Personal Assistance for Seniors Who Are Self-Reliant - Project Report

1. Introduction

1.1. Project Overview

- An app is built for the user (caretaker) which enables him to set the desired time and medicine. These details will be stored in the IBM Cloudant DB.
- If the medicine time arrives the web application will send the medicine name to the IoT Device through the IBM IoT platform.
- The device will receive the medicine name and notify the user with voice commands.

1.2. 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.

2. Literature survey

2.1. Existing problem

Elderly people let slip the medications at the correct time and the existing solutions for this problem is setting reminders or using pill boxes, calendars, Personal Assistance. Though the solutions give reminders, the voice commands or assistance given by this system is more efficient.

2.2. References

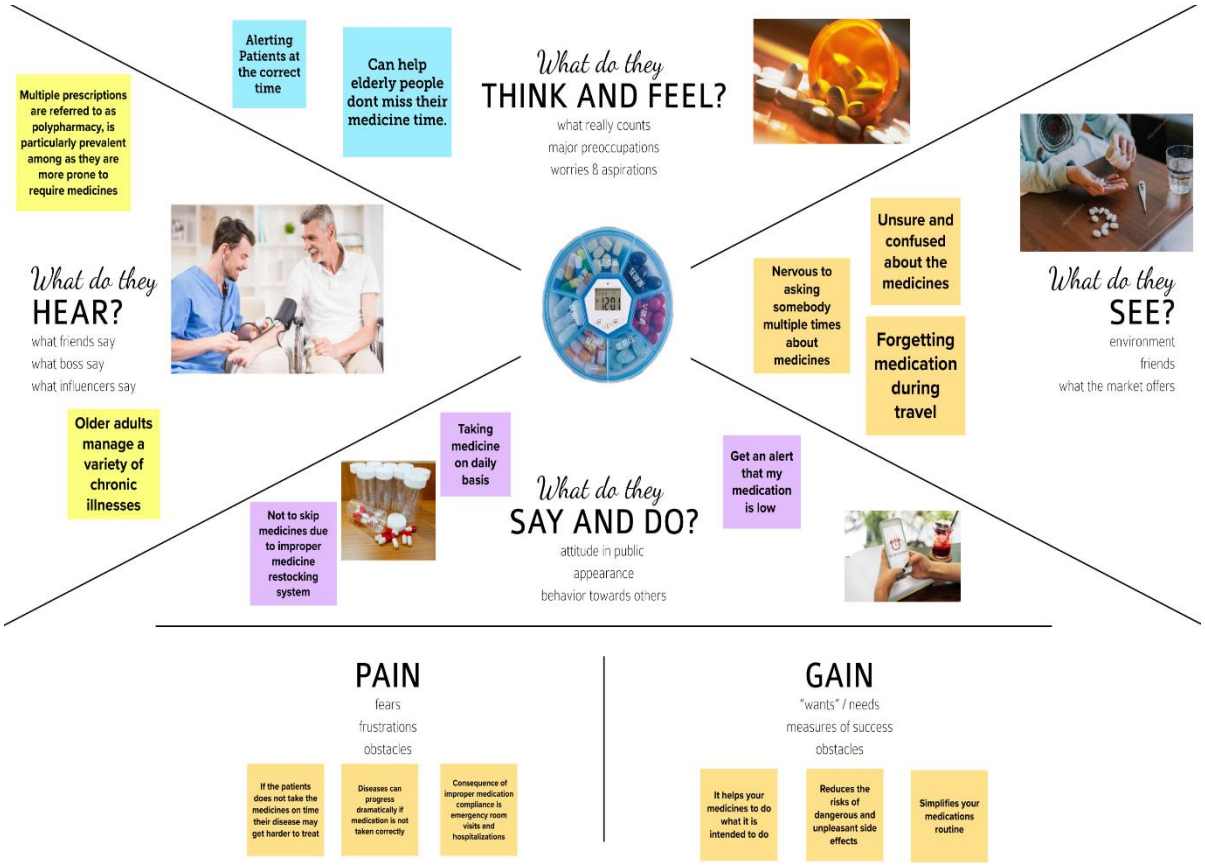
1) Visual Health Reminder: A Reminder for Medication Intake and Measuring Blood Pressure to Support Elderly People ; René Baranyi; Sascha Rainer; Stefan Schlossarek; Nadja Lederer; Thomas Grechenig
2) Cloud Computing based Medical Assistance & Pill Reminder ; A. Chinnasamy; Ram Prasad J; Syed Rafeeq Ahmed; Akash S

2.3. Problem Statement Definition

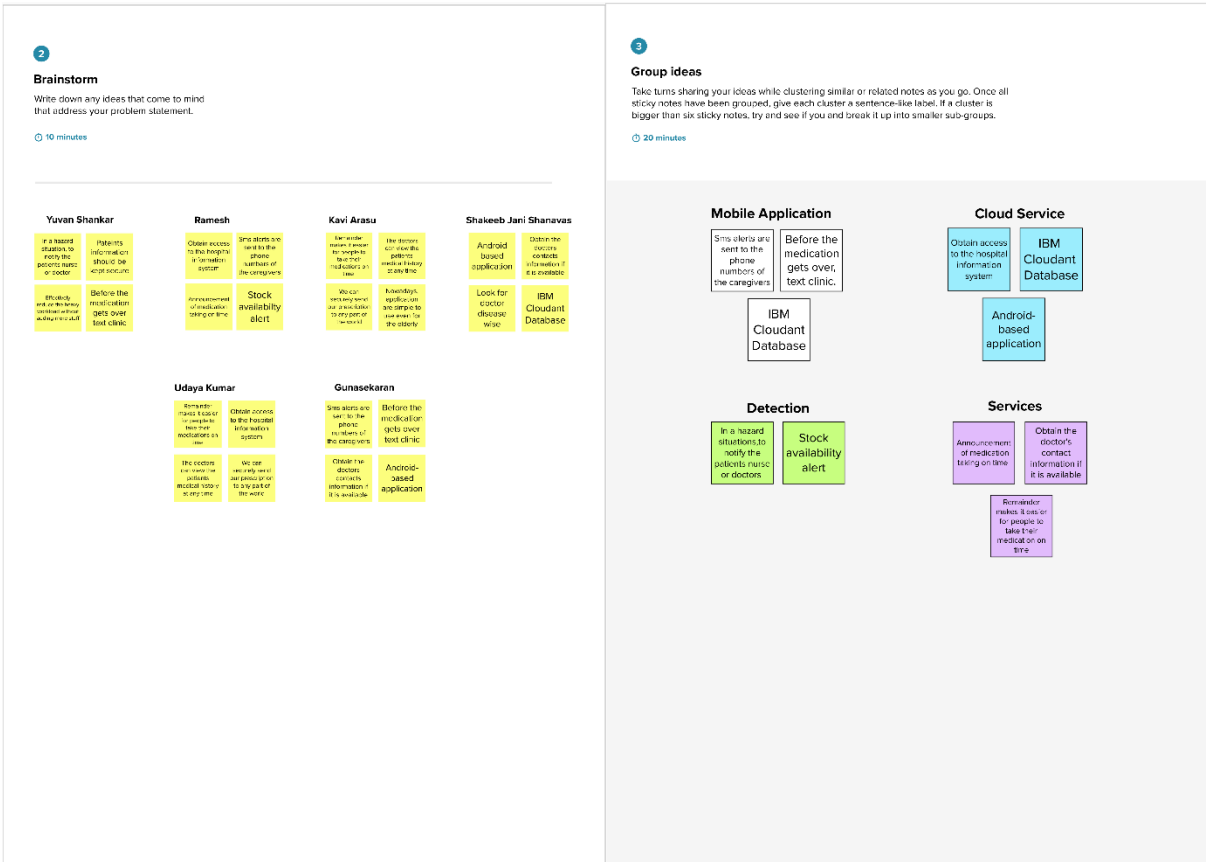
Skipping medicines can be serious for some medical health conditions; Sometimes elderly people forget to take their medicine at the correct time. They also forget which medicine one should take at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock

3. Ideation and Proposed Solution

3.1. Empathy Map Canvas



3.2. Ideation And Brainstorming

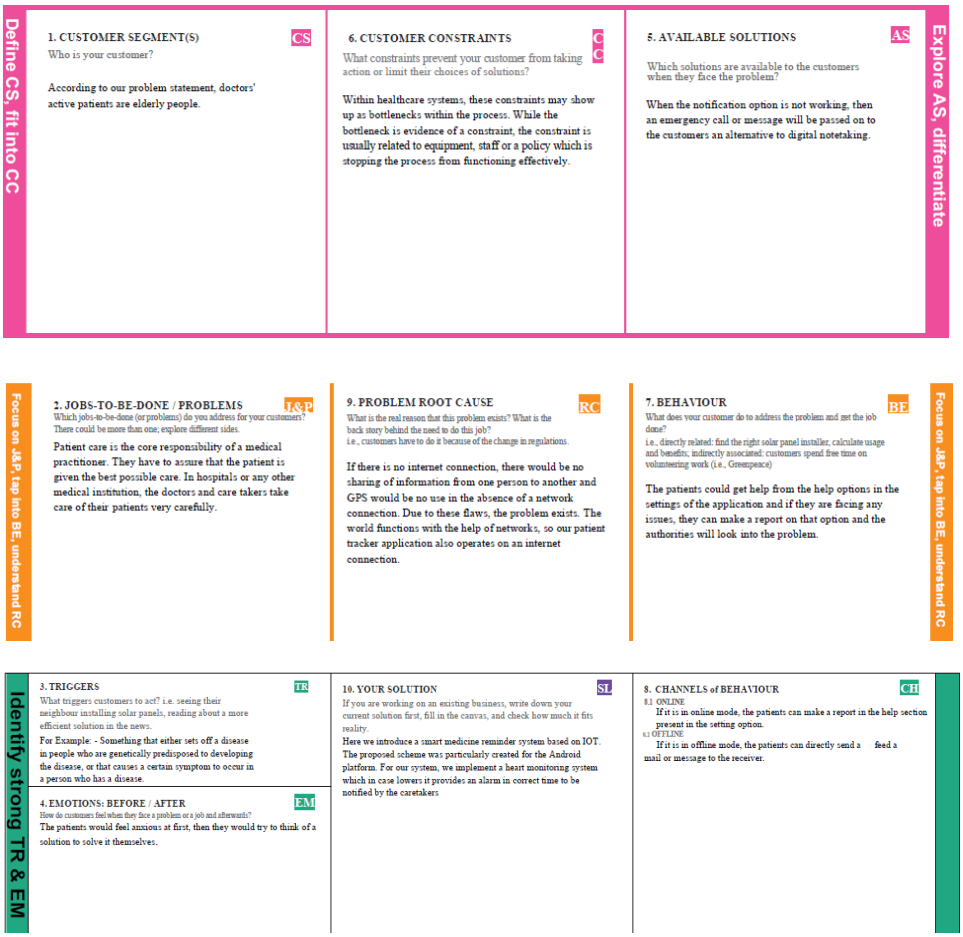


3.3. Proposed solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Sometimes elderly people forget to take their medicine at the correct time. They also forget which medicine should be taken at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock.
2.	Idea / Solution description	➢ A medicine reminder system is developed. An app is built for the user (caretaker) which enables him to set the desired time and medicine. ➢ These details will be stored in the IBM Cloudant DB. If the medicine time arrives the web application will send the medicine name to the IoT Device through the IBM IoT platform.

		➢ The device will receive the medicine name and notify the user with voice commands.
3.	Novelty / Uniqueness	➢ Keeping track of the medicines taken by the user at each time interval. ➢ Information is stored in the secured IBM cloud.
4.	Social Impact / Customer Satisfaction	The reminder system enables the user to take tablets at regular intervals prescribed by the physicians.
5.	Business Model (Revenue Model)	**Direct Mode:** We gain revenue from selling the medical reminder system to hospitals, medical health centres and even in old age homes. **Indirect Mode:** We gain profit by having partnership with pharmaceutical companies.
6.	Scalability of the Solution	The medical alert system can be used in hospitals, medical health centres and even in old age homes for dispensing medicines.

3.4. Problem Solution Fit



4. Requirement analysis

4.1. Functional Requirements:

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	Accessing the cloud service with correct credentials. Storing the details in the cloud database.
FR-4	IOT configuration	Fine Tuning the IOT device based Cloud DB access via device. Manage the data request and response effectively

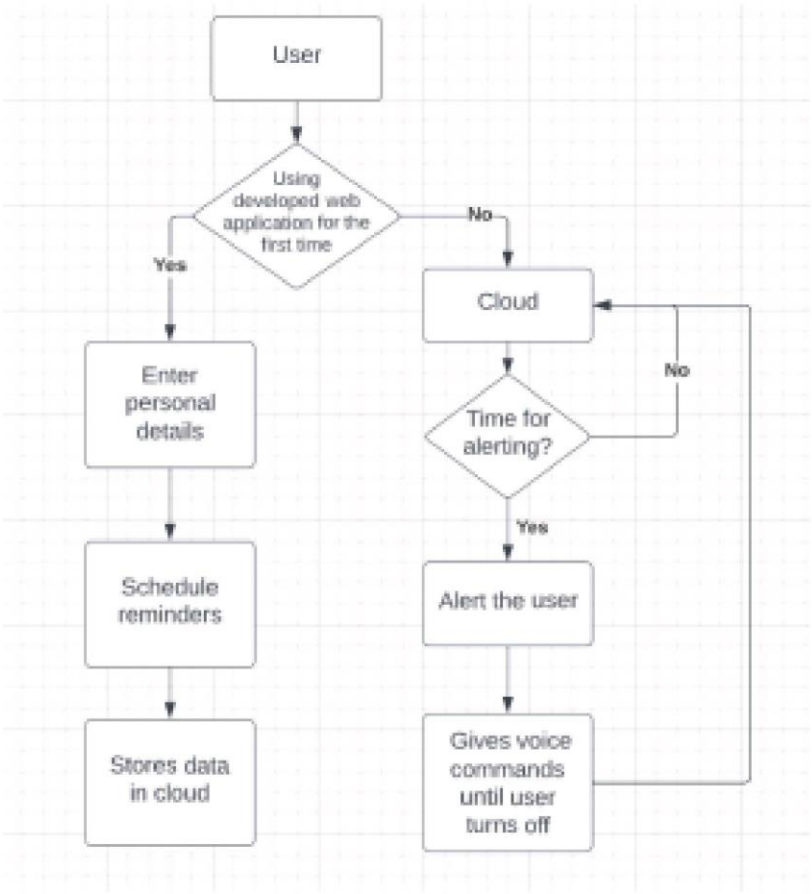
4.2. Non-functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	App can be used by anyone who has knowledge about applications and computers.
NFR-2	**Security**	For security, TFA is enabled and biometrics arealso added for user safety.
NFR-3	**Reliability**	Highly reliable since, It usestrusted and authentic cloud services like IBM

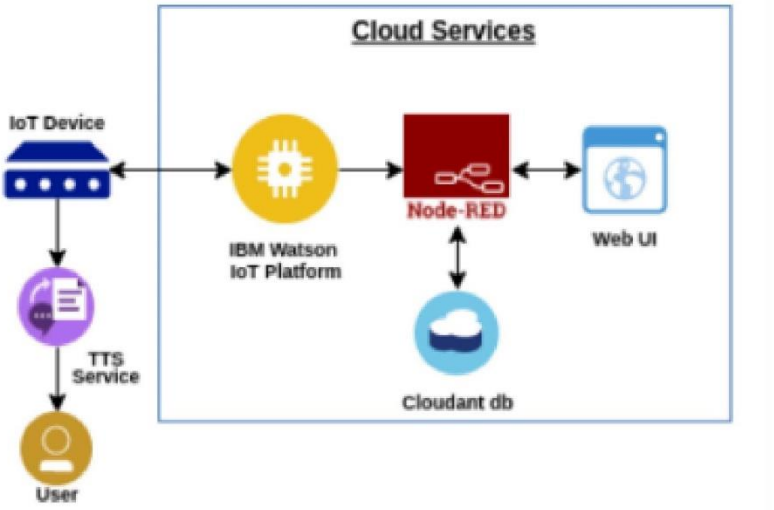
NFR-4	**Performance**	Performance is better compared to other marketproducts.
NFR-5	**Availability**	Available on mobile app.
NFR-6	**Scalability**	Using Cloud services, makes the scalability higher the using traditional locally stored database.

5. Project Design

5.1. Data Flow Diagrams



5.2. Technical architecture



5.3. 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

6. Project Planning and Scheduling

6.1. Sprint Planning And Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story points	Priority	Team Members
Sprint 1	Set Alarm	USN-1	As a user, I can set an alarm to alerting a medicine through medicine remainder system	10	High	Shakeeb Jani Shanavas
Sprint 1		USN-2	As a user, I can Activate and Deactivate the alarm	10	High	Yuvan Shankar
Sprint 2	Notification	USN-3	As a user once I can the set the alarm then I gets the notification	10	High	Ramesh
Sprint 2		USN-4	As a user, If I requires this system then a notification will be sent into his device.	10	High	Udaya Kumar
Sprint 3	Medication Detail	USN-5	As a user, I have multiple medications each day, I can put each pill in the box for the corresponding day.	10	High	Kavi Arasu

Sprint 3		USN-6	As a user, between setting an alarm and using a pillbox, I'll be able to stay on top of your medications and not miss a dose.	5	low	Yuvan Shankar, Shakeeb J.S, Kavi Arasu
Sprint 3		USN-7	As a user, I can store the name of the medicine with its description	10	High	Udaya Kumar, Gunasekaran, Ramesh
Sprint 4	GPS Tracking	USN-8	As a user, they can also help large hospitals and clinics manage their inventory more effectively	5	Low	Yuvan Shankar, Udaya Kumar, Kavi Arasu
	Sensor	USN-9	As a user ,they used for keeping the record in medicine details the reminding the schedule of medicine. We have used the IoT enabled Arduino device for monitoring the System.	10	High	Shakeeb J.S, Gunasekaran, Kavi Arasu

6.2. 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	12-11-2022	19-11-2022	20	19-11-2022
Sprint 2	10	4 days	15-11-2022	19-11-2022	10	19-11-2022
Sprint 3	20	3 days	16-11-2022	19-11-2022	20	19-11-2022
Sprint 4	10	2 days	17-11-2022	19-11-2022	10	19-11-2022

7. Coding and Solutioning

7.1 Feature 1

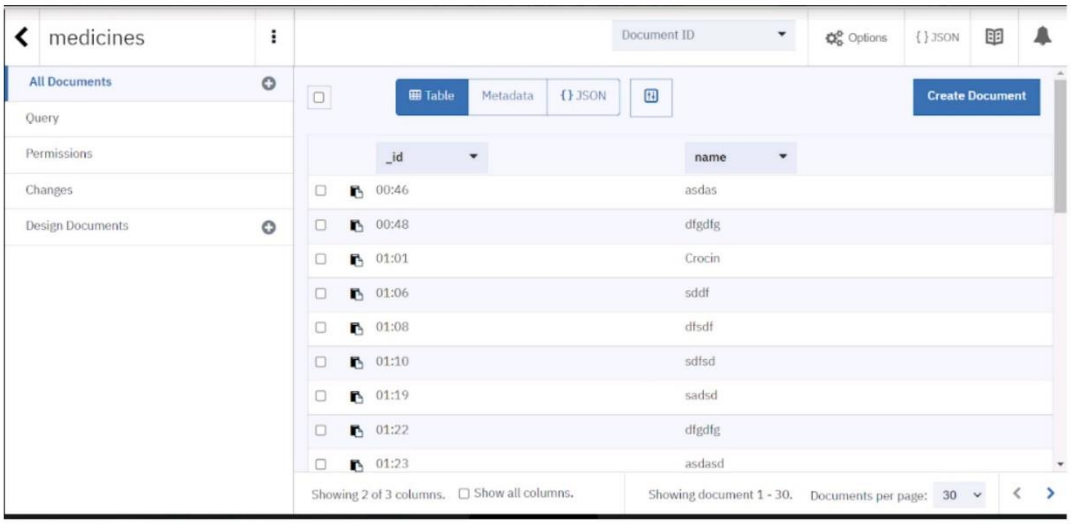
The mobile application developed has a feature of individual login by different users.

7.2 Feature 2

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

7.3. Feature 3

The project includes a cloud database system.



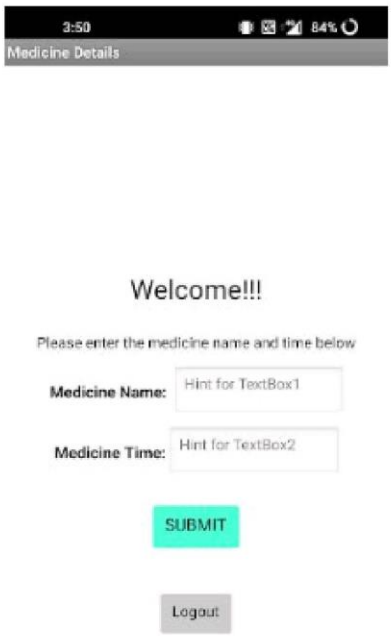
8. Testing

8.1. Test cases

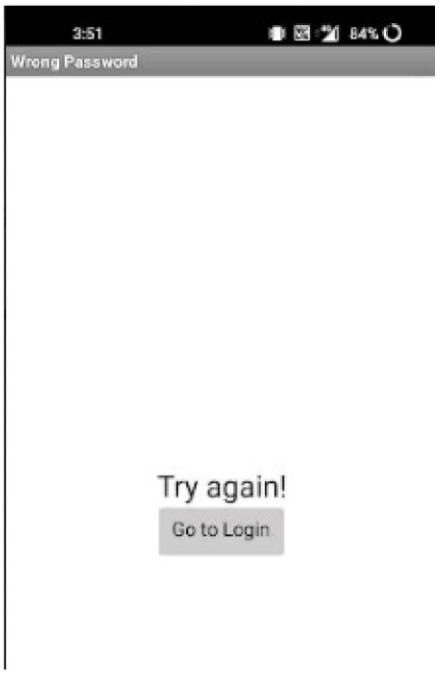
Test Case	Preconditions	Test Steps	Test Data	Expected Result
Verify login with valid credentials	User should have a network connections	1. Launch Url 2. Enter valid username. 3. Enter valid password. 4.Click on the “Login” button	Username: Shakeeb Password: 12345	Users should be able to login successfully.
Verify login with invalid credentials	User should have a network connections	1. Launch Url 2. Enter valid username. 3. Enter invalid password. 4.Click on the “Login” button	Username: Shakeeb Password: Shak123	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: Cetrizine Medicine Time:20.00	Users should be able to update it successfully.

8.2. User acceptance testing

Login page testing



Incorrect login attempt



Medicine page testing

9. Results

9.1. 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.

10. Advantages and 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.

11. 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.

12. 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.

13. 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 “ut4tn5” //IBM ORGANIZATION ID
 #define DEVICE_TYPE “b11m3edevicetype”//Device type mentioned in IBM Watson IOT platform
 #define DEVICE_ID “b11m3edevicetype_1”//Device ID mentioned in IBM Watson IOT platform
 #define TOKEN “12345678” //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="";


}
```