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E-Builders

Bachelor of Science in Computer Science

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Certificate

Put certificate text here!

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“The knowledge of anything, since all things have causes, is not acquired or complete unless it is known by its causes.”

Ibn Sina

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Acronyms and Abbreviations

DSA	Data Structure and Algorithms
OOP	Object Oriented Programming
PF	Programming Fundamentals
SE	Software Engineering
SQL	Structured Query Language
PE	Portable Executable
EXE	Executable
ML	Machine Learning

Chapter 1

Introduction

1.1 Brief Introduction

The real estate industry has seen a significant shift in recent years, with more buyers and sellers turning to digital solutions to streamline their transactions. This project aims to address this need by creating an innovative app that revolutionizes the way people buy and sell real estate.

The app utilizes cutting-edge 3D modeling technology to provide users with an immersive and interactive experience. By simply inputting the size of their property, users are able to view a 3D model of their home or prospective property, complete with an approximate cost of their house.

The app enables users to visualize their property in a realistic and immersive way while also providing valuable information about the potential cost of building a house based on their property size and desired features.

1.2 Background Information

Real estate refers to physical property, land, buildings, and structures along with the natural resources and immovable assets that are attached to the land. If someone wants to buy a new property then have to give a commission to the dealer and spend more money on others. Real estate transactions involve buying, selling, renting, or leasing properties in the physical world.

But our proposed mobile application “E-Builders” is designed to facilitate buyers and sellers by eliminating the middleman. This idea came into being because every single day we observe that the real estate business is growing and the middleman is taking a lot.

We not only buy and sell but also provide a proper 3D design/structure of the building according to the will and requirements of the customer/users.

E-Builders could be interpreted as real estate transactions or activities that are conducted electronically or online. With the advancement of technology, many aspects of the real estate industry have moved to the digital realm, including property listings, virtual tours, digital paperwork, 3D Designs, Cost Estimation, and online property auctions. Online platforms and real estate websites have become essential tools for buyers, and sellers, and through this, the buyer can see their house before construction and get the cost estimate/expenditure which is required to complete their building.

1.3 Problem Description

Buying or selling a property can be a daunting and overwhelming experience for many people, particularly when it comes to visualizing the potential of a property or estimating the cost of building a house. Traditional methods of viewing properties through photos, videos, or physical visits may not provide buyers and sellers with the level of detail and accuracy they need to make informed decisions. Furthermore, cost estimation can be a complex and time-consuming process, making it difficult for individuals to accurately calculate the expenses involved in building a house.

This project addresses these challenges by providing an immersive and interactive experience for users. By utilizing advanced 3D modeling technology and cost estimation features, our app will enable users to view a realistic and detailed 3D model of their property or prospective property, complete with maximum accuracy. The cost estimation feature provides users with a convenient and efficient way to calculate the approximate cost of building a house based on their property size and desired features, helping to reduce the complexity and uncertainty involved in cost estimation.

1.4 Project Objectives

To provide an innovative solution for buyers and sellers in the real estate market. By utilizing advanced 3D modeling technology. Analyze every user's behavior and show him/her recommended properties and models. Real-time cost estimation on a house (Grey structural or complete) and (with material or without material). For buying and selling (one can access property location via Google Maps). In addition, Area unit convertor. Our goal is to create an app that is user-friendly, functional, and visually appealing, and that will serve as a valuable resource for anyone looking to buy or sell real estate.

1.5 Project Scope

User benefits from:

- User registration and login.
- Buying and selling (one can access property location via Google Maps).
- Property size input.
- 3D modeling of the property.
- Cost estimation feature.
- Area unit convertor.
- Secure database management.
- User feedback collection.

The project does not include the following:

- Real estate agent services.
- Legal or financial advice.
- Property valuation or appraisal services.

Chapter 2

Literature Review

In this chapter, we have discussed the research made in the past on Real estate using 3D technology with increased Demand. We have also discussed the importance and challenges of the existing and new systems. There are several applications that are mainly developed for real Estate. Some of the existing products/applications are discussed in the remainder of this section based on their features and ratings.

2.1 Zameen.com

Zameen.com is a popular online property portal in Pakistan. It provides a platform for property buyers, sellers, and renters to connect and find residential and commercial properties. Users can search for properties, view details, and pictures, and contact property owners or real estate agents directly through the website. They also provide virtual tours to make it possible. Visit the sight and construct its model then publish it for clients. Time-consuming and the client had to wait. Zameen.com also has a construction cost calculator and Area unit converter.

It has a rating of 4.6 [Apps Store] and 45k+ reviews.

2.2 Graana.com

Graana.com is one of the popular online real estate marketplaces in Pakistan. It is one of the leading platforms for buying, selling, and renting properties in the country. It offers a vast database of property listings, including residential and commercial properties such as houses, apartments, plots, and commercial spaces. The platform allows users to search for properties based on their preferences, including location, price range, property type, and amenities.

One of the unique features of Graana.com is its use of artificial intelligence and data

analytics to provide real estate market insights and trends, helping users make informed decisions.

Additionally, Graana.com offers various tools and resources for both buyers and sellers, including property valuation services, mortgage calculators, and expert advice on real estate matters. Which are done by a professional individual.

It has a rating of 3.6 [Apps Store] and 3k+ reviews.

2.3 Lamudi.pk

Lamudi.pk was another prominent online real estate marketplace in Pakistan. It provides a platform for property buyers, sellers, and renters to search for residential and commercial properties in various cities and towns in Pakistan. Similar to other property portals, users can search for properties, view details, and photos, and contact property owners or real estate agents directly through the website.

The platform offers a wide range of property listings, including houses, apartments, plots, and commercial spaces. Users can use filters to narrow down their search based on location, price range, property type, and other features.

It has a rating of 3.8[FB page] and 237+ reviews.

2.4 RealProperty.pk

RealProperty.pk is another notable online real estate marketplace in Pakistan. It provides a platform for property buyers, sellers, and renters to search for residential and commercial properties across different cities and regions in the country.

RealProperty.pk offers a wide range of property listings, including houses, apartments, plots, and commercial spaces. Users can use various filters to refine their search based on location, price range, property type, and other specific criteria. The platform aims to connect property owners and real estate agents with potential buyers or tenants, making the process of buying, selling, or renting properties more accessible and convenient.

It has a rating of 3.9 [FB page] and 100+ reviews.

2.5 Homes Pakistan

HomesPakistan.com is also a well-known online property portal in Pakistan. Similar to Zameen.com, it provides a platform for property buyers, sellers, and renters to search for residential and commercial properties across various cities in Pakistan.

Tool	Buy	Sell	Cost Estimation	3D Model	Location
E builders	Yes	Yes	Yes	Yes	Yes
Zameen.com	Yes	Yes	Yes	No	Yes
Homes Pakistan	Yes	Yes	No	No	No
Lamudi.pk	Yes	Yes	No	No	No
Graana.com	Yes	Yes	No	No	No
RealProperty.pk	Yes	Yes	No	No	No

Figure 2.1: Comparison Table

HomesPakistan.com offers a comprehensive database of property listings, including houses, apartments, plots, and commercial spaces. Users can use advanced search filters to narrow down their search based on their specific requirements, such as location, price range, property type, and amenities.

It has a rating of 3.0 with 50+ reviews.

2.6 Conclusion

All these platforms are online places for buying, selling, and renting property. Some of them provide extra features like agent service, expert advice on property and mortgage calculation. Zameen.com provides more than that, it provides property cost estimation, virtual property tour, and Area unit convertor. These platform goals have to boost the sale of properties but not help an individual to build his own

Chapter 3

Requirement Specifications

3.1 Requirement Analysis

“An activity of translating the information gathered during the analysis phase into a document that defines a set of requirements”

3.2 Requirement Specifications

The requirements of our proposed system will be discussed in this chapter. We will discuss the criteria as well as existing centralized solutions and our proposed system differs from them. The chapter will give a quick overview of the existing system, planned system, and functional and non-functional requirements.

3.3 Existing System

A real estate platform called Zameen.com now exists and many more. Other platforms are focused on buying, selling, and renting a property but Zameen.com offers more. On zameen.com you can calculate the cost required to build and unit area convertor. Its unique feature is a virtual tour of a property. It has become a real estate giant in Pakistan. Their goal is to boost sales of property.

3.4 Limitations

Despite its advantages, they have certain drawbacks. First, many of them are not optimized for mobile. Not helping an individual to build but encouraging them to sell and buy. Cost estimation is universal based on dimensions (3 Marla and 1 canal). A person can only find the cost without knowing the design. There is always a possibility of outdated or incorrect information due to the dynamic nature of the real estate market. Existing systems have complex user interfaces or lack user-friendly features, this presents an opportunity to create an app with an intuitive and seamless user experience. A user-friendly interface can attract more users and enhance customer satisfaction.

3.5 Proposed System

Designing a proposed system seeks to revolutionize the real estate sector by removing middlemen and connecting buyers directly with sellers. Buyers can check details about the property using the app, including pictures, and videos, and can access location. A person can explore which design of the house he should be building with its required cost. To facilitate communication between buyer and seller, the app also has a chat feature. E-builder aims to simplify the procedure, increase efficiency, and enable buyers and sellers to communicate easily. Filtering is user-friendly and more accurate. Architects and designers can use it to create 3D models of their designs and estimate the cost of building each project. An inexperienced person in real estate can use it to get an idea about his property.

3.6 Benefits

- **Enhanced Visualization:** The app provides users with an immersive and interactive 3D model of their property or prospective property. This enhanced visualization allows users to better understand the layout, design, and potential of the property, making it easier for them to make informed decisions.
- **Accurate Cost Estimation:** The cost estimation feature of the app provides users with a convenient and efficient way to estimate the cost of building a house based on their property size and desired features. This helps users to plan and budget effectively for their real estate projects.
- **Time and Cost Savings:** Buyers can explore multiple properties from the comfort of their homes, reducing the need for physical visits. Sellers can showcase their properties to a broader audience without the need for extensive marketing efforts.
- **Boost sales:** show your ad in the top position and get noticed by potential buyers.

- **User Engagement and Retention:** The app's interactive and visually appealing features increase user engagement and encourage users to spend more time exploring properties. This can lead to higher user retention rates and increased app usage.
- **Industry Innovation:** By leveraging advanced 3D modeling technology and cost estimation algorithms, the app contributes to the innovation and advancement of the real estate industry, keeping it at the forefront of modern technology.

3.7 Software Requirement

- Android Studio
- Blender
- Firebase database
- MySQL

3.8 Hardware Requirement

- Computer
- Mobile

3.9 Functional Requirements

3.9.1 User Authentication and Registration:

Users should have the ability to log in or sign up on the E-Builder platform using their Google, Facebook, or email accounts. This functionality provides convenience and flexibility for users, allowing them to choose their preferred authentication method. The authentication process should prioritize security to safeguard user credentials and personal information.

3.9.2 User Profile and Account Creation:

The Frame E-builder platform should provide users with the ability to create a profile or account. When visiting the platform for the first time, users should have the option to register and create their unique account. This process typically involves providing essential information such as name, email address, and password. Users may also have the option to add additional details to their profile, such as a profile picture, contact information, or a brief bio.

By creating a profile or account, users can personalize their experience on the Frame E-Builder platform. It allows them to save their preferences, track their activities, and maintain a history of their interactions, such as viewed ads, posted ads, and past purchases. Moreover, having a profile or account enhances security by ensuring that user information and activities are safeguarded.

3.9.3 Admin:

The admin will be able to view all available listings of the properties, saved properties, and requests. The admin would be able to check all the received messages and can delete any message, property details, or any other admin.

3.9.4 Posting Ads:

The Frame E-builder platform should enable users to create and post advertisements. Users should have the ability to input relevant details such as the title, description, category, price, dimensions, pinned location, no. of rooms (etc.), and contact information for their ads. Additionally, the platform should provide options for including images or other media to enhance the visibility and appeal of the advertisements. This functionality allows users to effectively showcase their products or services to potential buyers within the Frame E-market community.

3.9.5 Viewing model:

In E-builder, a user just enters his property dimension (3 Marla, 1 canal), and the app provides him a bunch of 3D models on 3 Marla. When he selects the desired one then provides him with the cost required to build this house on his property.

3.9.6 Cost Estimation:

The E-builder platform allows the user to enter his budget (1-1.5 cr) and we proposed some 3D models. The model is predicted through the previous user's searches.

3.9.7 Viewing Ads and Details:

The Frame E-Builder platform should provide users with the ability to view advertisements and access their details. Users should be able to browse through a list of ads, sorted by categories or search criteria. Upon selecting a specific ad, users should be presented with comprehensive details such as the title, description, price, location, contact information, and any accompanying images or media. This functionality allows users to easily explore the available offerings, gather relevant information, and make informed decisions about potential purchases or interactions with ad posters.

3.9.8 Product Categorization:

The Frame E-Builder platform should offer a comprehensive categorization system to classify various products listed by users. This categorization system should include a range of categories such as houses, buildings, and shops. Each product should be assigned to a specific category to ensure efficient browsing and search functionalities. By categorizing products, users can easily navigate through the platform, filter their search results based on their specific interests, and find relevant products within their desired category.

3.9.9 Homepage Design:

The homepage of the Frame E-market platform should serve as the central hub, providing users with an intuitive and engaging interface. The design should be visually appealing and user-friendly, featuring key elements to enhance the user experience.

3.9.9.1 Search Bar:

A prominent search bar should be placed at the top of the homepage, allowing users to quickly search for specific products or browse through different categories.

3.9.9.2 Featured Products:

The homepage can showcase a selection of featured products or advertisements to grab users' attention. These featured items should be carefully chosen to highlight popular or new listings.

3.9.9.3 Category Navigation:

Clear and easily accessible category navigation links or menus should be provided to help users explore specific product categories directly from the homepage.

3.9.9.4 Latest Updates:

A section dedicated to displaying the latest updates, such as recently added products or advertisements, can be included to keep users informed about the freshest listings on the platform.

3.9.9.5 User Recommendations:

Personalized recommendations based on user preferences, browsing history, or previous interactions can be displayed to enhance the user experience and provide tailored suggestions.

3.9.9.6 Promotional Banners:

The homepage can incorporate promotional banners or sliders to highlight any ongoing sales, special offers, or featured sellers to attract user attention and encourage engagement.

3.9.9.7 Clear Navigation Menu:

A well-structured navigation menu should be present, allowing users to access other important pages of the platform, such as user profiles, shopping cart, settings, and customer support.

Overall, the homepage design should prioritize simplicity, ease of use, and a visually appealing layout to create a positive first impression and encourage users to explore the Frame E-builder platform further.

3.9.10 Settings:

The Frame E-Builder platform should provide users with a dedicated "Settings" section that allows them to customize and manage their account preferences. The settings page should include various options and features to enhance the user experience. Some key components of the settings section may include:

3.9.10.1 Account Information:

Users should be able to view and update their account information, such as name, email address, contact details, and profile picture.

3.9.10.2 Privacy and Security Settings:

Users should have the ability to manage their privacy and security settings. This may include options to control the visibility of their profile, choose notification preferences, enable two-factor authentication, or update their password.

3.9.10.3 Communication Preferences:

Users should be able to customize their communication preferences, such as opting in or out of promotional emails, newsletters, or notifications related to their activities on the platform. .

3.9.10.4 Language and Localization:

The settings section should provide options to select the preferred language and localization settings, allowing users to personalize their experience based on their language and regional preferences.

3.9.10.5 Notification and Alert Settings:

Users should be able to configure their notification and alert settings, including the types of notifications they wish to receive, such as new message alerts, ad updates, or system notifications.

3.9.10.6 Help and Support:

The settings section may also include links or access to customer support resources, FAQs, or a help center, enabling users to seek assistance or find answers to common queries.

The settings page should be organized in a user-friendly manner, with clear instructions and intuitive controls, ensuring that users can easily navigate and manage their account preferences according to their individual needs and preferences.

3.10 Non-functional Requirements

3.10.1 Performance:

The platform should provide fast and responsive performance, with quick loading times and smooth navigation, ensuring a seamless user experience even during peak traffic periods.

3.10.2 Security:

The platform should prioritize robust security measures to protect user data and ensure secure transactions. It should implement encryption protocols, secure user authentication, and measures to prevent unauthorized access or data breaches.

3.10.3 Scalability:

The platform should be designed to accommodate a growing number of users, ads, and transactions without compromising performance. It should be scalable to handle increased user demands and effectively manage system resources.

3.10.4 Usability:

The platform should have a user-friendly interface and intuitive navigation, ensuring ease of use for users with varying levels of technical expertise. It should provide clear instructions and easily accessible features to enhance user interaction.

3.10.5 Reliability:

The platform should be highly reliable, with minimal downtime or system failures. It should have backup and recovery mechanisms in place to prevent data loss and ensure system availability.

3.10.6 Compatibility:

The platform should be compatible with a variety of devices, browsers, and operating systems. It should be responsive and function optimally across different platforms, ensuring a consistent user experience.

3.10.7 Accessibility:

The platform should adhere to accessibility standards, making it accessible to users with disabilities. It should provide features such as screen reader compatibility, keyboard navigation, and appropriate color contrast to ensure equal access for all users.

3.10.8 Data Backup and Recovery:

The platform should regularly back up user data and have a robust data recovery mechanism in place. This ensures the availability and integrity of user data and enables quick restoration in case of system failures or data loss.

3.10.9 Performance Monitoring and Analytics:

The platform should incorporate tools to monitor performance metrics, track user behavior, and gather analytics data. This information can be used to optimize system performance, identify areas for improvement, and make data-driven decisions.

3.10.10 Regulatory Compliance:

The platform should comply with relevant laws, regulations, and industry standards pertaining to data protection, privacy, and electronic commerce. It should prioritize the security and privacy of user information.

These non-functional requirements focus on aspects related to system performance, security, scalability, usability, reliability, compatibility, accessibility, data management, and compliance. Adhering to these requirements ensures that the Frame E-market platform meets the necessary quality standards and delivers a reliable and user-friendly experience.

3.11 Hardware Requirements

3.11.1 Operating System:

The mobile application developed using Android Studio should be compatible with Android operating systems. It should run smoothly on the latest versions of these platforms, ensuring optimal performance and compatibility.

3.11.2 Processor:

The computer should have a good rendering speed

3.11.3 Memory (RAM):

A minimum of 16GB RAM is required

3.11.4 Display:

The application should be designed to adapt to different screen sizes and resolutions commonly found on mobile devices. It should be responsive and provide a consistent user interface across a variety of devices, ranging from small smartphones to larger tablets.

3.11.5 Network Connectivity:

The application should support various network connectivity options, including Wi-Fi and mobile data. It should be designed to handle intermittent network connections and provide an offline mode or caching mechanism for a seamless user experience in case of network disruptions.

3.12 Software Requirements

3.12.1 Development Tools:

To develop an Android Studio mobile application, developers will require a code editor or an integrated development environment (IDE) such as Visual Studio Code, Atom, or WebStorm. Additionally, they will need Node.js and a package manager like npm or Yarn to install and manage dependencies.

3.12.2 API Integration:

If the application needs to interact with external services or APIs, developers should identify and specify the required APIs. This may include authentication APIs, data retrieval APIs, or third-party service integrations. Documentation for the APIs should be provided to ensure seamless integration.

3.12.3 Data Management:

The application may require a data management solution such as Redux or MobX for state management and data flow control. This will enable efficient data handling, synchronization, and caching between the application and backend services.

3.12.4 Backend Services:

If the application relies on server-side functionality or requires data storage, developers should specify the required backend services, such as RESTful APIs, databases (e.g., MySQL, MongoDB), or cloud-based services (e.g., Firebase, AWS).

3.12.5 Testing Framework:

The application should be tested thoroughly to ensure its functionality, stability, and performance. A suitable testing framework, such as Jest or Enzyme, should be used for unit testing, integration testing, and UI testing. The choice of testing tools may depend on the specific requirements of the application.

3.12.6 Deployment and Distribution:

The application should be prepared for deployment to the app store (e.g., Google Play Store). Developers should ensure compliance with the respective app store guidelines and follow the necessary steps for code signing, packaging, and submission.

3.12.7 Continuous Integration and Deployment (CI/CD):

To streamline the development and release process, a CI/CD pipeline can be established using tools like Jenkins, Travis CI, or GitLab CI. This will automate tasks such as building, testing, and deploying the application whenever changes are made to the codebase.

3.12.8 Version Control:

Developers should utilize a version control system, such as Git, to manage source code and enable collaboration among team members. This ensures proper code versioning, facilitates code review processes, and helps in tracking and managing changes to the application codebase.

3.13 Use Cases

A use case diagram outlines the operational aspects of a system, detailing its functionalities and illustrating how users or actors can engage with the application to accomplish their objectives. In essence, it serves as a visual depiction of the system's operational framework.

The primary benefit of employing use cases lies in their effectiveness in system analysis, as they aid in recognizing, clarifying, and structuring system requirements

3.13.1 User Registration and Profile Creation:

- 1)The user opens the E-builder app and selects the "Register" option.
- 2)The user provides the necessary information like name, email, and password to create an account.
- 3) The user sets up their profile by adding additional details such as a profile picture and contact information.
- 4)Browsing and Searching for Products
- 5) The user launches the Frame E-builder app and navigates to the home screen.
- 6) The user explores different categories or uses the search feature to find specific products.
- 7)Users can view property listings, including images, titles, prices, and seller information.

3.13.2 Browsing and Searching for Products:

- 1)The user launches the E-Builder app and navigates to the home screen.
- 2) The user explores different categories or uses the search feature to find specific products.
- 3) Users can view property listings, including images, titles, prices, and seller information.

3.13.3 Viewing model:

- 1) A user enters the dimension of his property.
- 2)Select a model desired model.
- 3)Click on show detailed and all details will be shown to him

3.13.4 Placing an offer:

- 1) The user sees an ad for a house at the bottom and clicks on a button to make an offer.
- 2) Write his offer and click on send.
- 3) An offer will be received by the seller via notification.

3.13.5 Posting an Advertisement:

- 1) The user logs into the Frame E-builder app and selects the "Post Ad" option.
- 2) The user provides details such as the title, description, category, price, and contact information for the advertisement.
- 3) Users may upload images or other media to enhance the visibility of the ad.

3.13.6 Reviewing Products and Sellers:

- 1) The user selects a product they have purchased or interacted with.
- 2) Users can leave a review, provide ratings, and write comments about the product or seller.
- 3) User review appears on the product page to help other users make informed decisions.

3.13.7 Managing User Settings:

- 1) The user accesses the settings menu within the app.
- 2) Users can update personal information, such as name, email address, or contact details.
- 3) Users can manage communication preferences, privacy settings, and notification preferences.

3.13.8 App Notifications:

- 1) The user receives push notifications from the Frame E-Builder app for activities like order updates, new messages, or promotions.
- 2) Users can interact with the notifications to view details or take appropriate actions within the app.

These use cases illustrate the various ways in which users can interact with the Frame E-market mobile application, including registration, browsing products, adding to the cart, placing orders, posting advertisements, reviewing products and sellers, managing settings, and receiving app notifications,

3.14 Use Cases

USECASE NAME	Access use case	
Use case ID	UC-01	
Description	This use case allow user to create or login to his account and tell about Property buying and selling.	
Trigger	This use case triggers when the user wants to access provided tool on app	
Main Access scenario	Steps	Action
	1	User will create an account.
	2	.User will then login with that account and it will be verified
	3	User will then be viewing the main menu.
	4	User will then choose from either viewing data or buy/sell them.
Alternative flow	Steps	Action
	1	Invalid detail
	2	User will be given error message
Actor	User database	
Pre-condition	User Must input valid credentials	
User Interface	App	
Issues	User finds it hard to interact with the interface and quits	

Figure 3.1: Access use case

Use case Name	Login
Use case ID	UC-02
Actor	Admin/user
Description	The use case begins when the actor Indicates the intent to login to the system. It ends when the actor is logged in or Cancels login.
Pre-Condition	The login form exists
Post-Condition	The actor logs in successfully

Figure 3.2: Login

Use case Name	Cost Estimation
Use case ID	UC-03
Actor	Customer/user
Description	The system should be able to provide correct cost estimate of construction of house and building to the user according to the plot size.
Pre-Condition	The application must be installed on the mobile phone and have valid internet connection
Input summary	Customer can provide correct plot size
Output summary	System should provide correct cost estimation successfully

Figure 3.3: Cost Estimation

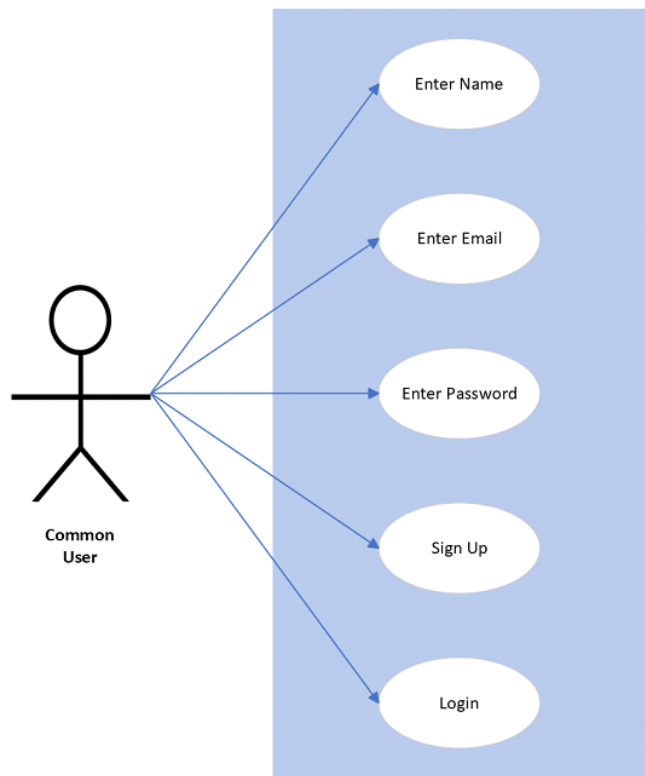


Figure 3.4: User login

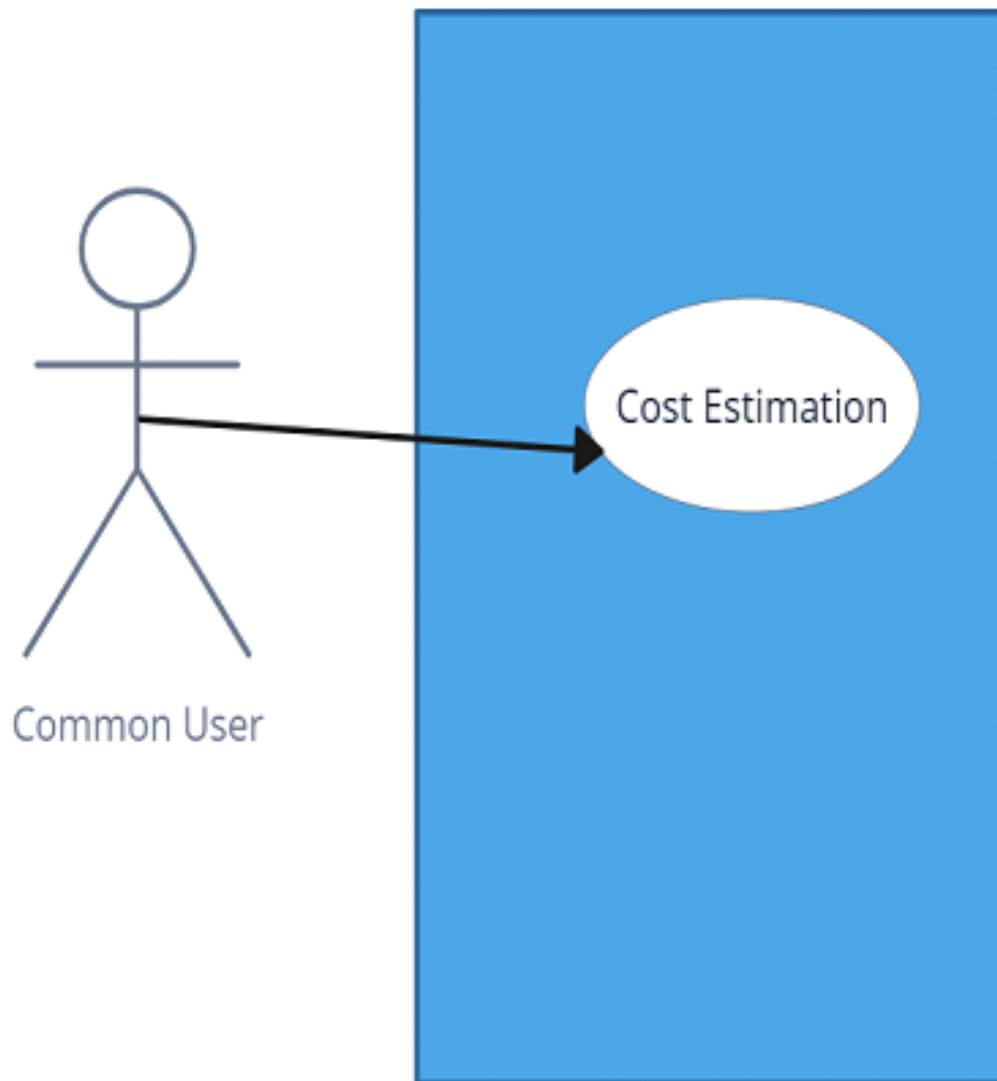


Figure 3.5: Cost Estimation

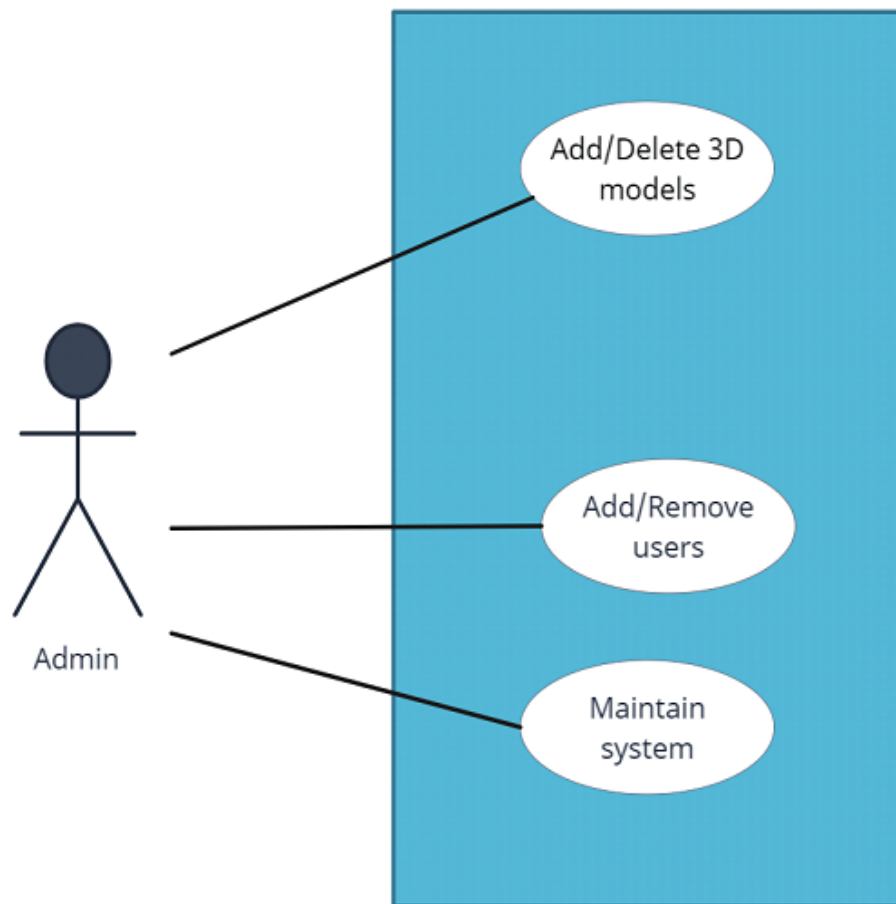


Figure 3.6: Admin Usecase chart

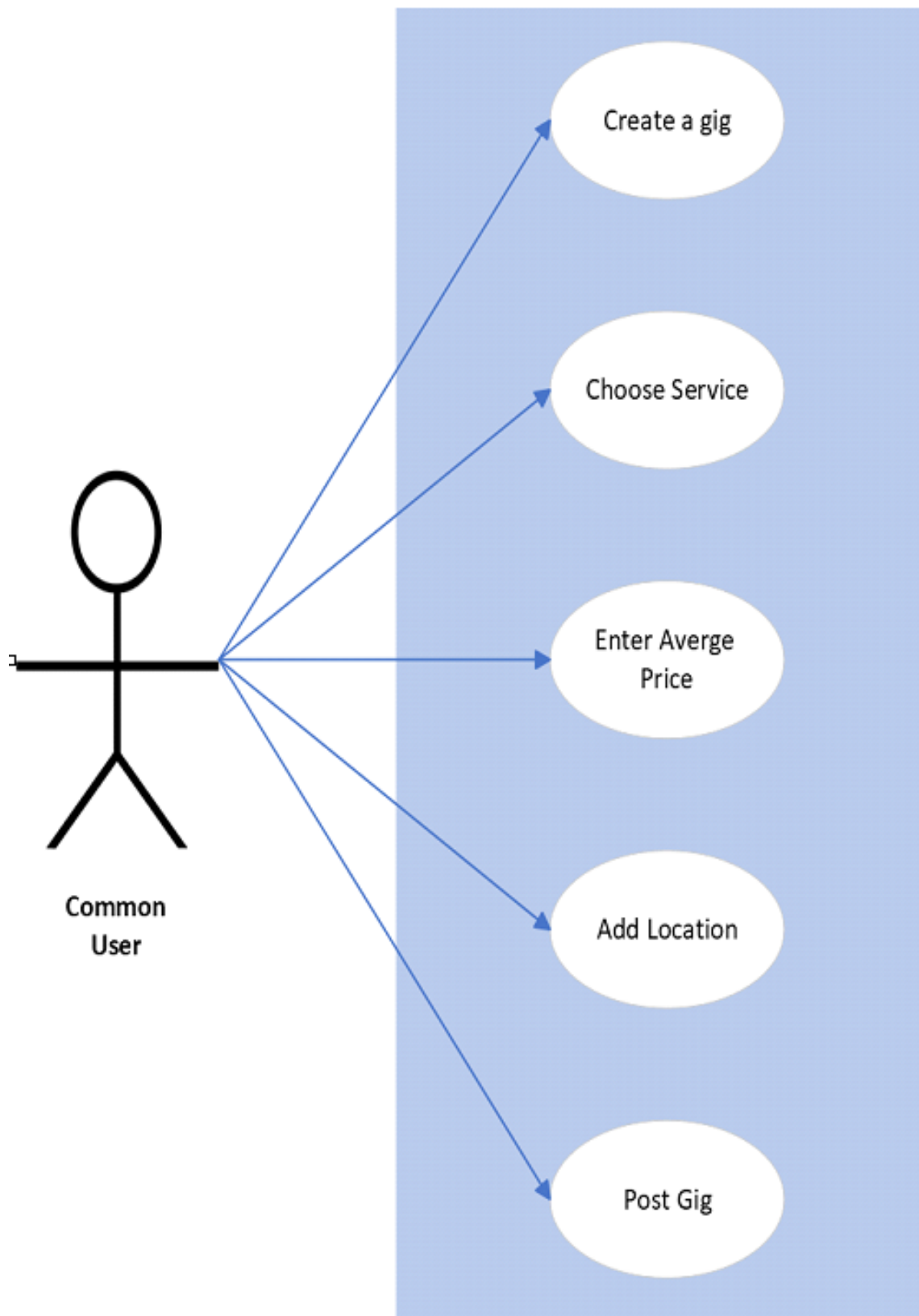


Figure 3.7: Add Posting Chart

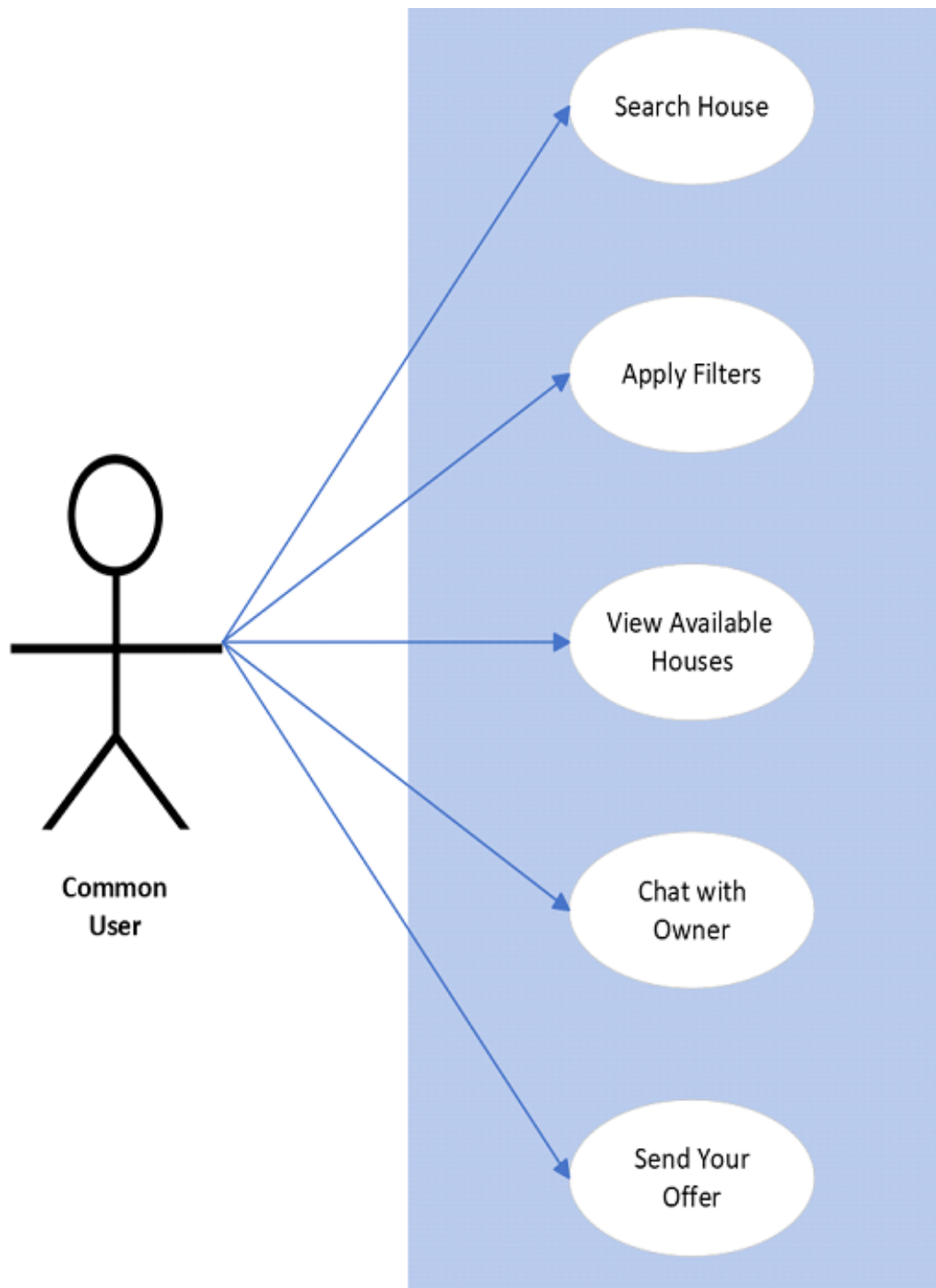


Figure 3.8: User search Chart

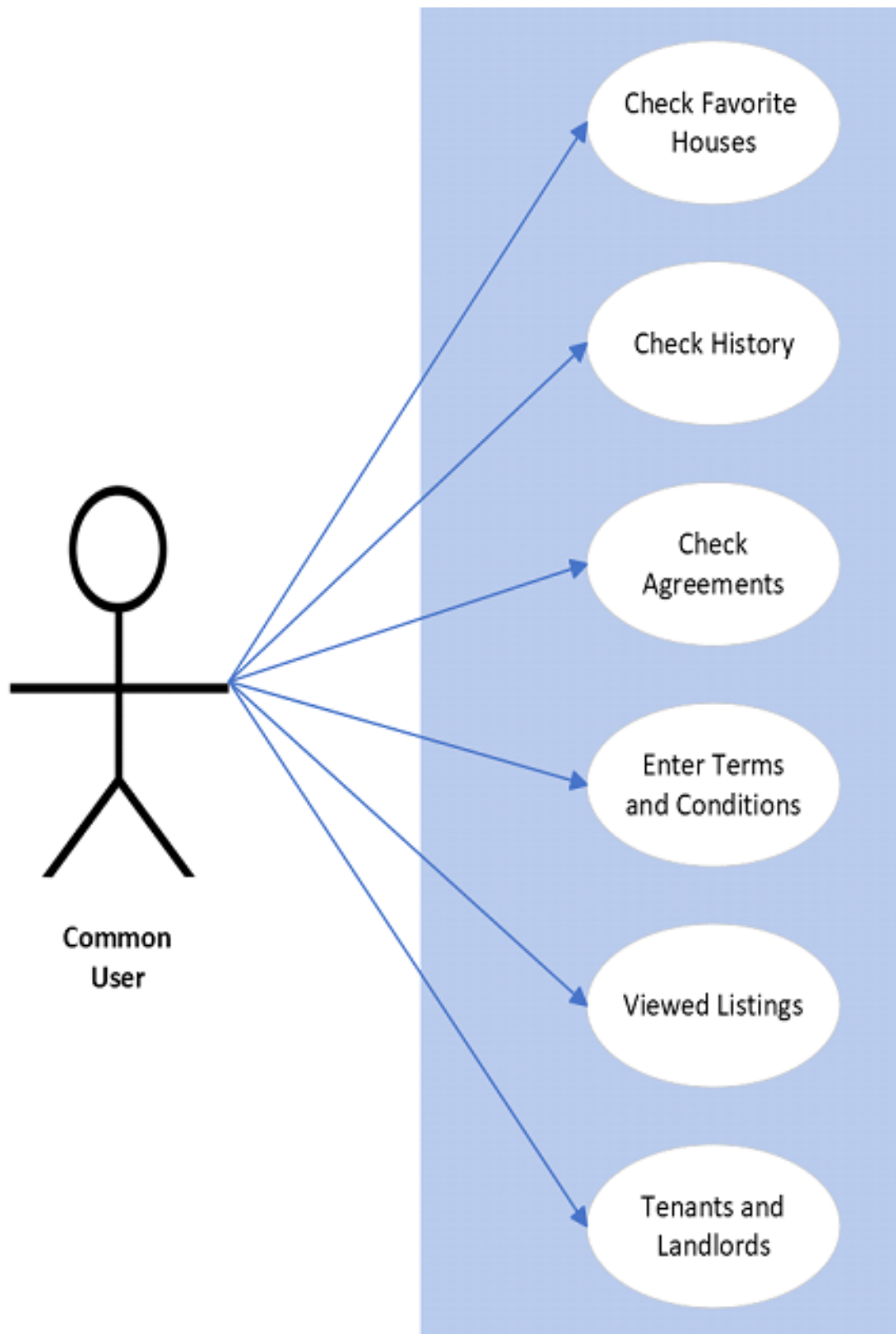


Figure 3.9: User data history

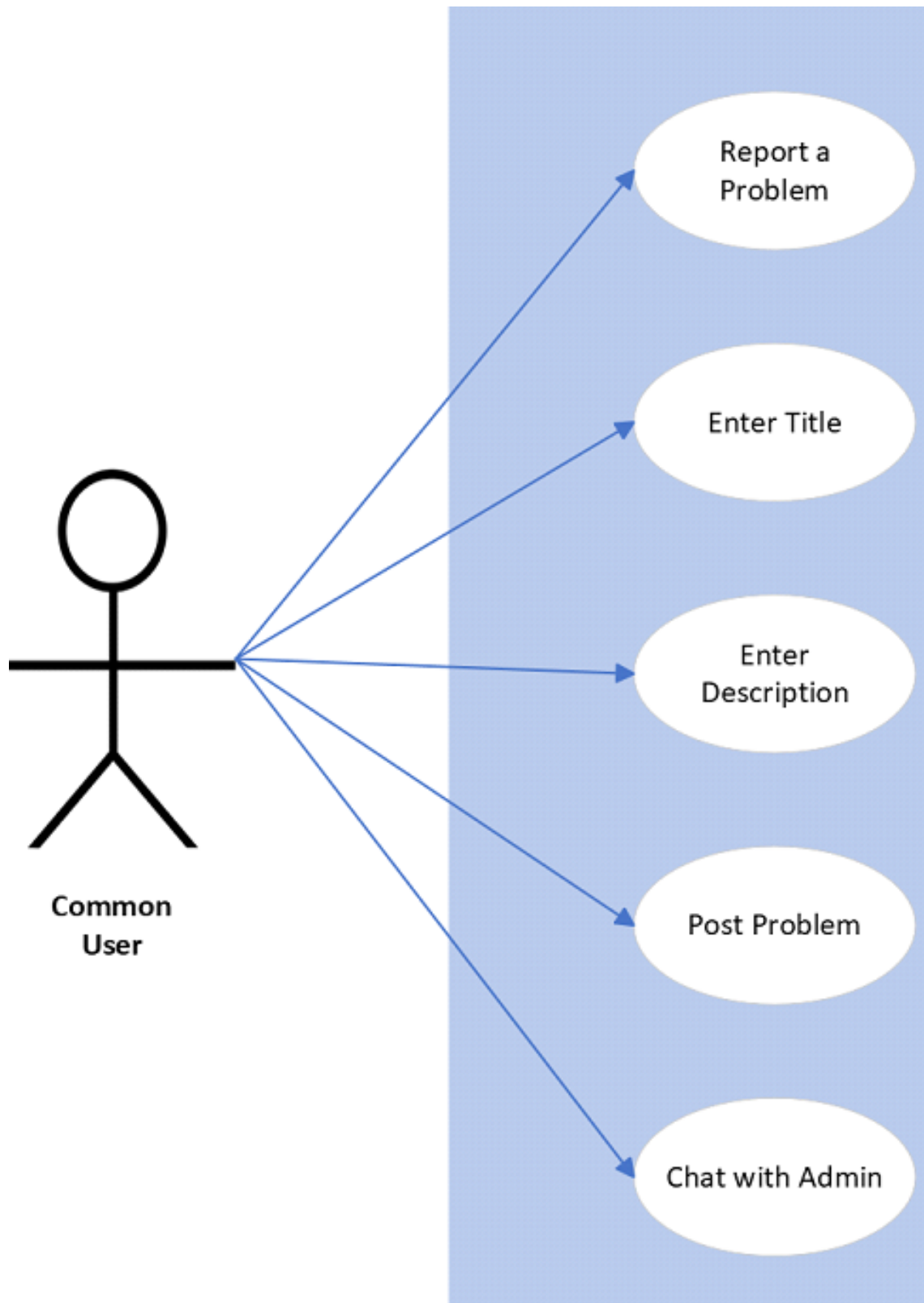


Figure 3.10: user Access

Chapter 4

Design

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. The following sections constitute this chapter:

4.1 System Architecture

This system architecture comprises of two primary components: an app and a database:

4.1.1 App:

We developed this application in Android Studio. Firstly, we design its front end in XML. Then we use Java as the back-end language of our application to connect the front-end. Lastly, we design the database and the schemas as per the requirements of the application. The app should be designed to be user-friendly, intuitive, and responsive, providing a seamless user experience. The App is designed to support a range of user actions, such as browsing content, submitting data, and viewing.

4.1.2 Database:

Firestore stands out as a widely adopted global database solution renowned for its constant availability and robustness. Firestore is a NoSQL database platform that adheres to the JSON protocol, making it proficient in handling data storage tasks. As a result, we have chosen Firestore as our database of choice due to its speed, reliability, user-friendliness, and scalability. The comprehensive system architecture is shown in Figure 4.1.

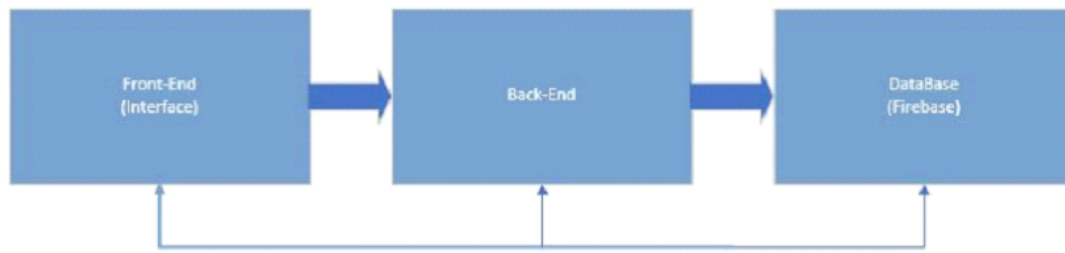


Figure 4.1: Database

4.2 Design Methodology

The proposed project will be implemented using an agile methodology. When it comes to accomplishing this goal, the agile technique will prove very beneficial. According to the agile methodology, the planned project is divided into various phases. Each phase demands continuous communication and feedback from team members, as well as continuous improvement. The agile model incorporates the following steps:

- Planning
- Requirements Analysis
- Design
- Development
- Testing
- Evaluation

The following figure 4.2 shows the design methodology followed by the E-Builder Platform

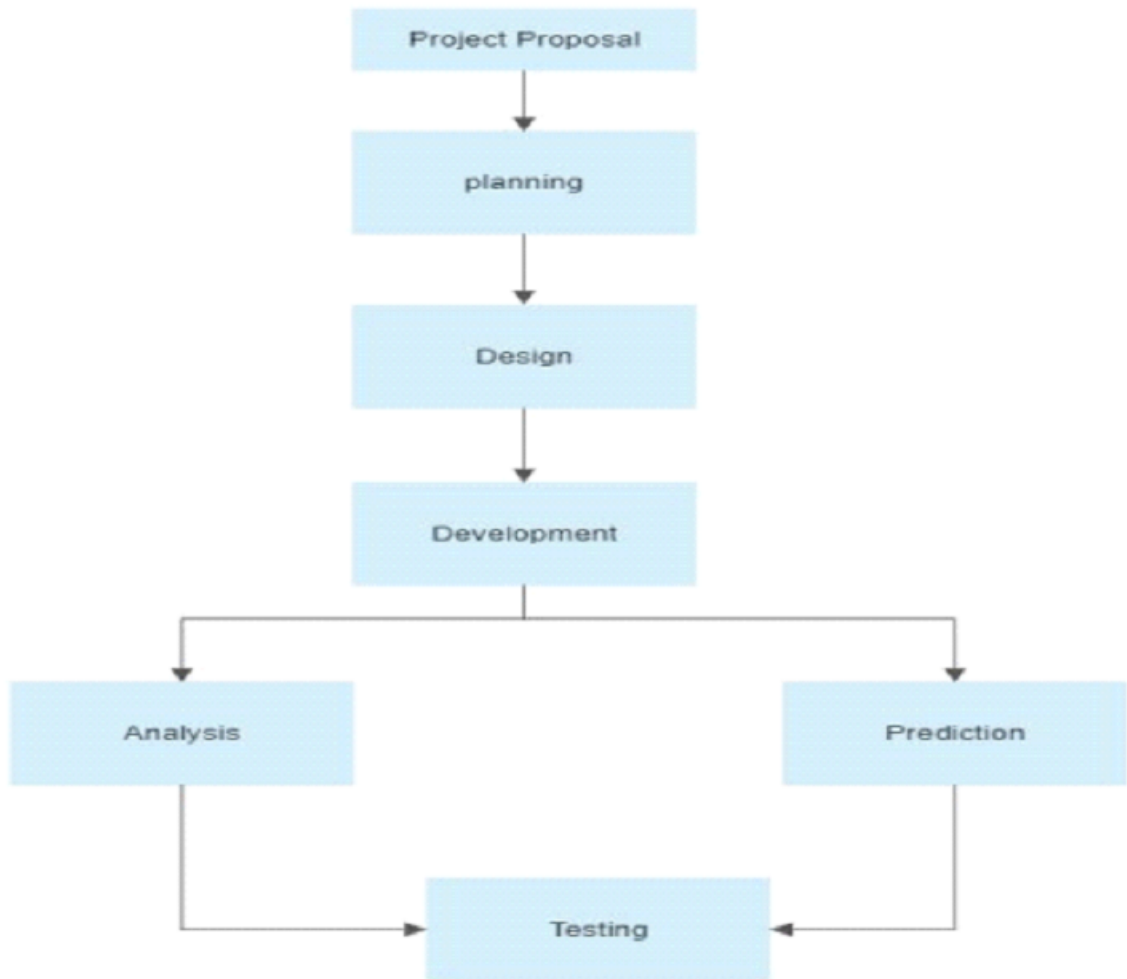


Figure 4.2: Design Methodology

4.3 Activity diagram

An activity diagram serves as a visual representation of a flowchart or data flow diagram, illustrating a sequence of actions or the control flow within a system. In use case diagrams, it can elucidate the procedural steps. These modeled activities can encompass both sequential and concurrent processes, but in both scenarios, the activity diagram will feature an initial state (start state) and a concluding state (end state).

4.4 Sequence diagram

Sequence diagrams depict particular interactions, often referred to as scenarios, involving system components. A scenario constitutes a unique interaction involving a defined set of elements, marked by a distinct sequence of messages exchanged between these modeled elements. By altering the sequence or modifying the messages, you create an entirely new scenario. Sequence diagrams find their utility in conveying interactions between external components and the system as they execute a use case. Furthermore, they're instrumental in representing noteworthy interactions among elements within the system's design.

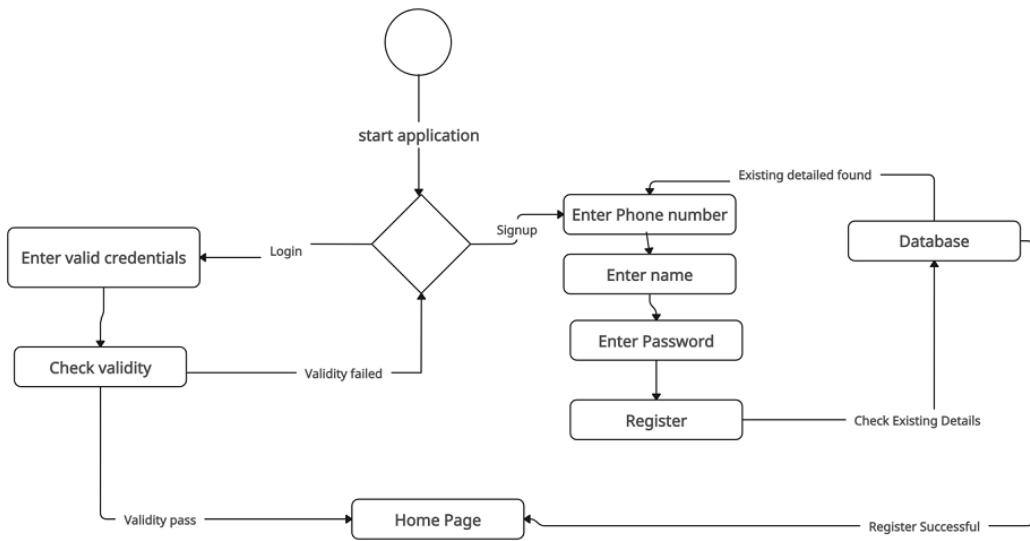


Figure 4.3: login/signup Activity

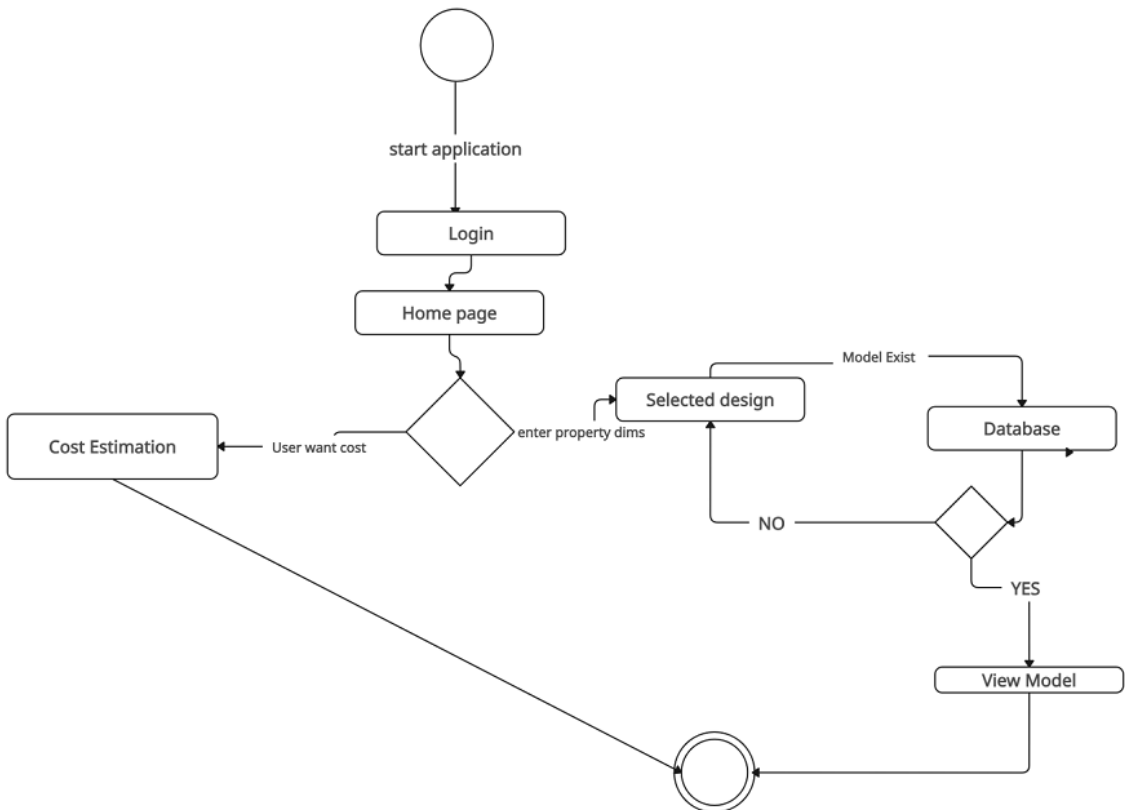


Figure 4.4: Home Activity

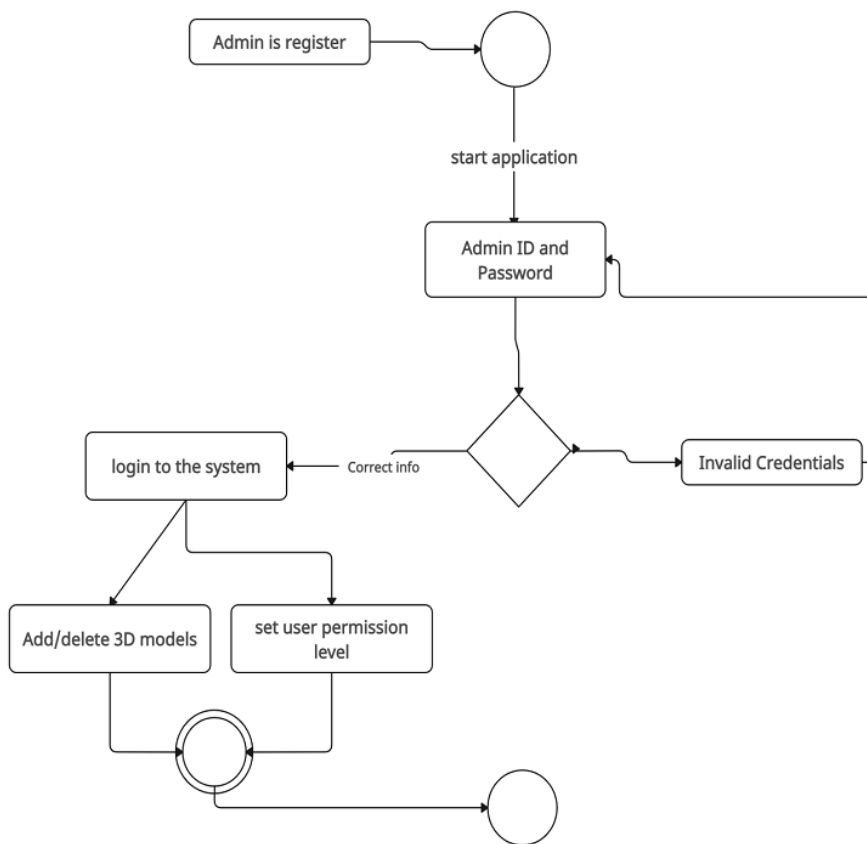


Figure 4.5: Admin Activity

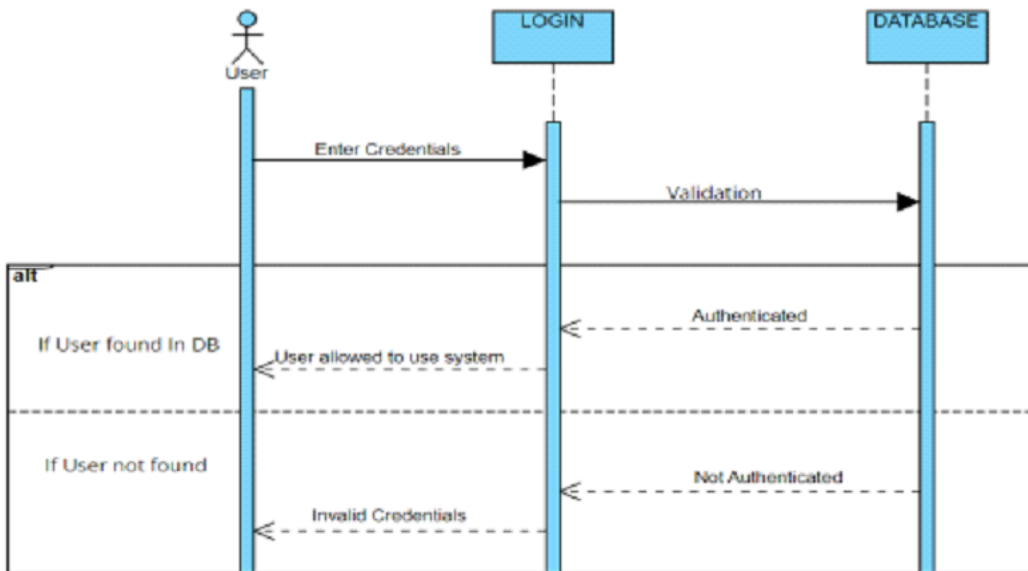


Figure 4.6: Login Sequence Diagram

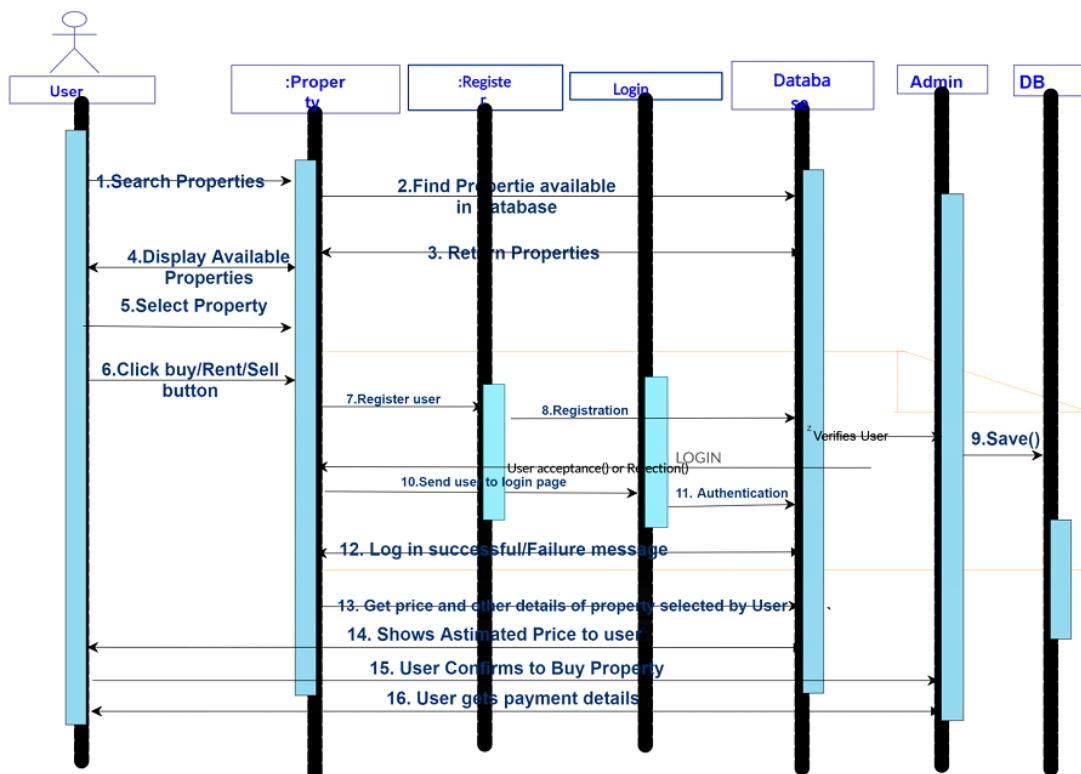


Figure 4.7: Sequence Diagram

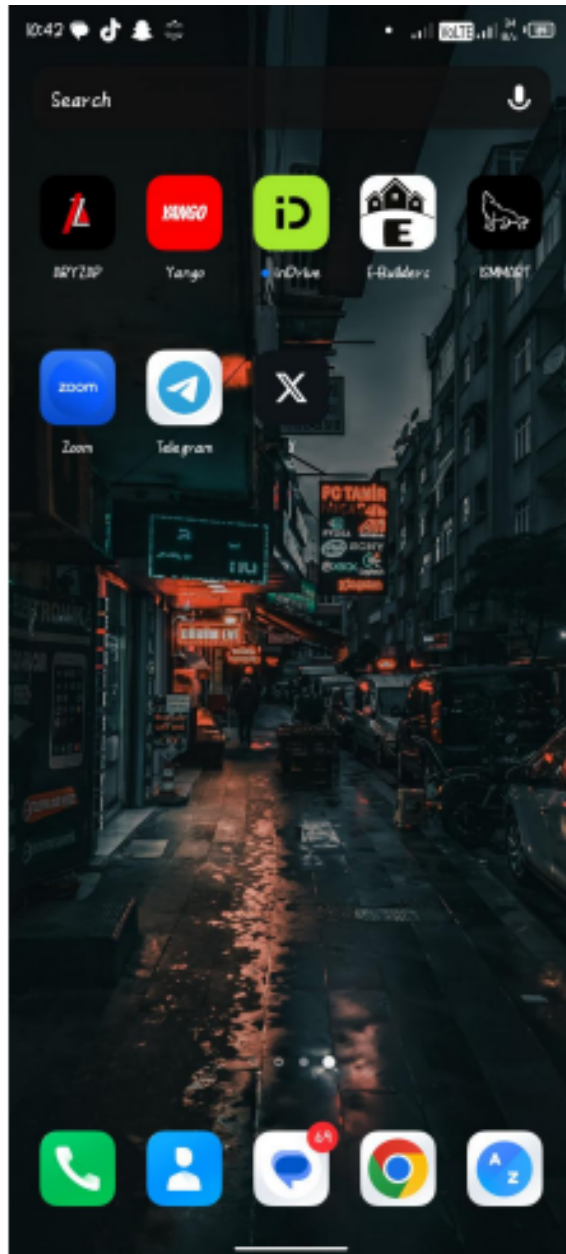


Figure 4.8: This is the Logo of E-Builders

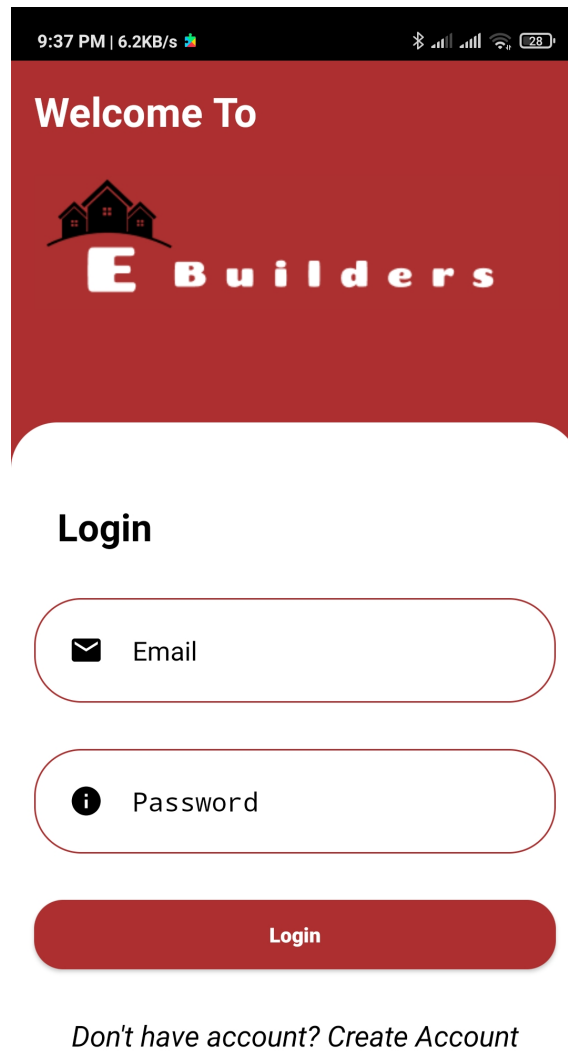


Figure 4.9: Login Interface. User put their Email Password if he/she already registered

9:37 PM | 5.1KB/s

E Builders

Sign Up

Sign UP

Already have account...login

Figure 4.10: user can sign-up by putting name, mail and password

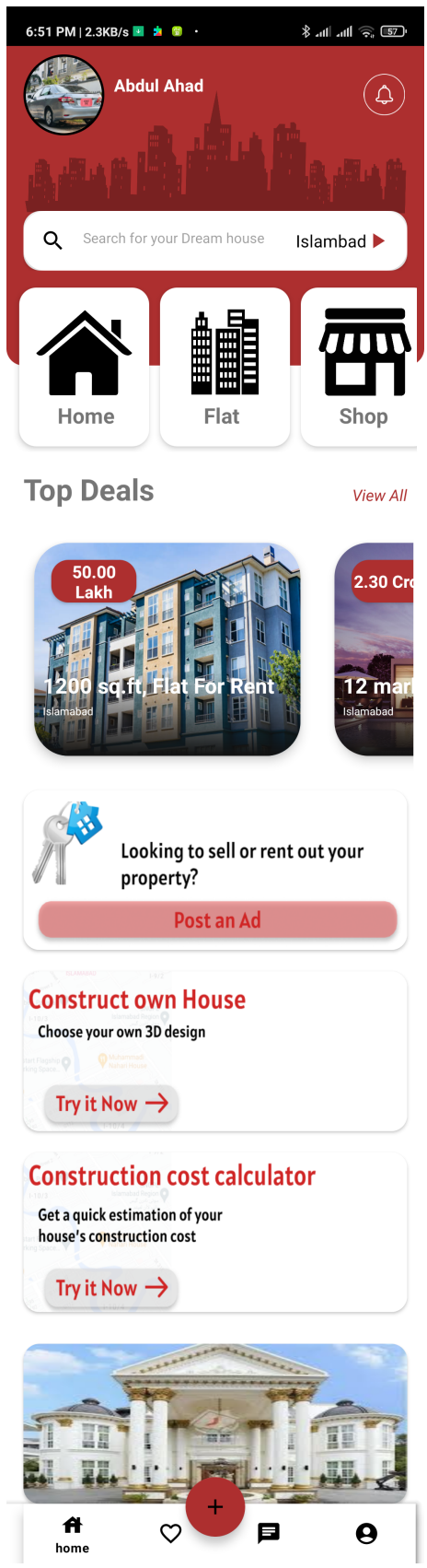


Figure 4.11: home screen of E-Builders

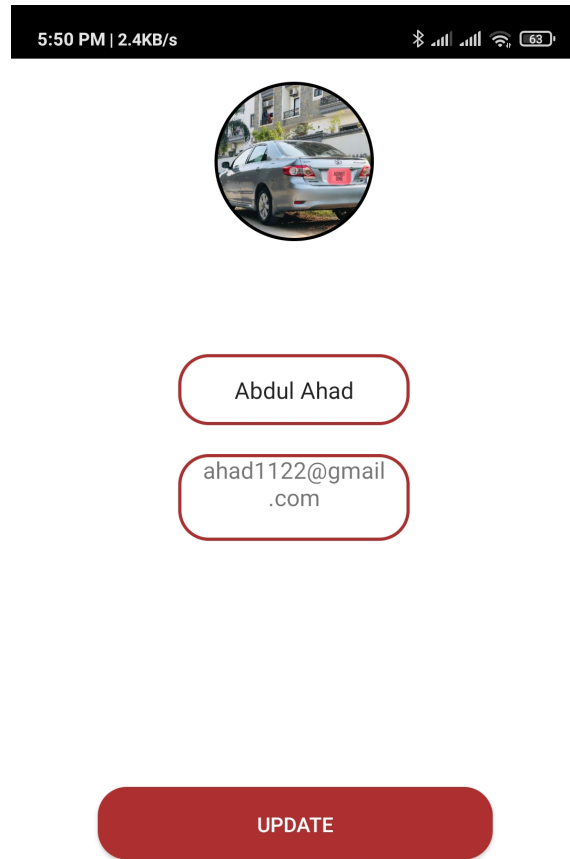


Figure 4.12: User is able to change his DP and name by clicking in account section

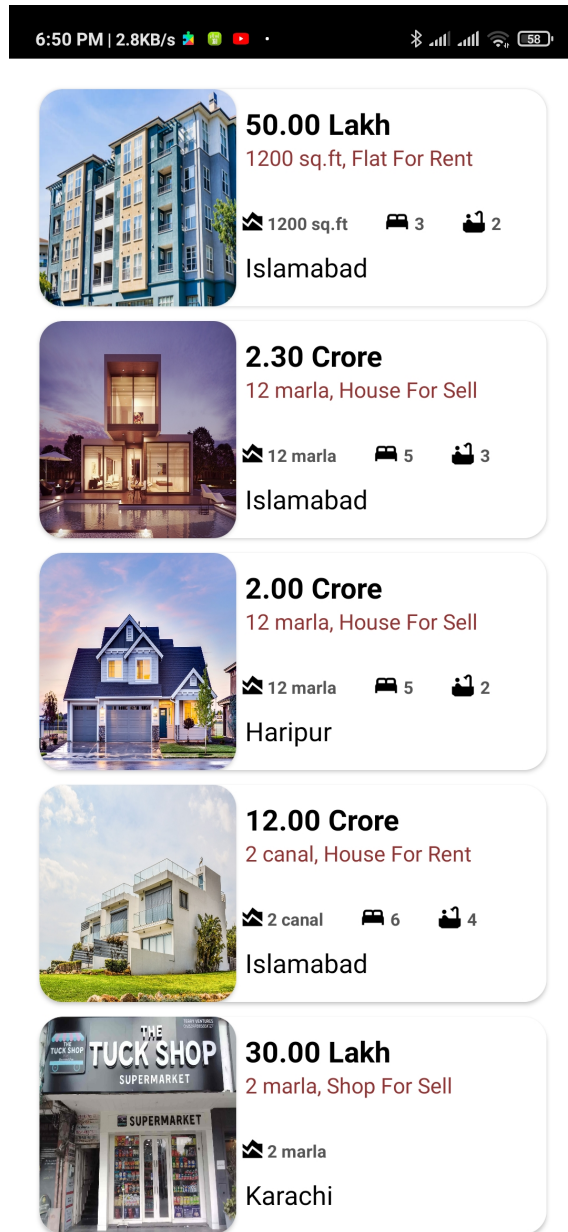


Figure 4.13: All Ad which is posted using this application.

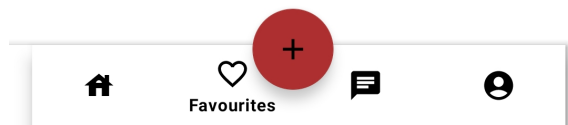
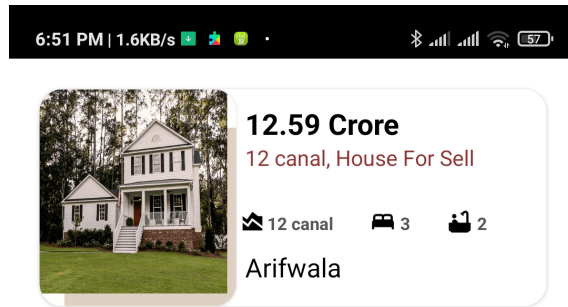
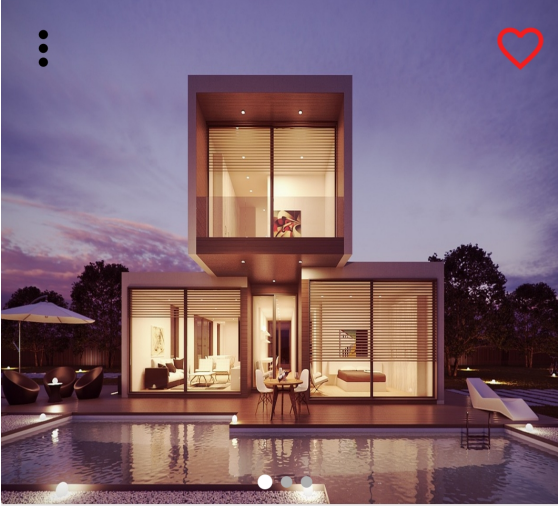


Figure 4.14: This is your favourite Ad and this is listed in your Favourite List

6:51 PM | 3.2KB/s | [Icons] | [Signal] [Wi-Fi] [57]



House for Sell 1 Dec 2023

PKR 2.30 Crore

Islamabad

12 marla House For Sell in Islamabad

[View Full Description](#)

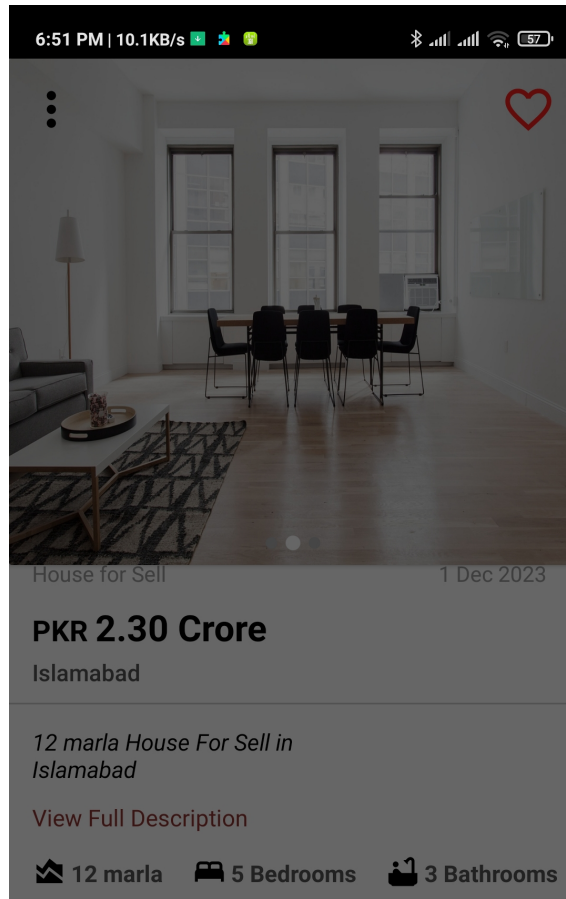
12 marla 5 Bedrooms 3 Bathrooms

just like new

Description:-

is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using

Figure 4.15: when user click on ad, then he is able to view all the info related to ad which is posted



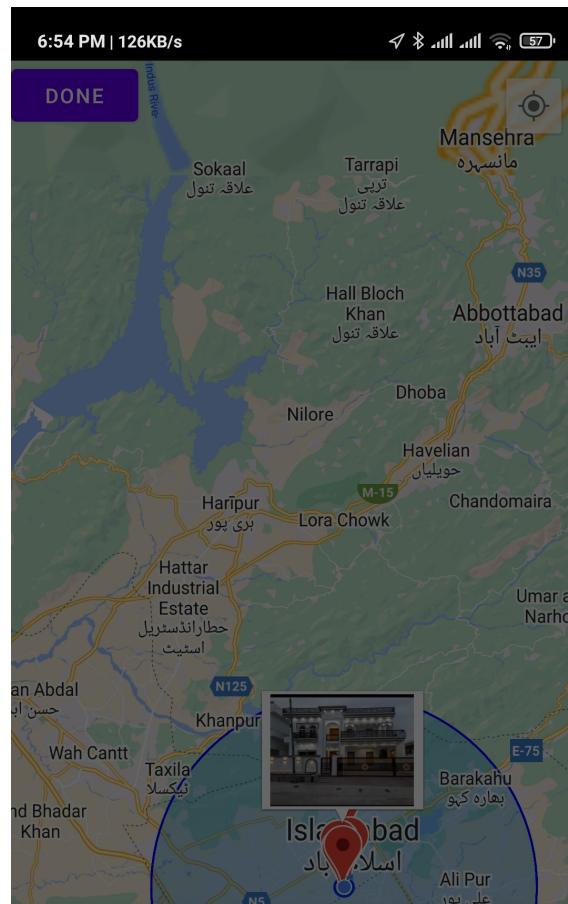
Title and Description

X

12 marla House For Sell in Islamabad

is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using Lorem Ipsum is that it has a more-or-less normal distribution of letters, as opposed to using 'Content here, content

Figure 4.16: Description of posted Ad



12 canal, House For Sell
12.59 Crore

show Ad

Figure 4.17: user are able to see ad by using his location.

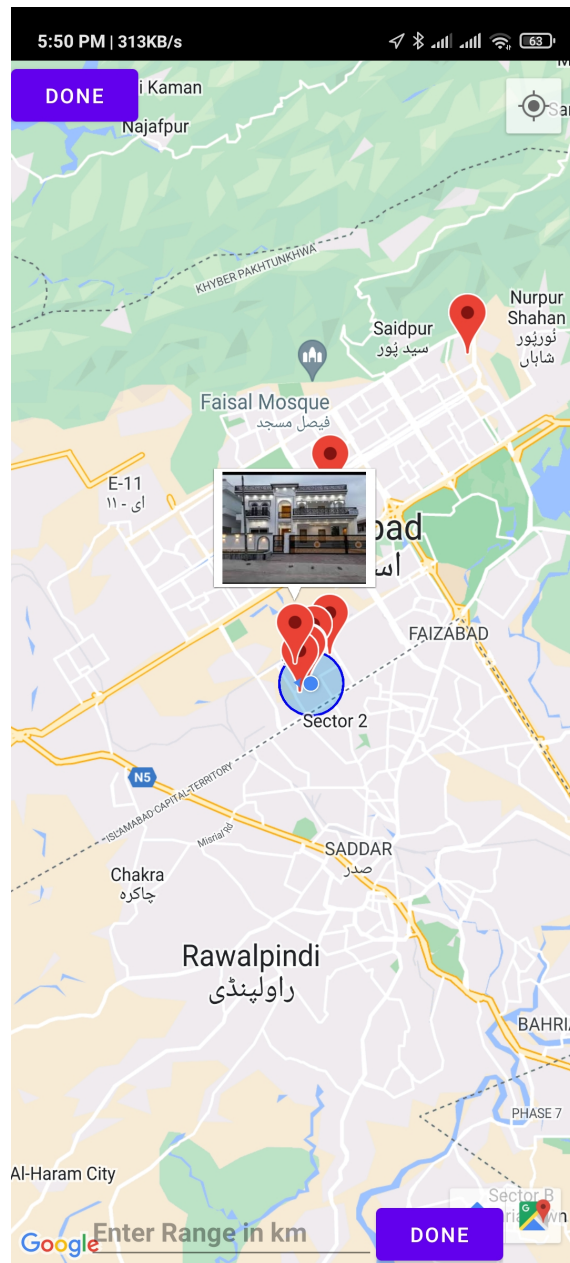


Figure 4.18: user are able to see ad by using his location. They are able to see ad nearby to his current location

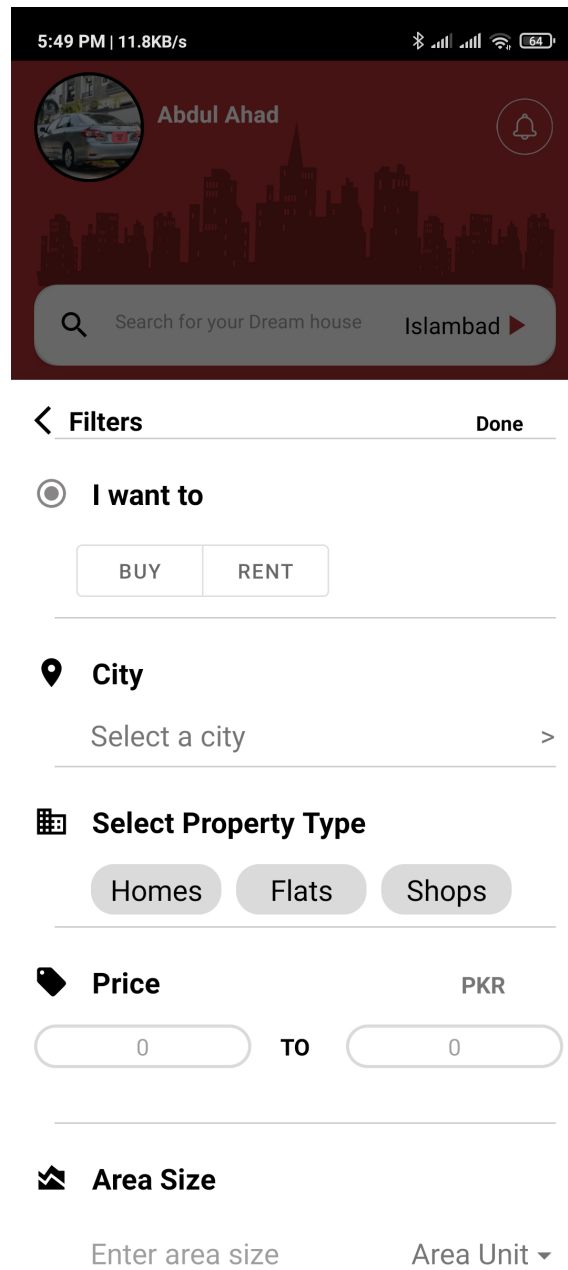


Figure 4.19: user can search just by selecting and ad filters

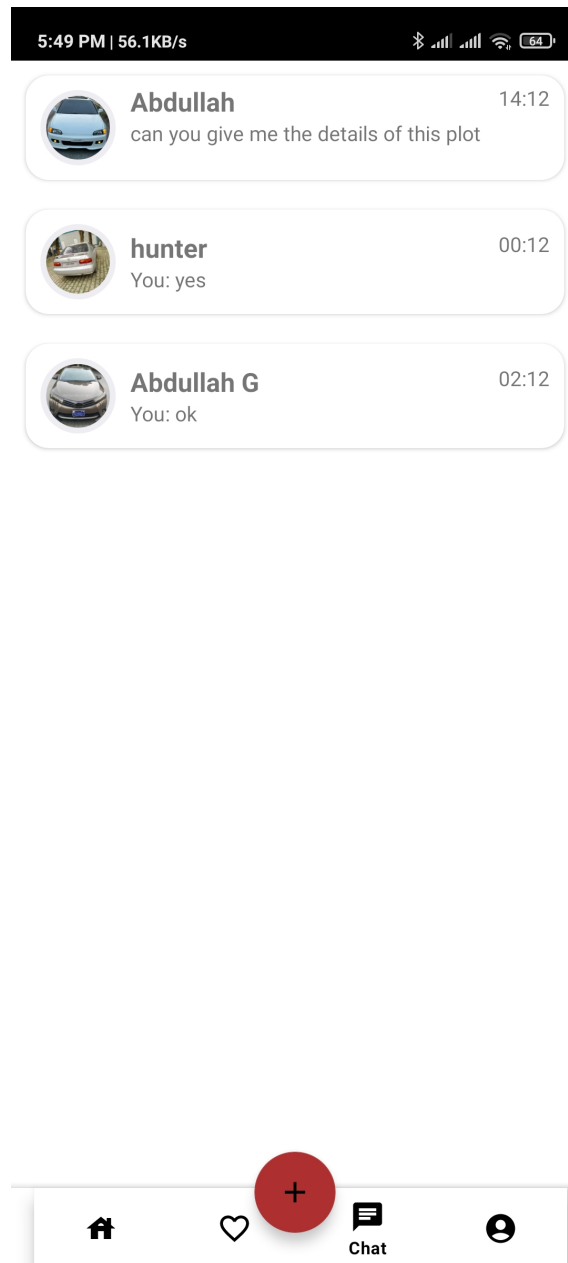


Figure 4.20: user can chat with the owner and ask for more details if he wants

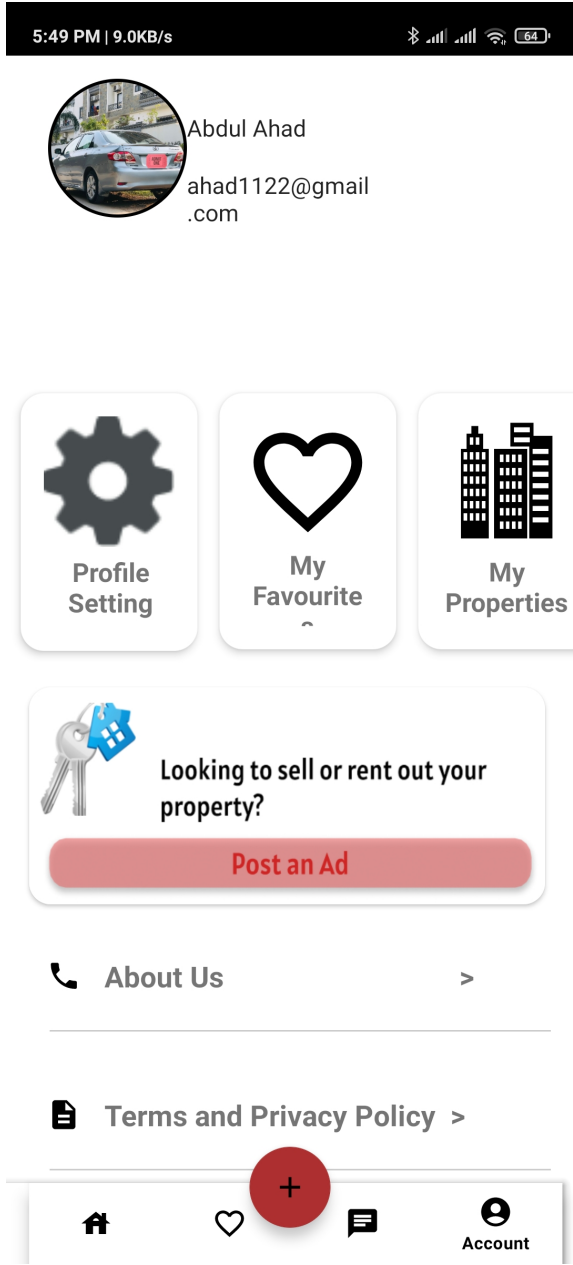


Figure 4.21: User Account

9:33 PM | 0.0KB/s

Post an Ad

Reach thousands of buyers in a few steps.

Purpose

Rent Out Sell

Select Property Type

House Flat

Shop Plot

City

Islamabad >


Geo location >

Click

Area Size


Enter area size Marla ▾

Figure 4.22: user can post his ad by filling this form


9:33 PM | 10.5KB/s 

Post an Ad


Reach thousands of buyers in a few steps.

 **Price**

Enter Amount PKR

 **Bedrooms**


1 2 3 4 5 6 7
8 9 10

 **Bathrooms**

1 2 3 4 5 6


T Property Title

Enter Title e.g Beautiful new house

 **Property Description**


Describe your property in details

Figure 4.23: user can post his ad by filling this form

9:33 PM | 0.2KB/s 

Post an Ad


Reach thousands of buyers in a few steps.

 **Bathrooms**


1 2 3 4 5 6

T **Property Title**

Enter Title e.g Beautiful new house

 **Property Description**

Describe your property in details

 **Features** [+ Homes](#)

Add additional features e.g. parking space, floor, etc

Figure 4.24: user can post his ad by filling this form

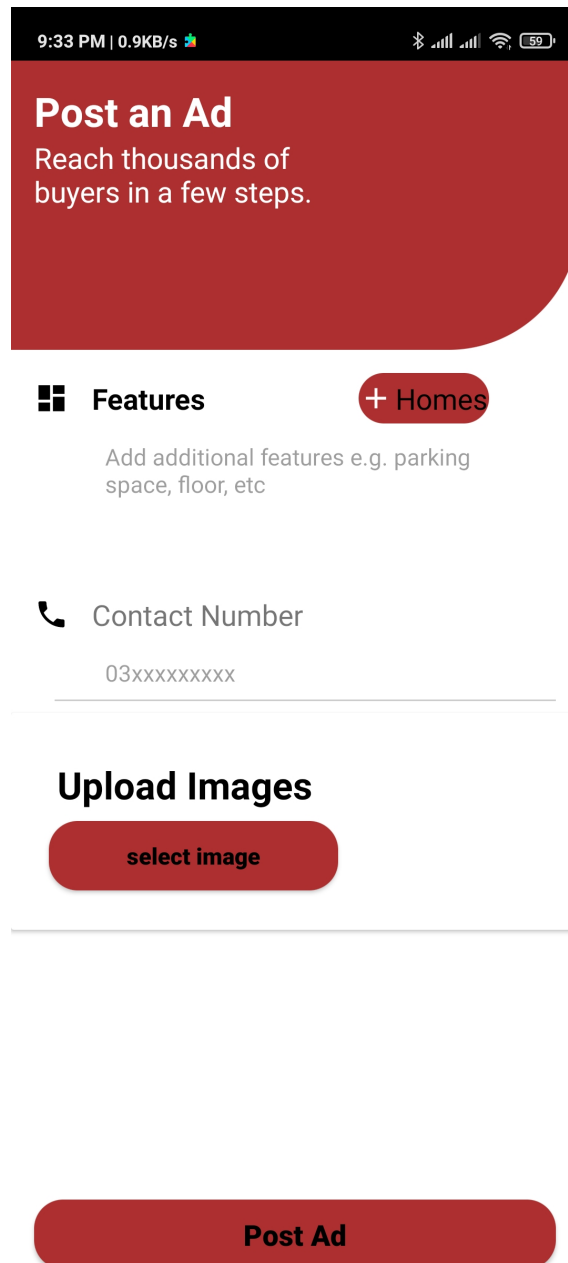


Figure 4.25: user can post his ad by filling this form

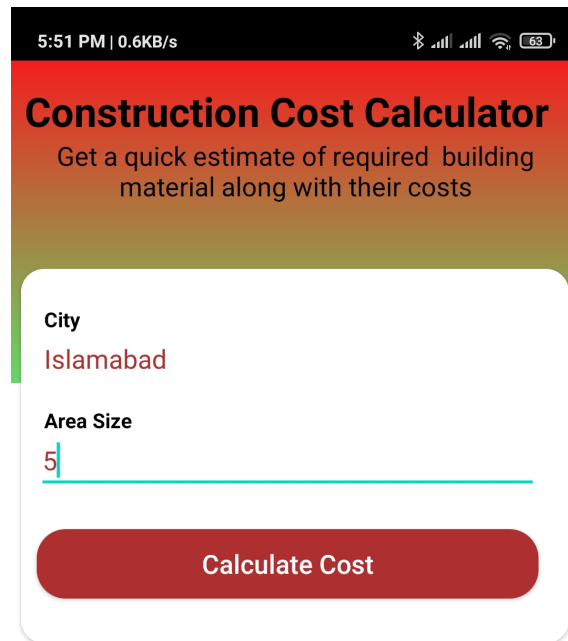


Figure 4.26: Cost Calculator just by put area size in Marla

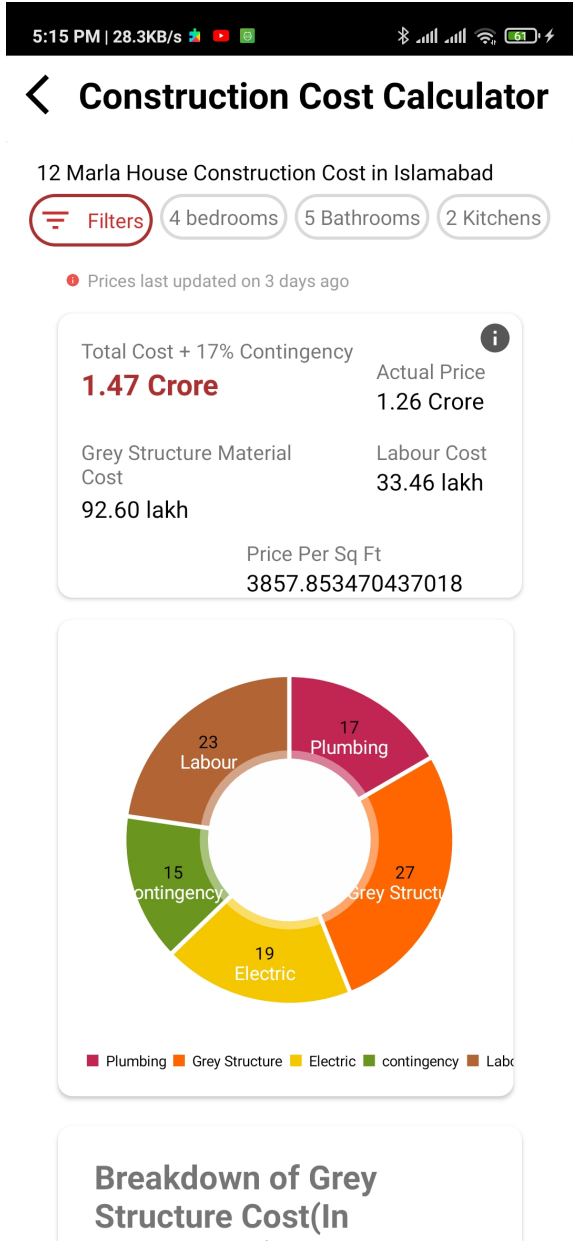


Figure 4.27: estimated cost and complete cost chart

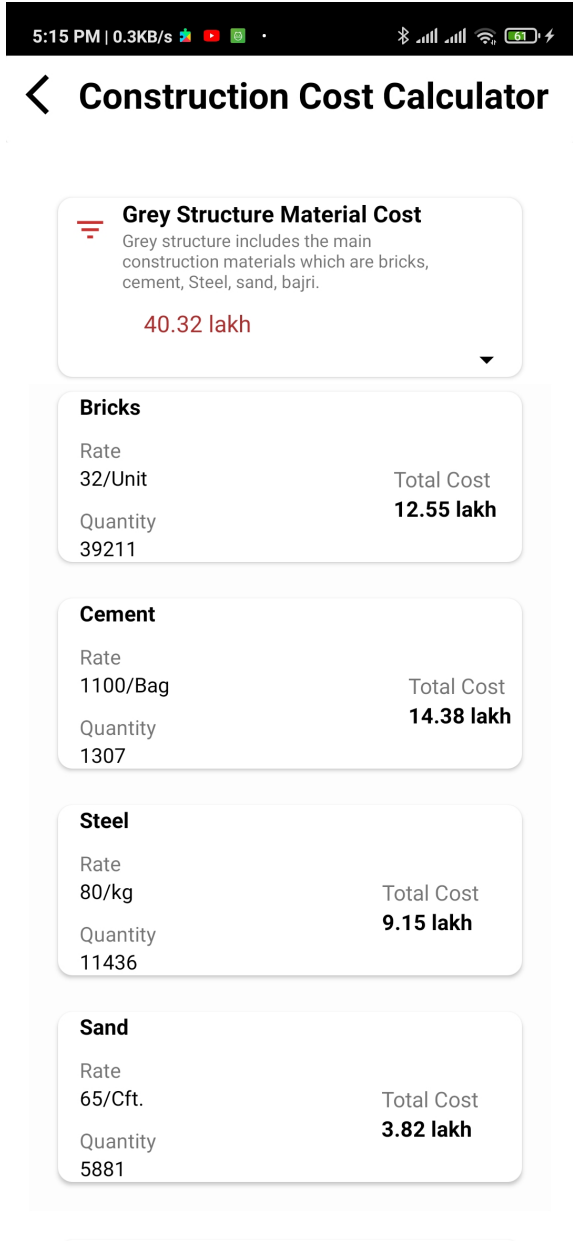


Figure 4.28: estimated cost and complete cost chart

< Construction Cost Calculator

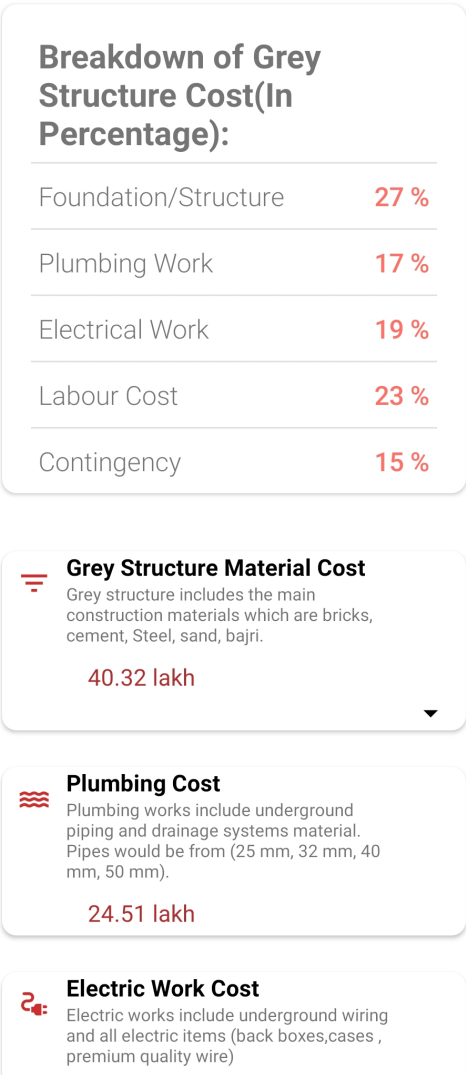


Figure 4.29: estimated cost and complete cost chart

5:15 PM | 0.6KB/s | [Icons] | [Signal] [Wi-Fi] [61] [Battery]

< Advanced Calculation

Area Size

12 Marla ▼

Covered Area ⓘ

3267.6000000000004 Sq.ft ▼

Bedrooms

4 ▼

Bathroom

5 ▼

Kitchen

2 ▼

Living Room

2 ▼

Drawing Room

1 ▼

Calculate Cost

Figure 4.30: estimated cost and complete cost chart

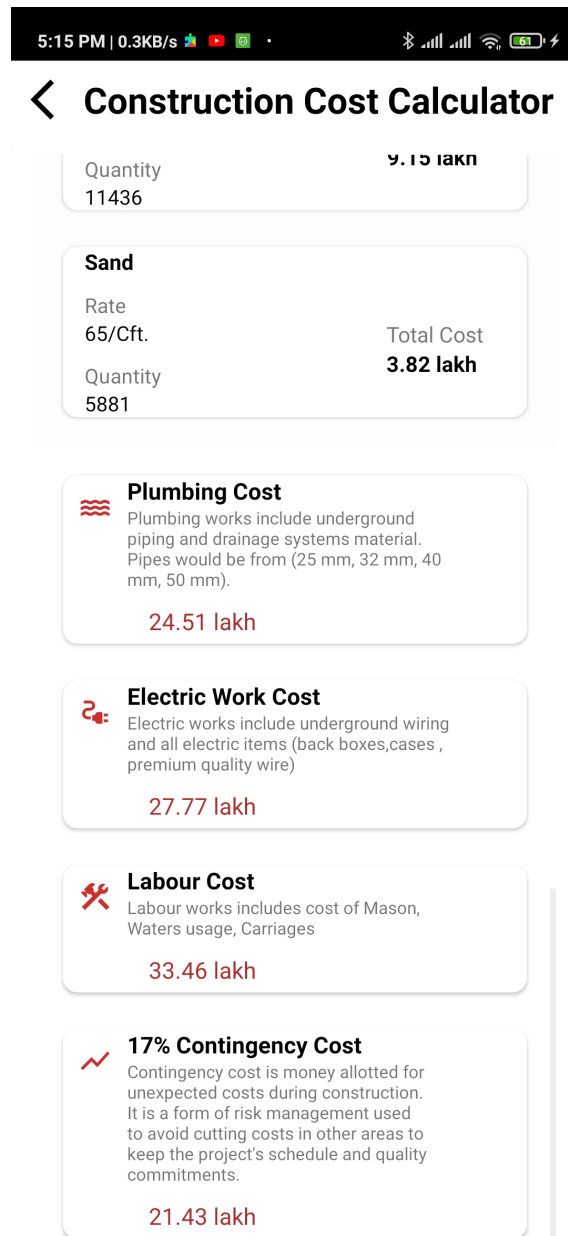
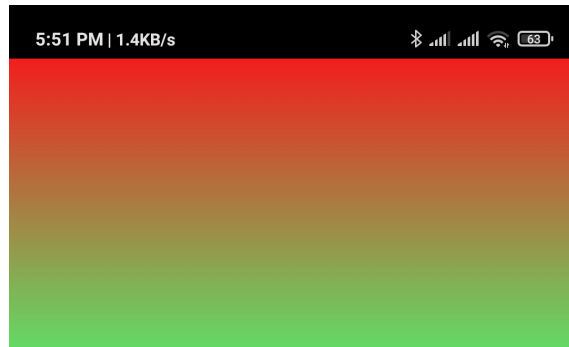


Figure 4.31: estimated cost and complete cost chart



Area Size

5

ENTER

SHOW MODEL IN MY SPACE

Figure 4.32: You can see model just by putting area size in Marla

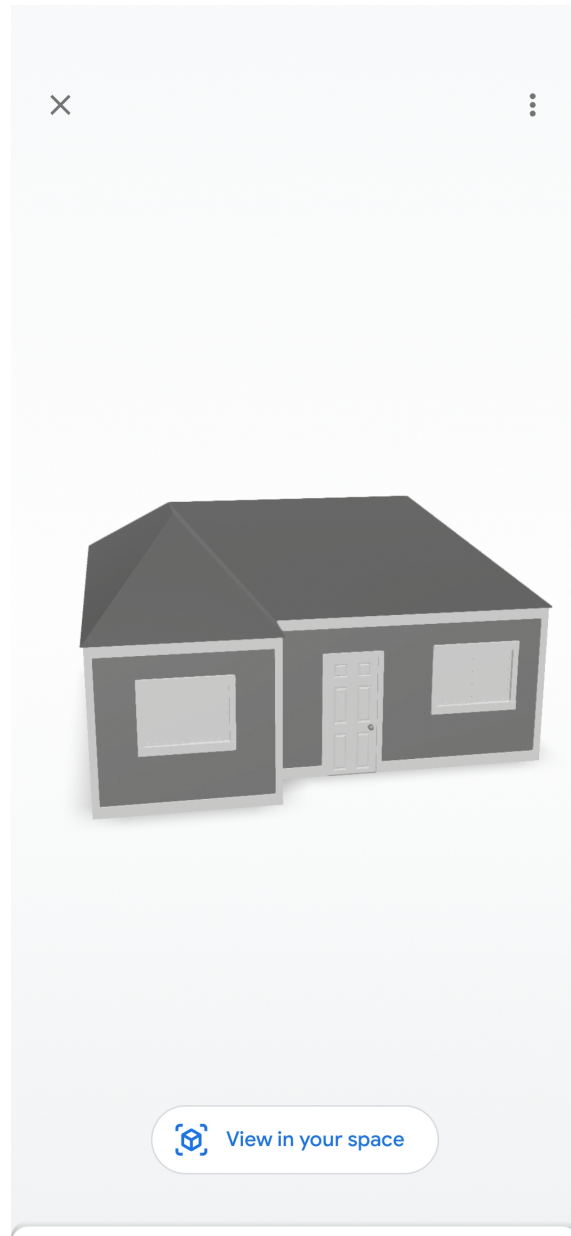


Figure 4.33: 3D model of an house



Figure 4.34: model creation in Blender

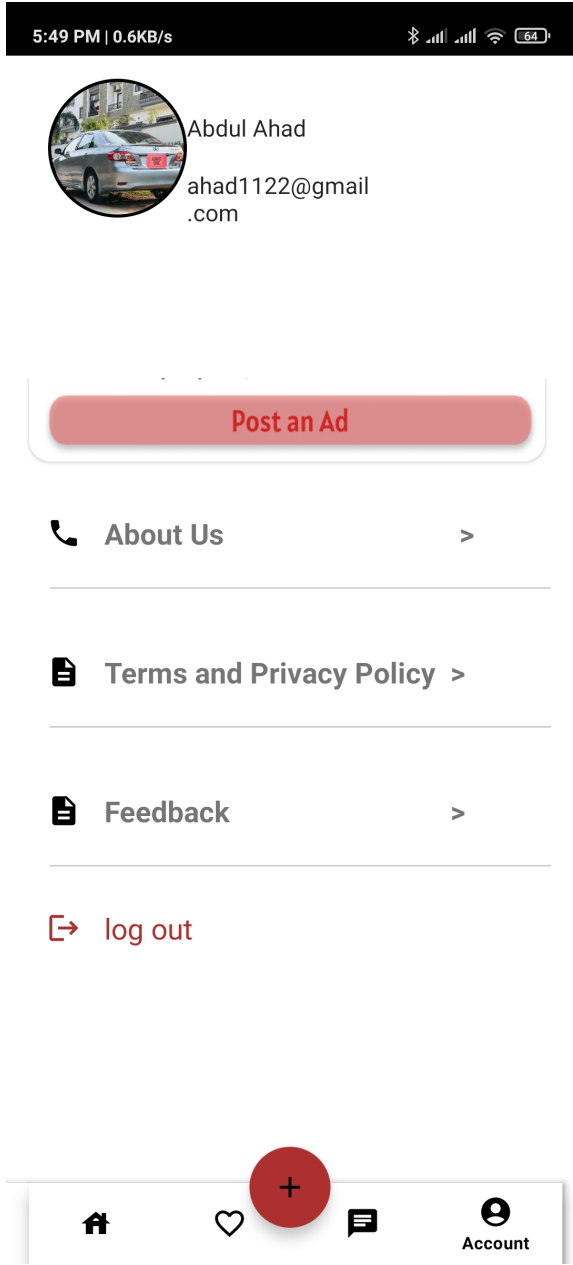
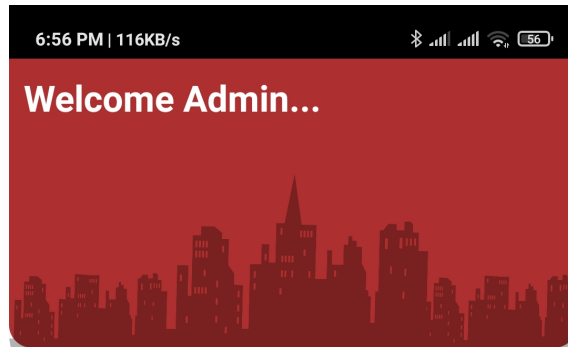


Figure 4.35: user account details






-  Users
-  Listings
-  Material Costs

Figure 4.36: Admin Controls

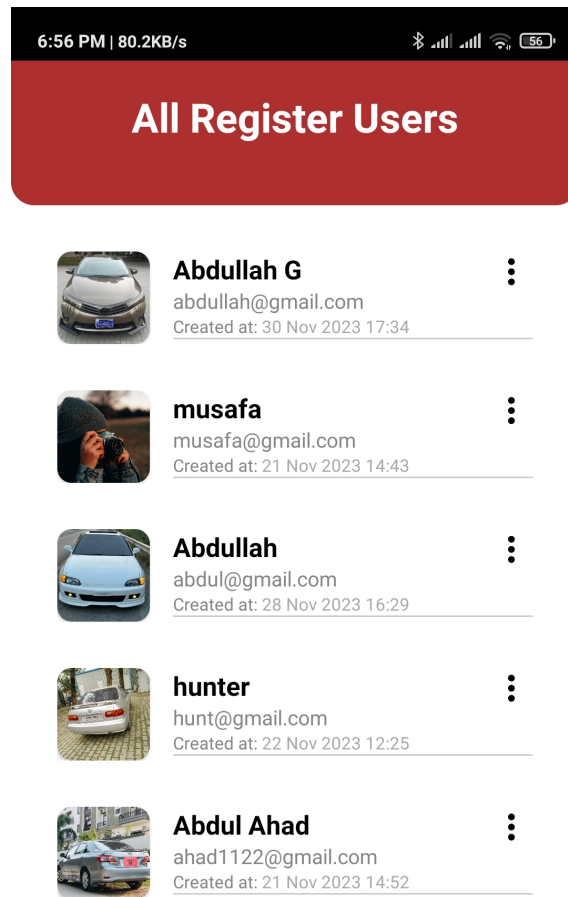


Figure 4.37: Admin can delete the user and adds

6:56 PM | 0.3KB/s

Bluetooth Signal Cellular Signal Wi-Fi Signal 56%

Changing Material Cost

City
Islamabad

1 Brick price
Price in Rs

Cement Price
Price of one bori

Electric Work
Price of electric work per ft

labour price
Price of labour work per ft

Plumbing price
Price of Plumbing work per ft

Sand price
Price of sand work per cubic.ft

Steel price
Price of steel per kg

Update

Show Current Price

Figure 4.38: Admin can change and update the prices of material, according to the current rates

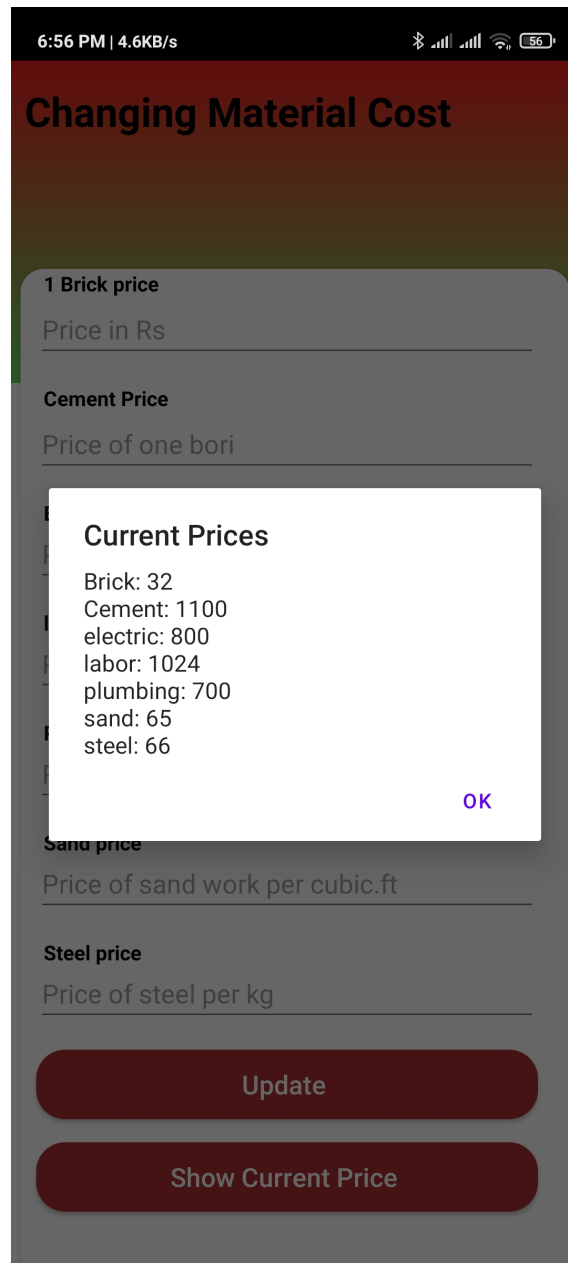


Figure 4.39: Current Prices

Chapter 5

System Implementation

In essence, implementation refers to the transformation of an abstract concept into a concrete reality. When it comes to a computer system, implementation involves the translation of a technical specification or algorithm into a program, software component, or other computer-based system through programming and deployment. In other words, it is the practical application of an idea that results in a functional product or service that can be utilized by end-users.

5.1 System architecture

It defines how the different components of our application will interact with each other and with external systems.

5.1.1 Client-Side (Front-End):

Android App: This is the user-facing part of our application. It is developed using Java and is responsible for the user interface, user input handling, and displaying 3D property models and cost estimates.

5.1.2 Database and (back-end):

User Data: Store user profiles, authentication information, and preferences.

Property Data: Store information about properties, including their size, location, and features.

3D Models: Store the 3D models of properties.

5.1.3 User Interfaces:

User Interface for Property Input: This is where users input property information like size and features.

3D Model Display Interface: The interface for displaying 3D models and the cost estimation results.

5.1.4 Security and Authentication:

Implement user authentication and authorization mechanisms to secure user data and ensure that only authorized users can access certain features.

5.1.5 Communication:

Use secure communication protocols (e.g., HTTPS) to ensure data privacy and security.

5.2 Tools and Technology Used

To successfully finalize this project, we utilized a range of different strategies and tools, including Blender and Android Studio. The following is a comprehensive list of the methodologies and resources that we employed:

5.2.1 Android Studio

Android Studio is the official Integrated Development Environment (IDE) for Android app development. It provides a comprehensive set of tools for developing, testing and debugging Android applications. You can use Java or Kotlin to program the front end of your app.

5.2.2 Blender

Blender is a popular and open-source 3D modeling and animation software. It's a powerful tool for creating 3D models of properties, interior designs, and other assets for your real estate app. You can use Blender to generate the 3D models that will be displayed in your app.

5.2.3 Firebase Database

Firebase is a popular choice for the back end of mobile applications, offering services such as real-time database, authentication, cloud storage, and hosting. It provides a robust

back-end infrastructure, which can handle data storage for your app, including user data, property information, and potentially 3D models.

5.2.4 OpenGL ES

Using OpenGL ES (Embedded Systems) for rendering and displaying 3D models in your Android app is a suitable choice. OpenGL ES is designed for mobile devices and offers hardware-accelerated graphics rendering. It's commonly used for 3D rendering in Android applications.

Chapter 6

System Testing and Evaluation

The testing phase of a website's development cycle is undeniably crucial as it plays a critical job in verifying the website's functionality, efficiency, and accuracy. The primary objective of testing is to identify any potential flaws or shortcomings within the system/application and determine if any improvements are necessary to ensure optimal performance and user satisfaction. It is also essential to find out if the system is user-friendly or not. Fundamentally, testing goes about as a litmus test to evaluate the general nature of the site and approve its preparation for delivery to general society. Without legitimate testing, an app's success could be imperiled, and its reputation tarnished due to glitches, errors, faults and other technical malfunctions. Therefore, putting sufficient time and assets into testing is basic to ensure the app's smooth activity and ideal execution.

6.1 Documentation Testing

The initial phase of our testing process involved a rigorous examination of our documentation, a stage known as documentation testing. This step was critical to ensure that the document we had developed was in line with the precise requirements of our app. We have conducted a comprehensive review of the document to verify its accuracy and completeness, making sure it provides a clear and precise guide on how to effectively utilize the system. This document covered all relevant details, from the initial preparatory phase to the execution phase, ensuring that users could easily navigate the application. This thorough assessment of our documentation laid the groundwork for our subsequent testing procedures, giving us the confidence to push ahead with certainty and a solid starting point until the end of our testing processes.

6.2 Functionality Testing

The primary objective of implementing this approach is to ensure the smooth operation of the application in alignment with the specified requirements. We have achieved this

by conducting a comprehensive examination of the app's various components to verify the functionality of all links, eliminating any broken or redundant links and activities. We also scrutinized the internal links to ensure their accuracy in guiding users to the intended pages. Our attention to detail guarantees a seamless user experience, free from technical issues or obstacles while navigating through the application. Through the precise and thorough execution of this approach, we established a robust foundation for optimal app functionality and user satisfaction.

6.3 Integration Testing

Integration testing ensures that our app functions as coherent and seamless. It helps catch issues related to data flow, communication, and compatibility between different components. By addressing these issues during the integration testing phase, we reduced the risk of critical problems arising in the production environment. 6.4 Usability Testing Usability testing entails the evaluation of a user's capability to interact with our application, including the user's ability to operate the app, input information accurately, and effectively interpret the output. In our testing procedure, we conducted a thorough usability test to gauge the user-friendliness of our application. We systematically evaluated each activity to assure its clarity and ease of navigation, rigorously tested the functionality of all buttons for responsiveness and functionality, and confirmed that users could seamlessly navigate back to the home page from other activities, ensuring a clear and smooth navigation route. By scrutinizing these usability aspects, we could identify any potential issues and implement necessary enhancements to optimize the user experience, thereby ensuring user satisfaction.

6.4 Graphic User Interface Testing

The Graphical User Interface (GUI) is crafted to simplify the interaction between humans and an application, providing users with the ability to click on different options and buttons. Additionally, the GUI encompasses visual elements, including color schemes, design patterns, fonts, and user-friendliness, all of which collectively enhance the user experience and facilitate more effective communication between people and computers.

6.5 Guerilla Testing

Guerilla testing is a technique involving the selection of individuals at random and providing them with access to an application. The aim is to gather feedback regarding any obstacles in human-computer interaction that may affect the user experience. To enhance both the User Interface (UI) and User Experience (UX) and resolve user concerns, we engaged numerous participants from both within and outside the university. Their valuable insights enabled us to enhance the website and introduce innovative solutions.

6.6 White Box Testing

This testing ensures the efficiency and complexity of the Source Code. Keeping in mind the time and memory of the hardware system. It also includes testing of coding capabilities of the developers.

6.7 Test Cases

Name	LCS-T1
Description	Signing up by the user
Pre-Conditions	Password and username should be different and unique
Steps	Username is entered by User Password is entered by user confirm password is entered by the user Submit button is clicked
Expected Results	Signs up successfully
Actual Results	Signs up successfully
Status	Pass

Figure 6.1: Test Case I: Login/Signup

Name	LCS-T2
Description	Login by the user
Pre-Conditions	user needs to be signed up
Steps	Username is entered by the user Password entered by the user Submit button is clicked by the user
Expected Results	Successfully logged in
Actual Results	Successfully logged in
Status	Pass

Figure 6.2: Test Case II: Login

Name	LCS-T3
Description	Dashboard must be the current viewed page
Pre-Conditions	user must be signed up and then Logged in
Steps	Any option is selected by the user Or user logs out
Expected Results	Option selected is executed successfully
Actual Results	Option selected is executed successfully
Status	Pass

Figure 6.3: Test Case III: Dashboard

Name	LCS-T4
Title	Cost Estimation
Description	The system should be able to provide correct cost estimate of construction of house and building to the user according to the plot size.
Steps	1. Run application. 2. Navigate to Cost estimation screen. 3. Cost estimation screen.
Expected Result	User is able to get the estimate cost for Construction of house.
Actual Results	It predict equitant cost according to latest prices
Status	pass

Figure 6.4: Test Case IV: Cost Estimation

Chapter 7

Conclusions

New people are entering this market every day and they lack the necessary knowledge required before investing. They are afraid that they might invest in the wrong property and suffer loss. By keeping all this in mind we are creating a support system that will help them a lot and keep them from worrying.

"Our app represents a significant advancement in the way people engage with property development. By enabling 3D modeling, cost estimation, and seamless data communication, we've created a tool that empowers users to visualize and plan their real estate projects more effectively. The project has followed agile principles, ensuring a user-centric approach and a rigorous integration testing phase to confirm seamless functionality. Looking forward, we see boundless opportunities for future enhancements and innovations in the dynamic real estate sector. We owe gratitude to our team, mentors, and advisors for their support. Our app is not just a project but a transformation tool poised to impact the real estate landscape."

7.1 Future Improvements

This is a rough draft of the application. The application can be further Improved with more functionalities; we can improve the system in Following ways:

- Better GUI
- More functionality
- More platform IOS
- Real-time 3D models.
- Augmented Reality
- Block-chain for Property Transactions
- Integrate mobile app with website

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