

# Project Report

Project Title	<b>Personal Assistance for Seniors Who Are Self-Reliant</b>
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## INTRODUCTION

### Project Overview

In modern society, most of the time people remain busy in their daily life schedule. It is true that they give more preference to their work than taking care of their health. Several diseases like diabetes, blood pressure is nowadays very common. Maintaining daily medication become very difficult for old people. Sometimes younger is faced with the same problem. There are many people in our family who need constant help may it be our elderly people, younger or others. But it is not always possible for us to remind them of their medicine's dosages every time. For this purpose, there needs to be some facility for us which monitoring patient and take care. Nowadays we are all used to living technology-based life. We can use this technology in a way that will be beneficial for us. Cell phones aren't best utilized for calling but now maybe used as an ensemble of embedded sensors that together allow new packages including human services, healthcare, social networks, environmental tracking etc. Today in medical services frameworks, the usage of cell phones is turning into an expanding number of values. IoT may be helpful to monitor real-time condition and IoT can be a powerful and effective paradigm to store data collected by sensors devices to the cloud. In our project, the IoT enabled device will control the overall monitoring system. And developed an android application which help patients by reminding medicine in take time and so on.

### Purpose

- Sometimes elderly people forget to take their medicine at the correct time.
- They also forget which medicine He / She should take at that particular time.
- And it is difficult for doctors/caretakers to monitor the patients around the clock. To avoid this problem, this medicine reminder system is developed.

## LITERATURE SURVEY

### Existing problem

As stated by the WHO Poor adherence can lead to serious health risk. For instance, a recent study found out that the risk of hospitalized patients, having diabetes congestive heart failure, mellitus, hypertension, or hypercholesterolemia who actually were nonadherent to prescribed remedy was more in comparison with the general population. Non-adherence rate can vary widely, even in the rigid controlled and **monitored environment of a clinical test**. To mention, patients with long term conditions are questionable to follow prescription than those with acute state. The effectiveness of a therapy or treatment directly depends upon a patient's ability and willingness to follow a prescribed regimen. The patient's ability for reading and understanding the instructions for medication is a key factor. Patients who face difficulties in understanding the instructions in a prescription which ultimately results in decreased adherence and poor medication management and consumption. Issues of low literacy must be recognized and strategies designed with this limitation in consideration. A patient with heart failure problem not taking prescribed medication or **who tends to forget to take their medicine**, costs the U.S. health care system an average of almost \$8,000 annually, according to a 2011 analysis published in Health Affairs. The figures are high for other illnesses too almost \$4,000 per patient with high blood pressure, over \$3,700 per patient with diabetes and about \$1,200 per patient with high cholesterol. Dr. Brennan and a team of researchers at Brigham and Women's Hospital, in Boston, have been studying this issue since 2010 by analyzing pharmaceutical insurance claims data.

They've determined several reasons behind not taking proper medication and among those, one of them is: There is a high degree of complications for patients who takes several different drugs for a variety of conditions. There are currently around 80 million U.S. residents with several chronic conditions and multiple medications to manage. Patients who have a several different kind of prescriptions are dubious to follow medications because they may have difficulty managing schedule that involves taking several different medications schedule throughout the day.

## References

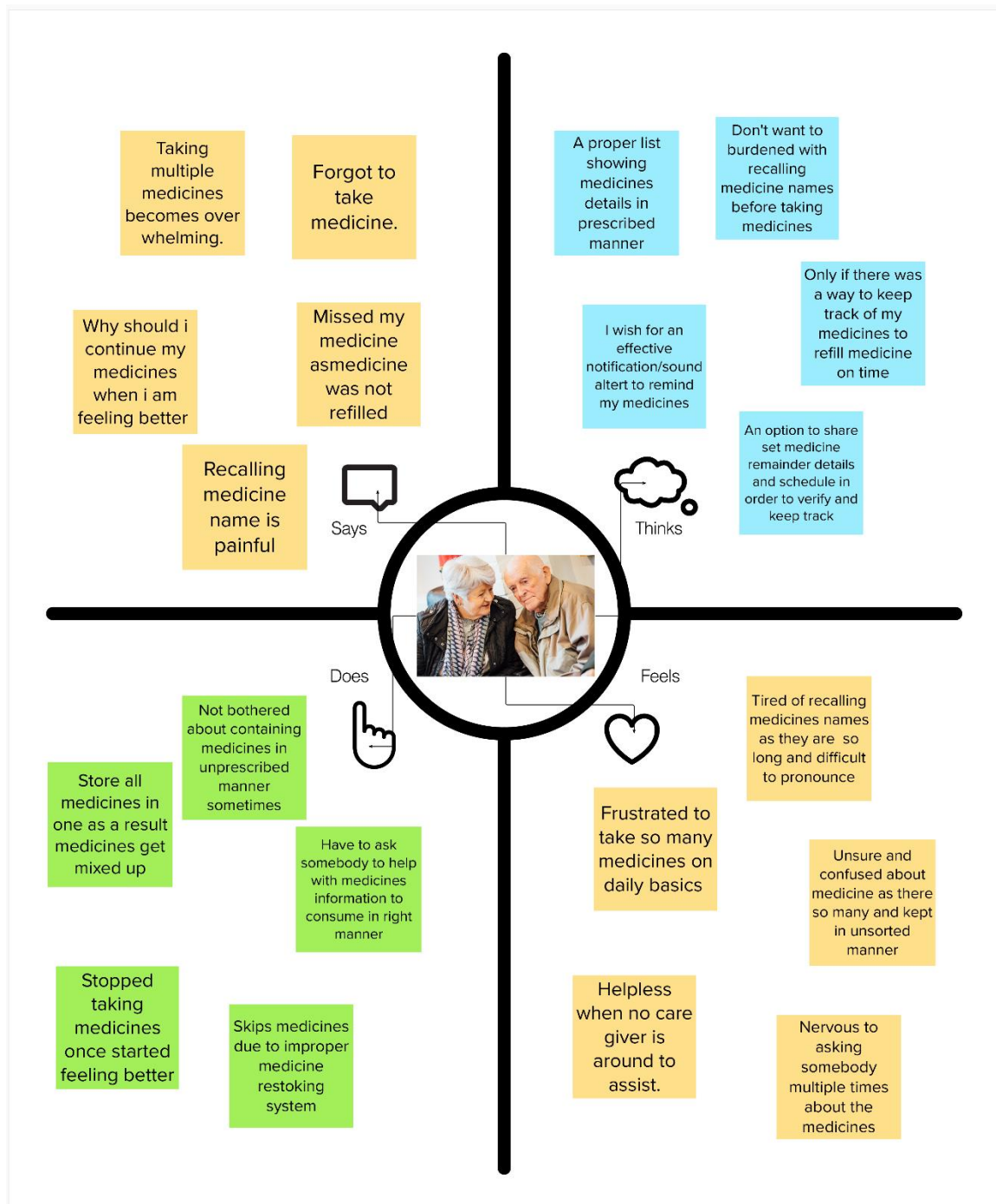
- [1] Aishwarya Chawariya<sup>1</sup>, Prajakta Chavan<sup>2</sup>, Akanksha Agnihotri<sup>3</sup> , "Fundamental Research On Medication Reminder System".
- [2] Slagle, J.M., Gordon, J.S., Harris, C.E., Davison, C.L., Culpepper, D.K., Scott P. and Johnson, K.B., (2011) "MyMediHealth– Designing a next generation system for child-centered medication Management", Journal of Biomedical Informatics, Vol. 43, No. 5.
- [3] Zao, J.K., Wang, M.Y., Peihuan, T. and Liu, J.W.S., (2010) "Smart Phone Based Medicine Intake Scheduler, Reminder and Monitor", IEEE e-Health Networking Applications and Services (Healthcom).
- [4] Prasad, B., (2013) "Social media, health care, and social networking", Gastrointest Endosc. Vol. 77.
- [5] Aishwarya Chawariya<sup>1</sup>, Prajakta Chavan<sup>2</sup>, Akanksha Agnihotri<sup>3</sup> , "Fundamental Research On Medication Reminder System".

## Problem Statement Definition

Skipping medicines can be serious for some medical health conditions; Sometimes elderly people forget to take their medicine at the correct time. They also forget which medicine one should take at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock.

# IDEATION & PROPOSED SOLUTION

## Empathy Map Canvas



## Proposed Solution

SNo	Parameter	Description
1.	Problem Statement (Problem to be solved)	Some people find it difficult to learn new apps in this ever-expanding digital environment, and people nowadays tend to forget things more easily, such as taking their prescriptions. People need a way to remember to take their prescriptions without having to learn how to use sophisticated programs.
2.	Idea / Solution description	Create a basic, easy-to-use app so that users don't forget their medicine schedules, can easily discover pharmacies and clinics near them, and can be directed through the app by their loved ones if necessary.
3.	Novelty / Uniqueness	My research began with a series of inquiries directed at a variety of people in order to have a better understanding of their issues and demands in remembering their routines. The purpose of this study was to gain a better understanding of individuals and their needs, as well as to put them at the centre of our design process and product.
4.	Social Impact / Customer Satisfaction	I constructed these proto-personas, or names, based on the research findings from the user interview. They would be crucial to the rest of the design process. All design decisions may be assessed and re-evaluated using these personas, keeping the user and their perspective in mind.
5.	Business Model (Revenue Model)	By using the model, we can collect basic and some medical information about the persona that helps us in showing relevant and profitable advertisements.
6.	Scalability of the Solution	As the model is integrated with cloud software, we can update the user experience without reinstalling a model and the persona can keep a remainder up to year.

## Problem Solution fit

**Problem-Solution fit canvas 2.0** Purpose / Vision

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <b>CS</b> Who is your customer? i.e. visiting parents of 0-5 y.o. kids 1) Here the customers are the elder people who needs to take medicine regularly at correct time. 2) Patients who can't be monitored 24X7 by doctors. 3) Visually challenged people who are self-reliant.	<b>6. CUSTOMER CONSTRAINTS</b> <b>CC</b> What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. 1) Due to lack of internet. 2) It should be present near to them. 3) Knowing the process of using the applications. 4) Registered user can use the application.	<b>5. AVAILABLE SOLUTIONS</b> <b>AS</b> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking 1) If customers forgot to take medicine, medicare application helps them to take medicine at right time. 2) Alert the customer by notification by SMS alarm. 3) Make the registered users remind their medicines through voice commands of medicine names.	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <b>J&amp;P</b> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. 1) Remembrance of the medicine to be consumed through voice. 2) Message sent on regarding intake of medicines to the closest persons. 3) Alert the patient about the low amount of medicine.	<b>9. PROBLEM ROOT CAUSE</b> <b>RC</b> What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. 1) Doctors cannot monitor the patients all the time. 2) Visually impaired persons need an assistance. 3) Elder people (self-reliant) who need care to be taken.	<b>7. BEHAVIOUR</b> <b>BE</b> What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) 1) The customer can use 'help' option in the application to get the problem solved. 2) The user can use user guide available in the 'about' section for reference.	
<b>3. TRIGGERS</b> <b>TR</b> What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. 1) The customers are introduced with this by the doctors. 2) By seeing ads on the internet.	<b>10. YOUR SOLUTION</b> <b>SL</b> If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. Notifying of medicines names through audio and message with the help of data fed from the mobile application which is initiated by web application which stores the user details.	<b>8. CHANNELS of BEHAVIOUR</b> <b>CH</b> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7 <b>ONLINE:</b> Customers can set reminder about their medicines in online mode. <b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. <b>OFFLINE:</b> Customers get notification alert to take medicine on proper time in offline mode.	Extract online & offline CH of BE	
<b>4. EMOTIONS: BEFORE / AFTER</b> <b>EM</b> <b>BEFORE:</b> Customers forgot to take at right time which affect their health. <b>AFTER:</b> Now after using medicare applications customers are taking their medicines properly at correct time.				

Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license  
 Created by Daria Nopeluckhina / Amaltama

**AMALTAMA**

## REQUIREMENT ANALYSIS

### Functional requirement

**Requirements:** Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Access Cloud services	Access the cloud service with correct credentials Store the details in the database Retrieve needed information for the user's operation
FR-4	IOT configuration	Fine Tuning the IOT device based on preference Access the Cloud DB via device Manage the request and response effectively

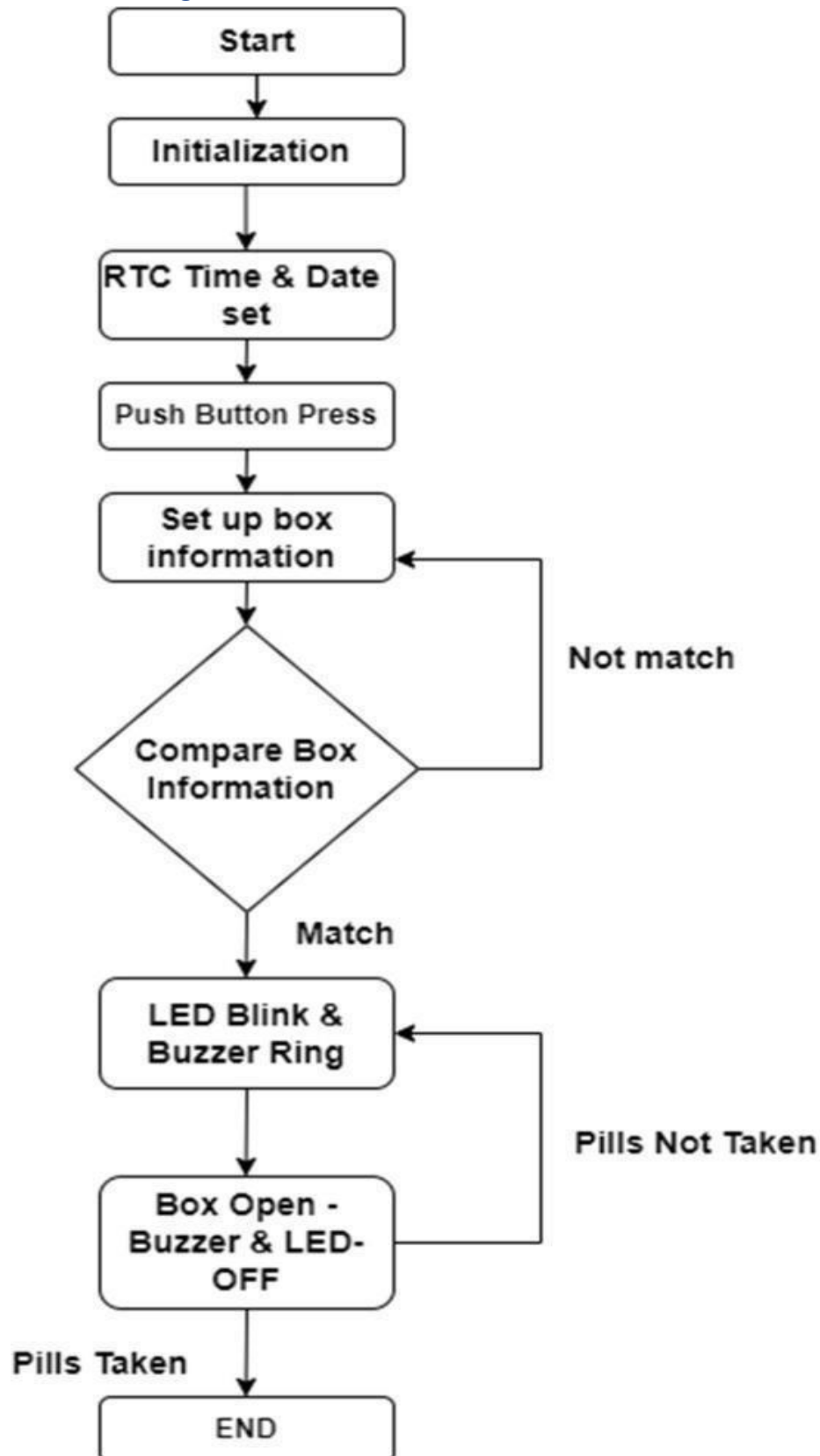
## Non-Functional requirements

**Non-functional Requirements:** Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	App can be used by anyone who has operational knowledge about internet and computer.
NFR-2	<b>Security</b>	For security, TFA is enabled and biometrics are also added for user safety.
NFR-3	<b>Reliability</b>	Highly reliable since, It uses Trusted cloud services like IBM
NFR-4	<b>Performance</b>	Performance is better compared to other market products.
NFR-5	<b>Availability</b>	Available on mobile app. Web version is getting ready for next release.
NFR-6	<b>Scalability</b>	Using Cloud services, makes the scalability higher the using traditional database.

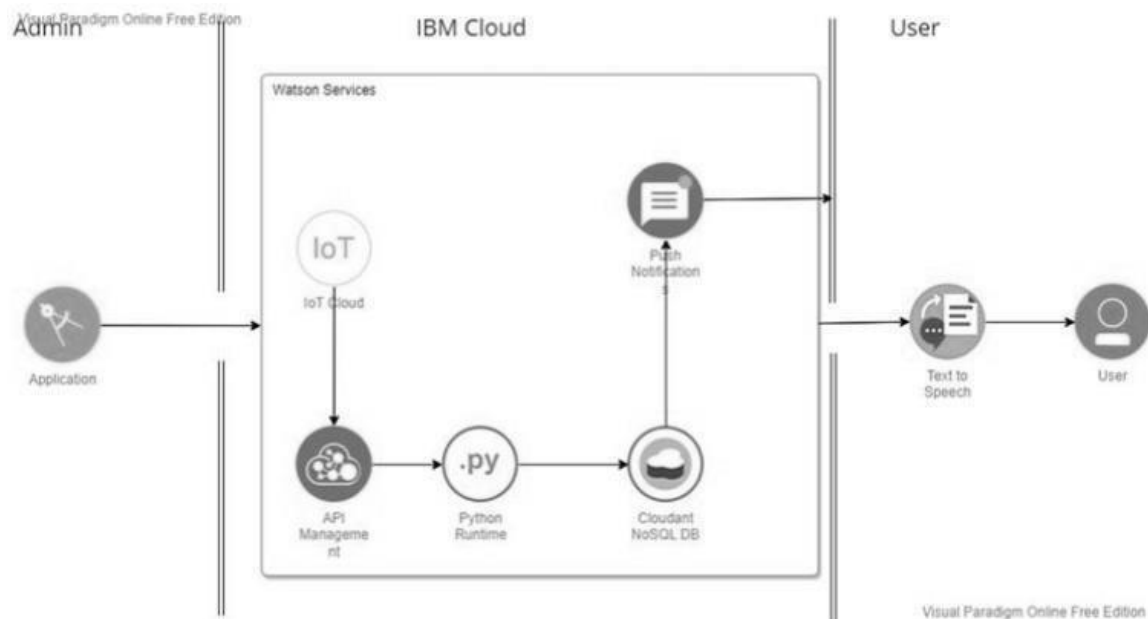
## PROJECT DESIGN

### Data Flow Diagrams





## Solution & Technical Architecture



## User Stories

User Type	Functional Requirement (Epic)	User Story number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email or mobile number, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email or mobile number & password	I can access my account / dashboard	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Dashboard	USN-5	As a user, I can update my reminders and medicines wherever required		High	Sprint-2
		USN-6	As a user, I can check the application whether the medicine dosage is completed.		Medium	Sprint-2
Customer Care Executive		USN-7	For any troubleshooting, the user can send a mail to the technical team.		Low	
Administrator		USN-8	Ensures smooth functioning and data warehousing strategies		Medium	Sprint-3

## PROJECT PLANNING & SCHEDULING

### Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	US-1	Create the IBM Cloud services which are being used in this project.	6	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-1	Create and initialize accounts in various public APIs like OpenWeatherMap API.	US-2	Configure the IBM Cloud services which are being used in completing this project.	4	Medium	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-1	Local Server/Software Run	US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create	5	Medium	Nadish KB Parthiban M Niranjan R Naveen TR

			the IBM Watson IoT platform.			
Sprint-1	Write a Python program that outputs results given the inputs like weather and location.	US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	5	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-2	Push the server/software to cloud	US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-2	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	US-2	Create a Node-RED service.	10	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-3	Hardware initialization	US-1	Develop a python script to publish random sensor data such as temperature, humidity, rain to the IBM IoT platform	7	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-3	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	US-2	After developing python code, commands are received just print the statements which represent the control of the devices.	5	Medium	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-3		US-3	Publish Data to The IBM Cloud	8	High	Nadish KB Parthiban M Niranjan R Naveen TR

Sprint-4	UI/UX Optimization & Debugging	US-1	Create Web UI in Node- Red	10	High	Nadish KB Parthiban M Niranjan R Naveen TR
Sprint-4		US-2	Configure the Node-RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB	10	High	Nadish KB Parthiban M Niranjan R Naveen TR

### Sprint Delivery Schedule

Sprint	Total Story Points	Duration Sprint Start Date Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	7 Days 03 Nov 2022 10Nov 2022	20	10 Nov 2022
Sprint-2	20	5 Days 6 Nov 2022 11 Nov 2022	20	11Nov 2022
Sprint-3	20	4 Days 8 Nov 2022 11 Nov 2022	20	11Nov 2022
Sprint-4	20	2Days 13 Nov 2022 15 Nov 2022	20	15 Nov 2022

### CODING & SOLUTIONING (Explain the features added in the project along with code)

#### Feature 1

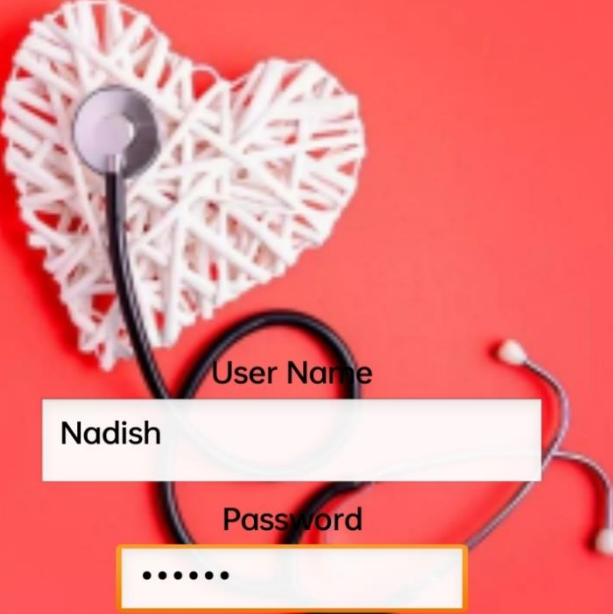
The mobile application developed has a feature of individual login by different users.

23:36

VoLTE 4G 100

Screen1

# Medicine Remainder



User Name

Nadish

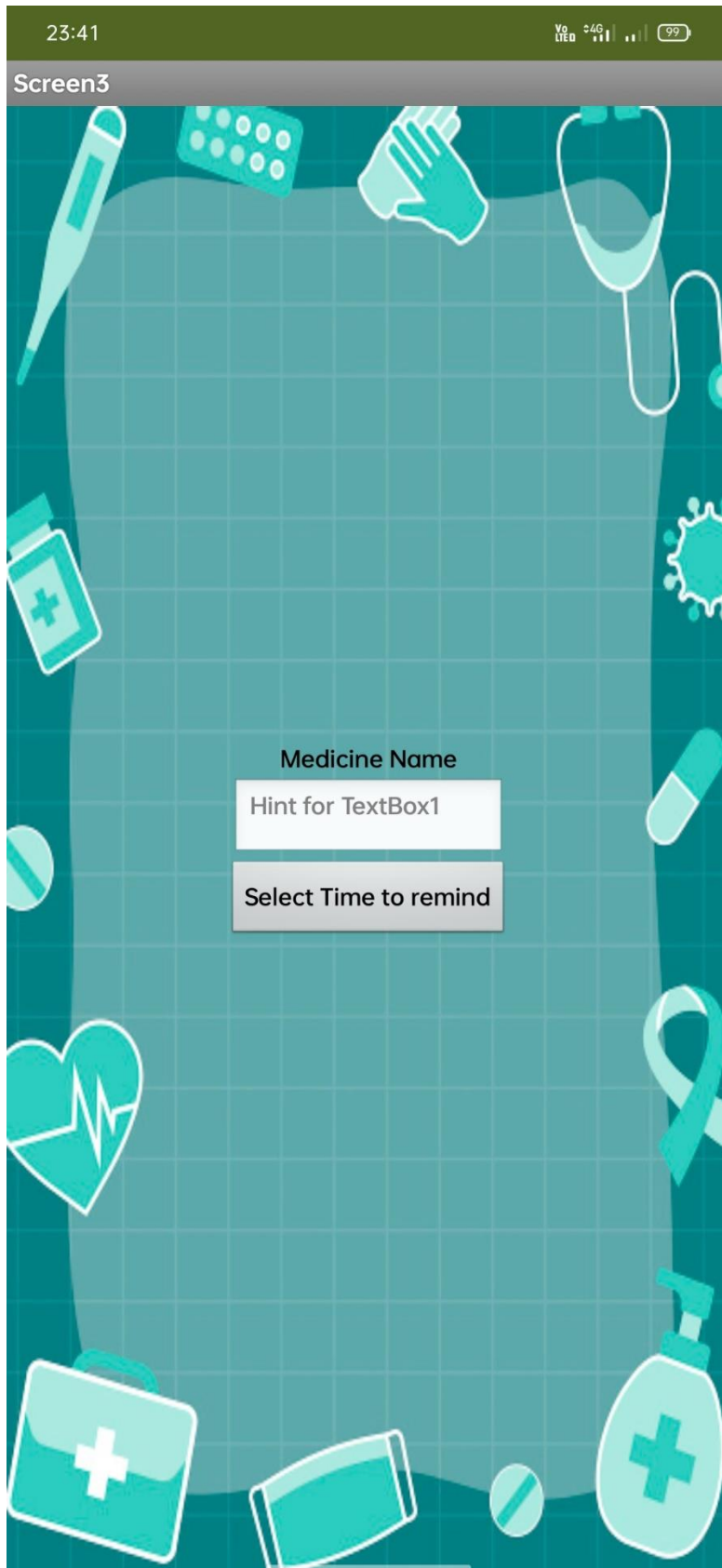
Password

.....

Enter

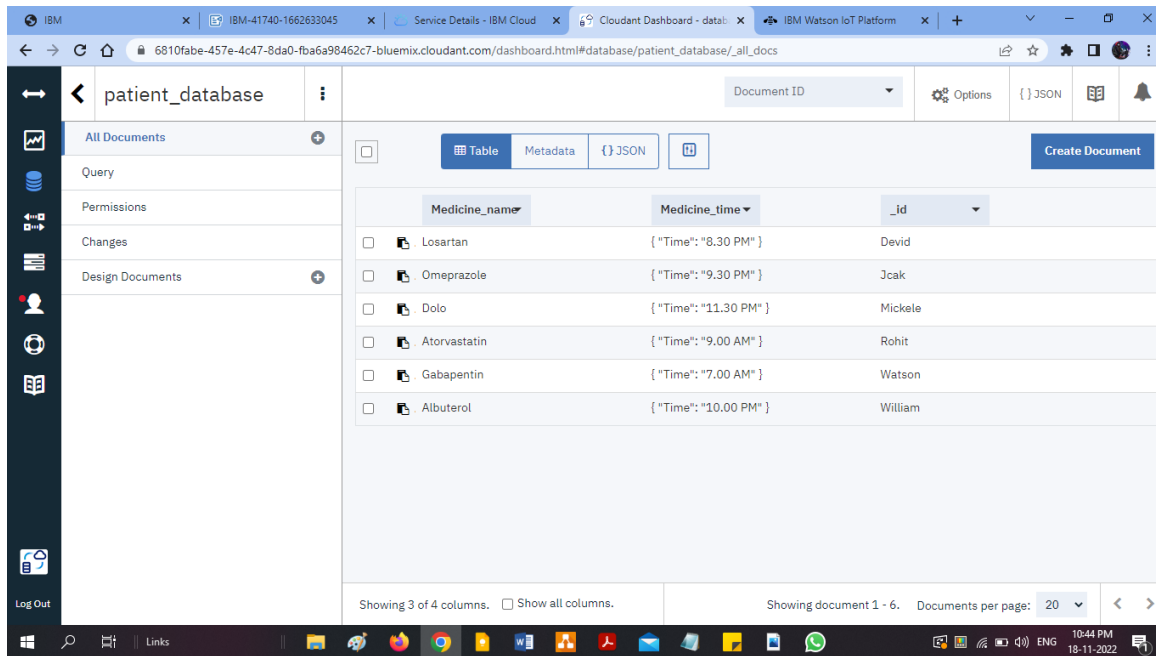
## Feature 2

The mobile application also has the feature of uploading medicine names in the cloud.



## Database Schema (if Applicable)

The project includes a cloud database system.



## TESTING

### Test Cases

Test case	Precondition	Test steps	Test data	Expected result
Verify login with valid credentials	User should have a network connection	1. Launch URL 2. Enter valid username. 3. Enter valid password. 4. Click on the "Login" button.	Username: Nadish Password: Nadish123	Users should be able to login successfully.
Verify login with invalid credentials	User should have a network connection	1. Launch URL 2. Enter valid username. 3. Enter invalid password. 4. Click on the "Login" button.	Username: Nadish Password: Nadish123	Users should not be able to login.
Update the medicine name with the time.	User should have a network connection	1. Enter valid medicine name. 2. Enter the time when the medicine has to be consumed. 3. Click on the "Submit" button.	Medicine Name: Cetirizine Medicine Time: 20.00	Users should be able to update it successfully.

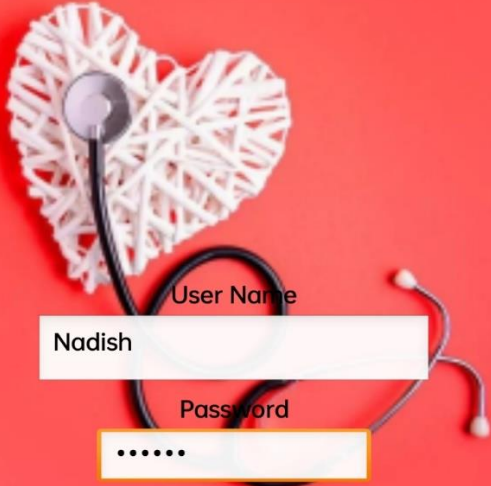
## User Acceptance Testing

### Login page testing

23:36 4G LTE 100

Screen1

# Medicine Remainder



User Name

Nadish

Password

.....

Enter



## RESULTS

### Performance Metrics

S. NO	Parameter	Performance
1.	Response Time	0.2s (Average of 10 trials)
2.	Workload	500 users (Calculated based on Cloud Space)
3.	Revenue	Individual users and pharmaceutical industries.
4.	Efficiency	Simple and straightforward workflow, which makes the process efficient.
5.	Down Time	Almost no down time due to IBM Cloud enabled solution.

## ADVANTAGES & DISADVANTAGES

### Advantages

- Help the elderly people to take their medicine at the correct time
- Avoid personal assistants or caretakers needed for medically sick people
- Cost efficient
- Can store multiple data and many notifications can be generated.
- Since it includes voice assistance, even blind people can use our device

### Disadvantages

- Makes people lethargic and makes them dependent always on others.
- Requires a stable internet connection.

## CONCLUSION

The project offers the elderly or medically sick people a personal assistant which reminds them of the medicines to be consumed at the particular time. Skipping tablets may lead to serious problems if the person has a severe illness and this can be avoided. Since the cloud is integrated with the mobile application, numerous data can be fed into the database and notifications can be generated. The mobile application developed is highly customisable by the user and easy to use.

## FUTURE SCOPE

The project can be further developed by bringing into the feature of informing the medicine name during the notification. The voice assistance which is given can be customized by adding the user's voice or the caretaker's voice. Further the mobile application can update medicines by taking voice commands as an input from the user.

## APPENDIX

### Source Code

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQTT
#include "SoundData.h"
#include "XT_DAC_Audio.h"
XT_Wav_Class Sound("voice_command.wav"); XT_DAC_Audio_Class DacAudio(2,0);
uint32_t DemoCounter=0;

void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);

//-----credentials of IBM Accounts-----
#define ORG "None"//IBM ORGANITION ID
#define DEVICE_TYPE "remainder"//Device type mentioned in ibm watson IOT
Platform
#define DEVICE_ID "33565"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "PNT2022TMID33565" //Token
String data3; float h, t;

//----- Customise the above values -----
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server
Name char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type
of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/test/fmt/String";// cmd REPRESENT
command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method char token[]
= TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id

//
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the
predefined client id by passing parameter like server id,portand
wificredential void setup()// configureing the ESP32
{
Serial.begin(115200);
```

```

delay(10); Serial.println(); wificonnect(); mqttconnect();
}

void loop()// Recursive Function
{

delay(1000); if (!client.loop()) {
mqttconnect();
}
}

/*.....retrieving to
Cloud..... */

void mqttconnect() {
if (!client.connected()) {
Serial.print("Reconnecting client to ");
Serial.println(server);
while (!client.connect(clientId, authMethod, token)) {
Serial.print("."); delay(500);
}
}

initManagedDevice(); Serial.println();
} }
void wificonnect() //function defination for wificonnect {
Serial.println();
Serial.print("Connecting to ");

WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to
establish the connection
while (WiFi.status() != WL_CONNECTED) {
delay(500);
Serial.print("."); }
Serial.println("");
Serial.println("WiFi connected");
Serial.println("IP address: ");
Serial.println(WiFi.localIP());
}

void initManagedDevice() {
if (client.subscribe(subscribetopic)) {
Serial.println((subscribetopic));
}
}

```

```

Serial.println("subscribe to cmd OK");
} else {
Serial.println("subscribe to cmd FAILED"); }
}

void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength) {

Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic);
for (int i = 0; i < payloadLength; i++) { //Serial.print((char)payload[i]);
data3 += (char)payload[i];
}

Serial.println("data: "+ data3); if(data3=="announce")
{
Serial.println(data3); for(int i=0;i<5;i++){ DacAudio.FillBuffer();
if(Sound.Playing==false)
DacAudio.Play(&Sound);
Serial.println(DemoCounter++);
} }
else
{ pass;

} data3="";

}

```

GitHub & Project Demo Link

<https://github.com/IBM-EPBL/IBM-Project-41740-1660644498>

<https://vimeo.com/772718202>