



Birla Vishvakarma Mahavidyalaya Engineering College

(An Autonomous Institution)

Information Technology Department

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CERTIFICATE

This is to certify that the project work entitled **Q & A Bot Application** has been successfully carried out by **Suchi Sathavara (19IT402)** for the subject **Major Project (4IT33)** during the academic year 2022-23, Semester-II for partial fulfilment of Bachelor of Technology in Information Technology. The work carried out during the semester is satisfactory.

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I will be failing in duty if I do not acknowledge with grateful thanks to the authors of the references and other literatures referred to in this project.

Thanking You,

Suchi Sathavara (19IT402)

Abstract

The development of chatbot applications for businesses has revolutionized the way employees resolve their business-related queries. These chatbot applications are designed to provide a convenient and efficient platform for employees to seek assistance and find solutions to their work-related questions. The primary objective of these chatbot applications is to streamline internal communication and provide quick access to information, enabling employees to resolve their queries promptly. By leveraging natural language processing (NLP) and machine learning algorithms, these applications can understand and interpret user inputs, allowing for a conversational interaction that closely resembles human conversation. The chatbot applications are integrated into the company's existing communication channels, such as internal messaging platforms, intranets, or dedicated mobile applications. This integration ensures that employees can access the chatbot easily and receive prompt responses to their queries. Employees can interact with the chatbot application by asking questions, seeking guidance, or requesting specific information related to their work. The chatbot analyses the queries, searches its knowledge base, and delivers relevant responses or solutions. In cases where the chatbot cannot provide a satisfactory answer, it can escalate the query to a human representative or provide alternative resources for further assistance. Furthermore, these chatbot applications generate valuable insights by collecting data on employee queries, trends, and frequently accessed information. Businesses can leverage these insights to identify areas of improvement, optimize processes, and enhance employee training and onboarding experiences.

Table of Content

Chapter 1: Introduction

1.1 Brief overview of the work	1
1.2 Objective	1
1.3 Scope	1
1.4 Project Modules	1
1.5 Project Hardware/Software Requirements	2

Chapter 2: Literature Review

2.1 Literature Review	3
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Chapter 3: System Analysis & Design

3.1 Comparison of Existing Applications with your Project with merits and demerits	5
3.2 Project Feasibility Study	6
3.3 Project Timeline chart	7
3.4 Detailed Modules Description7
3.5 Project SRS	
3.5.1 Use Case Diagram.....	8
3.5.2 Class Diagram	10
3.5.3 Data Flow Diagram	10
3.5.4 Entity Relationship Diagram.....	13
3.5.5 Event Trace Diagram.....	14
3.5.6 State Diagram	15
3.5.7 Activity Diagram	16

3.6 Data Dictionary	17
Chapter 4: Implementation and Testing	
4.1 User Interface and Snapshot	18
4.2 Testing using use cases	21
Chapter 5: Conclusion & Future work	
5.1 Conclusion	25
5.1 Future work	25
Chapter 6: Reference.....	26

List Of Figures

Figure 3.1 Time Line Chart.....	7
Figure 3.2 Use case diagram.....	9
Figure 3.3 Data Flow diagram.....	10
Figure 3.4 ER diagram.....	13
Figure 3.5 Sequence diagram.....	14
Figure 3.6 State diagram.....	15
Figure 3.7 Activity diagram.....	17
Figure 4.1 Login page.....	18
Figure 4.2 Signup Page.....	18
Figure 4.3 Login page for Admin Panel.....	19
Figure 4.4 Approval for employees.....	19
Figure 4.5 Get Credentials from Email.....	20
Figure 4.6 Chat Bot Page.....	20

List Of Tables

Table 3.1 Data Dictionary – employees.....	17
Table 3.2 Data Dictionary – admin.....	17
Table 4.1 Test Case 01.....	21
Table 4.2 Test Case 02.....	22
Table 4.3 Test Case 03.....	23
Table 4.4 Test Case 04.....	24

List Of Abbreviations

- SQL – Structured Query Language
- NLP – Natural Language Processing
- API – Application Programming Interface
- DNN- Deep Neural Network
- NLU- Natural Language Understanding
- CUI- Character User Interface
- DRL- Deep reinforcement learning
- UI- User Interface

Chapter 1: Introduction

1.1 Brief Overview

The Q & A based Bot application is a type of application that will allow employees to get information about things like purchase order, po line, unit wise prices, total cost, activity status, amount of quantity just by entering their query. Employees have to register themselves to use the functionality of the system and the approval will be provided to them by the admin via email. After getting access, they have to login into the system and enter their question from the Bot.

1.2 Objective :-

The Q & A based Bot application is an automated system that will interact with employees to provide them with relevant answers to their questions. The system will use natural language processing techniques to understand the user's query and provide an appropriate response. The main objective to develop this system is to reduce the time for the employees to resolve their queries.

1.3 Scope :-

The application will reduce the much of manual work which will affect the timeframe. It will be beneficial for the employees who want to track and manage their work and orders. This application provides detailed information about purchase as well as shipment orders so that will help to make future partnerships with only consistent dealers.

1.4 Modules :-

- Model Module
 - Database Management Module
 - Query Management Module
 - Training Script
- Integration Module
- Employee Module
- Admin Web Panel

1.5 Project Hardware And Software Requirements :-

1.5.1 Hardware :-

- Basic Computer / Laptop with Win 10 / Win 11 / Linux
- 4 / 8 GB RAM x86 64 – bit CPU (Intel / AMD Architecture)

1.5.2 Software :-

- Operating System: Windows 10 and above.
- Programming language: Python 3 and above, Sql, JSON, ReactJS, Java.
- Platform: SSMS, Android Studio, Pycharm, Postman, VS code
- Framework: Flask, Django.

Chapter 2: Literature Review

- According to the survey on Chatbot Implementation in Customer Service Industry through Deep Neural Network, the strategies for creating rules for chatbot have been advanced. strategy for creating chatbots has depended on hand-written rules and templates. With the rise of deep learning these models were quickly replaced by an end-to-end neural network. All the more specifically DNN is a powerful generative-based model to take care of the conversational response generation problems. This paper led an inside and out the review of ongoing literature, examining more than 70 publications related to chatbots published in the last 5 years. based on a literature survey this examination made a comparison from chosen papers according to the strategy adopted. This paper also introduced why current chatbot models fail to take into account while generating responses and how this affects the quality of conversation.
- According to the research intent detection based Lithuanian chatbot created via Automatic DNN hyper-parameter Optimization they handled a purpose recognition issue for the Lithuanian language with the real supervised data. The main principle of focus is on the upgrade of the NLUnderstanding module, responsible for the comprehension of user questions. The NLU model is prepared with an appropriately selected word vectorization type and a Deep Neural Network classifier. During their experiment, they have tentatively investigated fast text and bert embeddings.
- According to research chatbot technologies and challenges they gave an outline of the innovations that drive chatbot including Information Extraction and deep learning. they have additionally examined the contrasts between conversational and transactional chatbots. the former is defined manually on free form chat logs while the last is characterized physically to accomplish a particular objective like booking a flight. they have likewise given an outline of commercial tools and platforms that can help in creating and deploying chatbot. at last, they have introduced the limitations and future work difficulties around here.
- According to research Accessible conversational user interfaces consideration for design scope of current guidance and flow direction, reports, exploration and writing on an open plan for various disability groups of incorporating clients with psychological

well-being issues, mental imbalance, medical issue, intellectual incapacities, dyslexia, or learning challenges, and tangible, versatility or ability weaknesses. they grouped the component from this assortment of directions that seem applicable to the plan of available CUIs, and cases where direction presents issues that are less decisive, and require further investigation.

- According to research Ensemble-based, deep reinforcement learning for chatbots trainable chatbots that show familiar and human-like discussions remain a major challenge in artificial intelligence. Deep Reinforcement Learning is promising for tending to this test, however, its fruitful application remains an open inquiry. This article portrays a novel ensemble-based methodology applied to esteem-based DRL chatbots which utilize limited activity sets as a type of importance portrayal. In their methodology, while exchange activities are obtained from sentence clustering, the training datasets in our ensemble are obtained from discourse clustering. they latter plan to induce specific agents that figure out how to communicate in a specific style.

Chapter 3 : System Analysis & Design

3.1 Comparison Of Existing Applications With This Project With Merits And Demerits:-

- This application can be personalized with the particular business as and when needed, and using this application, we can decrease the lack of communication factor in multiple businesses.
- Chatbots are designed to understand user inputs and provide relevant responses, creating a natural conversation flow. In contrast, other types of applications typically rely on traditional user interfaces such as buttons, forms, and menus, which may not offer the same level of conversational interaction.
- Personalization: This application can offer personalized experiences by leveraging user data and preferences. This application can remember past conversations and tailor responses accordingly, making them more adaptable to individual users. Other types of applications may require users to manually input preferences or navigate through various screens to achieve a similar level of personalization.
- User Assistance: This application often deployed as virtual assistance, providing instant help and guidance to users. They can answer questions, provide recommendations, and assist with tasks in real-time. Other applications may require users to navigate through menus or search for information, which can be more time-consuming and less intuitive.
- Integration: The Chat Bot model can be integrated into various platforms and channels, including websites, messaging apps, voice assistants, and social media platforms. This versatility allows them to reach users in their preferred communication channels. In contrast, other types of applications are typically limited to specific platforms or devices.
- Automation: This application is well-suited for automation tasks, allowing them to handle repetitive or routine queries, transactions, and support requests. This automation can help streamline processes and free up human resources. Other types of applications may not offer the same level of automation capabilities without additional development efforts.

3.2 Project Feasibility Study :-

3.2.1 Technical Feasibility :-

The technical issue usually raised during the feasibility stage of the investigation includes the following :

- Does the necessary technology exist to do what is suggested?
Yes, We can build this system using existing technologies.
- Will the proposed system provide adequate response to inquiries, regardless of the number or location of users?
Yes, System will provide adequate response to inquiries as quickly as possible.
- Can the system be upgraded if developed?
Yes, System can be upgraded after it is developed.
- Are there technical guarantees of accuracy, reliability, ease of access and data security?
Yes, There are technical guarantees of accuracy, reliability, ease of access and data security.

3.2.2 Operational Feasibility :-

Some of the important issues raised are to test the operational feasibility of a project includes the following :

- Will the system be used and work properly if it is being developed and implemented?
Yes, System will work properly if it is being developed and implemented.
- Is there sufficient support for the management from the users?
Yes, There is sufficient support for the management from the users.

3.2.3 Economic Feasibility :-

Economic Feasibility looks for the financial aspects of the system. Economic Feasibility concern with the returns from the investment in a system. It determines whether it is worthwhile to invest in that proposed system.

3.2.4 Software Development Life Cycle :-

To develop this application, I have used the concept of waterfall model. Firstly I have check for the problem and based on that I have performed requirement gathering and gained some detailed knowledge of problem. After that I have planned for the workflow of the system and started working on the development of the modules. And in the last stage I have tested my application with multiple testcases.

3.3 Project Timeline chart :-

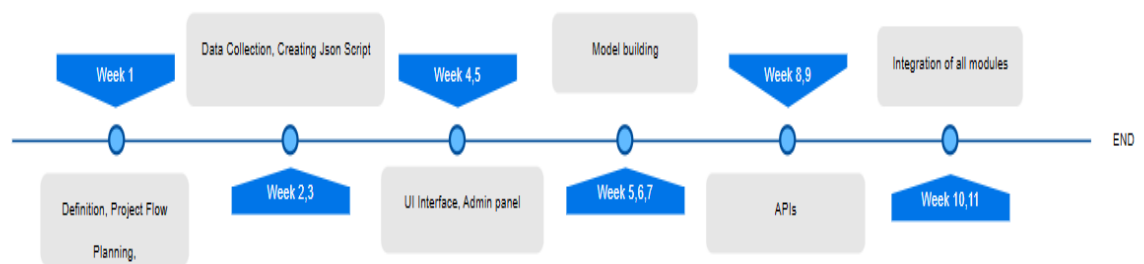


Figure 3.1 Time Line Chart

3.4 Detailed Modules Description :-

3.4.1 MODEL Side :-

- Database Management Module:
 - Collect, import and load the data files to get the server data into the same type of format. Then Pre-Process data and create a knowledge base format.
- Query Management Module:
 - In this module, I have created structured query scripts as well as records queries entered by the user.

- Training Script Module:
 - Created a JSON file, containing intents, patterns (questions) and the responses for each intent. The JSON file was loaded in the training script.

3.4.2 Integration Module :-

- The ability to integrate with external data sources such as databases, APIs and applications to provide more comprehensive answers to the users.

3.4.3 Employee Module :-

- Employees will get access to use an android application for Q&A. Which will have following features:
 - Login
 - Registration
 - Bot Page

3.4.4 Admin Web Panel :-

- Login:
 - To use the functionalities, admin has to login first.
- Approval to the employees:
 - A web panel for admin which will give approval to the employees.
- Manage employee account:
 - Performing operations like creating, deleting and updating employees account. and will be able to see queries entered by employees.

3.5 Project SRS :-

3.5.1 Use Case Diagrams :-

Use case diagrams are a common way to communicate the major functions of a software system. A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.



Figure 3.2 Use Case Diagram

3.5.2 Class Diagrams :-

The class diagram is the main building block of object-oriented modeling. It is used for general conceptual modeling of the system and of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

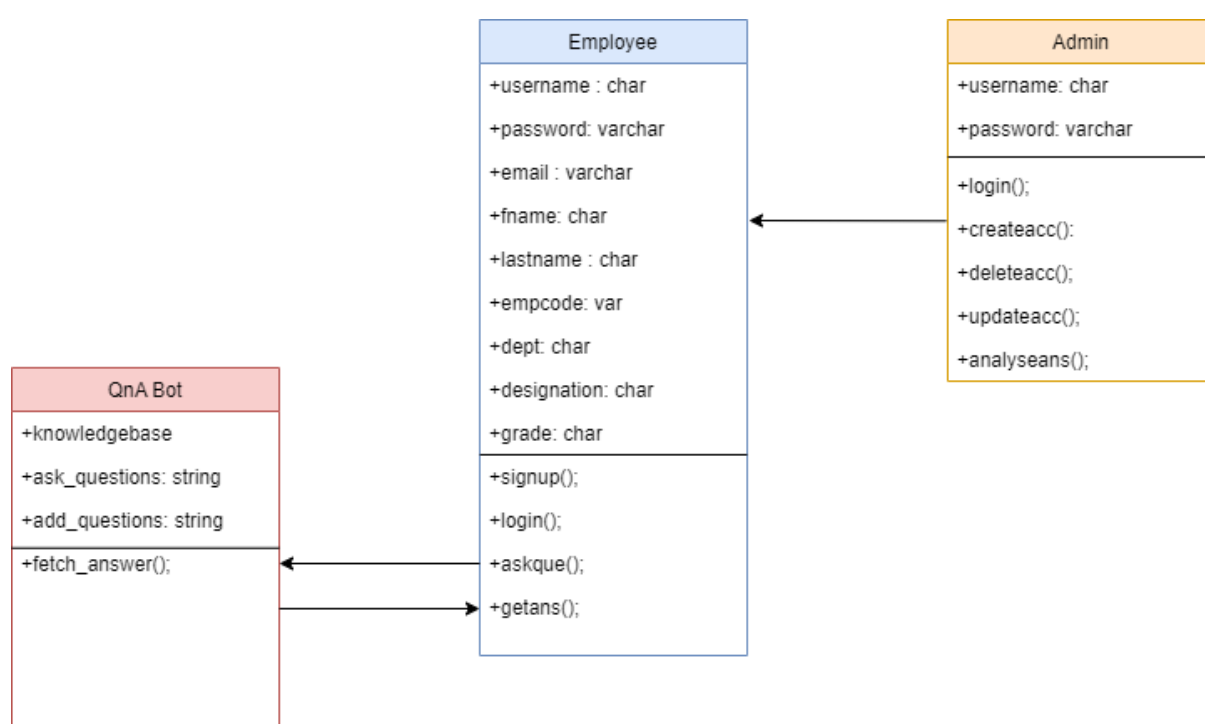
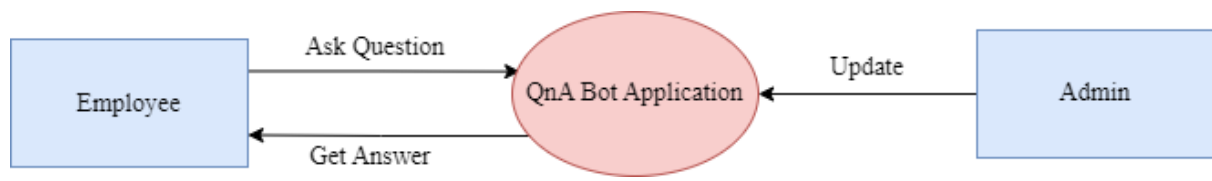


Figure 3.3 Class Diagram

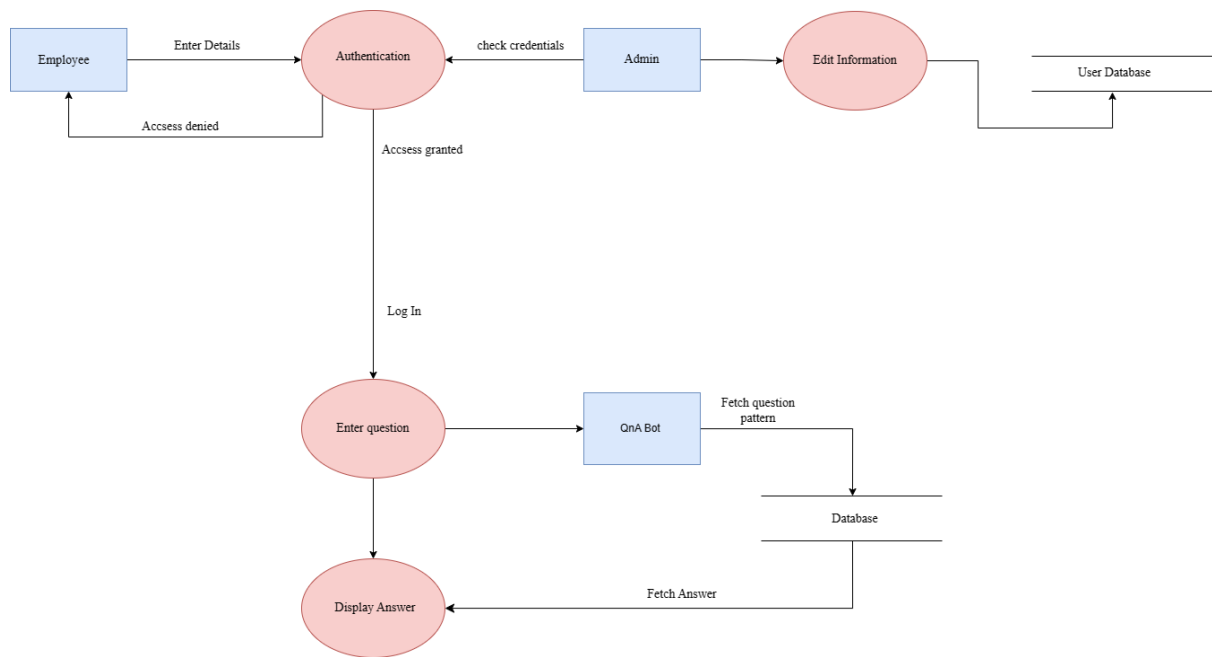
3.5.3 Data Flow Diagrams :-

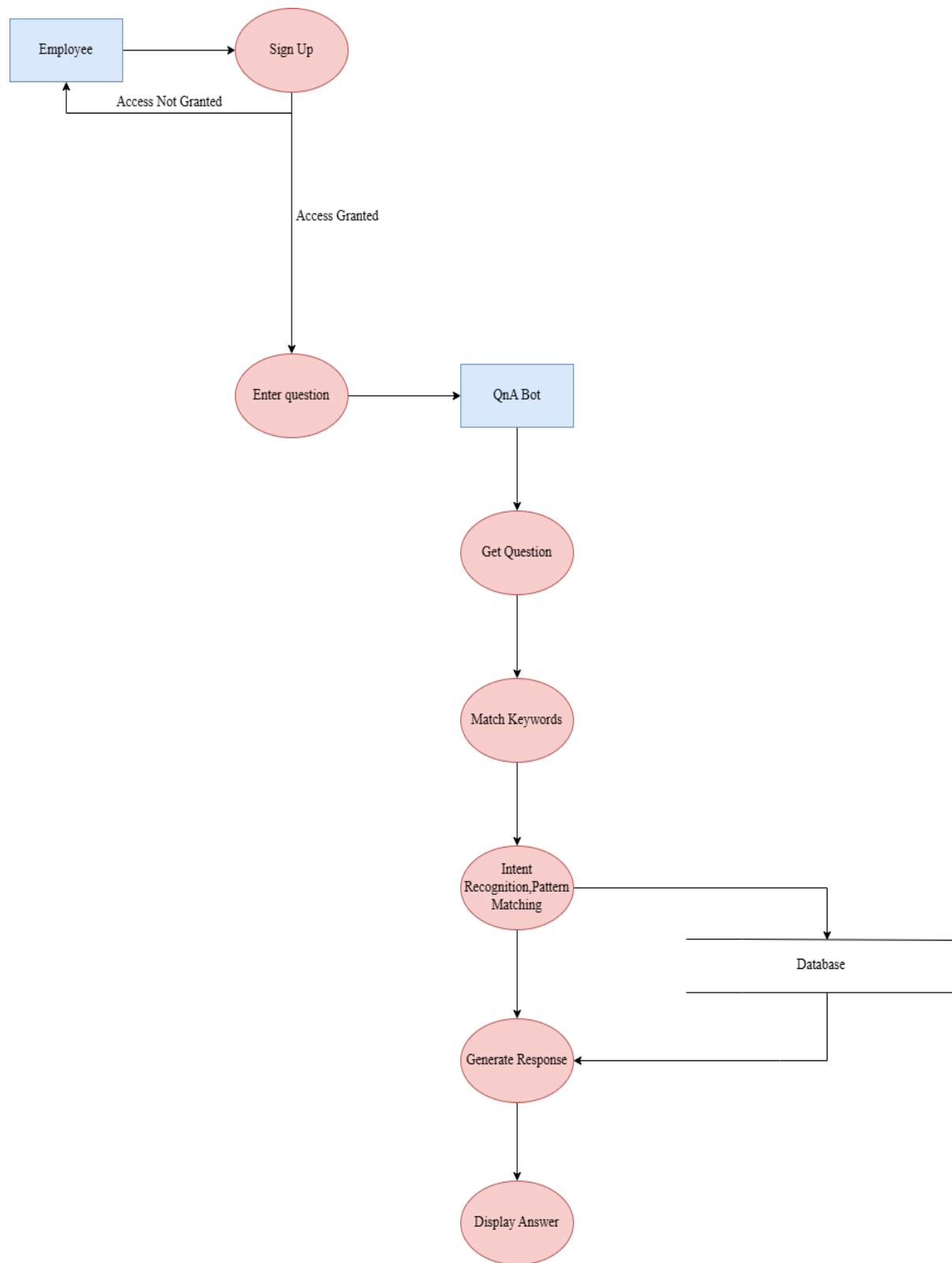
DFD provides the functional overview of a system. The graphical representation easily overcomes any gap between 'user and system analyst' and 'analyst and system designer' in understanding a system. Starting from an overview of the system it explores detailed design of a system through a hierarchy.

Level-0



Level-1



Level-2**Figure 3.4 Data Flow Diagram**

3.5.4 Entity Relationship Diagrams :-

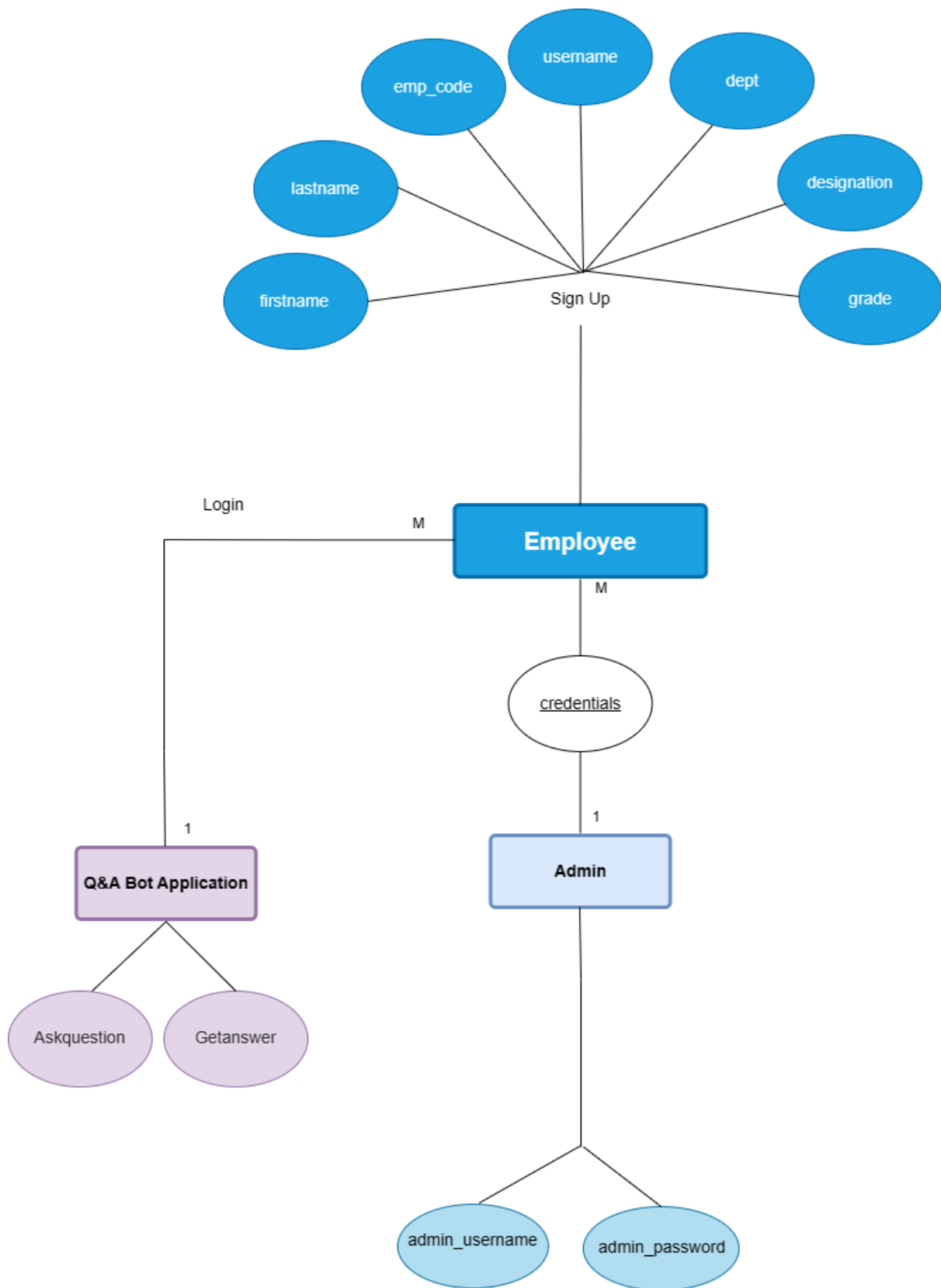


Figure 3.5 Entity Relationship Diagram

3.5.5 Sequence Diagrams :-

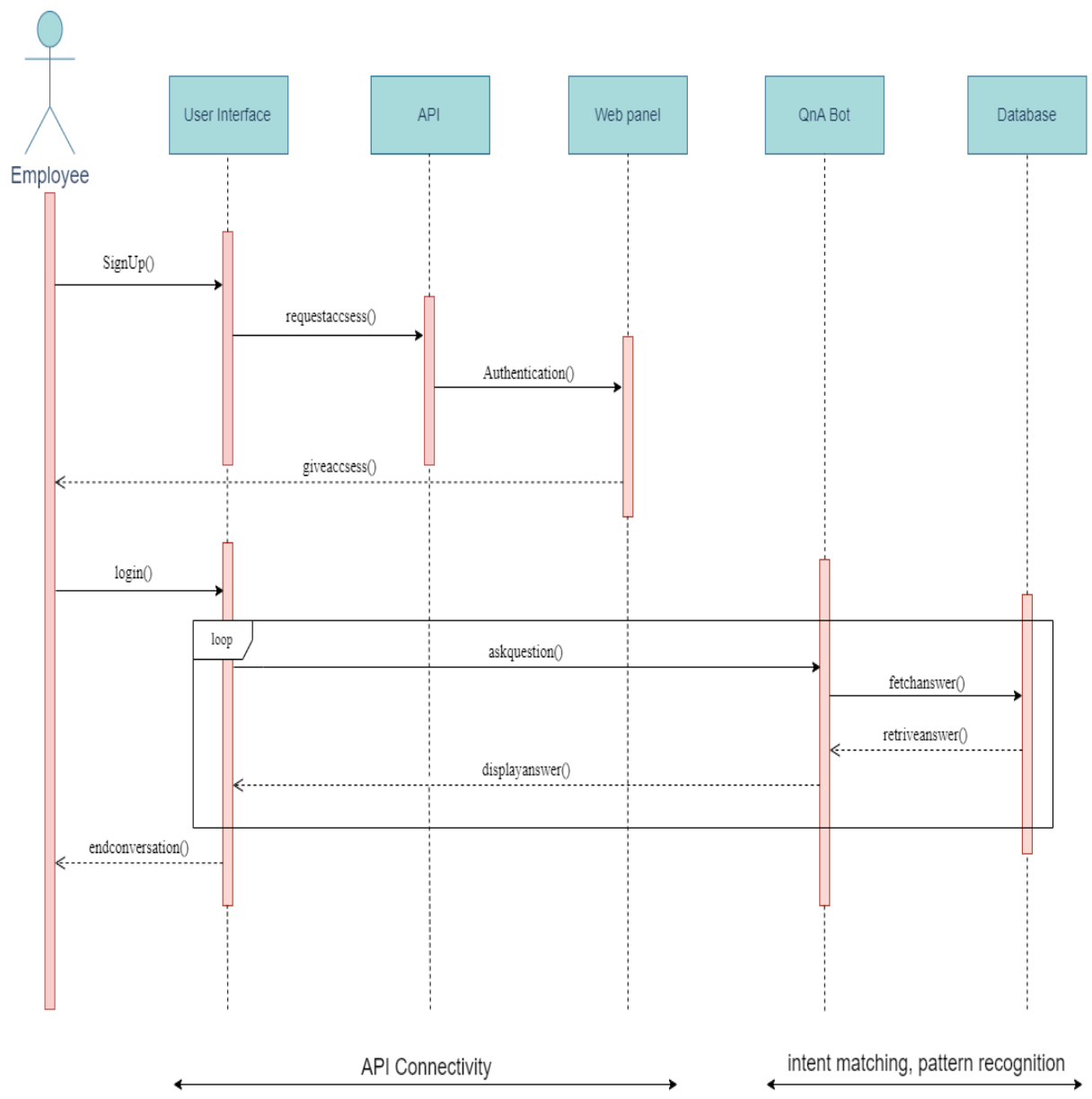


Figure 3.6 Sequence Diagram

When a user asks the question, it will be captured and sent to a next process. i.e Context Tracking, Intent recognition and entity recognition. Intent is the core part in the query and the entity is like a subpart of the user query. There can be a numerous number of entities present inside the intent.

3.5.6 State Diagrams :-

State diagrams mainly depict states and transitions. States are represented with rectangles with rounded corners that are labelled with the name of the state. Transitions are marked with arrows that flow from one state to another, showing how the states change.

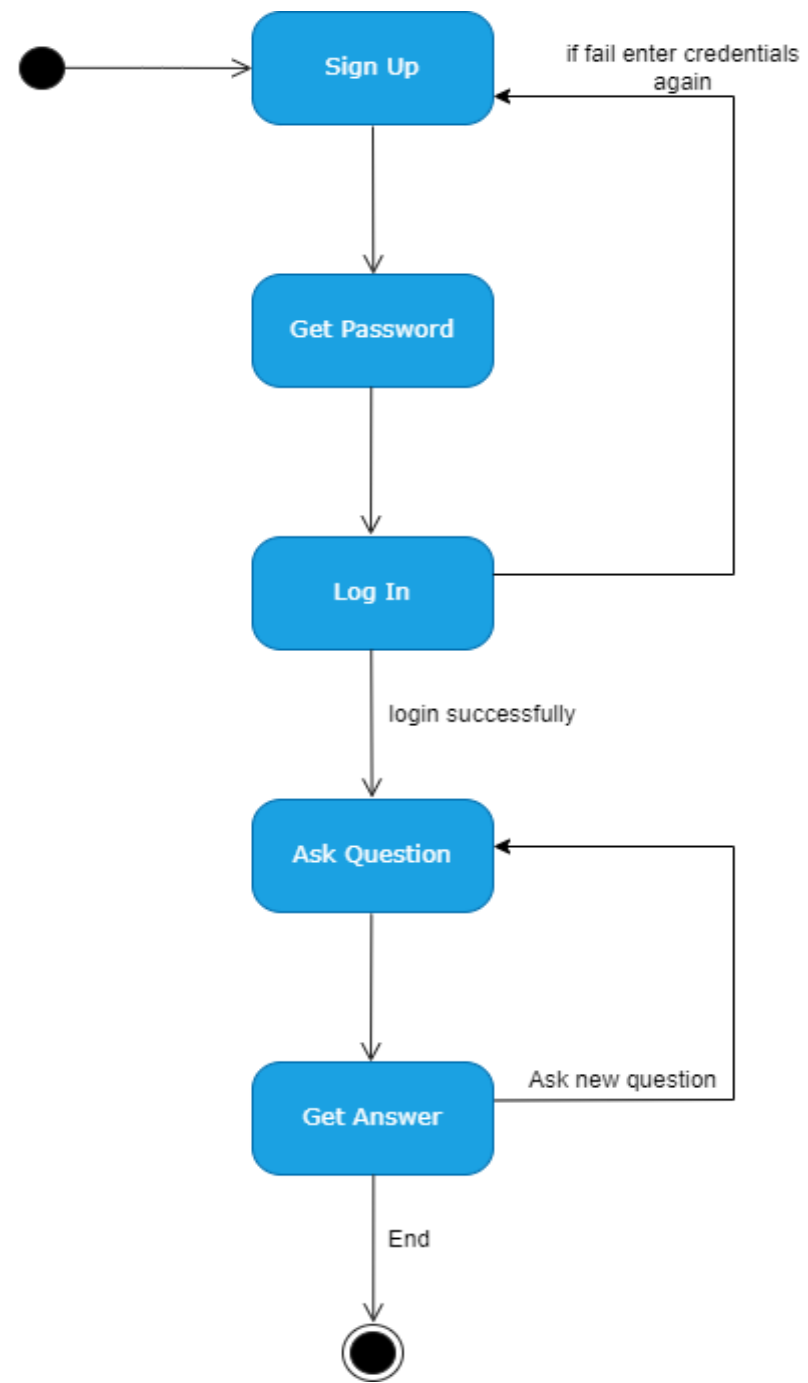


Figure 3.7 State Diagram

3.5.7 Activity Diagrams :-

Activity diagram is graphical representations of work processes of stepwise exercises and actions with backing for decision, emphasis and simultaneousness. In the Unified Modelling Language, movement outlines are planned to display both computational and authoritative procedures (i.e., workflows). Activity charts demonstrate the general stream of control.

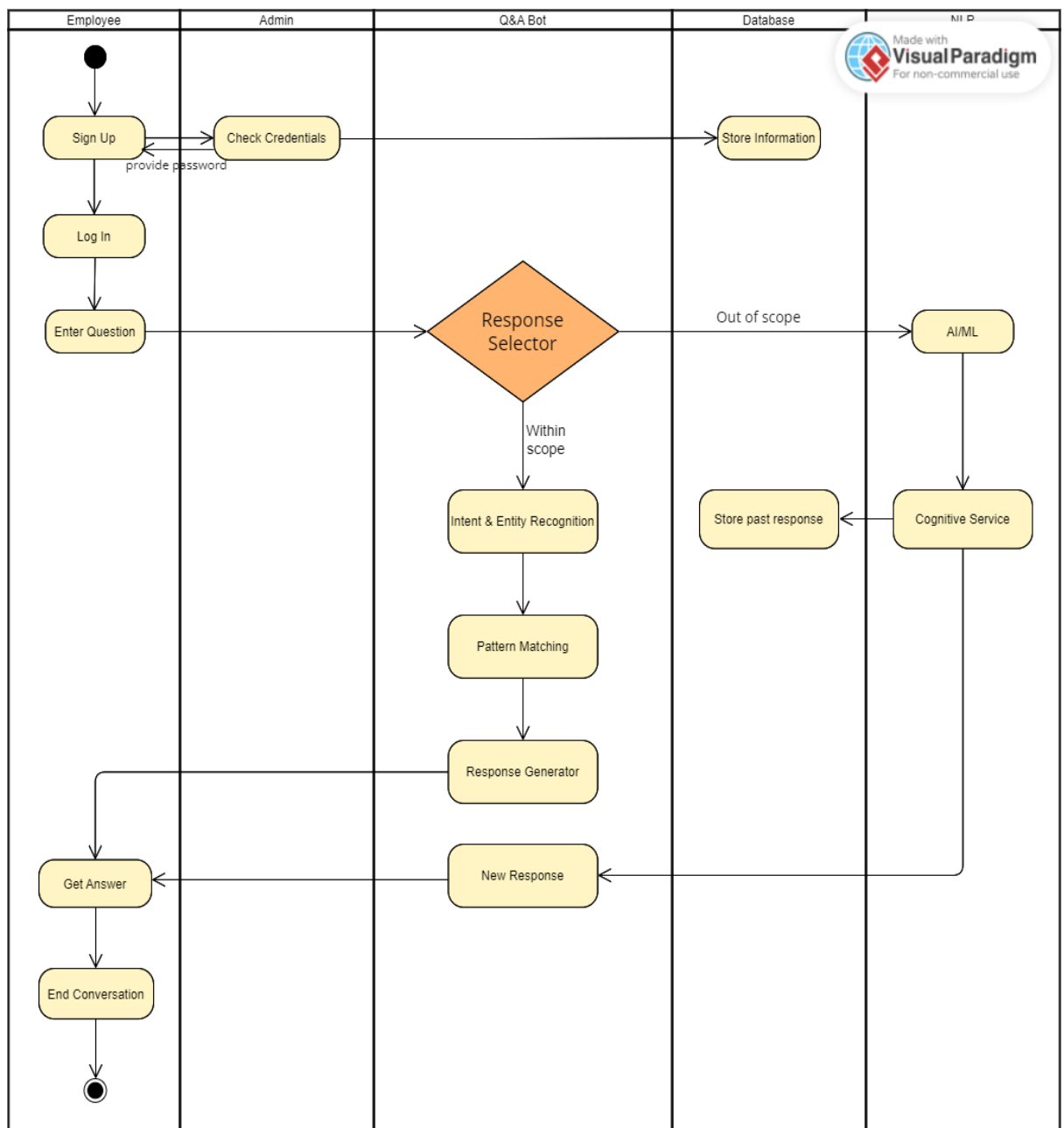


Figure 3.8 Activity Diagram

3.6 Data Dictionary :-

- **employees :**

Sr. No.	Field Name	Datatype (Size)	Constraint
1	username	char	Primary Key
2	password	varchar(10)	Not Null
3	email	varchar(25)	Not Null
4	fname	char	Not Null
5	empcode	var	Not Null
6	dept	char	Not Null
7	designation	char	Not Null
8	grade	char	Not Null

Table 3.1 Data Dictionary – employees

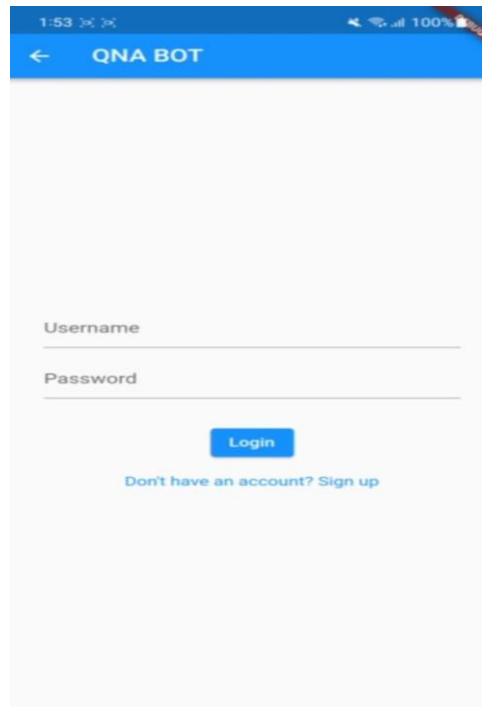
- **admin :**

Sr. No.	Field Name	Datatype (Size)	Constraint
1	username	char	Primary Key
2	password	varchar(10)	Not Null

Table 3.2 Data Dictionary – admin

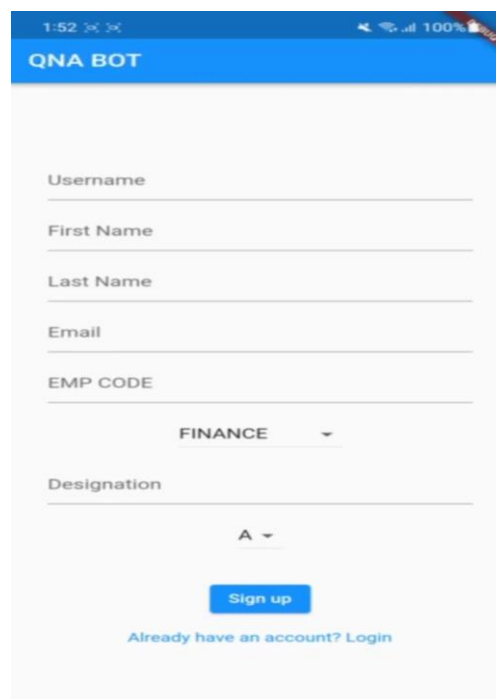
Chapter 4 : Implementation and Testing

4.1 User Interface and Snapshot :-



The screenshot shows the login interface of the QNA BOT application. At the top, there is a blue header bar with a back arrow and the text "QNA BOT". Below the header, the page has a light gray background. There are two input fields: "Username" and "Password". Below these fields is a blue "Login" button. At the bottom, there is a link that says "Don't have an account? Sign up". The status bar at the very top shows the time as 1:53, signal strength, and 100% battery.

Figure 4.1 Login page



The screenshot shows the signup interface of the QNA BOT application. At the top, there is a blue header bar with the text "QNA BOT". Below the header, the page has a light gray background. There are several input fields: "Username", "First Name", "Last Name", "Email", and "EMP CODE". Below the "EMP CODE" field is a dropdown menu currently showing "FINANCE". Below that is a "Designation" field with a dropdown menu currently showing "A". At the bottom, there is a blue "Sign up" button. At the very bottom, there is a link that says "Already have an account? Login". The status bar at the very top shows the time as 1:52, signal strength, and 100% battery.

Figure 4.2 Signup page

Login

Admin@Test

✓

✓

Login

Figure 4.3 Login page for Admin Panel

Approval of employees

First	Last	dept	designation	email	empCode	Grade	Approve/UnApprove
emp1	check	dept1	des1	employee1@gmail.com	1231	A	approve
emp2	check	dept1	des1	employee2@gmail.com	1232	A	approve
employee3	check	dept1	des3	emp3@gmail.com	1233	A	approve
employee4	check	dept1	des3	emp4@gmail.com	1234	A	approve
suchi25	sathavara	dept2	des2	suchi25sathavara@gmail.com	12345	A	approve

Logout

Figure 4.4 Approval for employees page

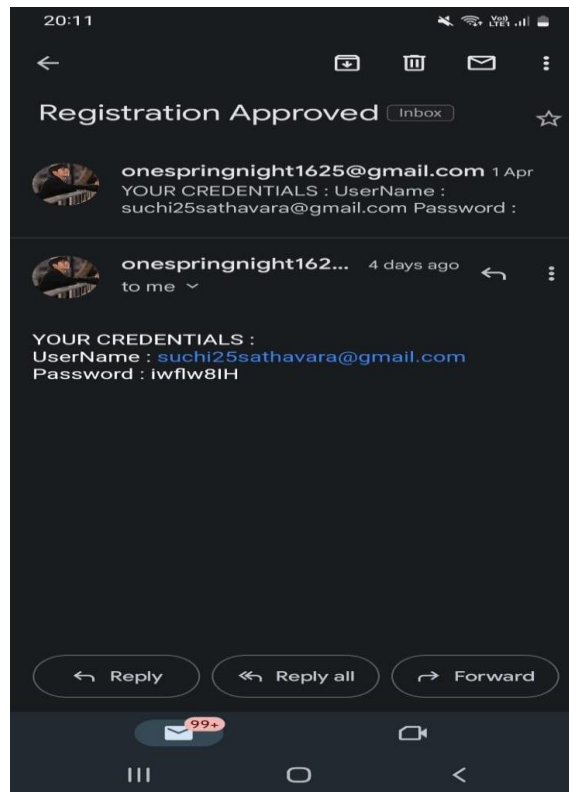


Figure 4.5 Get credentials on Email



Figure 4.6 Chat Bot page

4.2 Testing using Use Cases :-

Test Case ID	TC-01
Module to be tested	Sign up
Assumptions	---
Test Data	Check if the employee is able to sign up to the system if he enters the new user's name
Test Steps	<ol style="list-style-type: none"> 1. Choose the sign-up option 2. Enter the details 3. Click on the sign-up button
Expected results	It should store the employee's data and redirect it to the login page.
Result	Pass
Comments	After the successful sign-up, employee will go to the login page

Table 4.1: Test Case-01

Test Case ID	TC-02
Module to be tested	Sign-up page
Assumptions	---
Test Data	Check if user-name entered for the registration is already taken
Test Steps	<ol style="list-style-type: none"> 1. Choose the sign-up option 2. Enter the username which has been taken and password 3. Click on the sign-up button
Expected results	The employee should not be able to register for the system and displayed the error message to choose the different username
Result	Pass
Comments	If the username is already taken it will show the error message and system asked user to enter another username.

Table 4.2: Test Case-02

Test Case ID	TC-03
Module to be tested	Login Page
Assumptions	---
Test Data	Check When passing a correct username and invalid password
Test Steps	<ol style="list-style-type: none"> 1. Enter valid username 2. Enter incorrect password 3. Check on the login box
Expected results	Employee can't login and show error message
Result	Pass
Comments	Upon entering wrong password employee should not be able to logged in

Table 4.3: Test Case-03

Test Case ID	TC-04
Module to be tested	Bot page
Assumptions	Employee is already logged in
Test Data	Check that when employee enter question, bot should be able to respond it.
Test Steps	<ol style="list-style-type: none"> 1. Enter Question 2. Click the submit button
Expected results	Employee should get the answer.
Result	Pass
Comments	On click the submit button employee will get the answer for their question.

Table 4.4: Test Case-04

Chapter 5 : Conclusion & Future work

5.1 Conclusion :-

Q & A bot application is type of application that will allow employees to get information about things like purchase order, po line, unit wise prices, total cost, activity status, amount of quantity just by entering their query. In which employees have to register themselves to use the functionality of the system and the approval will be provided to them by the admin.

5.2 Future work :-

In future, our aim is to create application that can have more field related data as well as more intents and recognise patterns so it can be able to answer broad range of questions regarding dataset. As well as make it less time consuming and more accurate with answers.

Chapter 6 : References

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