

Project Report

Project Title: Personal Assistance for Seniors Who Are Self-Reliant

Team ID : PNT2022TMID11797

Team Size : 4

Team Leader : SOWBARNIKKAA S

Team member : YOGESHWARI S

Team member : PRAVEEN R

Team member : SANJAY K

1.Introduction

1.1. Project Overview

- The user (caregiver) can set the preferred time and medication with the use of an app. The IBM Cloudant DB will be used to hold these specifics.
- If the medication time arrives, the web application will use the IBM IoT platform to deliver the medication name to the IoT device.
- The system will recognise the medication name and issue voice commands to the user to alert them.

1.2. Purpose

- Elderly folks can fail to take their medication at the right time and which medication they should take at that specific time. Additionally, it is challenging for medical professionals to keep an eye on patients round-the-clock. The development of this medication reminder system addresses this issue.

2.Literature survey

2.1. Existing problem

Setting reminders or using pill boxes, calendars, or personal assistance are some known solutions for the issue of elderly individuals forgetting to take their medications at the right time. Although the solutions provide reminders, this system's voice instructions or help are more effective.

2.2. References

1. Sultan Ahmad, Mahamudul Hasan, Gouse Pasha Mohammed, Mohammad Shahabuddin, Tasnia Tabassum, Mustafa Wasif Allvi “IOT BASED PILL REMINDER AND MONITORING SYSTEM” Department of Computer Science, College of Computer Engineering and Sciences, Prince Sattam Bin Abdulaziz University, Al-Kharj, Saudi Arabia in International Journal of Computer Science and Network Security (IJCSNS) VOL.20 No.7, July 2020
2. N Chandana, Mayur Kumar, Megha, Guruprasada Shridhar Hegde, K Shashi Raj “IOT BASED MEDICINE REMINDER AND DISPENSING MACHINE” Department of Electronics and Communication Engineering, Dayananda Sagar College of Engineering, Bangalore, India.

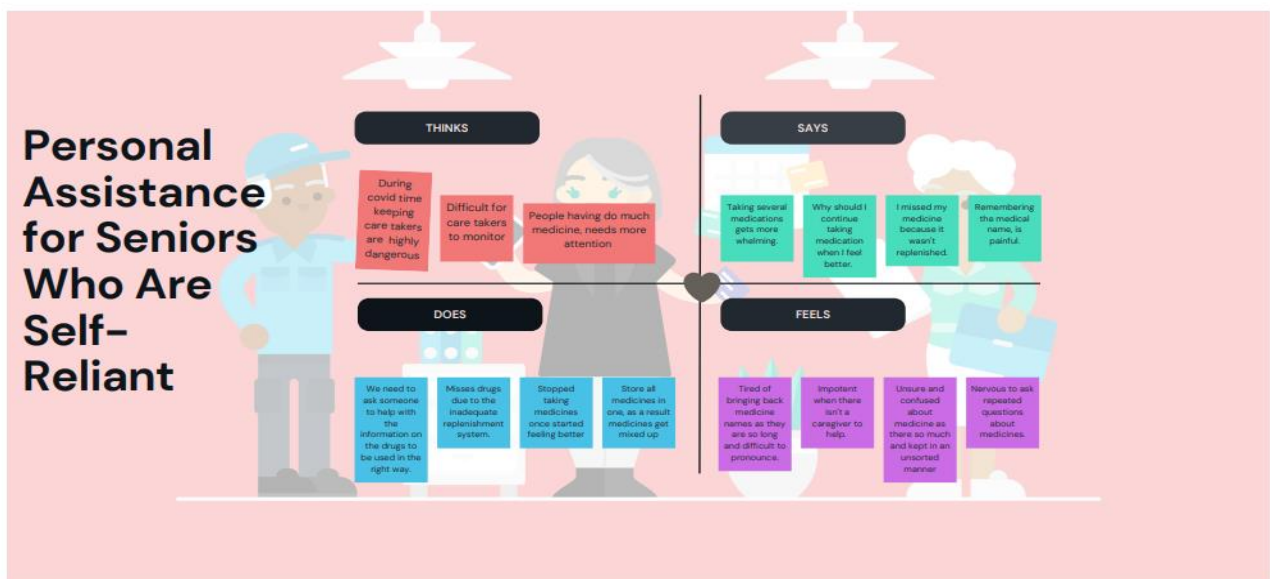
3. 3.Prafulla, Dehankar Manisha, Guru Shubhada, Sachin Patil, Nandkishor Bankar Department Journal of Infectious Diseases & Preventive Medicine Review Article “MEDICINE REMINDER AND MONITORING SYSTEM FOR SECURE HEALTH USING INTERNET OF THINGS” Fadanvis of Shalya Tantra, Datta Meghe Ayurvedic Medical College Hospital and Research Centre, Nagpur, India.
4. . Abhishek Madankar, Akhilesh Agrawal, Vedant Yede “IOT BASED ADVANCE PILL REMINDER SYSTEM FOR DISTINCT PATIENTS” in 2021 Fifth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC) Dept. of E and TC Engineering, Y. C. College of Engineering, Nagpur, India.
5. Balachandra Rao, Preetham M Nayak, Sachin S Nayak “MEDICATION REMINDER AND MONITORING SYSTEM USING IOT” in International Journal Of Current Engineering And Scientific Research (Ijcesr) Issn (Print): 2393-8374, (Online): 2394- 0697, Volume-4, Issue-6, 2017 Department of MCA, NMAMIT, Nitte, Karkala, Udupi District.

2.3. Problem statement definition

For some medical illnesses, skipping medications might have catastrophic consequences; occasionally, older individuals fail to take their medications on schedule. They also fail to remember which medication should be taken when. Additionally, it is challenging for medical professionals to keep an eye on patients round-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)	Elderly folks are prone to forgetting to take their medications on time. They also forget the specific medication the person should be taking at that moment. Additionally, it is challenging for medical professionals to keep an eye on patients round-the-clock. This medication reminder system was created to solve the issue. The user (caretaker) can set the preferred time and medication with the help of an app.
2.	Idea / Solution description	We present a clever Internet of Things-based medication reminder system. The suggested plan was specifically designed for the Android operating system. We use a reminder system for our system, which sounds an alert when it's time to take your medication. Additionally, the user can set their medication timing using an android application. There will be several features in the programme that allow the user to learn more specifics about their medication. It keeps track of the medications, allowing the user to adjust how much medication to take within the programme.
3.	Novelty / Uniqueness	It is an easy-to-use app that reminds users to take their medications and get them refilled, warns about drug interactions, and assists caregivers in managing prescriptions for loved ones.
4.	Social Impact / Customer Satisfaction	These proto-personas, or names, were created by me based on the study results from the user interview. They would be essential to the remaining design steps. Using these personas, any design decisions might be analysed
5.	Business Model (Revenue Model)	There is no one-size-fits-all answer when it comes to business. The model you select will rely on your target market, company objectives, and the resources you already have available.
6.	Scalability of the Solution	where the user can set the time for their medication. There will be several features in the programme that allow the user to learn more specifics about their medication. It keeps track of the medications, allowing the user to adjust how much medication to take within the programme

3.4. Problem Solution fit

Project Title: Personal Assistance For Seniors who are Self Reliant		Project Design Phase I Solution Fit Template		Team ID: PNT2022TMID11797	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Who is your customer? i.e. working parents of 0-5 y.o. kids According to our statement senior citizen who need external support to take care them for their medical support	6. CUSTOMER CONSTRAINTS CC 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. The best way to use this device is learning about technology. It is easy to handle with less complexity	5. AVAILABLE SOLUTIONS AS 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 In the past there were some medical systems which only alert but didn't give medicine names and this does not satisfy the customer. Our device promotes life by available all time	Explore AS, differentiate	
	2. JOBS-TO-BE-DONE / PROBLEMS JB Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides. This device gives the medicine name as a voice message for customers and it will show the image as the medicine which needs to be taken by the patient. If the medicine is not taken by the patient this device gives alert message to caretaker	9. PROBLEM ROOT CAUSE PR 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. This device should be recharged and regularly checked. It fully depends on information given to it. The data needs to be updated before usage.	7. BEHAVIOUR BE 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) The patient needs to check battery level in the device regularly. The patient needs to upload the information and life routines to the device.		
Identify strong TR & EM	3. TRIGGERS TR What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. If all the family members are working or nobody is available to take elderly person this device plays crucial role and take care by guiding them	10. YOUR SOLUTION SL 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. It is common that elderly people forget to take medicine regularly. Since it is busy world everyone needs to take care themselves so, it is better to use this device.	8. CHANNELS OF BEHAVIOUR CH 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7 8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. Customers can hear the voice message and so their health improves day by day.	Identify strong TR & EM	
	4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. Before using this device the elderly person feel social isolation and in confused state. Later they bridge gap and feel comfort to live as device takes care of them.				

4.Requirement analysis

4.1. Functional Requirements:

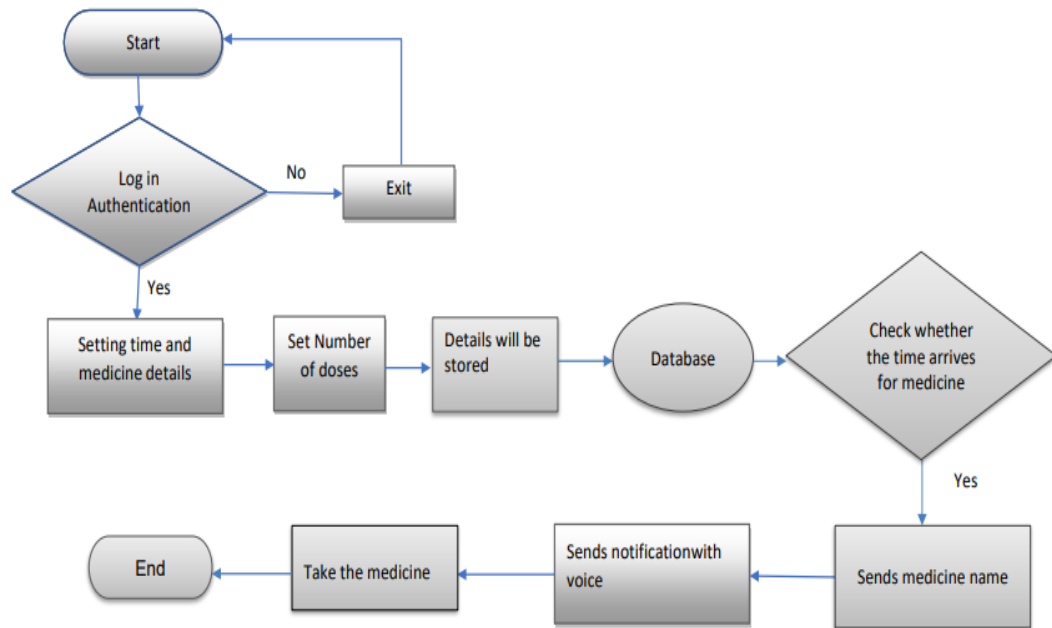
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	login through User Id and Password.
FR-4	Network Connectivity	via wifi /mobile data.
FR-5	IBM IoT Platform	Access cloud storage via internet and it gives medication information.
FR-6	Node-RED	Uses to transfer the data from IOT platform to UI platform and helps in storing the data.

4.2. Non-functional Requirements:

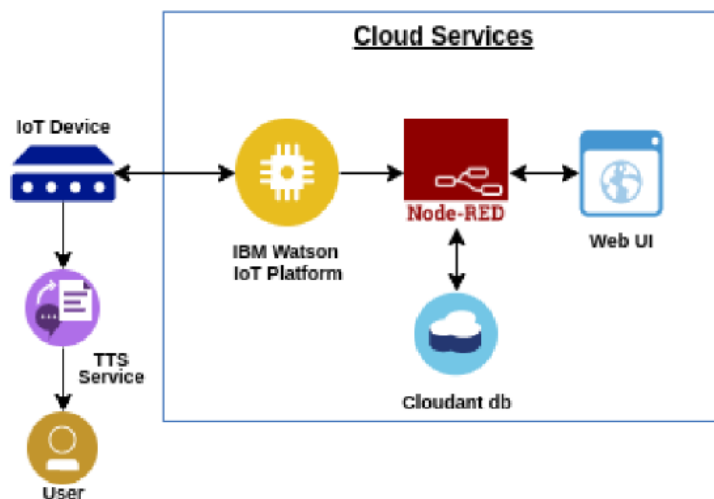
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	It can be easily track and monitor the user's medication time and will share the information to the caregivers.
NFR-2	Security	The cloudant database is highly secured and it prevents data from hacking.
NFR-3	Reliability	The prescription of medication for users is assured all the time.
NFR-4	Performance	It reminds the users to take their medications and get them refilled, warns about drug interactions, and assists caregivers in managing prescriptions.
NFR-5	Availability	To keep track the medicine of users.
NFR-6	Scalability	The users can set the time for their medicine and can also adjust how much medicine to take within the application.

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	User can register for the application by entering my username, password, and confirming my password.	User can access their account /dashboard	High	Sprint-1
		USN-2	User can register for the application through google.	User can register & access the dashboard with google Login	Low	Sprint-1
		USN-3	User can register for the application through Gmail	User can register for application through gmail.	Medium	Sprint-1
	Login	USN-4	User can log into the application by entering email & password	User can log into this application by entering email & password	Low	Sprint-1
Customer (Mobile user)	Data collection	USN-1	User I can set the time and medicine details	User can able to set the time and medicine details	High	Sprint-2
		USN-2	User can set the number of doses of the medicine.	User can set the doses of the medicine.	Low	Sprint-2
		USN-3	User can store the details in cloud database	User can store the details in cloud database.	High	Sprint-2
	Receiving data	USN-4	User can receive the medicine name as voice commands from the device.	User can receive the medicine details.	Medium	Sprint-2
Administrator	Improving system stability	USN-1	Administrator can update the system with new requirements.	User can able to improve the system	Low	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	Registration	USN-1	I can sign up for the application as a user by providing my email address, a password, and a password confirmation.	3	High	Yogeshwari S Praveen R
Sprint-1	Configuration Email	USN-2	When I register for the application as a user, I will get a confirmation email.	4	High	Yogeshwari S Sowbarnikkaa S
Sprint-1	Authentication	USN-3	I can sign up for the application as a user using Gmail and a mobile app.	4	Medium	Sanjay K Praveen R
Sprint-1	Login	USN-4	I can access the application as a user by providing my email address and password.	3	High	Sanjay K Sowbarnikkaa S
Sprint-1	Dashboard	USN-5	I must be able to see the actions that I can take as a user.	4	High	Sanjay K Yogeshwari S
Sprint-2	Notification	USN-1	I should be allowed to alert my parents and legal guardians in an emergency as a user.	10	High	Yogeshwari S Sowbarnikkaa S
Sprint-2	Store data	USN-5	I must continually enter my location information into the database as a user.	10	Medium	Sanjay K Praveen R
Sprint-3	Communication	USN-6	I should be able to communicate with user	6	Low	Praveen R Yogeshwari S
Sprint-3	IoT Device – Watson communication	USN-1,4	The IBM Cloud should receive the data from IoT devices.	7	Medium	Sowbarnikkaa S Praveen R
Sprint-3	Node RED- Cloudant DB communication	USN-5,2	The Cloudant DB should be correctly connected with the IBM Cloud's data.	7	High	Sowbarnikka S Yogeshwari S
Sprint-4	User – WebUI interface	USN-1,4	The Web UI should get inputs from the user	6	High	Praveen R Sanjay K
Sprint-4	Alarm	USN-2,3,5	Based on the time for the medication, the rest of the alarm should be set.	7	High	Sanjay K Sowbarnikkaa S

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

7. Coding and Solutioning

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7.1 Feature 1

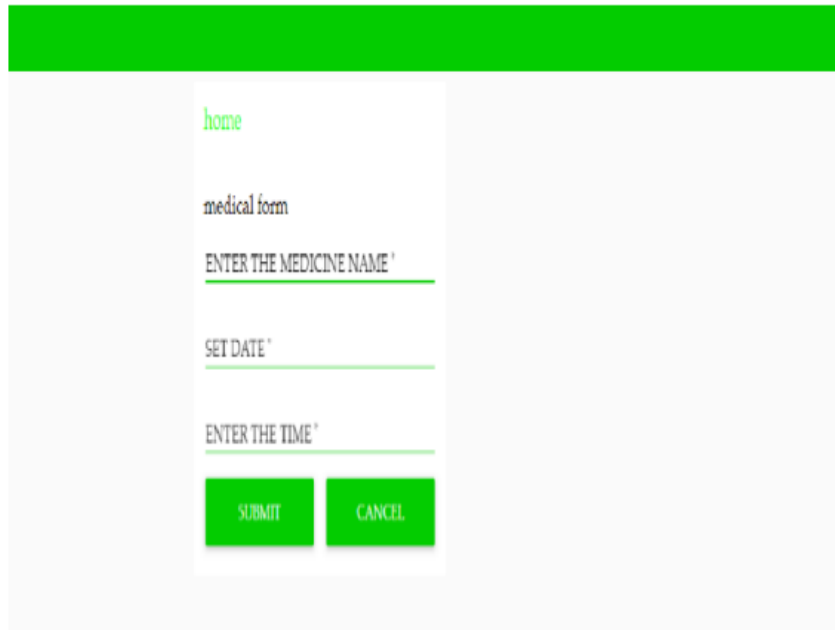
The project includes a cloud database system.

The screenshot displays a web-based interface for a cloud database system. The main area shows a table with two columns: '_id' and 'name'. The table contains ten rows of data, each with a unique ID and a name. The interface includes a sidebar on the left with navigation options like 'All Documents', 'Query', 'Permissions', 'Changes', and 'Design Documents'. At the top, there are tabs for 'Table', 'Metadata', and 'JSON', along with a 'Create Document' button. The bottom of the interface shows pagination information: 'Showing 2 of 3 columns', 'Showing document 1 - 30', and 'Documents per page: 30'.

_id	name
00:46	asdas
00:48	dfgdfg
01:01	Crocin
01:06	sddf
01:08	dfsd
01:10	sdfs
01:19	sads
01:22	dfgdfg
01:23	asdas

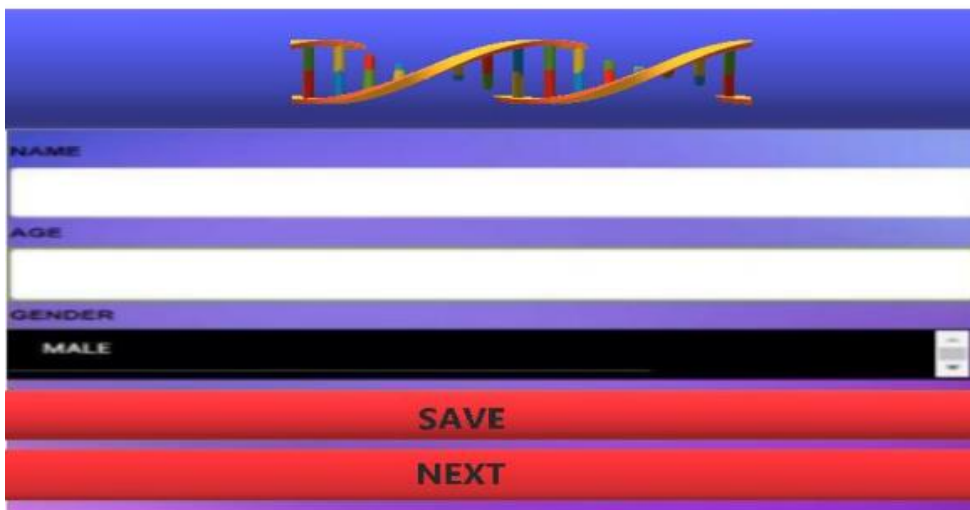
7.2 Feature 2

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



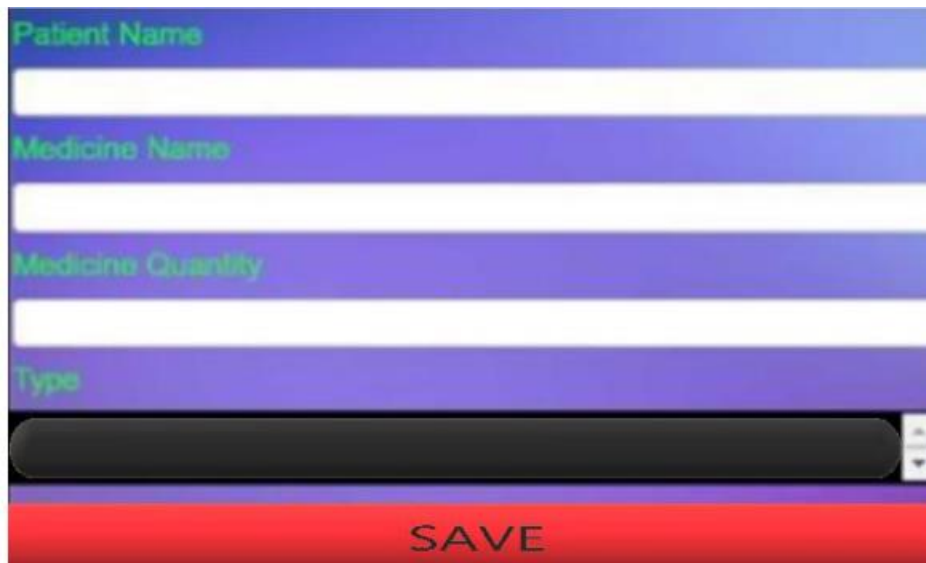
A screenshot of a mobile application interface. At the top is a solid green header bar. Below it, on the left, is a white card with a light gray border. The card contains the following elements from top to bottom: a green text label 'home', a green text label 'medical form', a text input field with the placeholder 'ENTER THE MEDICINE NAME', another text input field with the placeholder 'SET DATE', a third text input field with the placeholder 'ENTER THE TIME', and two green buttons labeled 'SUBMIT' and 'CANCEL' side-by-side. The background of the screen is a light gray.

Entering patient name and gender



A screenshot of a mobile application interface for entering patient information. At the top is a blue header bar with a 3D DNA double helix graphic. Below the header, the form has a purple background. It contains three white text input fields labeled 'NAME', 'AGE', and 'GENDER'. The 'GENDER' field has a dropdown menu with 'MALE' selected. At the bottom are two red buttons labeled 'SAVE' and 'NEXT'.

Entering the details of patient name and medicine details



A mobile application form with a blue header and a red footer. The form contains four input fields: 'Patient Name', 'Medicine Name', 'Medicine Quantity', and 'Type'. The 'Type' field is a dropdown menu. A red 'SAVE' button is at the bottom.

Patient Name

Medicine Name

Medicine Quantity

Type

SAVE

Setting alarm



A mobile application form with a blue header and a red footer. The form is titled 'SET ALERT MESSAGE :'. It contains a text input field for 'enter tablet name', two input fields for 'ENTER THE HOURS' and 'ENTER THE MINS', and a red 'SAVE' button at the bottom.

SET ALERT MESSAGE :

enter tablet name

ENTER THE HOURS

ENTER THE MINS

SAVE

8. Results

8.1. 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.

9. 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.

10. Conclusion

The initiative provides elderly or medically ill individuals with a personal assistant that reminds them of the medications that need to be taken at a specific time. If a person has a severe disease, skipping pills may cause serious issues that can be prevented. Numerous data may be put into the database and notifications can be generated because the cloud is coupled with the mobile application. The user-friendly, highly customizable mobile application was created.

11. Future Scope

By including the feature of notifying the pharmaceutical name during the notice, the project can be further enhanced. By adding the user's or the caregiver's voice, voice help can be made more personalised. Additionally, the mobile application may change medications by using user-provided voice commands as input.

12. 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 ORGANITION ID
#define DEVICE_TYPE "Arduino"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "SKAP"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "1234" //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 link: <https://github.com/IBM-EPBL/IBM-Project-27714-1660063539>