“Efficient Retrieval of Medical Data Using Aadhaar Cards”

Curriculum for Applied Learning
CSE3001 – SOFTWARE ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the project work entitled "Efficient Retrieval of Medical Data Using Aadhaar Cards" that is being submitted by Adarsh (16BCE2164), Rishab Gupta(16BCE0757) and Sahiba Bedi(16BCE0768) for SOFTWARE ENGINEERING(CSE3001) under my supervision. The contents of this Project work, in full or in parts, have not been taken from any other source.

Signature of Faculty
Prof. Swarnaltha P

Abstract

Healthcare management systems are designed to enable healthcare providers collect, store, retrieve and exchange patient healthcare information more efficiently and enable better patient care. It also helps to provide efficient and suitable healthcare facilities to the patients catering to their specific needs all the while suggesting medical professionals- doctors, nurses, and medical receptionists that are . We intend to build a multi-user, interactive case management system designed to meet the needs of diverse organisations to provide and track proper treatment in real time. The personalized approach of the app will alleviate stress and on the patients as well as on the healthcare providers by improving communication between the two. The software is delivered on demand via the firebase, and so, the healthcare providers are especially mindful about maintaining the privacy and security of the patient protected healthcare information.

The app will function on four different ends- **the patient, healthcare provider, nurses and medical receptionists, and government NGOs.** The Aadhar card function will link the individual's protected healthcare information to ensure privacy and security and enable The patients will be able to view their medical history and search for a suitable medical help according to their specific ailments. The doctors will be able to view and access their patients' medical history and provide the appropriate medical facilities accordingly. The nurses and medical receptionists will be able to view and check the availability of the clinical resources in their assigned area. The government NGO end will be able to extend the resources required in which ever area that is lacking.

All in all this will be a handy, go-to clinic for the patients where they can access and know all about them, medically, and since almost everyone has access to smartphones, it will be easy to reach a far out audience with just a simple task of putting the application on the online app stores across all platforms providing ease of access to people owning smartphones.

ACKNOWLEDGEMENT

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Problem Statement

Aadhaar card is an essential document of identification that almost every individual in India possesses. Every individual has their own unique Aadhaar card with an unique Aadhaar number when separates them from the rest.

Vaccinations are an important part of an individual's health care but it's hard to remember which ones they've got and which ones they are yet to get. Patients forget their medical details and prescriptions (hardcopies of medical records) are hard to maintain as they might get lost/eroded due to wear and tear. They need a proper, well. maintained database where they can view their data anytime they want and the records are safe.

Doctors also need to know all about their patients and about their medical history and view their prescriptions. This creates a problem for doctors as they need to maintain a database for all of their patients.

Government officials and NGOs need to know about the state of the nearby government dispensaries, clinics and hospitals and be on the lookout if any one of them need attention.

1. Document Purpose

The software that we intend to design is a health app which can scan your aadhar card and tell which vaccines a person has taken over their lifetime and which they need to take in the near future
The following application will help people keep a health track which will be beneficial for them in the long run.

Scope

The objective of this section is to highlight the scope and advantages of linking Aadhaar card to various systems. The government of India has been linking the Aadhaar card with various government schemes such as for cooking gas subsidies, house allotments, school scholarships, admission into remand and welfare houses, passports, e-lockers (eg. Digilocker), for archiving documents, bank accounts under PMJDY (Prandhan Mantri Jan Dhan Yojana), provident funds account, pensions, driving license, insurance policies, loan waivers and many more . Recently it has also been made mandatory for ATM Cash Transaction, railway reservation and applying PAN (Permanent Account Number) card, and filing income tax returns.

In fact in 2016, Aadhaar Bill (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) was introduced as a Money Bill in Lok Sabha, aimed to provide for good governance . In this bill, Aadhaar card was made mandatory for authentication purposes like

salary payment, pension schemes, school enrolment, train booking, for getting driving license, to get a mobile sim, to use a cyber café etc . Recent news suggest that UGC (University Grants Commission) instructed the universities to include a photograph and seed the 12 digit Aadhaar number on the mark sheet as well as on the certificates to bring consistency and transparency. Further with security features it would eliminate the duplication of the mark sheet. Apart from all these next we present literature review suggesting the linking of Aadhaar card to various systems and its advantages. First we discuss railway reservation system.

The application will scan the Aadhaar card and list out all the vaccines a person has gotten in their life and which all they need to take. This is a really efficient application that takes us one step closer to modernising medicine. As a result of the application people will become more careful towards their health and will be able to keep a track of their well being.

Also the application gives users notifications about their vaccine requirements and help the government also maintain a record of its citizens.

The scope is huge as it is a smartphone based application which requires simple steps of scanning one's Aadhaar card, a lot of people can use it due to the current market being occupied with smartphone users. The product being hassle-free, users can rely on this to store their personal medical data securely due to Firebase backend implementation which is 32-bit encrypted.

The main purpose of the application is to eradicate the need for a prescription or any hardcopy of a medical record and make everything digital i.e. progressive with the progress made in the smartphone industry.

Objectives

The main objective is to make a secure database of medical records for each and every individual and to display them on a smartphone where each and everyone can view their medical data. We also hope to take this product to as many doctors, nurses and government officials as possible.

Literature Survey

Aadhaar Card: Challenges and Impact on Digital Transformation

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Keywords: *Aadhaar card, UIDAI, data privacy, data protection*

Aadhaar project is one of the significant projects in India to bring the universal trend of digital innovation. The launch of this project was focused on the inter-operability of various e-governance functionalities to ensure the optimal utilization of Information, Communication and Technology Infrastructure. Towards this Government of India has recently made Aadhaar card mandatory for many government applications, and also has promoted Aadhaar enabled transactions.

Case Studies:

Data Loss

Data is an asset of an organization, and Privacy is some sort of assurance that an individual requires from an organization. Therefore Data privacy together refers to the ability of an organization that determines which data has to be shared with third party. As the Aadhaar card contains both the demographic and biometric data, so it becomes a risk for an individual as well as to the government if the data are insecure.

It is to be noticed that Clause 30 of IT Act 2000 states that biometric or demographic data are recognized as an ‘electronic and sensitive data of an individual’, and if someone tries to steal it, there is a Clause 34- 47 under Chapter VII of IT Act 2000 which deals with punishment related to it, and also is entitled as ‘Offences and Penalties’ 35 . Though there are strict laws but still whether the data in Aadhaar database are secure or not has always been a question. According to The Times of India 36, Maharashtra accepted that their 3 lakhs of Aadhaar data got lost with PAN. The incident happened when the IT Department were uploading the biometric information and PAN data to the UIDAI centralized server that is in Bengaluru (then Bangalore) from Mumbai, due to the crash of hard disk. In fact the data were being uploaded and encrypted using strong algorithm, and when the Headquarters were downloading the data, they couldn’t decrypt it. Therefore many applicants, who complained about this, were asked to re-register for it. Later the State

(Mumbai) IT department stated that the data belonged to people of Mumbai, and the lost data are being fully secured which can only be opened if you have 'keys and multi clues'. The State ensures that the data are safe but such type of issues has already raised serious concern.

In a recent case, Sakshi Dhoni, wife of Indian cricketer MS Dhoni tweeted to the Union of Law & Justice plus the Ministry of Electronics and IT about the Aadhaar data of MS Dhoni being leaked by the CSC e-Governance Services India Ltd 37. The CSC eGovernance Services India Ltd. had posted a photo of MS Dhoni fingerprint being scanned as well as the screenshot of the Aadhaar data of MS Dhoni. The shocking thing was that the Electronics and IT Minister also liked the tweet and retweeted the photo of MS Dhoni's fingerprint being scanned by the CSC agency. Later the UIDAI took the strong step and blacklisted the CSC e-Governance Services India Ltd for next 10 years. In spite of all these rule and regulations sharing the information from a partner company raise the issue that whether any privacy is left and does this ensure that whether Aadhaar data is in the right hands or not.

According to the sources of Indian Express 38, recently first time the NDA Government has admitted that the Aadhaar data had been leaked to the public domain. However the government had been ignoring the fact that Aadhaar is a sensitive data and assuring us by saying that Aadhaar is fully secured and it can't be breached easily. As the Aadhaar project has the largest database management the information loss or security breach to Aadhaar database can be a serious threat for India.

Data Redundancy

According to The Times of India 43, there was an Aadhaar controversy in which the Aadhaar card were being considered invalid on the various factors. In this case a senior citizen got his Aadhaar card without any hassle or without any problem, but the problem aroused when he got the Aadhaar card mentioning the 'Year of Birth' instead of 'Date of Birth' which was considered as an invalid Aadhaar card. Later the Secretary of State (Mumbai) IT Department considered it to be valid as the senior citizens who were born before the year 1989, can use Year of Birth as they didn't have the provision for birth certificate at that time. Recently, Aadhaar has been made mandatory to be linked with PAN card, since then various cases of mismatching names on PAN card and Aadhaar card have also been reported

According to Live mint 45, UIDAI filed a complaint on which Delhi police has lodged an FIR in which two different names enrolled with same biometric. The Deputy Director of UIDAI regional office in Pragati Maiden, Delhi told police that on March 18, a person named Raj Kishore Roy enrolled for Aadhaar and submitted his demographic and biometric details. However UIDAI found that on March 17, a person named Deben Roy enrolled for Aadhaar with same biometric information. This example also raises serious concerns. However later UIDAI lodged a complaint under Aadhar act as cheating by impersonation.

An Effective mechanism for Ensuring Security of QR Code

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QR-code stand for Quick Response Code, which is well known 2 dimensional barcode industrial as it, have high efficiency in accuracy and reading speed. QR-code is continuously developed by Denso Wave company [1], as development today its able to store more information. QR code is able to store up to 7089 numeric. It also able to store in different type of format such as Numeric Characters, Alphabetic Characters, Kanji Characters, Symbols, Binary and Control Code.

QR Codes have already overtaken the conventional bar codes because of the main fact that the capacity of data that can be stored by a conventional bar code is very much less when compared to the data that can be stored by a 2-D barcode, the QR Code. QR Code contains data both in horizontal and vertical positions. QR Codes have already overtaken the classical barcode in popularity in some areas. This stems in many cases from the fact that a typical barcode can only hold a maximum of 20 digits, whereas as QR Code can hold up to 7,089 characters. QR Codes are capable of encoding the same amount of data in approximately one tenth the space of a traditional bar code. A great feature of QR Codes is that they do not need to be scanned from one particular angle, as QR Codes can be read regardless of their positioning. QR Codes can be easily decoded with a mobile phone with appropriate software (Kaywa Reader) . Secure communication can also be established using QR Encoding techniques.

Requirement Analysis and Specifications

Functional Requirements

- Can scan their Adhaar card and view their medical history- what all vaccinations they need, what all vaccinations they have gotten done and more. This all data will be extracted from **Adhaar API** which is available on the internet website for app/ web and software developers
- Doctors can input their doctor ID provided by the government and can view their patient history so that if a patient visits that doctor again, the doctor already has their medical history and the use of prescriptions will be nullified
- Government officials and NGO Officials can log in the app and can check the status of nearby hospitals and local dispensaries and can regularly help in maintaining them so that they don't have lack of resources

1.1 (b) Non Functional Requirements

- The product shall be based on a smart phone application using firebase as a mobile platform and has to be run from a web server.
- The product shall take initial load time depending on the internet connection strength which also depends on the media from which the product is run.
- The product's performance shall depend upon the hardware components of the client/ customer.

The product's performance shall depend upon the server load and configuration

Safety and Security Requirements

Safety and Security constraints:

- SSL-Encryption Heartbleed attack
- Sniffing of password
- Restricted storage access

Software Quality Attributes

Technology constraints:

- Xcode for Swift in front-end
- Firebase for backend

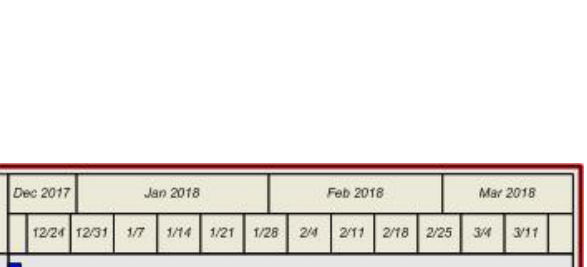
Interface constraints:

- Smartphone with latest operating system
- Latest web browser (Mozilla Firefox 3.3/ Safari 6.16/ Chrome 47.0)

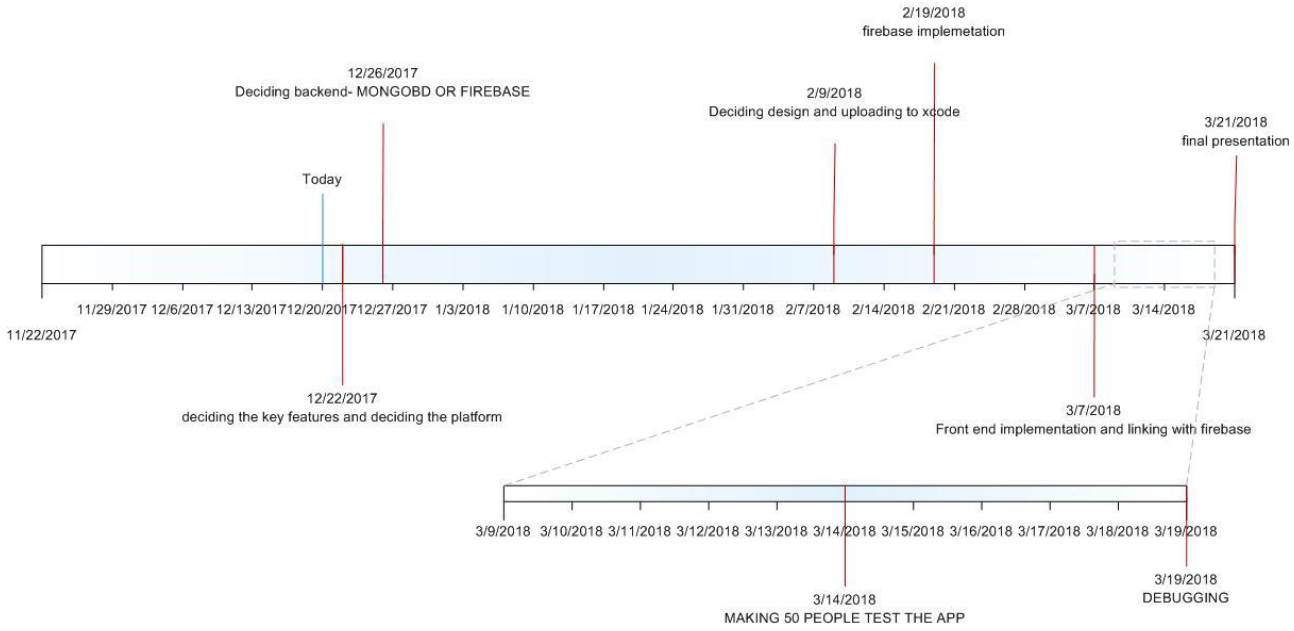
Scheduling Diagrams

Gantt Chart

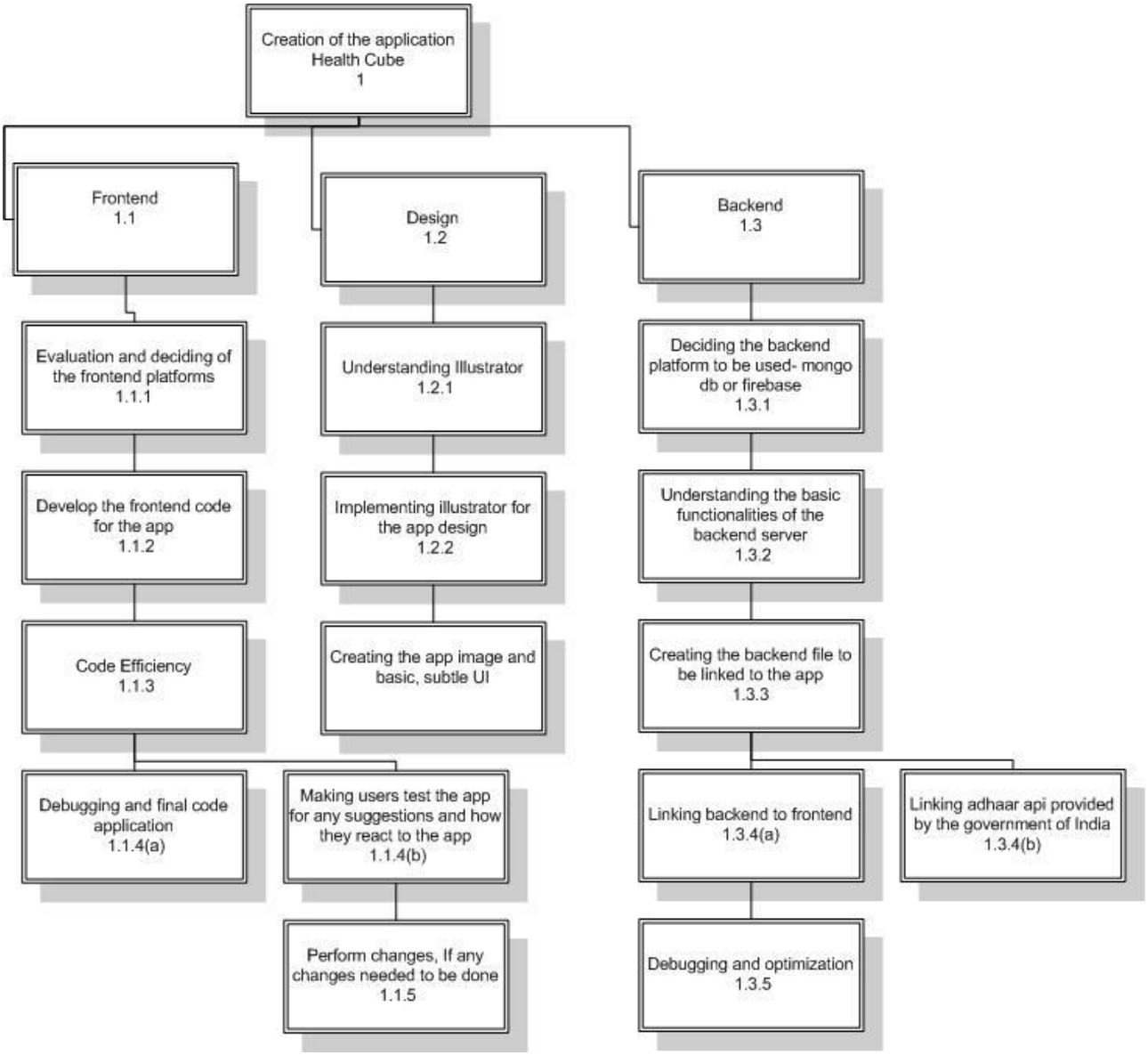
ID	Task Name	Start	Finish	Duration
1	Deciding the features of the app	12/21/2017	12/22/2017	2d
2	Deciding the app platform- weighing the pros and cons of android and ios	12/22/2017	12/22/2017	1d
3	Deciding the backend platform- mongodb or firebase	12/25/2017	12/26/2017	2d
4	Backend implementation- understanding the backend platform to be used	12/27/2017	2/19/2018	39d
5	Frontend implementation of the app- learning the basics of the frontend platform to be used- android studio or xcode	1/10/2018	3/7/2018	41d
6	Linking frontend to backend	2/20/2018	2/21/2018	2d
7	Designing the UI of the app through adobe illustrator	1/15/2018	2/9/2018	20d
8	Making people test the app and note their experience	3/9/2018	3/14/2018	4d
9	Deleting bugs and making the app more efficient	3/15/2018	3/19/2018	3d
10	Final Presentation	3/21/2018	3/21/2018	1d



Timeline



Work Breakdown Structure

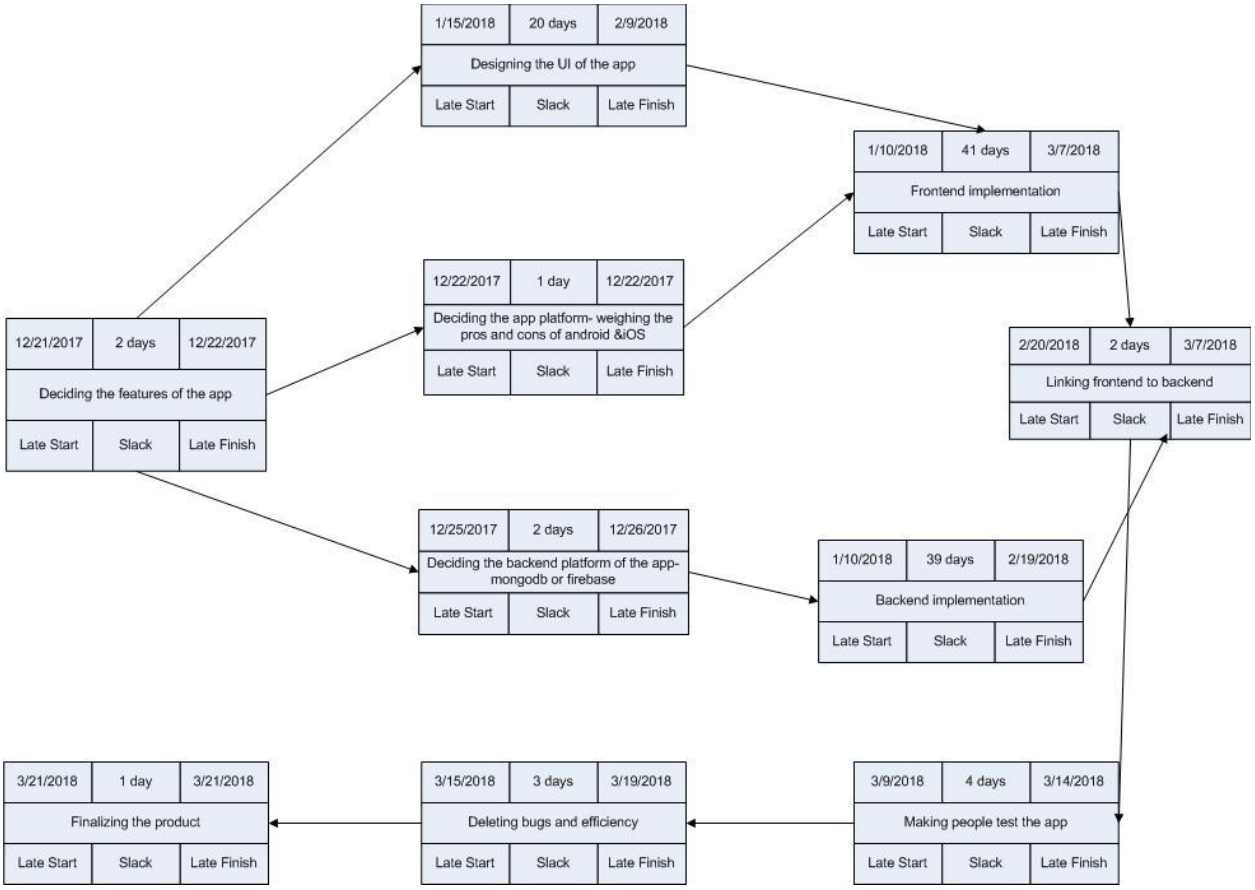


PERT Table

Task	Duration	Dependencies
Deciding the features (A)	2d	-
Deciding the app platform (B)	1d	A
Deciding the backend platform ©	2d	A
Backend Implementation (D)	39d	A, E
Frontend Implementation (E)	41d	A, G

Linking frontend to backend(F)	2d	D, E
Designing the UI (G)	20d	A
Making people test the app (H)	4d	F
Deleting Bugs and Efficiency (I)	3d	H
Finalizing (J)	1d	-

PERT Chart



Viewpoint

DYNAMIC – In this project, a dynamic viewpoint is the most useful and efficient for our goals. We are using an incremental software model, and hence we expect many variable changes at the later stages of the project, so this viewpoint is highly justifiable

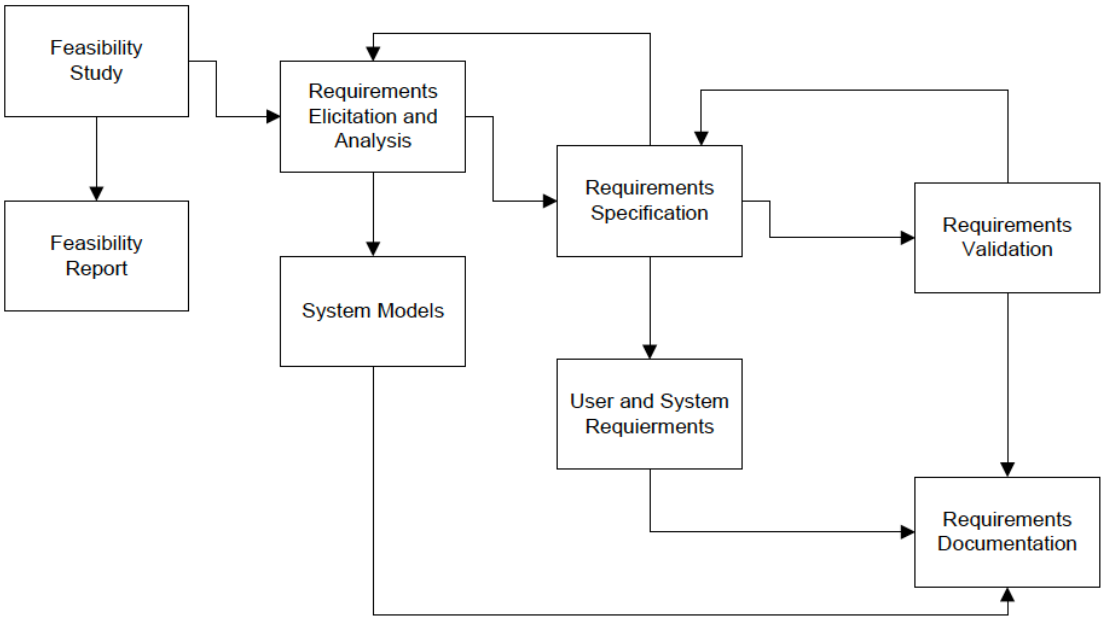
PROCESS MODEL

Incremental software development is better than any other approach for most business, e-commerce, and personal systems. By developing the software incrementally, it is cheaper and easier to make changes in the software as it is being developed.
Compared to the other model, incremental development has three important benefits:

The **cost of accommodating changing** requirements is reduced. The amount of analysis and documentation that has to be redone is much less than that's required with waterfall model.

It's easier to get **customer feedback** on the work done during development that when they system is fully developed, tested, and delivered.

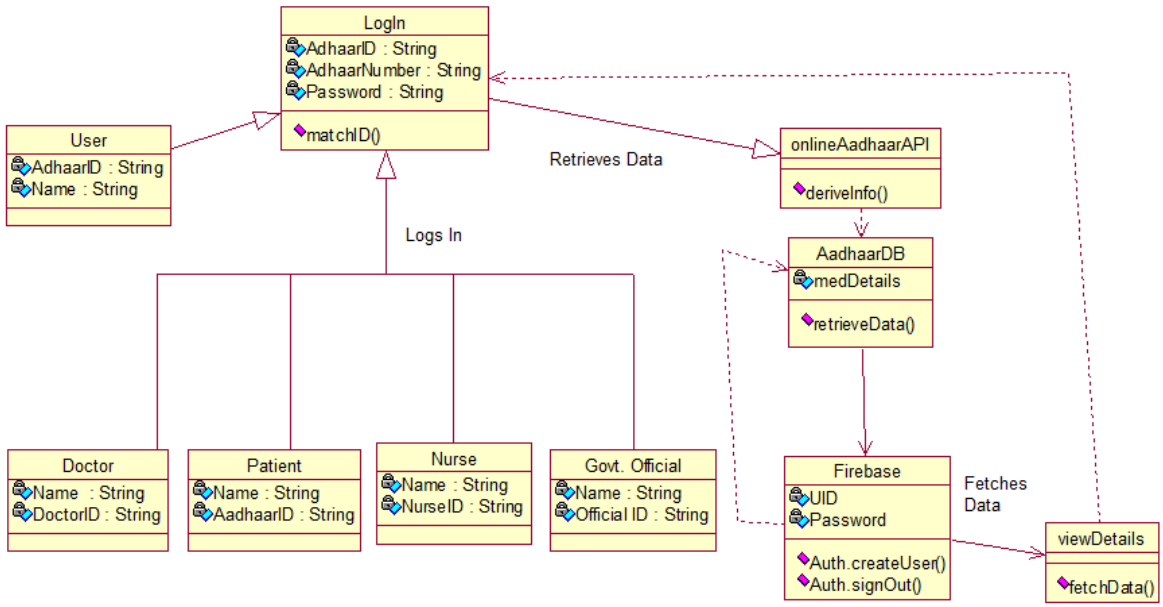
More **rapid delivery** of useful software is possible even if all the functionally hasn't been included. Customers are able to use and gain value from the software earlier than it's possible with other models



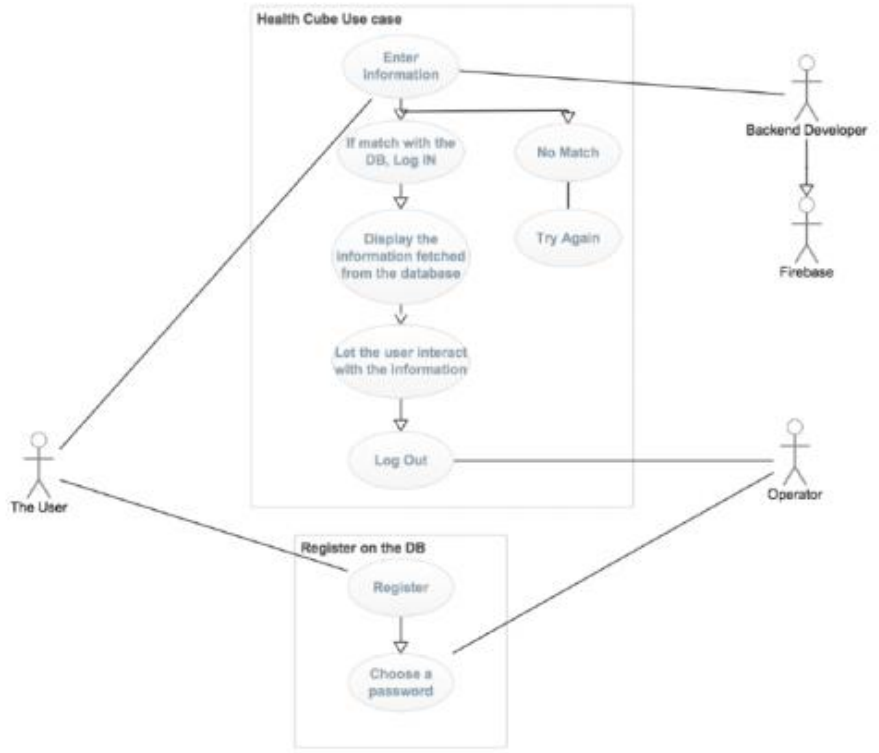
Incremental Process Model

Design Phase

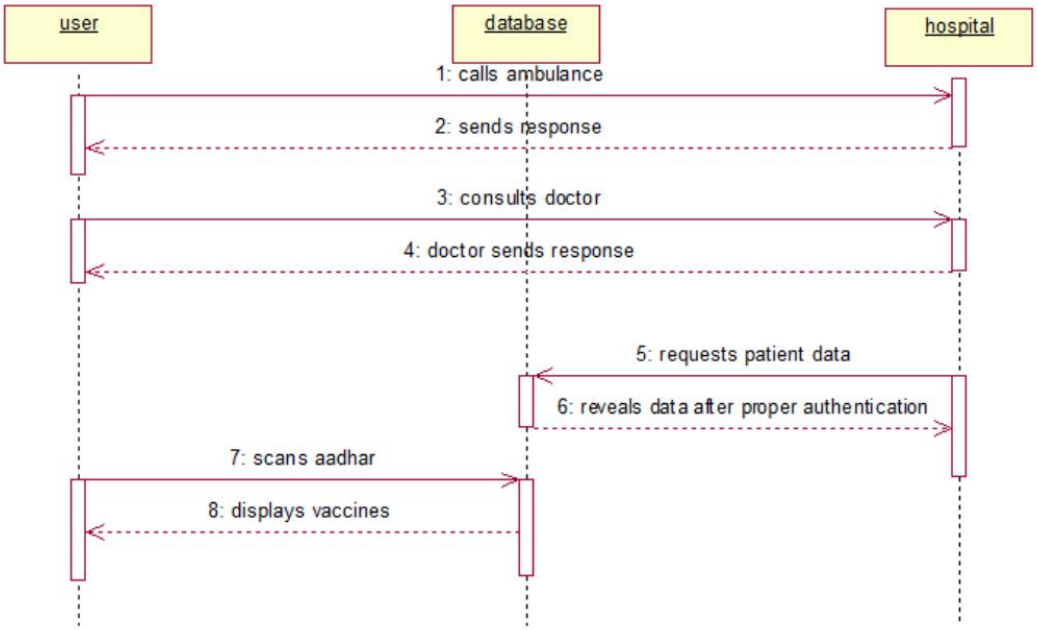
UML Class Diagram



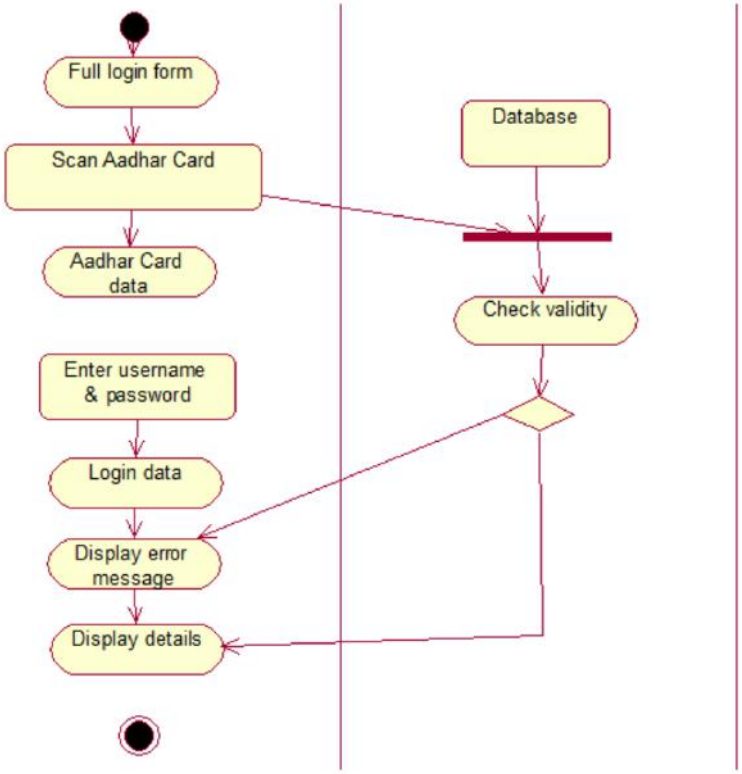
USE Case Diagram



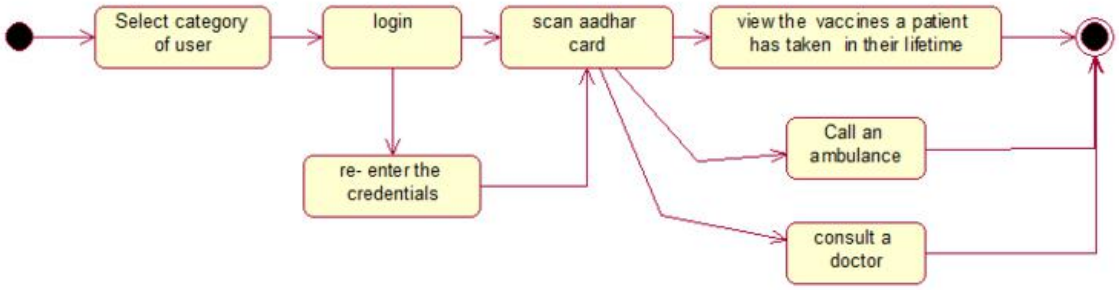
State Chart



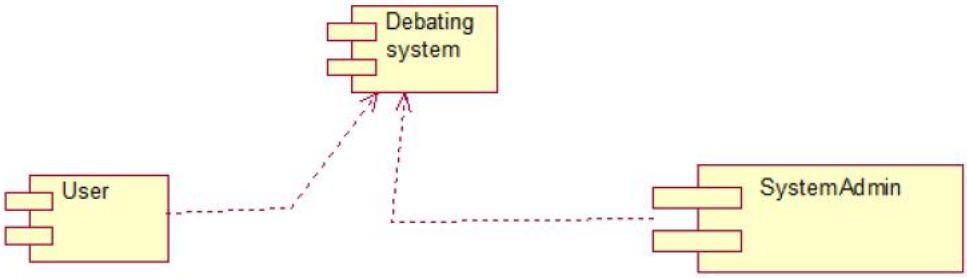
Sequence Diagram



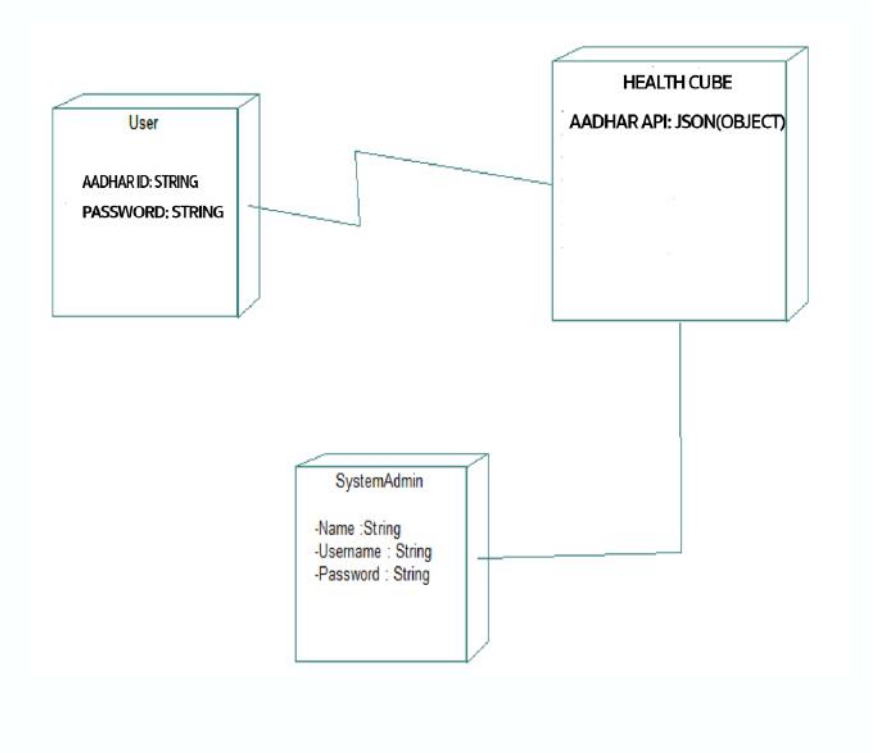
Activity Diagram



Collaboration Diagram



Deployment


HEALTH CUBE
AADHAR API: JSON(OBJECT)
User
AADHAR ID: STRING
PASSWORD: STRING
SystemAdmin
-Name :String
-Username : String
-Password : String

Definitions and Acronyms

Administrator	A person who manages and supports a computer system or network, as in a business or other organization
Author	Person submitting an article to be reviewed. In case of multiple authors, this term refers to the principal author, with whom all communication is made.
Database	Collection of all the information monitored by database this system.
Documentation	Material that provides official information or evidence or that serves as a record.
Field	A cell within a form.
GUI	Graphical User Interface
Interface	In computing, an interface is a shared boundary across which two or more separate components of a computer system exchange information
Software Requirements Specification	A document that completely describes all of the requirements functions of a proposed system and the specification constraints under which it must operate. For example, this document.

Design Considerations

DESIGN CONSIDERATION:

1. ASSUMPTIONS

the assumption we have made in the application is that all the users have Aadhar card and can only access the application using the Aadhar card.
Also we have made the application for Indian users since it only works with the Aadhar API.

2. CONSTRAINTS

the only constraint with the application is that, if the user doesn't have an Aadhar card, he cannot use the services provided by our application
Also one of the concern is that, as of now we are only available on iOS devices and will take some time to develop this for android or other devices.
Also we need a proper internet connection and working camera for the application to be functional.

3. SYSTEM ENVIRONMENT

The main component of our application is the application which will work only on iOS devices. The devices should also have working internet connection. Users should also ensure that the camera of their device is working properly.

4. DESIGN METHODOLOGY

The methodology is designed to be used by patients to explore doctors, find their vaccines and book appointments . The methodology has been informed by the initial literature review and by critical consideration and evaluation.
The methodology is made up of three stages:

> planning and design

> development

> performance and evaluation

The planning and design stage

The planning and design stage is concerned primarily with pedagogic considerations. Taking into account the context of the unit/module. This stage is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team. The basic GUI is set up.

The development stage

The development stage is concerned with the creation of resources to support the development of Health cube. In this stage the project is made more developed by regular and better updates. The formation of the design of the application is kept in constant working with the basic GUI in mind.

The performance and evaluation stage

The performance and evaluation stage is concerned with piloting, performing and improving the application.

Risk	Types of Risk	Effect of risk	Level of Risk	Action Plan
Size of database created or used by the product?	Product size	Bigger size of database may lead to congestion in network.	High	Assigning supercomputers or clouds to hold database of software.
Number of users of the product?	Product size	Many users in the same portal of debate may lead to a slow debate and lags if anyone has slow net.	Medium	Thus assigning number of members/participants to each portal and using an algorithm to make sure users in the portal all have a good net connection.
Number of projected changes to the requirements for the product? Before delivery? After delivery?	Product size	According to the testing and end users changes may occur due to change in requirements or needs of software.	Low	Thus changing or moulding the software according to needs of end user in testing phase as editing takes place.
Visibility of this product to the	Business impact	More visibility may lead to increase in users	Medium	Exposing the product to the world by advertisement on

appropriate for the product to be built in a better way		faulty analysis may lead to many problems while development.		organisation and start to the building.
Are testing tools available and appropriate for the product to be built relating to voice recognition?	Development environment	If faulty system is built with respect to voice recognition then hacking of accounts will be easy and system would be faulty.	Medium	Proper testing with different phases i.e. alpha and beta must be used thus to have minimum faults in the product.
Is a procedure followed for tracking and reviewing the performance of software? (feedback form on the site)	Process issue	If not then it may lead to wrong information about how much the progress has been done leading to confusions in the management.	High	Thus maintaining a proper track and record of progress and feedbacks submitted and taking them into account.
Is the voice recognition software being able to be in sync with the web portal created for debating?	Technical issue	If not then it leads to the whole software to be faulty and thus people may not use it if revised also.	Medium	Making it in such a way that sync takes less time and is efficient using extreme programming this may be made sure to an extent.

Architecture

The architecture provides the top level design view of a system and provides a basis for more detailed design work.

Overview

The system under consideration will perhaps be based upon an n-tier, client-server architecture. It is possible that the architecture will have secure managed interfaces or proxies to isolate systems from illegal access. The Architecture may be a simple client-server system in which web technologies are used to provide forms from a simple server that can be filled in remotely by someone, for example, at a border post. With a simple requirement to collect basic information, which can be entered as it is captured by the user, this two-tier architecture may well be quite sufficient.

Subsystem, Component, or Module 1 …N

Health Cube is broken up into three major components: a mobile application, a backend server where all user data is stored and an API to retrieve data.
The backend side application of our application works by Firebase and JSON to store and retrieve data respectively .
The application side is divided into two parts: the functional component and the graphical component (both written in swift). The functional component forms the core of health Cube. It receives user input and displays their medical information. The graphical component, as the name implies, is simply the graphical user interface. It provides all of the buttons, text boxes, and other on- screen elements which allow the user to access all of the features provided by the application.

Database Schema

Tables, Fields and Relationships

The database will be using a Tree to store data instead of a table.

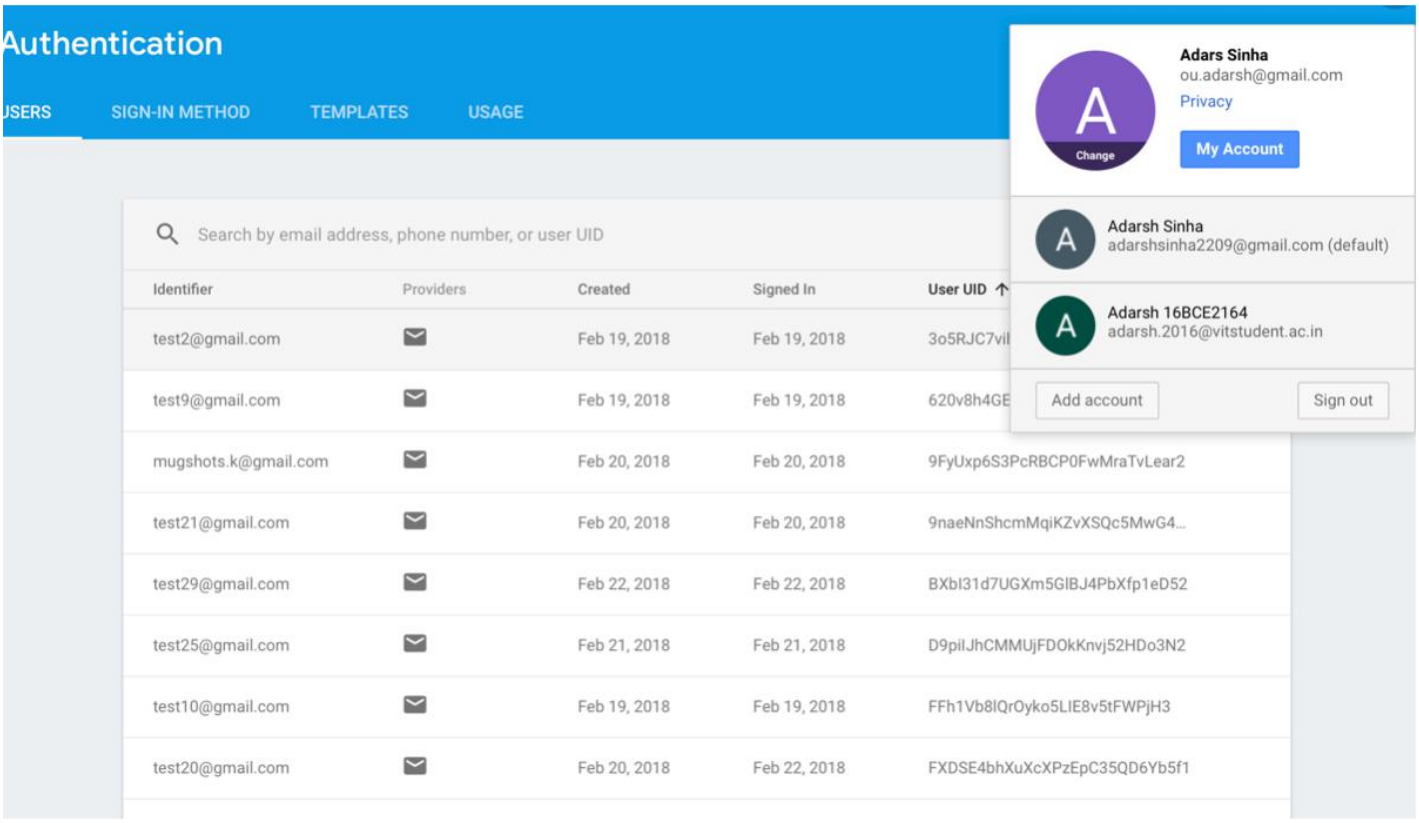
In User Tree, there will be a reference to Firebase where User's Details such as their unique ID and password will be stored in a tree structure under USER root node.

The **USER** tree will contain
a. USER Root Node
b. Child Node of Unique ID
c. Child node consisting of Password.

```
{ "statusCode": 400, //ERROR CODE FROM SERVICE
  "errors": [ //In case of multiple errors, check this for multiple messages.
    { "statusCode" : 400,
      "error" : "Bad Request",
      "message" : "OTP validation failed"
    } ],
  "message" : "OTP validation failed",
  "resultCode": "400", //ERROR CODE FROM UIDAI
  "Code": "2ecd287d9f774b4bbe7de701263e7a92",
  "RRN": "704418326186",
  "transactionId":"6d1XXXX-XXXX-XXXX-XXXX-XXXXXXXb53b", // unique gateway transaction Id
   "qTid":"e7c0XXXX-XXXX-XXXX-XXXX-XXXXXXXXe4bd",           // unique aadhaar transaction id sent by AadhaarAP
   "resident_authentication":"O",           //  mode of authentication F: Fingerprint, O: OTP
}
```

```
    User_Id: 'OUR SYSTEM USER ID',
    Aadhar_Id: '655XXXXXXXXX',
    e_Kyc: {
        status: 'y',
        Description: 'Authenticated Successfully',
        Code: '124be446983XXXXXXXXXXXXXXX',
        RRN: '6345XXXXXXXX',
        Poi: {
            Name: 'RESIDENT NAME HERE',
            Dob: 'DD-MM-YYYY',
            Gender: 'M'
        },
        Poa: {
            co: 'S/O: TEST NAME',
            house: 'ward no. 007',
            street: 'street name',
            landmark: 'landmark provided to Aadhaar',
            lc: 'locality',
            vtc: 'Panna',
            subdist: 'sub-district',
            dist: 'district',
            state: 'state name',
            pc: 'pin code',
            po: 'postal code',
            uidtag: 'AAPKA AADHAAR'
        },
        Photo: 'base-64-image-data-here'
    },
    payload: 'complete response in base64 encoded format',
    qTid: '',
    resident_authentication: '',
    transactionId: 'QT-6559XXXXXXX-OXXXXXXXX',
    time: 'DD/MM/YYYY, HH:MM:SS PM',
    ver: '2.1'
}
```

Database



New Fields(s)

List any new tables that will be needed, for each one including table name, table description, and related tables.

Table Name	Field Name	Data Type	Allow Nulls	Field Description
User	Unique ID	String (Varchar)	No	Stores user's unique ID
User	Password	Varchar(50) : String	No	Stores user's password

Fields Change(s)

Table Name	Field Name	What to change?
User	Unique ID	Not Required
User	Password	Not Required

All Other Changes

Except data in the Unique ID Field in the USER Tree, all other fields will remain as it is. We'll have to change the data in Unique ID field because we'll have to keep changing the input for different users at a time.

Data Migration

Data will be sent to the Firebase from the Application using **.reference()** function.

High Level Design

5.1 Login Screen

The product ‘Health Cube’ extracts details of the user’s adhaar card by scanning/ filling in the adhaar QR Code/Adhaar Number provided on the adhaar card and the user will be provided with their medical history as per updated by government’s records. The other options are described below:

The product will have several options such as Patient, Doctor, Asha and Gov/NGO where the users

Can scan their adhaar card and view their medical history- what all vaccinations they need, what all vaccinations they have gotten done and more. This all data will be extracted from **Adhaar API** which is available on the internet website for app/ web and software developers

Doctors can input their doctor ID provided by the government and can view their patient history so that if a patient visits that doctor again, the doctor already has their medical history and the use of prescriptions will be nullified

Government officials and NGO Officials can log in the app and can check the status of nearby hospitals and local dispensaries and can regularly help in maintaining them so that they don’t have lack of resources

Workflow sub-processes

Workflow subprocesses will be created for each individual user in user system. The template Model that will be used to create the sub-process is called LoginPerCarrier.

LoginExtension sub-processes will be created each time an extension is needed for each system login. The template Model name used to create the sub-process is called LoginExtension.

Low Level Design

This section provides low-level design descriptions that directly support construction of modules. Normally this section would be split into separate documents for different areas of the design.

Home Page

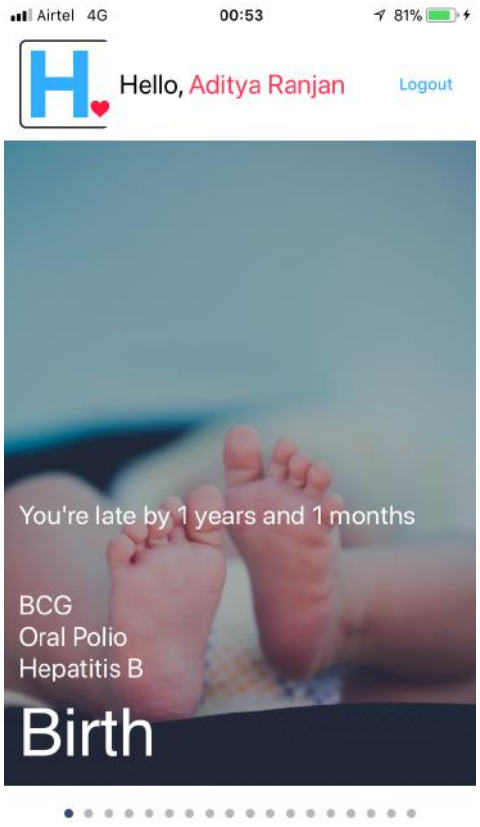
Sign-in/

The sign-in/register button will be enabled for all the users those who will be visiting our application.the user will be taken to a page where he will be able to choose options between patient, doctors, nurses, govt. officials.

The patients aka the general population: The most important user base if the general population as they constantly need to check on their medical history and all the vaccinations they need. Almost everyone needs to check on their health status and the history they need to present in case a doctor asks or one

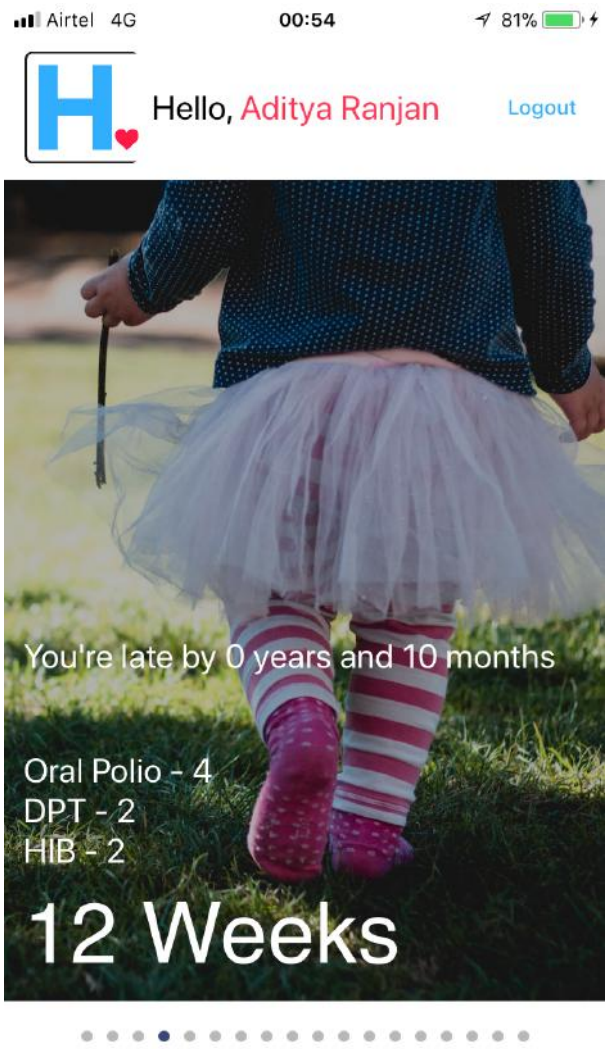
The Doctors: Our major doctor target base is government doctors who are affiliated to government and have their unique government provided doctor Ids. They can upload the patient's prescription on the app itself and can access it anytime they want. The data is there forever and the risk of losing a hardcopy of the prescription.

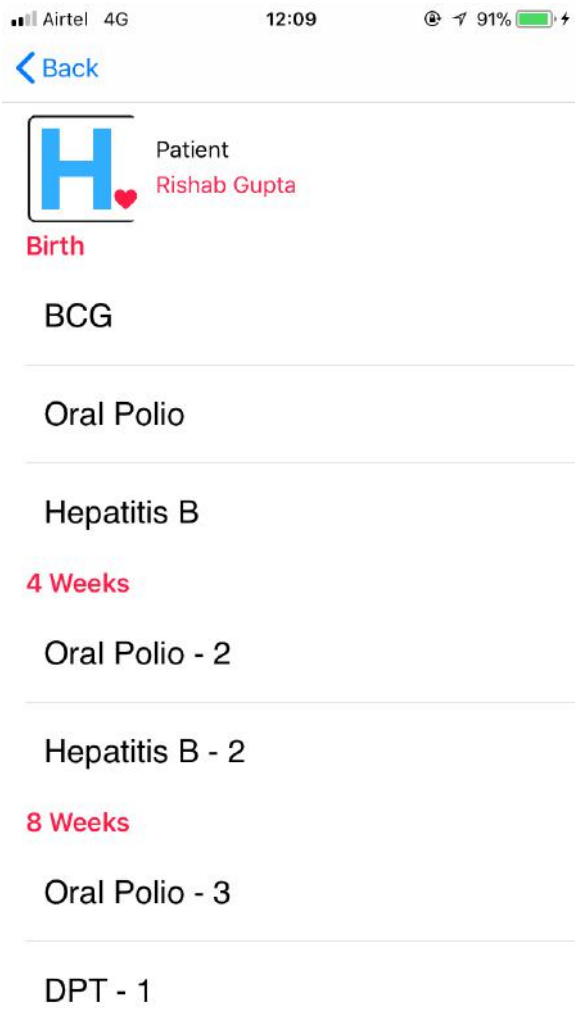
Govt. And NGO Officials: Maintenance of government hospitals and dispensaries is a very important task. This will be taken care of by such user base

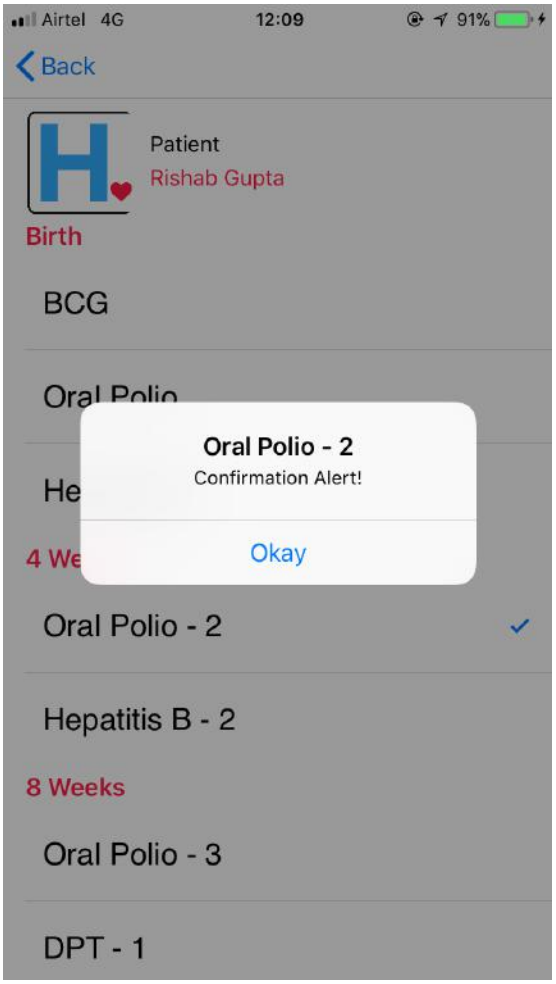


7. User Interface Design

This section provides user interface design descriptions that directly support construction of user interface screens.




Airtel 4G
12:09
91%
Back
Patient
Rishab Gupta
Birth
BCG
Oral Polio
Hepatitis B
4 Weeks
Oral Polio - 2
Hepatitis B - 2
8 Weeks
Oral Polio - 3
DPT - 1

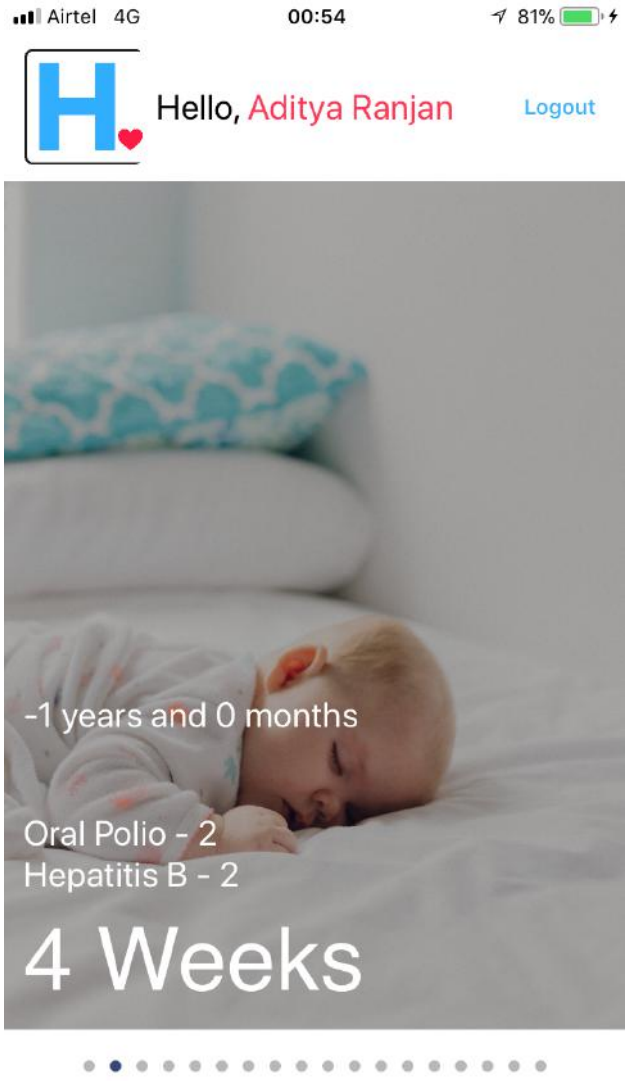

Airtel 4G
12:09
91%
Back
Patient
Rishab Gupta
Birth
BCG
Oral Polio - 2
Confirmation Alert!
Okay
Oral Polio - 2
Hepatitis B - 2
8 Weeks
Oral Polio - 3
DPT - 1

Application Controls
This section provides user interface design descriptions that directly support construction of user interface screens.

Screen 1

1. The Logged In Screen

2. Controller View



3. Logged Out Screen

Testing

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)	Notes
1	Navigate to login page	User= example@gmail.com Password: 1234	User should be able to login	User is navigated to their Aadhaar card details and shown medical Data	Pass	Can be made more responsive and fast
2	Provide valid username	UID = Aadhaar Number	Display Aadhaar number in the text field	Displaying their aadhaar number	Pass	QR Bug where when the camera is cancelled, text field is automatically filled. by previously used record
3	Provide valid password	Password	Any alphanumeric password	Password Accepted (Min Size is 6)	Pass	—
4	Click on Scan button	Scanning QR Code on Aadhaar Card for numeric value of Aadhaar Number	Text field should be filled by numeric data of Aadhaar ID	Aadhaar Number displayed in the field after scanning	Pass	Small Performance bugs — to be rectified
5	Click on Login	User's Details	Logged In data should show user's medical data	Medical Data is shown	Pass	Some static Data due to API malfunctioning— to be rectified
6	Logout	—	Should again show Login Page	Back to login Page after Logging Out	Pass	

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Efficient Retrieval of Medical Data from Aadhaar Cards

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Abstract— **Healthcare management systems are designed to enable healthcare providers collect, store, retrieve and exchange patient healthcare information more efficiently and enable better patient care. It also helps to provide efficient and suitable healthcare facilities to the patients catering to their specific needs all the while suggesting medical professionals- doctors, nurses, and medical receptionists that are . We intend to build a multi-user, interactive case management system designed to meet the needs of diverse organisations to provide and track proper treatment in real time. The personalised approach of the app will alleviate stress and on the patients as well as on the healthcare providers by improving communication between the two. The software is delivered on demand via the firebase, and so, the healthcare providers are especially mindful about maintaining the privacy and security of the patient protected healthcare information.**

Index Terms— **NGOs, Patients, Doctors, Aadhaar Cards, Unique ID, Medical Data**

I. INTRODUCTION

The app will function on four different ends- **the patient, healthcare provider, nurses and medical receptionists, and government NGOs.** The Aadhar card function will link the individual's protected healthcare information to ensure privacy and security and enable The patients will be able to view their medical history and search for a suitable medical help according to their specific ailments. The doctors will be able to view and access their patients' medical history and provide the appropriate medical facilities accordingly. The nurses and medical receptionists will be able to view and check the availability of the clinical resources in their assigned area. The government NGO end will be able to extend the resources required in which ever area that is lacking.

All in all this will be a handy, go-to clinic for the patients where they can access and know all about them, medically, and since almost everyone has access to smartphones, it will be easy to reach a far out audience with just a simple task of putting the application on the online app stores across all platforms providing ease of access to people owning smartphones.

India has adopted an identification system commonly known as Aadhar or Unique Identification Number (UID) that would cater to all the requirements of people residing in India. Individual identification system is popular in many nations as it helps the government of India to provide targeted services to individuals and enhance safety and security of the country. Take for example, the United States of America, where it is referred to as the Social Security Number. This unique code is a nine-digit number that is issued to both the permanent citizens of the United States as well as the temporary citizens who are working there. India, as a boost to its development efforts, also adopted this concept and thus, Aadhar Card came into existence.

The Unique Identification Authority of India (UIDAI) was created and given the task of developing and issuing the Aadhar Card. The agency was established by the Government of India in January 2009 and it operates under the central government. The purpose of Unique Identification Authority of India is to collect the biometric as well as the demographic details of every resident in India.

After the data is collected, it is stored in a centralized database system called the UID Database. The main data centre of the Unique Identification Authority of India where the data storage of Aadhaar takes place is situated at the Industrial Model Township (IMT) in Manesar, Haryana. The UIDAI then simultaneously issues the 12 digit unique identification number or the UID to the Indian resident, also known as Aadhaar card in India. The project boasts of being the largest national identification number project in the entire world.

The Aadhar Card contains the Aadhaar Number of the card holder. It is a unique 12-digit number allotted to each individual who opts for the card. The UID/Aadhaar is the number that contains the collected biometric and demographic data and details of the residents of India. Any citizen who resides in India, and fulfils all the criteria mentioned by the UIDAI irrespective of their caste, creed, region, religion or colour can put forward their enrolment for the Aadhar card.

Applying and consequently availing the Aadhar Card is voluntary. It is not mandatory on the part of any Indian citizen to opt for this card. It solely depends on the personal choice of the individual whether he wishes to get the Aadhar number and facilities associated with it or not. However, the Aadhar Card has a host of benefits which is why every individual willingly opts for the enrolment. The card is thus, gaining popularity since the time it was first launched on 28 January 2009.

Definitions and Acronyms

Administrator	A person who manages and supports a computer system or network, as in a business or other organization
Author	Person submitting an article to be reviewed. In case of multiple authors, this term refers to the principal author, with whom all communication is made.
Database	Collection of all the information monitored by database this system.
Documentation	Material that provides official information or evidence or that serves as a record.
Field	A cell within a form.
GUI	Graphical User Interface
Interface	In computing, an interface is a shared boundary across which two or more separate components of a computer system exchange information
Software Requirements Specification	A document that completely describes all of the requirements functions of a proposed system and the specification constraints under which it must operate. For example, this document.

II. LITERATURE SURVEY

A. Aadhaar Card: Challenges and Impact on Digital Transformation

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Keywords: Aadhaar card, UIDAI, data privacy, data protection

Aadhaar project is one of the significant projects in India to bring the universal trend of digital innovation. The launch of this project was focused on the inter-operability of various e-governance functionalities to ensure the optimal utilization of Information, Communication and Technology Infrastructure. Towards this Government of India has recently made Aadhaar card mandatory for many government applications, and also has promoted Aadhaar enabled transactions

Data is an asset of an organization, and Privacy is some sort of assurance that an individual requires from an organization. Therefore Data privacy together refers to the ability of an organization that determines which data has to be shared with third party. As the Aadhaar card contains both the demographic and biometric data, so it becomes a risk for an individual as well as to the government if the data are insecure. It is to be noticed that Clause 30 of IT Act 2000 states that biometric or demographic data are recognized as an ‘electronic and sensitive data of an individual’, and if someone tries to steal it, there is a Clause 34- 47 under Chapter VII of IT Act 2000 which deals with punishment related to it, and also is entitled as ‘Offences and Penalties’ 35 . Though there are strict laws but still whether the data in Aadhaar database are secure or not has always been a question. According to The Times of India 36, Maharashtra accepted that their 3 lakhs of Aadhaar data got lost with PAN. The incident happened when the IT Department were uploading the biometric information and PAN data to the UIDAI centralized server that is in Bengaluru (then Bangalore) from Mumbai, due to the crash of hard disk. In fact the data were being uploaded and encrypted using strong algorithm, and when the Headquarters were downloading the data, they couldn’t decrypt it. Therefore many applicants, who complained about this, were asked to re-register for it. Later the State (Mumbai) IT department stated that the data belonged to people of Mumbai, and the lost
data are being fully secured which can only be opened if you have ‘keys and multi clues’. The State ensures that the data are safe but such type of issues has already raised
serious concern.

Data Redundancy

According to The Times of India 43, there was an Aadhaar controversy in which the Aadhaar card were being considered invalid on the various factors. In this case a senior citizen got his Aadhaar card without any hassle or without any problem, but the problem aroused when he got the Aadhaar card mentioning the ‘Year of Birth’ instead of ‘Date of Birth’ which was considered as an invalid Aadhaar card. Later the Secretary of State (Mumbai) IT Department considered it to be valid as the senior citizens who were born before the year 1989, can use Year of Birth as they didn’t have the provision for birth certificate at that time. Recently, Aadhaar has been made mandatory to be linked with PAN card, since then various cases of mismatching names on PAN card and Aadhaar card have also been reported

According to Live mint 45, UIDAI filed a complaint on which Delhi police has lodged an FIR in which two different names enrolled with same biometric. The Deputy Director of UIDAI regional office in Pragati Maiden, Delhi told police that on March 18, a person named Raj Kishore Roy enrolled for Aadhaar and submitted his demographic and biometric details. However UIDAI found that on March 17, a person named Deben Roy enrolled for Aadhaar with same biometric information. This example also raises serious concerns. However later UIDAI lodged a complaint under Aadhar act as cheating by impersonation.

B. **An Effective mechanism for Ensuring Security of QR Code**

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QR-code stand for Quick Response Code, which is well known 2 dimensional barcode industrial as it, have high efficiency in accuracy and reading speed. QR-code is continuously developed by Denso Wave company [1], as development today its able to store more information. QR code is able to store up to 7089 numeric. It also able to store in different type of format such as Numeric Characters, Alphabetic Characters, Kanji Characters, Symbols, Binary and Control Code. QR Codes have already overtaken the conventional bar codes because of the main fact that the capacity of data that can be stored by a conventional bar code is very much less when compared to the data that can be stored by a 2-D barcode, the QR Code. QR Code contains data both in horizontal and vertical positions.

QR Codes have already overtaken the classical barcode in popularity in some areas. This stems in many cases from the fact that a typical barcode can only hold a maximum of 20 digits, whereas as QR Code can hold up to 7,089 characters. QR Codes are capable of encoding the same amount of data in approximately one tenth the space of a traditional bar code. A great feature of QR Codes is that they do not need to be scanned from one particular angle, as QR Codes can be read regardless of their positioning. QR Codes can be easily decoded with a mobile phone with appropriate software (Kaywa Reader) . Secure communication can also be established using QR Encoding techniques.

III. Comparative Analysis

This study is conducted to compare the Indian UID also known as Aadhar number with the identity of other countries. Here, this paper presents the study of country wise identity techniques with the biometric technique used in it. The paper give information about how biometric identification has been used for economic, political, and also for social purposes in developing countries.

Aadhaar was constituted under the Planning Commission. The Aadhaar number was established as a single proof of identity and address for resident in India that can be used to authenticate the identity of an individual in transactions with organisations that have adopted the Aadhar number. The scheme has been promoted as a tool for reducing fraud, theft cases in the public distribution system and enabling the government to deliver better benefits for public. The Aadhaar number is available to any resident of India.

SSN Vs Aadhaar

SSN was created as a number record keeping scheme for government services: The Social Security Act provides for the creation of a record keeping scheme - the SSN. Originally, the SSN was used as a means to track an individuals earnings in the Social Security system In 1943 via an executive order, the number was adopted across Federal agencies. Eventually the number has evolved from being a record keeping scheme into a means of identity. In 1977 it was clarified by the Carter administration that the number could act as a means to validate the status of an individual (for example if he or she could legally work in the country) but that it was not to serve as a national identity document. Today the SSN serves as a number for tracking individuals in the social security system and as one (among other) form of identification for different services and businesses. Alone, the SSN card does not serve proof of identity, citizenship, and it cannot be used to transact with and does not have the ability to store information.

Aadhaar was created as a biometric based authenticator and a single unique proof of identity: The Aadhaar number was established as a single proof of identity and address for any resident in India that can be used to authenticate the identity of an individual in transactions with organizations that have adopted the number. The scheme as been promoted as a tool for reducing fraud in the public distribution system and enabling the government to better deliver public benefits.

Verification

The SSN can be verified only in certain circumstances: The SSA will only respond to requests for SSN verification in certain circumstances:

- Before issuing a replacement SSN, posting a wage item to the Master Earnings File, or establishing a claims record - the SSA will verify that the name and the number match as per their records.

- When legally permitted, the SSA verification system will verify SSNs for government agencies.
- When legally permitted the SSA verification system will verify a workers SSN for pre-registered and approved private employers.
- If an individual has provided his/her consent, the SSA will verify a SSN request from a third party.

For verification the SSN number must be submitted with an accompanying name to be matched to and additional information such as date of birth, fathers name, mothers name etc. When verifying submitted SSN's, the system will respond with either confirmation that the information matches or that it does not match. It is important to note that because SSN is verified only in certain circumstances, it is not guaranteed that the person providing an SSN number is the person whom the number was assigned.

The Aadhaar number can be verified in any transaction: If an organization, department, or platform has adopted the Aadhaar number as a form of authentication, they can send requests for verification to the UIDAI. The UIDAI will respond with a yes or no answer. When using their Aadhaar number as a form of authentication individuals can submit their number and demographic information or their number and biometrics for verification.

Public and private entities can request Aadhaar: The Aadhaar number can be adopted by any public or private entity as a single means of identifying an individual. The UIDAI has stated that the Aadhaar number is not mandatory, and the Supreme Court of India has clarified that services cannot be denied on the grounds that an individual does not have an Aadhaar number.

SQL Databases Vs Firebase as a backend server

Since we are going to be linking to something such as a web or mobile application where the data is constantly changing by multiple users (all accessing the same database stored in the cloud) we used firebase for our application.

Pros

- If the app does run of a centralized DB, and is updated by a lot of users - then it's more than capable of handling the Real-Time data updates between devices.
- Stored in the cloud so readily available everywhere.
- Cross Platform API (If you are using this DB with an App)
- They Host the data. -Meaning if you are storing a lot of data, you don't have to worry about hardware!

Cons:

- Unless our app runs of one centralized database updated by a vast quantity of users, it's a major overkill.
- Storage format is entirely different to that of SQL, (Firebase uses JSON) so you wouldn't be able to migrate that easily.
- Reporting tools won't be anywhere near the ones of standard SQL.
- Costs! -Limited to 50 Connections and 100mb of Storage!

Whereas,
MySQL is an open-source relational database management system (RDBMS)

MySQL is offered under two different editions: the open source MySQL Community Server and the proprietary Enterprise Server.[70] MySQL Enterprise Server is differentiated by a series of proprietary extensions which install as server plugins, but otherwise shares the version numbering system and is built from the same code base.

Major features as available in MySQL are:

- A broad subset of ANSI SQL 99, as well as extensions
- Cross-platform support
- Stored procedures, using a procedural language that closely adheres to SQL/PSM[71]
- Triggers
- Cursors
- Updatable views
- Online DDL when using the InnoDB Storage Engine. etc

but since our application used dynamic content that has to be linked to some application, Firebase is a better way to go.

IV. METHODOLOGY

Health cube is an application that scans user's Aadhar card and tells the about the vaccines they have gotten in their lifetime. The main part of the job was to collect the data that would be displayed when the user scans their Aadhar cards, also it includes information about doctors available in a particular hospital.

The data for the Aadhar card is actually government collected data, for the generation of Aadhar cards. For the application Health cube, we used the Aadhar API that has the necessary data which is required for the application to work.The Aadhar API is a JSON object file and the application uses Aadhar authentication to provide the services.

Aadhaar authentication is the process wherein Aadhaar Number, along with other attributes, including biometrics, are submitted online to the CIDR for its verification on the basis of information or data or documents available with it. Aadhaar authentication provides several ways in which a resident can authenticate themselves using the system. At a high level, authentication can be 'Demographic Authentication' and/or 'Biometric Authentication'.During the authentication transaction, the resident's record is first selected using the Aadhaar Number and then the demographic/biometric inputs are matched against the stored data which was provided by the resident during enrolment/update process. Fingerprints in the input are matched against all stored 10 fingerprints.

For the part where the application tells about doctors, it is collected from a random hospital that will be willing to collaborate with the application.
The next part involves saving data on firebase. The basic database write operation is a set which saves new data to the specified database reference, replacing any existing data at that path.. The To data for your app is stored at a database reference
Let's start by saving some user data. We'll store each user by a unique username, and we'll also store their full name and date of birth. Since each user will have a unique username, it makes sense to use the set method here instead of the push method since you already have the key and don't need to create one.
First, create a database reference to your user data. Then use set() / setValue() to save a user object to the database with the user's username, full name, and birthday. You can pass set a string, number, boolean, null, array or any JSON object. Passing null will remove the data at the specified location.

For authenticating a user most apps need to know the identity of a user. Knowing a user's identity allows an app to securely save user data in the cloud and provide the same personalized experience across all of the user's devices.
Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, and more.

To sign a user into your app, you first get authentication credentials from the user. These credentials can be the user's email address and password, or an OAuth token from a federated identity provider. Then, you pass these credentials to the Firebase Authentication SDK. Our backend services will then verify those credentials and return a response to the client. After a successful sign in, you can access the user's basic profile information, and you can control the user's access to data stored in other Firebase products. You can also use the provided authentication token to verify the identity of users in your own backend services.

V. Design Considerations

1. ASSUMPTIONS

the assumption we have made in the application is that all the users have Aadhar card and can only access the application using the Aadhar card.
Also we have made the application for Indian users since it only works with the Aadhar API.

2. CONSTRAINTS

the only constraint with the application is that, if the user doesn't have an Aadhar card, he cannot use the services provided by our application
Also one of the concern is that, as of now we are only available on iOS devices and will take some time to develop this for android or other devices.
Also we need a proper internet connection and working camera for the application to be functional.

3. SYSTEM ENVIRONMENT

The main component of our application is the application which will work only on iOS devices. The devices should also have working internet connection. Users should also ensure that the camera of their device is working properly.

4. DESIGN METHODOLOGY

The methodology is designed to be used by patients to explore doctors, find their vaccines and book appointments . The methodology has been informed by the initial literature review and by critical consideration and evaluation.
The methodology is made up of three stages:

- planning and design
- development
- performance and evaluation

The planning and design stage

The planning and design stage is concerned primarily with pedagogic considerations. Taking into account the context of the unit/module. This stage is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team. The basic GUI is set up.

The development stage

The development stage is concerned with the creation of resources to support the development of Health cube. In this stage the project is made more developed by regular and better updates. The formation of the design of the application is kept in constant working with the basic GUI in mind.

The performance and evaluation stage

The performance and evaluation stage is concerned with piloting, performing and improving the application.

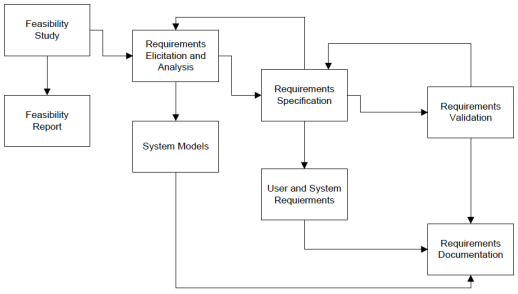
Development Methods

Incremental software development is better than any other approach for most business, e-commerce, and personal systems. By developing the software incrementally, it is cheaper and easier to make changes in the software as it is being developed.
Compared to the other model, incremental development has three important benefits:

The **cost of accommodating changing** requirements is reduced. The amount of analysis and documentation that has to be redone is much less than that's required with waterfall model.

It's easier to get **customer feedback** on the work done during development that when they system is fully developed, tested, and delivered.

More **rapid delivery** of useful software is possible even if all the functionally hasn't been included. Customers are able to use and gain value from the software earlier than it's possible with other models



Incremental Process Model

Fig 1. Showcases the ICM or process model used in this project

VI. Design

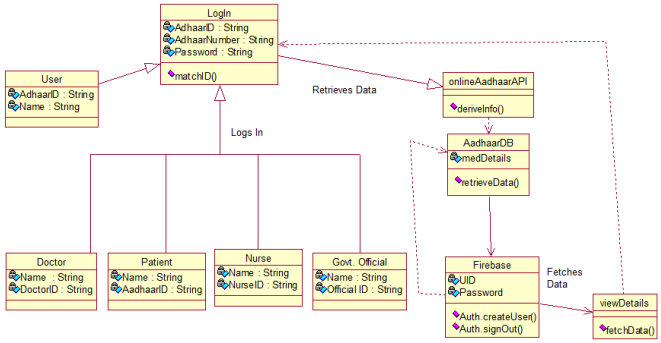


Fig 2. UML Class Diagram

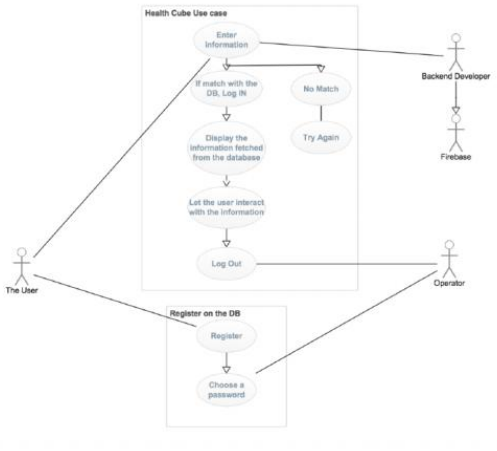


Fig 3. Use Case Diagram

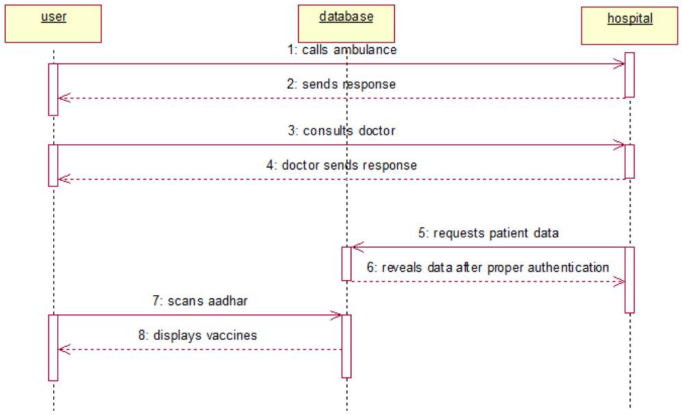


Fig 4. Sequence Diagram

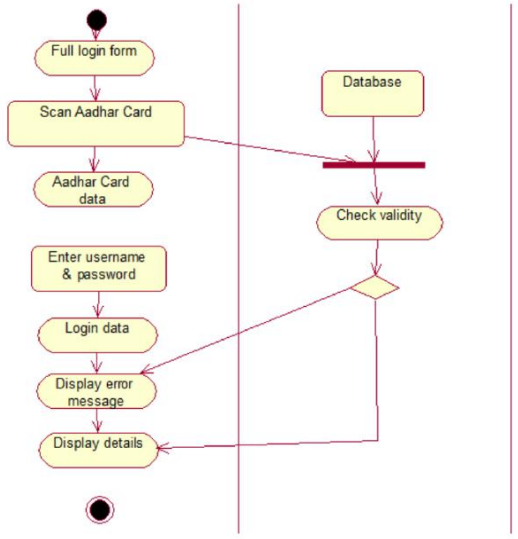


Fig 5. State Chart

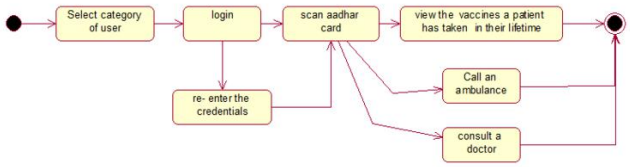


Fig 6. Activity Diagram

VII. Conclusion

The Aadhaar QR Code is in turn a very secure and successful way of implementing a person's identity. We were successfully able to retrieve data from a User's Aadhaar Unique ID using Health Cube, our iOS Application and display the same. This will prove to be a massive step in showing a person's medical vaccination details and can safely keep all their medical data in one save and secure google firebase Database. It's reliability and functionality will prove to be a great way of ensuring a successful, handy mobile applications for Aadhaar card users

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Evaluation Criteria	Score (0-10)
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