FINAL YEAR PROJECT REPORT

BS (SOFTWARE ENGINEERING)

BANKING CHATBOT

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MARCH 2024

FACULTY OF ENGINEERING, SCIENCE AND TECHNOLOGY

DEPARTMENT OF SOFTWARE ENGINEERING

FINAL YEAR PROJECT REPORT

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ABSTRACT

This project presents the design and implementation of a cutting-edge banking chatbot tailored to cater to diverse linguistic preferences, particularly in Urdu and English. The chatbot is meticulously engineered to offer an intuitive and user-friendly interface, ensuring seamless interaction with users across various demographics. Leveraging advanced machine learning algorithms, the chatbot dynamically adapts to user queries, providing accurate and relevant responses in real-time. The chatbot encompasses a comprehensive range of banking services, including inquiries about loan policies, account opening procedures, and associated details/forms. By integrating natural language processing techniques, the chatbot adeptly handles inquiries in both Urdu and English, thereby enhancing accessibility and inclusivity for a broader user base. Key features include an interactive feedback mechanism, allowing users to provide input and refine the chatbot's responses over time. Furthermore, the chatbot employs sophisticated machine learning models to continuously enhance its conversational capabilities, ensuring an enriched user experience and improved efficiency in addressing banking-related queries. In conclusion, the development of this multilingual banking chatbot represents a significant advancement in customer service within the banking sector. Its seamless integration of multiple languages, user-friendly interface, and machine learning-driven intelligence position it as a pivotal tool for facilitating banking interactions and enhancing customer satisfaction in diverse linguistic environments.

We have approved this manuscript for submission and presentation as fulfillment of Bachelor of Software Engineering/ Computer Science.

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Supervisor: Sir Fahad Najeeb

Date: 10-03-2024

_____

Project Coordinator: Dr. Aarij Mahmood Hussaan

Date: 10-03-2024

DECLARATION

I hereby declare that the work has been done by myself to fulfill the requirement of the BS (Software Engineering) and no portion of the work contained in this report has been submitted in support of any application for any other degree or qualification of this or any other university or institute of learning.

I hereby further declare that in the event of any infringement of the provision of the Act whether knowingly or unknowingly the university shall not be liable for the same in any manner whatsoever and undertake to indemnify and keep the university indemnified against all such claims and actions.

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LIST OF ACRONYMS

1. NLP = Natural Language Processing
2. NER = Named Entity Recognition
3. NLTK = Natural Language Tool Kit
4. BOG = Bag of Words
5. NLU = Natural-Language Understanding
6. ATM = Automated Teller Machine
7. XML = Extensible Markup Language
8. UX = User Experience
9. UI = User Interface
10. HTTP = Hypertext Transfer Protocol
11. DIET = Dual Intent Entity Transformer
12. TED = Transformer Embedding Dialogue

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CHAPTER – 1

1.0 Introduction:

Now a days as the technology is increasing day by day, every one has the accessibility of smart phones, tablets and the internet services and it is very natural that everyone in this world is now using this technology. The things which are changing significantly are the reason of the internet services, in the same banking sectors wants to reduce the rush and without any conflict they want to resolve the query of their customer and in the very low time to target maximum amount of customer and resolve their queries.

For this concern to reduce rush in banks with the help of technology it has shifted to the online platform, a human interaction BANKING CHATBOT, which will transform customer questions into a correct answer through this CHATBOT using AI Technology. Problems like customer want to know the details of account, or want to open an account, to know about loan policies customer has to visit bank for every little query and to contact service but because of high traffic of customer rush increased in banks and customer can't contact on service center.

Chat-bots in the past have been developed many times but they weren't used by any banks. They didn't cover a single specific banking field. So, if the user asks a query related to a specific field the chat-bot will not understand it. Our chat-bot will be used by bank customers. They will ask queries related to account opening and loan policies. This is how we will overcome banking chat-bot weakness.

Previously Study showing that the challenges users were facing that there was no voice chat bot, organization were targeting only specific area for their users, most of the Chat Bots were in the text form user use to write the whole paragraph in the form of text and then after evaluation of the text chat Bot reply according to it. This is main factor or challenge users facing a delay of time.

Most of the users are not familiar to the system, which is not easy for them to accessing the Chat Bot, which increase crowd in the bank area and wrong use of language by the customer.

To make previous Chat Bots more efficient as related to the enhancement in response time including voice chat as a human interaction. Customer can get the things done by online and can get all the information and policies of banking system which includes ATM Locator, Branch Locator. Proper bank details by online are the need of the customer in this technology era and to remove over extra rush from the banks.

So, after all these consequences our goal is to develop an android application to remove these conflicts in the banking sector which will definitely impact the growth of the Banking sector. This application has great potential for improving the banking sectors.
We will develop a Chat-bot using Python Libraries. As, it will help users to get responses on their hand-held devices rather than going into the bank and waiting in a queue. It will be an AI powered Chat-bot which will reply user according to their queries.
It will introduce new terms of banking sector, and help the customers to resolve the queries on time without visiting to bank because nowadays every customer wants that their problems should reduce by the online services.

This bot will help user to get all the details regarding how to open an account, the user can ask queries to take information related to account opening policy and loan policy. The Bot will respond accordingly to customer. Our Bot will also help to find the nearest ATM and Branch locator. This will benefit the customer to stand by on hold or wait for business hours and they no longer have to visit the branch for routine questions and tasks. This will also benefit the banks as the bot will do customer retention.

1.1 Scope of the Project:

The main objective is to provide service to the bank customer to get complete information about all the policies of bank by online Chat Bot System, goal it to make sure the availability of this service 24/7 with the immense knowledge and response customer without any delay.
Features includes sub-phases of this system are to help customer in finding the nearest ATM and Branch of bank. Simple task to be perform by customers to register in this system and if customer wants to open an account so they can fill the basic account opening form.

1.2 Motivation:

To make previous Chat Bots more efficient as related to the enhancement in response time including voice chat as a human interaction. Customer can get the things done by online and can get all the information and policies of banking system which includes ATM Locator, Branch Locator. Proper bank details by online is the need of the customer in this technology era and to remove over extra rush from the banks.

CHAPTER – 2

2.0 Introduction:

In this chapter, determining the right approach is essential to the development of any software system to ensure that the deadline is effective. At each stage of the project the requirements are clearly defined.

The incremental model is the most appropriate development method I can use for this project. The flexibility of the mounting model makes this project a good one as it is likely that new needs will be identified during the later stages of development and each duplicate construction makes it easier to implement new requirements throughout the development process.

This software approach came from the waterfall model. The app was built, upgraded, and tested using a growing construction phase. At the end of each construction, a foundation or element will be built. Each build will last a few weeks to produce a basic version of the app.

Feedback can be provided in any category and requirements. Errors or errors found in the application can be resolved at any stage of the development process.

To determine the application requirements, data collection must be performed Log out to find out what the end user wants the system to be able to do and what.

The user hopes to accomplish through the app. There are many ways to gather information, including:

2.1 Survey:

The survey contains a variety of questions such as closed-ended questions in which the user is asked to select options / boxes. Open-ended questions allow the user to express his or her opinion or provide any answer he or she deems appropriate. Other types of questions can be used as grades and scales that can be used to measure how strong a user can feel. Tests can be disrupted using email, the internet, research-based papers.

2.2 Proto-Type:

This approach can be useful in situations where the requirements are vague. This allows the end user to experience and get an impression of the system and determine whether it meets their needs. Developers will meet with the user to identify the system requirements and investigate what requirements that can be established. The prototyping approach allows the developer to get a deeper

understanding of the requirements through continuous communication and each prototype iteration or cycle.

2.3 Artificial Intelligent Methods:

1. NLP (Natural Language Processing) is a theory motivated range of computational techniques, for the automatic analysis and representation of human language. It has made great advancements in Machine Learning based systems to be able to extract meaning from natural language utterances.

2. Named Entity Recognition (NER) is the task of finding every instance of a named entity in text and labels its type in order to classify it correctly. Establishing the context of the user's message is important that allows the chat bot to deal with the situation.

3. Part of Speech Tagging: It involves assigning a label to each word of the user input with its part of speech (e.g.: noun, verb, adjective etc.). This is additionally used in response generation in order to outline the POS object type of the expected response made by the chat bot.

Using these methods will help BOT to work accurately, to perform all the actions correctly and responsive. There also other techniques which will apply on BOT to bring high percentage of accuracy in BOT.

2.3.1 Pre-processing:

. By using the NLTK library, the library which has been used for the purpose of Natural Language Processing. On because of the user input, will be in E n g l i s h, we have to let the machine to understand the query language that we used for the Natural Language Processing. Then to decrease further processing and to removing the ambiguity caused due to use of same word of different forms, we are using this pre- processing technique. Those steps included in this task are: Removing punctuation marks and extra spaces

2.3.2 Tokenization

The method Tokenization that we have used in the process is used to generate a sequence of words from user's input query. Removing stop words - Most of the common words like 'want', 'are', 'can', which we don't need to be considered while processing is re-moved for improving the performance of system.

2.3.3 Lemmatization–

By using the Word Net Lemmatize method for getting all the lemma (which means root form of the word) of the token. e.g. ’processing’ and ’processes should be considered as equal while processing. So, for getting ’process’ from ’processing’, the method lemmatization is used.

2.3.4 Vectorization:

On using the Bag of Words (BOG) we have converted our text data to vectorized format concept. BOG is a method, which has been used for preparing text for input to our machine learning algorithm. This BOG model develops a vocabulary from all of the documents which has been used and then model each document by counting number of times.

These techniques will be implemented through RASA NLU and CORE because Rasa is important in building great AI assistants

Rasa provides the necessary infrastructure and tools for efficient, robust, and efficient operational assistants. With Rasa, all developers can build better text-to-speech assistants.

2.4 Flow of the system

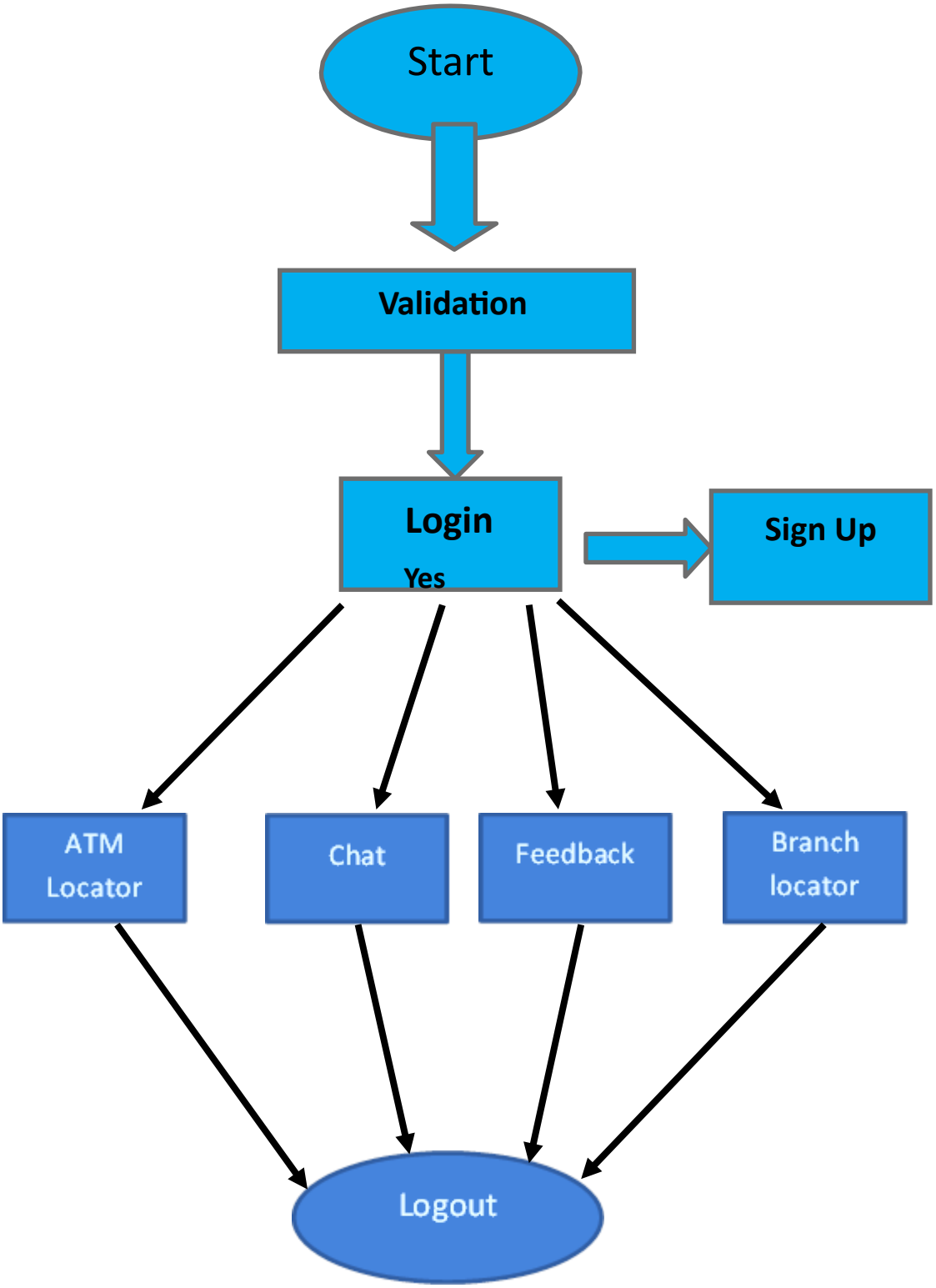


Figure 1 (Flow of the System)

This is the flow diagram of Banking-Chatbot which describes how the application works. Whenthe app starts it validates the username and password if the username and password are Authenticated it will successfully login the user; otherwise, it will ask them to sign up to use the features of the app.

Once the user has successfully logged in to the app there will multiple features which are shown in the above figure. If the user selects the chat option a chat will appear where user can ask questions related to account opening policies and loan policies. The Chatbot will reply with suitable answer to the user's question. User can ask queries in both text and voice.

The second option is of ATM Locator which will show the ATM located nearest to the user's current location.
The third option is of Branch locator which will show the nearest Branch of bank with respect to the user's current location.
The last option is of feedback which will allow the user to give feedback about the app and how the chatbot responded them. Was the answer accurate enough or not.

All these options will have a logout option which will lead to end the session of the user from the app.

2.5 New Features:

As compare to other bots in our application there are some new features will be surely helpful for the Bank Customer.

Features include helping customer in finding the nearest ATM and Branch of bank. Simple task to be perform by customers to register in this system and if customer wants to open an account so they can fill the basic account opening form.

Key benefits:

1. Bank Customers.
2. Online bank policies by chatbot.
3. Biggest problem to reduce rush in banks.
4. It helps in catering a huge amount of target audience at the same time 24/7.

5. Offering customers to talk with chat bot and get basic information

There can be Role of only Bank Customer as an App user, who will sign up through this App and use the features of this which include ChatBot with whom user can chat and get all the details regarding Account opening and Loan policies. User can also use the feature of finding nearest Branch and ATM by Branch and ATM locator Feature.

According to the user Requirements we will provide all the ease to the Bank Customer to resolve their queries by this app through chatting, no need to visit banks on daily basis and also a benefit for Banking Sector to reduce rush in their banks. Following are the Functional Requirements which are to be very important for this application.

2.6 Hardware and Software Requirements:

The following are the hardware & Software Requirements for ChatBot:

1. Android 8.0 (OREO)+ version
2. Ram: 1 GB
3. Your device must have Internet Connection
4. You must have enabled your location.

2.7 TOOLS & LANGUAGES

- Android Studio
- Adobe Photoshop
- XML
- Java
- Firebase
- Python

2.8 Functional Requirement:

Chatting:

Not a simple Chabot, It will answer according to the user requirement with a high percentage of accuracy.

Branch Locator:

It will help user to open an account to the nearest branch from his/her house.

ATM Locator:

Easy to find nearest ATM from the house.

Feedback:

To bring more enhancement in the system by getting feedback from the users.

Login:

User will have their own interface with various options.

Signup:

A signup panel for the new users which don't have an account in the app.

Administrative System:

A panel for admin through which he can update, add or delete users. Make modifications to the user's panel.

Loan Policies:

App will have general loan policies. A user which will apply for Loan will have to read and accept the policies before processing any further.

Account Opening Details/Form:

Some user who wants to open an account. We will have their basic details through which we can have their lead and the bank will further take care of the customer.

2.9 Non-Functional Requirements:

User-Interface:

The UI should be more appealing and furthermore the UX will also be taken care of.

Memory:

The memory of the app should be compatible with the phone with low specifications for e.g.: 1 GB RAM.

Security:

The data of the user should be secured for e.g.: Using HTTP Protocols and be sure that the APIs used are verified for the platform the bot is developing on.

Exception Handling:

Handling future problems which might occur from the user-end for e.g.: Raised when the user hits the interrupt key, when the user uses a slang language.

Capability:

Chat bot will understand the user demand on high accuracy percentage for e.g.: 90% accuracy.

Response Time:

It will respond immediately to the user requirement/ questions for e.g. the average time would be 10 seconds.

Availability:

Chabot's can be operational and ready to engage with their define target 24/7.

CHAPTER – 3

3.0 Introduction:

In this chapter we see the rapidly evolving landscape of banking, customer service and accessibility are becoming increasingly crucial. To meet these demands, the implementation of chatbots has become a prevalent strategy. This project aims to design and develop a chatbot tailored specifically for the banking sector, addressing customer inquiries, providing assistance, and enhancing overall user experience. The project plan encompasses the initial design phase, outlining key objectives, methodologies, and considerations for the development of an efficient and effective banking chatbot.

3.1 Project Plan & Initial Design:

There are five modules of our project

1. Documentation
2. Chatbot
3. Frontend
4. Chatbot Customization
5. Accuracy

3.2 Documentation

In this part of the project, we will do the research of the project what we have to do in this project and how to achieve the scope of the project within the given time period. We will try to complete this phase of the project within 15-20 days

3.3 Chatbot

This is the main part of the project and challenging one to create an effective bot who can give

accurate response to the user on the given query and it may get us more time to complete it. We will try to complete this phase of the project within two months if any problem not occurs.

3.4 Frontend

In this part of the project, we will create user interference. Challenge to make a UI design which is Attractive and give a good image of chatbot to the user. We will try to complete this phase of the project within one month.

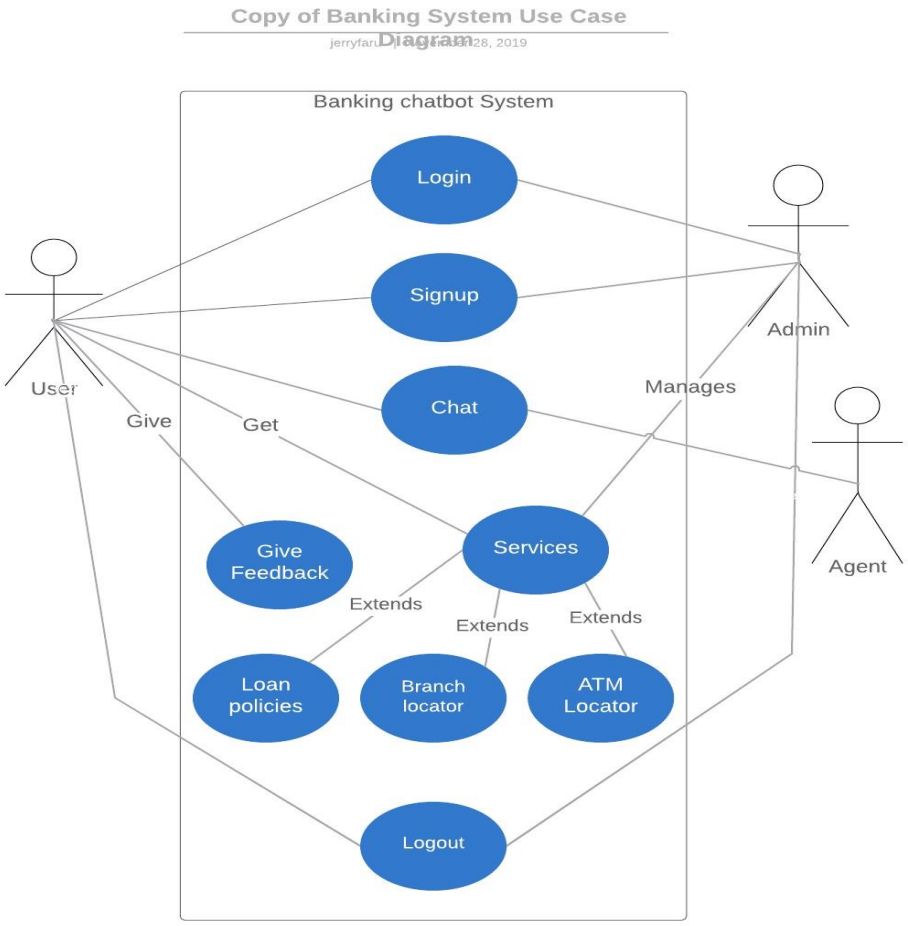
3.5 Chatbot Customization

In this phase of the project chatbot customization will be done. We will customize our chatbot related to banking queries only. We will try to complete this phase of the project within 20-25 days.

3.6 Accuracy

The challenging part of our project has to get accuracy in the chatbot and make a bot to give accurate answer to the question. We will try to complete this phase of the project within 20-25 days.

3.7 Use Case Diagram:



4 **Figure 2 (Use Case Diagram)**

3.8 Use Cases

Use Case Name	Customer Support	
Use case ID	UC-CS-001	
Actors	Customer	
Brief Description	This use case describes the process of a customer seeking assistance from the banking chatbot for general inquiries or issues related to their account or banking services.	
Pre-conditions		
Post-conditions	The customer is logged in or can access basic functionalities of the chatbot without authentication	
Normal flow of event	Actor Actions	System's Response
	1. Customer initiates a conversation with the banking chatbot by accessing the chat interface. 2. Customer greets the chatbot and provides a brief description of the issue or query requiring assistance.	1. The chatbot acknowledges the customer's greeting and prompts them to describe the issue or query in detail. 2. The chatbot analyzes the customer's input using natural language processing (NLP) techniques to understand the intent of the inquiry.

Table 1: Use case 1

Use Case Name	Transaction Assistance	
Use case ID	UC-CS-002	
Actors	Customer: The user who initiates the transaction inquiry.	
Brief Description	This use case describes the process by which a customer interacts with the banking chatbot to receive assistance with a transaction-related inquiry.	
Pre-conditions		
Post-conditions	The customer must have access to the banking chatbot platform.	
Normal flow of event	Actor Actions	System's Response
	1. The customer launches the banking chatbot application.	1. The chatbot greets the customer and prompts them to provide details about the transaction they need assistance with.

Table 2: Use case 2

Use Case Name	Feedback and Surveys	
Use case ID	UC-CS-003	
Actors	Customer (Primary Actor) Banking Chatbot (System)	
Brief Description	This use case describes the process by which a customer provides feedback or participates in a survey through the banking chatbot.	
Pre-conditions		
Post-conditions	The customer must have access to the banking chatbot interface.	
Normal flow of event	Actor Actions	System's Response
	1. The customer initiates a feedback or survey request by selecting the corresponding option from the chatbot menu or interface.	1. The banking chatbot acknowledges the customer's request and presents available feedback/survey options.

Table 3: Use case 3

Use Case Name	Integration with Messaging Platforms	
Use case ID	UC-CS-004	
Actors	Customer, Banking Chatbot	
Brief Description	This use case describes the interaction between a customer and a banking chatbot through a messaging platform such as WhatsApp, Facebook Messenger, or Telegram.	
Pre-conditions		
Post-conditions	The banking chatbot is integrated with the selected messaging platform.	
Normal flow of event	Actor Actions	System's Response
	1.The customer opens the messaging platform (e.g., WhatsApp) and initiates a conversation with the banking chatbot by sending a message.	1.The banking chatbot receives the message from the customer on the integrated messaging platform.

Table 4: Use case 4

Use Case Name	24/7 Availability	
Use case ID	UC-CS-005	
Actors	Customer/User and Banking Chatbot	
Brief Description	This use case describes the scenario where a customer requires assistance or information from the banking chatbot at any time, regardless of the hour, ensuring 24/7 availability.	
Pre-conditions		
Post-conditions	he banking chatbot system is operational and accessible.	
Normal flow of event	Actor Actions	System's Response
	1. The customer launches the banking chatbot platform/application.	1. The banking chatbot acknowledges the customer's request and greets them.

Table 5: Use case 5

Use Case Name	ATM and Branch Locator	
Use case ID	UC-CS-006	
Actors	Customer: The person seeking to locate an ATM or branch of the bank.	
Brief Description	This use case describes how a banking chatbot assists a customer in locating the nearest ATM or branch of the bank.	
Pre-conditions		
Post-conditions	The banking chatbot is operational.	
Normal flow of event	Actor Actions	System's Response
	1. The customer initiates a conversation with the banking chatbot.	1. The chatbot acknowledges the customer's request and prompts them to provide their current location or enter a specific address or postal code.

Table 6: Use case 6

Use Case Name	User Authentication (Sign-In)	
Use case ID	UC-CS-007	
Actors	User and Banking Chatbot	
Brief Description	This use case describes the process by which a user signs in to their banking account using the banking chatbot.	
Pre-conditions		
Post-conditions	The user has a registered account with the bank.	
Normal flow of event	Actor Actions	System's Response
	1. User: Initiates the sign-in process by accessing the banking chatbot interface.	1. User: Enters their username and password into the chatbot interface.

Table 7: Use case 7

Use Case Name	Account Registration (Sign-Up)	
Use case ID	UC-CS-008	
Actors	User and Banking Chatbot	
Brief Description	This use case describes the process of a user registering for a new account through the banking chatbot.	
Pre-conditions		
Post-conditions	The user has access to the banking chatbot platform and intends to create a new account.	
Normal flow of event	Actor Actions	System's Response
	1. The user initiates the account registration process by opening the banking chatbot application or accessing the chatbot through a supported platform.	1. The banking chatbot welcomes the user and presents the account registration options.

Table 8: Use case 8

Use Case Name	Two-Factor Authentication (2FA) Setup	
Use case ID	UC-CS-009	
Actors	User and Banking Chatbot	
Brief Description	This use case describes the process of setting up Two-Factor Authentication (2FA) for a user's banking account through interaction with the banking chatbot.	
Pre-conditions		
Post-conditions	The user must have a registered account with the bank.	
Normal flow of event	Actor Actions	System's Response
	1. The user initiates the process of setting up 2FA by accessing the security settings through the banking chatbot interface.	1. The banking chatbot acknowledges the user's request and provides information about the importance of 2FA for account security.

Table 9: Use case 9

Use Case Name	Account Verification	
Use case ID	UC-CS-0010	
Actors	User and Banking Chatbot	
Brief Description	This use case describes the process by which a customer verifies their account with the banking chatbot.	
Pre-conditions		
Post-conditions	The customer must have initiated the account verification process.	
Normal flow of event	Actor Actions	System's Response
	1. Customer initiates the account verification process by interacting with the banking chatbot.	1. The banking chatbot acknowledges the customer's request for account verification and prompts them to provide the required information.

Table 10: Use case 10

3.9 Prototypes:

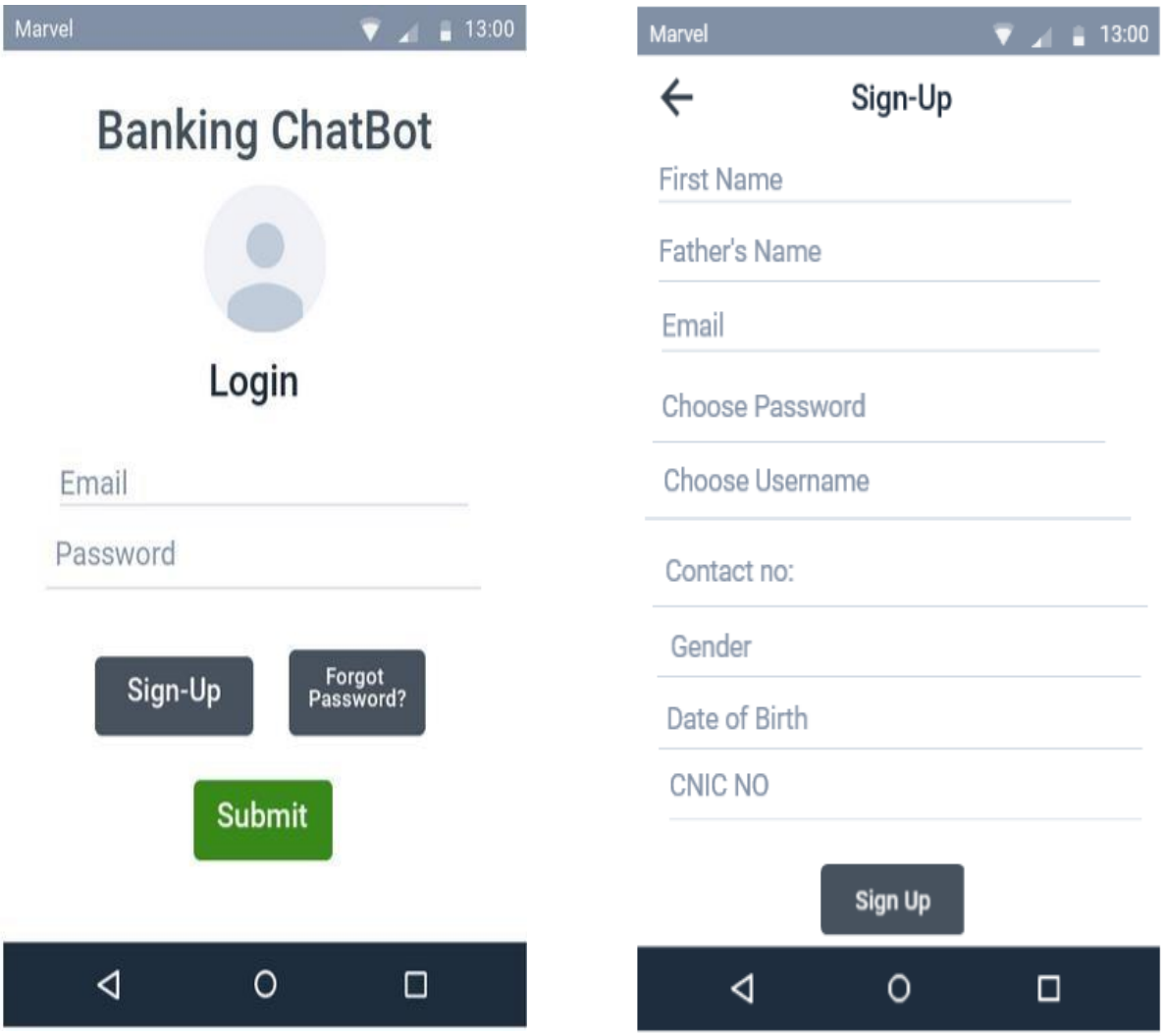


Figure 4 (Chat Bot Prototype)

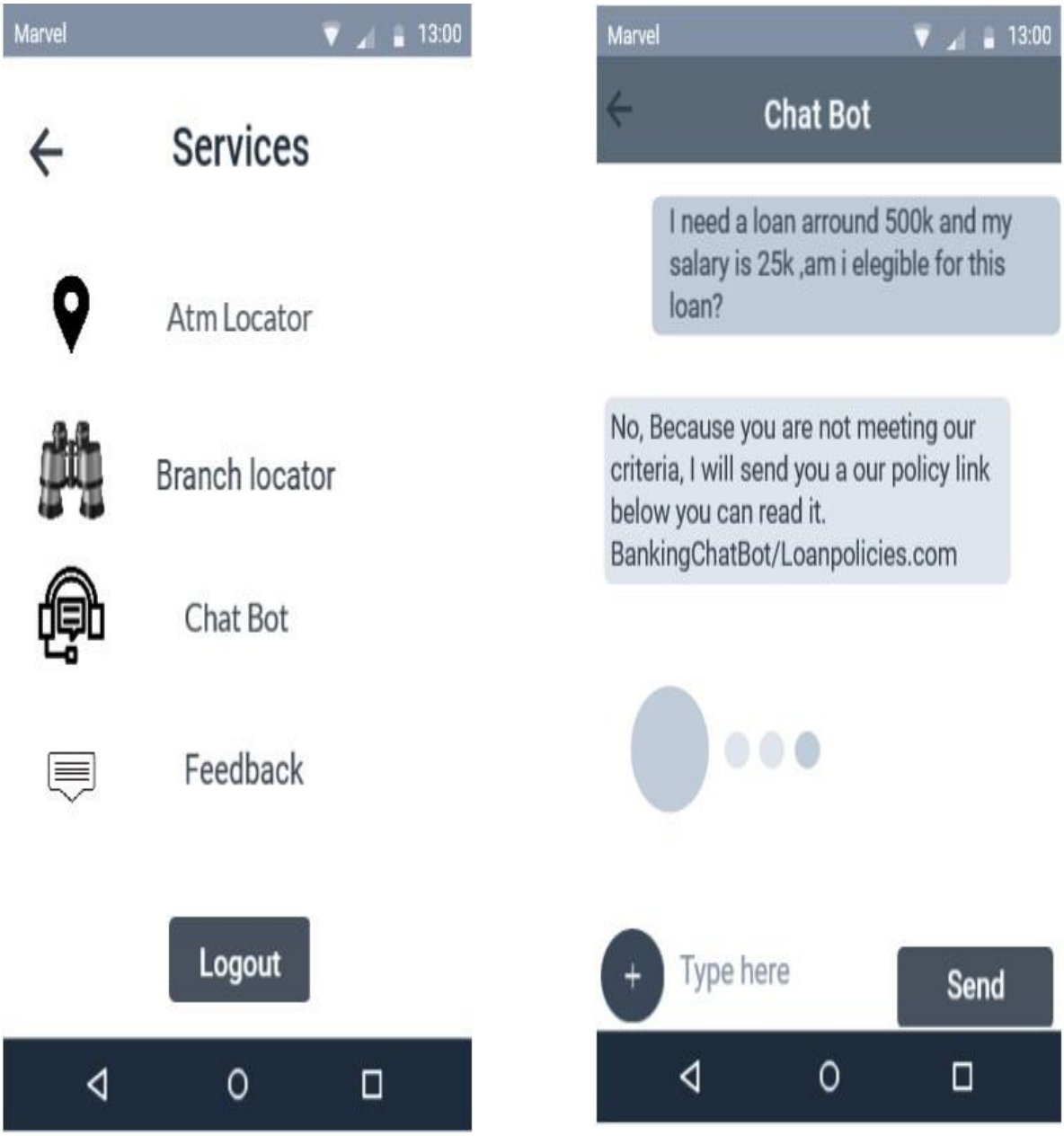


Figure 5 (Chat Bot Prototype)

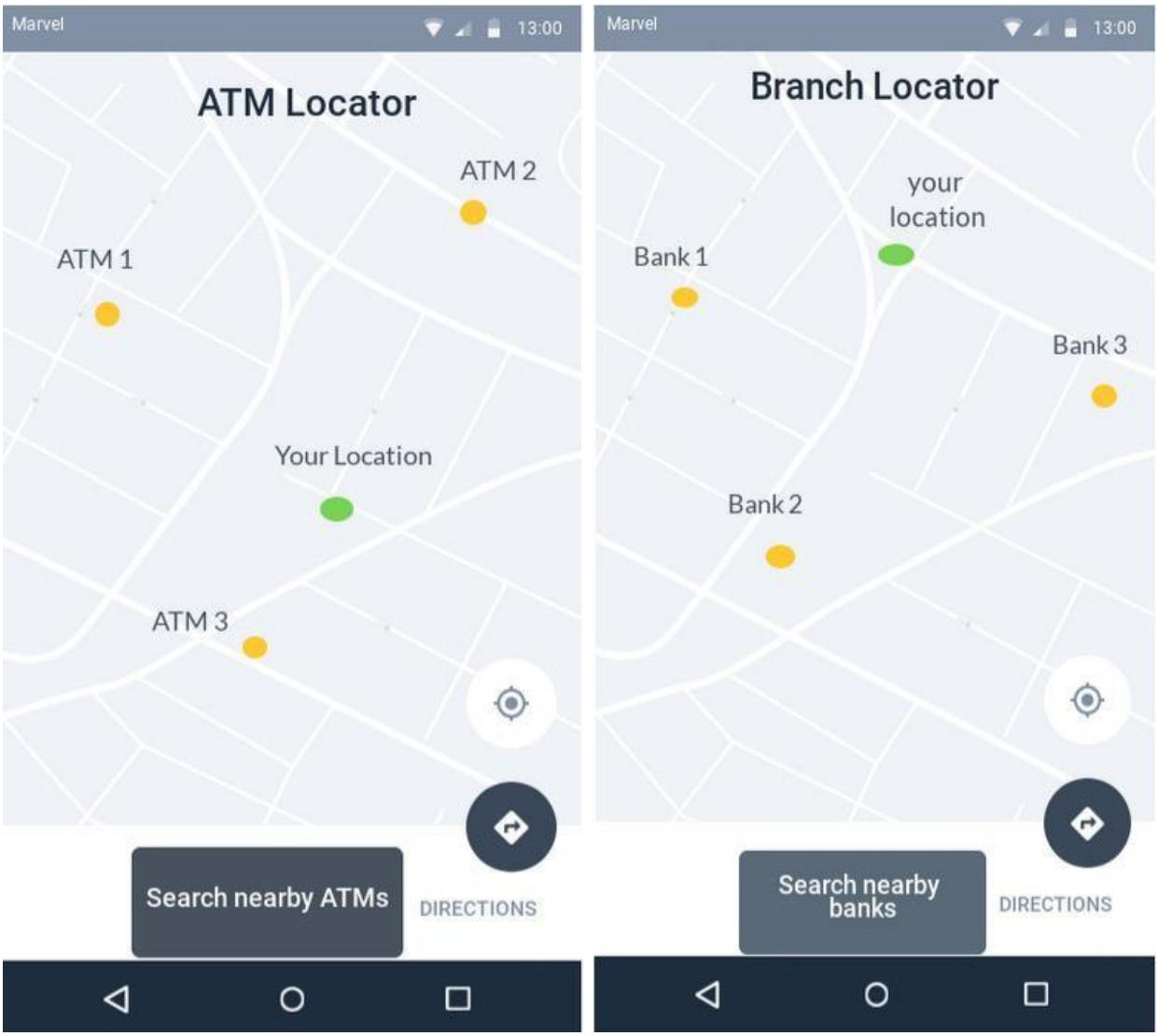


Figure 6 (Chat Bot Prototype)

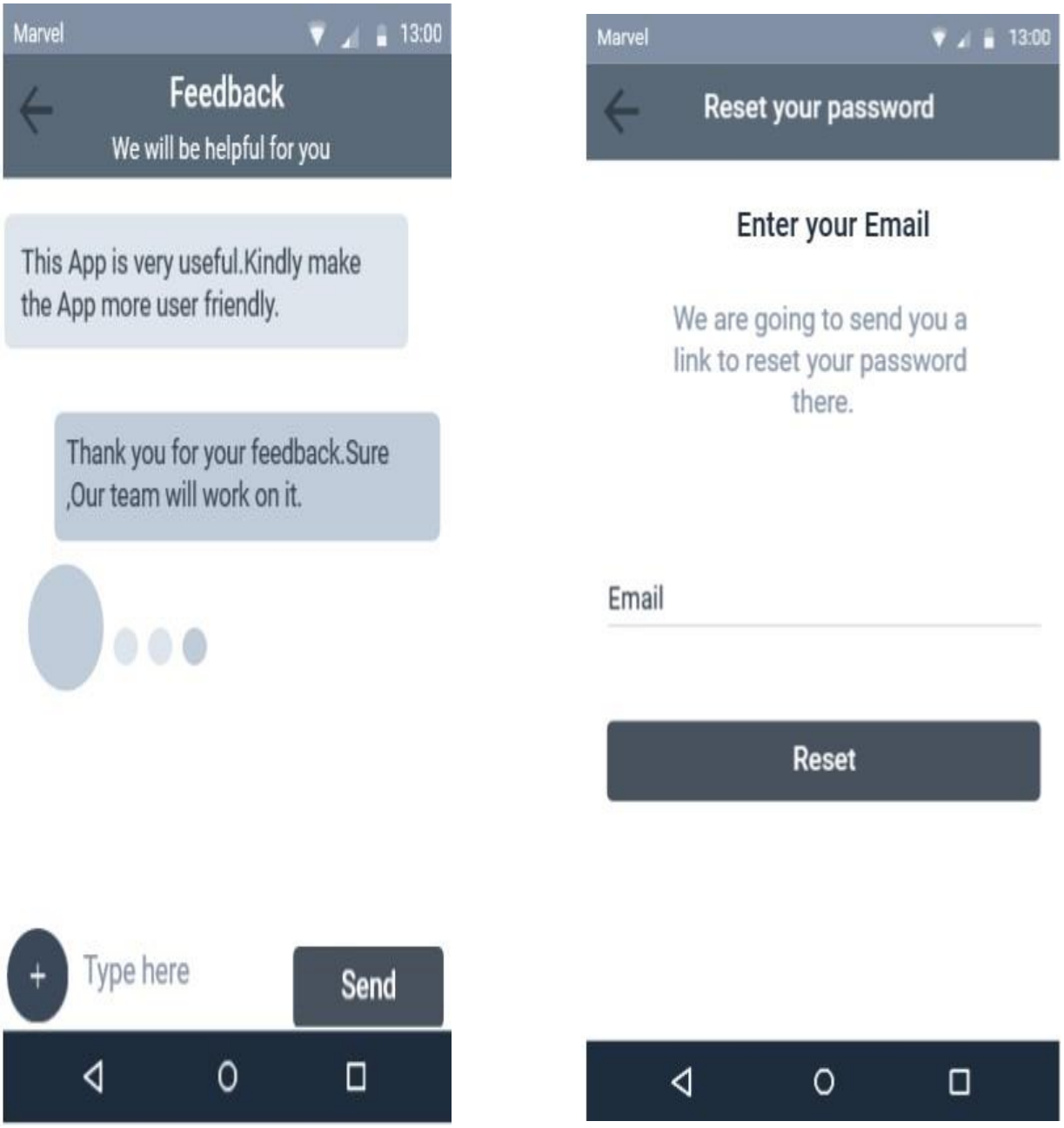


Figure 7 (Chat Bot Prototype)

CHAPTER – 4

4.0 Introduction:

In this chapter, we have discussed about the test cases to determine the intricacies of testing procedures aimed at ensuring the optimal functionality and performance of a banking chatbot. Through a meticulous examination of test cases, we ascertain whether the chatbot operates as intended, consistently delivering the anticipated results. Moreover, we extend our analysis to include usability test cases, which enable us to evaluate the chatbot's user-friendliness and accessibility, thereby providing readers with comprehensive insights into its functionality. By systematically evaluating various test scenarios tailored to the banking domain, we aim to equip readers with a nuanced understanding of the chatbot's capabilities, both major and minor. Through this comprehensive approach, readers gain valuable insights into the chatbot's operational nuances, empowering them to navigate its features effectively.

4.1 Test Cases:

Requirement Reference	**FR-3.2.2**	**Project Name**	**Banking Chatbot**
Test Case Id	TC-1		
Test-Case Description	**Account Balance Inquiry:** • Test if the chatbot correctly retrieves the account balance when asked.		
Test Steps	• User asks for account balance. • Chatbot requests account info. • User provides info. • Chatbot retrieves and displays balance.		

Expected Result	⋅ Chatbot prompts for account info. ⋅ Chatbot retrieves and displays balance accurately.
Actual Result	⋅ All steps execute smoothly; balance is retrieved and displayed correctly.
Pass/Fail	Pass
Date Prepared	10/03/2024
Date Run	10/03/2024
Prepared By	Aqib khan
Tested By	Aqib khan

Table 11: Test case 1

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-2		
Test-Case Description	**Transaction History:** • Verify if the chatbot accurately displays the transaction history upon request.		
Test Steps	• User requests transaction history. • Chatbot retrieves and displays history.		
Expected Result	• Chatbot accurately presents transaction history.		
Actual Result	• Actual transaction history displayed		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 12: Test case 2

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-3		
Test-Case Description	**Funds Transfer: Test if the chatbot successfully executes a funds transfer between accounts.**		
Test Steps	• User requests funds transfer. • Chatbot prompts for transfer details. • User provides details. • Chatbot executes transfer and confirms to user.		
Expected Result	• Chatbot accurately processes and confirms the transfer.		
Actual Result	• Actual transfer outcome		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 13: Test case 3

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-4		
Test-Case Description	**Bill Payments:** • Verify if the chatbot can process bill payments accurately for registered bills.		
Test Steps	• User requests bill payment. • Chatbot asks for bill details. • User provides details. • Chatbot processes and confirms payment.		
Expected Result	• Chatbot accurately prompts user for bill details. • Chatbot successfully processes the bill payment. • Chatbot confirms the payment completion to the user.		
Actual Result	• Actual bill payment process outcome		
Pass/Fail	fail		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 14: Test case 4

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-5		
Test-Case Description	**Card Management:** • Test if the chatbot can handle requests to block or unblock a debit/credit card.		
Test Steps	• User requests card block/unblock. • Chatbot asks for card details. • User provides details. • Chatbot processes and confirms action.		
Expected Result	• Chatbot accurately prompts user for card details. • Chatbot successfully blocks or unblocks the card as requested. • Chatbot confirms the action completion to the user.		
Actual Result	• Actual card management process outcome		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 15: Test case 5

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-6		
Test-Case Description	**ATM Locator:** • Check if the chatbot provides correct information about nearby ATMs based on user location.		
Test Steps	• User provides current location to the chatbot. • Chatbot retrieves nearby ATM information. • Chatbot presents the list of nearby ATMs to the user.		
Expected Result	• Chatbot accurately retrieves and displays nearby ATM locations based on the user's provided location.		
Actual Result	• Actual list of nearby ATMs provided by the chatbot		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 16: Test case 6

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-7		
Test-Case Description	• **Branch Locator:** • Verify if the chatbot can correctly provide branch locations and working hours based on user queries.		
Test Steps	• User asks for branch locations or working hours. • Chatbot retrieves and presents branch locations and working hours. • Verify accuracy of the information provided by the chatbot.		
Expected Result	• Chatbot accurately retrieves and presents branch locations and working hours based on user queries.		
Actual Result	• Actual branch locations and working hours provided by the chatbot		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 17: Test case 7

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-8		
Test-Case Description	**Exchange Rates:** • Test if the chatbot accurately provides current exchange rates for various currencies.		
Test Steps	• User requests exchange rates for specific currencies. • Chatbot retrieves current exchange rates for the requested currencies. • Verify accuracy of the exchange rates provided by the chatbot.		
Expected Result	• Chatbot accurately retrieves and provides current exchange rates for the requested currencies.		
Actual Result	• Actual exchange rates provided by the chatbot		
Pass/Fail	Fail		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 18: Test case 8

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-9		
Test-Case Description	**Loan Application:** • Verify if the chatbot guides users effectively through the loan application process.		
Test Steps	User initiates loan application process. • Chatbot prompts user for necessary details (e.g., loan amount, purpose, personal information). • User provides required information. • Chatbot guides user through additional steps (if any), such as document submission or verification.		
Expected Result	• Chatbot effectively prompts user for all necessary details required for the loan application. • Chatbot guides user through each step of the application process clearly and accurately. • Chatbot confirms successful submission of the application to the user.		
Actual Result	• Actual experience of user interaction with the loan application process		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 19: Test case 9

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-10		
Test-Case Description	**Interest Rates Inquiry:** • Test if the chatbot can provide current interest rates for different types of accounts or loans.		
Test Steps	• User requests current interest rates for specific accounts or loans. • Chatbot retrieves current interest rates for the requested accounts or loans. • Chatbot presents the interest rates to the user.		
Expected Result	• Chatbot accurately retrieves and displays current interest rates for the requested accounts or loans.		
Actual Result	• Actual interest rates provided by the chatbot		
Pass/Fail	Fail		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 20: Test case 10

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-11		
Test-Case Description	**Credit Score Check:** • Verify if the chatbot can provide users with their current credit score upon request.		
Test Steps	• User requests their current credit score. • Chatbot prompts user for necessary information (e.g., identification details). • User provides required information. • Chatbot retrieves user's current credit score.		
Expected Result	• Chatbot accurately prompts user for required identification details. • Chatbot successfully retrieves and displays the user's current credit score.		
Actual Result	• Actual credit score provided by the chatbot		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 21: Test case 11

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-12		
Test-Case Description	**Account Statement Request:** • Test if the chatbot correctly sends the account statement to the user's registered email address.		
Test Steps	• User requests an account statement. • Chatbot prompts user for confirmation and asks for the email address. • User provides the email address. • Chatbot processes the request and sends the account statement to the provided email address.		
Expected Result	• Chatbot accurately prompts user for confirmation and collects the email address. • Chatbot successfully sends the account statement to the provided email address. • Chatbot confirms the successful email transmission to the user. •		
Actual Result	• Actual confirmation and email transmission process		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 22: Test case 12

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-13		
Test-Case Description	**Password Reset:** • Verify if the chatbot can assist users in resetting their accountpasswords securely.		
Test Steps	• User requests password reset assistance. • Chatbot verifies user's identity through secure authentication methods (e.g., security questions, verification code sent to email orphone). • Chatbot guides user through the password reset process. • User successfully resets their account password. • Chatbot confirms the password reset completion to the user. •		
Expected Result	• Chatbot securely verifies user's identity before proceeding with thepassword reset. • Chatbot effectively guides user through the password resetprocess. • User successfully resets their account password with the chatbot'sassistance. • Chatbot confirms the successful password reset to the user. •		
Actual Result	• Actual password reset process		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 23: Test case 13

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-14		
Test-Case Description	**Customer Support Assistance:** • Test if the chatbot can effectively handle various customer inquiries and provide appropriate •		
Test Steps	• User asks various customer inquiries (e.g., account balance, transaction history, bill payments). • Chatbot processes each inquiry and provides appropriate responses. • Evaluate the accuracy and effectiveness of chatbot responses for each inquiry. •		
Expected Result	• Chatbot accurately understands and addresses various customer inquiries. • Chatbot provides relevant and helpful responses to each inquiry. •		
Actual Result	• Evaluation of chatbot responses for each inquiry		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 24: Test case 14

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-15		
Test-Case Description	**Account Closure Process:** • Verify if the chatbot can guide users through the account closure process efficiently.		
Test Steps	• User requests to close their account. • Chatbot confirms user's intention to close the account and provides necessary information about the closure process (e.g., outstanding balances, consequences). • Chatbot guides user through any required steps for closing the account (e.g., transferring funds, canceling subscriptions). • Chatbot initiates the account closure process. • Chatbot confirms successful closure of the account to the user. •		
Expected Result	• Chatbot accurately confirms user's intention to close the account and provides relevant information. • Chatbot efficiently guides user through required steps for account closure. • Chatbot successfully initiates the account closure process. • Chatbot confirms the successful closure of the account to the user. •		
Actual Result	• Actual account closure process		
Pass/Fail	Pass		

Date Prepared	10/03/2024
Date Run	10/03/2024
Prepared By	Aqib khan
Tested By	Aqib khan

Table 25: Test case 15

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-16		
Test-Case Description	• **Deposit Account Opening:** • Test if the chatbot can assist users in opening a new deposit account smoothly.		
Test Steps	• User requests deposit account opening. • Chatbot asks for necessary details (e.g., account type, initial deposit). • User provides information. • Chatbot guides through additional steps if needed. • Chatbot confirms successful account opening.		
Expected Result	• Chatbot collects required details smoothly. • Chatbot assists user through the process effectively. • User successfully opens account. • Chatbot confirms opening to user. •		
Actual Result	• Actual outcome of deposit account opening process		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 26: Test case 16

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-17		
Test-Case Description	**Credit Card Application:** • Verify if the chatbot can guide users through the credit card application process accurately.		
Test Steps	• User requests credit card application. • Chatbot collects user information. • Chatbot presents available credit card options. • User selects a card. • Chatbot guides application process. • Chatbot confirms submission. •		
Expected Result	• Chatbot collects information smoothly. • User selects desired card. • Chatbot assists in application process effectively. • Application confirmation provided.		
Actual Result	• Actual outcome of credit card application process		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 27: Test case 17

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-18		
Test-Case Description	• **Investment Guidance:** • Test if the chatbot can provide basic investment advice based on user preferences and risk tolerance.		
Test Steps	• User asks for investment guidance. • Chatbot collects preferences and risk tolerance. • Chatbot provides tailored advice		
Expected Result	• Chatbot collects data effectively. • Chatbot offers relevant advice.		
Actual Result	• Actual advice provided		
Pass/Fail	Fail		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 28: Test case 18

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-19		
Test-Case Description	• **Transaction Confirmation:** • Verify if the chatbot sends accurate transaction confirmations via email or SMS.		
Test Steps	• User initiates a transaction (e.g., fund transfer, bill payment) using the chatbot. • Chatbot processes the transaction. • Chatbot sends a confirmation message via email or SMS to the user. • User receives the confirmation message.		
Expected Result	• Chatbot accurately processes the transaction. • Chatbot sends a confirmation message promptly after the transaction. • The confirmation message received by the user accurately reflects the details of the transaction.		
Actual Result	• Actual transaction confirmation process, including the accuracy of the confirmation message		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 29: Test case 19

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-20		
Test-Case Description	• **Privacy and Security Queries:** • Test if the chatbot can effectively address user concerns regarding privacy and security measures.		
Test Steps	• User asks about privacy and security. • Chatbot reassures and provides information. • Chatbot offers guidance on account protection. • Chatbot directs to support if needed.		
Expected Result	• Chatbot addresses concerns effectively. • Chatbot provides clear information and guidance. • Users feel reassured about privacy and security.		
Actual Result	• Actual responses provided by the chatbot		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 30: Test case 20

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-22		
Test-Case Description	• **Multi-factor Authentication:** • Verify if the chatbot correctly handles multi-factor authentication processes for sensitive transactions.		
Test Steps	• User initiates sensitive transaction. • Chatbot prompts for additional authentication. • User provides authentication. • Chatbot verifies and proceeds if successful.		
Expected Result	• Chatbot accurately identifies and handles multi-factor authentication. • Transaction proceeds after successful authentication.		
Actual Result	• Actual handling of multi-factor authentication by the chatbot		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 31: Test case 21

Requirement Reference	FR-3.2.2	Project Name	Banking Chatbot
Test Case Id	TC-24		
Test-Case Description	• **Language Support:** • Test if the chatbot can understand and respond appropriately to queries in different languages, if supported.		
Test Steps	• User inputs queries in supported languages. • Chatbot interprets and responds in corresponding languages. • Evaluate accuracy and coherence of responses.		
Expected Result	• Chatbot accurately understands and responds in supported languages.		
Actual Result	• Actual behavior of the chatbot in processing queries in different languages		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 32: Test case 22

Requirement Reference	**FR-3.2.2**	**Project Name**	Banking Chatbot
Test Case Id	TC-25		
Test-Case Description	• **Integration Testing:** • Verify if the chatbot integrates seamlessly with backend banking systems and external APIs for data retrieval and transaction processing.		
Test Steps	• Execute various transactions and inquiries. • Monitor interactions with backend systems/APIs. • Verify accuracy and speed of data retrieval and transaction processing. • Test error handling. • Ensure data security.		
Expected Result	• Seamless integration with backend systems/APIs. • Accurate data retrieval and efficient transaction processing. • Effective error handling. • Maintained data security.		
Actual Result	• Actual behavior during integration testing		
Pass/Fail	Pass		
Date Prepared	10/03/2024		
Date Run	10/03/2024		
Prepared By	Aqib khan		
Tested By	Aqib khan		

Table 33: Test case 22

CHAPTER – 5

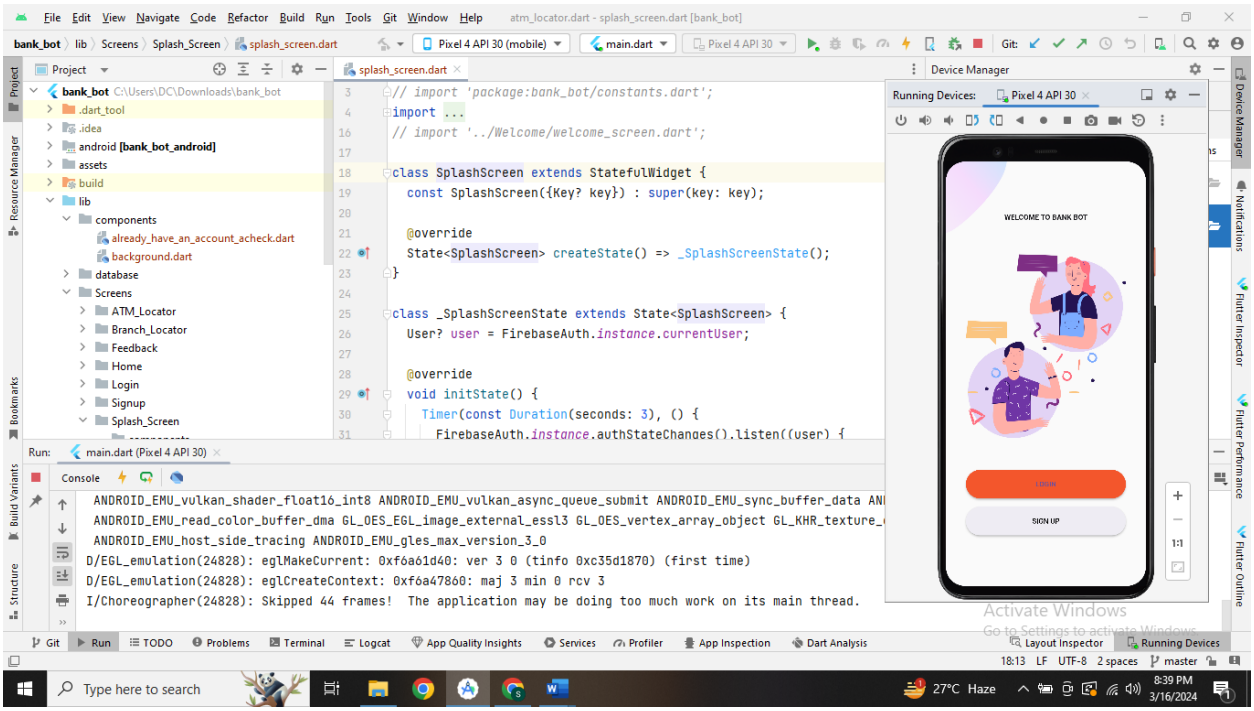
5.0 Introduction

In this chapter, we delve into the intricate workings of creating a banking chatbot, focusing particularly on coding, frontend screens, and the underlying database structure. A banking chatbot serves as an innovative solution to enhance customer interactions within the financial sector, providing users with a seamless and efficient means of accessing banking services and information. Frontend screens play a crucial role in the user experience, serving as the interface through which customers interact with the chatbot. We discuss the design principles, user interface (UI) elements, and frontend frameworks utilized to create visually appealing and user-friendly screens. Incorporating responsive design practices ensures compatibility across various devices, enhancing accessibility for users.

5.1 Design (Front-End)

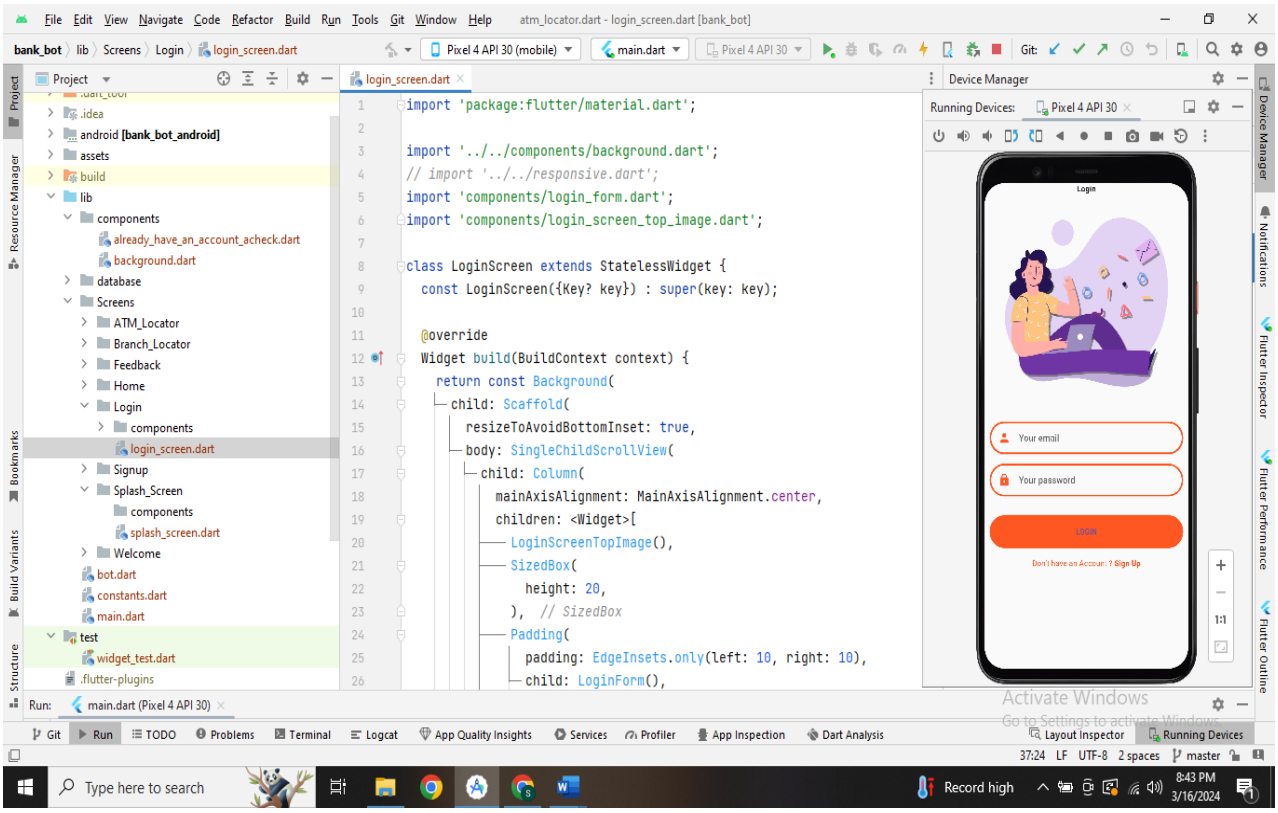
Main Screen

The starting of an application has a graphical view, which commonly describe the name of Application and to attract user, especially this screen is all about the name of Company, Company Logo or any other content for advertisement. Frequency indicates when the app will belaunched on an Android device or possibly be some kind of process used to show the screen to the user just before the app fully loads.


splash_screen.dart
// import 'package:bank_bot/constants.dart';
import ...
// import '../Welcome/welcome_screen.dart';
class SplashScreen extends StatefulWidget {
const SplashScreen({Key? key}) : super(key: key);
@override
State<SplashScreen> createState() => _SplashScreenState();
}
class _SplashScreenState extends State<SplashScreen> {
User? user = FirebaseAuth.instance.currentUser;
@override
void initState() {
Timer(const Duration(seconds: 3), () {
Device Manager
Running Devices: Pixel 4 API 30
WELCOME TO BANK BOT
SIGN UP
Run: main.dart (Pixel 4 API 30)
Console
D/EGL_emulation(24828): eglMakeCurrent: 0xf6a61d40: ver 3 0 (tinfo 0xc35d1870) (first time)
D/EGL_emulation(24828): eglCreateContext: 0xf6a47860: maj 3 min 0 rcv 3
I/Choreographer(24828): Skipped 44 frames! The application may be doing too much work on its main thread.
Activate Windows
Type here to search
27°C Haze
8:39 PM
3/16/2024

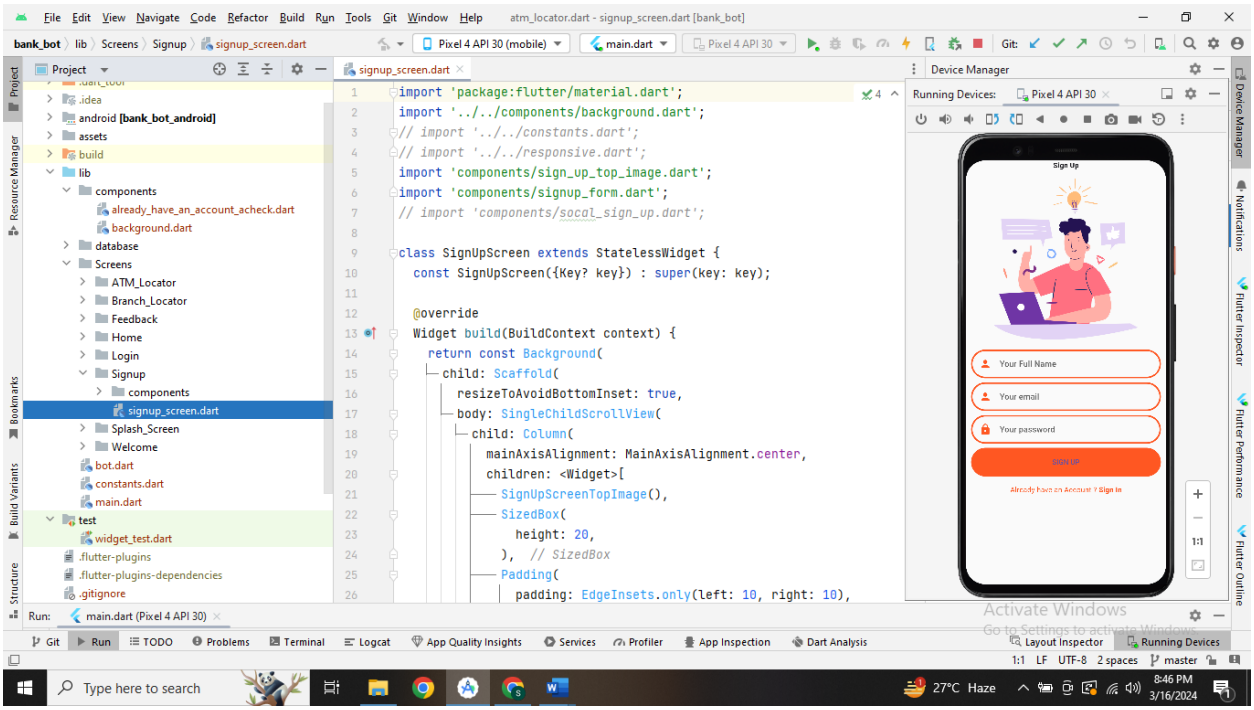
5.2 Login Information:

An application requires an app user to enter his or her email and password on thesign-in screen. The details included in the sign-in screen check with the firebase authentication service. If incorrect information will provide an error and if the information provided is true then it will go to next screen which is your dashboard page. Verify users with their email addresses again passwords. The Firebase Authentication SDK provides ways to build and manage users who use it their email addresses and passwords to log in.



5.3 Sign-Up Information:

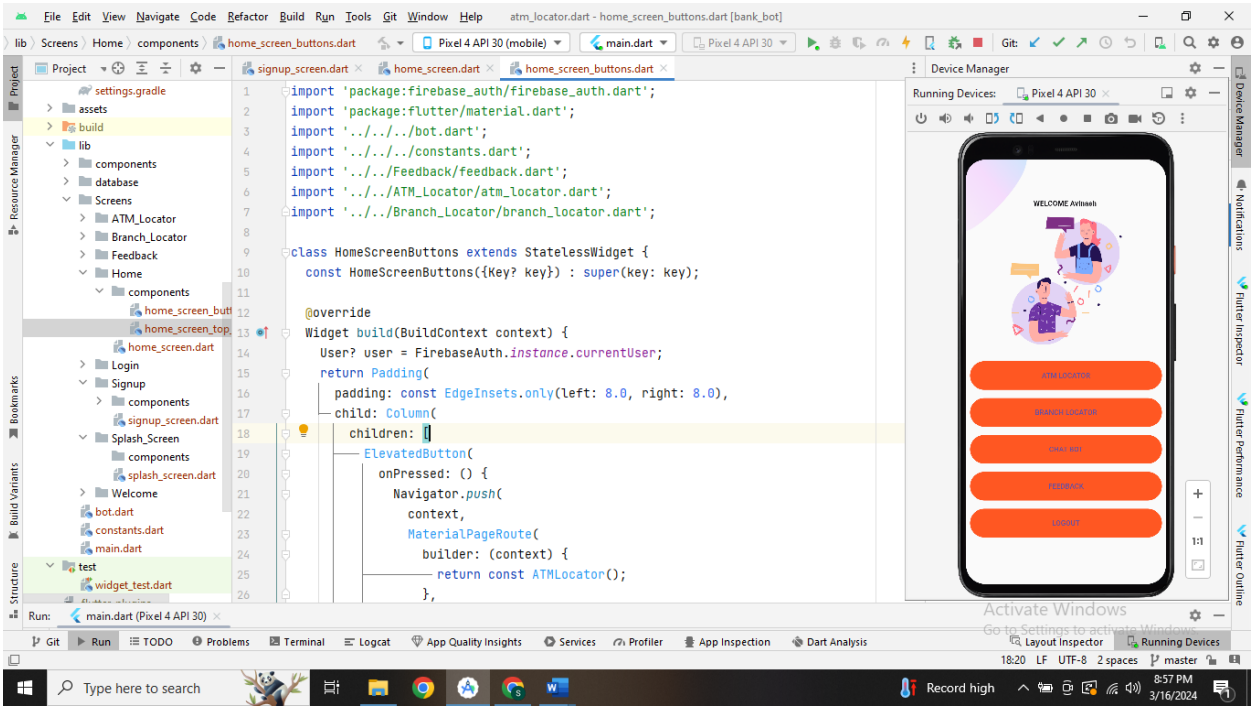
Before you can use the app, you must Sign Up your account with the correct details at least your email address should be updated. Application password verification is a very strong format so you should check the verification provided when you do not enter the password and tap directly the sign-up button will therefore give you confirmation of how to enter the password andfill in all the required fields' details. When all the details are correct then it will confirm by sending you a confirmation link to your email to verify your account otherwise you will not sign in details will be stored in the Firebase Real-time Database.



5.4 Service Screen

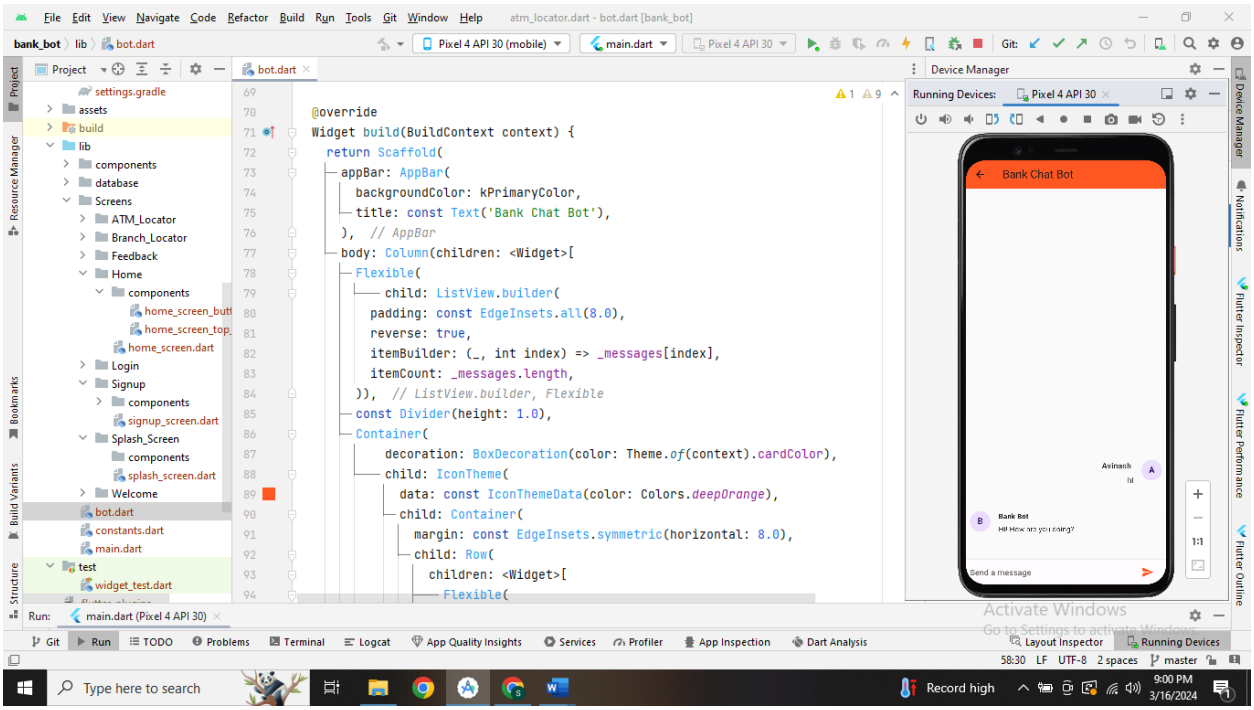
This is the main Dashboard of this application, through this user can any use any service,want to. This screen includes all the features of the application as follows

- Chatbot
- ATM Locator
- Branch Locator
- Feedbacks



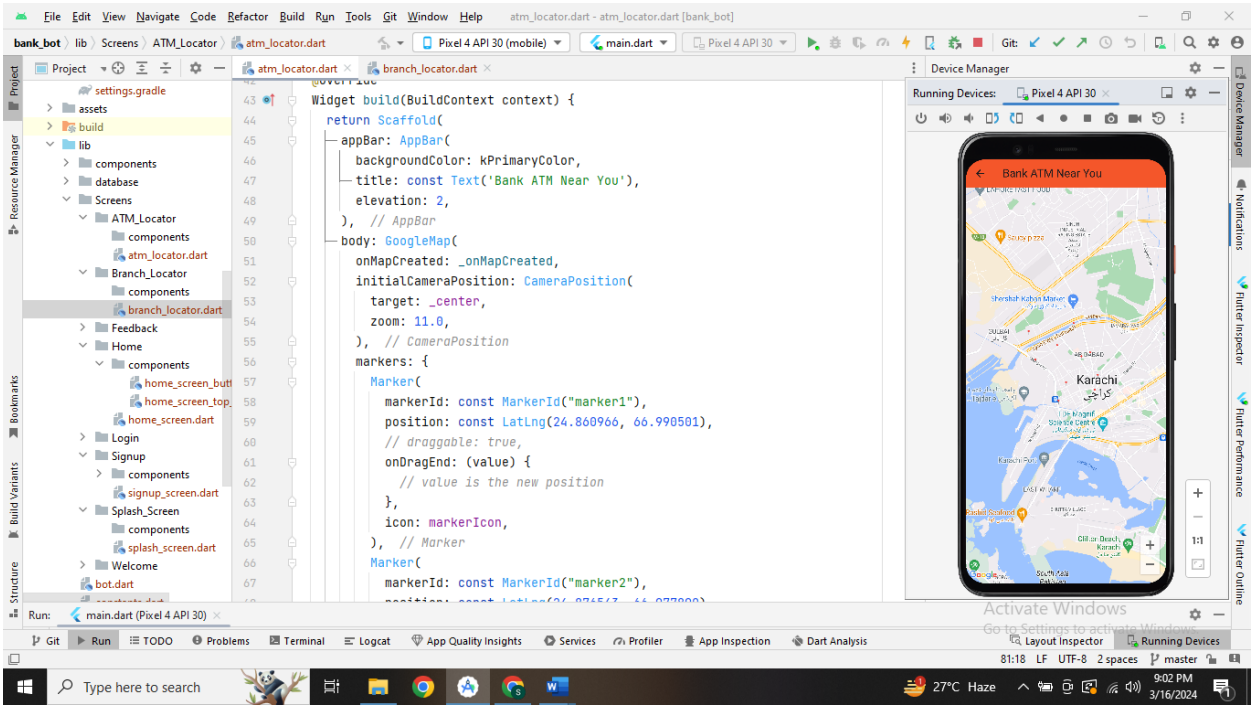
5.5 Chatbot

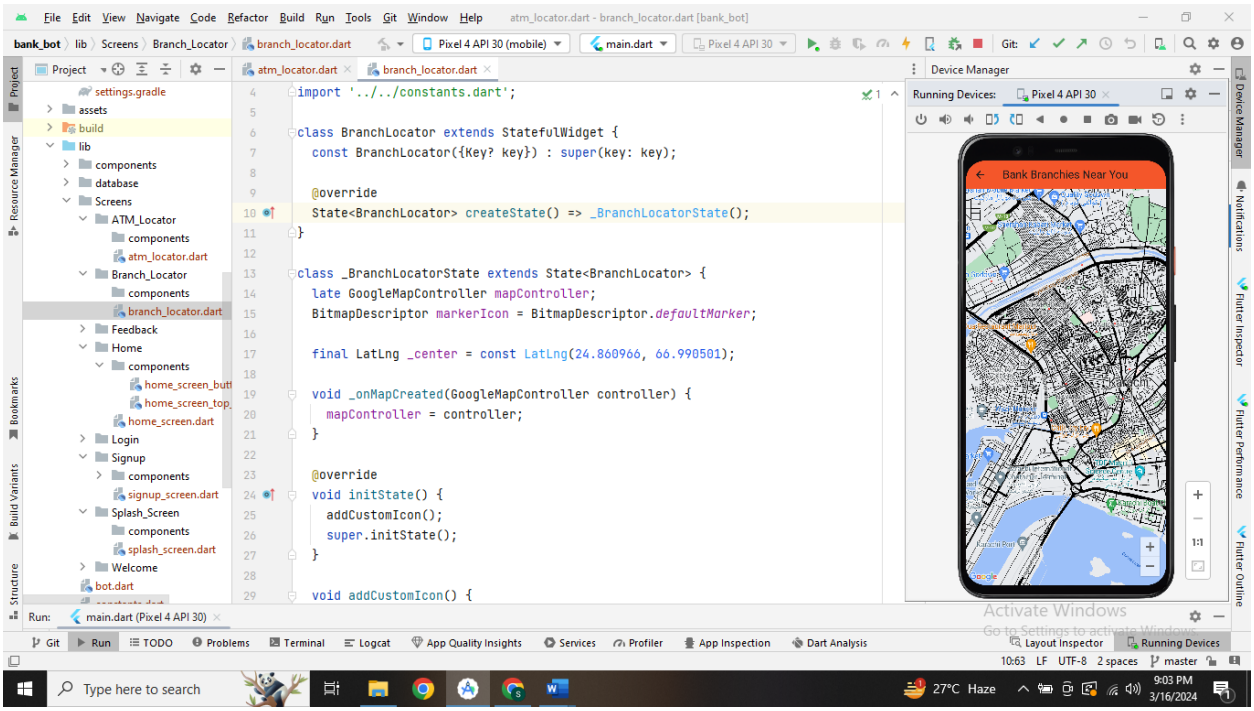
This the main feature screen of this App, Chatbot. Where user can talk to the BOT and get all the details regarding an opening account and loan policies, also the best thing it's a responsive Chatbot and will be available 24/7.User can type a message in English.



5.6 ATM Locator and Branch Locator:

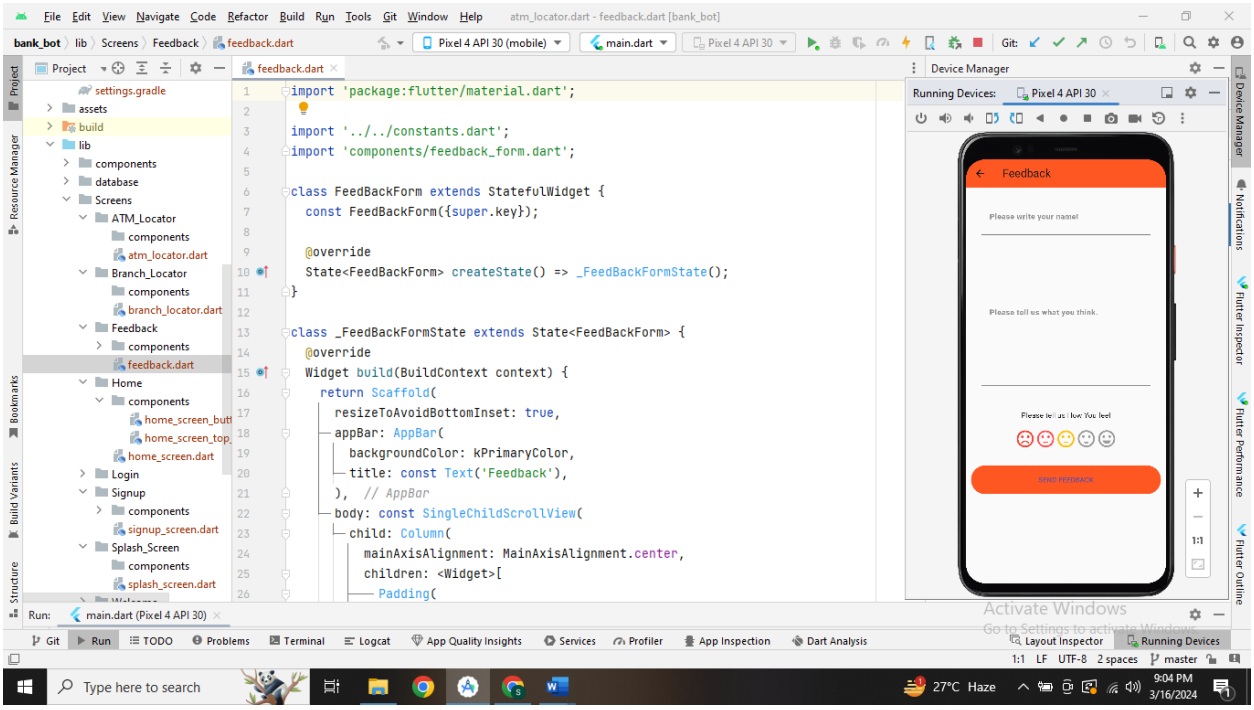
This feature is for the user ease to find the nearest ATM or Branch from their House. This app is going to make easy for the user to follow map and reach the nearest ATM and Branch of the Bank.



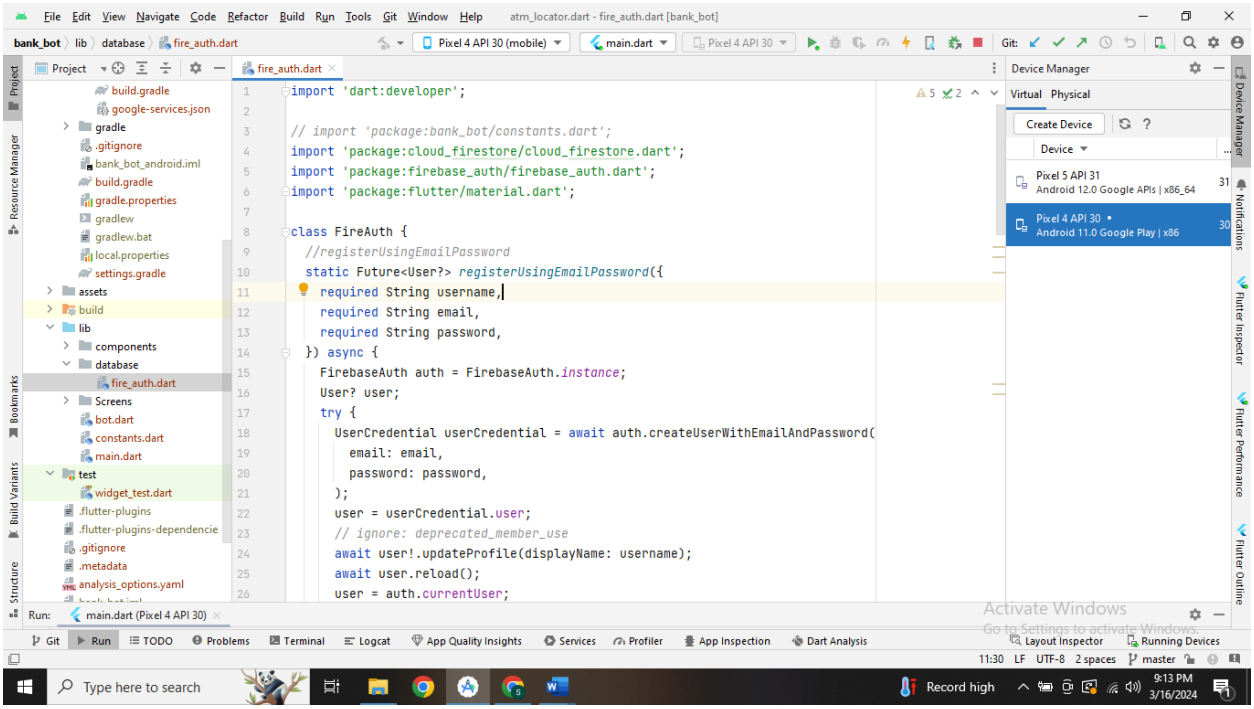

import '../../constants.dart';
class BranchLocator extends StatefulWidget {
const BranchLocator({Key? key}) : super(key: key);
@override
State<BranchLocator> createState() => _BranchLocatorState();
}
class _BranchLocatorState extends State<BranchLocator> {
late GoogleMapController mapController;
BitmapDescriptor markerIcon = BitmapDescriptor.defaultMarker;
final LatLng _center = const LatLng(24.860966, 66.990501);
void _onMapCreated(GoogleMapController controller) {
mapController = controller;
}
@override
void initState() {
addCustomIcon();
super.initState();
}
void addCustomIcon() {
Bank Branchies Near You
Activate Windows
Go to Settings to activate Windows.
Type here to search
27°C Haze
9:03 PM
3/16/2024

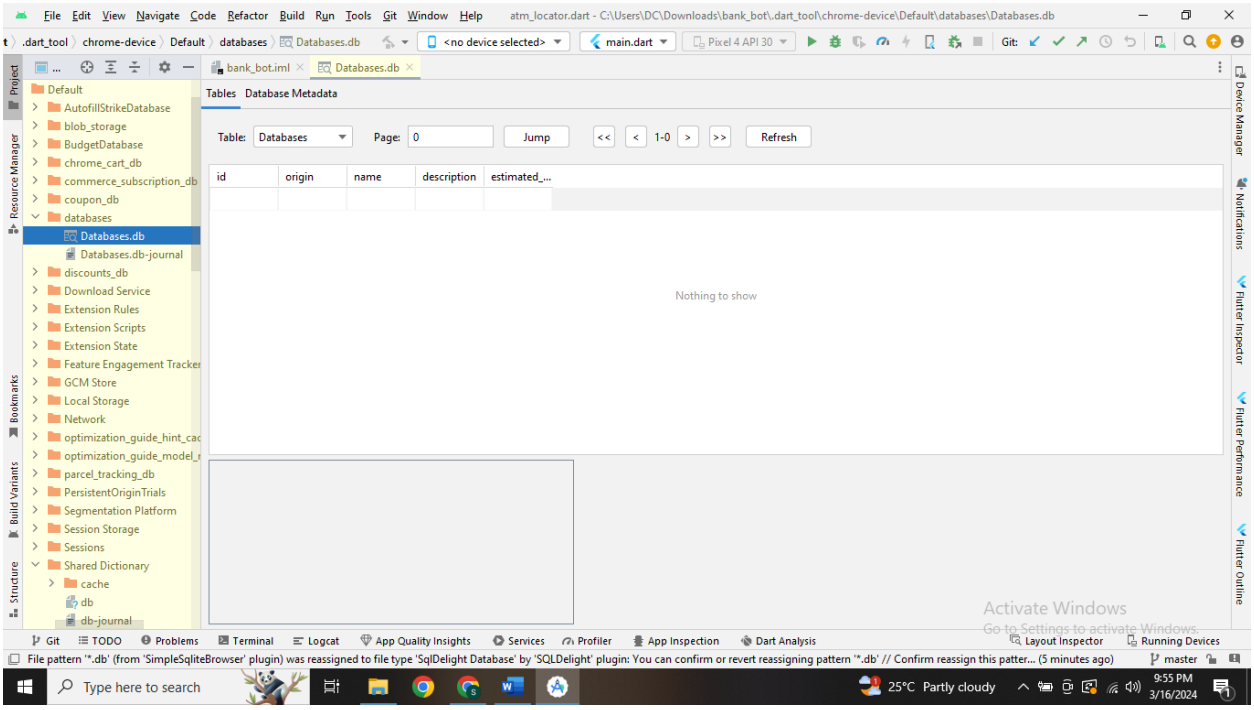
5.7 Feedback Screen:

This screen is all about to get the review of the user that our app is user friendlyand how much useful and informative for the user, through this we will get user feedback to make our app better for future.



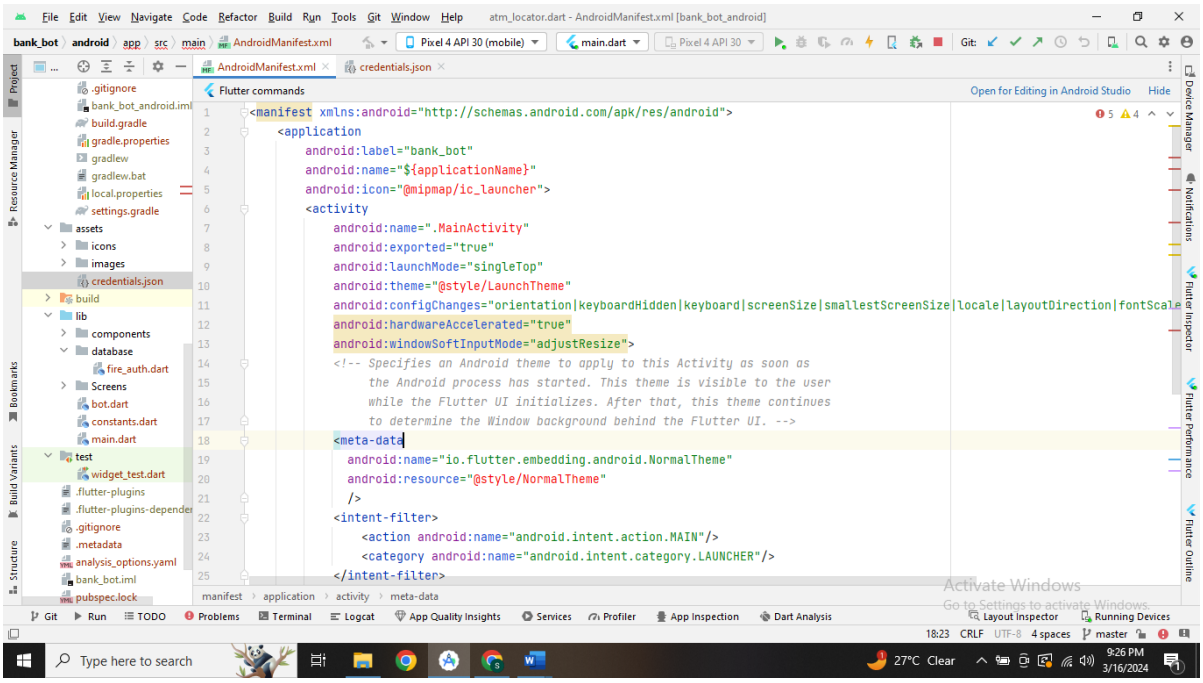
Database:

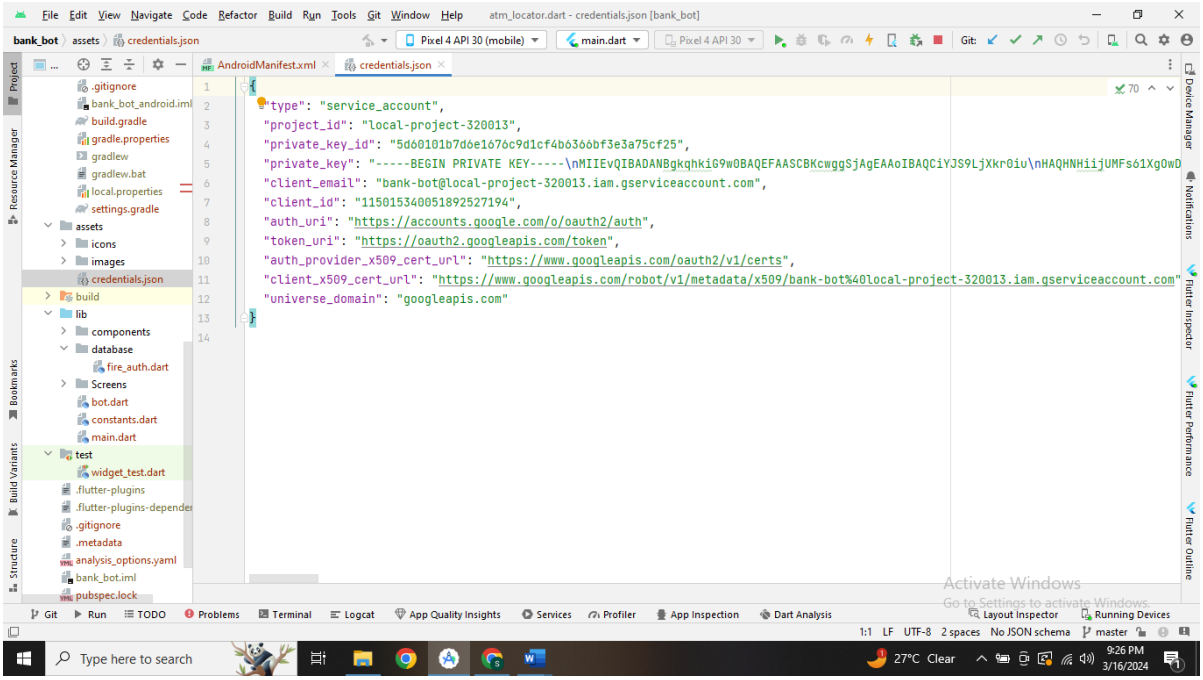

File Edit View Navigate Code Refactor Build Run Tools Git Window Help
atm_locator.dart - fire_auth.dart [bank_bot]
bank_bot lib database fire_auth.dart
Pixel 4 API 30 (mobile)
main.dart
Pixel 4 API 30
Project
fire_auth.dart
build.gradle
google-services.json
gradle
.gitignore
bank_bot_android.iml
build.gradle
gradle.properties
gradlew
gradlew.bat
local.properties
settings.gradle
assets
build
lib
components
database
fire_auth.dart
Screens
bot.dart
constants.dart
main.dart
test
widget_test.dart
.flutter-plugins
.flutter-plugins-dependencie
.gitignore
.metadata
analysis_options.yaml
1 import 'dart:developer';
2
3 // import 'package:bank_bot/constants.dart';
4 import 'package:cloud_firestore/cloud_firestore.dart';
5 import 'package:firebase_auth/firebase_auth.dart';
6 import 'package:flutter/material.dart';
7
8 class FireAuth {
9 //registerUsingEmailPassword
10 static Future<User?> registerUsingEmailPassword({
11 required String username,
12 required String email,
13 required String password,
14 }) async {
15 FirebaseAuth auth = FirebaseAuth.instance;
16 User? user;
17 try {
18 UserCredential userCredential = await auth.createUserWithEmailAndPassword(
19 email: email,
20 password: password,
21);
22 user = userCredential.user;
23 // ignore: deprecated_member_use
24 await user!.updateProfile(displayName: username);
25 await user.reload();
26 user = auth.currentUser;
Device Manager
Virtual Physical
Create Device
Device
Pixel 5 API 31
Android 12.0 Google APIs | x86_64
Pixel 4 API 30
Android 11.0 Google Play | x86
Run: main.dart (Pixel 4 API 30)
Git Run TODO Problems Terminal Logcat App Quality Insights Services Profiler App Inspection Dart Analysis
Activate Windows
Layout Inspector Running Devices
11:30 LF UTF-8 2 spaces master
Type here to search
Record high
9:13 PM
3/16/2024


File Edit View Navigate Code Refactor Build Run Tools Git Window Help
atm_locator.dart - C:\Users\DC\Downloads\bank_bot\.dart_tool\chrome-device\Default\databases\Databases.db
.dart_tool chrome-device Default databases Databases.db
<no device selected>
main.dart
Pixel 4 API 30
bank_bot.iml
Databases.db
Tables
Database Metadata
Table: Databases
Page: 0
Jump
<< < 1-0 > >>
Refresh
id
origin
name
description
estimated_...
Nothing to show
Default
AutofillStrikeDatabase
blob_storage
BudgetDatabase
chrome_cart_db
commerce_subscription_db
coupon_db
databases
Databases.db
Databases.db-journal
discounts_db
Download Service
Extension Rules
Extension Scripts
Extension State
Feature Engagement Tracker
GCM Store
Local Storage
Network
optimization_guide_hint_cac
optimization_guide_model_
parcel_tracking_db
PersistentOriginTrials
Segmentation Platform
Session Storage
Sessions
Shared Dictionary
cache
db
db-journal
Git TODO Problems Terminal Logcat App Quality Insights Services Profiler App Inspection Dart Analysis
Activate Windows
Layout Inspector Running Devices
File pattern '*.db' (from 'SimpleSqliteBrowser' plugin) was reassigned to file type 'SqlDelight Database' by 'SQLDelight' plugin: You can confirm or revert reassigning pattern '*.db' // Confirm reassign this patter... (5 minutes ago)
master
Type here to search
25°C Partly cloudy
9:55 PM
3/16/2024

5.8 Design (Back-End)

In our backend designing our main focus to train our BOT with good training data for trainingBOT we are using different types which are mention below in Development stages. Here are the images of some code which are labeled as **Intent**, **Stories** and **Responses** to trainour BOT.





5.9 Screenshots:

Figure 8: Floating Window

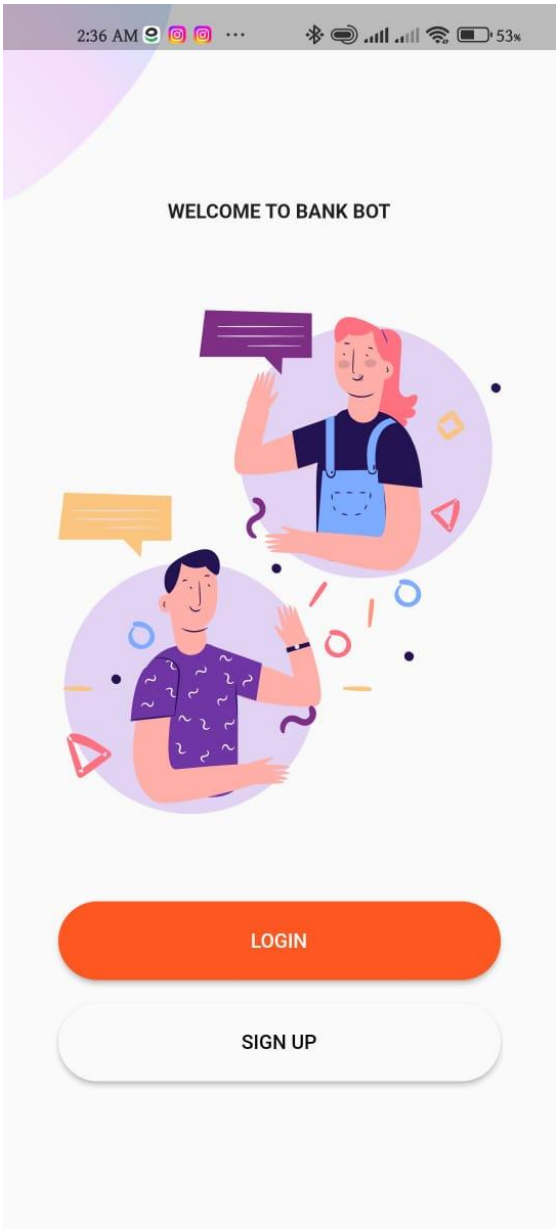


Figure 9: Main Window

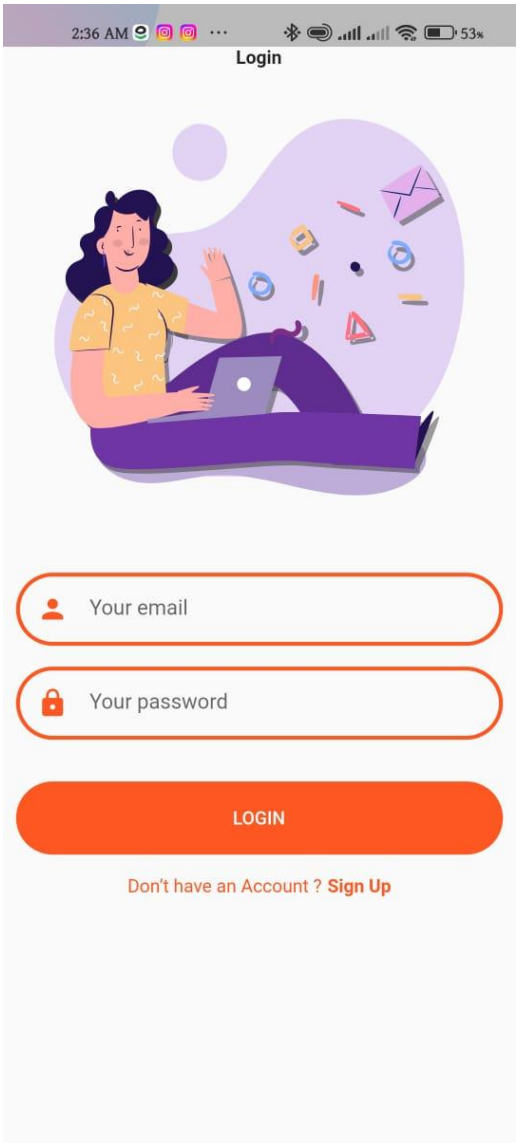


Figure 10: Login Window

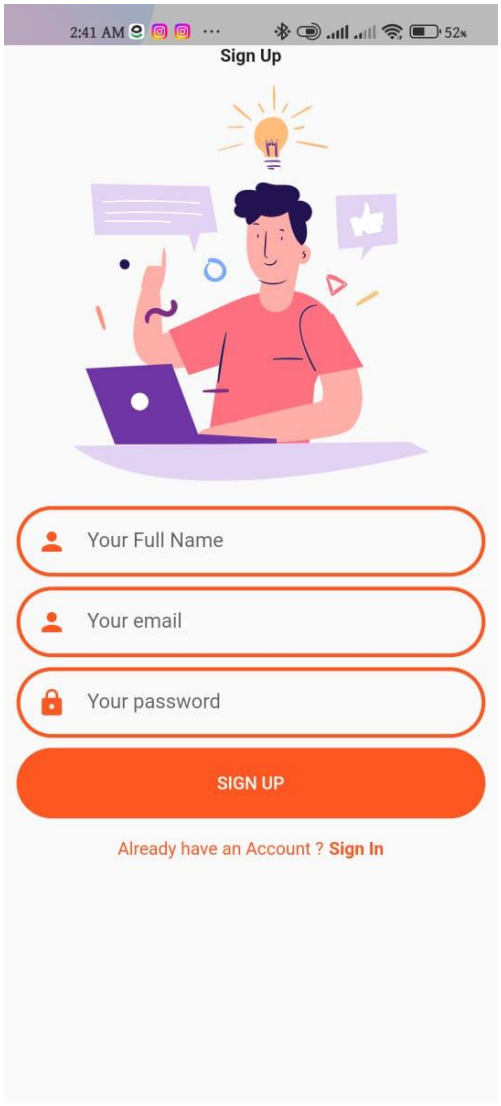


Figure 11: Sign Up Window

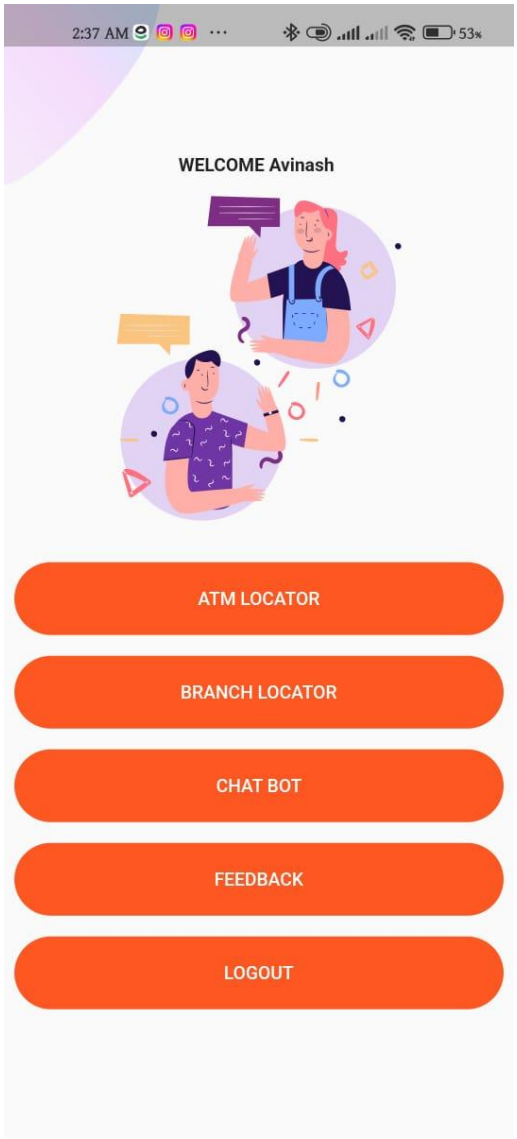


Figure 12: Choosing Option Window

Figure 13: Bank ATM Locater Window

Figure 14: Bank Branches Locater Window

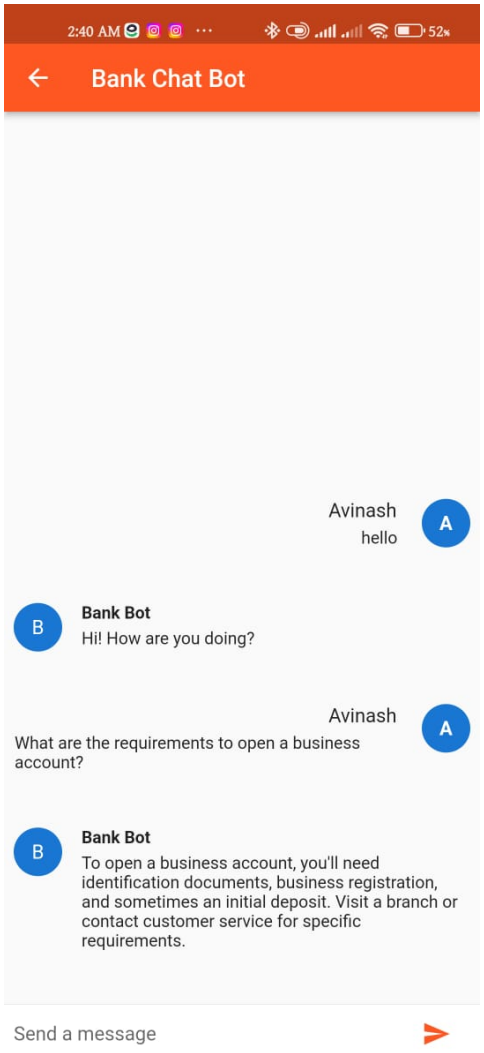


Figure 15: Bank CHATBOT Window

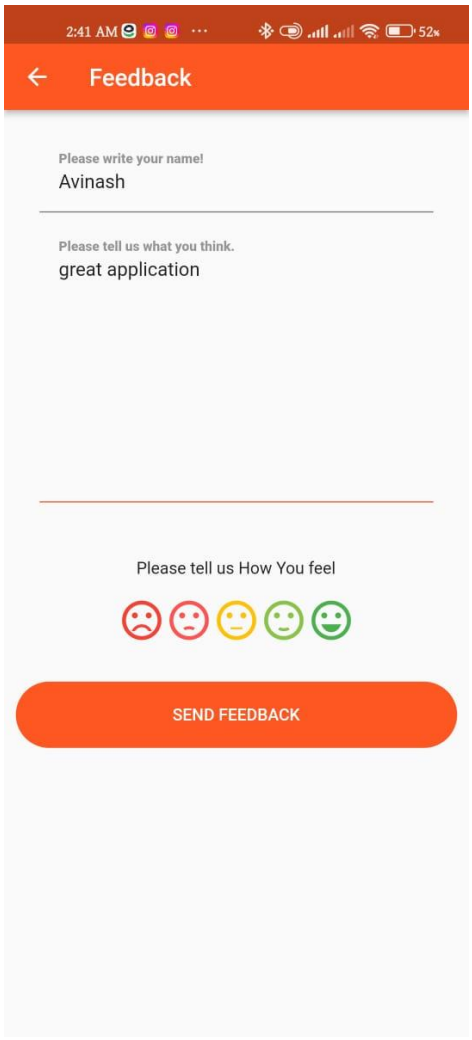


Figure 16: Feedback Window

CHAPTER – 6

6.0 Introduction:

In this chapter where we delve into the future prospects and challenges associated with our ongoing project. As we progress, it becomes increasingly important to anticipate the path ahead and prepare for the tasks that lie beyond the current scope. In this chapter, we will explore the envisioned developments and obstacles within our project framework. we delve deep into the exciting prospects awaiting us as we chart a course towards enhancing customer engagement within the banking sector. Through the integration of cutting-edge Python technology, we aim to revolutionize the way customers interact with banking services, automating responses to their queries with unprecedented efficiency and precision. Join us as we navigate through the realms of possibility, envisioning a future where advanced AI capabilities and seamless user experiences converge to redefine the benchmarks of excellence in customer service. Through our exploration of future work and challenges, we pave the way for transformative innovations that will shape the future of banking interactions.

6.1 System Limitations and Challenges:

Despite the promising prospects, our journey towards implementing this automated system is not without its challenges. Some of the key hurdles we anticipate include:

1. **Technical Complexity:** Integrating Python technology into our existing infrastructure requires meticulous planning and execution. We must navigate the complexities associated with software development, ensuring seamless compatibility and functionality.

2. **Data Security:** Handling sensitive banking information demands a robust approach to data security. Maintaining the confidentiality and integrity of customer data remains paramount throughout the development process.

3. **Accuracy and Reliability:** As our program assumes the responsibility of responding to customer queries, ensuring accuracy and reliability is imperative. We must meticulously refine our algorithms to minimize errors and provide consistent responses.

4. **Scalability:** With the potential influx of customer queries, scalability becomes a critical consideration. Our system must be capable of accommodating varying levels of demand without compromising performance or responsiveness.

5. **User Experience:** Central to the success of our project is the user experience. We must prioritize user-centric design principles to ensure that interacting with our automated system is intuitive and seamless for customers.

6.2 Future Work:

The primary objective of our future work revolves around the development of a sophisticated program utilizing Python technology. This program is designed to address the evolving needs of our customers within the banking sector. Through leveraging the capabilities of Python, we aim to create a dynamic system capable of automatically responding to customer queries in a timely and efficient manner.

6.3 Conclusion:

In conclusion, the future work within our project entails the development of a Python-based program aimed at enhancing customer service within the banking sector. While we are poised for progress, we must remain vigilant in addressing the challenges that lie ahead. By navigating these obstacles with diligence and innovation, we are well-positioned to realize the full potential of our project and deliver value to both our organization and customers alike.

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https://link.springer.com/chapter/10.1007/978-3-030-02613-4_50

APPENDIX
Business Canvas:

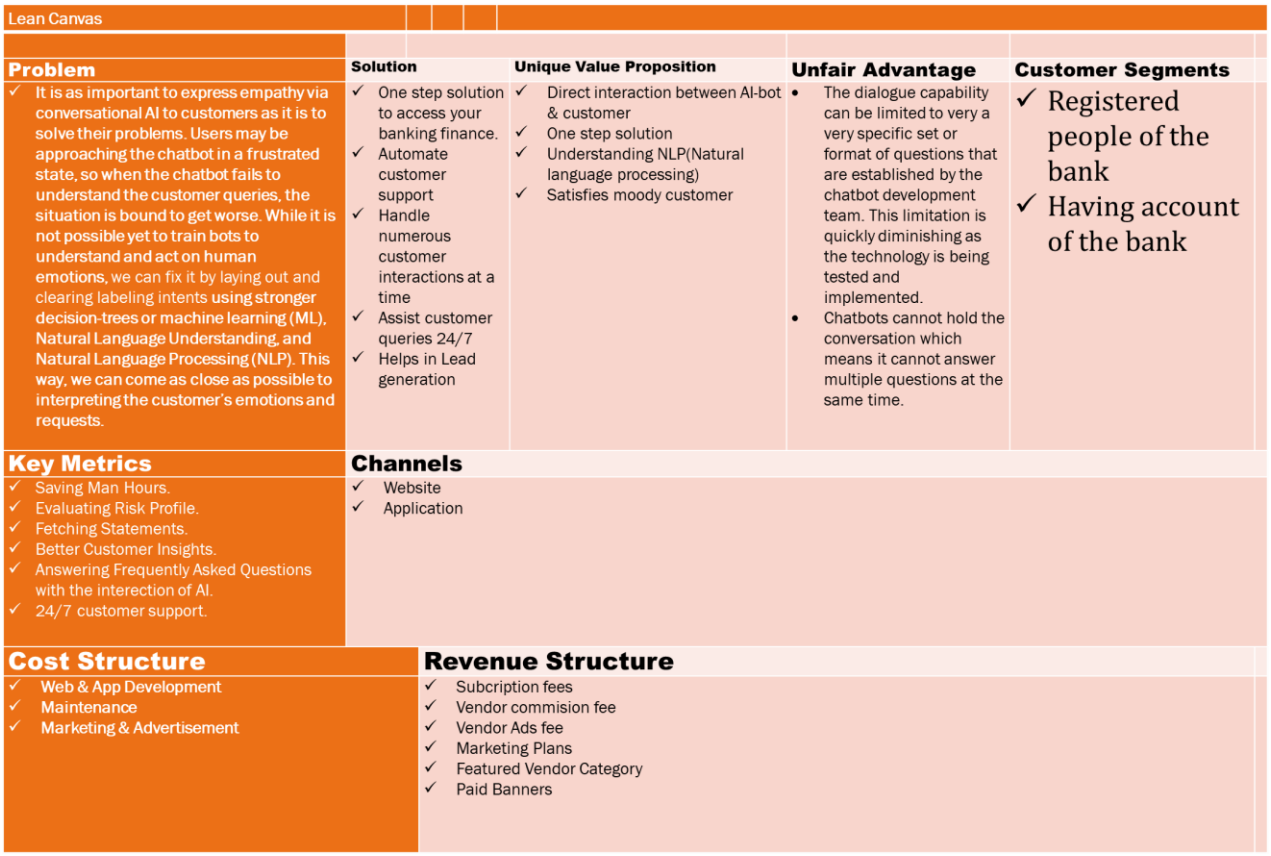

Figure 17: Canvas

Gantt Chart:

	Week 1-4	Week 5-8	Week 9-12	Week 13-16	Week 17-20	Week 21-24	Week 25-28	Week 29-32	Week 33-36	Week 37-40
Proposal Approval										
Introduction & Literature Review										
Research methodology, Functional & Non Functional Requirements										
Research methodology, Functional & Non Functional Requirements										
Use Cases & ERD's										
Prototyping Budgeting & Poster										
Finalize & Review things in detail										

Figure 18: Gantt Chart