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1. INTRODUCTION

The Internet of Things (IoT) is helping society facilitate a major challenge of meeting the needs of an ageing population.As technology improves, IoT can help eliminate these issues. Data collected from IoT devices formulates an individual's daily story by monitoring their routine, picking up inconsistencies and alerting emergency services if necessary. Connected IoT devices in the home improve safety, with experts projecting sales of 50 million wireless consumer devices for monitoring health by 2017, the smart home is here to stay.

1.1 Project overview

Sometimes elderly people forget to take the medicine at the correct time. They have difficulty in taking medicine on time often end up in hospitals or home nursing by spending huge amount of money. 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.

1.2 purpose

More senior citizens in the world are facing the problem of living alone. After research, I find that medication is a very important part of seniors' life. The design is about medicine reminder that can also connect the seniors with their family members. At first, we focused on the social relationship of senior citizens and started to research medication remindersin the market.Then made mockups to try to test the best way for seniors to control a reminder such as the behavior of remembering medications to take. After that, made the prototypes and brought them to the nursing home. More refinements were made after these discussion in the nursing home. The final version of my design uses an interesting and noticeable way to remindsenior citizens to take their medicine. Besides that, my product can connect to phone or a device of seniors' family members, which gives seniors better connection with family member.

2.LITERATURE SURVEY

Personal Assistance for Seniors Who Are Self-Reliant

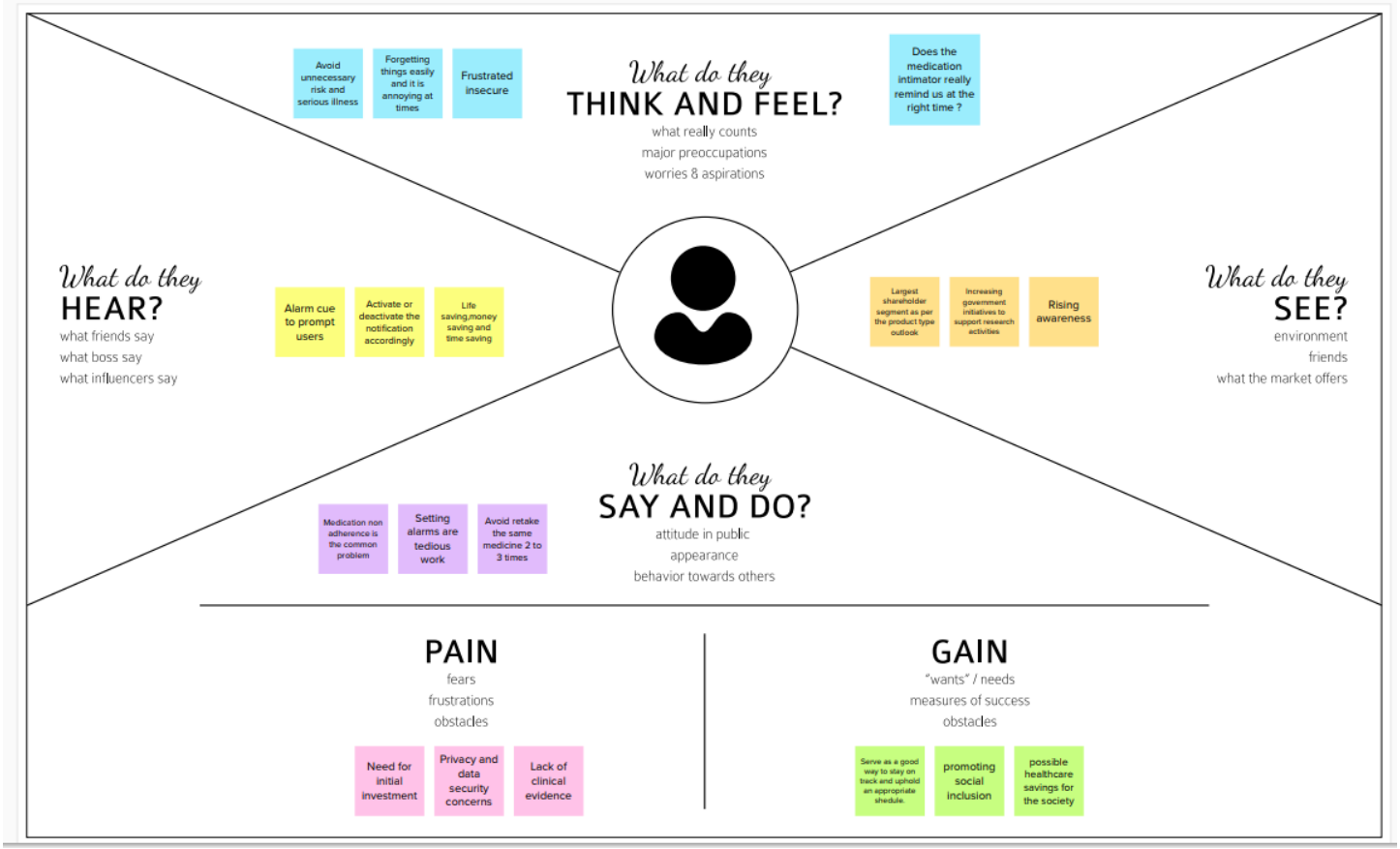
TITLE	AUTHOR	DESCRIPTION	HIGHLIGHTS	DRAWBACKS
HABITAT- AN IOT SOLUTION FOR INDEPENDENT ELDERLY	1.ELENA BORELLI 2.GIACOMO PAOLINI 3.FRANCESCO ANTONIAZZI 4.MARINA BARBIROLI	project HABITAT (Home Assistance Based on the Internet of Things for the Autonomy of Everybody), aiming at developing smart devices to support elderly people both in their own houses and in retirement homes, and embedding them in everyday life objects, thus reducing the expenses for healthcare due to the lower need for personal assistance, and providing a better life quality to the elderly users.	The technological solutions integrated in HABITAT have the purpose to assist needy people in the longest stay in their homes in safe conditions, helping them to conduct autonomously most of the activities tied to the satisfaction of their primary needs, sustaining actions focused on both de-hospitalization and home-care.	In particular, motorized actuators could be controlled directly by the HABITAT system in order to customize the behavior of the chair according to the profile of each user.
Understanding the care and support needs of older people: a scoping review and categorisation using the WHO international classification of functioning, disability and health framework	1. Sarah Abdi 2. Alice Spann 3. Jacinta Borilovic 4. Luc deWitte 5.MarkHawley	The number of older people with unmet care and support needs is increasing substantially due to the challenges facing the formal and informal care system in the United Kingdom. Addressing these unmet needs is becoming one of the urgent public health	The review highlighted that older people living with chronic conditions have unmet care needs related to their physical and psychological health, social life, as well as the environment in which they live and interact. Findings of this review also	There is a possibility that the screening process, the analysis and interpretation of the themes was influenced by the author's own perceptions or understanding of the topic.

		priorities. In order to develop effective solutions to address some of these needs, it is important first to understand the care and support needs of older people.	emphasized the importance of developing care models and support services based around the needs of older people.	
Using IoT technologies to develop a lowcost smart medicinebox	1. Danyllo V. da Silva 2. Taisa G. Goncalves 3. Paulo F. Pires	Regarding IoT scenarios, we applied a scenariobased technique named ScenarIoT. The scenario can be defined as a sequence of actions or an ordered set of interactions among parts. We choose ScenarIoT because it can be employed during requirements specification, architecture definition,documentation activities, and system's features idealization. This technique supports analysts during early development activities and suggests a list of IoT arrangements with their information catalogs	This work proposed a low-cost smart medicine box system employing a robust architecture to support users and health professionals during medicines consumption. The proposed architecture enables to embody other types of devices such as wearable, electronic devices, home appliances,among others, offering infinite possibilities of applications and functions.	This system can be improved, providing a more flexible way to schedule medicines consumption alarms such as twice a week, three times a week, every other day, among others .

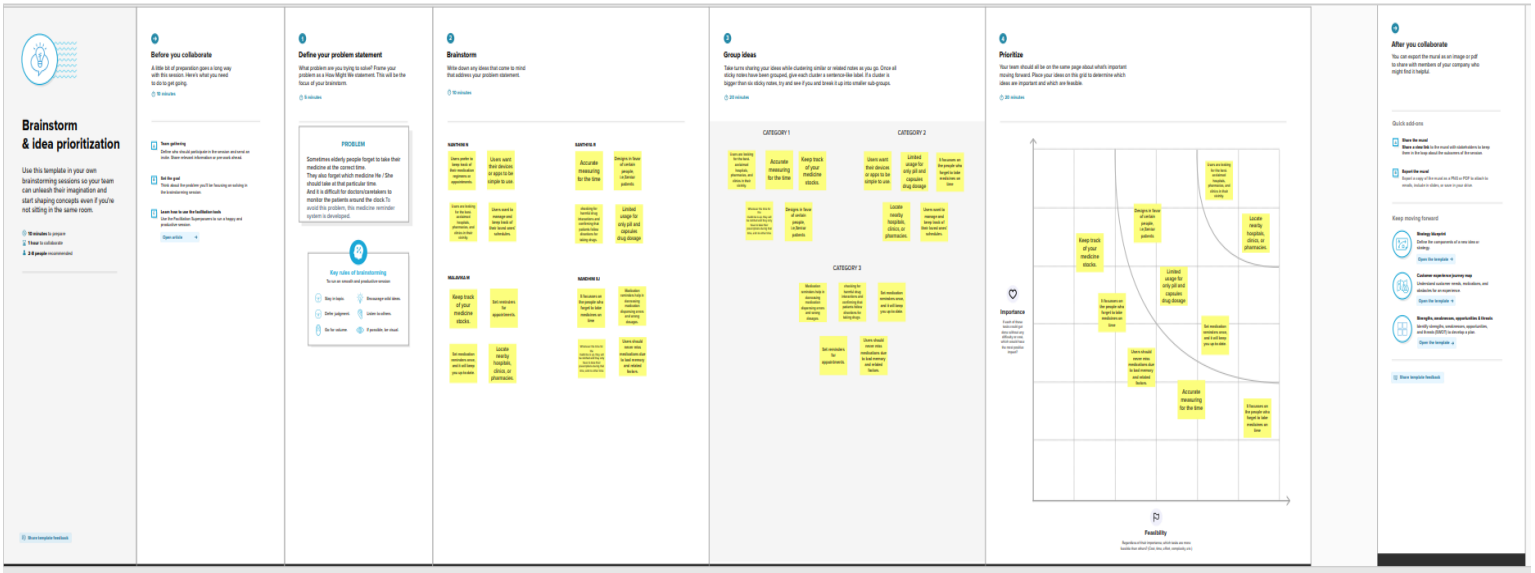
IoT-Based Smart Medicine Dispenser to Control and Supervise Medication Intake v	RodríguezDomínguez. Hornos 4. Ma Mercedes	The dispenser emits a sound and lights up an LED to alert the patient that it is time to take his/her medication. When he/she is close to the smart medicine dispenser, it will identify him/her through facial recognition and deliver the prescribed medication. If the medication is not removed during the expected timings, a notification is sent to the caregiver through the mobile application so that she/he can act consequently.	Using a facial identification mechanism, it recognizes the patients registered in the system and supplies IoT-Based Smart Medicine Dispenser them with the medicines they should take just when needed. Every time the dispenser provides a medicine box, it generates a sound and illuminates the corresponding compartment. The system also sends remote notifications to caregivers, informing them of the medicines dispensed to their dependents directly on their smartphone.	To improve the proposed system, closing the dispenser compartments so that they only open when the camera detects the face of the caregiver who must place the medicine boxes in them. This would make it safer. It would also be good for the system to automatically detect which medicines and how many of them the caregiver has put in the different compartments; currently, he/she is who must provide these data through the mobile app

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canva



3.2 Ideation & 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 He / She should take at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock
2	Idea / Solution description	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.
3	Novelty / Uniqueness	Voice assistant is used to remember the time for take medicines.
4	Social Impact / Customer Satisfaction	It helps the family members to know about their loved ones
5	Business Model (Revenue Model)	By using subscription model we increase the revenue of the business
6	Scalability of the Solution	The details will be stored in the IBM cloud so the space is provided more than enough. The user also has the option to change the timings whenever the situation changes.

3.4Problem Solution fit

4. EMOTIONS: BEFORE / AFTER stress due to forgets the time. After the usage of app they will be happy.		

4.REQUIREMENT ANALYSIS

4.1 Functional requirement

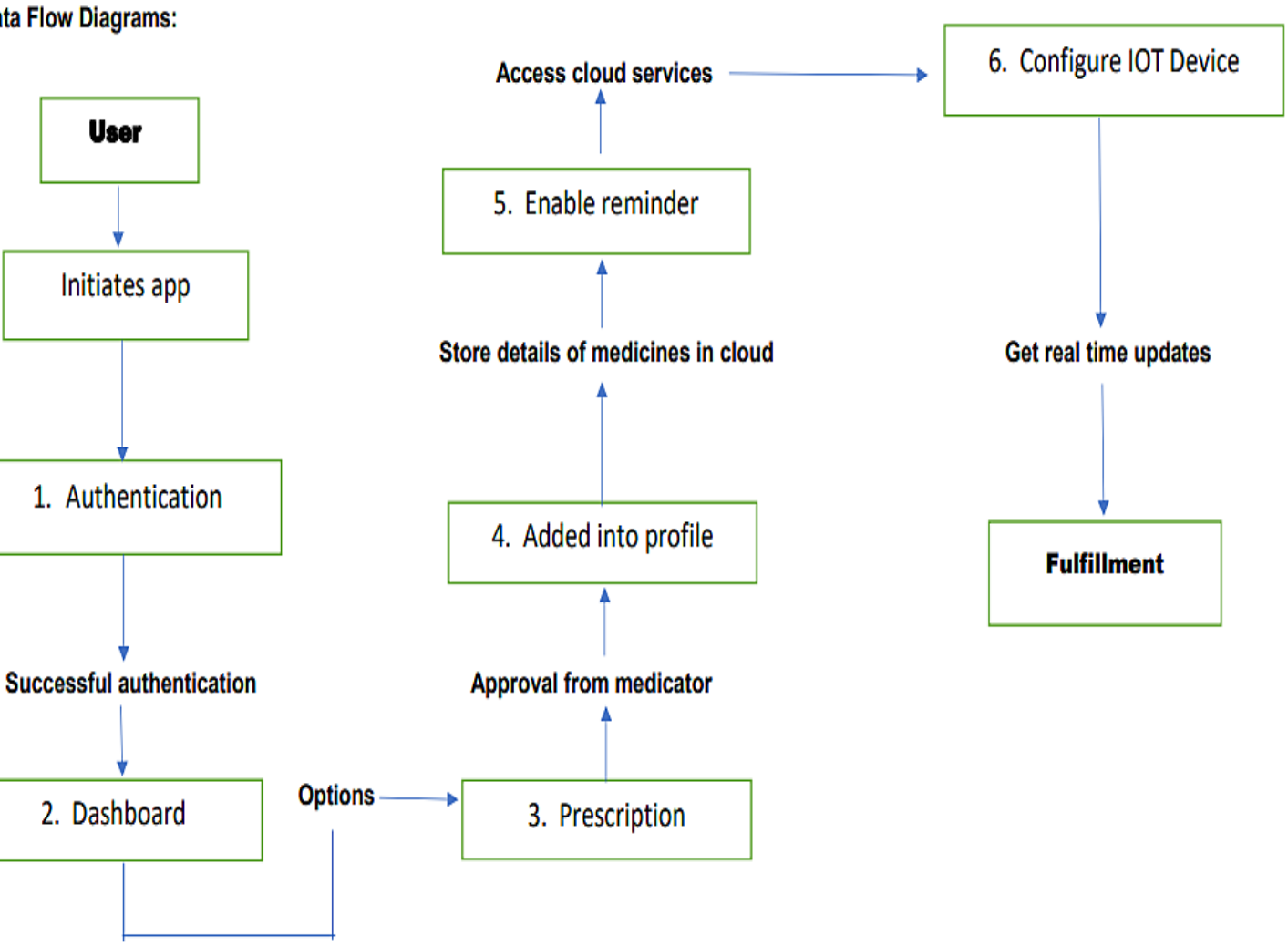
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR1	User Registration	Registration through SMS Registration through Gmail
FR2	User Confirmation	Confirmation via Email Confirmation via OTP
FR3	User Login(Web)	Login with Registered Mail id and Password Login with Registered Mobile number and OTP
FR4	User Login(Mobile app)	Login with Registered Mail id and Password Login with Registered Mobile number and OTP
FR5	User's Medical Information E	Enter your Medical Information.Then set the Date and Time.
FR6	User Input Management	All the user's data are available in the dashboard.

4.2 Non-Functional requirements

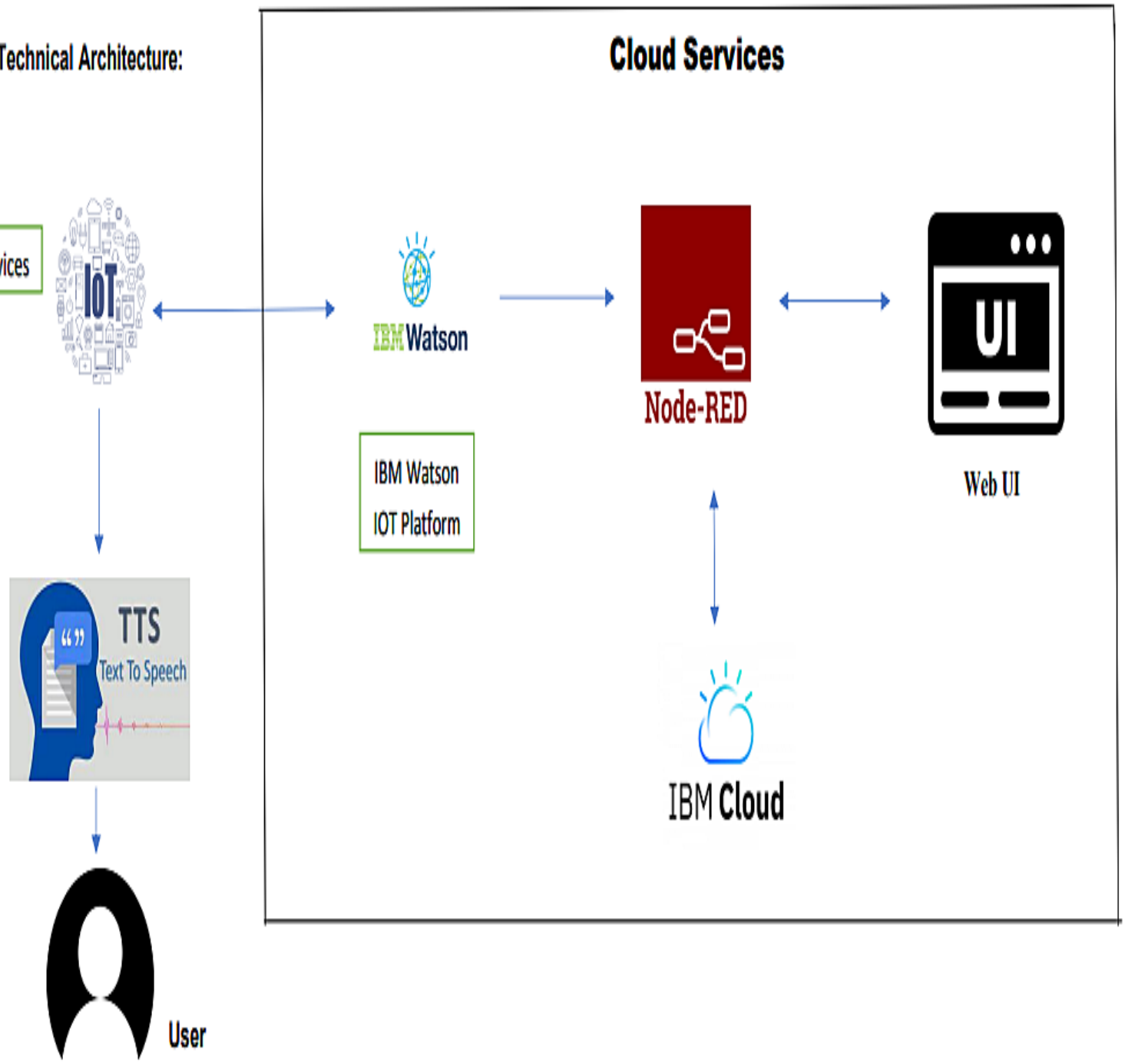
FR NO	Non-Functional Requirement	Description
NFR 1	Usability	The App Should be User-friendly for the Users. It is used to remind the Medicine on time. It alerts the users through Voice Commands.
NFR2	Security	The Data of the users Should not be accessed by Cyber Attackers. The Data of the users should be kept Confidential
NFR3	Reliability	It reminds the users correct on time. It shows the correct medicine name on that particular time.
NFR4	Performance	The Reminders will be delivered accurately on time. It works without any glitch.
NFR5	Availability	The device should be monitored 24X7 for the alert of Medicine reminder. It can be used at any Place.
NFR6	Scalability	The Device is compatible and portable. It is easily adaptable

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
stomer Senior ser)	Caretaker	USN-1	As a user, I want to take medicine on proper time and to take care my health.	I need to take a medicine on proper time	High	sprint1
ustomer Diabetes atient)	Smart medicine box	USN-2	As a user, I want to take medicine on time and monitor my health.	I want to take my medicine on proper time by a voice command /msg.	high	sprint1
Custer (Thyroid patient)	Smart medicine box	USN-3	As a user, my patient needs to take medicines on time and monitoring	Mypatient needs to take tablets on time.	medium	sprint2

			the activity.			
Customer(ma patient)	Caretaker	USN-4	As a user, my patient needs medication time and prescription should load in database for upcoming week.	Mypatient medication time and prescription should be in database list	low	sprint3
Customer(Disabled people)	Smart medicine box	USN-5	As a user, I need to take my medicine in nearby places along with light signal/notification.	I need to take my medicine in nearby places with light notification.	medium	sprint2

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning and Estimation

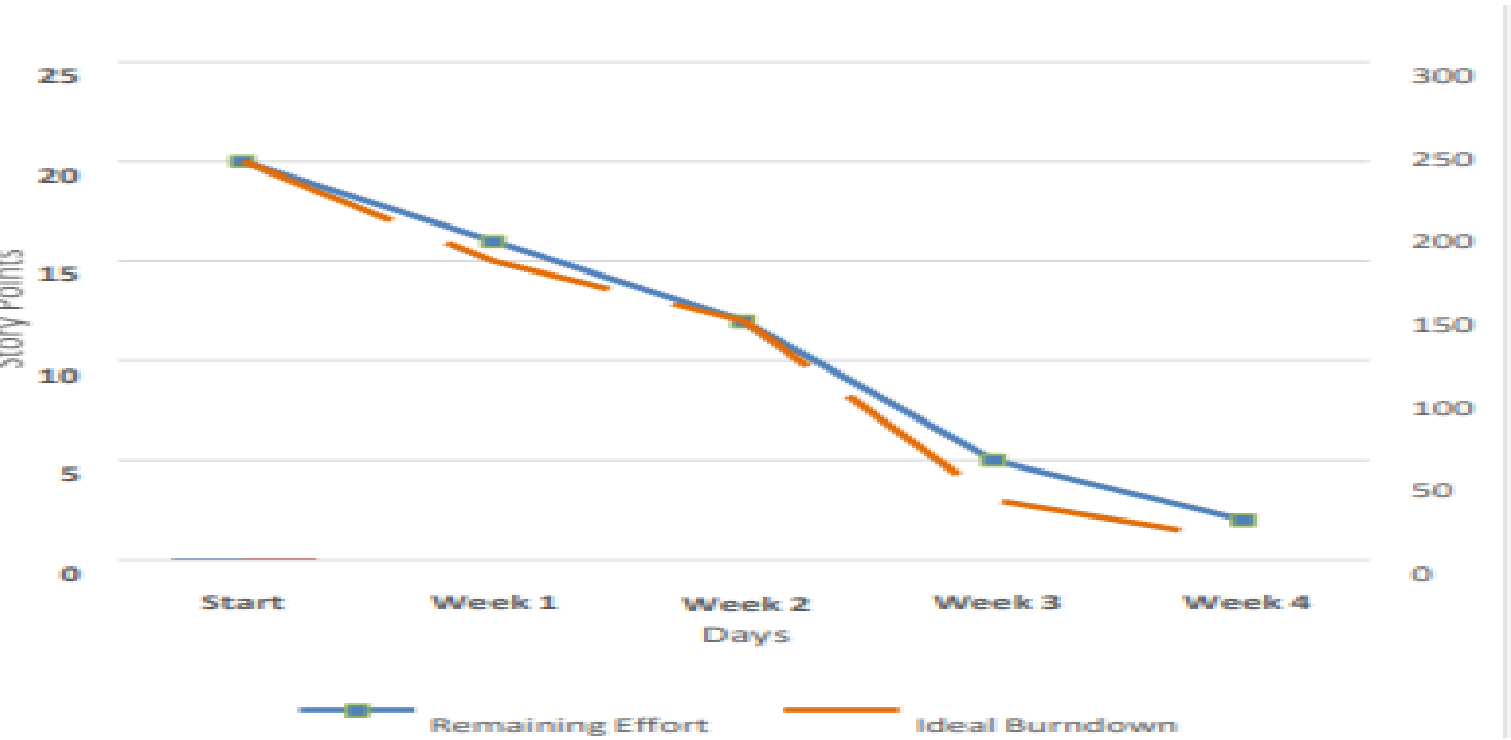
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story points	Priority	Team Members
sprint1	set alarm	USN 1	As a user, I can set an alarm for	10	high	nanthini n

			alerting to take medicine through Medicine remainder system			
sprint1		USN 2	As a user, I can Activate and Deactivate the alarm	10	high	santhiya r
sprint2	voice assistant	USN 3	As a user once I set the alarm it will alert us voice assistant.	10	high	nandhini sj
sprint2		USN 4	It will tell us the time and name of the medicine once the time has set.	10	high	malavika m
sprint3	Cloudant DB	USN 6	For storing the details of medicine reminder for which Cloud DB is used	5	low	nanthini n malavika m nandhini sj santhiya r
sprint3		USN 7	As a user, I can stor the name of th medicine wit timing.	10	high	malavika m santhiya r nandhini sj nanthini n
sprint4	User Friendly	USN 8	Our app will b	5	low	santhiya r nandhinsj

	Application		companian for th senior citizen to consumes the medicines on time.			nanthini n malavika m
sprint4		USN 9	As a user, one need to set the medicine and time as per th instruction given by the user the voice assistan will help to take medicines on time fo senior citizens.	10	high	nandhini sj malavika m nanthini n santhiya r

sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
sprint1	20	8 days	08-10-2022	15-11-2022	20	17-11-2022
sprint2	10	8 days	09-11-2022	16-11-2022	10	18-11-2022
sprint3	20	8 days	10-11-2022	17-11-2022	20	19-11-2022

sprint4	10	8 days	10-11-2022	17-11-2022	10	19-11-2022



7.CODING & SOLUTIONING:

HTML code for Login Page:

```
<!DOCTYPE html>
<html lang="en" >
<head>
  <meta charset="UTF-8">
  <title>Login and Registration Form </title>
  <h1>Personal Assistance for Seniors who are Self-reliant</h1>
  <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/normalize/5.0.0/normalize.min.css">
<link rel='stylesheet' href='https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.2.0/css/font-awesome.min.css'><link rel="stylesheet" href="./style.css">

</head>
<body>
<!-- partial:index.partial.html -->
<nav class="main-nav">
   <ul>
```

```
      <li><a class="signin" href="#0">Sign in</a></li>
      <li><a class="signup" href="#0">Sign up</a></li>
    </ul>
</nav>

<div class="user-modal">
      <div class="user-modal-container">
        <ul class="switcher">
          <li><a href="#0">Sign in</a></li>
          <li><a href="#0">New account</a></li>
        </ul>

        <div id="login">
          <form class="form">
            <p class="fieldset">
              <label class="image-replace email" for="signin-email">E-mail</label>
              <input class="full-width has-padding has-border" id="signin-email" type="email" placeholder="E-mail">
            </p>

            <p class="fieldset">
              <label class="image-replace password" for="signin-password">Password</label>
              <input class="full-width has-padding has-border" id="signin-password" type="password"
placeholder="Password">
              <a href="#0" class="hide-password">Show</a>
            </p>

            <p class="fieldset">
              <input type="checkbox" id="remember-me" checked>
              <label for="remember-me">Remember me</label>
            </p>

            <p class="fieldset">
              <input class="full-width" type="submit" value="Login">
            </p>
          </form>
          <p class="form-bottom-message"><a href="#0">Forgot your password?</a></p>
          <!-- <a href="#0" class="close-form">Close</a> -->
        </div>

        <div id="signup">
          <form class="form">
```

```
            <p class="fieldset">
              <label class="image-replace username" for="signup-username">Username</label>
              <input class="full-width has-padding has-border" id="signup-username" type="text"
placeholder="Username">
            </p>

            <p class="fieldset">
              <label class="image-replace email" for="signup-email">E-mail</label>
              <input class="full-width has-padding has-border" id="signup-email" type="email" placeholder="E-
mail">
            </p>

            <p class="fieldset">
              <label class="image-replace password" for="signup-password">Password</label>
              <input class="full-width has-padding has-border" id="signup-password" type="password"
placeholder="Password">
              <a href="#0" class="hide-password">Show</a>
            </p>

            <p class="fieldset">
              <input type="checkbox" id="accept-terms">
              <label for="accept-terms">I agree to the <a class="accept-terms" href="#0">Terms</a></label>
            </p>

            <p class="fieldset">
              <input class="full-width has-padding" type="submit" value="Create account">
            </p>
          </form>

          <!-- <a href="#0" class="cd-close-form">Close</a> -->
        </div>

        <div id="reset-password">
          <p class="form-message">Lost your password? Please enter your email address.</br> You will receive a
link to create a new password.</p>

          <form class="form">
            <p class="fieldset">
              <label class="image-replace email" for="reset-email">E-mail</label>
              <input class="full-width has-padding has-border" id="reset-email" type="email" placeholder="E-mail">
            </p>
```

```
            <p class="fieldset">
              <input class="full-width has-padding" type="submit" value="Reset password">
            </p>
          </form>

          <p class="form-bottom-message"><a href="#0">Back to log-in</a></p>
        </div>
        <a href="#0" class="close-form">Close</a>
      </div>
    </div>
<!-- partial -->
  <script src='https://cdnjs.cloudflare.com/ajax/libs/jquery/2.1.3/jquery.min.js'></script><script
src="./script.js"></script>

</body>
</html>
```

Text to Speech code:

```
from ibm_watson import TextToSpeechV1
from ibm_cloud_sdk_core.authenticators import IAMAuthenticator
authenticator = IAMAuthenticator('NF0qqePBq845-q9DzSz-fdFMGfr7kvKxILoxBykOnlbX')
text_to_speech = TextToSpeechV1( authenticator=authenticator
)
text_to_speech.set_service_url('https://api.au-syd.text-to-speech.watson.cloud.ibm.com/instances/f4c57d17-
ac42-458a-8552-cf3a0baa9ca7')
with open('hello_world.wav', 'wb') as audio_file: audio_file.write( text_to_speech.synthesize(
'its time to take insulin',

voice='en-US_AllisonV3Voice', accept='audio/wav'
).get_result().content)
```

08.Testing:

Test Cases:

Test Case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
TC_OO1	Functional	Medicine reminder_ Home Page	Verify user is able to set alarm into application with Valid credentials	IBM Cloud,Python IDLE,Node-Red	1.Enter medicine name 2.Enter time (h:m) 3.Enter date (d:m:y)	medicine name:paracetamol time:09:00	Alarm is set	Alarm is set	Pass
TC_OO2	Functional	Medicine reminder_ Home Page	Verify user is able to set alarm into application with Valid credentials	IBM Cloud,Python IDLE,Node-Red	1.Enter medicine name 2.Enter time (h:m) 3.Enter date (d:m:y)	medicine name:dolo time:11:00	Alarm is set	Alarm is set	pass
TC_OO3	Function	Medici	Verify	IBM	1.Enter		Alarm is	Alarm is	pass

	al	ne reminder_ Home page	user is able to set alarm into application with Valid credentials	Cloud,Python IDLE,Node-Red	medicine name 2.Enter time (h:m) 3.Enter date (d:m:y)	medicine_name:Insulin time:02:00	set	set	
TC_OO4	Functional	Medicine reminder_ Home page	Verify user is able to set alarm into application with Valid credentials	IBM Cloud,Python IDLE,Node-Red	1.Enter medicine name 2.Enter time (h:m) 3.Enter date (d:m:y)	medicine_name: paracetamol time:03:30	Alarm is set	Alarm is set	pass

Performance test cases:

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 for seniors who are	New	Low	Moderate	Moderate	Low	>5 to 10%	ORANGE	As we have seen the changes

	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	Endurance	App Crash/ Site 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)
1	Medicine Reminder Web -UI	Stress	Performance	CPU -01	GO	High Performance server	Closed
2	Medicine Reminder Web -UI	Load	Scalability	DB Storage - 01	NO-GO	ibm cloud	Closed

10. Advantages & Disadvantages:

Advantages:

The technological solutions integrated in HABITAT have the purpose to assist needy people in the longest stay in their homes in safe conditions, helping them to conduct autonomously most of the activities tied to the satisfaction of their primary needs, sustaining actions focused on both de-hospitalization and home-care.
Using a facial identification mechanism, it recognizes the patients registered in the system and supplies IoT-Based Smart Medicine Dispenser them with the medicines they should take just when needed. Every time the dispenser provides a medicine box, it generates a sound and illuminates the corresponding compartment. The system also sends remote notifications to caregivers, informing them of the medicines dispensed to their dependents directly on their smartphone.

This work proposed a low-cost smart medicine box system employing a robust architecture to support users and health professionals during medicines consumption. The proposed architecture enables to embody other types of devices such as wearable, electronic devices, home appliances,among others, offering infinite possibilities of applications and functions.

Disadvantages:

In particular, motorized actuators could be controlled directly by the HABITAT system in order to customize the behavior of the chair according to the profile of each user. To improve the proposed system, closing the dispenser compartments so that they only open when the camera detects the face of the caregiver who must place the medicine boxes in them. This would make it safer. It would also be good for the system to automatically detect which medicines and how many of them the caregiver has put in the different compartments; currently, he/she is who must provide these data through the mobile app.
This system can be improved, providing a more flexible way to schedule medicines consumption alarms such as twice a week, three times a week, every other day, among others .

11.Conclusion and Future Scope:

In this work,we propose a medication reminder framework that is not only practical for young people who are familiar with technology but also for senior citizens. The framework begins with users scanning the QR code on their pill bag as an input. Then, the medication notification is automatically generated and reminds the user to take the medication as prescribed. All of the user's medication-taking records are collected and analysed in various forms in order to assist the physician to identify medication non adherence. As a result, they can adjust the prescribed schedule to be more suitable for their patients or monitor their patients related symptoms closely and in a timely manner. Several quantitative results demonstrate that our frame work out perfoms the baselines in many aspects. Moreover, qualitative results emphasize that our medication-taking report is practical.

There are a couple of directions in which we would like to extend our work. First, we would like to apply a text detection and recognition algorithm directly to the medication label and automatically extract the information for the purpose of reminder generation. By doing this, our system will be simpler and much more user-friendly, especially for seniors. Moreover, we hypothesize that by training the deep learing algorithm to inspect the user's medication-taking records, as physician assistant, it might be able to identify a clue of some of disclosed illness. Further more, we aim to enlarge our MedThai dataset to include more medicines, directions of use videos or an English-language version of our dataset. Finally, we would like to include the text-to speech function to obviate the necessity for seniors to read the medication details.

Source code:

Python code:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

#Provide your IBM Watson Device Credentials
organization = "y2uwyi"
deviceType = "medicinereminder"
deviceId = "16011601"
authMethod = "token"
authToken = "20222023"

# Initialize GPIO
def myCommandCallback(cmd):
```

```
    print("Command received: %s" % cmd.data['command'])
    name=cmd.data['command']
    print ("Take medicine :" +name)

try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-
token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................

except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()

while True:
    #Get Sensor Data from DHT11
    deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-16335-1659611621

DEMO LINK:

https://youtu.be/ExgDZm2SiJw