# PERSONAL ASSISTANCE FOR SENIORS WHO ARE SELF-RELIANT

## Project Report

| | |
|---|---|
| Project Name | Personal Assistance For Seniors Who Are Self-reliant |
| Team ID | PNT2022TMID18706 |
| Team Members | KISHORE K(Team Lead )<br>KARTHIKEYAN.S<br>KRISH S<br>LOGENDIRAN P |
| | |

## 1. INTRODUCTION

### 1.1 Project Overview:

A medicine reminder app designed for people who frequently forget to take their medications. An app is built for the caretaker which enables him to set the desired time and medicine.You may also keep track of your appointments. Its parental feature distinguishes it from other apps on the market, allowing you to keep track of and remotely assist your loved ones who find it difficult to utilize such an app with their reminders. The device will receive the medicine name and modify the user with voice command.

### 1.2 Purpose:

- This helps elderly people to take medicine on time
- Taking medicine on time can improve their health conditions
- Caretakers can feel at ease and are reminded too

## 2. LITERATURE SURVEY

### 2.1. Existing problem:

The Internet of Things is a new reality that is completely changing our everyday life, and promises to revolutionize modern healthcare by enablinga more personalized ,preventive and collaborative form of care. Aiming to combine these two important topics, this work presents an IoT-ready solution for the elderly living assistance which is able to monitor and register patients vital information as well as to provide mechanisms to trigger alarms. Devices in the form of wearables like fitness bands and other wirelessly connected devices like blood pressure and heart rate monitoring cuffs, glucometer etc. give patients access to personalized attention. These devices can be tuned to remind calorie count, exercise check, appointments, blood pressure variations and much more. IoT has changed people's lives, especially elderly patients, by enabling constant tracking of health conditions. This has a major impact on people living alone and their families. On any disturbance or changes in the routine activities of a person, alert mechanism sends signals to family members and concerned health providers

### 2.2. References:


- T. L. Hayes, J. M. Hunt, A. Adami and J. A. Kaye, "An Electronic Pillbox for Continuous Monitoring of Medication Adherence", Conf. Proc. IEEE Eng. Med. Biol. Soc, pp. 6400-6403, 2006.
- S. Shinde, T. Kadaskar, P. Patil and R. Barathe, A Smart Pill Box With Remind And Consumption Using IoT, pp. 152-154, 2017.
- H. K. Wu, C. M. Wong, P. H. Liu, S. P. Peng, X. C. Wang, C. H. Lin, et al., "A Smart Pill Box with Remind and Consumption Confirmation Functions", Conf. Proc. IEEE Consumer Electronics, pp. 658-659, 2015.
- B. B. Singh, GSM Based Automatic Pill Dispenser, vol. 7, no. 4, pp. 10694-10695, 2017.
- S. C. Huang, H. Y. Chang, Y. C. Jhu and G. Y. Chen, "The intelligent pillbox - Design and implementation", Conf. Proc. IEEE Consumer Electronics, pp. 235-236, 2014. 7.P. H. Tsai, T. Y. Chen, C. R. Yu, C. S. Shih and J. W. S. Liu, "Smart Medication Dispenser: Design Architecture and Implementation", IEEE Systems Journal, pp. 99-110, 2010.


### 2.3 Problem Statement Definition:

Elderly people (Senior) who wants to take medicines on time, but unable to take medicines on time due to their forgetfulness, are worried about their health.

# 3.IDEATION AND PROPOSED SOLUTION

## 3.1 Empathy Map Canvas:

# Empathy Map

Dive into the mind of the user for focused product development

Build empathy and keep your focus on the user by putting yourself in their shoes.

Older adults manage a variety of chronic illnesses.

Alerting patients at correct time.

Can help elderly people dont miss their medicine time.

Multiple prescriptions are referred to as polypharmacy, is particularly prevalent among as they are more prone to require medicine,

Says

Thinks

Not to skip medicine due to improper medicine restocking systems.

Does

Feels

Nervous to asking somebody multiple times about medicine.

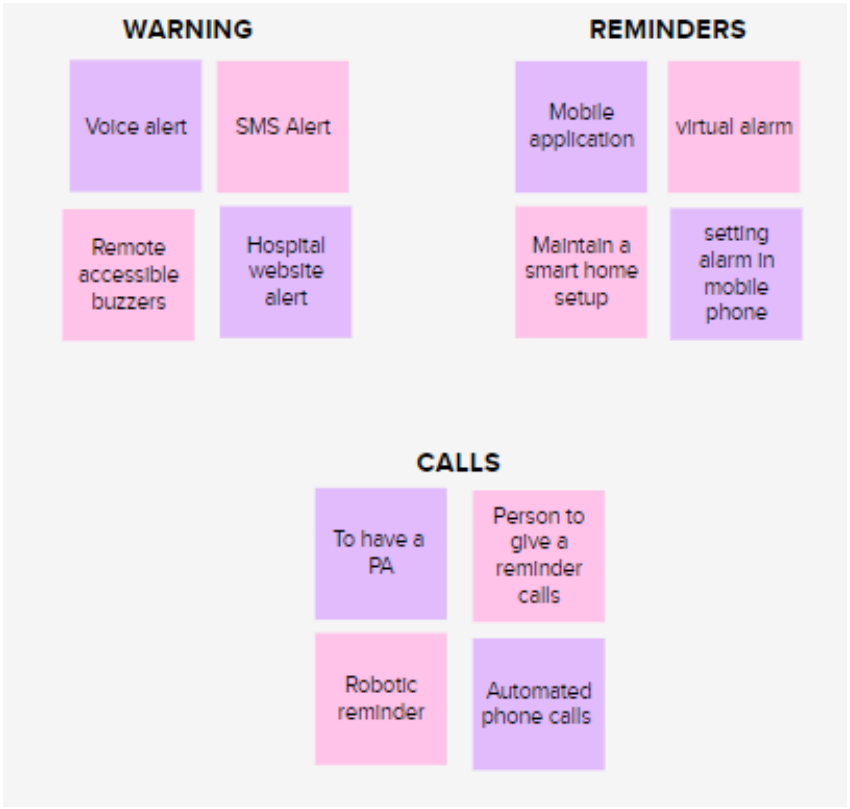
Taking medicine on daily basis.

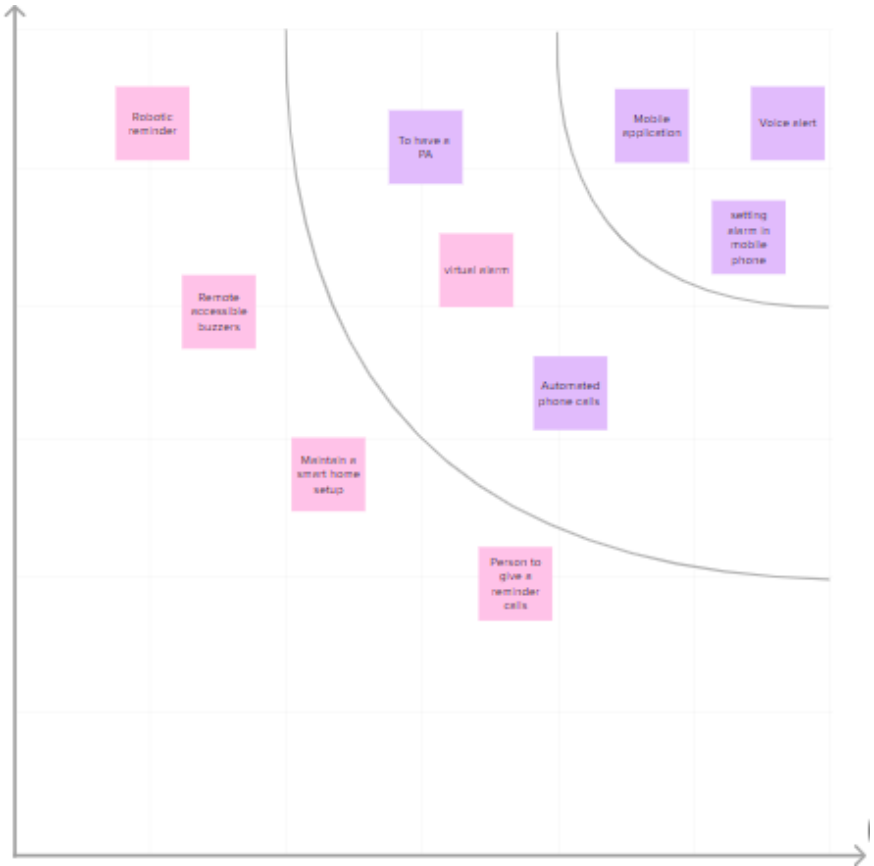
Unsure and confused aboud medicine.

Get an alert that my medication

Forgetting medication during Travel

## 3.2 Ideation and Brainstorming:



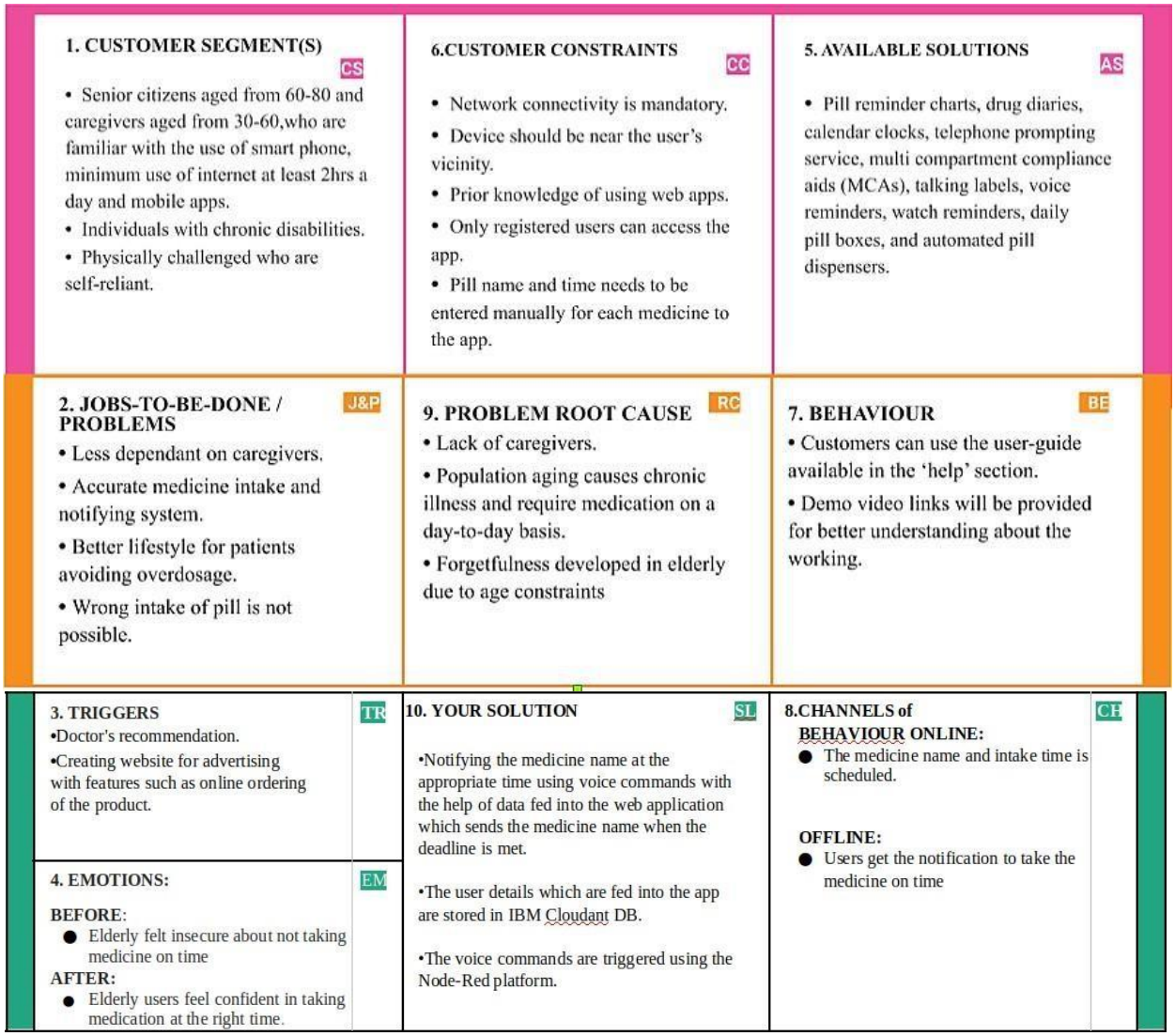



### 3.3 Proposed Solution:

A website is built for the user 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.

| S.No. | Parameter | Description |
|---|---|---|
| 1. | Problem Statement (Problem to be solved) | Elderly patients(above age of 55) who are in need of pill reminders For taking medicines on time. |
| 2. | Idea / Solution description | Web application integrated with a microcontroller to provide scheduled voice output of the medicine name during intake time |
| 3. | Novelty / Uniqueness | It avoids over dosage of medication by the patients. |
| 4. | Social Impact / Customer Satisfaction | Improved ability to stay self-sufficient at home. |
| 5. | Business Model (Revenue Model) | Revenue can be generated by selling the web app at a cost for the users in playstore/App store and also by using the app to advertise pharmaceutical products. |
| 6. | Scalability of the Solution | The web app can be further improved to record and analyze daily activities (such as sleep tracking,step counting)to help maintain a successful diet and lead a healthy lifestyle. |

## 3.4 Proposed Solution Fit:



## 4.REQUIREMENT ANALYSIS

### 4.1 Functional Requirements:

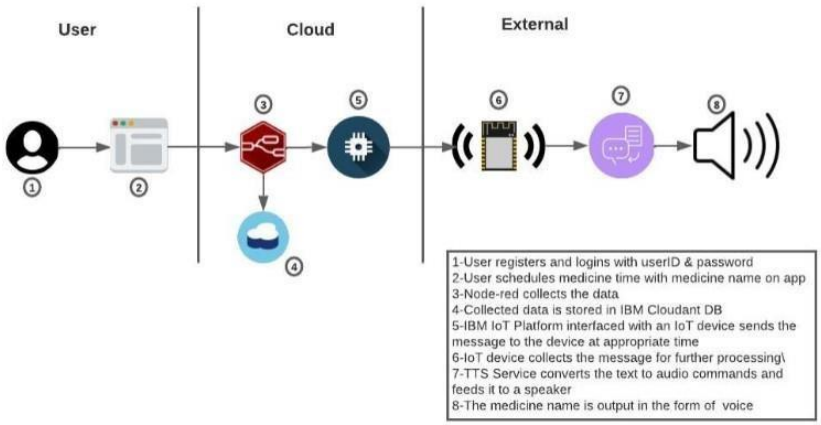
| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|---|---|---|
| FR-1 | User Registration | Registration through Form<br>Registration through Gmail<br>Registration through LinkedIN |
| FR-2 | User Confirmation | Confirmation via Email<br>Confirmation via OTP |
| FR-3 | User Login | Login via username and password |
| FR-4 | Network connectivity | Mobile data/Wi-Fi |
| FR-5 | Node-Red | Sends the message from Web App to Iot device at the scheduled time using MQTT protocol. |
| FR-6 | IBM Cloudant DB | For storing user details and medicine details on cloud. |

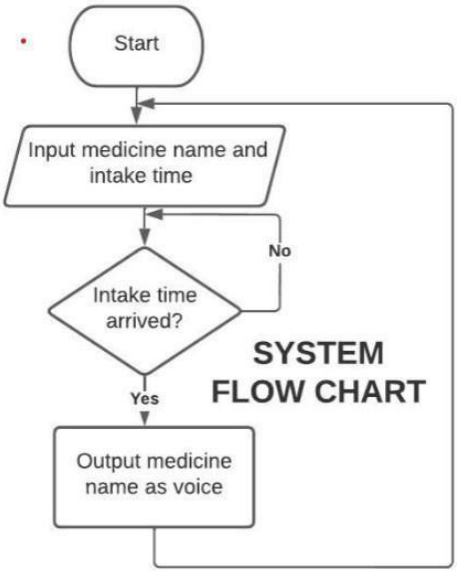
### 4.2 Non-Functional Requirements:

| FR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | **Usability** | It tracks the medication time and signals the user when it's time to take the medicine |
| NFR-2 | **Security** | IBM Cloudant DB is highly secure from various attacks |
| NFR-3 | **Reliability** | The app sends scheduled messages to take the medicine on time without any latency. |
| NFR-4 | **Performance** | The system manages the overall user interaction and increases the efficiency of taking the medicine at the right time. |
| NFR-5 | **Availability** | The system functions round the clock when connected to the internet. |
| NFR-6 | **Scalability** | The users can schedule a large number of medicines to be taken in a day using the app |

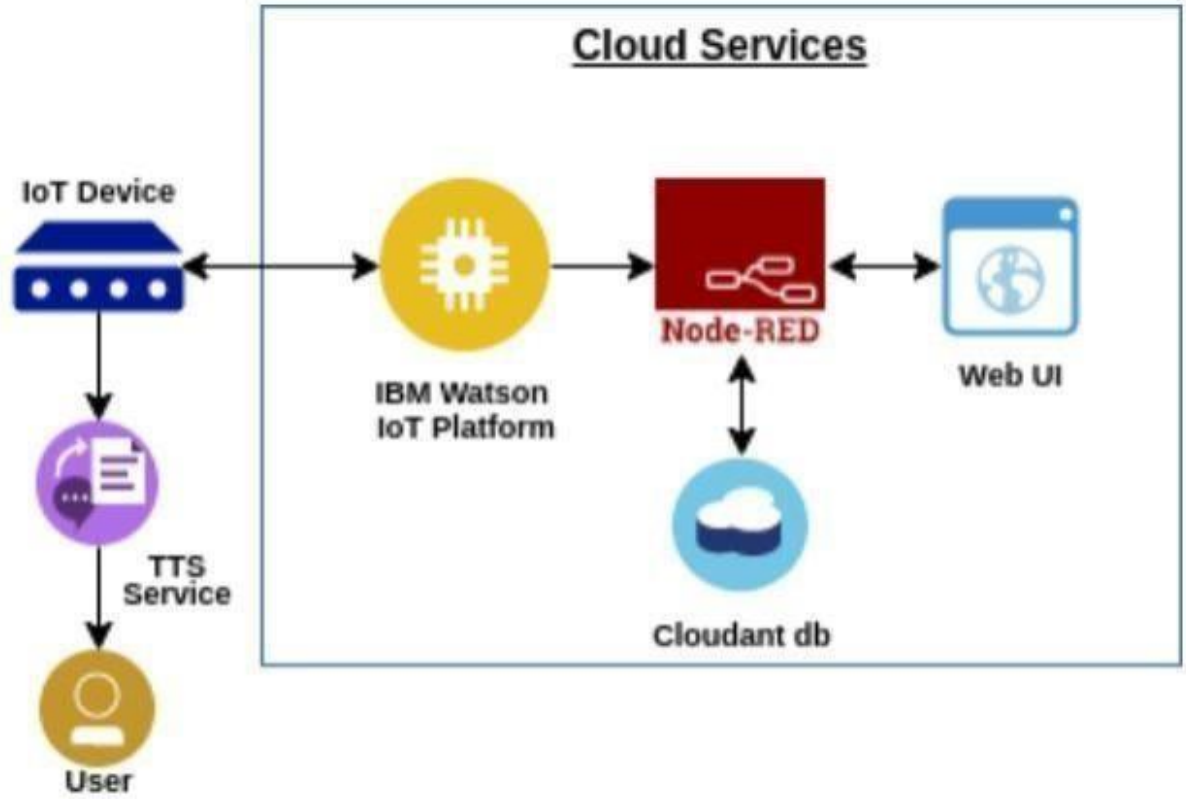
## 5.PROJECT DESIGN

### 5.1. Data Flow diagrams:




### 5.2 Solution and Technical Architecture:



## 5.3 User Stories:

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|---|---|---|---|---|---|---|
| Customer (Citizen) | Scheduling | 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 (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 (Doctor) | Smart medicine box | USN-3 | As a user, my patient needs to take medicines on time and monitoring the activity. | My patient needs to take medicines on time | Low | Sprint-2 |
| Customer (CareTaker) | Data storage | USN-4 | As a user, my patient needs medication time and prescription should load in the database for the upcoming week. | My patient medication time and prescription should be in database list | Medium | Sprint-3 |
| Customer (CareTaker) | Smart medicine box | USN-5 | As a user, I need to take my medicine in nearby places with light notification. | I want to access the customer health 24/7 | High | Sprint-4 |
| Customer (Patient) | User Experience | USN-6 | As a user,the app should be easy and simple to use | I want an easy to handle application | Medium | Sprint-4 |

# 6.PROJECT PLANNING AND SCHEDULING

## 6.1 Sprint Planning and Schedule:

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 | IBM Watson IOT platform | USN-1 | Creating devices and board and generating data | 1 | medium | KISHORE K,LOGENG IRAN P,KARTHI KEYAN S,KRISH S |
| Sprint-2 | Storing Data using node-red | USN-2 | Storing the data in IBM Cloudant DB through node-red functions | 2 | High | KISHORE K,LOGENG IRAN P,KARTHI KEYAN S,KRISH S |
| Sprint-3 | IoT device/ Microcontroller Board | USN-4 | The board connect with the cloud and retrieve the information and remain the peoples | 2 | Low | KISHORE K,LOGENG IRAN P,KARTHI KEYAN S,KRISH S |
| Sprint-4 | Reminder (TTS) | USN-5 | Getting the speech reminder to users to take their tablet | 1 | High | KISHORE K,LOGENG IRAN P,KARTHI KEYAN S,KRISH S |

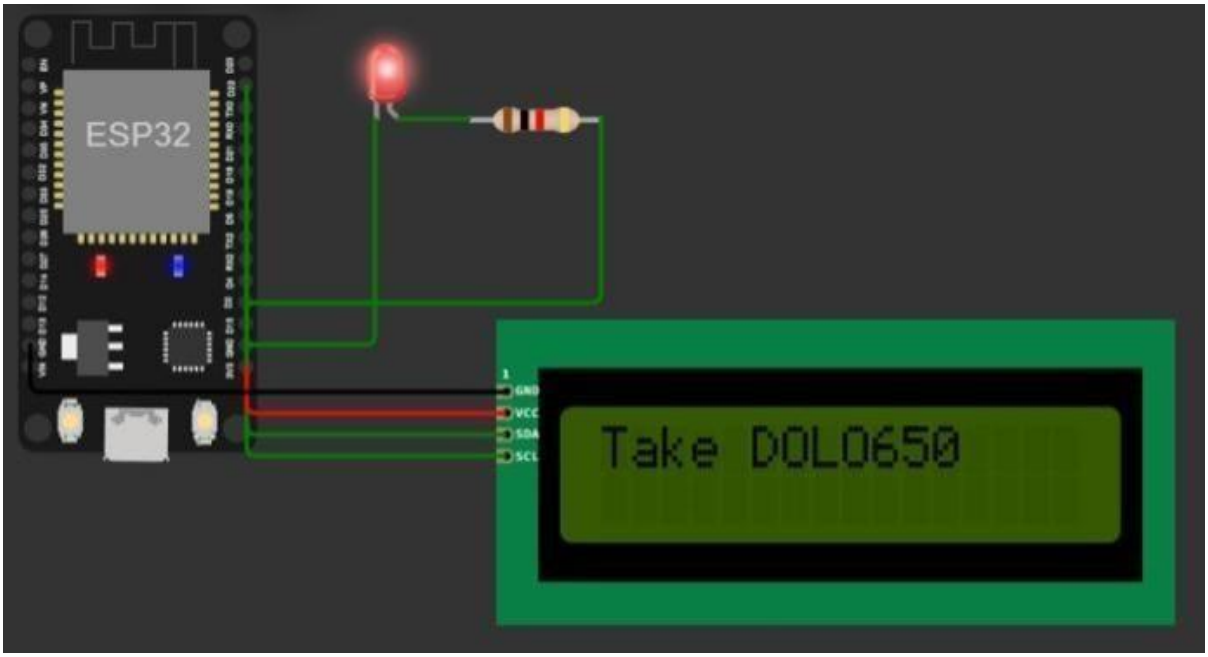
## 6.2 Report From Jira:

## 7.CODING & SOLUTIONING

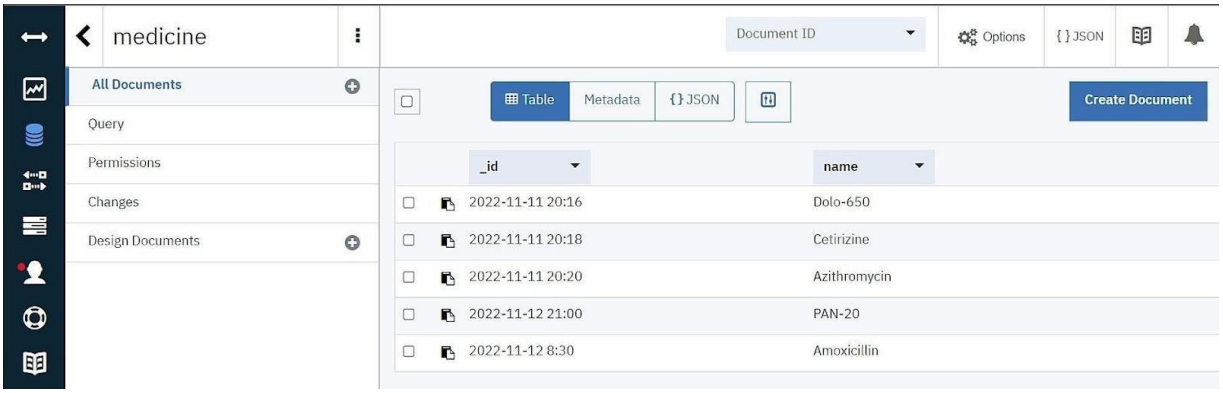
### 7.1 Web UI to enter medicine name and time for intake:

### 7.2 Sending voice output at the scheduled time:

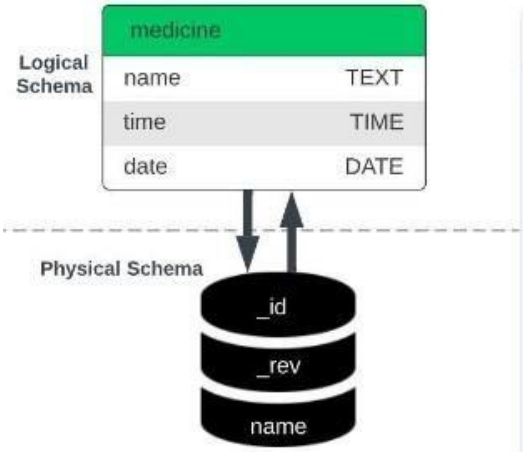
## 7.3 Display the name of the medicine in an IoT device at the scheduled time:




## 7.4 Cloudant Database to store medicine name and intake time:



## 7.5 Database Schema:




```
id "2022-11-11 20:16"

{
 "id": "2022-11-11 20:16",
 "key": "2022-11-11 20:16",
 "value": {
  "rev": "1-4910298aee742c3f200a0e4191701a3a"
 },
 "doc": {
  "_id": "2022-11-11 20:16",
  "_rev": "1-4910298aee742c3f200a0e4191701a3a",
  "name": "Dolo-650"
 }
}
```

# 8. TESTING

## 8.1 Test Cases:

| Test case ID | Feature Type | omponer | Test Scenario | Steps To Execute | Test Data | Expected Result | Actual Result | Sta tus | Commnets | TC for Automation(Y/N | BUG ID | Executed By |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LoginPage_TC_OO3 | Functional | Home page | User can enter the data in specified format | To have browsers to have enhanced capabilities | URL | enter a data in specified format only | specified input is not received | Fail | Specify the User formats | NO | 110 | Vincy Veronica A |
| LoginPage_TC_OO4 | Functional | Home page | User can enter the data in any format | User can enter the data in required format | Time(HH:MM): DATE(YYYY-MM- | User can enter the data in specified format now | Input received properly | Pas s | Format specified | YES | | Maria Anisha |
| OUD_STORAGE_TC_ | Functional | Cloud | Verify if User input is stored in the cloud | User is able to access the URL with the given link. User has to enter the data(name,time and date) and click the SUBMIT button.Data to be stored in IBM cloud | MEDICINE NAME: Time(HH:MM) : DATE(YYYY-MM-DD): | User inputs has to be stored in cloud | Failed to storing the inputs | Fail | Cloud not connected properly | YES | 111 | Jane Ruffina Marg |
| OUD_STORAGE_TC_( | Functional | Cloud | Verify if User input is stored in the cloud | User is able to access the URL with the given link. User has to enter the data(name,time and date) and click the SUBMIT button.Data to be stored in IBM cloud | MEDICINE NAME: Time(HH:MM) : DATE(YYYY-MM-DD): | User inputs has to be stored in cloud | Inputs are stored in the cloud | Pas s | Cloud connected properly | YES | | Preethi R |
| OUPUT_TC_007 | Functional | Iot device | Verify if it reminds the medicine intake to the user | Comparing the UTC time and medicine intake time | Real time and medicine intake time | Gives True when both times match | Null | Fail | Check the input | YES | 113 | Vincy Veronica A |
| OUPUT_TC_007 | Functional | Iot device | Verify if it reminds the medicine intake to the user | Comparing the UTC time and medicine intake time | Real time and medicine intake time | Gives True when both times match | TRUE | Fail | verified | Yes | | Maria Anisha |
| TTS_TC_008 | Functional | Iot device | Verify if it gives voice notifications | When True it gives a voice notifications | Voice notifications | Voice notifications | Voice notifications service didn't work | Fail | In program, commands are as object instead of string | NO | 121 | Preethi R |
| TTS_TC_009 | Functional | Iot device | Verify if it gives voice notifications | When True it gives a voice format notifications | Voice notifications | Voice notifications | Voice notifications | Pas s | New string functions were added | YES | | Jane Ruffina Marg |
| ACK_TC_010 | Functional | URL | Verify whether the patient has taken the medicine or not | The TAKEN button has been included | The status of the medicine intake | The User clicks the TAKEN button to show that medicine has been taken | Button is unfunctional | Fail | Error occurs due to failure of call and connect function of the "taken." button' | NO | 132 | Maria Anisha |
| ACK_TC_011 | Functional | URL | Verify whether the patient has taken the medicine or not | The TAKEN button has been included | The status of the medicine intake | The User clicks the TAKEN button to show that medicine has been taken | The Taken status is updated in the cloud | Pas s | The status of the medicine intake is updated in the cloud | Yes | | Vincy Veronica A |

## 8.2 User Acceptance Testing (UAT):

### Purpose:

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

**Defect Analysis:**

This report shows the number of 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 | 5 | 3 | 1 | 2 | 11 |
| Duplicate | 2 | 1 | 0 | 0 | 3 |
| External | 2 | 2 | 0 | 0 | 4 |
| Fixed | 10 | 2 | 3 | 15 | 30 |
| Not Reproduced | 0 | 1 | 0 | 0 | 1 |
| Skipped | 0 | 0 | 2 | 0 | 2 |
| Won't Fix | 0 | 2 | 4 | 5 | 11 |
| Totals | 19 | 10 | 8 | 22 | 62 |

## Test Case Analysis:

This report shows the number of test cases that have passed, failed, and untested.

| Section | Total Cases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| Print Engine | 5 | 0 | 0 | 5 |
| Client Application | 42 | 0 | 0 | 43 |
| Security | 1 | 0 | 0 | 1 |
| Outsource Shipping | 0 | 0 | 0 | 0 |
| Exception Reporting | 2 | 0 | 0 | 2 |
| Final Report Output | 6 | 0 | 0 | 6 |
| Version Control | 1 | 0 | 0 | 1 |

# 9.RESULTS

## 9.1 Performance Metrics:

| | | | NFT - Risk | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No | Project Name | Scope | Functional Changes | Hardware Changes | Software Changes | Impact of Downtime | Load/Volume Changes | Risk Score | Justification |
| 1 | Personal Assistance For Seniors who are Self-Reliant | Existing | Low | Moderate | Moderate | Causes delay in runtime | >10 to 30% | ORANGE | As we have seen the changes, it adds the setup time |

| NFT - Detailed | | | | |
|---|---|---|---|---|
| S.No | Project Overview | NFT Test approach | Assumptions/Dependencies/Risks | Approvals/SignOff |
| 1 | Personal Assistance For Seniors who are Self- | LOAD | Dependencies | SignOff |

| End Of Test | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Project Overview | NFT Test approach | NFR - Met | Test Outcome | GO/NO-GO decision | Recommendations | Identified Defects (Detected/Closed/Open) | Approvals/SignOff |
| 1 | Providing Assistance to Seniors by developing a Software application to remind their medicine intake time | LOAD | MET | Able to Support in Other Platforms | GO | To have browsers to have enhanced capabilities | Closed | Approval |

## 10. ADVANTAGES & DISADVANTAGES

**Advantages:**

- Helpful for people who have no caretakers.
- Helps people to take medicines on time by voice command.

**Disadvantages:**

- Elderly people should be aware of how to use the application.
- There is no way to determine what actually happened as it only gives the remainder to take the medicineInternet connection is required.

## 11. CONCLUSION:

Our project's goal is to see how successful an automated pill dispenser will be in assisting individuals in better self-managing their medications. This might be demonstrated by the following:

- Better quality of life for individuals with chronic disabilities and their caregivers.
- Improved ability to stay self-sufficient at home.
- Social impact on the pharma sector .
- Less dependency on health-care and social-services.

The device is intended for those with memory impairments, and several of the medical diagnoses recorded for trial participants, including Alzheimer's and dementia, the elderly and persons with long-term medical conditions who must take many prescriptions every day, backed up this claim.

**In conclusion, we used technology to have a social effect in the pharmaceutical industry.**

## 12.FUTURE SCOPE:

- We will further extend the app where the prescriptions of the patients will be directly uploaded to the database.
- When your medicine runs low, we will reach out to third parties so you can get it delivered at your door.
- Touch sensors can be incorporated on each compartment to track the number of times the compartment has been opened so that refill time can be calculated.

## 13.APPENDIX:


**1. Introduction** **1**

1.1 Project Overview 1

1.2 Purpose 1

**2. Literature Survey** **2**

2.1 Existing Problem 2

2.2 References 2

2.3 Problem Statement Definition 2

**3. Ideation & Proposed Solution** **3**

3.1 Empathy Map Canvas 3

3.2 Ideation & Brainstorming 3

3.3 Proposed Solution 5

3.4 Problem Solution Fit 6

**4. Requirement Analysis** **7**

4.1 Functional Requirement 7

4.2 Non-functional Requirements 7

**5. Project Design** **8**

5.1 Data Flow Diagrams 8

5.2 Solution & Technical Architecture 8
5.3 User Stories 9
6. **Project Planning & Scheduling** **9**
6.1 Sprint Planning & Schedule 9
6.2 Reports From Jira 10
7. **Coding & Solutioning (explain The Features Added In The Project Along With Code)** **10**
7.1 Web UI to enter medicine details 10
7.2 Text to Speech 10
7.3 Display name in IoT device 11
7.4 Cloudant DB 11
7.5 Database Schema 12
8. **Testing** **12**
8.1 Test Cases 12
8.2 User Acceptance Testing 12
9. **Results** **14**
9.1 Performance Metrics 14
10. **Advantages & Disadvantages** **15**
11. **Conclusion** **15**
12. **Future Scope** **16**
13. **Appendix** **16**

**SOURCE CODE:**

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include <LiquidCrystal_I2C.h>
#define LED 2
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);


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

#define ORG "ok5c7o"//IBM ORGANITION ID
#define DEVICE_TYPE "ESP"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "ESP32"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "LC!x?+V9etumdVMaSR"      //Token
String data3="";


//-------- 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(0x27,16,2);
```

```
//_____________________________
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);
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

void loop()// Recursive Function
{
  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("Please take "+ data3);
  if(data3 != "")
  {
    lcd.init();
    lcd.print("Take"+ data3);

digitalWrite(LED,HIGH);
delay(20000);
```

```
digitalWrite(LED,LOW);

  }

  else
  {
digitalWrite(LED,LOW);

  }
data3="";



}
```

**GITHUB LINK: [https://github.com/IBM-EPBL/IBM-Project-26166-1660019746](https://github.com/IBM-EPBL/IBM-Project-26166-1660019746)**

**DEMO LINK:**

**https://sonatechac-my.sharepoint.com/:v:/g/personal/kishore_19it_sonatech_ac_in/EVcThX_7p8lAqjYHh6mffKUBUOEel_LnO6y5rD5Ra02GJA?e=BgsGV4**