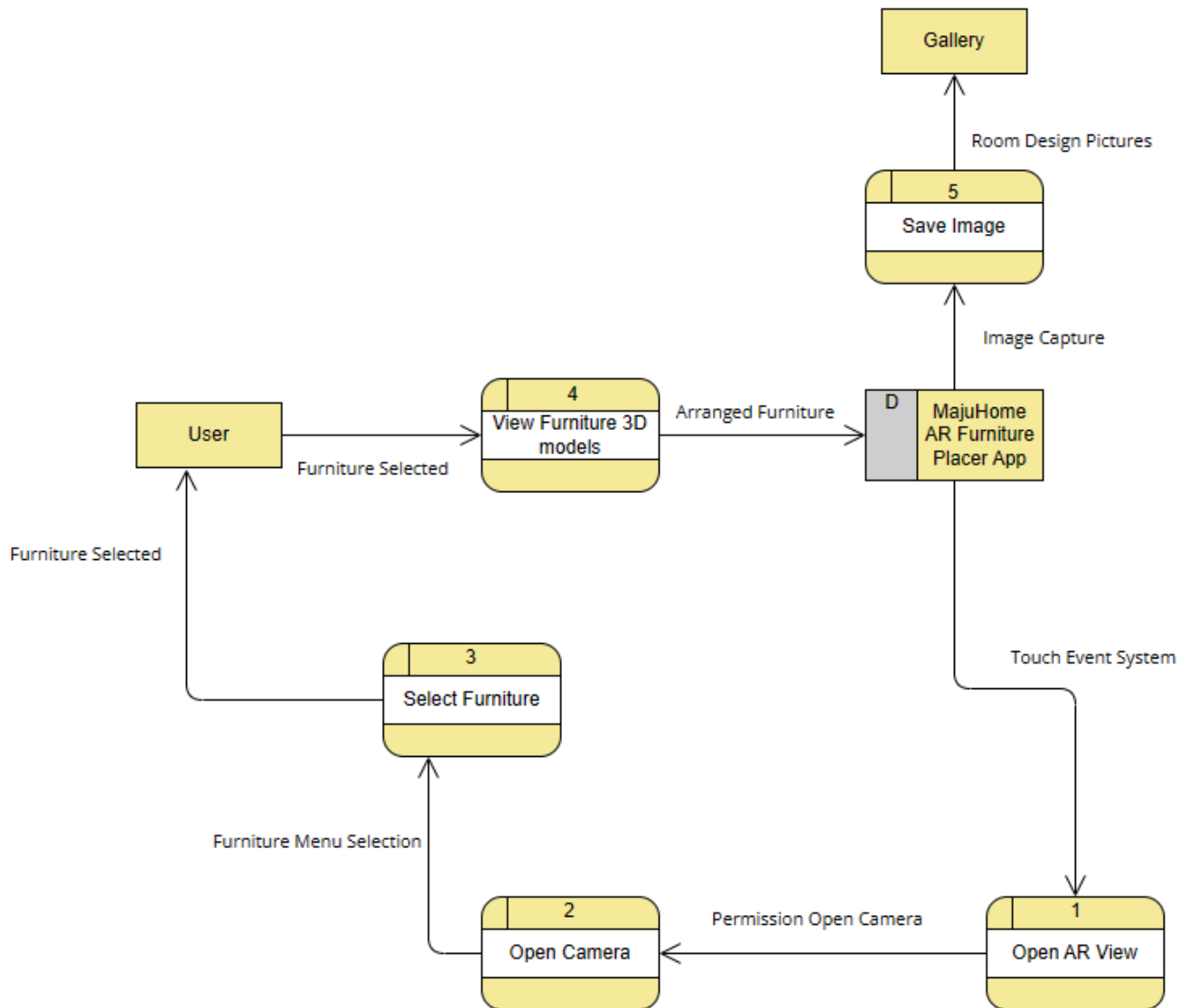


Figure 4.1.2.1: MAJUHOME AR Diagram 0

4.1.3 Use Case Diagram

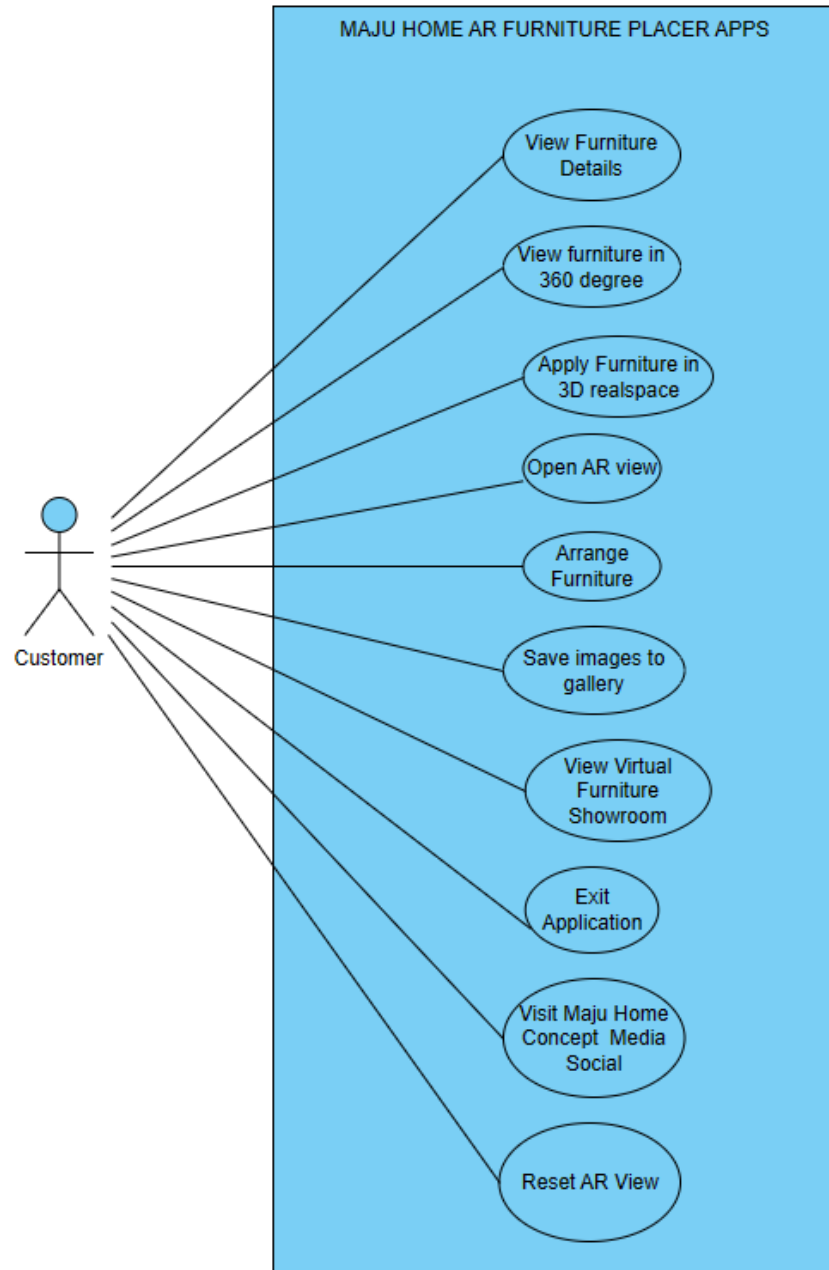


Figure 4.1.3.1: MAJUHOME AR Use Case Diagram

4.1.4 Functional Decomposition Diagram (FDD)

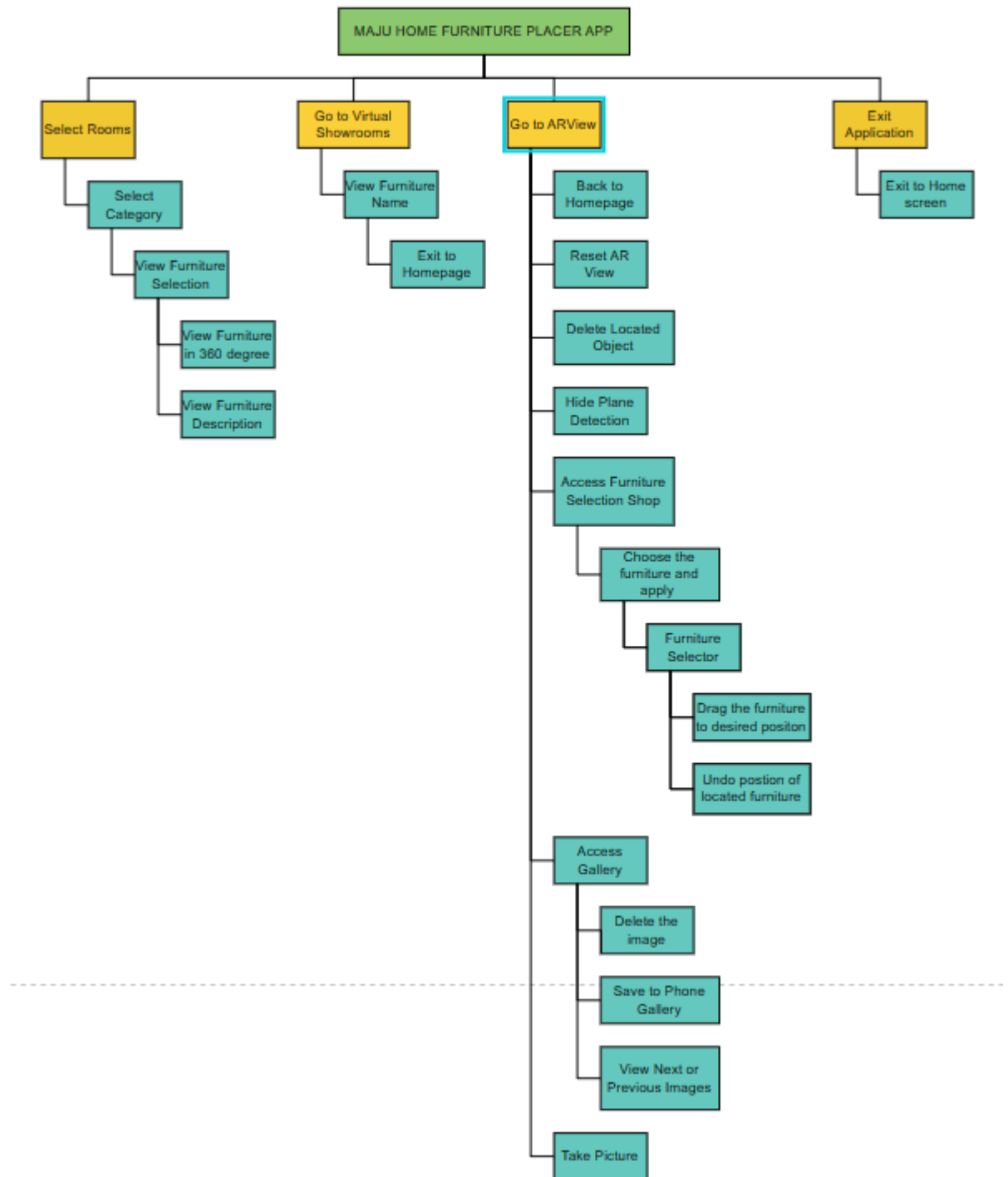


Figure 4.1.4.1: MAJUHOME AR Functional Decomposition Diagram

4.1.5 Entity-Relationship Diagram

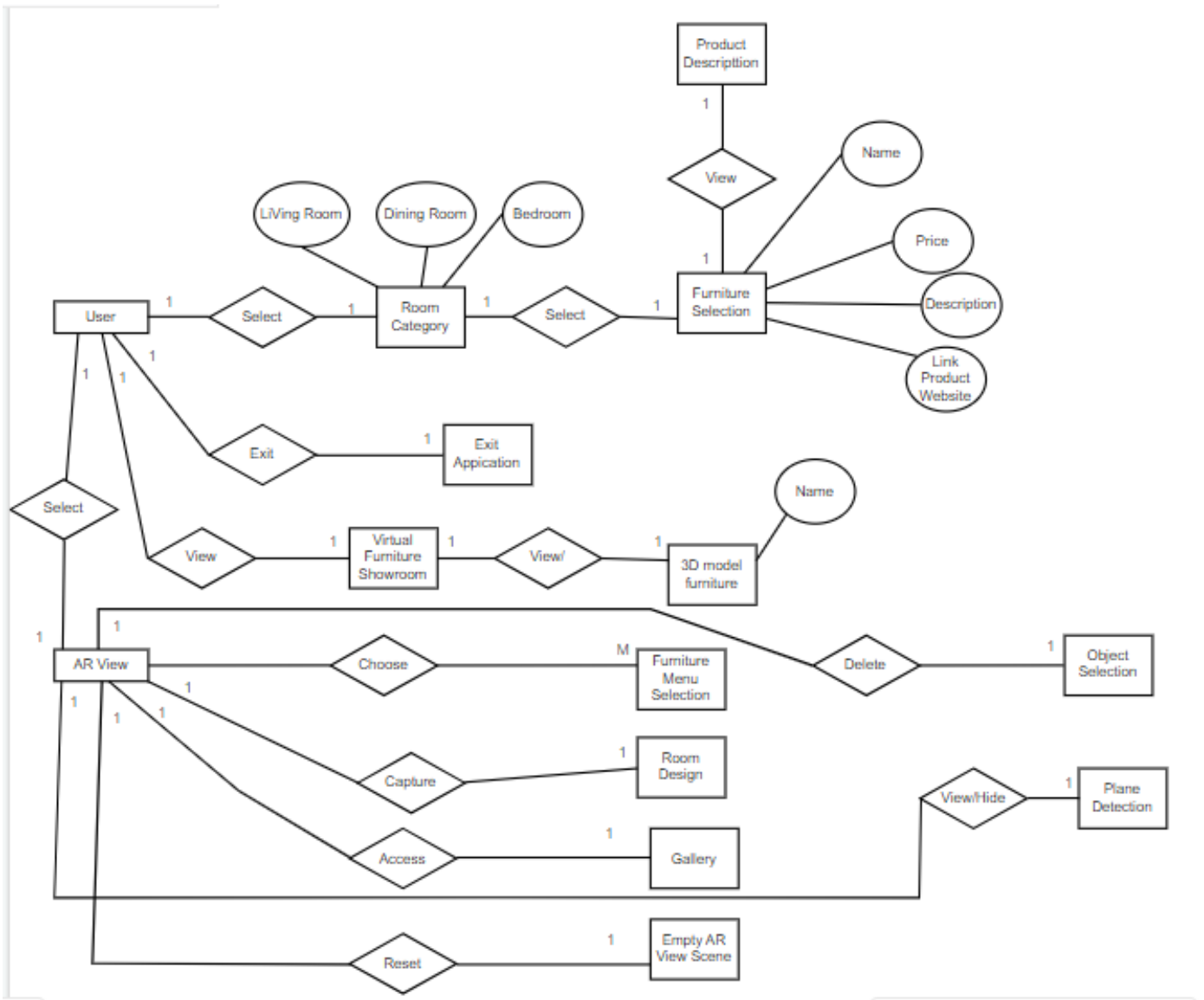


Figure 4.1.5.1: MAJUHOME AR Entity-Relationship Diagram

4.2 Physical Design

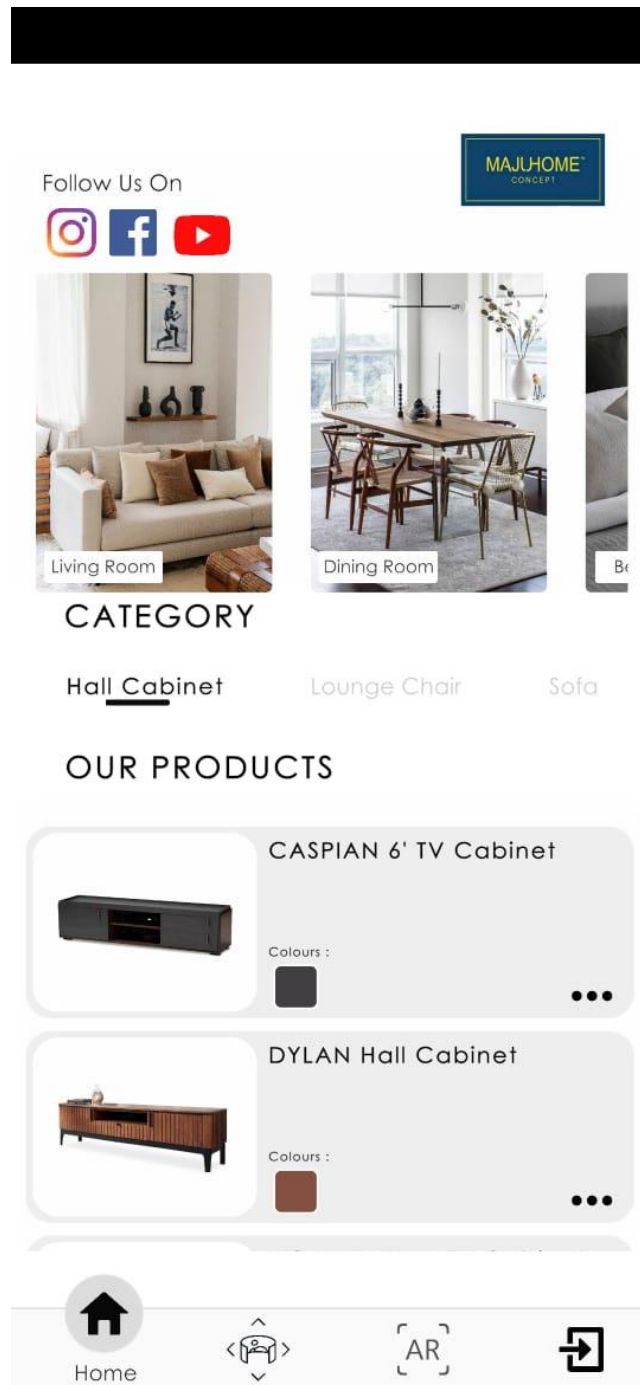


Figure 4.2.1: MAJUHOME AR Home Page

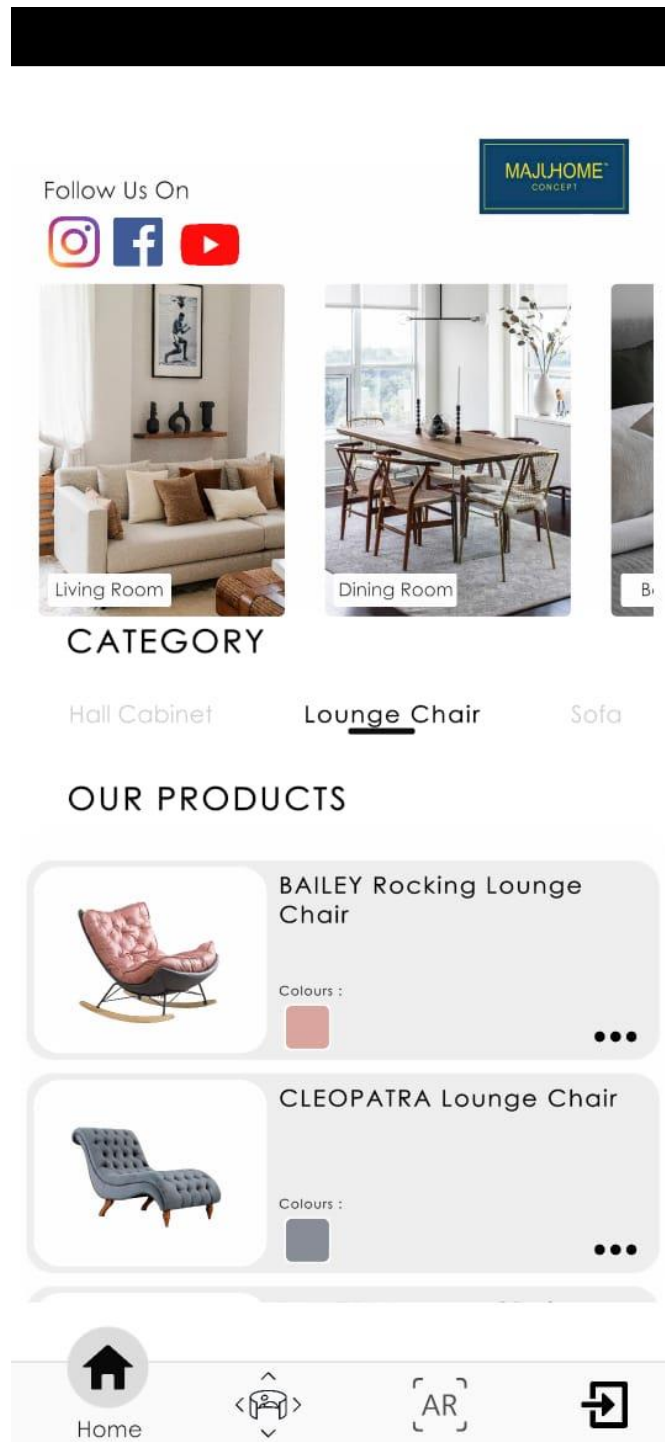


Figure 4.2.2: MAJUHOME AR Lounge Chair Page

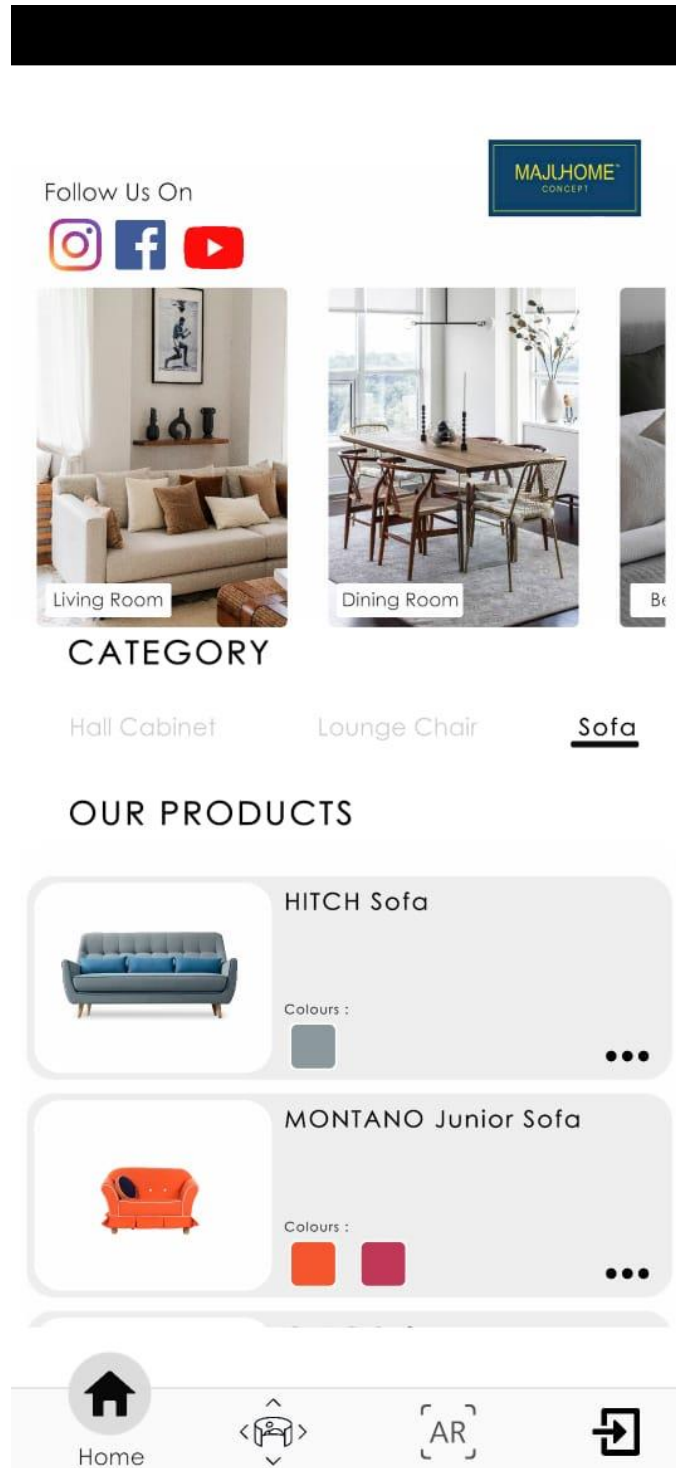


Figure 4.2.3: MAJUHOME AR Sofa Page

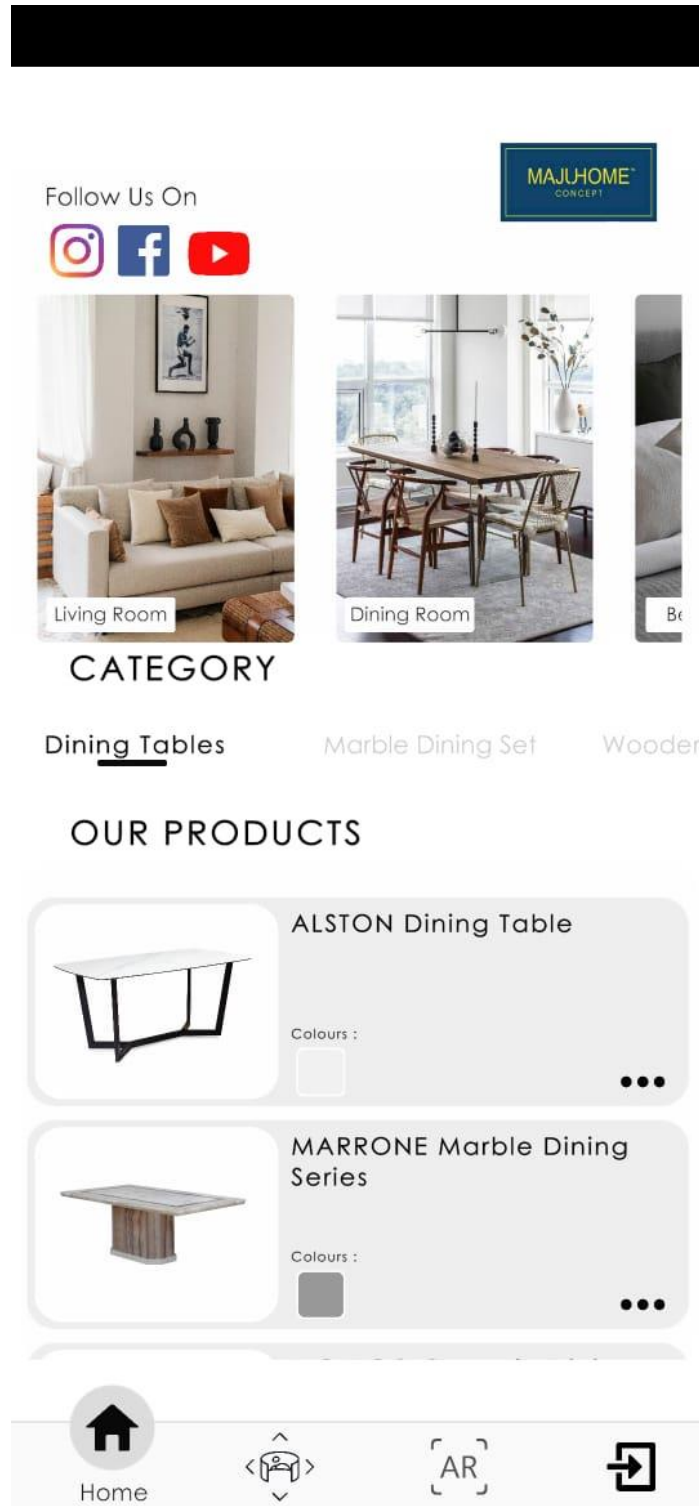


Figure 4.2.4: MAJUHOME AR Dining Table Page

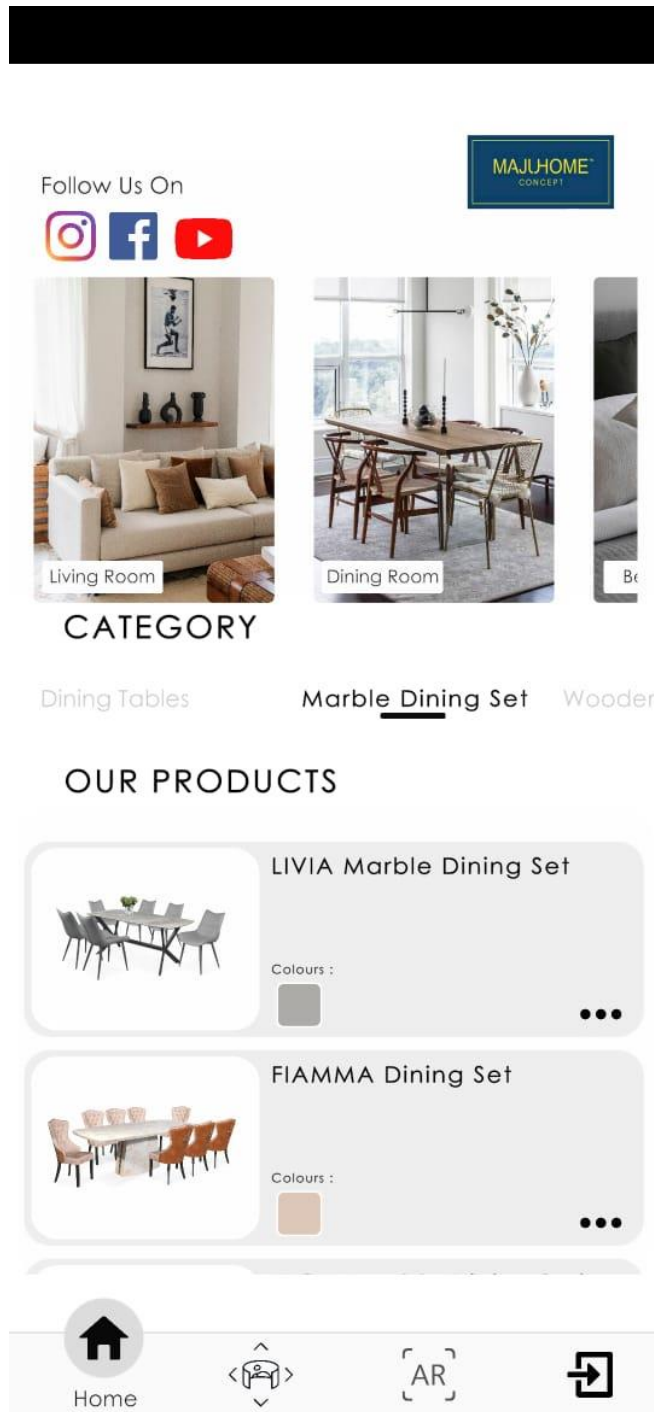


Figure 4.2.5: MAJUHOME AR Marble Dining Set Page

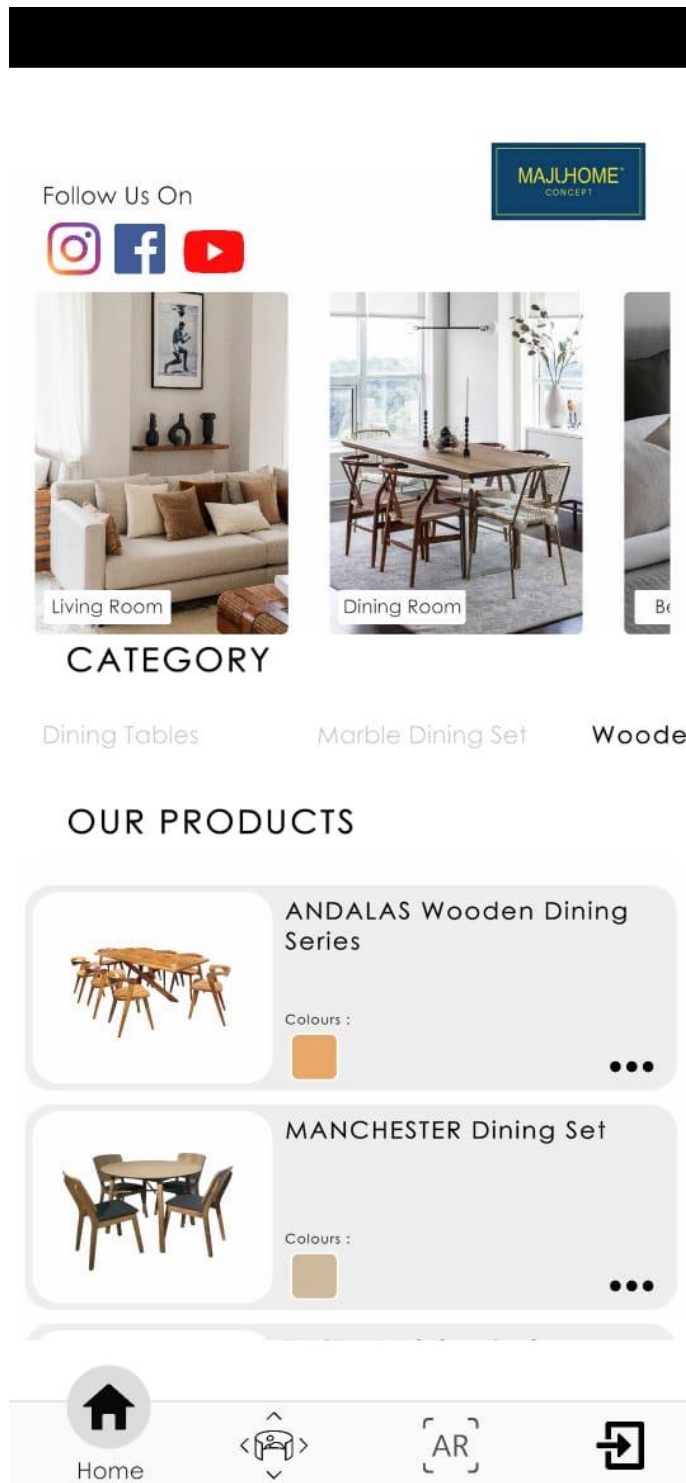


Figure 4.2.6: MAJUHOME AR Wooden Dining Set Page

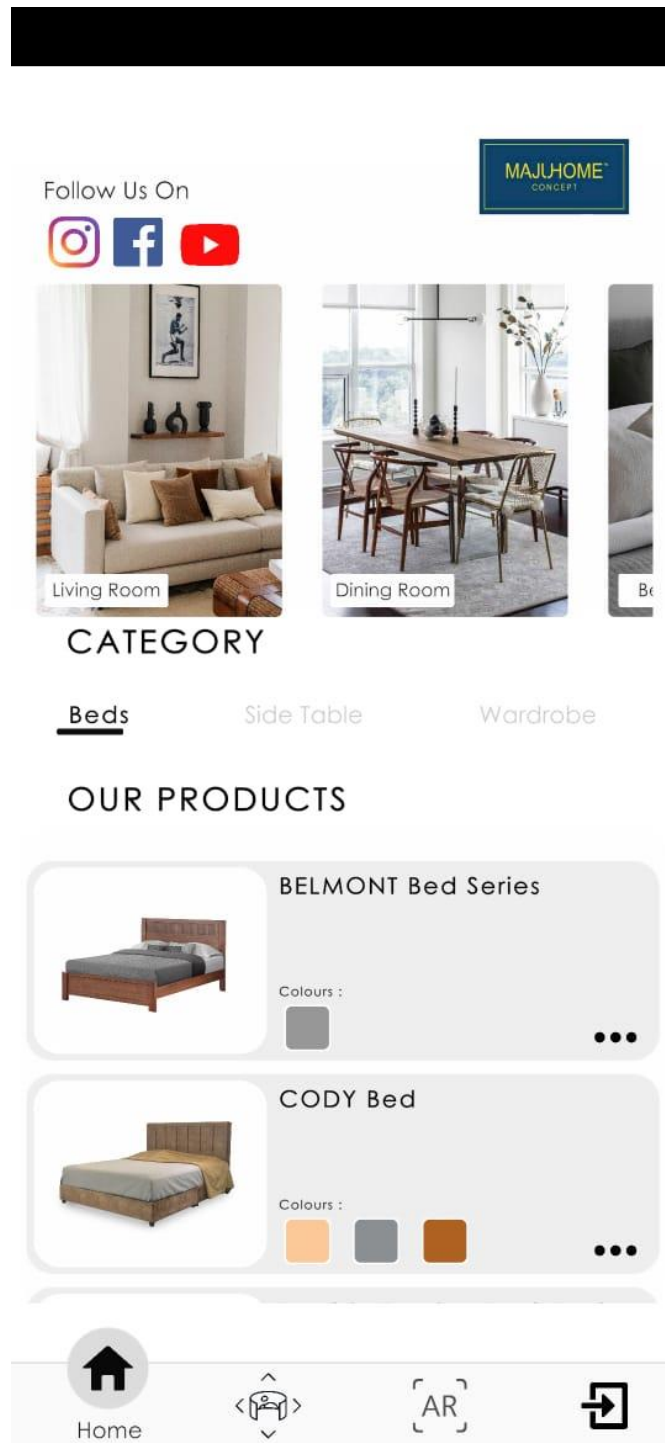


Figure 4.2.7: MAJUHOME AR Beds Page

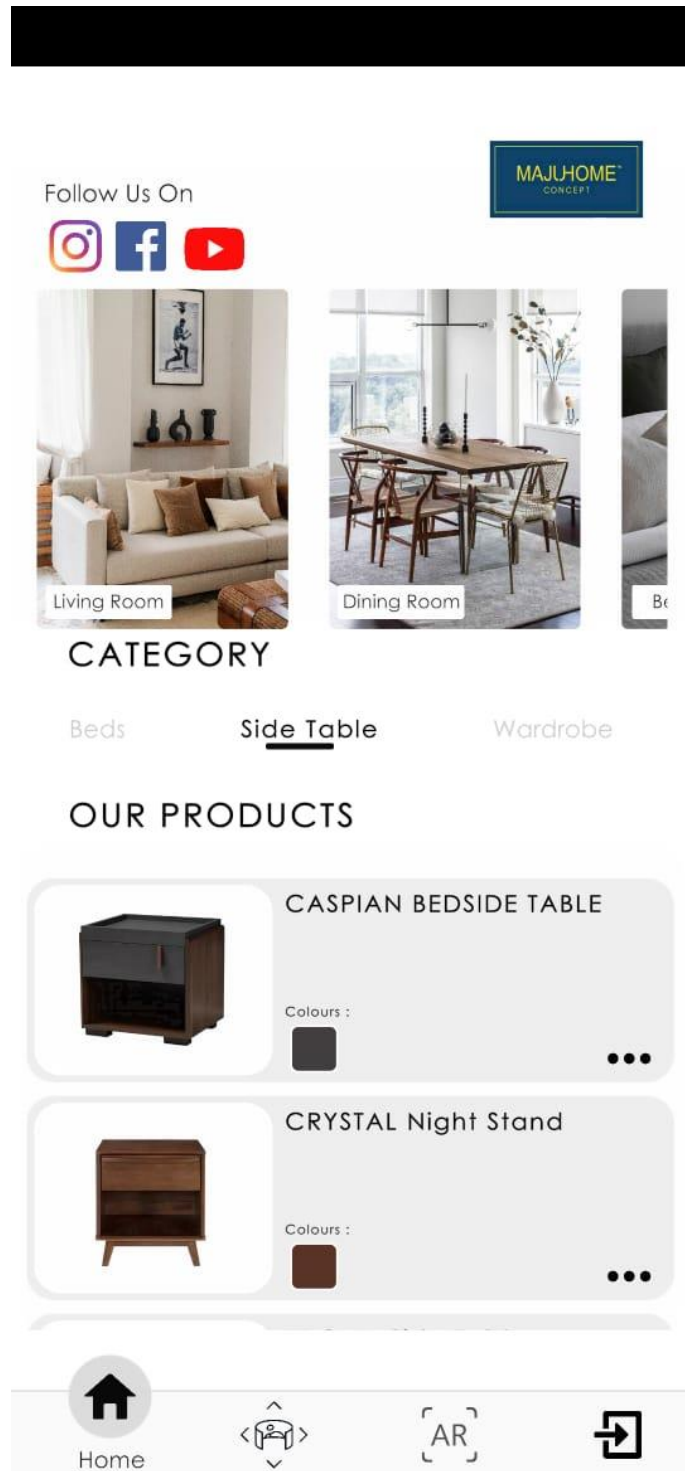


Figure 4.2.8: MAJUHOME AR Side Table Page

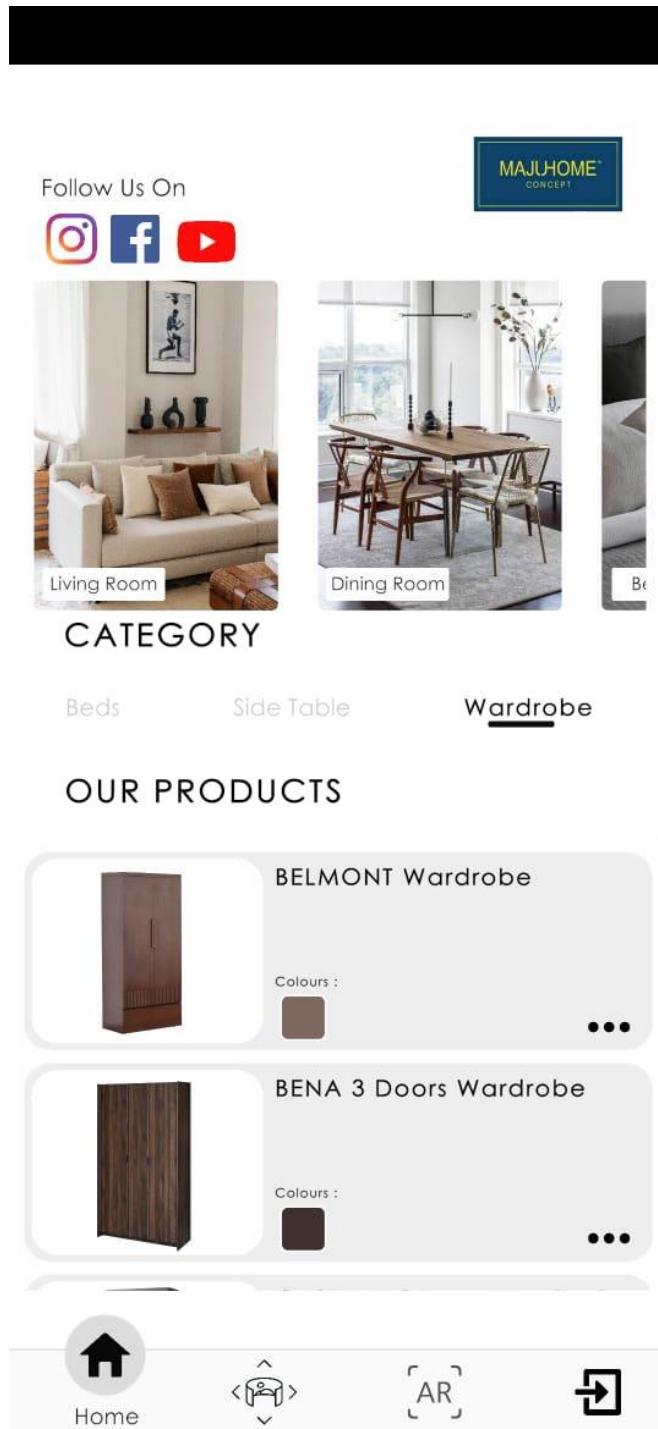


Figure 4.2.9: MAJUHOME AR Wardrobe Page

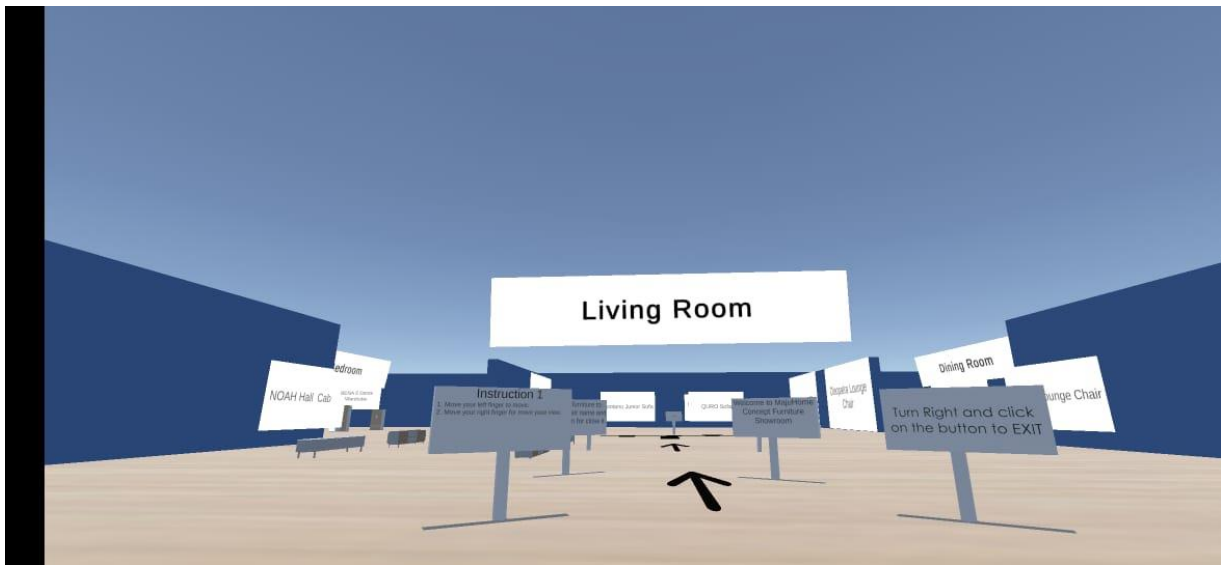


Figure 4.2.10: MAJUHOME AR Virtual Furniture Showroom Scene

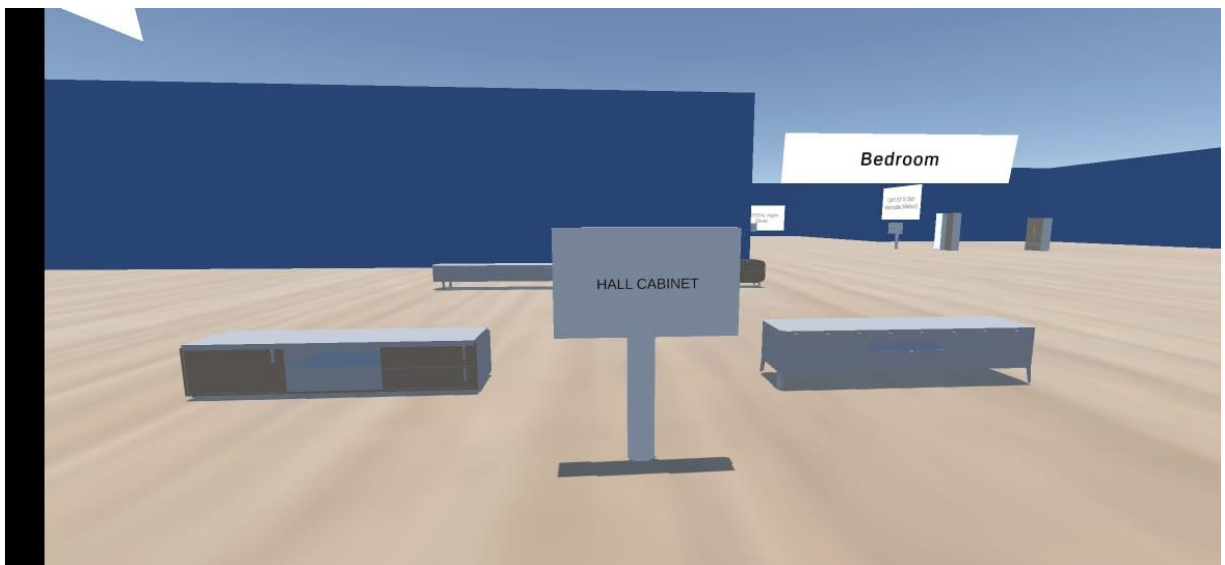


Figure 4.2.11: MAJUHOME AR Hall Cabinet Section in Virtual Showroom Scene



Figure 4.2.12: MAJUHOME AR AR Scene Plane Detection Scene

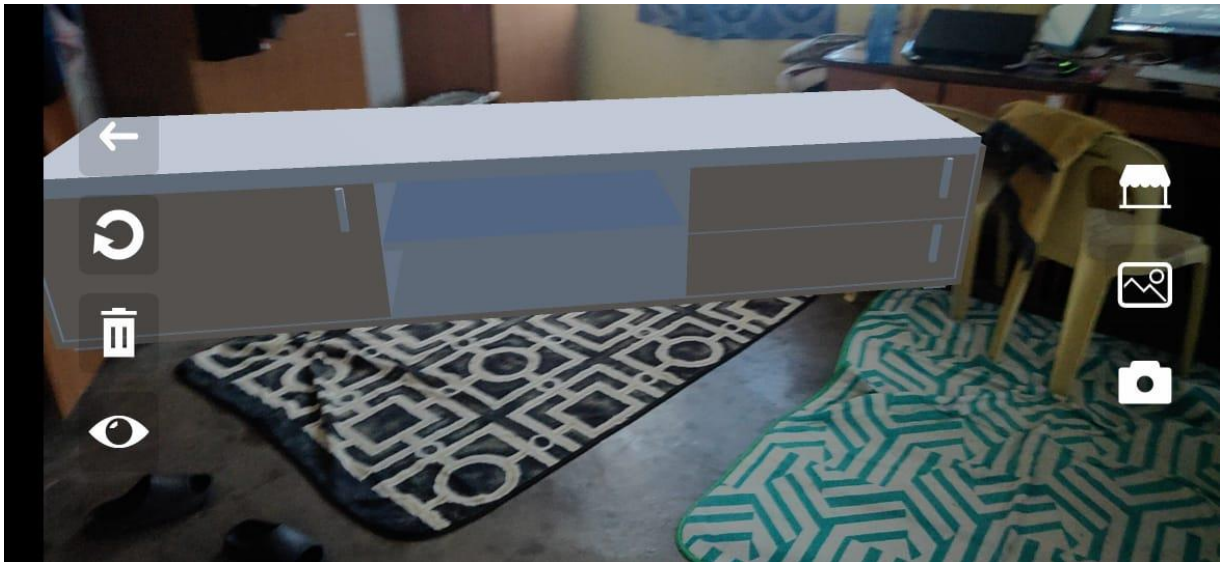


Figure 4.2.13: MAJUHOME AR AR Scene with hide Plane Detection Scene

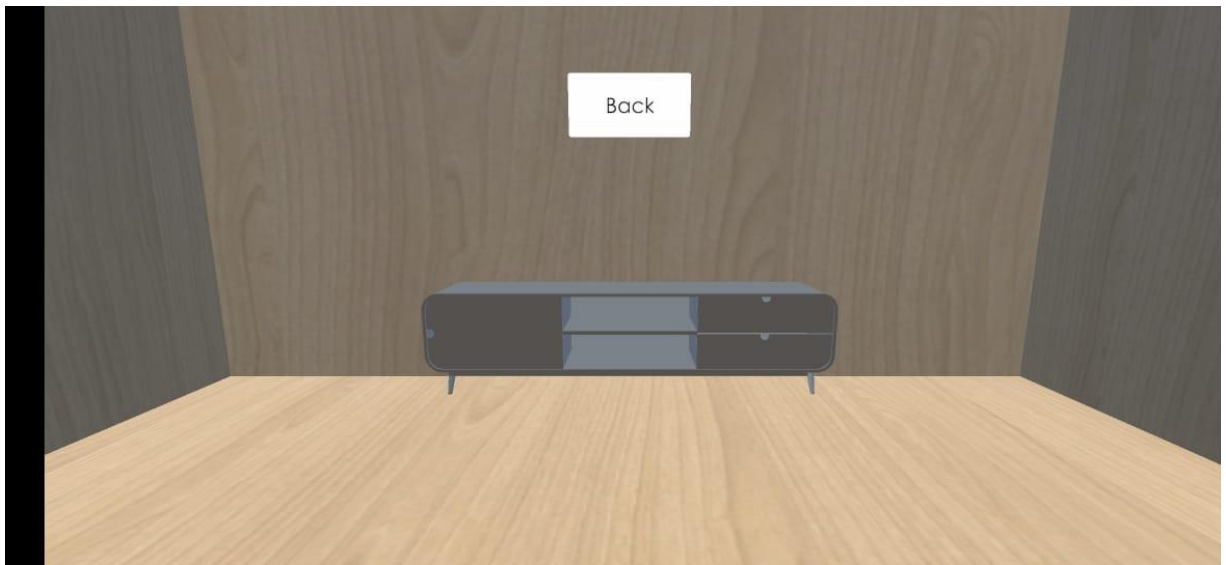


Figure 4.2.14: MAJUHOME AR 360-degree view furniture Scene

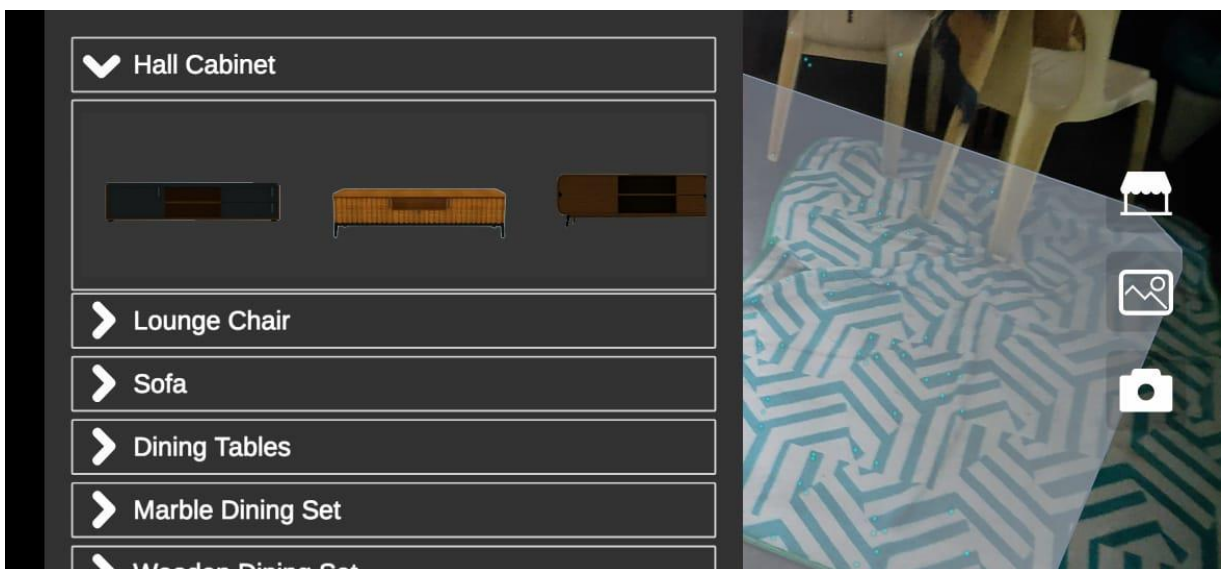


Figure 4.2.15: MAJUHOME AR Furniture Menu Selection in AR View Scene

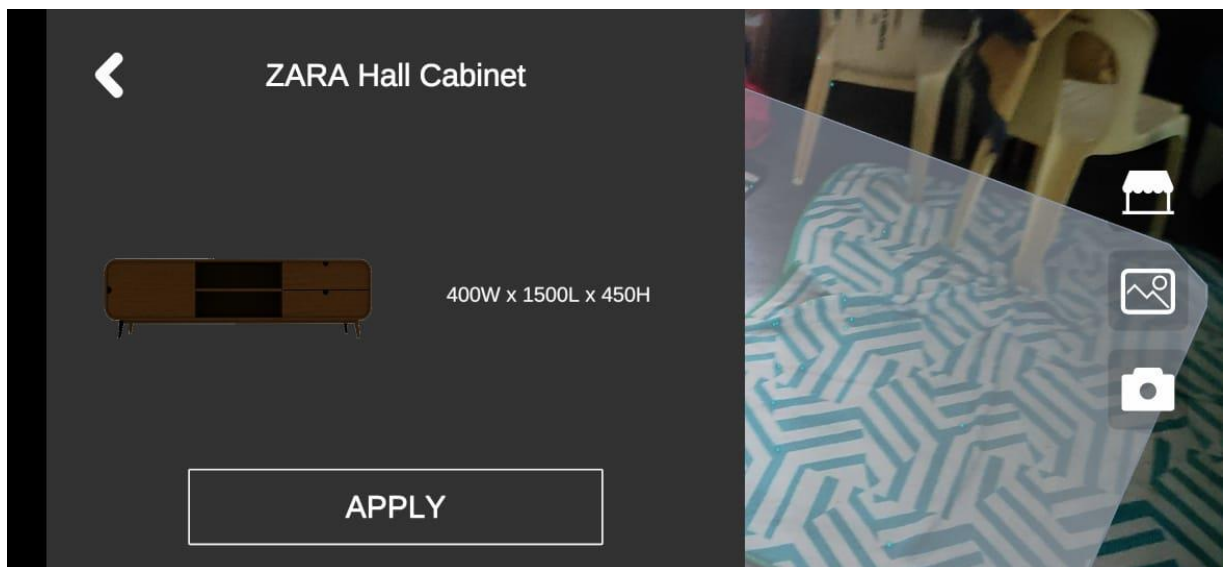


Figure 4.2.16: MAJUHOME AR Product Description in AR View Scene

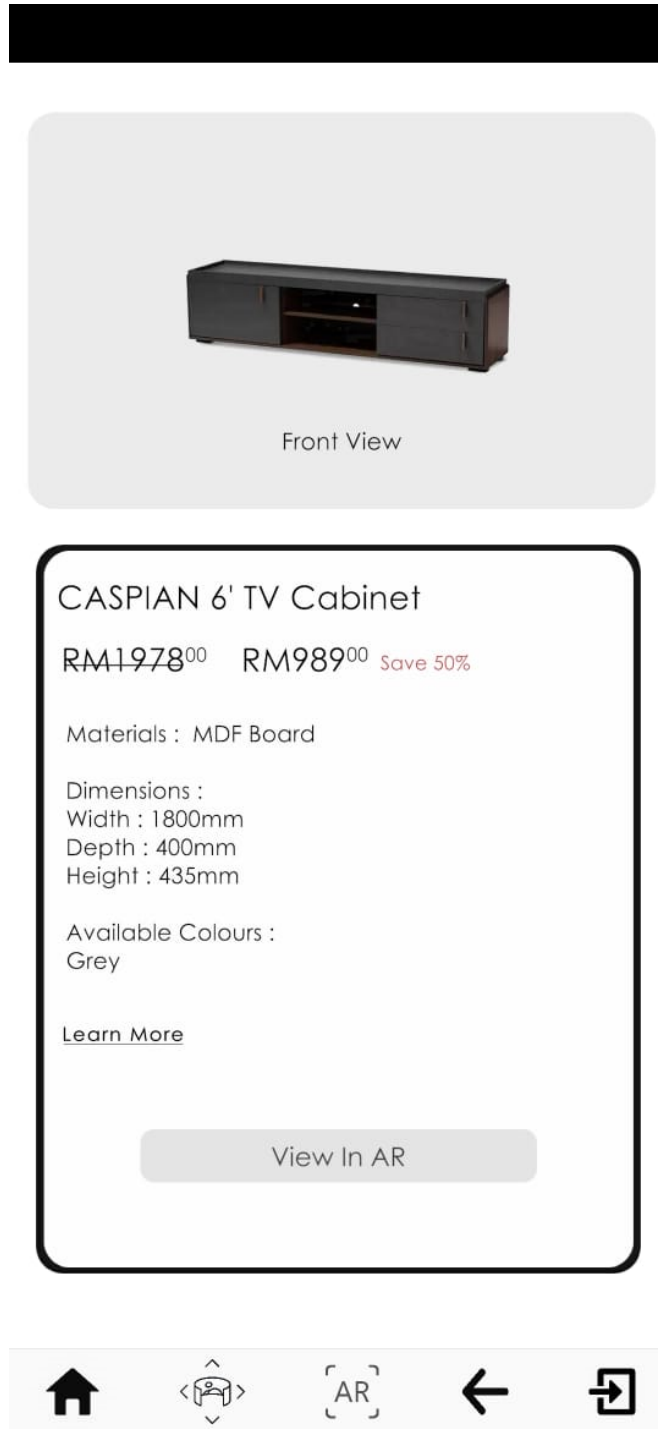


Figure 4.2.17: MAJUHOME AR Product Description Page



Figure 4.2.18: MAJUHOME AR Furniture Selected in AR View Scene

5.0 TEXT DESCRIPTION AND RESULT

5.1 Unit Testing Plan

Table 5.1.1: MAJUHOME AR selection furniture category Unit Testing Plan

MAJUHOME AR selection furniture category						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Dining Room Button	Touch on the image of Dining Room	None	Change to page Dining Room	Amir Haziq	Pass
2.	Category Marble Dining Set word	Touch on the word Marble Dining Set	None	Change to page Dining Room with category of Marble Dining Set	Amir Haziq	Pass
3.	Category Dining Tables word	Touch on the word Dining Tables	None	Change to page Dining Room with category of Dining Tables	Amir Haziq	Pass
4.	Category Marble Dining Set word	Touch on the word Wooden Dining Set	None	Change to page Dining Room with category of Wooden Dining Set	Amir Haziq	Pass
5.	Bedroom Button	Touch on the image of Bedroom	None	Change to page Bedroom	Amir Haziq	Pass
6.	Category Side Table word	Touch on the word Side Table	None	Change to page Bedroom with category of Side Table	Amir Haziq	Pass
7.	Category Wardrobe word	Touch on the word Wardrobe	None	Change to page Bedroom with category of Wardrobe	Amir Haziq	Pass
8.	Category Beds word	Touch on the word Beds	None	Change to page Bedroom with category of Beds	Amir Haziq	Pass

9.	Living Room Button	Touch on the image of Living Room	None	Change to page Living Room	Amir Haziq	Pass
10.	Category Lounge Chair word	Touch on the word Lounge Chair	None	Change to page Living Room with category of Lounge Chair	Amir Haziq	Pass
11.	Category Sofa word	Touch on the word Sofa	None	Change to page Living Room with category of Sofa	Amir Haziq	Pass
12.	Category Hall Cabinet word	Touch on the word Hall Cabinet	None	Change to page Living Room with category of Hall Cabinet	Amir Haziq	Pass

Table 5.1.2: MAJUHOME AR view furniture in 360-degree Unit Testing Plan

MAJUHOME AR view furniture in 360 degrees						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	CASPIAN'6 TV Cabinet Button	1.Touch on image of Living Room 2.Touch on the word Hall Cabinet 3.Touch on the first product of Hall Cabinet 4.Rotate the 3D model with finger	None	The CASPIAN'6 TV Cabinet 3D model can rotate 360-degree	Vincent Tam	Pass
2.	DYLAN Hall Cabinet Button	1.Touch on image of Living Room 2.Touch on the word Hall Cabinet 3.Touch on the second product of Hall Cabinet 4.Rotate the 3D model with finger	None	The Dylan Hall Cabinet 3D model can rotate 360-degree	Vincent Tam	Pass
3.	NOAH Hall Cabinet Button	1.Touch on image of Living Room 2.Touch on the word Hall Cabinet 3.Scroll down the product list 4.Touch on the third product of Hall Cabinet 5. Rotate the 3D model with finger	None	The Noah Hall Cabinet 3D model can rotate 360-degree	Vincent Tam	Pass
4.	ZARA Hall Cabinet Button	1.Touch on image of Living Room 2.Touch on the word Hall Cabinet 3.Scroll down the product list 4.Touch on the last product of Hall Cabinet 5. Rotate the 3D model with finger	None	The Zara Hall Cabinet 3D model can rotate 360-degree	Vincent Tam	Pass

5.	BAILEY Rocking Lounge Chair Button	1.Touch on image of Living Room 2.Touch on the word Lounge Chair 3.Touch on the first product of Lounge Chair 4. Rotate the 3D model with finger	None	The Bailey Rocking Lounge Chair 3D model can rotate 360- degree	Vincent Tam	Fail
6.	CLEOPATR A Lounge Chair Button	1.Touch on image of Living Room 2.Touch on the word Lounge Chair 3.Touch on the second product of Lounge Chair 4. Rotate the 3D model with finger	None	The Cleopatra Lounge Chair 3D model can rotate 360-degree	Vincent Tam	Fail
7.	DANZEL Lounge Chair Button	1.Touch on image of Living Room 2.Touch on the word Lounge Chair 3.Scroll down the product list 4.Touch on the third product of Lounge Chair 5. Rotate the 3D model with finger	None	The Danzel Lounge Chair 3D model can rotate 360-degree	Vincent Tam	Fail
8.	MOSES Lounge Chair Button	1.Touch on image of Living Room 2.Touch on the word Lounge Chair 3.Scroll down the product list 4.Touch on the last product of Lounge Chair 5. Rotate the 3D model with finger	None	The Moses Lounge Chair 3D model can rotate 360- degree	Vincent Tam	Fail

9.	HITCH Sofa Button	1.Touch on image of Living Room 2.Touch on the word Sofa 3.Touch on the first product of Sofa 4.Rotate the 3D model with finger	None	The Hitch Sofa 3D model can rotate 360-degree	Vincent Tam	Fail
10.	MONTANO Junior Sofa Button	1.Touch on image of Living Room 2.Touch on the word Sofa 3.Touch on the second product of Sofa 4. Rotate the 3D model with finger	None	The Montano Junior Sofa 3D model can rotate 360-degree	Vincent Tam	Fail
11.	QURO Sofa Button	1.Touch on image of Living Room 2.Touch on the word Sofa 3.Scroll down the product list 4.Touch on the third product of Sofa 5. Rotate the 3D model with finger	None	The QURO Sofa 3D model can rotate 360-degree	Vincent Tam	Fail
12.	UME Recliner Sofa Button	1.Touch on image of Living Room 2.Touch on the word Sofa 3.Scroll down the product list 4.Touch on the last product of Sofa 5. Rotate the 3D model with finger	None	The UME Recliner Sofa 3D model can rotate 360-degree	Vincent Tam	Fail

13.	ALSTON Dining Table Button	1.Touch on image of Dining Room 2.Touch on the word Dining Tables 3.Touch on the first product of Dining Tables 4. Rotate the 3D model with finger	None	The ALSTON Dining Table 3D model can rotate 360-degree	Vincent Tam	Fail
14.	MARRONE Marble Dining Table Button	1.Touch on image of Dining Room 2.Touch on the word Dining Tables 3.Touch on the second product of Dining Tables 4. Rotate the 3D model with finger	None	The MARRONE Marble Dining Table 3D model can rotate 360-degree	Vincent Tam	Fail
15.	MONICO Ceramic Dining Table Button	1.Touch on image of Dining Room 2.Touch on the word Dining Tables 3. Scroll down the product list 4.Touch on the third product of Dining Tables 5. Rotate the 3D model with finger	None	The MONICO Ceramic Dining Table 3D model can rotate 360-degree	Vincent Tam	Fail

16.	SANDRO Ceramic Dining Table Button	1.Touch on image of Dining Room 2.Touch on the word Dining Tables 3. Scroll down the product list 4.Touch on the last product of Dining Tables 5. Rotate the 3D model with finger	None	The SANDRO Ceramic Dining Table 3D model can rotate 360- degree	Vincent Tam	Fail
17.	LIVIA Marble Dining Set Button	1.Touch on image of Dining Room 2.Touch on the word Marble Dining Set 3.Touch on the first product of Marble Dining Set 4. Rotate the 3D model with finger	None	The LIVIA Marble Dining Set 3D model can rotate 360-degree	Vincent Tam	Fail

18.	FIAMMA Dining Set Button	1.Touch on image of Dining Room 2.Touch on the word Marble Dining Set 3.Touch on the second product of Marble Dining Set 5. Rotate the 3D model with finger	None	The FIAMMA Dining Set 3D model can rotate 360-degree	Vincent Tam	Fail
19.	NICIA Marble Dining Series Button	1.Touch on image of Dining Room 2.Touch on the word Marble Dining Set 3. Scroll down the product list 4.Touch on the third product of Marble Dining Set 5. Rotate the 3D model with finger	None	The NICIA Marble Dining Series 3D model can rotate 360-degree	Vincent Tam	Fail

20.	RICCA Marble Dining Series Button	1.Touch on image of Dining Room 2.Touch on the word Marble Dining Set 3. Scroll down the product list 4.Touch on the last product of Marble Dining Set 5. Rotate the 3D model with finger	None	The RICCA Marble Dining Series 3D model can rotate 360-degree	Vincent Tam	Fail
21.	ANDALAS Wooden Dining Series Button	1.Touch on image of Dining Room 2.Touch on the word Wooden Dining Set 3.Touch on the first product of Wooden Dining Set 4. Rotate the 3D model with finger	None	The ANDALAS Wooden Dining Series 3D model can rotate 360-degree	Vincent Tam	Pass

22.	MANCHESTER Dining Set Button	1.Touch on image of Dining Room 2.Touch on the word Wooden Dining Set 3.Touch on the second product of Wooden Dining Set 4. Rotate the 3D model with finger	None	The MANCHESTER Dining Set 3D model can rotate 360-degree	Vincent Tam	Pass
23.	TRISTAN Dining Series Button	1.Touch on image of Dining Room 2.Touch on the word Wooden Dining Set 3. Scroll down the product list 4.Touch on the third product of Wooden Dining Set 5. Rotate the 3D model with finger	None	The TRISTAN Dining Series 3D model can rotate 360-degree	Vincent Tam	Fail

24.	WALTEN Dining Set Button	1.Touch on image of Dining Room 2.Touch on the word Wooden Dining Set 3. Scroll down the product list 4.Touch on the last product of Wooden Dining Set 5. Rotate the 3D model with finger	None	The WALTEN Dining Set 3D model can rotate 360-degree	Vincent Tam	Pass
25.	BELMONT Bed Series Button	1.Touch on image of Bedroom 2.Touch on the word Beds 3.Touch on the first product of Beds 4. Rotate the 3D model with finger	None	The BELMONT Bed Series 3D model can rotate 360-degree	Vincent Tam	Fail

26.	CODY Bed Button	1.Touch on image of Bedroom 2.Touch on the word Beds 3.Touch on the second product of Beds 4. Rotate the 3D model with finger	None	The CODY Bed 3D model can rotate 360-degree	Vincent Tam	Fail
27.	Double Decker Bunk Bed Button	1.Touch on image of Bedroom 2.Touch on the word Beds 3. Scroll down the product list 3.Touch on the third product of Beds 5. Rotate the 3D model with finger	None	The Double Decker Bunk Bed 3D model can rotate 360-degree	Vincent Tam	Fail

28.	JACK Bed Button	1.Touch on image of Bedroom 2.Touch on the word Beds 3. Scroll down the product list 3.Touch on the last product of Beds 5. Rotate the 3D model with finger	None	The JACK Bed 3D model can rotate 360-degree	Vincent Tam	Fail
29.	CASPIAN BEDSIDE Table Button	1.Touch on image of Bedroom 2.Touch on the word Side Table 3.Touch on the first product of Side Table 4. Rotate the 3D model with finger	None	The CASPIAN BEDSIDE Table 3D model can rotate 360-degree	Vincent Tam	Pass

30.	CRYSTAL Night Stand Button	1.Touch on image of Bedroom 2.Touch on the word Side Table 3.Touch on the second product of Side Table 4. Rotate the 3D model with finger	None	The CRYSTAL Night Stand 3D model can rotate 360-degree	Vincent Tam	Fail
31.	KRONA Side Table Button	1.Touch on image of Bedroom 2.Touch on the word Side Table 3. Scroll down the product list 4.Touch on the third product of Side Table 5. Rotate the 3D model with finger	None	The KRONA Side Table 3D model can rotate 360-degree	Vincent Tam	Pass

32.	SOLVEN Night Stand Button	1.Touch on image of Bedroom 2.Touch on the word Side Table 3. Scroll down the product list 4.Touch on the last product of Side Table 5. Rotate the 3D model with finger	None	The SOLVEN Night Stand 3D model can rotate 360-degree	Vincent Tam	Pass
33.	BELMONT Wardrobe Button	1.Touch on image of Bedroom 2.Touch on the word Wardrobe 3.Touch on the first product of Wardrobe 4. Rotate the 3D model with finger	None	The BELMONT Wardrobe 3D model can rotate 360-degree	Vincent Tam	Pass

34.	BENA 3 Doors Wardrobe Button	1.Touch on image of Bedroom 2.Touch on the word Wardrobe 3.Touch on the second product of Wardrobe 4. Rotate the 3D model with finger	None	The BENA 3 Doors Wardrobe 3D model can rotate 360-degree	Vincent Tam	Pass
35.	CASPIAN 2 Door Wardrobe Button	1.Touch on image of Bedroom 2.Touch on the word Wardrobe 3. Scroll down the product list 4.Touch on the third product of Wardrobe 5. Rotate the 3D model with finger	None	The CASPIAN 2 Door Wardrobe 3D model can rotate 360-degree	Vincent Tam	Pass

36.	DAYLEY 2 Door Wardrobe Button	1.Touch on image of Bedroom 2.Touch on the word Wardrobe 3. Scroll down the product list 4.Touch on the last product of Wardrobe 5. Rotate the 3D model with finger	None	The DAYLEY 2 Door Wardrobe 3D model can rotate 360-degree	Vincent Tam	Fail
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Table 5.1.3: MAJUHOME AR AR View Scene Unit Testing Plan

MAJUHOME AR AR View Scene						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	AR View Navigation Button	1.Touch the icon AR view in navigation bar	Open MAJUHOME AR app	Change to AR View Scene and screen will auto rotate become landscape	Badli	Pass
2.	View in AR button	1.Touch on the Product button in the room category page 2.Touch on the View in AR button in the bottom page of Product description	Must in Scene Product Description	Change to AR View Scene and screen will auto rotate become landscape	Badli	Pass

Table 5.1.4: MAJUHOME AR Virtual Showroom Unit Testing Plan

MAJUHOME AR Virtual Showroom						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Virtual Showroom Navigation Button	1.Touch the icon virtual showroom at second button counts from left in navigation bar	Open MAJUHOME AR app	Change to Virtual Showroom Scene and screen will auto rotate become landscape	Badli	Pass

Table 5.1.4: MAJUHOME AR Save Room Design Unit Testing Plan

MAJUHOME AR Save Room Design						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Back Button	Touch the Back Button at left side of screen	None	Change to Previous Page and the screen automatically become back portrait	Vincent Tam	Pass
2.	Reset Butoon	Touch the Reset Button at left side of screen	None	The AR scene will reset become empty	Vincent Tam	Pass
3.	Delete Button	1.Select the 3D model of furniture from menu selection. 2.Apply and place the 3D model at the scene 3.Select the 3D model. 4. Touch the Delete button at left side of screen	Must have 3D object inside the AR scene	The 3D object will be deleted	Vincent Tam	Pass

4.	Menu Selection Button	1.Touch the Menu Selection button that placed on the top right of screen. 2.Touch the arrow to drop down the furniture category selection 3.Select the 3D model furniture by touch on the image on the 3D model. 4.Touch on the APPLY button on the bottom left of screen 5.Touch on the plane detection to place the 3D model furniture	None	View the 3D model furniture selection and place the 3D model in the AR View Scene	Vincent Tam	Pass
5.	Gallery Button	Touch on the Gallery button at the right side of screen	None	View the images that capture before	Vincent Tam	Pass
6.	Capture picture Button	Touch on the camera icon at the right side of screen	None	The screen view appears a white blink	Vincent Tam	Pass

7.	Undo Furniture Placer Button	1. Apply the 3D model on the AR View Scene 2. Select the 3D model by touch the interface of 3D model 3. Touch the button at the bottom center of screen	3D model in the AR scene	The furniture will disappear in AR View Scene	Vincent Tam	Pass
8.	Save image button in Gallery	1. Select the previous or next room design picture by touch the to navigate bottom that place left and right of screen that want to save in phone gallery 2. Touch on the save button at the bottom left of screen	Have at least one picture	The picture will save to phone gallery	Vincent Tam	Pass

9.	Delete button in Gallery	1. Select the previous or next room design picture by touch the to navigate bottom that place left and right of screen that want to delete 2.Touch the delete button at the bottom right of screen	Have at least one picture	The picture will be deleted from the app gallery	Vincent Tam	Pass
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Table 5.1.5: MAJUHOME AR Exit Function Unit Testing Plan

MAJUHOME AR Exit Function						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Exit Button	1. Open the app 2.Touch the Exit Button at bottom right side navigation bar.	None	Exit to phone home screen	Ibrahim	Pass

Table 5.1.6: MAJUHOME AR view furniture description Unit Testing Plan

MAJUHOME AR view furniture description						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	3 dots detail button in CASPIAN'6 TV Cabinet Button	1.Touch on the 3 dots detail button at product list	None	Change page to view CASPIAN'6 TV Cabinet description and can touch the link "learn more" to go to MAJUHOME Concept's website to see this product details	Ibrahim	Pass
2.	3 dots detail button in DYLAN Hall Cabinet Button	1.Touch on the 3 dots detail button at product list	None	Change page to view DYLAN Hall Cabinet description and can touch the link "learn more" to go to MAJUHOME Concept's website to see this product details	Ibrahim	Pass
3.	3 dots detail button in NOAH Hall Cabinet Button	1.Touch on the 3 dots detail button at product list	None	Change page to view NOAH Hall Cabinet description and can touch the link "learn more" to go to MAJUHOME Concept's website to see this product details	Ibrahim	Pass
4.	3 dots detail button in ZARA Hall Cabinet Button	1.Touch on the 3 dots detail button at product list	None	Change page to view ZARA Hall Cabinet description and can touch the link "learn more" to go to MAJUHOME Concept's website to see this product details	Ibrahim	Pass
5.	3 dots detail button in BAILEY Rocking Lounge Chair Button	1.Touch on the 3 dots detail button at product list	None	Change page to view BAILEY Rocking Lounge Chair description and can touch the link "learn more" to go to MAJUHOME Concept's website to see this product details	Ibrahim	Pass

6.	3 dots detail button in CLEOPATRA Lounge Chair Button	1.Touch on the 3 dots detail button at product list	None	Change page to view CLEOPATRA Lounge Chair description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
7.	3 dots detail button in DANZEL Lounge Chair Button	1.Touch on the 3 dots detail button at product list	None	Change page to view DANZEL Lounge Chair description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
8.	3 dots detail button in MOSES Lounge Chair Button	1.Touch on the 3 dots detail button at product list	None	Change page to view MOSES Lounge Chair description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
9.	3 dots detail button in HITCH Sofa Button	1.Touch on the 3 dots detail button at product list	None	Change page to view HITCH Sofa description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
10.	3 dots detail button in MONTANO Junior Sofa Button	1.Touch on the 3 dots detail button at product list	None	Change page to view MONTANO Junior Sofa description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
11.	3 dots detail button in QURO Sofa Button	1.Touch on the 3 dots detail button at product list	None	Change page to view QURO Sofa description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

12.	3 dots detail button in UME Recliner Sofa Button	1.Touch on the 3 dots detail button at product list	None	Change page to view UME Recliner Sofa description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
13.	3 dots detail button in ALSTON Dining Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view ALSTON Dining Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
14.	3 dots detail button in MARRONE Marble Dining Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view MARRONE Marble Dining Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
15.	3 dots detail button in MONICO Ceramic Dining Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view MONICO Ceramic Dining Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
16.	3 dots detail button in SANDRO Ceramic Dining Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view SANDRO Ceramic Dining Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
17.	3 dots detail button in LIVIA Marble Dining Set Button	1.Touch on the 3 dots detail button at product list	None	Change page to LIVIA Marble Dining Set description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

18.	3 dots detail button in FIAMMA Dining Set Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in FIAMMA Dining Set description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
19.	3 dots detail button in NICIA Marble Dining Series Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in NICIA Marble Dining Series description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
20.	3 dots detail button in RICCA Marble Dining Series Button	1.Touch on the 3 dots detail button at product list	None	Change page to view RICCA Marble Dining Series description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
21.	3 dots detail button in ANDALAS Wooden Dining Series Button	1.Touch on the 3 dots detail button at product list	None	Change page to in ANDALAS Wooden Dining Series description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
22.	3 dots detail button in MANCHESTER Dining Set Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in MANCHESTER Dining Set description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

23.	3 dots detail button in TRISTAN Dining Series Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in TRISTAN Dining Series description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
24.	3 dots detail button in WALTEN Dining Set Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in WALTEN Dining Set description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
25.	3 dots detail button in BELMONT Bed Series Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in BELMONT Bed Series description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
26.	3 dots detail button in CODY Bed Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in CODY Bed description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
27.	3 dots detail button in Double Decker Bunk Bed Button	1.Touch on the 3 dots detail button at product list	None	Change page to view Double Decker Bunk Bed description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
28.	3 dots detail button in JACK Bed Button	1.Touch on the 3 dots detail button at product list	None	Change page to view JACK Bed description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

29.	3 dots detail button in CASPIAN BEDSIDE Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in CASPIAN BEDSIDE Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
30.	3 dots detail button in CRYSTAL Night Stand Button	1.Touch on the 3 dots detail button at product list	None	Change page to view CRYSTAL Night Stand description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
31.	3 dots detail button in KRONA Side Table Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in KRONA Side Table description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
32.	3 dots detail button in SOLVEN Night Stand Button	1.Touch on the 3 dots detail button at product list	None	Change page to view SOLVEN Night Stand description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
33.	3 dots detail button in BELMONT Wardrobe Button	1.Touch on the 3 dots detail button at product list	None	Change page to view BELMONT Wardrobe description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
34.	3 dots detail button in BENA 3 Doors Wardrobe Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in BENA 3 Doors Wardrobe description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

35.	3 dots detail button in CASPIAN 2 Door Wardrobe Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in CASPIAN 2 Door Wardrobe description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass
36.	3 dots detail button in DAYLEY 2 Door Wardrobe Button	1.Touch on the 3 dots detail button at product list	None	Change page to view in DAYLEY 2 Door Wardrobe description and can touch the link “learn more” to go to MAJUHOME Concept’s website to see this product details	Ibrahim	Pass

5.2 Integration Testing Plan

Table 5.2.1: MAJUHOME AR view furniture in 360-degree Integration Testing Plan

MAJUHOME AR view furniture in 360-degree						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	View furniture in 360-degree	Touch on the button rectangle that contain image of furniture and model	None	Change to 3D view scene and can rotate the 3D model in 360-degree	Harith	Pass

Table 5.2.2: MAJUHOME AR AR View Scene Integration Testing Plan

MAJUHOME AR AR View Scene						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	AR View Navigation Button	1.Touch the icon AR view in navigation bar	Open MAJUHOME AR app	Change to AR View Scene and screen will auto rotate become landscape	Harith	Pass
2.	View in AR button	1.Touch on the Product button in the room category page 2.Touch on the View in AR button in the bottom page of Product description	Must in Scene Product Description	Change to AR View Scene and screen will auto rotate become landscape	Harith	Pass

Table 5.2.3: MAJUHOME AR Exit Function Integration Testing Plan

MAJUHOME AR Exit Function						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Exit Button	1. Open the app 2.Touch the Exit Button at bottom right side navigation bar.	None	Exit to phone home screen	Harith	Pass

Table 5.2.4: MAJUHOME AR Save Room Design Integration Testing Plan

MAJUHOME AR Save Room Design						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Back Button	Touch the Back Button at left side of screen	None	Change to Previous Page and the screen automatically become back portrait	Harith	Pass
2.	Reset Button	Touch the Reset Button at left side of screen	None	The AR scene will reset become empty	Harith	Pass
3.	Delete Button	1.Select the 3D model of furniture from menu selection. 2.Apply and place the 3D model at the scene 3.Select the 3D model. 4. Touch the Delete button at left side of screen	Must have 3D object inside the AR scene	The 3D object will be deleted	Harith	Pass

4.	Menu Selection Button	1.Touch the Menu Selection button that placed on the top right of screen. 2.Touch the arrow to drop down the furniture category selection 3.Select the 3D model furniture by touch on the image on the 3D model. 4.Touch on the APPLY button on the bottom left of screen 5.Touch on the plane detection to place the 3D model furniture	None	View the 3D model furniture selection and place the 3D model in the AR View Scene	Harith	Pass
5.	Gallery Button	Touch on the Gallery button at the right side of screen	None	View the images that capture before	Harith	Pass
6.	Capture picture Button	Touch on the camera icon at the right side of screen	None	The picture will save to gallery	Harith	Pass

7.	Undo Furniture Placer Button	1.Apply the 3D model on the AR View Scene 2.Select the 3D model by touch the interface of 3D model 3.Touch the button at the bottom center of screen	3D model in the AR scene	The furniture will disappear in AR View Scene	Harith	Pass
8.	Save image button in Gallery	1.Select the previous or next room design picture by touch the to navigate bottom that place left and right of screen that want to save in phone gallery 2.Touch on the save button at the bottom left of screen	Have at least one picture	The picture will save to phone gallery	Harith	Pass

9.	Delete button in Gallery	1. Select the previous or next room design picture by touch the to navigate bottom that place left and right of screen that want to delete 2.Touch the delete button at the bottom right of screen	Have at least one picture	The picture will be deleted from the app gallery	Harith	Pass
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Table 5.2.5: MAJUHOME AR Virtual Showroom Integration Testing Plan

MAJUHOME AR Virtual Showroom						
No	Test Case Name	Test Procedure	Pre-condition	Expected Result	Tester	Result (Pass/Failure)
1.	Virtual Showroom Navigation Button	1.Touch the icon virtual showroom at second button counts from left in navigation bar	Open MAJUHOME AR app	Change to Virtual Showroom Scene	Harith	Pass

6.0 MAJOR FINDINGS AND DISCUSSION

6.1 The Advantage(s) of the Project

The advantages of the project are as follows:

i. Visualize Furniture in Real Environment

Users may virtually place furniture products in their actual living spaces using AR technology, allowing them to visualise how the furniture will appear and fit in their homes before making a purchase. This tool removes guesswork and allows users to make more informed judgements.

ii. Time and Cost Savings

Users can save time by virtually trying on furnishings instead of visiting actual locations. This convenience is especially helpful for users who have limited time or reside a long distance away from furniture showrooms. Furthermore, it assists users in avoiding pricey furniture purchases that may not be suitable for their living space.

iii. Regular Security Checks and Updates

Our app is subjected to frequent security checks and code reviews in order to discover and fix any potential security risks. We provide regular updates to improve the app's security and assure its resilience to emerging attacks.

6.2 The disadvantage(s) of the Project

The disadvantages of the project are as follows:

i. **Device Compatibility**

AR apps may require specific hardware capabilities, such as advanced cameras and sensors, to function properly. Not all devices may support AR technology.

ii. **App Size**

AR apps have greater file sizes due to the inclusion of 3D models and components. This can take up a lot of storage space on users' devices, especially if they have a small storage capacity.

iii. **Potential Glitches**

AR technology is constantly improving, and certain AR home furnishings apps may encounter malfunctions, tracking issues, or object placement inconsistencies. These technical issues may have an impact on user satisfaction.

7.0 RECOMMENDATION AND CONCLUSION

In conclusion, the MAJUHOME AR FURNITURE PLACER APPS, which makes use of AR technology, provides a valuable solution for users to visualize furniture in their physical space. It is a cutting-edge tool for homeowners, interior designers, and anyone else interested in realistic and interactive room design. The app improves efficiency and enjoyment in the design process by allowing users to experiment with different styles. Furthermore, it benefits the client by increasing customer satisfaction, decreasing returns, and gaining a market competitive advantage. Overall, this app is a game changer in the field of room visualization and has the potential to change the way people approach interior design.

To ensure the success of the AR furniture placer app, optimizing app performance is one of the key recommendations. It is because to ensure smooth and immersive AR experiences for users. Furthermore, the key recommendation is increasing customization options. For example, provide customization options that allow users to personalize furniture items with different colors and materials. Lastly, use quality 3D models. Create and use high-quality 3D models and textures for furniture pieces to provide a realistic and immersive AR experience.

8.0 REFERENCES

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9.0 ENTREPRENEUR MIND SET

Our MAJUHOME AR furniture placer apps address a more immersive and convenient furniture shopping experience. With the development of technology, our living space become more compact, users seek ways to visualize how furniture fits into their homes before making purchase decisions. And for people now, time is money, so our app provides the AR furniture visualization to users use for visualizing the virtual 3D furniture models place at their living space. However, users can save their time and easily to know what type of furniture fit their living space although none of them have visited the physical store yet. Another from that, this application can also greatly reduce the rate of wrong purchases because they can try to place them in their own space first, and only go to the physical store to buy if they are suitable. Lastly, our app aims to bridge this gap by providing a virtual try-before-you-buy experience to users.