

A
PROJECT REPORT ON

AN ANDROID APPLICATION
FOR PERSONAL HEALTH
RECORD MANAGEMENT

By

DIVYA SHAH (CE-120) (18CEUOD003)
NIHAR SODHA (CE-128) (17CEUBG094)
RAMYA SURATI (CE-130) (17CEUBS108)

B.Tech CE Semester-VI
Subject: System Design Practice

Guided by:
Prof. Pandav K. Patel
Assistant Professor
Dept. of Comp. Engg.



Faculty of Technology
Department of Computer Engineering
Dharmsinh Desai University



**Faculty of Technology
Department of Computer Engineering
Dharmsinh Desai University**

CERTIFICATE

This is to certify that the practical / term work carried out in the subject of
System Design Practice and recorded in this journal is the
bonafide work of

**DIVYA SHAH (CE-120) (18CEUOD003)
NIHAR SODHA (CE-128) (17CEUBG094)
RAMYA SURATI (CE-130) (17CEUBS108)**

of B.Tech semester **VI** in the branch of **Computer Engineering**
during the academic year **2019-2020**.

Prof. Pandav K. Patel
Assistant Professor,
Dept. of Computer Engg.,
Faculty of Technology
Dharmsinh Desai University, Nadiad

Dr. C. K. Bhensdadia,
Head,
Dept. of Computer Engg.,
Faculty of Technology
Dharmsinh Desai University, Nadiad

ABSTRACT

In today's world of rapid modernization, the memory of human beings to remember different things has always been a difficult task. In the race of the world to earn more money, humans had never care about personal health. Number of new infections and diseases are growing very fast today. Also humans forgot the medication of their individuals and the family ones too. So to fulfill the gap of technology and personal health we here by developed an app called "**PHRM**". This system is very boon for personal use because it covers a wide range of facilities. From managing the insurance details to the reminder of vaccination and lot more aspects related to the personal health are covered in the system.

Contents

1. Introduction.....	01
2. Software Requirement Specification.....	02
3. Design.....	09
a. Use Case diagram.....	09
b. Class diagram.....	11
c. Sequence diagram.....	12
d. Activity diagram.....	13
e. State diagram.....	14
f. E-R diagram.....	15
g. Data dictionary.....	16
4. Implementation Detail.....	22
5. Testing.....	24
6. Screen-shots.....	25
7. Conclusion.....	28
8. Limitation and Future Extension.....	29
9. Bibliography.....	30

Introduction

“PHRM, (Personal Health Record Management)” is an android based application which focuses on the personal and family related health facilities. This platform helps the user to manage insurance details, doctor’s appointment, past medical records, prescription of medicines, allergies (if any) and many more other facilities are present in the system. This system also helps for the health management and the medical management. Also it takes care of the various appointment to the doctor and the vaccination details for the kids in the family. Alarms to take medicines time can be setup and the dosage can be taken in time without fail. Also, the platform helps to manage our medical documents and medical history, blood reports last but not the least the emergency contacts are also available to the system.

Technology Used:

- Android
- Firebase by GOOGLE
- Emulator:

In computing, an emulator is hardware or software that enables one computer system to behave like another computer system. An emulator typically enables the host system to run software or use peripheral devices designed for the guest system.

- JAVA

Hosting Platform:

- Android Device

Tools Used:

- Git hub(version control)
- Android Studio

Software Requirement Specification

R-1) MANAGE_USERS_INFORMATION:

DESCRIPTION: This function allows the user to create his/her account while he/she is using the app for the first time. This function also allows the user to login through his/her account and proceed further according to the needs.

R-1.1) Add_User_Info:

INPUT: User enters the Name, email, password, phone.

OUTPUT: Details will be forwarded to the system and the system will assign the account accordingly.

PROCESS: The entered details will be authenticated internally.

NEXT: The login page will be displayed.

R-1.2) User_Login:

INPUT: The login page will be available for users, with his/her email-id and Password he/she can log in.

OUTPUT: The homepage will be displayed.

PROCESS: The id and password will be authenticated and then the output will be provided if successful.

NEXT: The homepage will be shown.

R-1.3) Delete_User_Info:

INPUT: Customer Selection.

OUTPUT: Confirmation Message.

R-2) MANAGE_PERSONAL_INFO:

DESCRIPTION: Users can manage personal info by this function in the system.

R-2.1) Add_Personal_info:

INPUT: Personal info.

OUTPUT: Confirmation message.

R-2.2) Update_Personal_info:

INPUT: Personal Info.

OUTPUT: Confirmation message.

R-2.3) Delete_Personal_info:

INPUT: User Selection.

OUTPUT: Confirmation message.

R-2.4) Display_Personal_info:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected personal information.

R-3) MANAGE APPOINTMENTS & VISITS:

DESCRIPTION: Users can manage appointments and visit information by this function in the system.

R-3.1) Add appointment and visits:

INPUT: Appointment and visit details.

OUTPUT: Confirmation message.

R-3.2) Update appointment and visits:

INPUT: Appointment and visit details

OUTPUT: Confirmation message.

R-3.3) Delete appointment and visits:

INPUT: Appointment and visit details.

OUTPUT: Confirmation message.

R-3.4) Display appointment and visits:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected appointments and visit.

R-4) MANAGE ALLERGIES:

DESCRIPTION: Users can manage allergies information by this function in the system.

R-4.1) Add allergies:

INPUT: Allergy details.

OUTPUT: Confirmation message.

R-4.2) Update allergies:

INPUT: Allergies details.

OUTPUT: Confirmation message.

R-4.3) Delete allergies:

INPUT: Allergies details.

OUTPUT: Confirmation message.

R-4.4) Display allergies:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected allergies.

R-5) MANAGE MEDICAL DOCUMENTS:

DESCRIPTION: Users can manage medical documents this function in the system.

R-5.1) Add medical documents:

INPUT: Medical Documents details.

OUTPUT: Confirmation message.

R-5.2) Update medical documents:

INPUT: Medical Documents details.

OUTPUT: Confirmation message.

R-5.3) Delete medical documents:

INPUT: Medical Documents details.

OUTPUT: Confirmation message.

R-5.4) Display medical documents:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected allergies.

R-6) MANAGE MEDICAL HISTORY:

DESCRIPTION: Users can manage medical history details this function in the system.

R-6.1) Add medical history:

INPUT: Medical history details.

OUTPUT: Confirmation message.

R-6.2) Update medical history:

INPUT: Medical history details.

OUTPUT: Confirmation message.

R-6.3) Delete medical history:

INPUT: Medical history details.

OUTPUT: Confirmation message.

R-6.4) Display medical history:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected allergies.

R-7) MANAGE BLOOD REPORT & TESTS:

DESCRIPTION: Users can manage blood report and tests details this function in the system.

R-7.1) Add Blood report and tests:

INPUT: Blood report and tests details.

OUTPUT: Confirmation message.

R-7.2) Update Blood report and tests:

INPUT: Blood report and tests details.

OUTPUT: Confirmation message.

R-7.3) Delete Blood report and tests:

INPUT: Blood report and tests details.

OUTPUT: Confirmation message.

R-7.4) Display Blood report and tests:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Blood report and tests.

R-8) MANAGE EMERGENCY CONTACTS:

DESCRIPTION: Users can manage emergency contact details this function in the system.

R-8.1) Add Emergency Contacts:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R-8.2) Update Emergency contact:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R-8.3) Delete Emergency contact:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R-8.4) Display Emergency contact:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Emergency contact.

R-9) MANAGE EMERGENCY CONTACTS:

DESCRIPTION: Users can manage emergency contact details this function in the system.

R-9.1) Add Emergency Contacts:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R-9.2) Update Emergency contact:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R-9.3) Delete Emergency contact:

INPUT: Emergency contact details.

OUTPUT: Confirmation message.

R9.4) Display Emergency contact:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Emergency contact.

R-10) MANAGE IMMUNIZATIONS:

DESCRIPTION: Users can manage immunizations details this function in the system.

R-10.1) Add Immunizations:

INPUT: Immunizations contact details.

OUTPUT: Confirmation message.

R-10.2) Update Immunizations:

INPUT: Immunizations details.

OUTPUT: Confirmation message.

R-10.3) Delete Immunizations:

INPUT: Immunizations details.

OUTPUT: Confirmation message.

R-10.4) Display Immunizations:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Immunizations.

R-11) MANAGE DRUGS:

DESCRIPTION: Users can manage drugs details by this function in the system.

R-11.1) Add Drugs:

INPUT: Drug details.

OUTPUT: Confirmation message.

R-11.2) Update Drug:

INPUT: Drug details.

OUTPUT: Confirmation message.

R-11.3) Delete Drug:

INPUT: Drug details.

OUTPUT: Confirmation message.

R-11.4) Display Drug:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Drug.

R-12) MANAGE INSURANCE:

DESCRIPTION: Users can manage insurance details by this function in the system.

R-12.1) Add Insurance:

INPUT: Insurance details.

OUTPUT: Confirmation message.

R-12.2) Update Insurance:

INPUT: Insurance details.

OUTPUT: Confirmation message.

R-12.3) Delete Insurance:

INPUT: Insurance details.

OUTPUT: Confirmation message.

R-12.4) Display Insurance:

INPUT: User Selection.

OUTPUT: The page will be displayed which will have all details about the selected Insurance.

Design

I. Use Case Diagrams

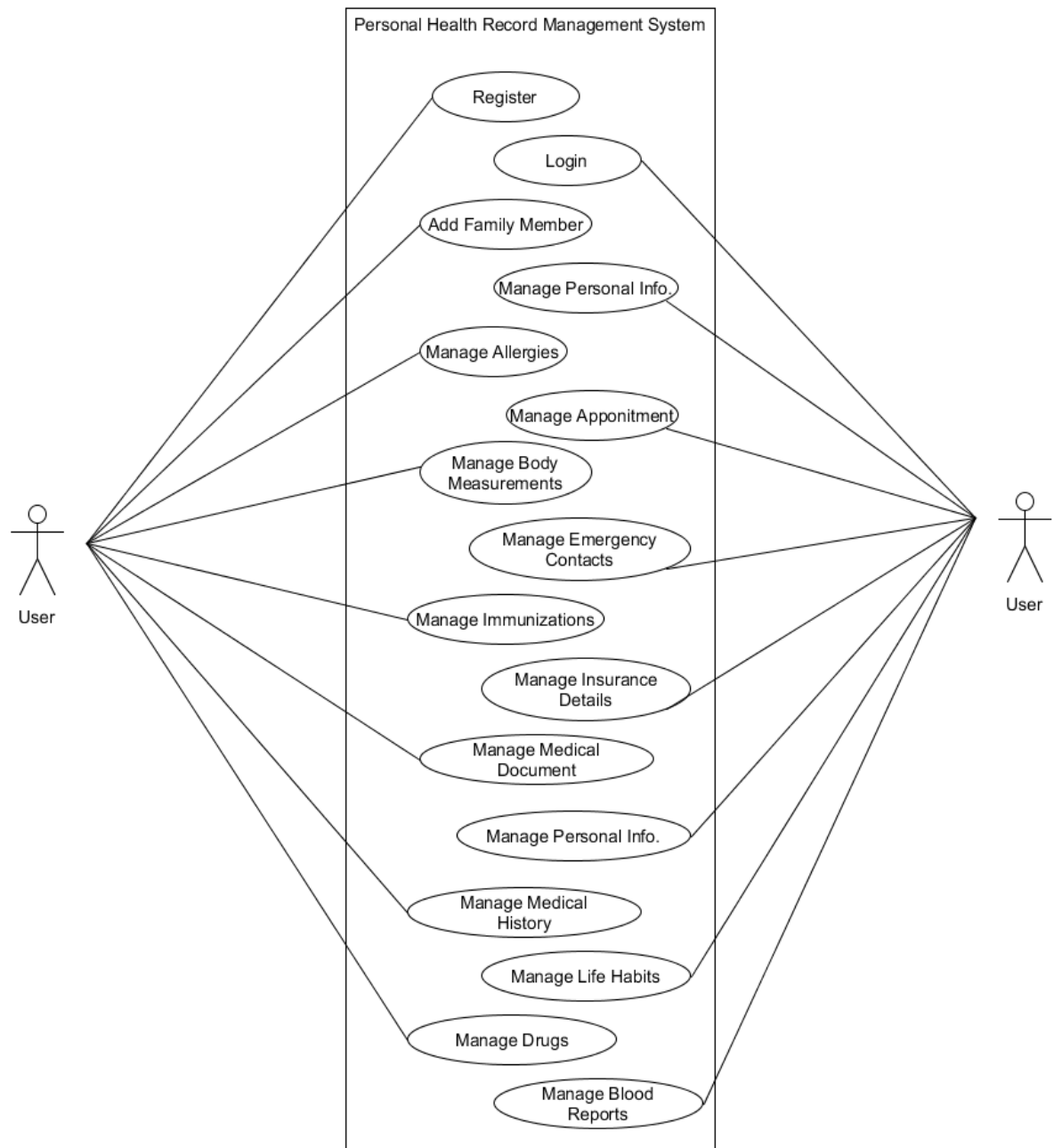


Fig 3.1.1 Use Case Diagram of Personal Health Record Management System

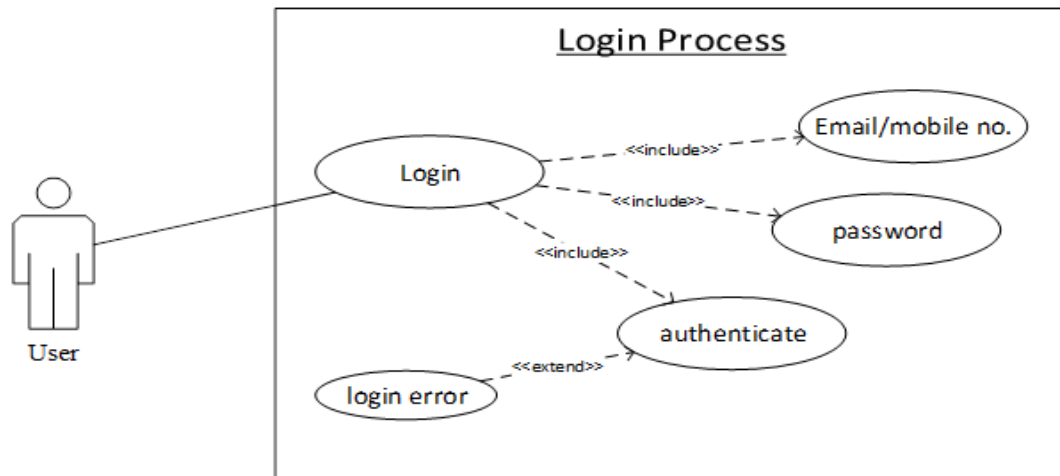


Fig. 3.1.2 Use Case Diagram of Login Process

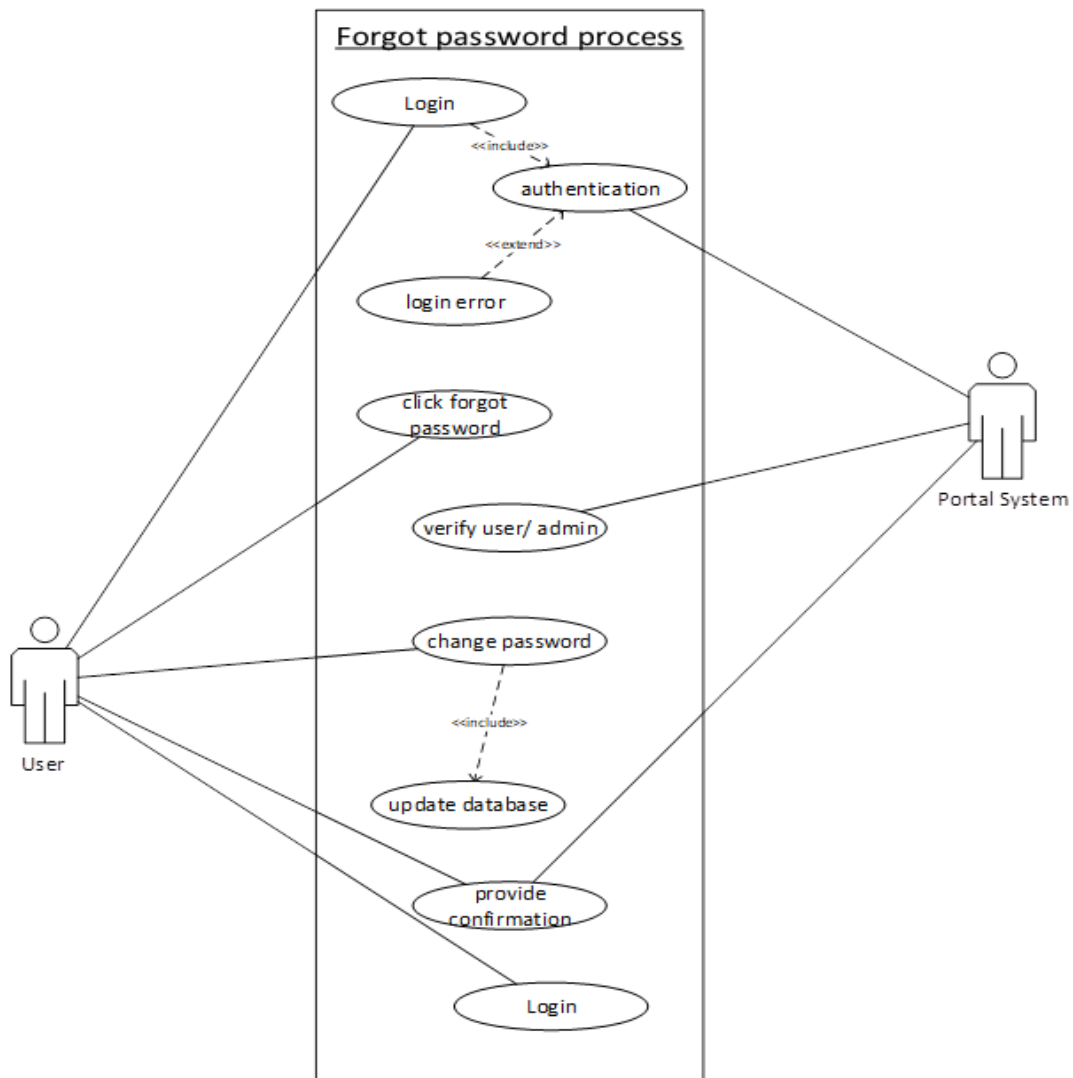


Fig. 3.1.3 Use Case Diagram of Forgot Password Process

II. Class Diagram

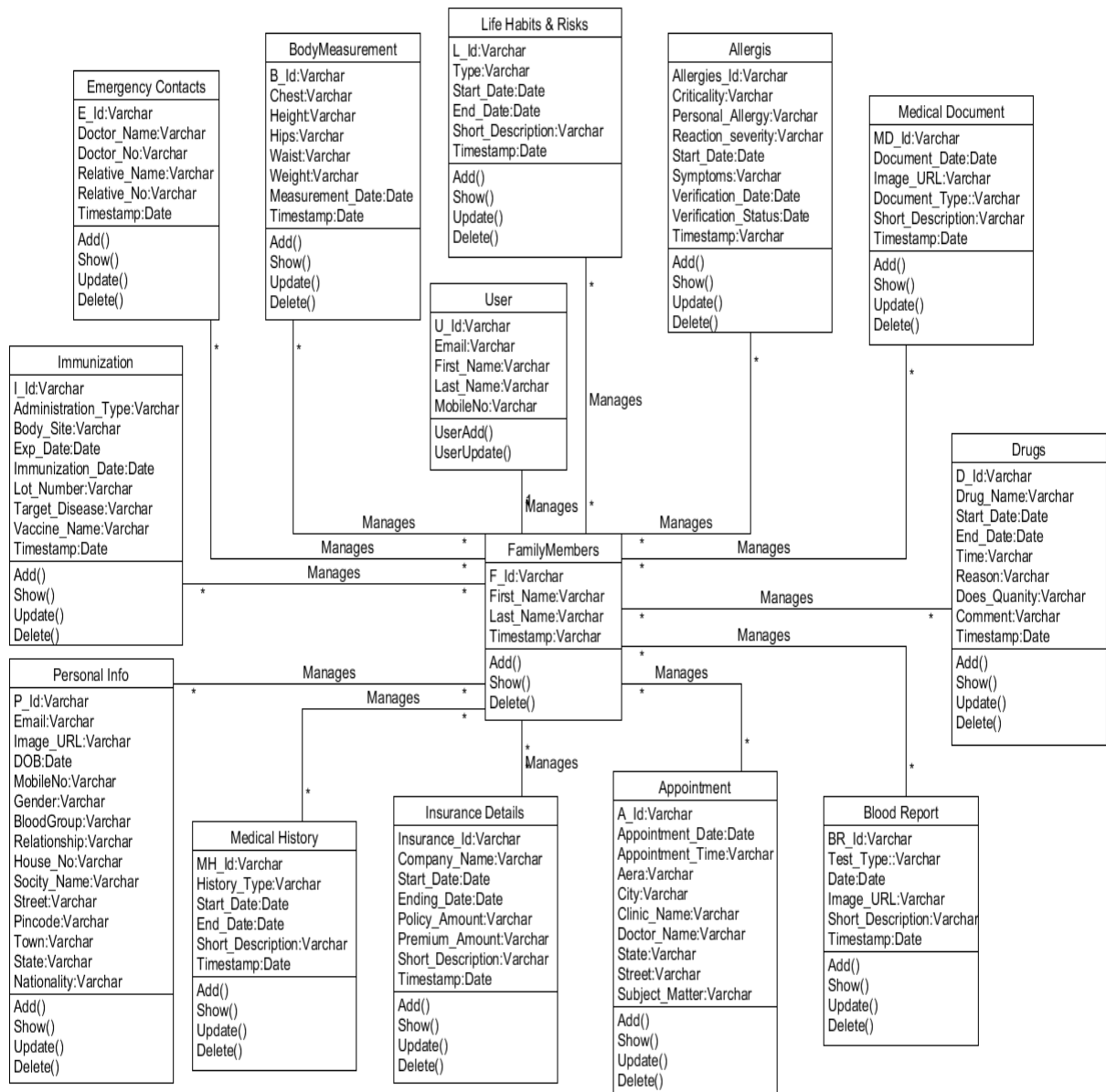


Fig 3.2.1 Class Diagram of Personal Health Record Management System

III. Sequence Diagrams

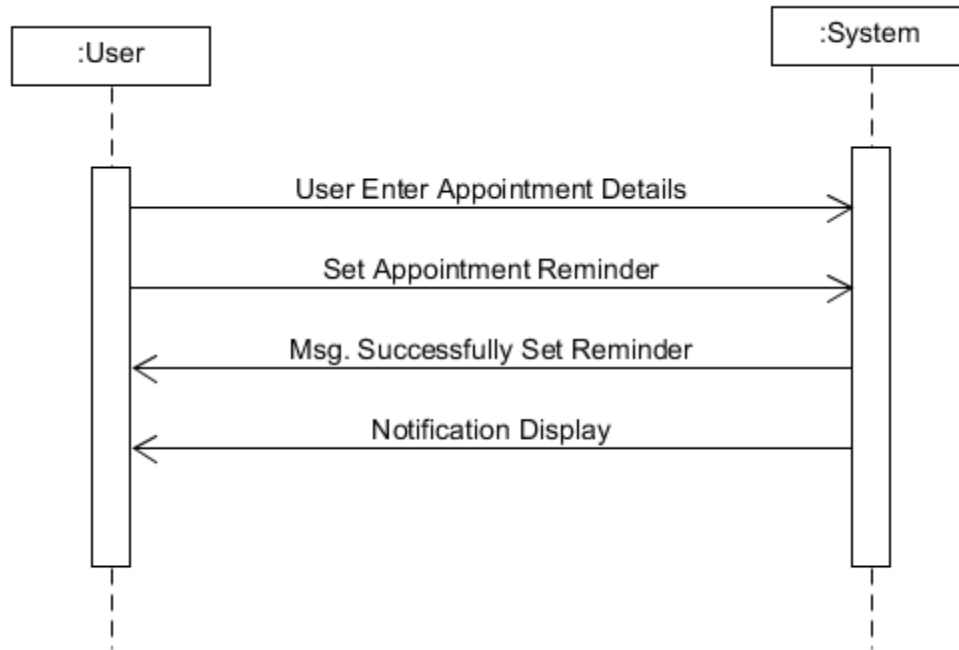


Fig 3.3.1 Sequence Diagram of Appointment Notification Process

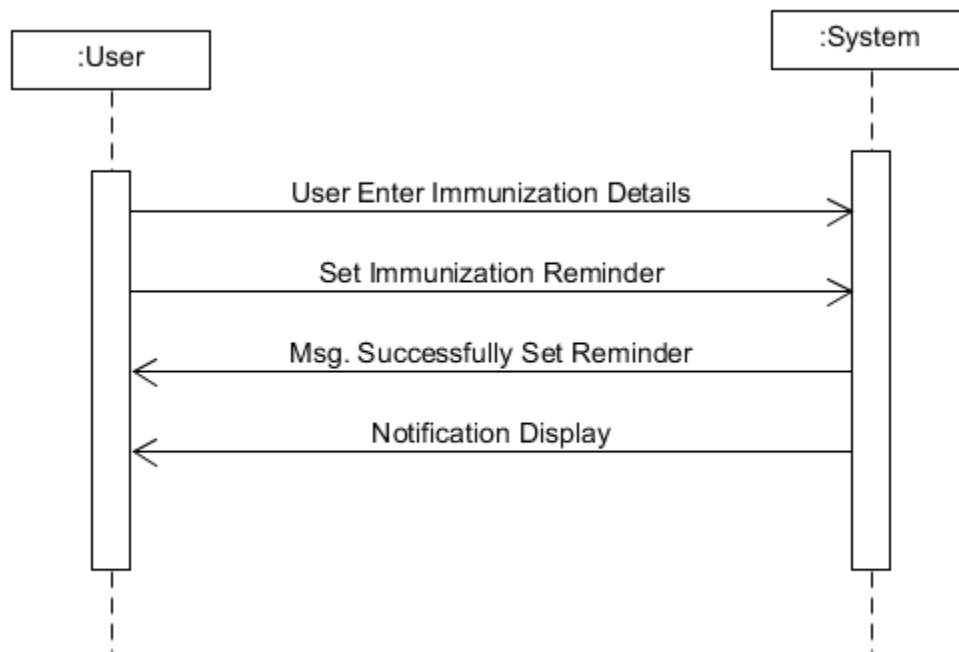


Fig 3.3.2 Sequence Diagram of Immunization Notification Process

IV. Activity Diagrams

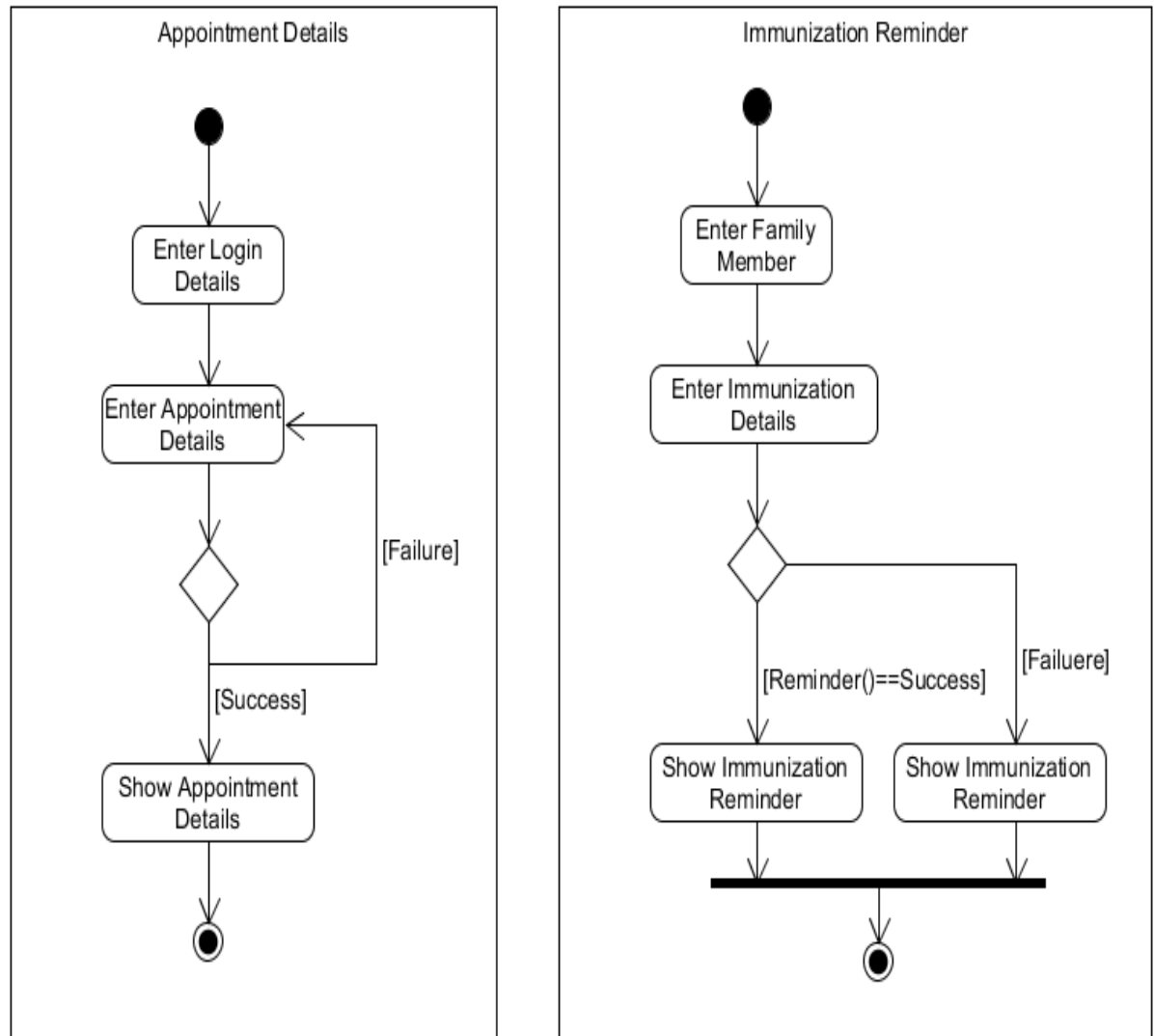


Fig 3.4.1 (i) Activity Diagram of Appointment Details
(ii) Activity Diagram of Immunization Reminder

V. State Diagram

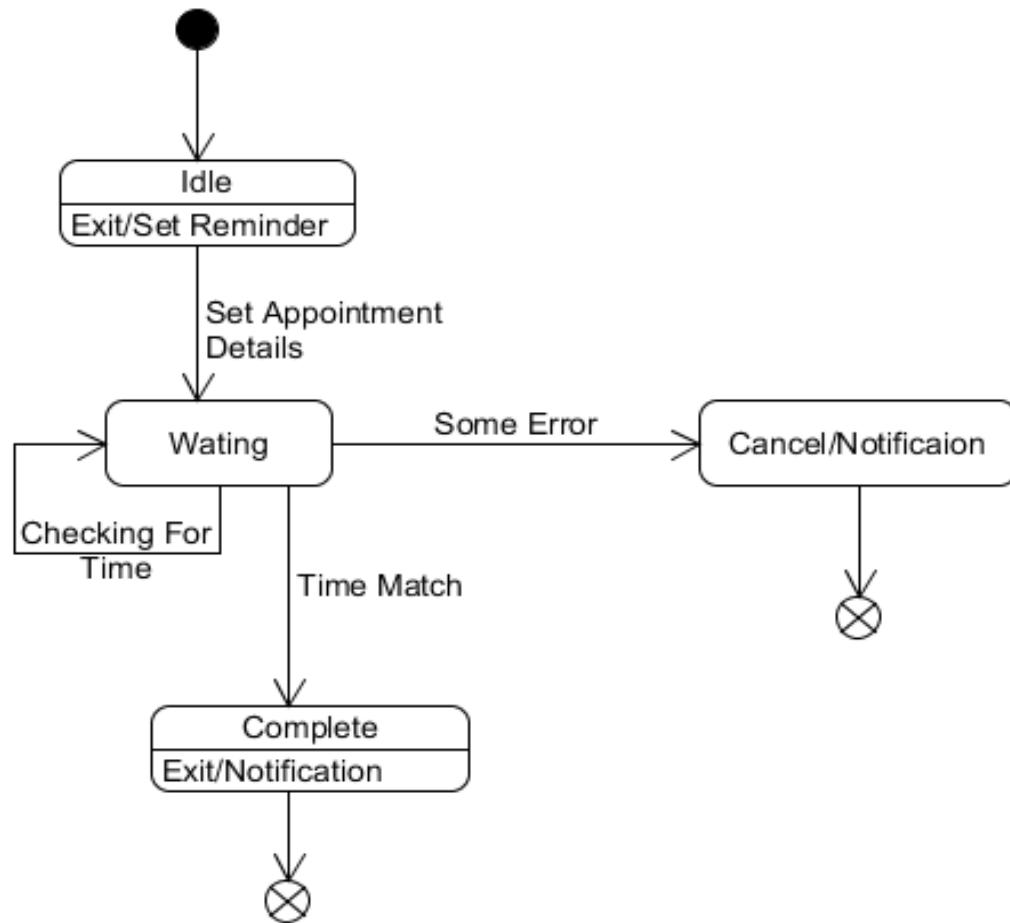


Fig 3.5.1 State Diagram of Appointment Notification

VI. E-R Diagram

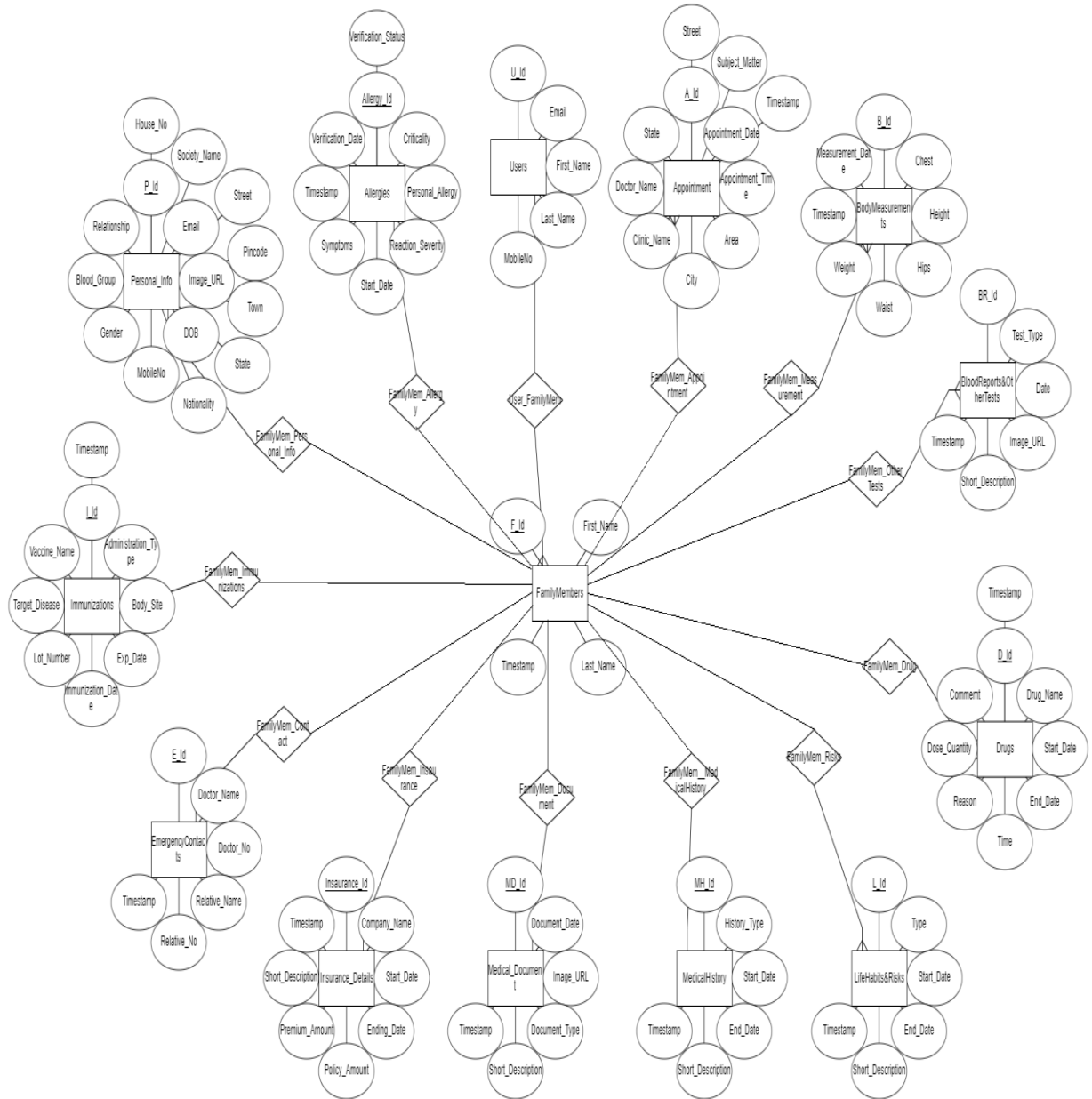


Fig 3.6.1 E-R Diagram of Personal Health Record Management System

VII. Data Dictionary

Users								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	U_Id	Varchar	30	Yes	Yes	PK		
2.	Email	Varchar	30	Yes	No			
3.	First_Name	Varchar	30	Yes	No			
4.	Last_Name	Varchar	30	Yes	No			
5.	MobileNo	Varchar	10	Yes	Yes			

Family Members								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	F_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	First_Name	Varchar	30	Yes	Yes			
4.	Last_Name	Varchar	30	Yes	No			
5.	Timestamp	Varchar	10	Yes	Yes			

Allergies								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	Allergies_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Criticality	Varchar	20	Yes	No			
5.	Personal_allergy	Varchar	20	Yes	No			
6.	Reaction_severity	Varchar	20	Yes	No			
7.	Start_Date	Date						
8.	Symptoms	Varchar	20	Yes	No			
9.	TimeStamp	Date						
10.	Verification_Date	Date						
11.	Verification_status	Varchar	20	Yes	No			

Appointment								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	A_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Appointment_Date	Date						
5.	Appointment_Time	Varchar	20	Yes	No			
6.	Area	Varchar	20	Yes	No			
7.	City	Varchar	20	Yes	No			
8.	Clinic_Name	Varchar	20	Yes	No			
9.	Doctor_Name	Varchar	20	Yes	No			
10.	State	Varchar	20	Yes	No			
11.	Street	Varchar	20	Yes	No			
12.	Subject_Matter	Varchar	20	Yes	No			

BodyMeasurements								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	B_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Chest	Varchar	20	Yes	No			
5.	Height	Varchar	20	Yes	No			
6.	Hips	Varchar	20	Yes	No			
7.	Waist	Varchar	20	Yes	No			
8.	Weight	Varchar	20	Yes	No			
9.	TimeStamp	Date						
10.	Measurement_Data	Date						

Emergency Contacts								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	E_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Doctor_Name	Varchar	20	Yes	No			
5.	Doctor_No.	Varchar	10	Yes	No			
6.	Relative_Name	Varchar	20	Yes	No			
7.	Relative_No	Varchar	10	Yes	No			
8.	Timestamp	Date						

Immunizations								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	I_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Administration_type	Varchar	20	Yes	No			
5.	Body_Site	Varchar	20	Yes	No			
6.	Exp_Date	Date						
7.	Immunization_Date	Varchar	20	Yes	No			
8.	Lot_Number	Varchar	20	Yes	No			
9.	Target_Disease	Varchar	20	Yes	No			
10.	Vaccine_Name	Varchar	20	Yes	No			
11.	Timestamp	Date						

Personal Health Record Management System

Insurance Details								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	Insurance_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Company_Name	Varchar	20	Yes	No			
5.	Start_Date	Date						
6.	Ending_Date	Date						
7.	Policy_Amount	Varchar	20	Yes	No			
8.	Premium_Amount	Varchar	20	Yes	No			
9.	Short_Description	Varchar	40	Yes	No			
10.	Timestamp	Date						

Medical Document								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	MD_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Document_Date	Varchar	20	Yes	No			
5.	Image_URL	Varchar	100	Yes	No			
6.	Document_Type	Varchar	20	Yes	No			
7.	Short_Description	Varchar	40	Yes	No			
8.	Timestamp	Date						

Personal Info								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	P_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Email	Varchar	30	Yes	No			
5.	Image_URL	Varchar	100	Yes	No			
6.	DOB	Date						

Personal Health Record Management System

7.	MobileNo.	Varchar	10	Yes	No			
8.	Gender	Varchar	20	Yes	No			
9.	Blood Group	Varchar	05	Yes	No			
10.	Relationship	Varchar	20	Yes	No			
11.	House_No.	Varchar	04	Yes	No			
12.	Society_Name	Varchar	20	Yes	No			
13.	Street	Varchar	20	Yes	No			
14.	Pincode	Varchar	06	Yes	No			
15.	Town	Varchar	20	Yes	No			
16.	State	Varchar	20	Yes	No			
17.	Nationality	Varchar	20	Yes	No			

Medical History								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	MH_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	History_Type	Varchar	20	Yes	No			
5.	Start_Date	Date						
6.	End_Date	Date						
7.	Short_Description	Varchar	40	Yes	No			
8.	Timestamp	Date						

Life Habits & Risks								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	L_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Type	Varchar	20	Yes	No			
5.	Start_Date	Date						
6.	End_Date	Date						
7.	Short_Description	Varchar	40	Yes	No			

Personal Health Record Management System

Drugs								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	D_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Drug_Name	Varchar	20	Yes	No			
5.	Start_Date	Date						
6.	End_Date	Date						
7.	Time	Varchar	20	Yes	No			
8.	Reason	Varchar	40	Yes	No			
9.	Does_Quantity	Varchar	20	Yes	No			
12.	Comment	Varchar	40	Yes	No			
11.	Timestamp	Date						

Blood Report & Other Tests								
Sr. No.	Field Name	Data Type	Width	Required	Unique	PK/FK	Referenced Table	Description
1.	BR_Id	Varchar	30	Yes	Yes	PK		
2.	U_Id	Varchar	30	Yes	Yes	FK	User	
3.	F_Id	Varchar	30	Yes	Yes	FK	FamilyMembers	
4.	Test_Type	Varchar	20	Yes	No			
5.	Date	Date						
6.	Image_URL	Varchar	100	Yes	No			
7.	Short_Description	Varchar	40	Yes	No			
8.	Timestamp	Date						

Implementation Detail

4.1) Home Module:

This module allows users to select the option which he/she wants to work with i.e. he/she can select from either personal info, appointments, emergency contacts, immunizations, reports, insurance details, medical documents and allergies in the home module.

4.2) Login and Sign up Module:

Users need to log in first before using the application, this module will facilitate users to Sign up if they are using the app for the first time or will let them log into the system if they already have an account.

4.3) Personal Info Module:

Users can manage personal information like address, photograph, blood group, mobile number, email etc. Thus by providing the personal information to the system. The data will be saved to the database and success message will be prompted.

4.4) Appointment and Visits Module:

Users can manage the appointments and visits to the doctors by providing data to filed such as doctor name, doctor address, reason, time and date to the system. The data will be saved to the database and success message will be prompted.

4.5) Allergies Module:

Users can manage allergies record by providing allergy name, history, starting period, reason, symptoms. The data will be saved to the database and success message will be prompted.

4.6) Family Member Module:

Users can manage family member record by providing family member details and relationship. All health management modules can be used for the family member also. The data will be saved to the database and success message will be prompted.

4.7) Medical Documents Module:

Users can manage medical documents to the system like X-Ray, blood report, CT-Scan and many more medical documents. The data will be saved to the database and success message will be prompted.

4.8) Immunizations Module:

Users can manage immunization details by providing proper vaccination details like name of vaccine, date to get injected, symptoms, reasons etc. System will prompted reminder

notification in the system before the date of vaccine to inject. The data will be saved to the database and success message will be prompted.

4.9) Emergency Contacts Module:

Users can manage emergency contacts details by providing information of closed ones and doctors if necessary. The data will be saved to the database and success message will be prompted.

4.10) Insurance Details Module:

Users can manage insurance details of the whole family. Policy number, premium amount, date of expiration another necessary data can be given in the module. The data will be saved to the database and success message will be prompted.

4.11) Drugs Module:

Users can manage medical drugs by maintaining prescription given by the doctor and the detail of the drug to the system. The data will be saved to the database and success message will be prompted.

Testing

The image shows a mobile application interface for a 'Personal Health Record' system. At the top, the title 'Personal Health Record' is displayed. Below it, there is a login form with two input fields: the first contains the email 'divyashah.qa@gmail.com' and the second contains a masked password '.....'. A blue 'LOGIN' button is positioned below the password field. Underneath the button, there are two links: 'Forgot Password? Click Here' and 'Don't Register?Click Here'. At the bottom of the screen, a grey toast message bubble displays the text 'Login Failed'.

Fig. 5.1 If User Enter Invalid Credentials
Show Toast Message “Login Failed.”

The image shows a mobile application interface for a 'Personal Health Record' system, specifically the registration screen. The title 'Personal Health Record' is at the top. Below it, there is a registration form with five input fields: 'First Name', 'Last Name', 'Email', 'Password', and 'Phone'. Each field has a red underline, indicating that all fields are required. A blue 'REGISTER' button is located below the 'Phone' field. Underneath the button, there is a link 'Already Register?Click Here'. At the bottom of the screen, a grey toast message bubble displays the text 'Please Enter All The Details'.

Fig. 5.2 All Field Must be Required.

Screen-Shots

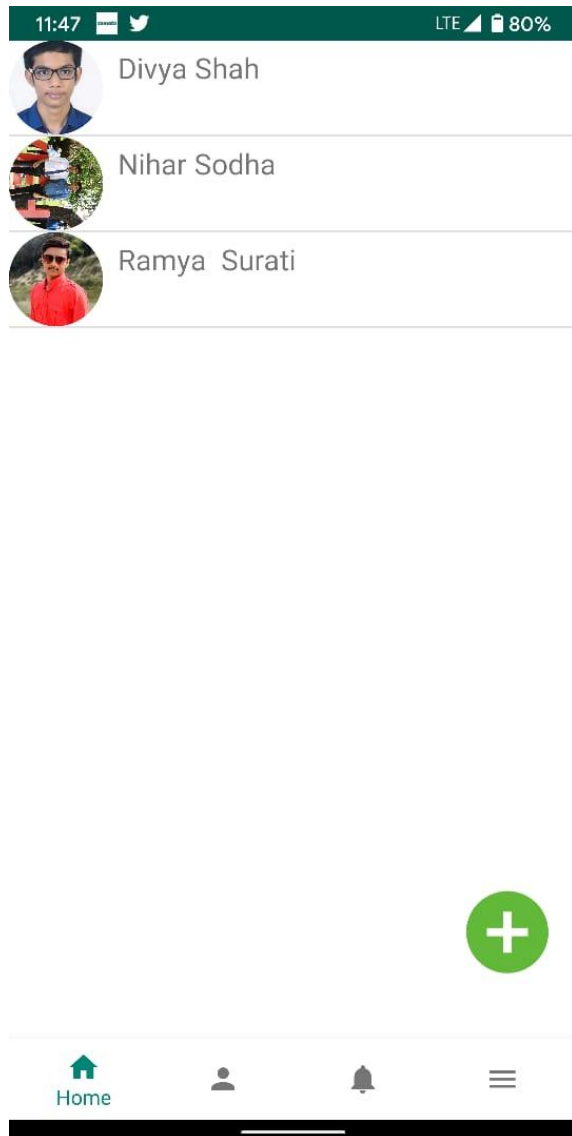


Fig 6.1 Home Screen of Application & User Add Family Member Click on Plus Button.

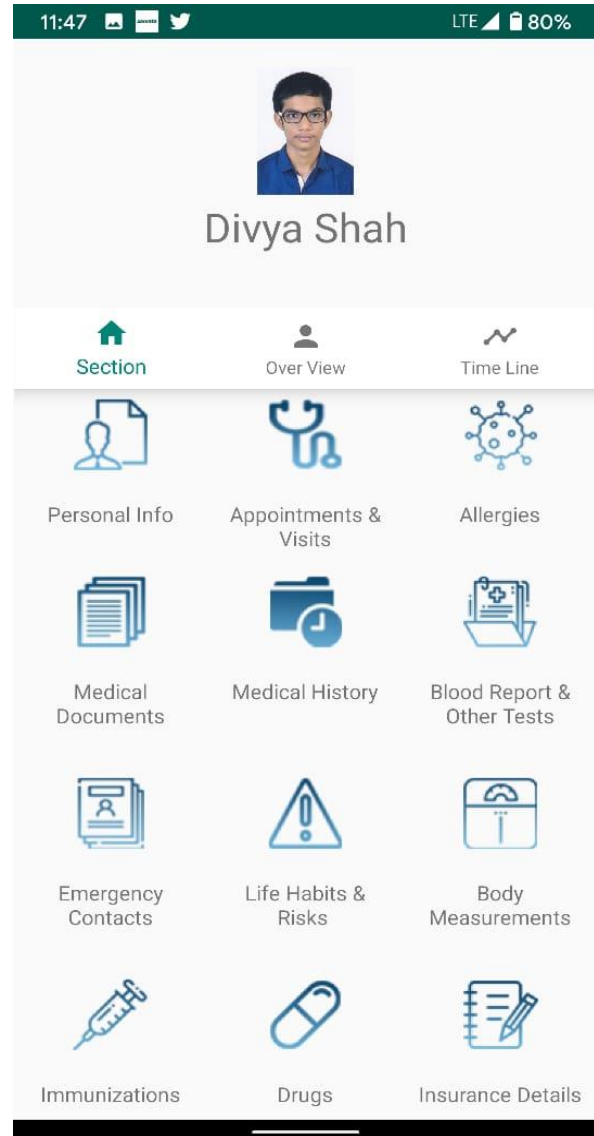


Fig 6.2 User Click on Name after then Open This Page and select any out of them.

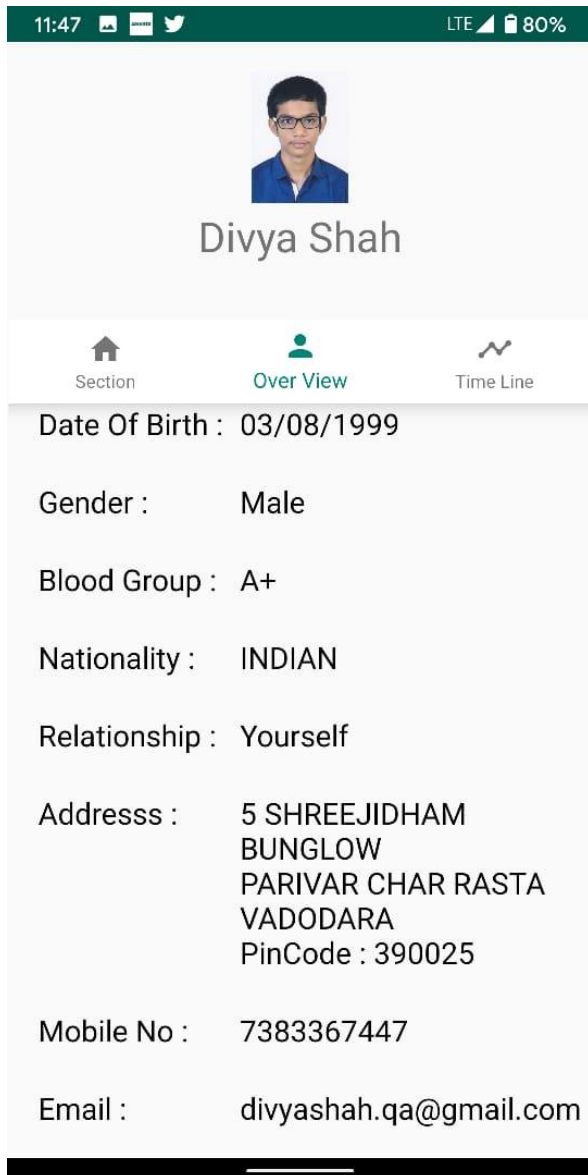


Fig 6.3 User Can Show All The Personal Info.

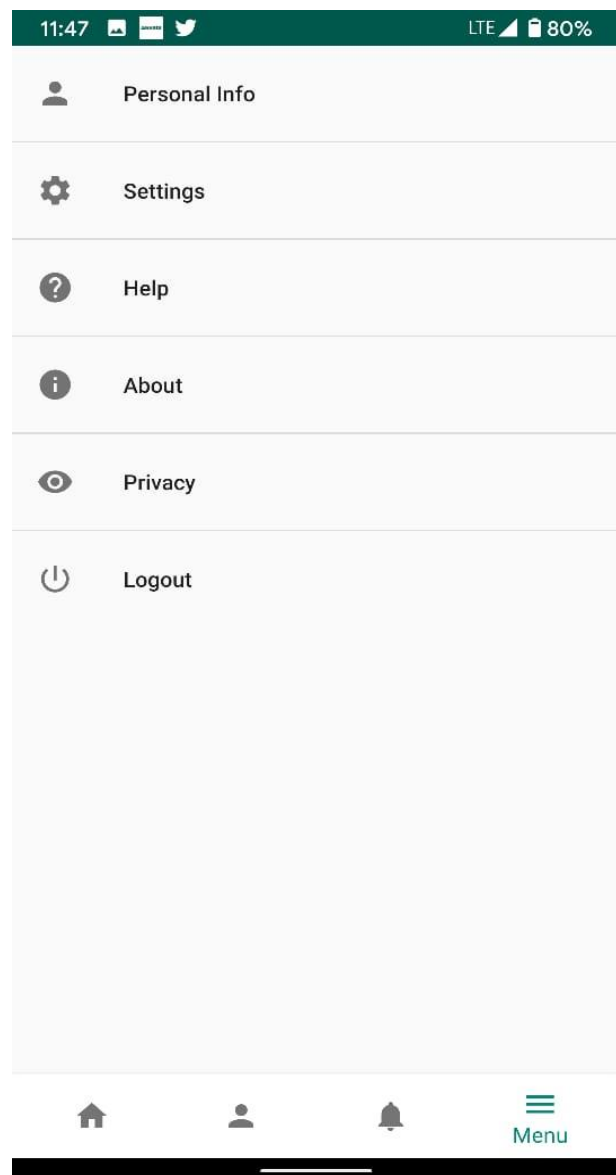


Fig 6.4 This is Menu Activity in the Application

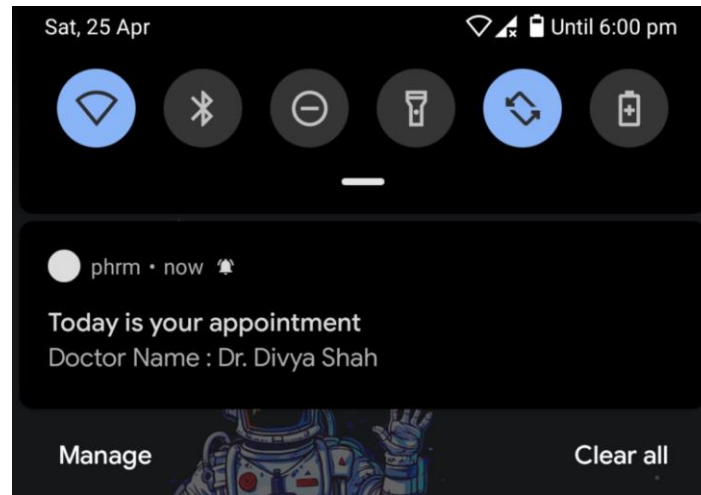


Fig 6.5 When User set Reminder For Appointment and Notification will be Pop Up.

Conclusion

The above mentioned functionalities were implemented successfully after gathering all the requirements. The flow control was defined first and then the modules were integrated to the system. All the modules were tested before the deployment and requirements of the system were fulfill. Thus, all the requirements of the system were implemented successfully to the system.

Limitation & Future Extension

Limitation:

- Supports only android operating system.
- Not a light weight system.
- Text message or calls cannot be done.
- Minimum android version required is OREO.

Future Enhancement:

- Support for ios.
- Calls and text message can be done.

Bibliography

- [1] <https://developer.android.com/training/basics/firstapp/building-ui>
- [2] <https://codelabs.developers.google.com/>
- [3] <https://firebase.google.com/docs>
- [4] <https://www.tutorialspoint.com/android/index.htm>
- [5] <https://stackoverflow.com/>
- [6] <https://developer.android.com/training/notify-user/build-notification>