Furniture Management App with AR

Final Year Project

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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

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Designation: Associate Professor

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Project Report

Furniture Management App with AR

Change Record

Author(s)	Version	Date	Notes	Supervisor's Signature
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			<Changes Based on Feedback from Supervisor>	
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APPROVAL

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PROJECT SUPERVISOR

Comments: _____

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Name:_____

Date:_____ Signature:_____

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PROJECT MANAGER

Comments: _____

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Date:_____ Signature:_____

HEAD OF THE DEPARTMENT

Comments: _____

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Date:_____ Signature:_____

Dedication

This work is dedicated to my family, all my respected teachers, friends and everyone who showered me with their care, love and support. I am especially thankful to my father, mother and my mentor who gives me passion to achieve my dreams. I'm grateful to those who presented challenges to my work and I pray for them because without their resistance I would never have been able to achieve what I did.

Acknowledgements

I am really thankful to my supervisor Miss Sabah Arif who has guided us well throughout the semester. We consider our self very fortunate for being able to work with a very considerate and encouraging supervisor like her. Without her offering to accomplish this project, we would not able to finish our FYP on time. As well as the people, who helped us and coordinate our project especially in writing this report. I would also like to thank my friends and family that provided us with the opportunity and support for developing this project.

We also owe many thanks to our classmate and all of our teachers that always support us in our lives. They made our life at Superior University a truly memorable experience and their friendships are invaluable for us.

Executive Summary

rooOmywill be a Furniture management app with the functionality of AR to help our people to make sure what and which product will suit their home. This app will have 2 panels.

1- ADMIN
2- USER

Admin will manage all the furniture products. He'll Add, delete, update furniture. He'll manage all the orders keep check and balance of all the furniture products.

User will create an account, login into account search the furniture products. Add them into cart and then a camera window will pop up which will have a built in 3D models of furniture just like sofa, carpets, chairs, tables, lamps etc. End users will drag and set the models just to clear things up. This feature of AR will help our end users to make sure which product will suit in their room and then they will just confirm the order and move to the checkout page for shipping details.

This app will save much time of the clients. Similarly this Furniture management app will fascinate the furniture companies. Furniture companies will also take advantage of this era of technology.

NOTE: This will be the 1st AR based furniture app in Pakistan.

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Chapter 1

Introduction

Chapter 1: Introduction

Furniture designing & supply companies usually maintain display center or showroom for the display of their brands or furniture items. These companies provide different furniture items for houses, shops, schools, hotels, business and offices. Rapid progress in technology will change the scenario of online furniture shopping. With the rapid progress in VR & AR, Virtual Reality (VR) based systems can entirely transform the conventional product display mechanism at showrooms by providing products. This App will change the persona of Furniture shopping.
It will really help customers to buy furniture online along with using AR technology they can set furniture randomly with the help of 3d models to just get an idea of things.

1.1. Background

We all know that the world is moving so fast and there are incredible technologies that make our life easier as new technologies are introduced day by day. There are not as such furniture apps with AR functionality in Pakistan. We have to visit different shops to buy furniture products and as we all know due to covid 19 its very difficult to shop around so in this current situation this app will really help people to buy furniture products without wasting their time.

1.2. Motivations and Challenges

There are not as such furniture management apps with AR functionality for clients, as we know technology is making our life easy so this platform will help clients to buy furniture products easily by doing just few clicks and with the AR functionality they will get an idea with the help of built in 3D models like what and which product at which place will suit much.

1.3. Goals and Objectives

Our goal is to develop a furniture app for online furniture shopping with AR by providing several features like Search product, Add Product , Use AR functionality to make things clear or just get an idea how things works and looks in the room with the help of built in 3D models. The main objective is to provide digital platform for clients to buy furniture products with ease.

1.4. Literature Review/Existing Solutions

There are very few existing platforms that provide this AR functionality along with furniture management such as " FURNITURE DROP ". This existing app have good solutions only in US it provides facility to drag furniture products and place them wherever you want to. But also this solution have some limitations just like it supports limited devices and also this app is in testing phase and also have poor position detection.

Target Audience:
* Clients who really wants to buy furniture products without wasting a lot of time by visiting furniture showrooms etc.

1.5. Gap Analysis

There is no AR app with furniture management system here in Pakistan. Some existing apps don't provide proper functionality for furniture management. Some existing apps are made in UNITY so they are lacking in different panels of settings, user info updation, Shipping functionality, Checkout functionality etc. Our app will have all these functionalities.

1.6. Proposed Solution

Basically, it will be a complete furniture management app with 2 panels.

- User Panel
- Admin Panel

In Admin's panel admin will register himself and then with that specific credentials he will login to the app where he can Add || Delete || Update || furniture products along with managing all the orders. He can also check the remember me checkbox to enter again after dismissing the app from background.

In User's panel user will register themselves and after logging in they will see different furniture products. He can also check the remember me checkbox to enter again after dismissing the app from background. User can change their settings by updating their profile picture and also change their name or address etc. In the main dashboard, user can see different products added by the admin then after searching all the products user can add those products and after adding their will be a camera button for AR functionality and the camera window will open and some built in 3d models of furniture will come just to clear an idea of user like how and which

product will suit much. User will frag and drop those objects and it will really help them by doing this he'll come to know that which product should be at which place and it will really change the persona of online furniture shopping. After doing all this user can checkout and enter details for shipment.

1.7. Project Plan

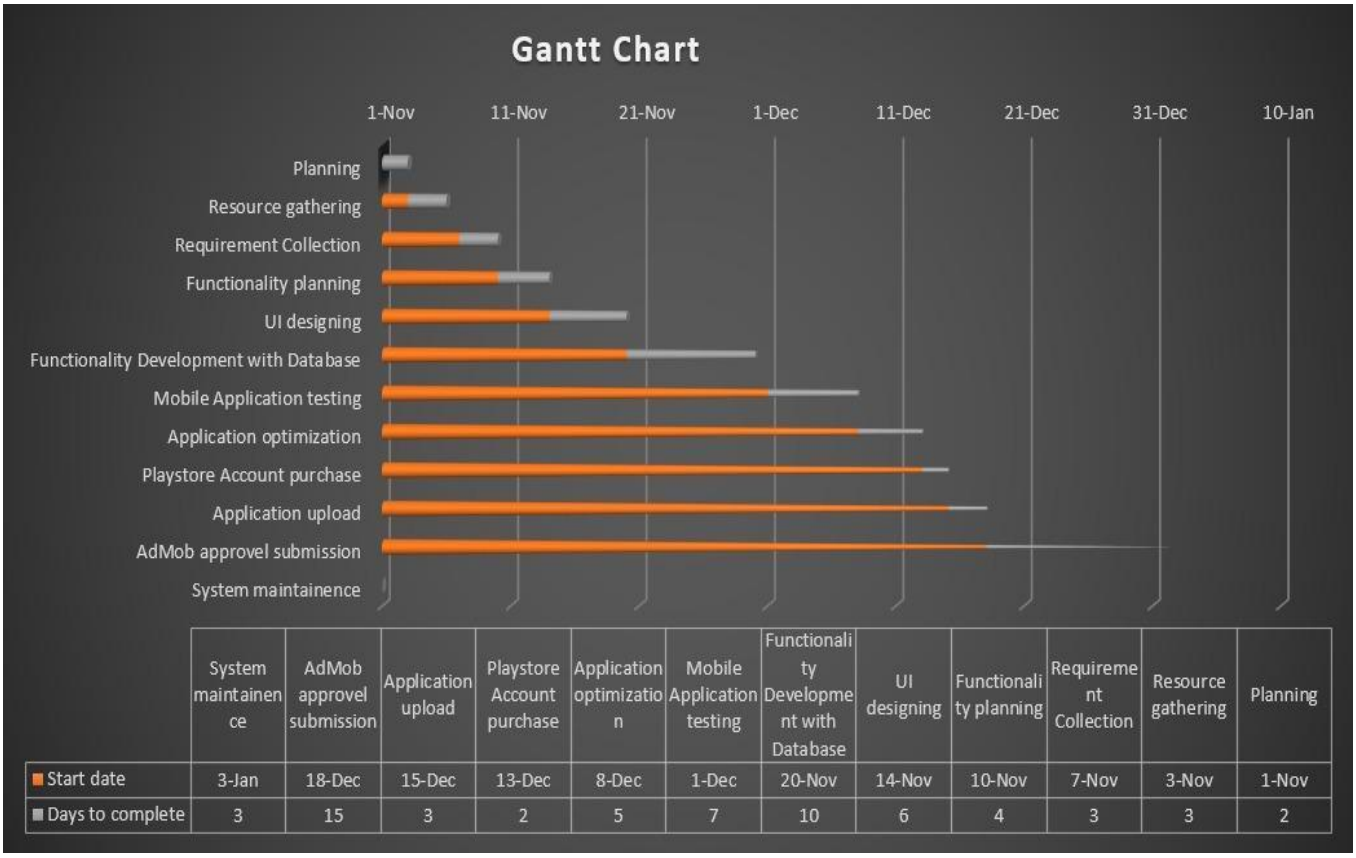
The plan that is going to adopted to develop the system is the waterfall model.Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

1.7.1. Work Breakdown Structure

Task	Start date	Days to complete	Roles and Responsibilities
Planning	1-Nov	2	Asad, Muaz and Hamza
Resource gathering	3-Nov	3	Hamza
Requirement Collection	7-Nov	3	Asad
Functionality planning	10-Nov	4	Muaz
UI designing	14-Nov	6	Muaz, Asad and Hamza
Functionality Development with Database	20-Nov	10	Asad, Muaz
Mobile Application testing	1-Dec	7	Hamza, Muaz
Application optimization	8-Dec	5	Asad
Playstore Account purchase	13-Dec	2	Hamza, Muaz and Asad
Application upload	15-Dec	3	Asad
AdMob approvel submission	18-Dec	15	Muaz
System maintainence	3-Jan	3	Muaz, Asad and Hamza

1.7.2. Roles & Responsibility Matrix

RESPONSIBILITY MATRIX (Furniture Management App with AR)			
Project Deliverables	**Muaz Butt**	**Mirza Asad Baig**	**Hamza Majeed**
Application Technicalities	**Responsible**	**Consulted**	**Informed**
Supervision	**Responsible**	**Responsible**	**Consulted**
Marketing	**Accountable**	**Informed**	**Responsible**
Finances	**Consulted**	**Accountable**	**Responsible**
UI/UX + Ads Placement	**Responsible**	**Consulted**	**Accountable**
Business Development	**Consulted**	**Responsible**	**Informed**



	System maintainence	AdMob approvel submission	Application upload	Playstore Account purchase	Application optimization	Mobile Application testing	Functionality Development with Database	UI designing	Functionality planning	Requirement Collection	Resource gathering	Planning
Start date	3-Jan	18-Dec	15-Dec	13-Dec	8-Dec	1-Dec	20-Nov	14-Nov	10-Nov	7-Nov	3-Nov	1-Nov
Days to complete	3	15	3	2	5	7	10	6	4	3	3	2

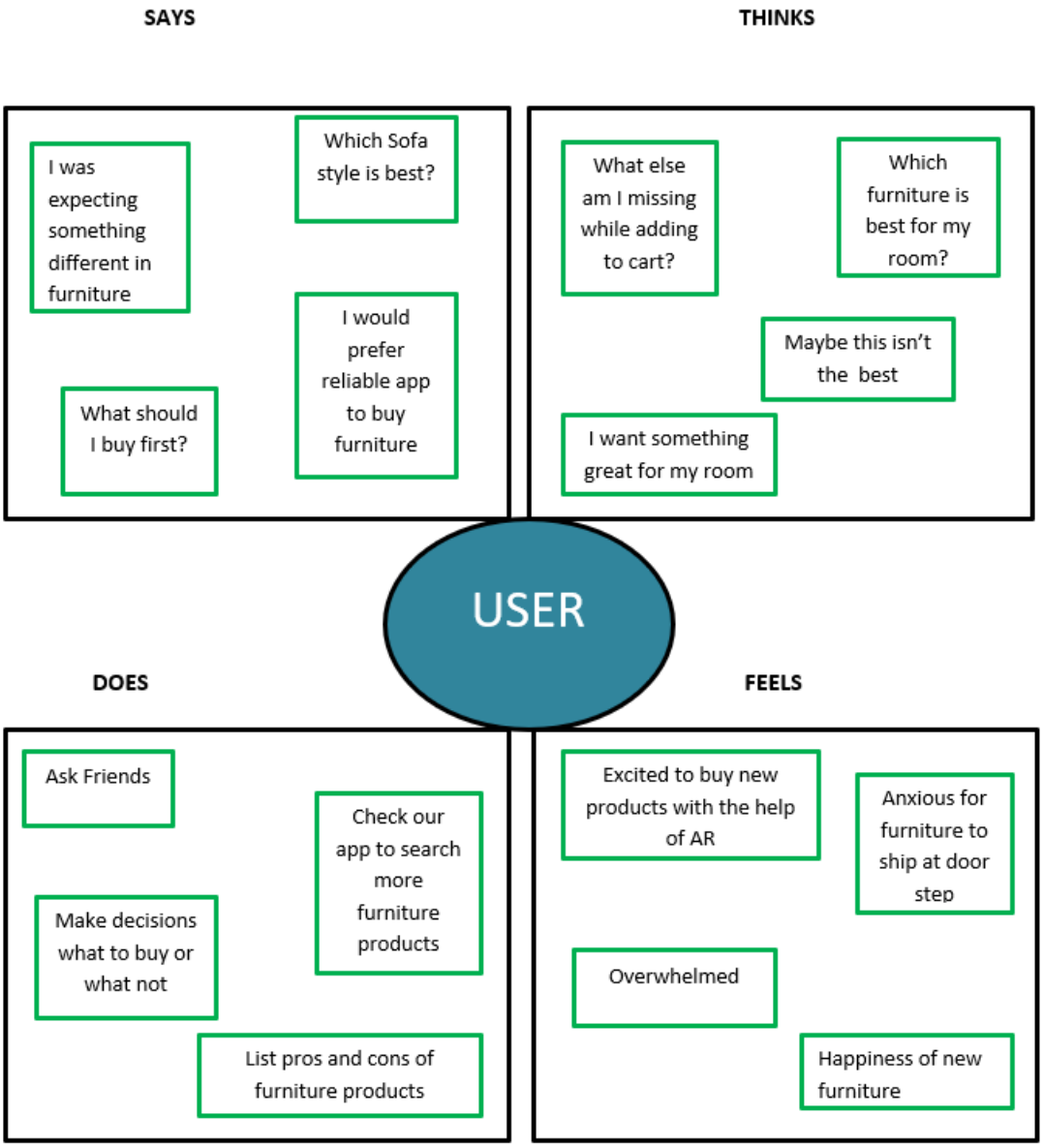
1.7.3. Gantt Chart

Task	Start date	Days to complete
Planning	1-Nov	2
Resource gathering	3-Nov	3
Requirement Collection	7-Nov	3
Functionality planning	10-Nov	4
UI designing	14-Nov	6
Functionality Development with Database	20-Nov	10
Mobile Application testing	1-Dec	7
Application optimization	8-Dec	5
Playstore Account purchase	13-Dec	2
Application upload	15-Dec	3
AdMob approvel submission	18-Dec	15
System maintainence	3-Jan	3

1.8. Report Outline

In this project we will be going to develop a furniture management app with the functionality of AR to given an idea of realistic shopping. Users can search different furniture products add those products into cart and with the help of AR functionality and built in 3d models of furniture they will get an idea of what and which products will suit their home. It will really change the persona of online shopping. It can save a lot of time of the users. This will also help the furniture companies to evolve them with technology.

1.9. Empathy Map



Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

1.1. Introduction

1.1.1. Purpose

The purpose of the Software Requirement Specification (SRS) document is to specify all the requirements for "Furniture Management App with AR". It will also describes each of the essential requirement including (Functional, Non Functional, Performance, Design Constraints, and External requirements) of this system. This document will provide the basis for evaluating the system as it fulfilled the specified requirements or not. This app will give the opportunity to buy furniture products through app and also drag and drop 3d models to get an idea of furniture placement and excitement of realistic shopping. The app will interact with user and help user to buy products, use AR to get an idea, update settings, and much more. On the other hand Admin can Add || View || Delete || Update || Manage products and orders.

1.1.2. Document Conventions

This document features some terminology which readers may be unfamiliar with. This document follows MLA Format. Bold-faced text has been used to emphasize section and Sub-section headings. Highlighting is to point out words in the glossary and italicized text is Used to label and recognize diagrams.

1.1.3. Intended Audience and Reading Suggestions

This document is intended for anyone who wants to know about the project, its purpose, its development & operating method or who want to relate and develop similar projects. It is intended for all the stakeholders that has direct or indirect relation with this project. Following are some examples of how different readers can use this document.

#	Reader / Audience	Document Usage
1	User	User of project can read this document to get overall concept of this project
		They can understand its purpose and problem that it solves
		Users can read this document in order to learn how to use this document
2	Project Manager	Project manager can use this document as a reference to verify development process
		Project manager can use this document to assess the responsible person and properly manage development process
3	Developer	Developers can use this document to understand the flow of data and relations between components
		They can use this to develop system properly
4	Testers	Testers can use this document as a reference to develop test plan
		They can use this to understand flow of data and conventions.
		They can use this document in order to determine the test data
5	Business / Marketing personal	They can use this document to estimate market potential
		They can use this document in order to understand project's working, the problem it solves, the opportunity and technology it provides.
6	Investors	They can use this document to understand the project
		Investors can read this document in order to get the idea of market potential and success percentage.
7	Document writers	Document writes can use this document as a reference to develop similar documentation.
		They can use this document to compare different projects.
8	Other readers	Anyone can read this document to get an idea about project. What is this all about, how project works, how to use it and what features it provides.

1.1.4. Product Scope

"rooOmy" is the first ever Pakistan's AR based furniture shopping app that provides a real time idea which buying furniture products by sitting at home and can save their time with the help of 3d models to get an idea of furniture before buying it. This app will have different modules.

ADMIN PANEL:

- Admin can register with their unique phone number and with that unique phone number they can login in to their account.
- Admin will have a panel which will show different categories.
- Admin can select any category and after that a new window will open where they can tap on an image and from gallery they can upload a new pic of furniture and with that they can add information of that specific product.
- Admin can Add, Delete, update products and will manage all the orders and will keep an eye on all the orders in this app.

USER PANEL:

- User can register with their unique phone number and with that specific number and password they can login to that account.
- User can also check the remember me checkbox for future sign in.
- User panel will have a search bar and a number of products where they can see all the furniture products added by the Admin.
- User can add furniture products and after that a new window will pop up which will be an AR window with couple of built in beautiful 3D furniture models which will give a real time shopping idea for users to make sure which products should be a t which place. This unique functionality will really help and change the persona of online shopping.

- After this unique functionality user can add products into cart and they will redirect to the checkout window for payment.

1.1.5. References

This SRS archives utilizes the accompanying references.

- See the task extension record for detail data with respect to the undertaking degree.
- A use case chart and completely dressed use case are available in the part 3 to go with segment: 2.2 Overall product description and segment: 2.3 Product Feature.
- To comprehend about the framework and its concern section no. 1 is included this report.

1.2. Overall Description

1.2.1. Product Perspective

This section will provide the background information about the specific requirements of "Furniture Management App with AR" system development environment and services required to develop the system in detail. This section will also give the information about the factors which affect our system performance and efficiency.

rooOmy*will be a Furniture management app with the functionality of AR to help our users to make sure what and which product will suit their home. This app will have 2 panels.*

1- *ADMIN*
2- *USER*

Admin will manage all the furniture products. He'll Add, delete, update furniture. He'll manage all the orders keep check and balance of all the furniture products.

User will create an account, login into account search the furniture products. Add them into cart and then a camera window will pop up which will have a built in 3D models of furniture just like sofa, carpets, chairs, tables, lamps etc. This feature of AR will help our end users to make sure which product will suit in their room and then they will just confirm the order and move to the checkout page for shipping details.

1.2.2. Product Functions

Following are some of the main function that the website must perform.

- Furniture Management App with AR
  - App operations

Clients

- Signup
- Login
- Remember me option for future use of app
- Update profile pics and information
- Search Products // Buy Products
- AR option with built in 3d models to give an idea to users
- Logout

Admin

- Register
- Login
- Remember me option
- Select different categories and add different products
- Update products // Delete products
- Manage orders
- View current orders
- Logout

Following are some of the main functions that website platform must perform.

Security related

- If user with 1 phone number is registered then the other user with the same number can't even register for app.

1.2.3. User Classes and Characteristics

This document will discuss about the various user classes that you anticipate will use this product.

2.2.3.1 App // End User:

App user is the person who uses our app by registering into the app with his/ her number. After logging into the app they can buy furniture products and can also use the AR facility to just get an idea of furniture placement. A user who can understand English can use it properly. Users don't need to have high level of knowledge and technical expertise. But should have an understanding about the user interface and the different techniques which are used to show the information.

2.2.3.2 Admin

Admin is the person who is responsible for the management of system's user. Admin can also use the system in order to get detail and check system by performing user's activities to manage the system. The person should have a high level of knowledge and technical expertise. Admin user manages all user information, products information including user's accounts detail, Order details and other activities detail. Admin user also manages the products add them update them delete them in database.

1.2.4. Operating Environment

This document will describe the environment in which the software will operate, including the hardware platform, operating system. The system will operate with the following hardware and software components.

The operating environment for "Furniture Management App with AR" is following.

- Internet connection
- Android device

The Hardware components for mobile application "Online Veterinary Appointment" are

- **Smart Phone:**
  - A smart phone with min android API level 19 to run the user application
- **Processor:**

- Core 2 or more

❖ **Memory:**

- 1GB RAM or more

❖ **Storage:**

- 100MB storage or more

❖ **Software:**

- Operating system: Android
- Database: Firebase database (Real time cloud storage database)
- Lottie Animations
- Poly files for 3d models
- Some plugins in android studio (SCENEFORM || WAVEFRONT)

1.2.5. Design and Implementation Constraints

Following are the design and implementation constraints of our system.

Design Constraints

- User interference design must be simple and attractive
- System design must be optimized and efficient
- App user interface design should be easy to learn
- App user interface design should be easy to use
- App user interface design should be easy to remember how to use
- All information should be distributed properly
- System design should be consistent
- System user interface design should be user friendly

Implementation Constraints

- Coding standards must be followed
- Code must be clean and readable
- Use comments for better understandings

Product must me developed within time and budget

1.2.6. User Documentation

We will provide the user documentation or user manual separately for app "Furniture Management App with AR" in the form of guide. All the user documents and main points will be discussed in the guide and it will really help the end user like how to use our app.

1.2.7. Assumptions and Dependencies

Following are the assumptions and dependencies that will be considered in order to use system.

- User knows how to use a mobile device
- User knows how to use internet
- Use can understand English language to understand guide
- User knows how to connect to internet

1.3. External Interface Requirements

1.3.1. User Interfaces

The User interface of this system is fully responsive, user friendly, adaptive, modern and compatible with any type of device that can connect with the internet explorer. Mobile browsers with above with android OS 6 and above. Here are the some screenshots of the UI for better understanding.

1.3.2. Hardware Interfaces

The Hardware interface for app "Furniture Management App with AR" includes.

- Processor:

- ***Qualcomm Snapdragon*** *855+*

❖ Ram:

- 6GB RAM to 8GB RAM

❖ Memory:

- 64GB or more

❖ Camera:

- 8000 x 6000 pixels, 60fps

1.3.3. Software Interfaces

The Software interface for app “Furniture Management App with AR” includes

 Software:

- Operating System: Android
- Android Studio
- Firebase Database (Cloud Real-time Database)
- Lottie Animations
- Poly 3D models
- Wave front for (3D models in android)

1.3.4. Communications Interfaces

The communication between different components of our system is most important because they depend on each other. The method in which the communication takes place is important.

1.4. System Features

Following are the main feature of our system with complete explanation of each functionality. This section is organized according to the use cases.

1.4.1. User Registration

1.4.1.1. Description and Priority

App will provide secure and efficient registration facility. User will enter related detail into interactive fields and submit it in order to sign into the app. According to app, the priority of this feature is **high** as it is used for entering into the app by registration.

1.4.1.2. Registration Stimulus/Response Sequences

User Actions	System Responses
User will Enter Required detail in the particular input fields, and tap on register account button.	App will get data from registration fields App will validate entered data according to number saved in database while logging in.
	If entered data is not valid, app will display error message
	If entered data is valid, app will redirect to he login panel and there you can enter your credentials and login in to the app
	If entered data does not exist, app will show a toast message i.e. number not exist in database
	After all the registration and login process user can see all the furniture products.

1.4.1.3. Functional Requirements

2. REQ-SF1-1: User can click signup button.
3. REQ-SF1-2: App displays signup page.
4. REQ-SF1-3: User can enter text in input fields.
5. REQ-SF1-4: User name field only accept alphabets.
6. REQ-SF1-5: User phone number field only accept numeric text.

7. REQ-SF1-6: User password field only accept alphanumeric text.
8. REQ-SF1-7: User password field hide actual text with dots.
9. REQ-SF1-8: App must validate all data entered by user.
10. REQ-SF1-9: App must verify the existence of phone number entered by user.
11. REQ-SF1-10: App will display an error message if phone number entered by user already exists.
12. REQ-SF1-11: App will save details and login user if phone number entered by user does not already exist

2.4.2 Login

2.4.2.1 Description and Priority

App will provide facility to login the app. User can login app by providing phone number and password and click login button. According to system, the priority of this feature is **high** because it's the way users can enter into system and access their accounts.

2.4.2.2 Login Stimulus/Response Sequences

User Actions	System Responses
User will Enter phone number and password in respective input fields and click login button.	App will get phone from phone input field of login form.
	App will get password from password input field of login form.
	App will validate entered data according to defied set of rules.
	If entered data is not valid, app will display error message on the particular field with invalid input.
	If entered data is valid, System will verify phone number and password entered by user.

	If entered phone number and password matches with the record, Then system will display user's profile.
	If entered email and password does not match, system will display an error message saying "Invalid Email or Password".

2.4.2.3 Functional Requirements

3 REQ-SF2-1: User can center text in input fields.

4 REQ-SF2-2: User phone field only accept numeric format.

5 REQ-SF2-3: User password field only accept alphanumeric text.

6 REQ-SF2-4: User password field hide actual text with dots.

7 REQ-SF2-5: User can click login/sign in button.

8 REQ-SF2-6: App must validate all data entered by user.

9 REQ-SF2-7: App must verify and match the phone number entered by user.

10 REQ-SF2-8: App must verify and match the Password entered by user.

11 REQ-SF2-9: App load user's profile if phone number and password entered by user matches with the database.

12 REQ-SF2-10: App will display an appropriate message if email and password entered by user does not match.

2.4.3 Settings

2.4.3.1 Description and Priority

App will provide settings facility. User can change their settings from system by clicking settings from navigation. User can change all the settings also profile picture. According to system, the priority of this feature is **high** because users can update settings according to their need and timeline.

2.4.3.2 Settings Stimulus/Response Sequences

User Actions	System Responses
User clicks on "Settings" button from menu	App will show fields to update all the information
	App will update the settings and also in the database.

2.4.3.3 Functional Requirements

REQ-SF9-1: User can click settings from menu.

REQ-SF9-2: App will show input fields.

REQ-SF9-3: App will update the settings of user.

2.4.4 Products

2.4.4.1 Description and Priority

App will provide products search and buying facilities. User can search different products from the name of the product and can add different products in the cart. According to system, the priority of this feature is **high** because users can search or add different furniture products.

2.4.4.2 Products Stimulus/Response Sequences

User Actions	System Responses
User can add products from main window	App will show different products added by the admin.
	App will add all the products into cart added by the user and after that it will show the bill.

2.4.4.3 Functional Requirements

REQ-SF9-1: User can add products.

REQ-SF9-2: User can search products.

REQ-SF9-3: User can delete or update products from cart.

REQ-SF9-4: App will show different products.

REQ-SF9-5: App will add all the products added by the user in the cart.

REQ-SF9-6: App will show a camera window for 3d models idea.

REQ-SF9-7: App will take user to the checkout window and then shipping details.

2.4.5 Admin Registration

2.4.5.1 Description and Priority

App will provide secure and efficient registration facility. Admin will enter related detail into interactive fields and submit it in order to sign into the app. According to app, the priority of this feature is **high** as it is used for entering into the app by registration.

2.4.5.2 Registration Stimulus/Response Sequences

Admin Actions	System Responses
User will Enter Required detail in the particular input fields, and tap on register account button.	App will get data from registration fields

	App will validate entered data according to number saved in database while logging in.
	If entered data is not valid, app will display error message
	If entered data is valid, app will redirect to the login panel and there you can enter your credentials and login in to the app
	If entered data does not exist, app will show a toast message i.e. number not exist in database
	After all the registration and login process admin can see all the furniture categories

2.4.5.3 Functional Requirements

REQ-SF1-1: Admin can click signup button.

REQ-SF1-2: App displays signup page.

REQ-SF1-3: Admin can enter text in input fields.

REQ-SF1-4: Admin name field only accept alphabets.

REQ-SF1-5: Admin phone number field only accept numeric text.

REQ-SF1-6: Admin password field only accept alphanumeric text.

REQ-SF1-7: Admin password field hide actual text with dots.

REQ-SF1-8: App must validate all data entered by admin.

REQ-SF1-9: App must verify the existence of phone number entered by admin.

REQ-SF1-10: App will display an error message if phone number entered by admin already exists.

REQ-SF1-11: App will save details and login admin if phone number entered by admin does not already exist

2.4.6 Login

2.4.6.1 Description and Priority

App will provide facility to login the app. Admin can login app by providing phone number and password and click login button. According to system, the priority of this feature is **high** because it's the way users can enter into system and access their accounts.

2.4.6.2 Login Stimulus/Response Sequences

Admin Actions	System Responses
Admin will Enter phone number and password in respective input fields and click login button.	App will get phone from phone input field of login form.
	App will get password from password input field of login form.
	App will validate entered data according to defied set of rules.
	If entered data is not valid, app will display error message on the particular field with invalid input.
	If entered data is valid, System will verify phone number and password entered by admin.
	If entered phone number and password matches with the record, Then system will display admin's profile.
	If entered email and password does not match, system will display an error message saying "Invalid Email or Password".

2.4.6.3Functional Requirements

REQ-SF2-1: Admin can center text in input fields.

REQ-SF2-2: Admin phone field only accept numeric format.

REQ-SF2-3: Admin password field only accept alphanumeric text.

REQ-SF2-4: Admin password field hide actual text with dots.

REQ-SF2-5: Admin can click login/sign in button.

REQ-SF2-6: App must validate all data entered by admin.

REQ-SF2-7: App must verify and match the phone number entered by admin.

REQ-SF2-8: App must verify and match the Password entered by admin.

REQ-SF2-9: App load admin's profile if phone number and password entered by admin matches with the database.

REQ-SF2-10: App will display an appropriate message if email and password entered by admin does not match.

2.4.7 Products

2.4.7.1 Description and Priority

App will provide facility to admin to add different furniture products respective to their categories. Admin can select a product category and add a picture by the gallery along with some information. Admin can also manage all the products, delete the, update them, manage orders etc. According to system, the priority of this feature is **high** because users can update settings according to their need and timeline.

2.4.7.2 Settings Stimulus/Response Sequences

Admin Actions	**System Responses**
Admin clicks on different categories and add different products along with some information. Admin will also delete update or manage all the products.	App will different categories where admin can go and add products
	App will update that specific product in the database.
	App will show that specific product to user as

	well.
	App will delete all the products from database also which admin will delete also update all the products which admin will update.

2.4.7.3 Functional Requirements

REQ-SF9-1: Admin can select different categories.

REQ-SF9-2: Admin can add different products.

REQ-SF9-3: Admin can manage different products.

REQ-SF9-3: Admin can update products.

REQ-SF9-3: Admin can delete different products.

REQ-SF9-3: App will add all the products in the database

REQ-SF9-3: App will delete all the products when admin will delete them.

REQ-SF9-3: App will update all the products when admin will update them.

2.4.8 Orders

2.4.8.1 Description and Priority

App will provide manage order facility to admin. Admin can check the status of current orders and after completion of order admin can approve them etc. According to system, the priority of this feature is **high** because admin can manage orders and without this user can't purchase anything.

2.4.8.2 Products Stimulus/Response Sequences

Admin Actions	**System Responses**
Admin can manage orders and check the status which order is pending or cleared.	App will show different orders to admin and admin will manage them.
	After approval of orders and completion app will allow users to buy more products etc

2.4.8.3 Functional Requirements

REQ-SF9-1: Admin will manage all the orders

REQ-SF9-2: Admin will check the status of the orders

REQ-SF9-3: App will show different orders to admin

REQ-SF9-4: App will allow users to buy more products when their old order will be completed.

2.5 Other Nonfunctional Requirements

2.5.7 Performance Requirements

The app should display confirmation message to users within 4 milliseconds after the user submits information to the system. If user registers then app should display an instant message same is the case while logging in or adding deleting or updating any product

The system should generate policy with an accuracy of 99%.

2.5.8 Safety Requirements

Following are the safety requirement for this system.

- User details has to be maintained properly.
- Users will be authenticated.
- User will be verified.
- The database backup will be kept.
- Safety disclaimers will be given for both user and employees.

In case of any problem using system, users can communicate with the help and support team.

2.5.9 Security Requirements

Following are the safety requirement for this system.

- User's data will be secure at system and communication level.

- After entering the password and email, users can access their profile.
- The details of users will be safe and secure.
- There will be protection against hacker's attack.
- Sharing of details will be secure.
- Password will be hashed and salted.
- User's private detail will be kept private.
- System's internal detail will be kept private.
- User will be registered after verification of user data.
- Secure login and logout facility will be provided.

2.5.10Software Quality Attributes

Following are the software quality attributes of the system under consideration.

Usability:

- App will be easy to use.
- App will be easy to learn how to use.
- App will be user friendly.
- App will be consistent.
- App design will be clear.

Correctness:

- App provide autocomplete search secessions.
- App will display accurate/appropriate/relative notifications.
- App will display accurate/appropriate/relative user's detail.

Portability:

- App will be used on different android devices.
- App's design will be made responsive.

Reliability:

- App could handle up to 100 concurrent online users.

Availability:

- App will be available 24/7.

Accessibility:

- Accessibility should be limited to Authorized/Registered users and Admins, no other person should be able to access the app's data.

Flexibility:

- App will have the ability to scale to meet increased demand without downtime.

Interpretability:

- Support android operating system.

Testability:

- Test environment to mirror production.

Robustness:

App will handle crash situations.

2.5.11Business Rules

Following are the business rules for this system

- User will sign up and login in order to use app.
- User has to follow terms and conditions of app.
- User will accept the terms and conditions of app.
- User will read and accept app policy.
- Suitable notifications will be sent to customer for all scheduled maintenance and modification related to data.
- System delivers customer support with inclusive training.

System will kept detailed software and database manuals, including interface guides and database schemas.

2.6 Other Requirements

- If unable to process the request then appropriate error message will be displayed.
- A good camera and Internet connection is must because it will help to get built in 3d models

Chapter 3

Use Case Analysis

Chapter 3: System Analysis

This chapter describes the framework use cases and how the different actors are interacting with the system. In the use case diagram, main functionalities of the system are defined that are divided in different modules e.g. major use case in which all functionalities of the system are defined is divide into User activities like Register, Login, Add product, update settings, Use AR camera, Checkout. Each actor interacting with module and performing his module functionalities.

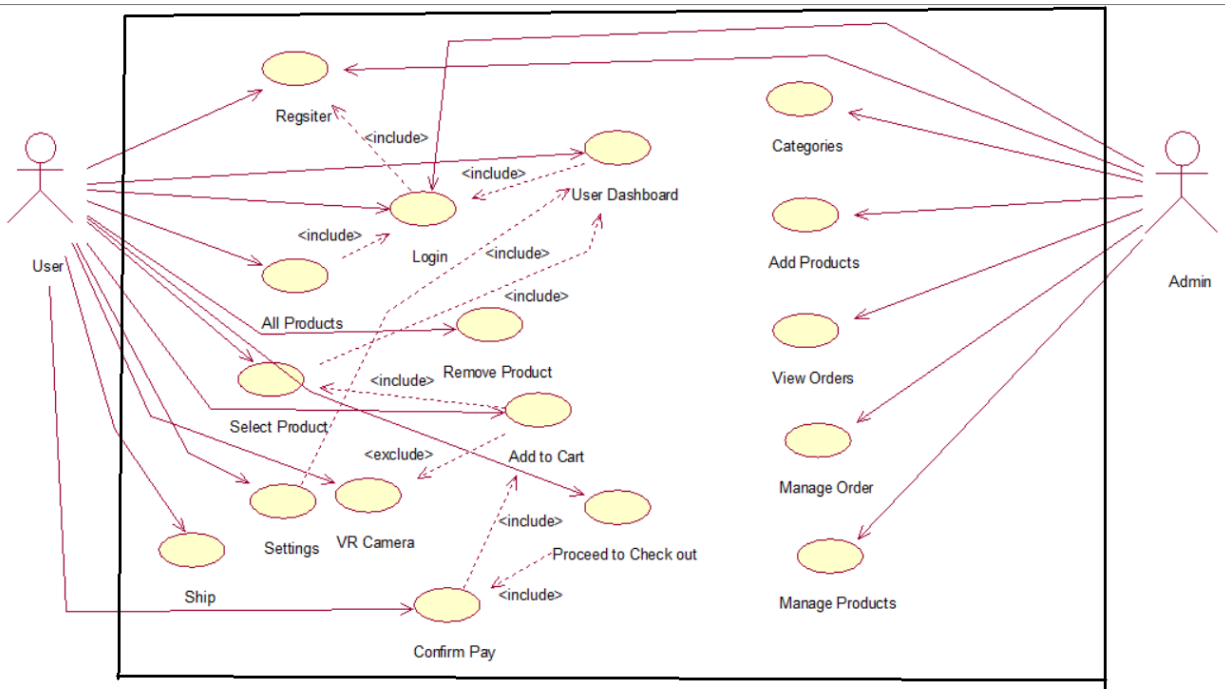
In this chapter the use-case diagram and fully dress use-cases of system under consideration are clearly describe. The main actors and use-cases are defined in this chapter. Our system contains have 2 main actors, the primary actor is “User” and secondary actor is “Admin”.

3.1. Use Case Model

Our system consist of online veterinary appointment web portal

Following are some of the major function of our system.

- Register
- Login
- Categories
- Add Products
- View Products
- Remove products
- Manage orders
- Settings
- AR Camera
- Confirm payment
- Shipment



3.2. Use Case Description

Use Case Name	Register
Level	User/Admin
Scope	Furniture Management App with AR
Primary Actor	User/Admin
Stakeholders & Interest	**User:** He wants to make an account to buy furniture products with the help of AR.

	Admin: He will manage products and manage orders.
Pre-condition	User must a valid phone number and password
Post Condition	User registered account is created. User can login to his account. User can view his profile with all furniture products.
Main success scenario	User/Admin He requests to local the sign-up panel He enters the information. Click the "Register account"
Extension	Registration Failed: System displays message "Registration is failed" Provide details are not valid: System details that are invalid. User will correct the invalid. User will try to register again
Special Requirements	User friendly interface. Response time is less than 4s or less.
Technology & Data variation list	Use Android Studio and cloud base database.

Use Case Name	**Login**	
Scope	Furniture Management App with AR	
Level	User/Admin	
Primary Actor	User/Admin	
Stakeholders & Interest	**User:** He wants to login to his account. So that he can buy furniture products. **Admin:** He will login and will add products, manage products and manage orders.	
Pre-condition	User must register User must have a valid phone and password User must have clicks on "Login" button.	
Post Condition	User can view different products and can tweak some settings of his profile and add products into cart	

Main Success Scenario	User/Admin He Request to Login Enter Phone & Password. **Click Login** User login Successfully	System login page will open Validate & open the account. User profile is locked
Extension	The System will display an error message if user is failed to login. Provide details are not valid.	
Special Requirements	User Friendly interface. Response time less than 4s or less.	
Technology & Data variation list	Use new app development technologies and frame work for the development.	

Use Case Name	**Products**	
Level	User/Admin	
Scope	Furniture Management App with AR	
Primary Actor	User/Admin	
Stakeholders & Interest	User: After login in his database He can add products into card, He can update or delete the products from the cart as well. Admin: After login he can choose categories and he can add furniture products also he can manage products.	
Pre-condition	User and admin must have a valid phone number and password.	
Post-condition	User and admin can add products and manage them respectively.	
Main success scenario	User/Admin They will request to add new products into cart, remove or update product to cart.	System will respond to their request to click product or manage product

Extension	System will show an error if the added product will not have proper instructions from the admin side	
Special Requirement	User friendly interface Response time is less than 4s or less.	
Technology & Data variation list	Use new android technologies and framework.	

Use Case Name	**Orders**	
Level	Admin	
Scope	Furniture management app with AR	
Primary Actor	Admin	
Stakeholders & Interest	Admin will see now orders and he will manage all orders and without his approval specific user can't add more products or order another product.	
Pre-condition	User must confirm orders so admin can see new orders.	
Post-condition	Admin will manage new orders	
Main success scenario	Admin He will manage orders	System will respond on his request
Extension	If user will not buy any furniture then admin will not have any order to manage and show message "No order to show"	
Special Requirement	User friendly interface Response time is less than 4s or less	
Technology & Data variation list	Use android development technologies & framework.	

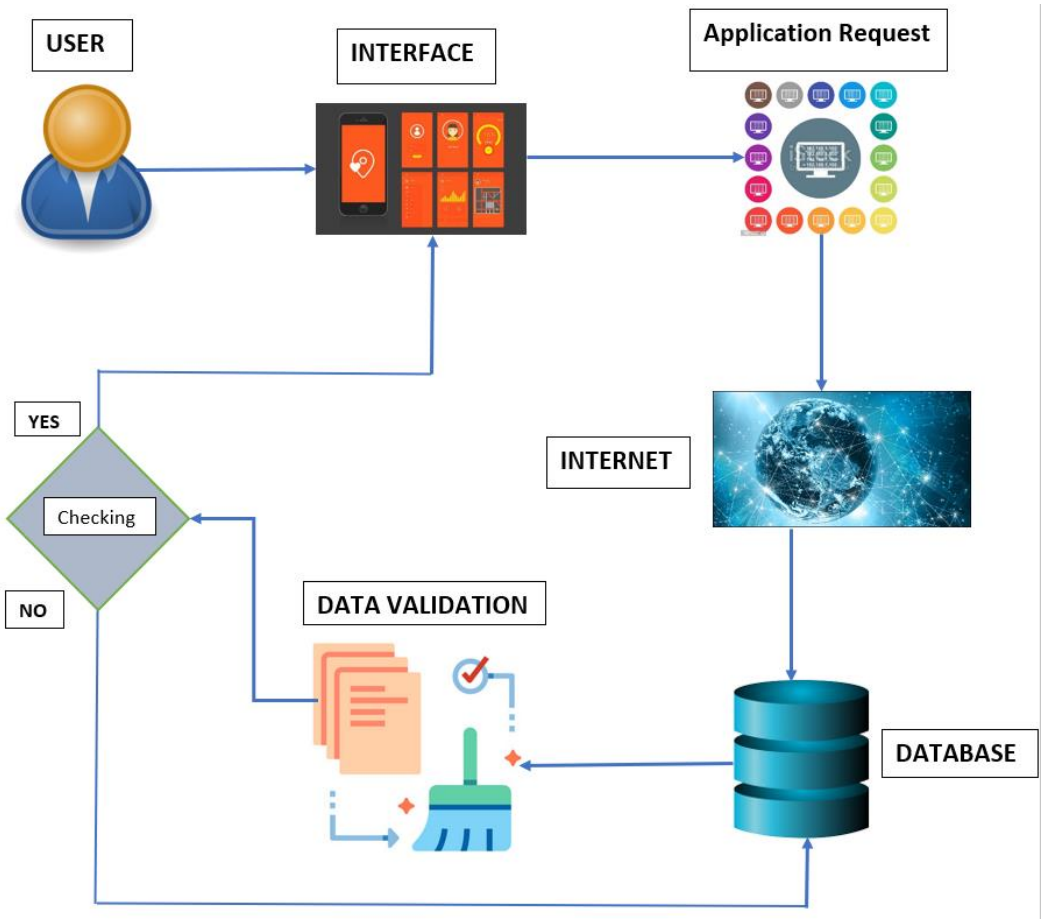
Chapter 4

System Design

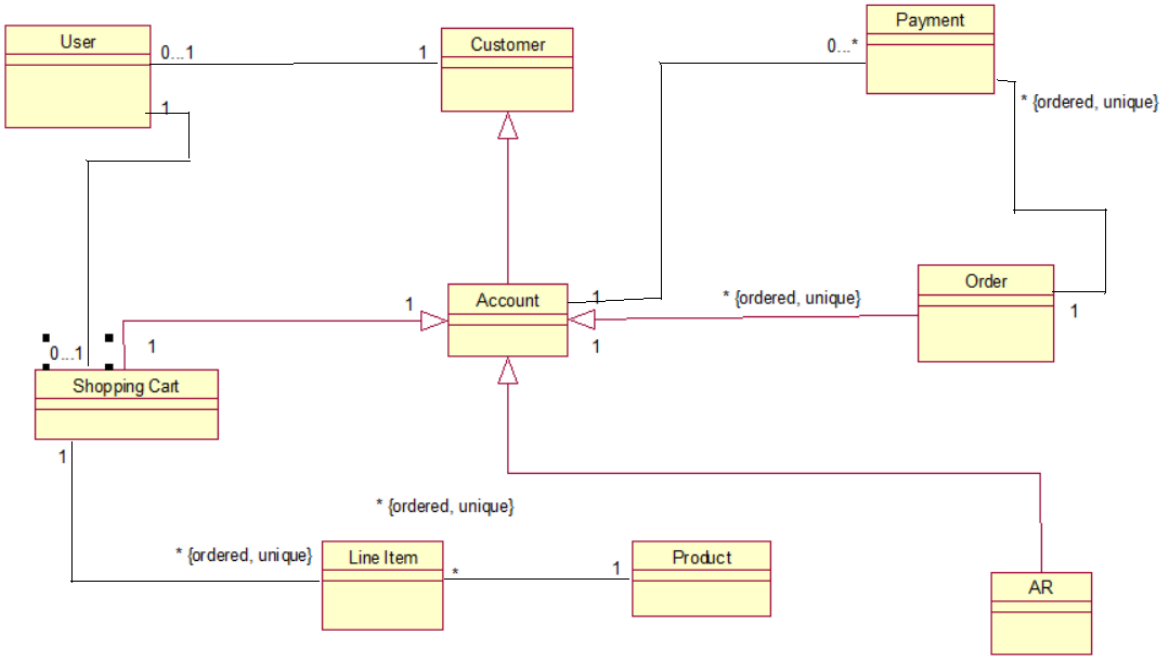
Chapter 4: System Design

In system design the whole design of system is described. System design contains architecture design of our system, UML design of our system, Domain model, class diagram, entity relationship diagram with data dictionary, Sequence diagram, Activity diagram, State transition diagram, component diagram and deployment diagram of our system.

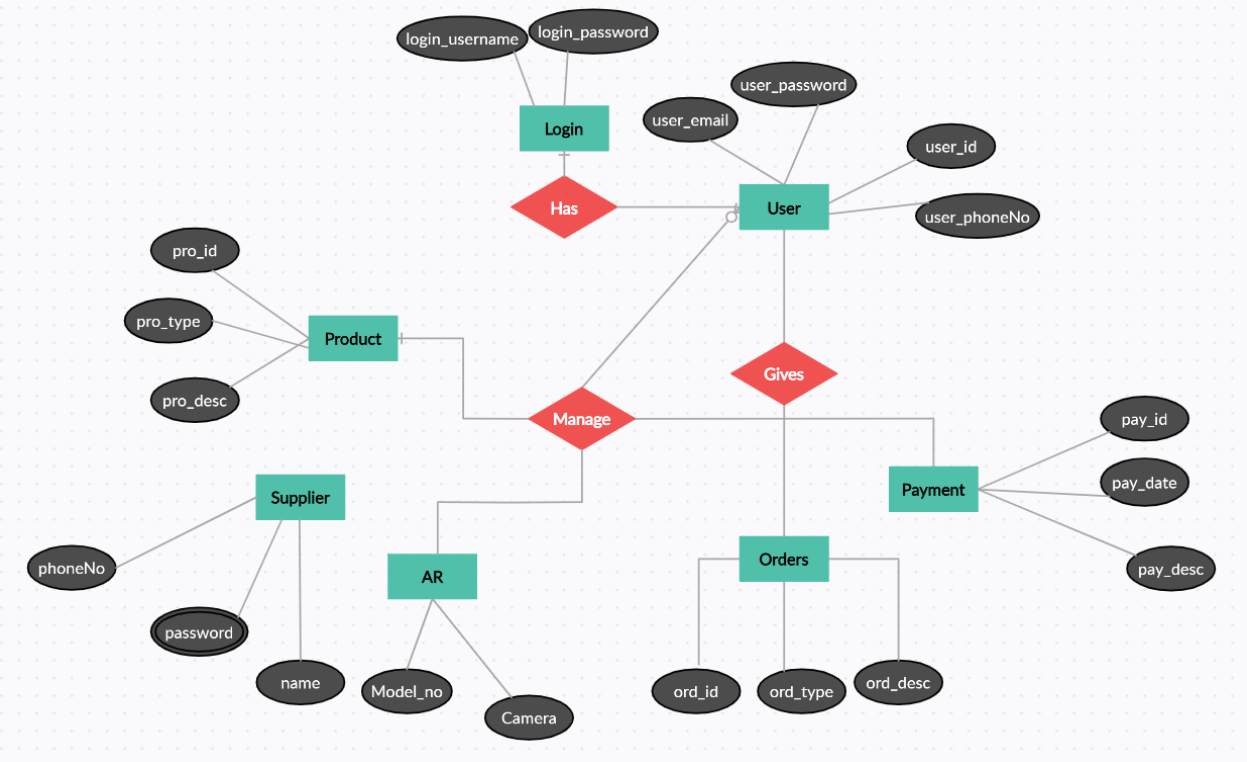
4.1. Architecture Diagram



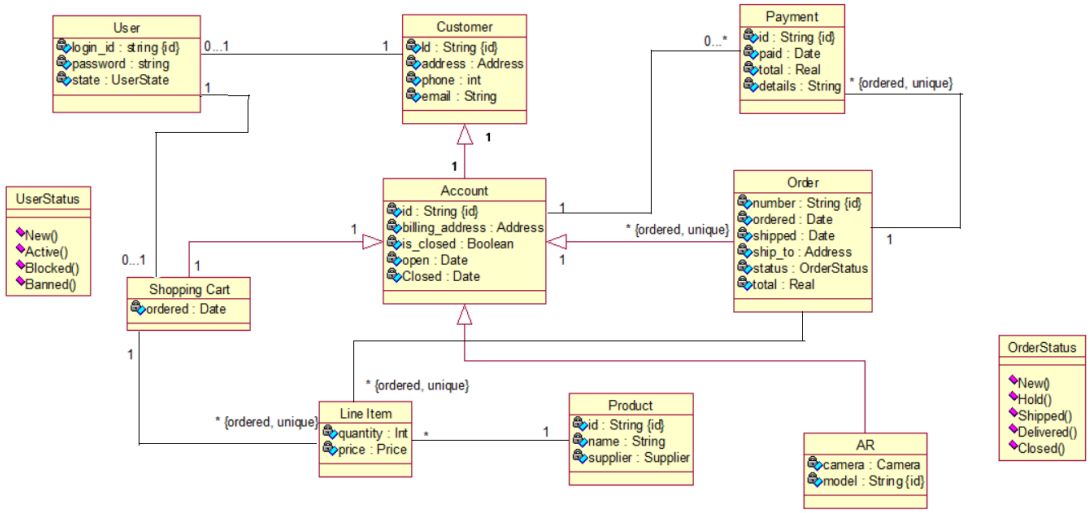
4.2. Domain Model



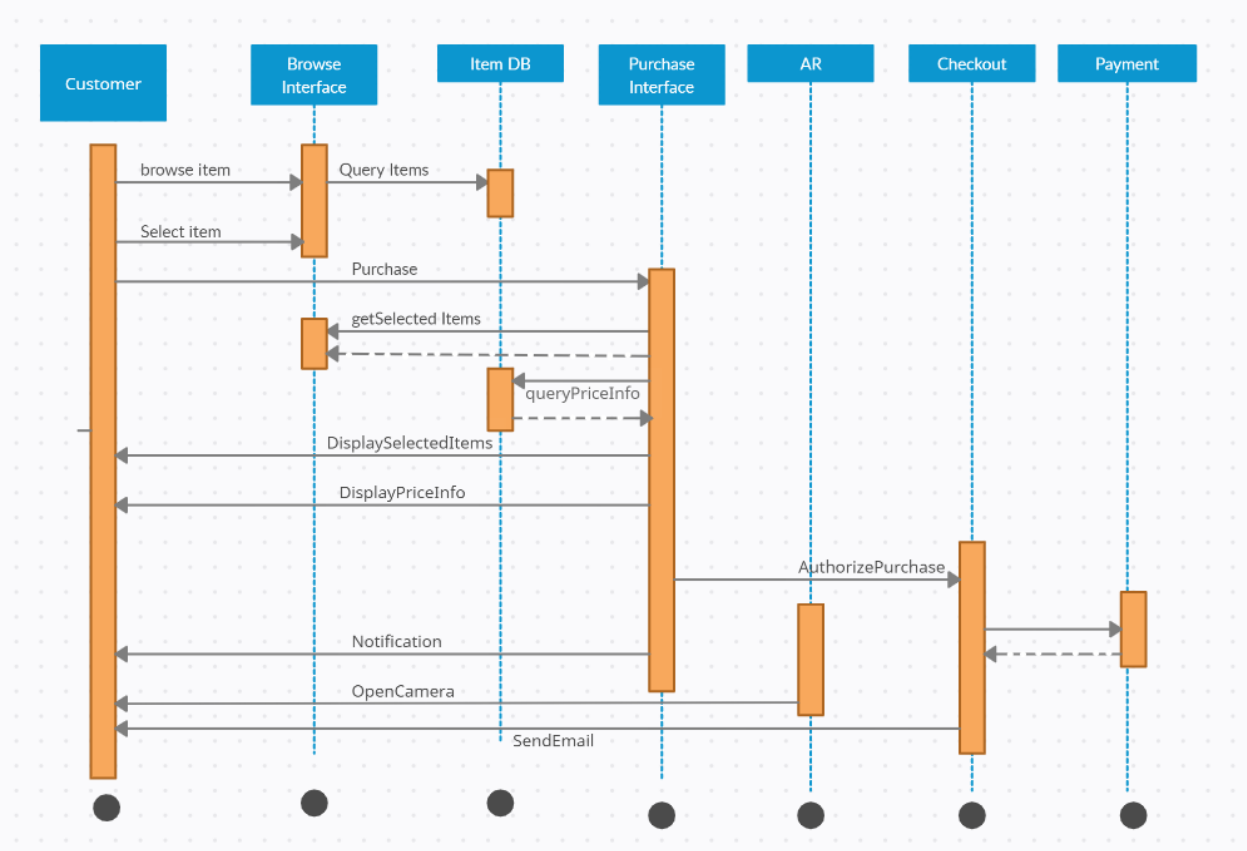
4.3. Entity Relationship Diagram with data dictionary



4.4. Class Diagram



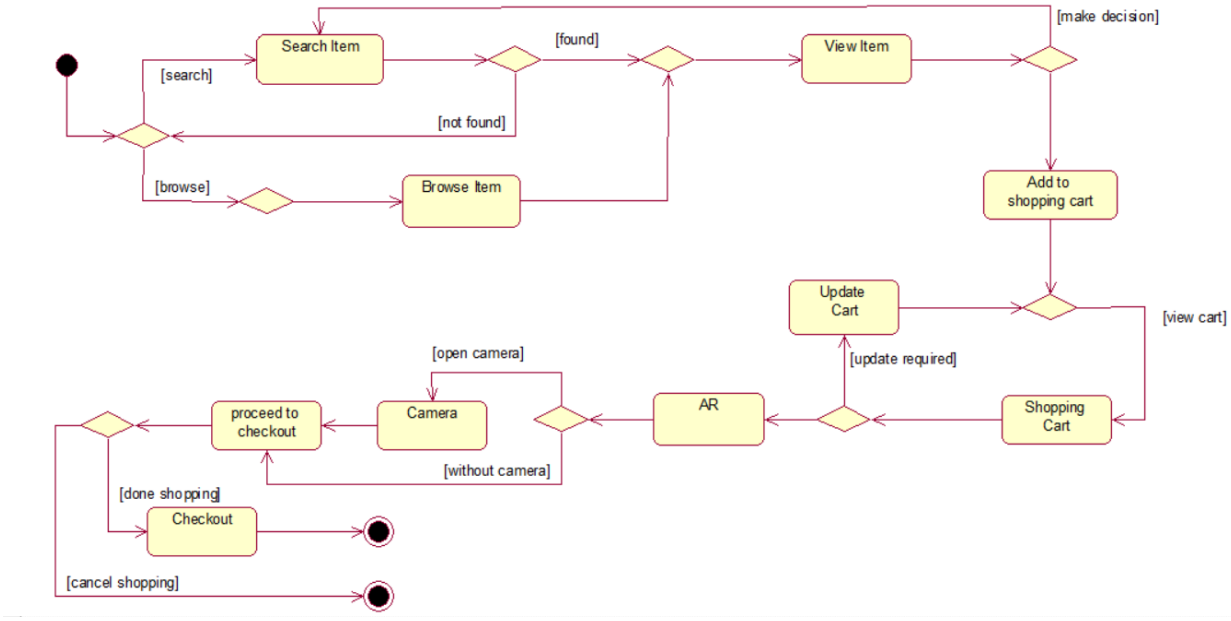
4.5. Sequence / Collaboration Diagram



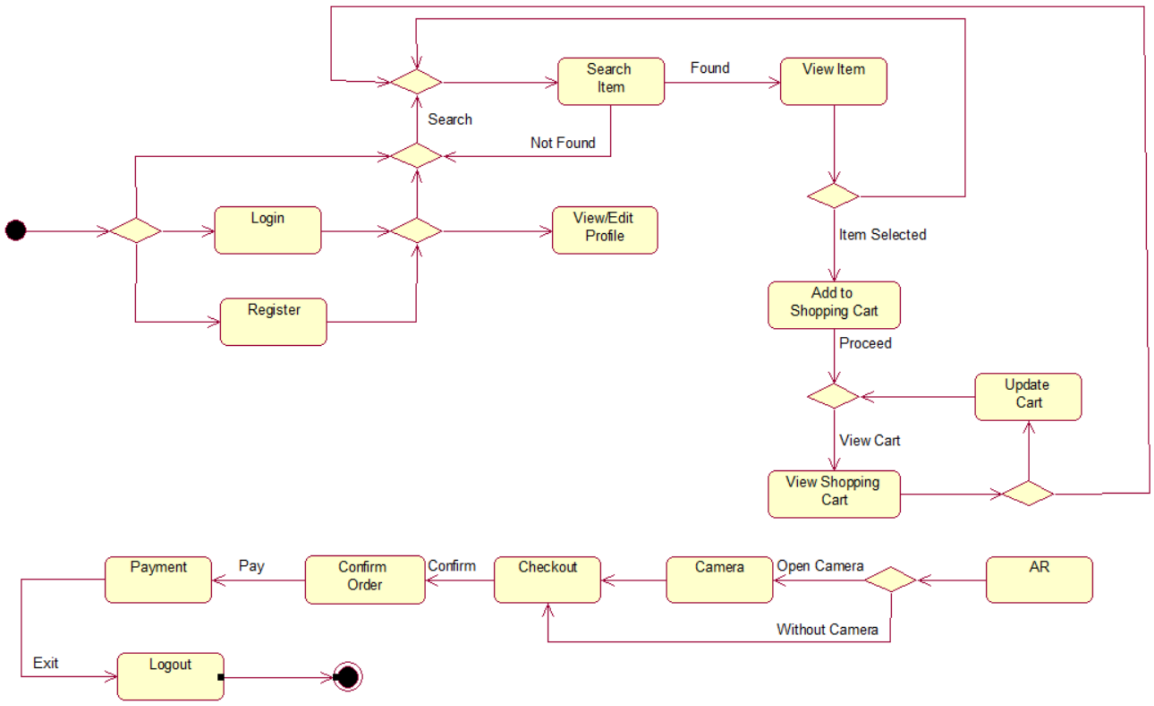
4.6. Operation contracts

[Paragraph Text 12 pt, Calibri, 1.5 Line Spacing, Justified]

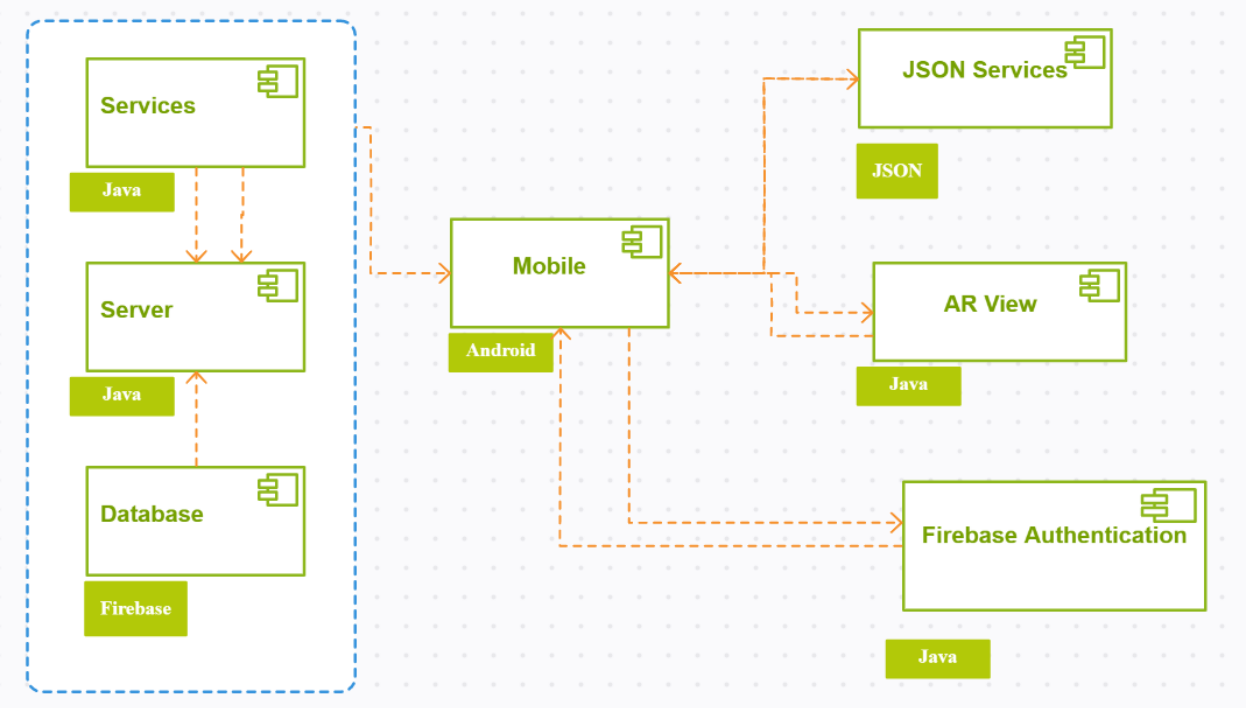
4.7. Activity Diagram



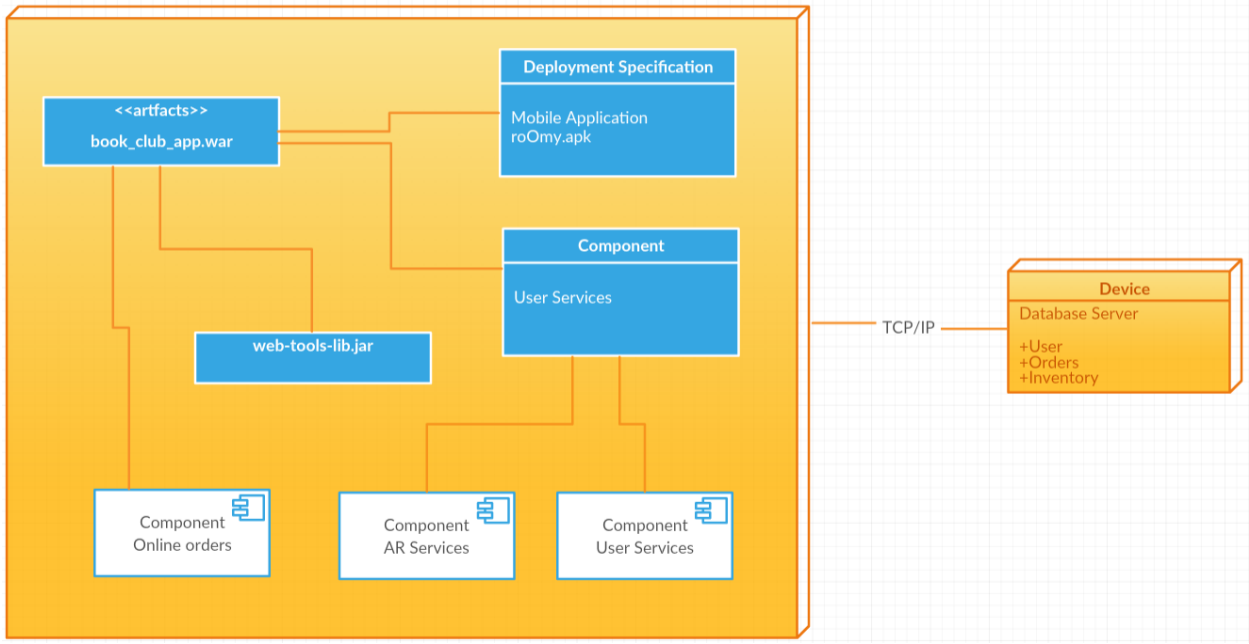
4.8. State Transition Diagram



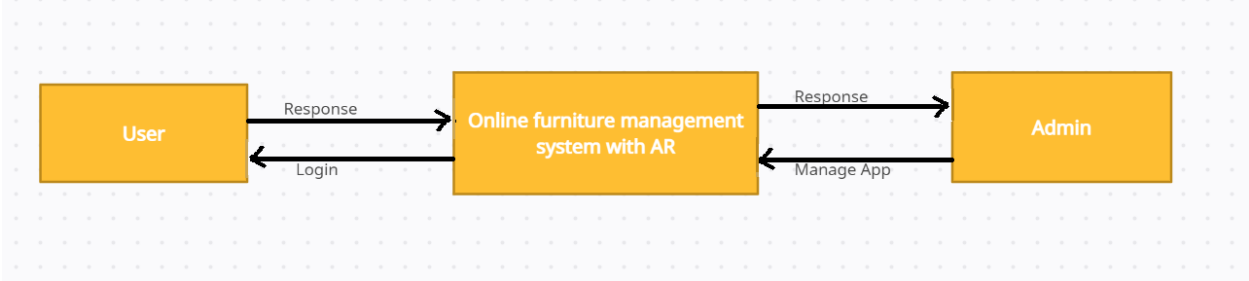
4.9. Component Diagram



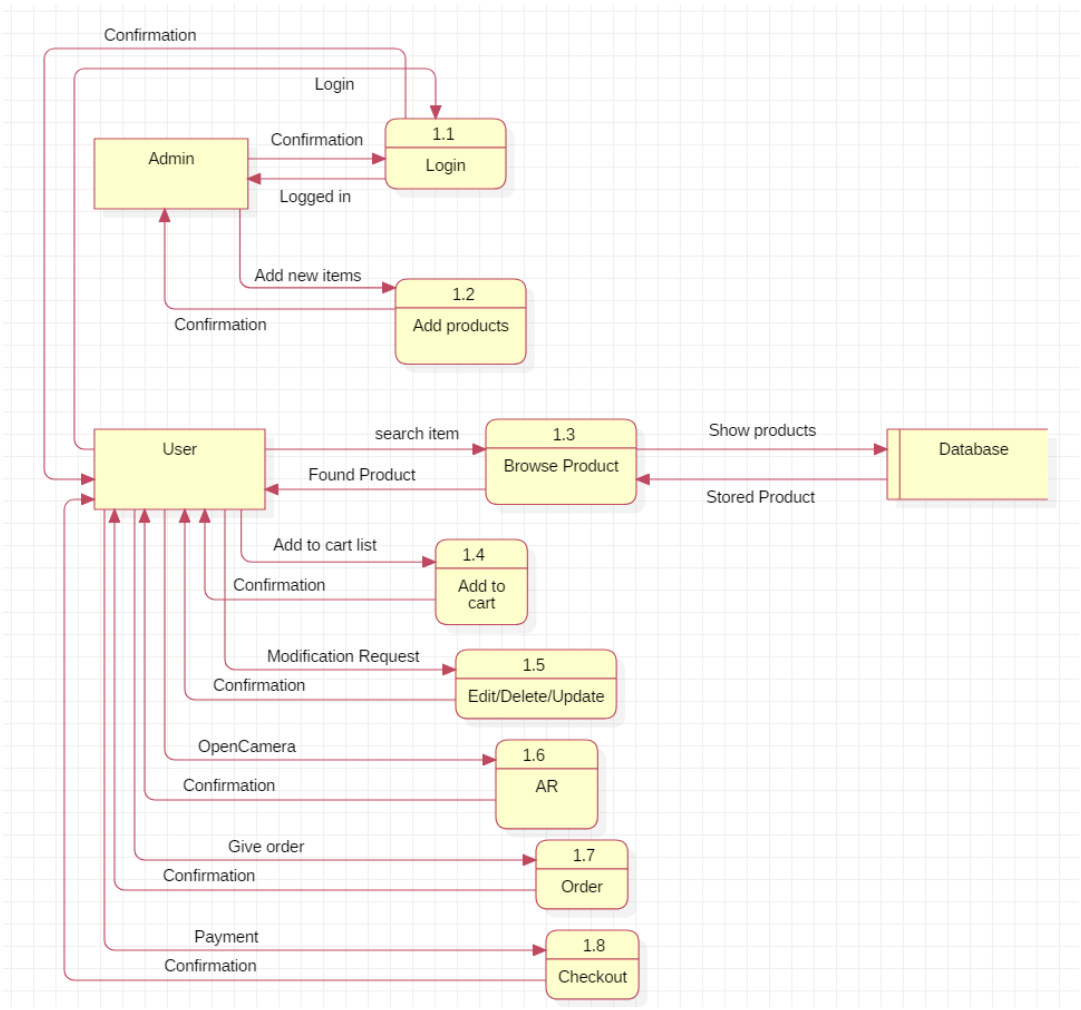
4.10. Deployment Diagram



4.11. Data Flow diagram [*only if structured approach is used - Level 0 and 1*]



LEVEL 1:


Confirmation
Login
Admin
Confirmation
1.1
Login
Logged in
Add new items
1.2
Add products
Confirmation
User
search item
1.3
Browse Product
Show products
Database
Found Product
Stored Product
Add to cart list
1.4
Add to cart
Confirmation
Modification Request
1.5
Edit/Delete/Update
Confirmation
OpenCamera
1.6
AR
Confirmation
Give order
1.7
Order
Confirmation
Payment
1.8
Checkout
Confirmation

Chapter 5
Implementation

Chapter 5: Implementation

In implementation it defines the important flow of control of our system, its Components, Libraries and web services which are used to develop the system. It describes the deployment environment of system along with the coding standards and version controller of it. It also describes the tools and techniques that are used for the development of our system.

5.1. Important Flow Control/Pseudo codes

5.1.1 Registration:

1) User visits registration panel
2) Enters information
3) System will validate user detail
4) System will save user detail
5) Then system will take user to the login page

5.1.2 Login

- User visits login page
- Enters phone number and password
- System validate detail
- System match phone and password with the existing record
- If matched, system will display the user's dashboard where he can see different products.

5.1.2 Settings

- User login the system.
- User will clicks on menu to tweak some settings if needed.
- Settings panel will open where user can update all the information along with profile picture.
- Click on update button

5.1.3 Products

- User login the system.
- In User's dashboard he will see different furniture products added by the admin

- He will select the products and will add them in the cart
- In the add to cart window there will be an ar camera option and also proceed to checkout button it depends on user whether he wants to avail that functionality or not.
- After that user can add information of shipping and checkout.
- In user's dashboard he can also update or delete the added products of the cart.

5.1.5 Logout

- After buying products or visiting his/her profile.
- User can logout him/herself from the app.
- Select logout from the menu and that's it you're out of your profile.

5.2. Components, Libraries, Web Services and stubs

Following are the components used for the app under consideration.

- ❖ Register component
- ❖ Login component
- ❖ Search product component
- ❖ Add product component
- ❖ Manage products component
- ❖ Settings component
- ❖ AR component
- ❖ Shipping component
- ❖ Logout component

5.3. Deployment Environment

Deployment Environment for backend, which is cloud based database names as **FIREBASE REALTIME DATABASE** and frontend is also designed and developed in **Android Studio** with the help of some AR plugins (Wave front &Scene form) for animations and design we will use **LOTTIE ANIMATIONS& XML**.

5.4. Tools and Techniques

We will be using the following tools and techniques in making of our project.

Documentation

- MS Office
- Rational rose
- Smartdraw.io
- Print

Project Management

- MS Project 2016

Programming Languages

- Android Studio
- XML

Database

- Furniture_app

Server

- Firebase real-time cloud database

5.5. Best Practices / Coding Standards

- Comment line will be written in the coding
- No coding repetition
- No more coding standards will be used in the system
- Design of the app should be user friendly
- Avoid code stuffing

5.6. Version Control

Furniture management app with AR will be used for version control. Initially beta versions will be released and after user testing and user satisfaction, the stable version will be released. All versions of application will remain stored in database.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

This chapter is about understanding the testing or our project with respect to the use cases we've developed as well as the stress testing of our prototype.

6.1. Use Case Testing

4. Login Test Case for Admin

Test Suit ID	001
Actor	Admin
Test Case ID	Admin_Login
Test Case Summary	If registration is already done login to the system
Related Requirements	Admin must register first
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Click login button
Test Data	Username: Asad Password: asad
Expected Results	After successful login dashboard should be appeared

Status	Pass

Login Test Case for Admin # 2

Test Suit ID	001
Actor	Admin
Test Case ID	Admin_Login02
Test Case Summary	Trying to login with wrong credentials
Related Requirements	He must be first login into the system
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Click login button
Test Data	Username: Muaz Password: Muaz123
Expected Results	A dialogue box will appear which will tell the credentials are wrong
Status	Pass

Register Test Case for Admin # 1

Test Suit ID	001
Actor	Admin
Test Case ID	Admin_Register01
Test Case Summary	Should register by providing correct credentials
Related Requirements	Admin will be able to login into the system after correctly providing the details
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Previous admin can make another admin if someone wants the rights Make admin in the dashboard setting panel Take valid credentials from the 2nd admin Done Then he can login into the dashboard
Test Data	Username: Muaz Password: Muaz123
Expected Results	The new admin must be able to login into the App dashboard after successful registration
Status	Pass

Add Product Test Case for Admin # 1

Test Suit ID	001
Actor	Admin
Test Case ID	Add01
Test Case Summary	Add a new product to the App
Related Requirements	He must be login into the system
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Click login button Add product on the dashboard and store them. Done
Test Data	Username: Muaz Password: muaz123
Expected Results	Update the category and database after adding product a successful dialogue box will appear.
Status	Pass

Delete Product Test Case for Admin # 1

Test Suit ID	001
Actor	Admin
Test Case ID	delete01
Test Case Summary	Delete a product from the App
Related Requirements	He must be login into the system
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Click login button Delete the product and also remove it from the database. Done
Test Data	Username: muaz Password: muaz123
Expected Results	Update the category and database after removing product a successful dialogue box will appear.
Status	Pass

Update Product Test Case for Admin # 1

Test Suit ID	001
Actor	Admin
Test Case ID	update01
Test Case Summary	Update a product in the App
Related Requirements	He must be login into the system
Pre- Requisites	Visit App login page Internet connection is must Registration must be done
Test Procedures	Visit the App Click on Already have a account? Login Enter credentials Click login button Update the desired product and update the database as well. Done
Test Data	Username: muaz Password: muaz123
Expected Results	Update the page and database after updating product a successful dialogue box will appear.
Status	Pass

6.1. Equivalence partitioning

Equivalence class partitioning is a software or application Testing technique in which input data of a software unit divides into partitions of equivalent data. These test cases are designed to cover each and every portion at least once.

Derived Equivalence Classes

- Email with @ and .com. (Valid)
- Email without @ or .com. (Invalid)
- Password should be more than 1 characters. (Valid)

Serial Number	Test Data	Results
1	Asad@gmail.com	Valid
2	Asad@%	Invalid
3	11225544887755	Valid

6.2. Boundary value analysis

Boundary Value Analysis is another Black Box Test Design Technique, which is utilized to discover the mistakes at limits of information area instead of discovering those blunders in the focal point of info.

Serial Number	Test Data	Results
1	5	It will not be accepted as it is less than 1 characters
2	1987456321	It will be accepted as it is greater than 1characters

6.3. Data flow testing

Data Flow testing is a group of test techniques dependent on choosing ways through the program's control stream to investigate groupings of occasions identified with the situation

with factors or information objects. Dataflow Testing centers around the focuses at which factors get values and the focuses at which these qualities are utilized.

In Data Flow Testing we will monitor the accompanying things:

- Behavior of App based on client input
- Reaction of App in the event that it crashes
- App status under thorough testing and stress
- App ought to be ready for all special cases and should not crash based on
- Client input.

6.4. Unit testing

The tools which we've used for unit testing have their own specifications and specialized search for ambiguity and code. Let me list down some tools that we've used for unit testing of our prototype.

- Android Studio

6.5. Integration testing

Test ID	Test Case Description	Procedures	Expected Results	Actual Results
1	When admin click login button, he should be login into the App	Provide usernameand password	If credentials are correct show the dashboard	Login successful
2	When Client clicks on the product to check them,	Only visit the App with active internet connection	If product will add to cart for shipping and done.	Shipment Successful.

3	Crud operations on products by admin like Add, Delete, Update,	Provide username and password to enter into the dashboard.	Crud operations must be performed successfully.	Successful.

6.6. Performance testing

- Device Performance
- Server/API Performance
- Network Performance

Device Performance
When the client experiences slow app, they get annoyed.
For device performance, you will check following -

- **App Start-Up**

  How much time your app takes to start up? It is the first performance parameter adjudged by the user. As a thumb rule, after the user taps on app icon the first screen should be shown in 1-2 seconds.

- **Battery Time while using an app**

  On constant use, some mobile apps, consume a high amount of battery life and heat the phone. This factor adds a lot to the performance of any mobile app and could normally happen when your app is using more resources than required. Excessive resource usage creates a burden on the processor and phone gets heat up.

- **Memory Consumption**

  When Testing an app, the memory consumption by an app should be checked. By implementing certain functionalities in the app, the memory consumption also increases. For example, in Android apps when push notifications are implemented then memory consumption increases.
  In some cases, it has been observed that memory usage by whole O.S is mere 14%, but a new app is consuming 11%. So, these factors must be handled before deploying the app to the real world or giving to the client.

- **Hardware/Software Variation**

  When testing a mobile app, it is mandatory to check apps on different devices. It could be the case that app is running smoothly on one device but not on other. Like for different vendors of Android devices, we can check the app on Samsung, HTC, and Lenovo phones. Similarly, the app needs to be tested with different RAM and processor specifications like 1 GB or 2 GB.

- **Usage with Other Apps**

  When the app under test is running in parallel with other apps, there should be no interference. The best way to check it is by switching app under testing and other apps.

- **App in background**

  An app that is running in the background is retrieved, it should remain in the same state as it was before. If this scenario is not handled properly, then data get lost. Again you have to enter data from scratch upon retrieving the app.

Server/API Performance
When the app is interacting with the server via API, the response time becomes critical to performance. For Server performance, you will check -

- **Data to and from server**

  The app should handle data efficiently that is sent from the server. It must not take too much time while loading data. In certain apps, data is sent in a specified format. So before displaying it in the app, it should be converted to a relevant format. In this process, apps sometimes become slower and response time becomes longer.

- **API Calls Generated from App**

The number of calls from App under test to the server generated from app should be less. In some cases, multiple API calls are made for the same functionality. For better performance, this should be handled with less number of calls.

- **Server Down Time**

  Due to any reason if the server is down or unreachable we can save data in the native database. So, whenever the server is down, we can show data stored in the native database. Another solution could be the failover database servers i.e. if one of the servers is down or in maintenance phase the backup server should be available to switch over. The failover/backup server should be in continuous replication and synchronization with the main server.

Network Performance

The performance of the app on different networks and network properties need to be measured.

For Network performance, you will check following things.

- **Jitters**

  When there is a delay in receiving information on the network, then it is termed as jitters. It is a problem with the connectionless networks or packet switch networks. As the information is distributed into packets, packets can travel by a dissimilar path from the sender to the receiver. When data arrives at the intended location, it becomes scrambled than it was originally sent. In the case of Jitters, the mobile app should be capable enough to handle it.
  You need to Show the appropriate notifications to the end user, either to resend the request or wait till the system responds again.

- **Packet Loss**

  In the case of complete packet loss, the app should be able to resend the request for the information or should generate the alerts accordingly. If data is not complete, then the user will not be able to comprehend information displayed in App. This can be stressful for the user. So, it is better to display a suitable message or prompt user to try again.

- **Network Speed**

  The app needs to be checked on a variety of networks with variable speed. The app should be tested on 2.5G, 3G, and 4G networks. Both Wi-Fi and mobile networks are included in this. Also, the behavior of app should be monitored. Especially, when both networks are available, and switching occurred from one network to another.

For example, an issue may arise in an app for the users while switching phone network from 4G to WIFI and vice versa. In this case, the app becomes unresponsive and may require restarting the app for use.

6.7. Stress Testing

While doing stress testing our app performed great even when I used my app on different new mobile phones.

With the help of this testing, we observed that our app looks very nice on every mobile

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

Furniture designing & supply companies usually maintain display center or showroom for the display of their brands or furniture items. These companies provide different furniture items for houses, shops, schools, hotels, business and offices. Rapid progress in technology will change the scenario of online furniture shopping. With the rapid progress in VR & AR, Virtual Reality (VR) based systems can entirely transform the conventional product display mechanism at showrooms by providing products. This App will change the persona of Furniture shopping.

It will really help customers to buy furniture online along with using AR technology they can set furniture randomly with the help of 3d models to just get an idea of things.

7.2. Achievements and Improvements

The achievements are shared with respect to the prototype made for stress testing and UI . We've discussed out app with almost 5 to 6 furniture companies in Lahore and they really liked our idea and they are willing to collaborate or even buy our idea.

We tested more then 5 UI models in order to understand user behavior. As well as, we are trying to develop an algorithm which will help the user get what the user needs and recommendations will be done accordingly.

7.3. Critical Review

The critical review is collected by our users and different tech head referred to us by Infinit Connections the software house in which we are doing this project.

User perspective: According to the user app is fine the most common review we got is to work more or some modules and AR.

Tech Head Perspective: According to the industry tech head we got the review of improving our app in some modules like AR, notifications, products etc

7.4. Lessons Learnt

The most important lesson that we learnt by doing this project is to stick to one tech stack instead of going with multiple and approach should be followed by doing proper user research because the user satisfaction is what we want at the end.

7.5. Future Enhancements/Recommendations

According to the market recommendations the most common enhancement what we are looking forward in the future is to make this app more prominent in the furniture market. Many end users suggested to add more modules in the app with payment integration.

Reference and Bibliography

Reference and Bibliography

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