PERSONAL ASSISTANT FOR SENIORS WHO ARE SELF – RELIANT

TEAM ID

PNT2022TMID00365

TEAM MEMBERS

S SIBI SELVAN (312319106148)

M RANJITH ROSHAN (312319106130)

RAJAGOPALAN VG (312319106127)

N SURIYA PRAKASH (312319106158)

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1. INTRODUCTION:

1.1 PROJECT OVERVIEW:

The project named titled "Personal Assistance For Seniors Who Are Self-Reliant" is developed through this initiative by the team with team ID PNT2022TMID00365. This project aims to remove the difficulties faced by senior citizens and people who have disabilities. The medicinal remainder is implemented with the help of IBM Node Red Service, IBM Watson IoT Platform, IBM Cloudant, Integrated Web UI with Node Red Service and a TTS service. IoT devices are internet enabled devices capable of forming a network. It can be anything including that of mobile phones, laptops, smart watches,etc., Hence for the implementation of our project we have used our own laptops's for the purpose of verifying output. Let us look into the every stage of the project in detail with this report.

1.2 PURPOSE:

The aim of the project is to help with the senior citizens and the people with disabilities in reminding them with the periodic timely remainders on the medicine that they should be consuming as per the prescription of medicial practioner. In a world where everyone is connected digitally and disconnected physically due to various reasons such as job, education, this application would be of great beneficial for the young generations to digitally serve the older generation.

2 LITERATURE SURVEY:

2.1 EXISTING PROBLEM SOLUTIONS:

In **"An observational study of medication administration errors in old-age psychiatric inpatients"** authored by Camilla Haw, Jean Stubbs and Geoff Dickens, This paper main aim is to know about the medication administration errors in mental health setting and to investigate the frequency and nature of medication administration errors in old-age psychiatry. In fact, Medication administration errors are common and mostly minor. Direct observation is a useful, sensitive method for detecting medication administration errors in psychiatry and detects many

more errors than chart review or incident reports. The technique appeared to be acceptable to most of the nursing staff that were observed.

In **"Driver drowsiness detection model using convolutional neural networks techniques for android application"** authored by R. Jabbar, M. Shinoy, M. Kharbeche, K. Al-Khalifa, M. Krichen, and K. Barkaoui, This article focuses on the detection of micro sleep and drowsiness using neural network-based methodologies. In this paper, accuracy was increased by utilizing facial and marks which are detected by the camera and that is passed to a Convolutional Neural Network (CNN) to classify drowsiness. The proposed CNN based model can be used to build a real-time driver drowsiness detection system for embedded systems and Android devices with high accuracy.

In **"Two stream deep convolutional neural network for eye state recognition and blink detection"** authored by **R. Sanyal and K. Chakrabarty**, In this paper, a precise multimodal eye blink recognition method using feature level fusion (MmERMFLF) is proposed. Eye state recognition and blink detection has been an important research problem in various fields like driver fatigue and drowsiness measurement, dry eye detection, video spoofing detection, psychological status analysis and many others. Hence an automated eye state classification and blink detection algorithm which is robust to a variety of conditions is required for this purpose.

In "**Internet of Things for Healthcare Using Effects of Mobile Computing: A Systematic Literature Review**" authored by **Shah Nazir, Yasir Ali, Naeem Ullah, and Iv´anGarc´ıa-Magariño**, In this paper, the impact of Internet of Things has been revolutionized in all fields of life, but its impact on the healthcare system has been significant due to its cutting edge transition. The role of Internet of Things becomes more dominant when it is supported by the features of mobile computing. The mobile computing extends the functionality of IoT in healthcare environment by bringing a massive support in the form of mobile.

2.2 REFERENCES:

- Camilla Haw, Jean Stubbs and Geoff Dickens, "An observational study of medication administration errors in old-age psychiatric inpatients", International Journal for Quality in Health Care, 2007.
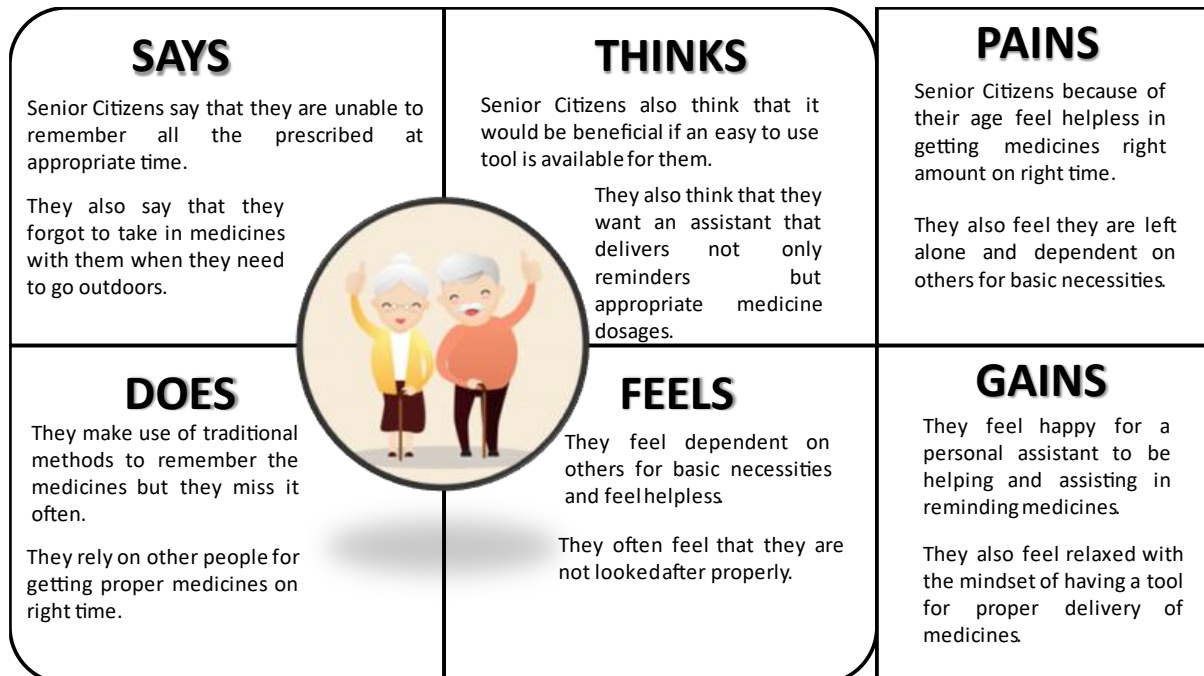
- R. Jabbar, M. Shinoy, M. Kharbeche, K. Al-Khalifa, M. Krichen, and K. Barkaoui, "Driver drowsiness detection model using convolutional neural networks techniques for android application," International Conference on Informatics, IoT, and Enabling Technologies (ICIoT), 2020.

- R. Sanyal and K. Chakrabarty, "Two stream deep convolutional neural network for eye state recognition and blink detection," International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech), 2019.

- Shah Nazir, Yasir Ali, Naeem Ullah, and Iv´anGarc´ıa-Magariño, "Internet of Things for Healthcare Using Effects of Mobile Computing: A Systematic Literature Review", Journal on Hindawi Wireless Communications and Mobile Computing, 2019.

2.3 PROBLEM STATEMENT DEFINITION:

- 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. These details will be stored in the IBM Cloudant DB.
- If the medicine time arrives the web application will send the medicine name to the IoT Device through the IBM IoT platform.
- The device will receive the medicine name and notify the user with voice commands.

3. IDEATION:

3.1 EMPATHY MAP CANVAS:

SAYS

Senior Citizens say that they are unable to remember all the prescribed at appropriate time.

They also say that they forgot to take in medicines with them when they need to go outdoors.

THINKS

Senior Citizens also think that it would be beneficial if an easy to use tool is available for them.

They also think that they want an assistant that delivers not only reminders but appropriate medicine dosages.

PAINS

Senior Citizens because of their age feel helpless in getting medicines right amount on right time.

They also feel they are left alone and dependent on others for basic necessities.

DOES

They make use of traditional methods to remember the medicines but they miss it often.

They rely on other people for getting proper medicines on right time.

FEELS

They feel dependent on others for basic necessities and feel helpless.

They often feel that they are not looked after properly.

GAINS

They feel happy for a personal assistant to be helping and assisting in reminding medicines.

They also feel relaxed with the mindset of having a tool for proper delivery of medicines.

3.2 IDEATION AND BRAINSTORMING:

In this modern era people may find difficult to spend time with the elderly people in their house also they don't find time to take care and monitor the elderly people in the house. About 40% of people aged 65 or older have age associated memory impairment—in the United States, about 16 million people. Only about 1% of them will progress to dementia each year. As most of the old aged people suffer from memory impairment issue, they might not even remember to take up their medications, which is a serious dilemma because this might even cause a severe health issue to them. So, we address this problem and came up with a solution of developing an automated reminder system which assists the elderly people by reminding them to take their medication at the right time. We plan to build a web application interface using Node Red that would enable caretakers to provide the medicine name and time at which the medication should be provided as an input. This web application is bounded with the IBM Cloudant database service where the medication data and time will be stored. The web application is interfaced with the IoT device which is used to control the Sound actuators. The IoT device is integrated with web application by means of IBM Watson IoT platform. The IoT devices are realized in the project with the help of TinkerCad or any other similar IoT-supported simulation software.

The data is sent as the input. The Web application Continuously monitors the time and checks with input data. When the time is identical with the input time it pushes a message through the IoT devices realized via simulation. The Sound actuators perform the Text to Speech Transition Service by which the output will be converted as an audio signal. The audio signal can be easily understandable and reminds the user to take his/her medication on time.

3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In this modern era people may find difficult to spend time with the elderly people in their house also they don't find time to take care and monitor the elderly people in the house. About 40% of people aged 65 or older have age associated memory impairment—in the United States, about 16 million people. Only about 1% of them will progress to dementia each year. As most of the old aged people suffer from memory impairment issue, they might not even remember to take up their medications, which is a serious dilemma because this might even cause a severe health issue to them. So, we address this problem and came up with a solution of developing an automated reminder system which assists the elderly people by reminding them to take their medication at the right time.
2.	Idea / Solution description	We plan to build a web application interface using Node Red that would enable caretakers to provide the medicine name and time at which the medication should be provided as an input. This web application is bounded with the IBM Cloudant database service where the medication data and time will be stored. The web application is interfaced with the IoT device which is used to control the Sound actuators. The IoT device is integrated with web application by means of IBM Watson IoT platform. The IoT devices are realized in the project with the help of TinkerCad or any other similar IoT-supported simulation software. The data is sent as the input. The Web application Continuously monitors the time and checks with input data. When the time is identical with the input time it pushes a message through the IoT devices realized via simulation. The Sound actuators perform the Text to Speech Transition Service by which the output will be converted as an audio signal. The audio signal can be easily understandable and reminds the user to take his/her medication on time.

3.	Novelty / Uniqueness	Our motive in this project is to assist the elderly people by reminding them to take their medications on time. A step ahead we would like to bring in another innovation that makes this project even better by introducing the **Bone Conduction Methodology** that helps blind old people to interpret their surroundings ahead of them. Bone conduction is the **conduction of sound** to the inner ear primarily through the bones of the skull, allowing the hearer to perceive audio content without blocking the ear canal this allow the
		users to hear audio content while maintaining situational awareness. This has also been acknowledged by NASA in their press release where the astronauts in space could communicate with one another in the absence of gravity by using Bone Conduction phones. Normal person could perceive sound vibrations because of cochlea in ear canal. Deaf persons cannot perceive as their cochlea could have been damaged. Bone conduction phones principle is implemented in the piezoelectric transducers that convert electrical signals(voltage) into vibration signals(mechanical). This can be incorporated with the help of sound amplifiers powered by microcontroller interfaced with transducers.
4.	Social Impact / Customer Satisfaction	Old people often find it difficult to remember important things especially when they suffer from illness, it further deprives their ability to remember important things. They begin to depend on others to help them but no one can be there for them around the clock to old people often find it difficult to remember important things especially when they suffer from illness it further deprives their ability to remember things. They become dependent on others to help them but no one can be there for them around the clock to assist them. Old patients need to take up prescribed medicines on time but they eventually forget and it further aggravates their health issues. In this modern era people may find difficult to spend time with the elderly people in their house also they don't find time to take care and monitor the elderly people in the house. About 40% of people aged 65 or older have age associated memory impairment—in the United States, about 16 million people. Only about 1% of them will progress to dementia each year. As most of the old aged people suffer from memory impairment issue, they might not even remember to take up their medications, which is a serious dilemma because this might even cause a severe health issue to them.

5.	Business Model (Revenue Model)	

THE BUSINESS MODEL

KEY PARTNERS
- ELECTRONICS INDUSTRIALISTS
- CLOUD SERVICE PROVIDERS
- INNOVATORS
- INVESTORS
- PRIVATE CARE TAKER AGENCIES

KEY ACTIVITIES
- ALGORITHM AND APP DEVOLOPMENT
- HIGH QUALITY HARDWARE COMPONENTS
- MARKETING OUR INNOVATION

KEY RESOURCES
- CLOUD PLATFORMS.
- COMMERCIAL PRODUCTS
- R&D TEAM

VALUE PROPOSITION
- USER FRIENDLY INTERFACE.
- EASILY PORTABLE
- AFFORDABLE MAINTENANCE
- IOT BASED AND VERY CONGENIAL

CUSTOMER RELATIONSHIP
- EXCELLENT PRODUCT SERVICE
- ASSURED WITH WARRANTY

CHANNELS
- RESEARCH PAPER AND INDUSTRIAL PUBLICATIONS
- DIRECT SALES
- E COMMERCE

CUSTOMER SEGMENTS
- GOVERNMENT AIDED NGO'S.
- SENIOR CITIZENS
- PRIVATE DAY CARE AGENCIES.
- TARGETING ALZYMER PATIENTS.
- PEOPLE WHO COULD'NT AFFORD CARE TAKERS CAN ALSO AVAIL OUR PRODUCT, WHICH IS CHEAPER THAN OTHERS.

COST STRUCTURE
CLOUD STORAGE - 3000   EQUIPMENTS - 1000
WEB DEVELOPMENT - 4000
DIGITAL MARKETING - 1750
PRODUCT RETURNS - 5000
MISCELLANEOUS - 2000

REVENUE STREAMS
- PRODUCTION COST OF BASIC MODEL- INR 1500
- MARKET PRICE FOR BASIC MODEL: INR 2000
- 25% PROFIT MARGIN

3.4 PROBLEM SOLUTION FIT:

CUSTOMER SEGMENTS
- Senior citizens who are unable to live independently and require the aid of another person
- Also, people with disabilities who are in constant care of others

CUSTOMER LIMITATIONS
- As the product is intended for people who find it hard to live independently, it must be easy to use, cost effective and highly efficient for their use

AVAILABLE SOLUTIONS
- Currently Reminder apps in mobile phones exist but old aged people find it to adapt to modern tech phones
- Another way is to make use of stickers and labels but there is a probability of missing it by forgetting things

PROBLEMS
- The main problem to which the product addresses is the inability of senior citizens, disabled people to track medicines on time and in take it.
- It will also be helpful for busy office going people who often skip their medicine interval because of their tight schedules

PROBLEM SOLUTION-FIT AND ARCHITECTURE

EMOTIONS
Surely, the intended customers will be happy to receive the product that makes them independent.

BEHAVIOUR
The intended product will surely make impact in the addressed market section and will be a hit on successful implementation

TRIGGERS
- Marketing as a aiding tool with leading pharmaceutical chains, doctors and nursing homes will help to take it to masses
- Joint collaboration with corporations for marketing will be helpful in order to establish as a startup.

CAUSE FOR PROBLEM
- Human Beings tend to forget things easily. It's the nature of any human being to skip the medicine interval because of their busy schedule
- Also, the inability of some people to remember because of redundant brain activity

CHANNELS
As a startup P2P, P2C model will be beneficial in gaining experience in this field and also building a network, getting feedback and making corrections as per that

SOLUTION
Our solution is the development of **easy to use**, **standalone hardware device** that is **highly efficient** as well as **cost effective** accustoming to our customer segment.

4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENTS:

Functional Requirements:

Following are the functional requirements of the proposed solution.

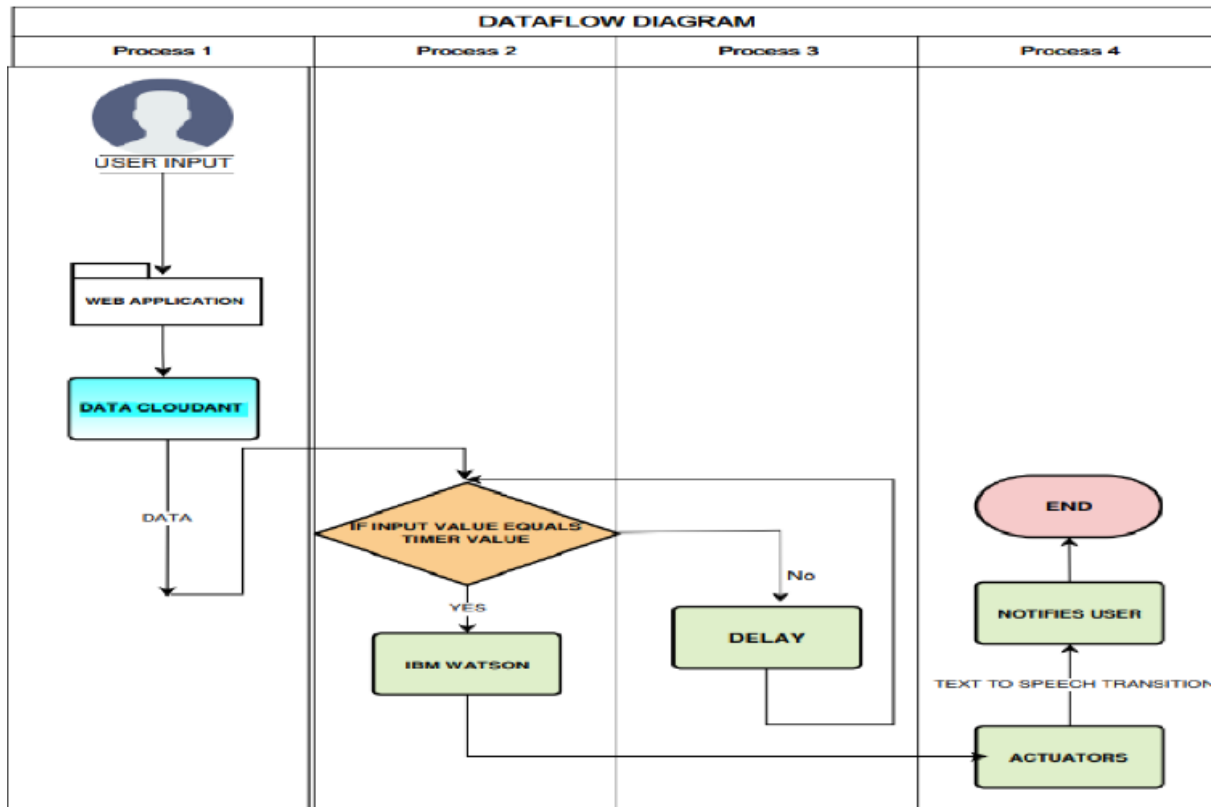| FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through our web application.
FR-2	User Confirmation	Confirmation within the web application.
FR-3	User Input Medication Data	Data should be fed to the dashboard text fields in the application.
FR-4	Acknowledgement	Data will be saved in the application and acknowledgement will be given to the user.
FR 5	Internet Connectivity	User should have a stable internet connection to access the functionality of our project via web application.
FR 6	Actuators	Speakers are required to notify the users.

4.2 NON FUNCTIONAL REQUIREMENTS:

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The whole system can be accessed through web application. Hence it is very easy to use.
NFR-2	**Security**	The data will be stored in the cloud so the user's data is secured.
NFR-3	**Reliability**	As the data is stored in cloud, the data cannot be manipulated externally so it is highly reliable.
NFR-4	**Performance**	As virtual sensors are used for sensing operations its values are quite accurate. Hence performance would be considerably good.
NFR-5	**Availability**	The Cloud server is active all the time the user can avail it anytime.
NFR-6	**Scalability**	The application can be used in any kind of operating system either in small or large OS so the scalability is very high.

5. PROJECT DESIGN:

5.1 DATA FLOW DIAGRAMS:

5.2 SOLUTION AND TECHNICAL ARCHITECTURE:
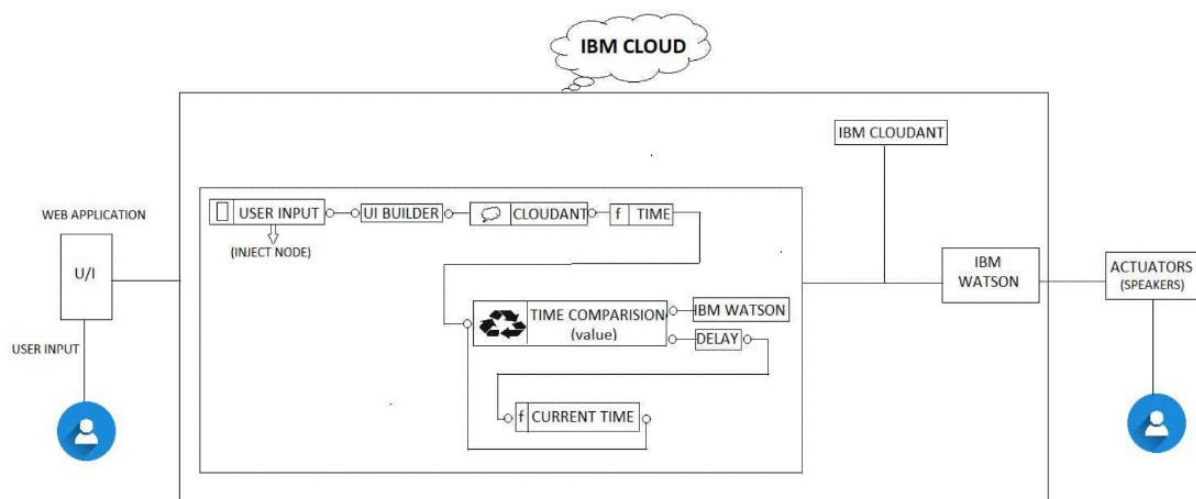
5.3 USER STORIES:

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (web user)	Registration	USN-1	As a user, I can register for the application by entering the username and password.	I can access my account / dashboard	High	Sprint-1
	Login	USN-2	As a user, I can log into the application by entering username & password		High	Sprint-1
	Dashboard	USN-3	The user can enter their medication name and the time at which the medicines should be provided can be given as input in dashboard.		High	Sprint-2

6. PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING AND EXECUTION:

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

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	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	5	High	2
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation within the web application once I have registered for the application	3	Low	1
Sprint-1	Login	USN-3	As a user, I can login into the application using my email and password	5	High	3
Sprint-1	Dashboard	USN-4	As a user, I can access the dashboard to enter the name of the medicines with their timings to be taken	4	Medium	1
Sprint-1	Data Save Acknowledgement	USN-5	Data will be saved in the web application and acknowledgement will be given to the user.	3	Low	1
Sprint-2	User-Web UI interface	USN-6	The Web UI should get inputs from the user	7	High	2
Sprint-2	App interface	USN-7	An application for a user to access the facility	6	Medium	2
Sprint-2	Store Data	USN-8	User's data must be saved properly in Database	7	High	3
Sprint-3	IoT Watson Communication	USN-9	The data from IoT device should reach the cloud though this	6	Medium	2

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Node-Red service	USN-10	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	Medium	2
Sprint-3	Integration of Cloud & Node-Red Service	USN-11	Must ensure if there is an established communication between all services	7	High	3
Sprint-4	Text-To-Speech service	USN-12	Data processed from the IBM Watson must be converted into speech and be reverted back to users	10	High	4
Sprint-4	Alarm Reminder	USN-13	The Alarm of the remainder should be done based on the medication time	10	High	4

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	28 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	04 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

6.2 SPRINT DELIVERY AND SCHEDULE:

Burndown Chart:
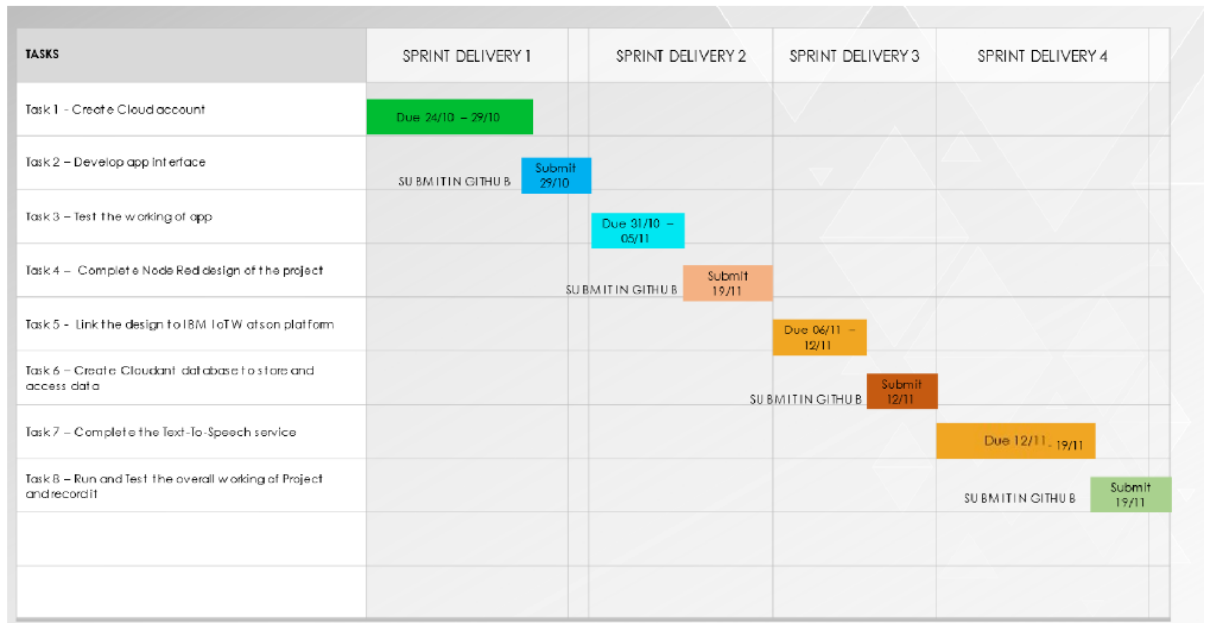
7. CODING AND SOLUTIONING:

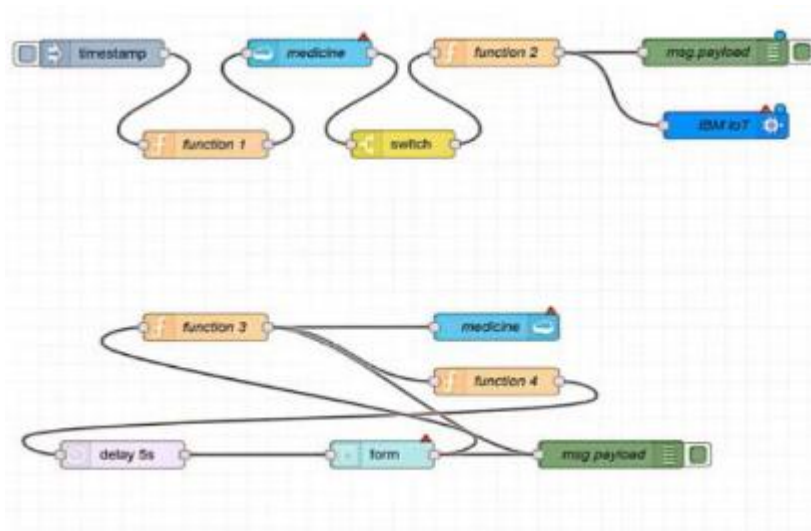## 7.1 FUNCTION TO COMPARE TIME:

```
ar
d=new
Date();
        var utc = d.getTime() + (d.getTimezoneOffset() * 60000);
        var offset = 5.5;
        // @ts-ignore
        newDate = new Date(utc + (3600000 * offset));
        // @ts-ignore
        var n = newDate.toISOString()
        var date = n.slice(0, 10)
        var time = n.slice(11, 16)
        global.set('time', time)
        msg.payload - date + " " + time
        return msg;
```

7.2 ACCESSING API'S OF TEXT TO SPEECH SERVICE:

```python
from ibm_watson import TextToSpeechV1
from ibm_cloud_sdk_core.authenticators import IAMAuthenticator
authenticator = IAMAuthenticator('1SuMpBioLx9PuvKX-
wnvMh3Z3lQbUKcXZErWleXdmY9j')
text_to_speech = TextToSpeechV1(
    authenticator=authenticator
)
text_to_speech.set_service_url('https://api.au-syd.text-to-
speech.watson.cloud.ibm.com/instances/d3e4f1ee-ccf4-4e79-a3bf-71cdb9fdf9e8')
with open('hello_world.wav', 'wb') as audio_file:
    audio_file.write(
        text_to_speech.synthesize(
            'Take Crocin Now',
            voice='en-US_AllisonV3Voice',
            accept='audio/wav'
        ).get_result().content)
```

7.3 NODE RED DESIGN:

7.4 NODE RED DEBUG USING COMMAND PROMPT:

7.5 MIT APP INVENTOR – DESIGN:
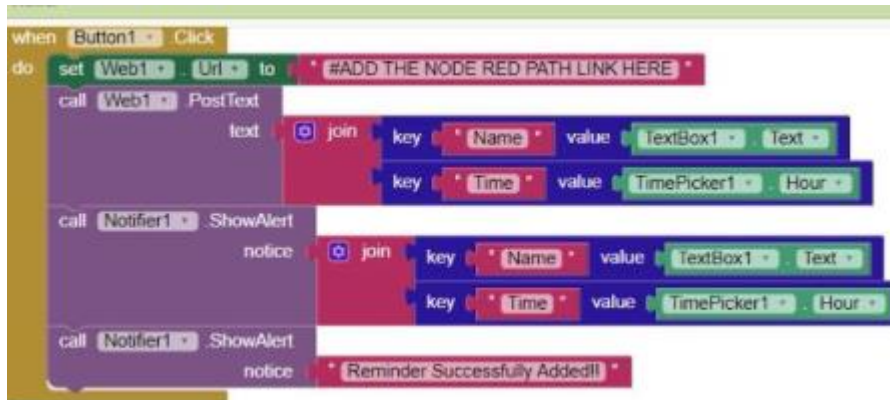
7.6 IBM CLOUDANT REGISTRATION:

7.7 IBM WATSON DEVICE REGISTRATION:

Deployment details

CRN	crn:v1:bluemix:public:cloudantnosqldb:eu-gb:a/51092465b31c48fdb3ca4edea1e2011 a:d14f8894-5b9c-467b-8ead-2037b9fc3e23::
Location	London
External endpoint	https://e6b13ac7-a727-4477-a6d2-6f657b7dda84-bluemix.cloudant.com
External endpoint (preferred)	https://e6b13ac7-a727-4477-a6d2-6f657b7dda84-bluemix.cloudantnosqldb.appdo main.cloud
Authentication methods	IBM Cloud IAM and Cloudant credentials Migrate to IAM Only
Activity Tracker event types ⓘ	Management ⌄ Save
Disk encryption	Yes. Automatically generated disk encryption key.

8 TESTING:

8.1 TEST CASES:

The test cases used in the project were random and based on the demanding situations.

8.2 UAT REPORT:

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	8	3	4	20
Duplicate	0	0	1	3	4
External	1	3	0	2	6
Fixed	12	3	9	12	37
Not Reproduced	1	0	0	0	1
Skipped	1	0	0	1	2
Won't Fix	4	0	0	4	8
Totals	24	14	13	26	77

9. RESULTS:

The project was successfully implemented and deployed, ready for going live.

9.1 PERFORMANCE METRICS:

						NFT - Risk Assessment			
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Risk Score	Justification	
1	Personal Assistant For Seniors who are Self Reliant	New	Low	No Changes	Moderate	Node Red Services are Crucial and without it the system is non functional	RED	We can seen the importance of it.	
2	Personal Assistant For Seniors who are Self Reliant	New	Low	No Changes	Moderate	Watson IoT Platform is used for connectivity, without it the ouput device won't be connected.	RED	The connectivity issues due to high traffic, gave its importance.	
3	Personal Assistant For Seniors who are Self Reliant	New	Low	No Changes	Moderate	Cloudant DB is used to store the values, else the user input cannot be stored.	ORANGE	Data is essential part of any process.	
4	Personal Assistant For Seniors who are Self Reliant	Old	Low	No Changes	Less	TTS Service is used to give output to users. Else there won't be any point in the project.	ORANGE	Output Source.	
5	Personal Assistant For Seniors who are Self Reliant	Old	Low	No Changes	Less	Web UI is used to give input to the system, Both Web UI system or MIT app can be used.	YELLOW	Input Source.	

		NFT - Detailed Test Plan		
S.No	Project Overview	NFT Test approach	umptions/Dependencies/R	Approvals/SignOff
1	Personal Assistant for Seniors w	Random Values	Dependent on Node Red, C	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	Personal Assistant for Seni	Random Values	Met	Success	GO	Proceed to Deployment	Closed	Approved

10. ADVANTAGES AND DISADVANTAGES:

The ability to provide highly economical, stable and efficient solution for the problems faced by senior citizens for medical prescription reminder.

The use of network-based connectivity is a key disadvantage as their functioning is based on network coverage.

11. CONCLUSION:

It was an amazing journey going through various stages of project development. The first project of ours was a great success boosting our morals.

12. FUTURE SCOPE:

The project can be further developed into commercial product with many more functionalities which will be initiated in future.

13. APPENDIX:

GIT HUB REPO LINK:

https://github.com/IBM-EPBL/IBM-Project-12450-1659451627

PROJECT DEMO VIDEO LINK:

https://github.com/IBM-EPBL/IBM-Project-12450-1659451627/blob/Main/Final%20Deliverables/Final%20Deliverables%20-%20Project%20Demo.mp4