PERSONAL ASSISTANCE FOR SENIORS WHO ARE SELF-RELIANT

IBM PROJECT REPORT

TEAM ID : PNT2022TMID34317

Submitted by

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CHAPTER 1

INTRODUCTION

1.1. PROJECT OVERVIEW

Sometimes elderly people forget to take their medicine at the correct time.They also for get 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. 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. Here Node-red connects the Web UI, Cloudant DB and IBM Watson IoT platform.

1.2. PURPOSE

Today, most people can expect to live into their seventies and beyond. According to the United Nations, the number of people aged 60 years or older is projected to grow by 56 percent worldwide by 2030. Many of these people will have physical impairments (loss of hearing, eyesight) and yet be self reliant. These senior citizens need assistance while taking their medications. Wealthy people hire personal caretakers for reminding them to take the correct medication at the right time. But most people cannot afford to hire caretakers.

To help these people, a medicine reminder system is developed that reminds self reliant seniors to take the correct medication at the right time. This medicine reminder system will also help doctors monitor patients around the clock. The application is built such that the user can store their medical details in IBM Cloudant DB. The user's device will receive the medicine name via cloud and notify the user at the right time using voice commands.

The major purpose of this project is to help the elderly people who can assist themselves with the is to help the elderly people who can assist themselves in all other works these type of elderly people will make of this project to their best. This method of medicine alerts also avoids the need of personal care assistance expenses and man power.

CHAPTER 2
LITERATURE SURVEY

Sl. NO	Existing	Problem Statement Definition	References
1.	Health Alert and Medicine Remainder using Internet of Things	This paper proposes a model of automatic medicine reminder and apothecary system. This system can relieve unevenness in taking recommended dosage of pills on time prescribed by the doctor and switch from ways primarily reliant with the memory of the human being Insignificant regulation, hence people can be freed doing wrong things due to human error like taking pill at different time with incorrect dosage. Various medicine boxes exist in the market.	1. Eric J. MacLaughlin et al., "Assessing medication adherence in the elderly", Drugs & aging 22.3, pp. 231- 255, 2005. 2. Automatic pill dispenser and method of administering medical pills, Mar 1986.
2.	Medicine Assistant and Diet Remainder for Secure Healthcare	This assistant helps the end-user to get the medicines and diet remainders as per their daily schedule. There are a lot of remainders available in the market, but this work mainly helps elderly people who are not aware of modern technology, visually challenged people, and people suffering from Alzheimer's. so the medicines and diet remainders as per their daily schedule	1. F. M. Belenguer, A. Martínez-Millana, F. S. C. Ramón and A. Mocholí-Salcedo 2. A. Carullo and M. Parvis, "An ultrasonic sensor for distance Measurement in automotive applications"

3.	Design & Implementation of an Automated Reminder Medicine Box for Old People and Hospital	The device has twenty-one airtight compartments to keep the medicine. The attendant of a patient or can make a weekly plan of medicine remainder by keeping medicine in twenty-one compartments for taking medicine three times per day. The attendant can manually set the time of taking medicine or load a text file in an SD card mentioning the time .	1. Aakash Sunil Salgia, K. Ganesan and Raghunath Ashwin, "Smart pill box" 2. S. Mukund and N. K. Srinath, "Design of Automatic Medication Dispenser"
4.	Intelligent and Safe Medication Box In Health IoT Platform for Medication Monitoring System with Timely Remainders	The progress in IoT health care is considered to be a massive contribution to the elderly people. The elderly people and people who are suffering from chronic diseases need to intake tablets regularly on timely basis. Care takers with their busy daily routine may forget the instructions and time about pills which are prescribed for patient. Also care takers who are dealing increased number of patients may feel hectic to sort the medicine list for corresponding patients at proper time	1. S. V. Zanjal and G. R. Talmale, "Medicine reminder and monitoring system for secure health using IOT" 2. L. M. Dang, M. Piran, D. Han, K. Min and H. Moon, "A survey on internet of things and cloud computing for healthcare"

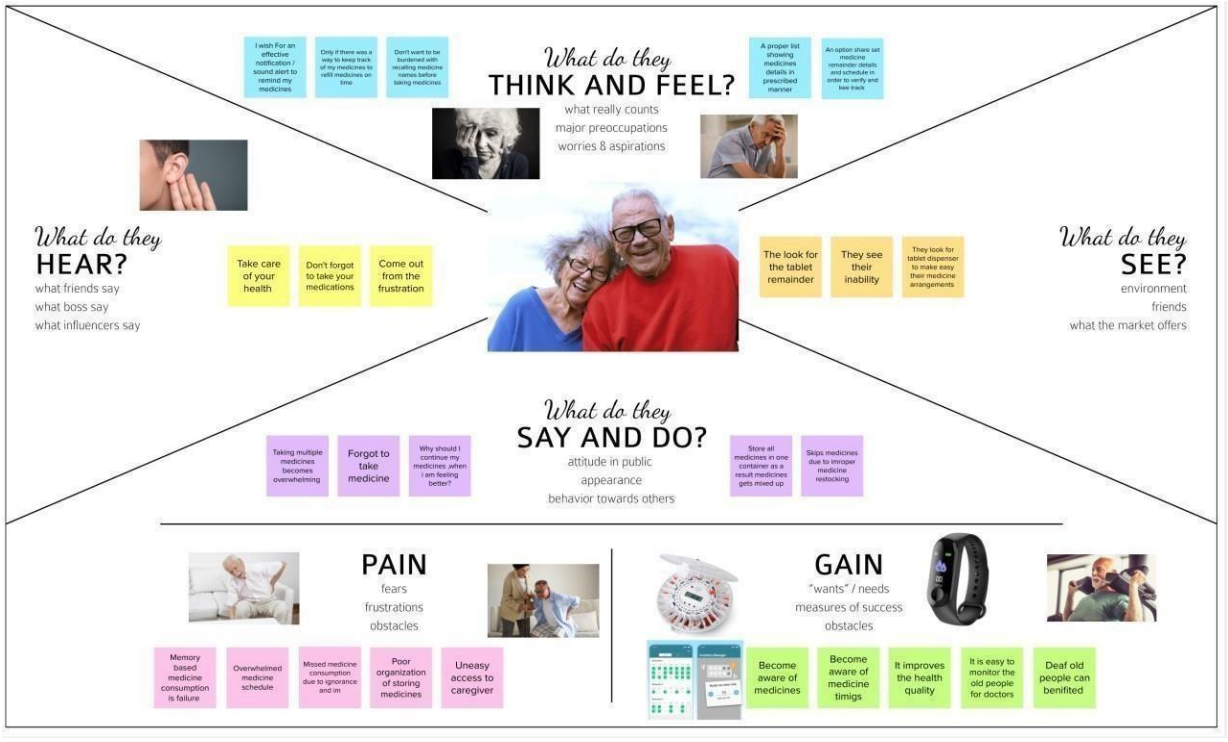
CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1. EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

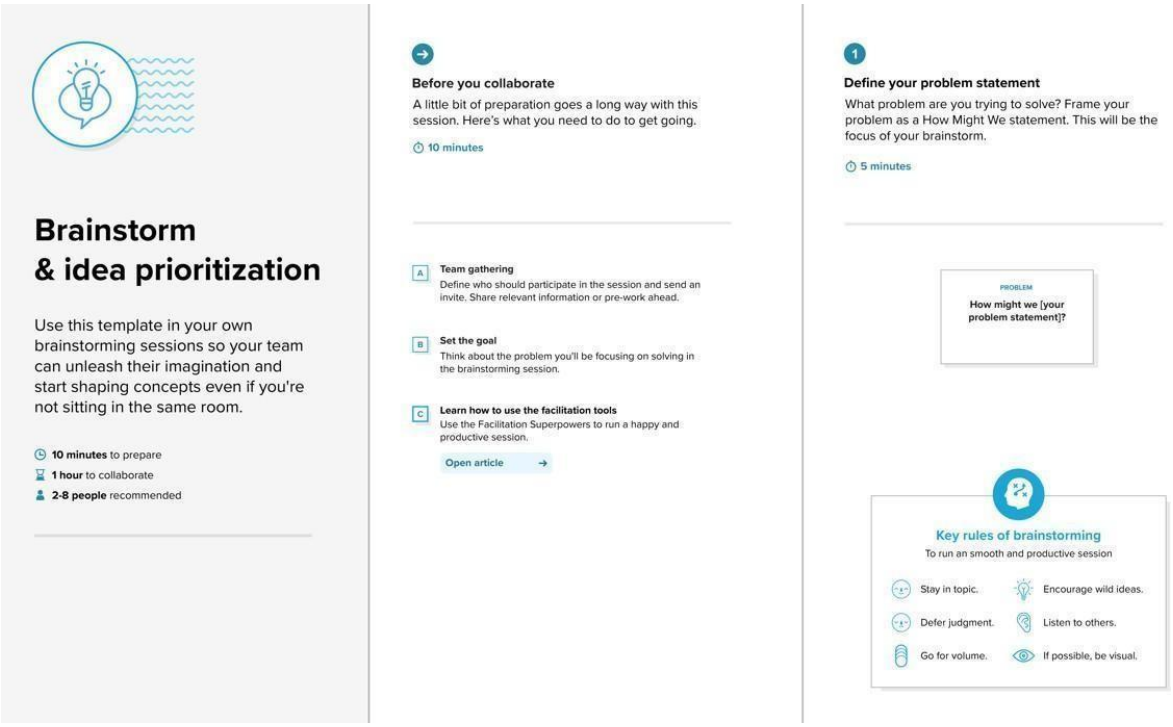


3.2. IDEATION & BRAINSTORMING

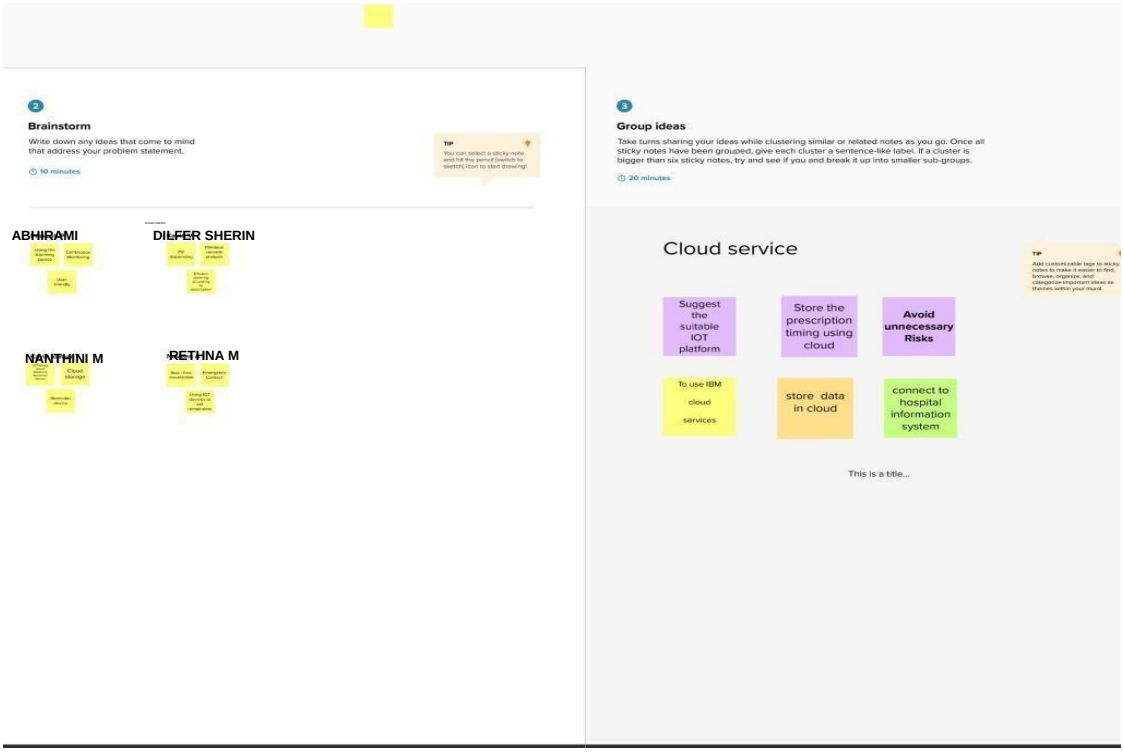
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

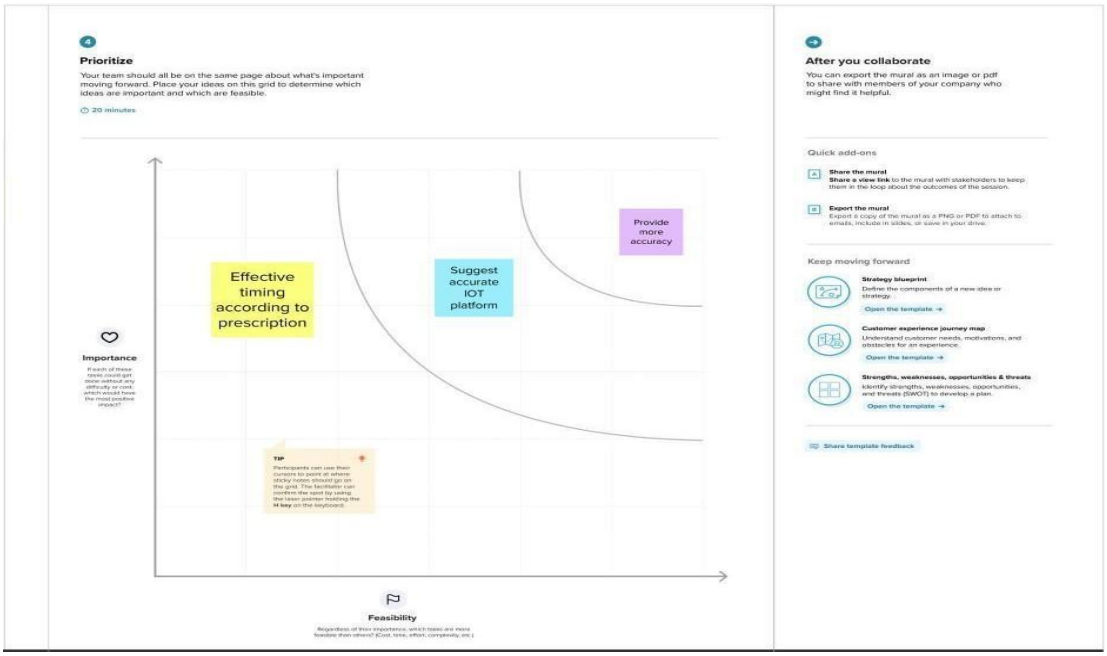
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritisation

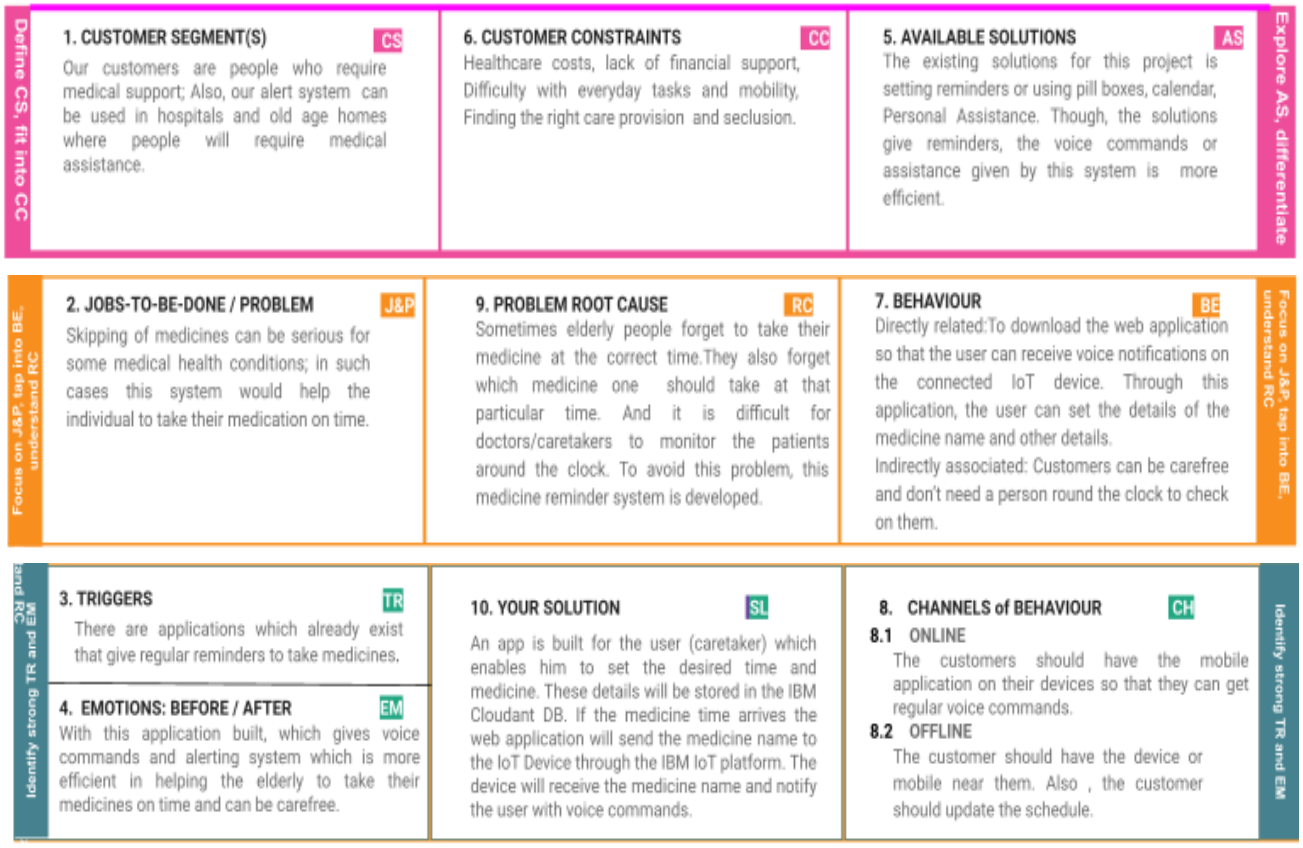


3.3. PROPOSED SOLUTION

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 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. An app is built for the user (caretaker) which enables him to set the desired time and medicine.
2.	Idea / Solution description	we introduce a smart medicine reminder system based on IoT. The proposed scheme was particularly created for the Android platform. For our system, we implement a reminder system which provides an alarm when it is time for taking medicine. Along with that, there is an android application where the user can set their medicine time. In the application, there will some feature that help the user to know more details about their medicine. It keeps track for the medicine which means how much medicine they have to take they can be fixed in the application
3.	Novelty / Uniqueness	It is a user-friendly app that sends users medication and refill reminders, provides drug interaction warnings, and helps caregivers manage prescriptions for loved ones
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)	When it comes to the business there is no one- size-fits- all solution. The model you choose depends on your target audience,
		business goals, and the resources you already possess.
6.	Scalability of the Solution	where the user can set their medicine time. In the application, there will some feature that help the user to know more details about their medicine. It keeps track for the medicine which means how much medicine they have to take they can be fixed in the application

3.4. Problem Solution fit



CHAPTER 4

REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form in the application.
FR-2	User Confirmation	Confirmation within application
FR-3	Internet Connectivity	Users should have a stable internet connection to access the app.
FR-4	Data management	All the data are managed & manipulated using the cloud.
FR-5	User Input management	All the user's data are gotten with the help of a text field in the dashboard in the app.
FR-6	Acknowledgement	All the data are stored in the cloud via the app and acknowledgment will be given to the user

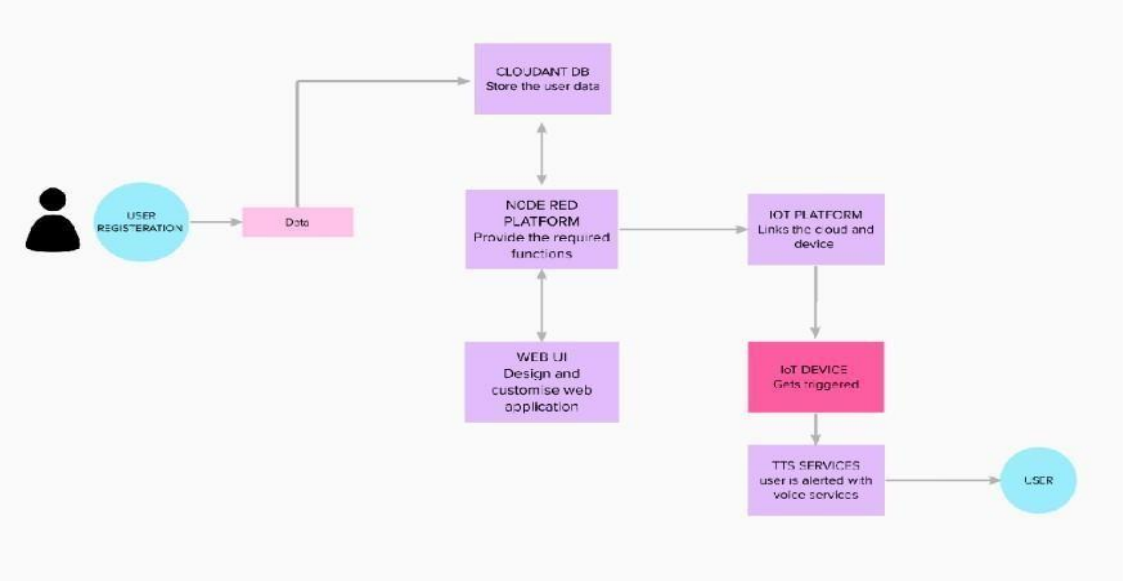
4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The app is made with a simple UI, so the elders can easily use the app.
NFR-2	Security	All the data are stored in the IBM cloudant DB, so the user's data will be secured.
NFR-3	Reliability	As the data are stored in the IBM cloud, the user's data will be reliable and confidential.
NFR-4	Performance	As the app uses virtual sensors, so the accuracy and performance will be high.
NFR-5	Availability	The data stored in the cloud is available for all the time, So the users can avail the app all the time.
NFR-6	Scalability	Even though the users count increases, the app will be more scalable.

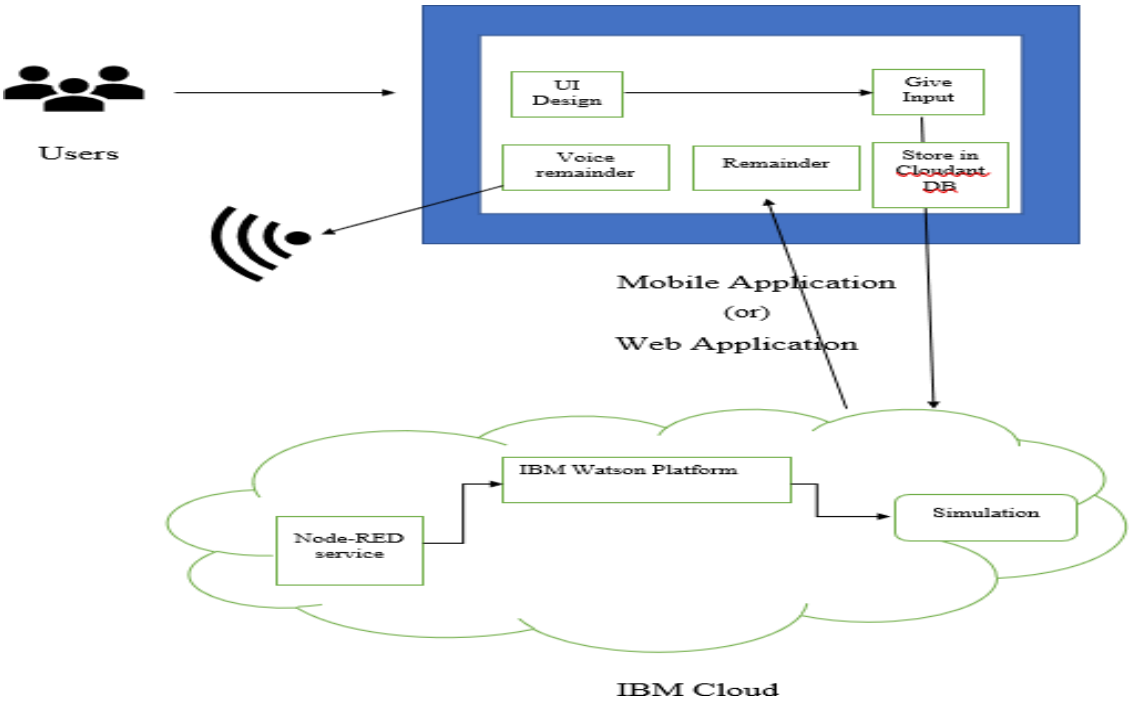
CHAPTER 5

PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functioal Requiremnt (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Senior user)	caretaker	USN-1	As a user, I want to take Medicines on time and monitor my health	I want to take medicines on time	High	Sprint-1
Customer (Diabetes Patient)	Smart medicine box	USN-2	As a user, I want to take my tablets on time by voice command	I want to take my tablets on time by voice command	High	Sprint-1
Customer (Thyroid Patient)	Smart medicine box	USN-3	As a user, my patient needs to take medicine s Ontim e and monitorni g the activity	My patient needs to take medicines on time	Medium	Sprint-2
Customer (Coma Patient)	Caretaker	USN-4	As a user, my patient needs medicatio n time and prescripti on	My patient medication time and prescription should be in database list	Low	Sprint-4

			should load indatabase for upcoming week			
Customer (Disabled People's)	Smart Medicine box	USN-5	As a user ,i need To take my medicine in nearby places with light notification	I need to take my medicine in nearby places with light notification	Medium	Sprint-3

CHAPTER 6
PROJECT PLANNING & SCHEDULING

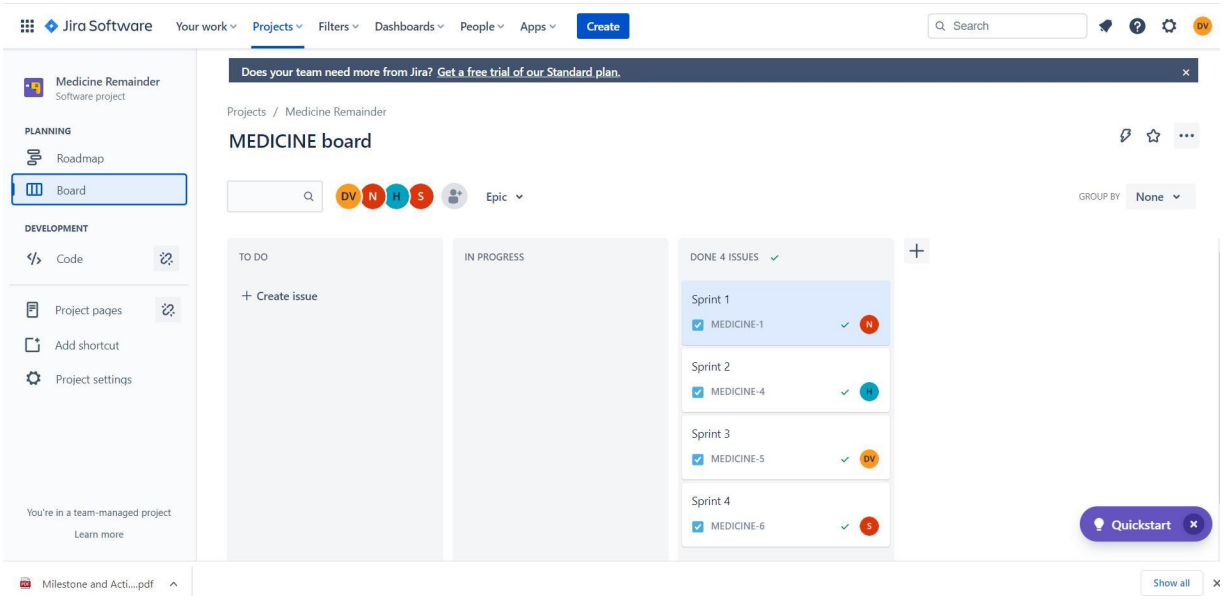
6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirming my password.	3	High	Abhirami R
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	Dilfer Sherin
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	Nanthini M
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	3	High	Rethna M
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	Abhirami R Dilfer Sherin
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	Rethna M Nanthini M
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium	Nanthini M
Sprint-3	Communication	USN-3,1	I should be able to communicate with user	6	Low	Rethna M
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium	Abhirami R
Sprint-3	Node RED- Cloudant DB communication	USN-5,2	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	High	Dilfer Sherin
Sprint-4	User – WebUI interface	USN-1,4	The Web UI should get inputs from the user	6	High	Abhirami R Rethna M
Sprint-4	Alarm	USN-2,3,5	The Alarm of the remainder should be done based on the medication time	7	High	Dilfer Sherin

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA



CHAPTER 7
CODING & SOLUTIONING

7.1 Feature 1

Node-Red

It is built on Node. js, which is a none-blocking, lightweight I/O model, making it lightweight and efficient. Flows created in Node-RED are stored using JSON, and can imported and exported and shared with ease

json code:

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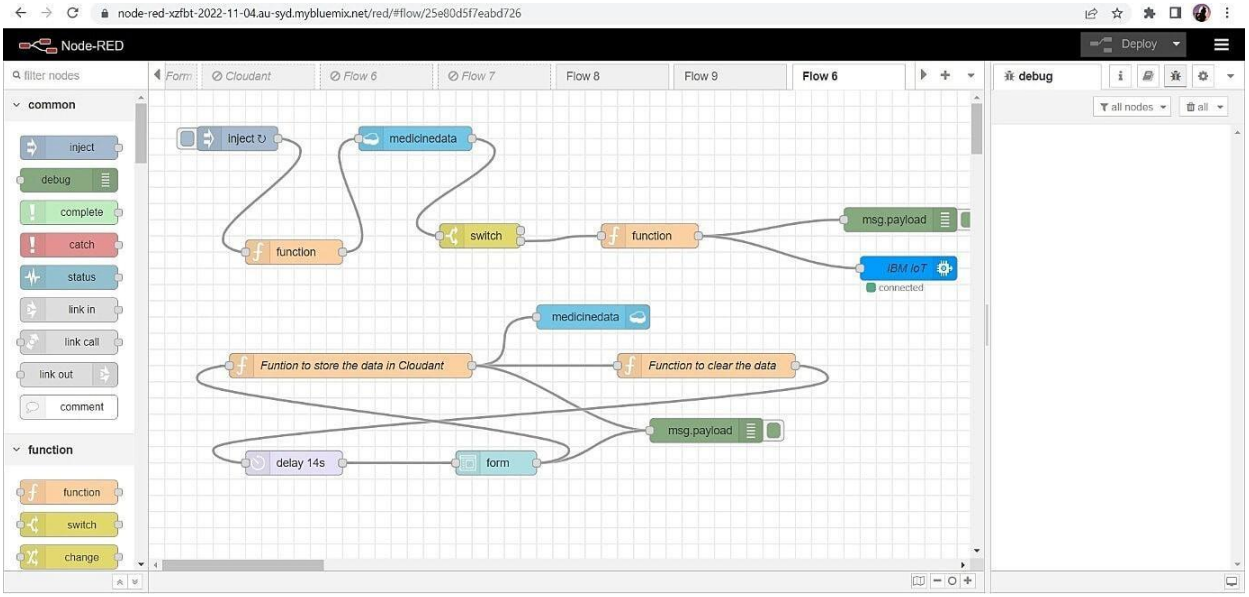
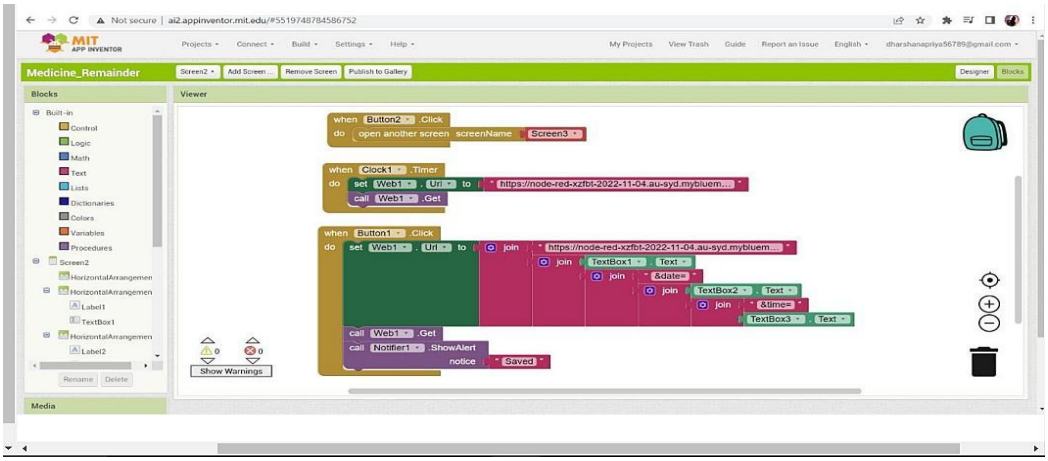


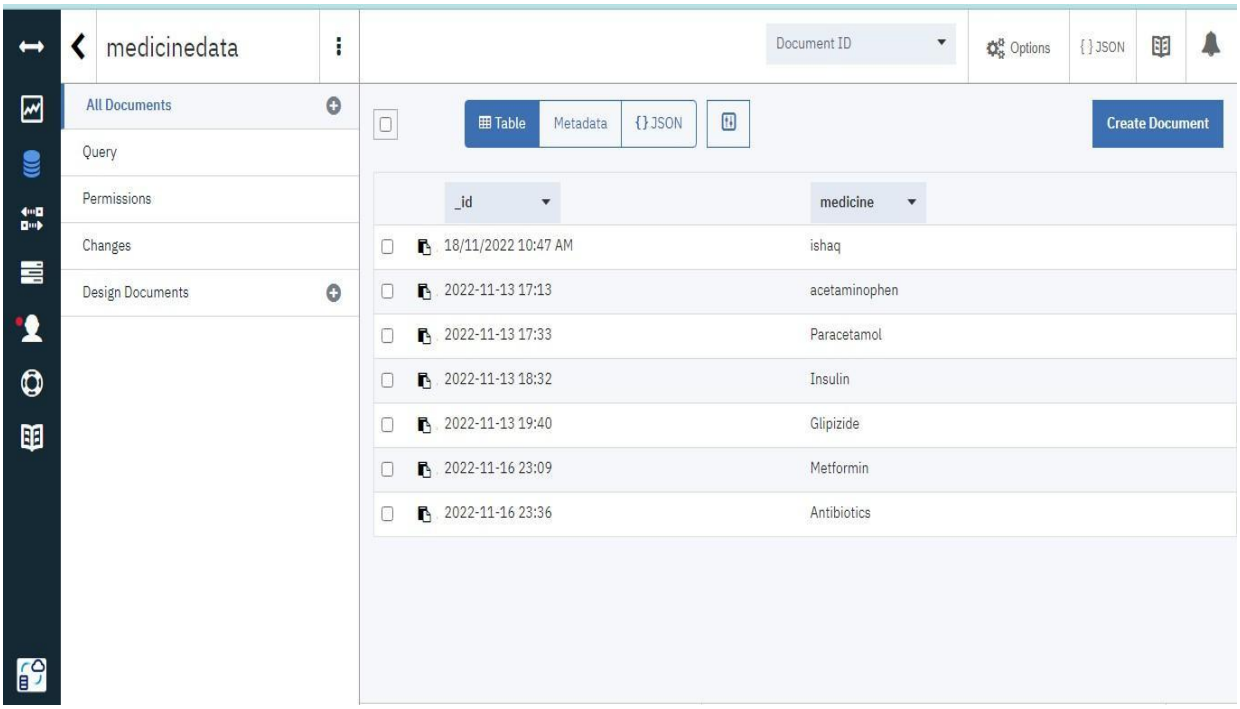
7.2 Feature 2

MIT App inventor

MIT App Inventor is an online platform designed to teach computational thinking concepts through development of mobile applications. Students create applications by dragging and dropping components into a design view and using a visual blocks language to program application behavior



7.3 Database Schema (if Applicable)



CHAPTER 8
TESTING

8.1 Test Cases

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status
SplashScreen_TC_OO1	Functional	Home Page	Verify the splash screen is working good	1. Enter URL and click go 2. The splash screen will open 3.click the image in splash screen		Splash screen should display	Working as expected	Pass
HomePage_TC_OO2	UI	Home Page	Verify the UI elements in Home screen	1. Enter URL and click go 2. Enter the medicine details to store data: a.Enter the medicine name b.Enter the Date c.Enter the Time 3. click next button to move to the next page		Application should show below UI elements: a.Name of Medicine text box b.Date text box c.Time tedt box d.Next button	Working as expected	pass
Remainder Page_TC_OO3	Functional	Home page	Verify user is able to get the remainder alarm with medicine name displayed	1. Enter URL and click go 2. automatically diplay the medicine data in the text box 3.The alarm should ring at the user entered time	It' Time to Take Medicine Glipizide	Get the remainder alarm	Working as expected	pass

DB_TC_OO4	Functional	Login page	verify the data is stored in cloudant DB	1. Enter URL and click go 2. go to cloudant DB 3.Verify the data	{ "id": 2022-11-18 21:23, "medicine":Glipizide}	The Medicine data should stored in the DB	Working as expected	pass
Simulation_TC_OO5	Functional	Login page	Verify the simulation is Working Good	1. Enter URL and click go 2. Run the simulation 3. The LED should Blink 4. The Alarm should ring	Glipizide	The Alarm should come through buzzer and the LED also Blink then the Medicine name should display in the LED	Working as expected	pass

8.2 User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the project-personal assistance for seniors who are self reliant at the time of the release to User Acceptance Testing(UAT).

2. Defect Analysis

This reportshows the numberof resolved or closed bugs at each severity level,and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37

Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3. Test Case Analysis

This report showsthe number of test casesthat have passed,failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	2	0	0	2
Client Application	2	0	0	2
Security	1	0	0	1

CHAPTER 9

RESULTS

9.1 Performance Metrics

NFT - Risk Assessment

S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	Personal Assistance	New	Low	Moderate	Moderate	Low	>10 to 30%	GREEN	As we had made this project in
	for Seniors Who Are								MERN stack With industry Mentor Aproval
	Self-Reliant								

NFT - Detailed Test Plan

S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff
1	Medicine Reminder Web -UI	Stress	App Crash/ Developer team/ Site Down	Approved
2	Medicine Reminder Web -UI	Load	Server Crash/ Developer team/ Server Down	Approved

End Of Test Report

S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Medicine Reminder Web -UI	Stress	Performance	CPU -01	GO	High Performance Netlify Cloud server	Closed	Approved
2	Medicine Reminder Web -UI	Load	Scalability	DB Storage - 01	NO-GO	One MongoDB Instance for free	Closed	Approved

CHAPTER 10
ADVANTAGES & DISADVANTAGES

Advantages :

1. **Remote monitoring:** Real-time remote monitoring via connected IoT devices and smart alerts can diagnose illnesses, treat diseases and save lives in case of a medical emergency.
2. **Prevention**: Smart sensors analyze health conditions, lifestyle choices and the environment and recommend preventative measures, which will reduce the occurrence of diseases and acute states.
3. **Reduction of healthcare costs**: IoT reduces costly visits to doctors and hospital admissions and makes testing more affordable.
4. **Medical data accessibility**: Accessibility of electronic medical records allow patients to receive quality care and help healthcare providers make the right medical decisions and prevent complications.
5. **Improved treatment management**: IoT devices help track the administration of drugs and the response to the treatment and reduce medical error.
6. **Improved healthcare management**: Using IoT devices, healthcare authorities can get valuable information about equipment and staff

Disadvantages:

1. **Security and privacy**: Security and privacy remain a major concern deterring users from using IoT technology for medical purposes, as health monitoring solution have the potential to be breached or hacked. The leak of sensitive information about the patient's health and location and meddling with sensor data can have grave consequences, which would counter the benefits of IoT.
2. **Risk of failure**: Failure or bugs in the hardware or even power failure can impact the performance of sensors and connected equipment placing healthcare operations at risk. In addition, skipping a scheduled software update may be even more hazardous than skipping a doctor checkup.
3. **Integration**: There's no consensus regarding IoT protocols and standards, so devices produced by different manufacturers may not work well together. The lack of uniformity prevents full-scale integration of IoT, therefore limiting its potential effectiveness.
4. **Cost**: While IoT promises to reduce the cost of healthcare in the long-term, the cost of its implementation in hospitals and staff training is quite high.

CHAPTER 11

Conclusion

It is an advanced digital era, we can also opt for expert agencies without thinking much about the distance. For example, suppose we stay in the European region. In that case, we can look for a healthcare app development company in the USA or a healthcare mobile app development firm in other states.

IoT is already practicing most of these technologies to assist healthcare in developing, and this development will proceed. Promptly than later, healthcare and the Internet of Things will become intertwined, ultimately modifying how we approach our healthcare.

CHAPTER 12

FUTURESCOPE

IoT has a lot of potentials and it's not only in healthcare. In future challenges of IoT in healthcare, many companies are working on new ways to solve the challenges with the help of this technology to help our medical world.

It can reach every patient from all over the world and connect doctors with patients. There is no denying that IoT has already made a huge impact and is only set to grow further.

It is a matter of time before the future use of IoT in healthcare medical industry will be run mostly by IoT technology and will be treating patients in less time and low cost of treatment.

CHAPTER 13

APPENDIX

13.1Source Code

1.Python code for random medicine and time generating:

```
import
json
import
wiotp.sdk
.device
import
time
import
random
myConf=
{
"identity"
: {
     "orgId": "dhhnmy",
     "typeId": "naveen",
     "deviceId": "ibm"
   },
   "auth": {
     "token": "Nanee_Depp_3112"
   }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)client.connect()

for i in range(0,20):
  tablet=["Paracetamol","Aspirine","Azithral","Asthalin","Sinare
  st"] medicinetime=[12.00,1.00,2.00,3.00,5.00,18.00,20.00,7.00]
```

```
   name = "mani"
   medicine=random.choice(t
   ablet)
   medicinetime=random.cho
   ice(medici netime)
   mydata = {'Patient Name': name, 'Medicine Name':
   medicine, 'Time':
   medicinetime}client.publishEvent("IoTSensor", "json",
   data=mydata, qos=0, onPublish=None) print("Data
   published to IBM IOT platform :", mydata)
   ti
me.s
lee
p(5)
Client.disconnect()
```

WOKWI SIMULATED CODE

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for
MQtt #include <LiquidCrystal_I2C.h>
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT11         // define type of
sensor DHT 11 #define LED 2
DHT (DHTPIN, DHTTYPE);// creating the instance by passing pin and
typr of dht connected
void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);


//-------credentials of IBM Accounts------

#define ORG "64yf7x"//IBM ORGANITION ID
#define DEVICE_TYPE "b11m3edevicetype"//Device type mentioned in ibm
watson IOT Platform
#define DEVICE_ID "b11m3edeviceid"//Device ID mentioned in ibm
watson IOT Platform
#define TOKEN "-&EMtr7l-v-Gz2G))e"
//Token String data3="";
int buzz= 13;

//-------- 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/command/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 LiquidCrystal_I2C lcd(0x27,32,2);

// -----------------------------------
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)
  ; dht.begin();
  pinMode(buzz,
  OUTPUT);
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect()
```

```
}

  void loop()// Recursive Function
  {
    if (!client.loop())
      { mqttconnect();
    }

  }



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

  void PublishData(float temp, float humid) {
    mqttconnect();//function call for connecting to ibm

  }
  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 = 13; i < payloadLength-2; i++) {
    //Serial.print((char)payload[i
    ]); data3 += (char)payload[i];
  }

  Serial.println("Medicine Name: "+
  data3); if(data3 != "")
  {
    lcd.init();

    lcd.print(data3);
   digitalWrite(LED,HIGH);
   tone(buzz, 100, 1000);
   delay(2000);
   digitalWrite(LED,LOW);
   noTone(buzz);
   delay(1000);

  }

  else
  {
digitalWrite(LED,LOW);

  }
data3="";
}
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-16585-1659618103