

## **PROJECT REPORT**

### **1. INTRODUCTION**

The category of patients involve all human beings-teachers, students, businessmen, housewives, children and also all of us have a busy hectic schedule. Today's life is full of responsibilities and stress. So people are prone to diseases of different types and it is our duty to make ourselves stay fit and healthy. If the patient stays at home then he or she might get someone to look after him/her but when one is not at home, is out of the city or state away from home then it is hard for the family members to call them and remind them their dosage timings every time. In our developing and technology dependent life we totally rely on gadgets especially smart phones. Today everyone has a smart phone. With this we get an opportunity to use technology in a better way so that it can be made useful to us. And it plays an important part in our daily life and helps us staying fit in many ways. The remarkable problem is that patients forget to take the proper medicines in proper proportion and in proper time. Medication adherence, which refers to the degree or extent to which a patient takes the right medication at the right time according to a doctor's prescription, has recently emerged as a serious issue because many studies have reported that non adherence may critically affect the patient, thereby raising medical cost. Medical nonadherence is a common, complex and costly problem that contributes to poor treatment outcomes and consumes health care resources.

#### **1.1 Project Overview**

In this work, a flexible and extensive digital platform for Smart Homes is presented, exploiting the most advanced technologies of the Internet of Things, such as Radio Frequency Identification, wearable electronics, Wireless Sensor Networks, and Artificial Intelligence. Thus, the main novelty of the paper is the system-level description of the platform flexibility allowing the interoperability of different smart devices. This research was developed within the framework of the operative 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.

## **1.2 Purpose**

Non-medical home care often includes the service of “medication reminders” for people who have prescription medicines to take. It might seem odd that someone needs a reminder when there are pill boxes with the days of the week and more, but it’s an important part of well-being. Some people are living with cognitive impairment due to some form of dementia or trauma and truly cannot remember to take a pill.

Medications often come with crucial instructions such as taking them at a certain time of day, with or without foods, taking them with or without certain liquids, keeping them at specific temperatures, and each of these needs to be adhered to in order for the medicine to work or minimize possible side effects.

### **Reminders vs. Assistance vs. Administration**

- Medication reminders are just that: someone telling you or a loved one that it is time to take a pill or a spoonful of medicine.
- Skilled services might include “medication assistance” in which a nurse or other appropriately- trained person gives someone their medicine; this might include placing a pill on their tongue when they are unable to do so for themselves.
- “Medication administration” begins with opening the container, therefore unlicensed caregivers in the home cannot assist to this extent.

### **Safety & Medication Reminders**

- According to the Centers for Disease and Prevention (CDC), between 2011-2014, “the percent of person using at least one prescription drug in the past 30 days” was 48.9%. A Mayo Clinic study found that 20% of Americans are on five or more medications. Other statistics show 8 out of 10 older Americans take at least one medication per day to help manage a chronic illness.
- When any medication is not taken or taken incorrectly, there can be a lack of improved health or harmful side effects. After a hospital discharge, there are often important medications to take—even for the short-term—that can mean the difference between healing at home and a readmittance.
- When someone is routinely available to remind a person to take their medicine, it can be part of keeping them safe at home.

## 2. LITERATURE SURVEY

### 2.1 Existing problem

If you're helping an older person with health and healthcare, chances are that person is taking at least a few prescription medications, if not several. Do you ever wonder if he or she is on the right medications? Do you worry about side-effects and interactions? These are sensible concerns to have. Although medications do often help maintain health and wellbeing, studies have repeatedly shown that lots of older adults end up suffering from problems related to medication. So I want to share a list of common ways that medications affect the health and wellbeing of aging adults. I'll then explain what you can do, to minimize problems.

### 2.2 References

1. Lee, J.; Kim, D.; Ryoo, H.-Y.; Shin, B.-S.; Lee, J.; Kim, D.; Ryoo, H.-Y.; Shin, B.-S. Sustainable Wearables: Wearable Technology for Enhancing the Quality of Human Life. *Sustainability* 2016, 8, 466. [CrossRef]
2. Cedillo, P.; Sanchez, C.; Campos, K.; Bermeo, A. A Systematic Literature Review on Devices and Systems for Ambient Assisted Living: Solutions and Trends from Different User Perspectives. In *Proceedings of the 2018 International Conference on eDemocracy & eGovernment (ICEDEG) IEEE, Ambato, Ecuador, 4–6 April 2018*; pp. 59–66.
3. Baig, M.M.; Afifi, S.; GholamHosseini, H.; Mirza, F. A Systematic Review of Wearable Sensors and IoT-Based Monitoring Applications for Older Adults—A Focus on Ageing Population and Independent Living. *J. Med. Syst.* 2019, 43, 233. [CrossRef]
4. Seneviratne, S.; Hu, Y.; Nguyen, T.; Lan, G.; Khalifa, S.; Thilakarathna, K.; Hassan, M.; Seneviratne, A. A Survey of Wearable Devices and Challenges. *IEEE Commun. Surv. Tutor.* 2017, 19, 2573–2620. [CrossRef]
5. Blackman, S.; Matlo, C.; Bobrovitskiy, C.; Waldoch, A.; Fang, M.L.; Jackson, P.; Mihailidis, A.; Nygård, L.; Astell, A.; Sixsmith, A. Ambient Assisted Living Technologies for Aging Well: A Scoping Review. *J. Intell. Syst.* 2016, 25, 55–69. [CrossRef]
6. Peetoom, K.K.B.; Lexis, M.A.S.; Joore, M.; Dirksen, C.D.; De Witte, L.P. Literature review on monitoring technologies and their outcomes in independently living elderly people. *Disabil. Rehabil. Assist. Technol.* 2015, 10, 271–294. [CrossRef] [PubMed]

7. Reisberg, B.; Prichet, L.; Mosconi, L.; John, E.R.; Glodzik-Sobanska, L.; Boksay, I.; Monteiro, I.; Torossian, C.; Vedvyas, A.; Ashraf, N.; et al. The pre-mild cognitive impairment, subjective cognitive impairment stage of Alzheimer's disease. *Alzheimer Dement.* 2008, 4, S98–S108. [CrossRef] [PubMed]
- Sensors 2020, 20, 2826 21 of 22
8. Azzawi, M.A.; Hassan, R.; Azmi, K.; Bakar, A. A Review on Internet of Things (IoT) in Healthcare *IEEE*
- 802.11aa Intra-AC Prioritization View project A Rule-Based Technique to Detect. Router Advertisement
- Flooding Attack Against Web Application View project. *Int. J. Appl. Eng. Res.* 2016, 11, 10216–10221.
9. Chen, S.; Lee, H.; Chen, C.; Huang, H.; Luo, C. Wireless Body Sensor Network With Adaptive Low-Power
- Design for Biometrics and Healthcare Applications. *IEEE Syst. J.* 2009, 3, 398–409. [CrossRef]
10. Rodrigues, D.; Luis-Ferreira, F.; Sarraipa, J.; Goncalves, R. Behavioural Monitoring of Alzheimer Patients with Smartwatch Based System. In *Proceedings of the 2018 International Conference on Intelligent Systems (IS) IEEE*, Funchal-Madeira, Portugal, 25–27 September 2018; pp. 771–775.
11. Ehrler, F.; Lovis, C. Supporting elderly homecare with smartwatches: Advantages and drawbacks. *Stud. Health Technol. Inform.* 2014, 205, 667–671. [PubMed]
12. Sharma, J.; Kaur, S. Gerontechnology—The study of alzheimer disease using cloud computing. In *Proceedings of the 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS) IEEE*, Chennai, India, 1–2 August 2017; pp. 3726–3733.
13. Aljehani, S.S.; Alhazmi, R.A.; Aloufi, S.S.; Aljehani, B.D.; Abdulrahman, R. iCare: Applying IoT Technology for Monitoring Alzheimer's Patients. In *Proceedings of the 2018 1st International Conference on Computer Applications & Information Security (ICCAIS) IEEE*, Riyadh, Saudi Arabia, 4–6 April 2018; pp. 1–6.
14. Creation of an Assisted Living Environment for Elderly People using Ubiquitous Networking Technologies. Available online: <https://www.iimcal.ac.in/sites/all/files/sirg/1-1-ageing-creation-assistedliving.pdf> (accessed on 15 May 2020).
15. Karakaya, M.; Sengül, G.; Bostan, A. Remotely Monitoring Activities of the Elders Using Smart Watches. *Int. J. Sci. Res. Inf. Syst. Eng.* 2017, 3, 56.
16. Barri Khojasteh, S.; Villar, J.R.; de la Cal, E.; González, V.M.; Sedano, J.; Yazgan, H.R. Evaluation of a Wrist-Based Wearable Fall Detection Method; Springer: Cham, Switzerland, 2018; pp. 377–386.
17. Algase, D.L.; Beattie, E.R.A.; Leitsch, S.A.; Beel-Bates, C.A. Biomechanical activity devices to index wandering behaviour in dementia. *Am. J. Alzheimer Dis.* 2003, 18, 85–92. [CrossRef]

18. Chong, Z.H.K.; Tee, Y.X.; Toh, L.J.; Phang, S.J.; Liew, J.Y.; Queck, B.; Gottipati, S. Predicting Potential Alzheimer Medical Condition in Elderly Using IOT Sensors—Case Study; Singapore Management University: Singapore, 2017.
19. Thorpe, J.R.; Rønn-Andersen, K.V.H.; Bie ´n, P.; Özkil, A.G.; Forchhammer, B.H.; Maier, A.M. Pervasive assistive technology for people with dementia: A UCD case. *Healthc. Technol. Lett.* 2016, 3, 297–302. [CrossRef]
20. Ellis, R.J.; Ng, Y.S.; Zhu, S.; Tan, D.M.; Anderson, B.; Schlaug, G.; Wang, Y. A Validated Smartphone-Based Assessment of Gait and Gait Variability in Parkinson’s Disease. *PLoS ONE* 2015. [CrossRef]
21. Weiss, A.; Herman, T.; Mirelman, A.; Shiratzky, S.S.; Giladi, N.; Barnes, L.L.; Bennett, D.A.; Buchman, A.S.; Hausdorff, J.M. The transition between turning and sitting in patients with Parkinson’s disease: A wearable device detects an unexpected sequence of events. *Gait Posture* 2019, 67, 224–229. [CrossRef]
22. Mc Ardle, R.; Morris, R.; Hickey, A.; Del Din, S.; Koychev, I.; Gunn, R.N.; Lawson, J.; Zamboni, G.; Ridha, B.; Sahakian, B.J.; et al. Gait in Mild Alzheimer’s Disease: Feasibility of Multi-Center Measurement in the Clinic and Home with Body-Worn Sensors: A Pilot Study. *J. Alzheimers Dis.* 2018, 63, 331–341. [CrossRef] [PubMed]

## 2.3 Problem Statement Definition

When the population in a country consists of a fastincreasing percentage of seniors as compared to the youngsters, there may be various societal and economicrelated issues that may affect the country and the usual way of life in that particular country. An ageing society is loosely defined as when it’s citizens who are aged above the age of 60 years account for more than 10% of the total population in that particular country. One of the main problems faced by the elderly is their forgetfulness, especially when it comes to consuming their medications on time and on a consistent basis. Multiple researches have supported the idea that the Internet of Things (IoT) can be used to solve the issues faced by the elderly. By solving the medication consumption reminder issue, a large section of the elderly will be able to live independently, thus reducing the dependency of the elderly on other family members to remind them to take their medicines.

### 3. IDEATION & PROPOSED SOLUTION

#### 3.1 Empathy Map Canvas

An **empathy map** is a collaborative visualization used to articulate what we know about a particular type of user. It externalizes knowledge about users in order to

- create a shared understanding of user needs
- aid in decision making.

#### Why Use Empathy Maps

Empathy maps should be used throughout any UX process to establish common ground among team members and to understand and prioritize user needs. In user-centered design, empathy maps are best used from the very **beginning of the design process**.

Both the process of making an empathy map and the finished artifact have important benefits for the organization:

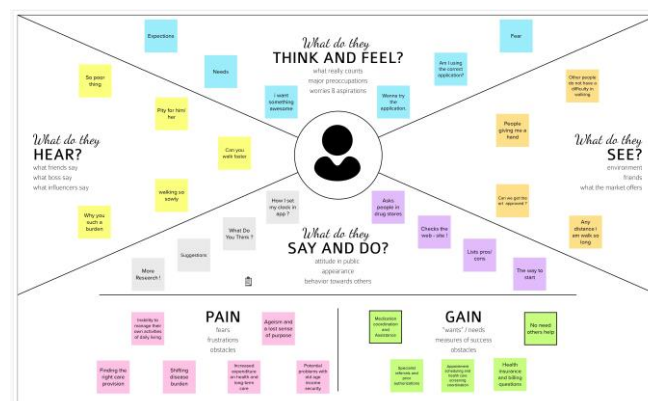


Fig 3.1 Empathy Map

- **Capture who a user or person is.** The empathy-mapping process helps distill and categorize your knowledge of the user into one place. It can be used to:
  - Categorize and make sense of qualitative research (research notes, survey answers, user-interview transcripts)
  - Discover gaps in your current knowledge and identify the types of research needed to address it. A sparse empathy map indicates that more research needs to be done.
  - Create personas by aligning and grouping empathy maps covering individual users

- **Communicate a user or persona to others:** An empathy map is a quick, digestible way to illustrate user attitudes and behaviors. Once created, it should act as a source of truth throughout a project and protect it from bias or unfounded assumptions.

### 3.2 Ideation & Brainstorming

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity.

Brainstorming is a great way to generate a lot of ideas that you would not be able to generate by just sitting down with a pen and paper. The intention of brainstorming is to leverage the collective thinking of the group, by engaging with each other, listening, and building on other ideas. Conducting a brainstorm also creates a distinct segment of time when you intentionally turn up the generative part of your brain and turn down the evaluative part. You can use brainstorming throughout any design or work process, of course, to generate ideas for design solutions, but also any time you are trying to generate ideas, such as planning where to do empathy work, or thinking about product and services related to your project.

### 3.3 Proposed Solution

**Proposed Solution** means the combination of software, hardware, other products or equipment, and any and all services (including any installation, implementation, training, maintenance and support services) necessary to implement the solution described by Vendor in its Proposal.

### Problem Statement

Elderly people living alone in empty nests have safety hazards such as mistaking, missed medication, and mildew of the medication; at the same time, understand the medication situation of the elderly, carry out information statistics and feedback, and provide references for doctors or pharmacies. So they need to be dependent on other persons which makes them feel more reliable on others. There is lot of challenge for medical professionals to have an eye on patients 24x7.

### Idea / Solution description

To avoid such complications, the medicine remainder system is developed. For the user (caretaker), a web application is created that allows him to choose the

preferred time and medication. The IBM Cloud securely stores and protects all of the customer's or user's information. If the medication's due time approaches, the web application will use the IBM IoT platform to send the medication's name to the IoT device. The device will receive the medicine name and notify the user with voice commands.

## Social Impact / Customer Satisfaction

It will also serve to assist the elderly in a more effective manner and will be used to improve their daily life in terms of medicine consumption. Our system promotes safe and independent living which makes them more self-reliable and healthier cared-for individuals. From anywhere in the world, family members may check on a loved one's wellbeing.

## Scalability of the Solution

The proposed application is more convenient to use in both Android and ios based systems. The user can customize the timing of the intakes and update his medical records. This solution is provided with Cloud storage with needed space. Extra storage space can be provided with the subscription.

### 3.4 Problem Solution fit

The Problem-Solution Fit canvas is based on the principles of Lean Startup, LUM (Lazy User Model) and User Experience design. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why.

It is a template to help identify solutions with higher chances of solution adoption, reduce time spent on testing and get a better overview of the current situation

Project Title: Personal Assistance For Seniors Who Are Self-Reliant				Project Design Phase-I - Solution Fit Template		Team ID: PNT2022TMD42536	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <div>● Senior Citizens. ● Persons who have Amnesia. ● Peoples who are lonely senior and have busy schedule.</div>	6. CUSTOMER CONSTRAINTS <div>● Device will not be able to keep track of other health signs of the patient and thus, will be limited in providing a wholesome elderly patient care experience. ● All the people cannot afford as the manufacturing cost of these device.</div>	5. AVAILABLE SOLUTIONS <div>● Keep track of their medication consumption patterns. receive reminders to consume their medications. ● The system cannot monitor other health parameters of the user.</div>				Problem Statement
	2. JOBS-TO-BE-DONE / PROBLEMS <div>● Elderly folks occasionally fail to take their medications at the right time and need to dependent on other persons which makes them feel more reliable on them. ● It is challenging for medical professionals to keep an eye on patients round-the-clock.</div>	9. PROBLEM ROOT CAUSE <div>● Cognitive decline occurs as people age. Dementia is a common cognitive health condition that affects most of the senior citizens. ● Due to muscle weakness, seniors may no longer be able to stand over the stove to cook. Consuming inadequate nutrients may be the outcome of forgetfulness or depression in the seniors. A normal part of aging is the loss of social Connections. This creates the depression in the seniors.</div>	7. BEHAVIOUR <div>● This interactive drug reminder to maximize the connection between the elderly and their families. Reminding the elderly to take their medicine is a very human and practical way to communicate. ● It can reduce the complexity of drug administration and reduce the burden on families of dispensing drugs to the elderly.</div>				
Focus on CS, fit into CC	3. TRIGGERS <div>People simply forget /skip or stop their medications which leads to non-adherence. Trigger helps people to integrate healthy behavior by using this reminder in a very simple way.</div>	10. YOUR SOLUTION <div>As we all know, medication is a very important part for senior citizens. There are so many who need to notice when they should take their medicine. So the medicine reminder system is developed. ● If the medication's due time approaches, the web application will use the IBM IoT platform to send the medication's name to the IoT device. ● The device will receive the medicine name and notify the user with voice commands.</div>	8. CHANNELS of BEHAVIOUR <div>Once the medicine-taking time arrives give alarm through the alarm device to remind a patient to take medicine. ● A medicine list can be updated in a fully automatic manner, and manual input is not needed, so that the intelligent medicine-reminder is simple and convenient so that the patient does not take the medicine on time and the medical treatment effect is poor are solved.</div>				Solution
Focus on CS, fit into CC	4. EMOTIONS: BEFORE / AFTER <div>Most of the senior person suffer from Alzheimers so they frequently forget to take medicine and this impact in their health. But after using the medicine reminder they can take their medicine with correct dosage by themselves without waiting for others.</div>						

Fig 3.2 Problem Solution Fit



## 4. REQUIREMENT ANALYSIS

Requirements analysis involves frequent communication with system users to determine specific feature expectations, resolution of conflict or ambiguity in requirements as demanded by the various users or groups of users, avoidance of feature creep and documentation of all aspects of the project development process from start to finish. Energy should be directed towards ensuring that the final system or product conforms to client needs rather than attempting to mold user expectations to fit the requirements.

### 4.1 Functional requirement

Functional requirements may involve calculations, technical details, data manipulation and processing, and other specific functionality that define what a system is supposed to accomplish.<sup>[2]</sup> Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Uploads	Interacts with User and plays a vital role for the senior citizens who don't need a caretaker to take their medicines.
FR-2	User Selection	Knowledge about the medicines is quiet enough for the selection
FR-3	User Input	An app is built for the user (caretaker) which enables him to set the desired time and medicine
FR-4	User Output	The output will be given by a voice commands to the user.
FR-5	User Storage	IBM CLOUDANT DB is used for storage

**Table 4.1 Functional Requirement**

### 4.2 Non-Functional requirements

Non functional Requirements (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability and usability. They serve as constraints or restrictions on the design of the system across the different backlogs.

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	IOT device verifies the usability is a special and important perspective to analyze user requirements, which can further improve the design quality. In the design process with user experience as the core, the analysis of user's product usability can indeed help designers better understand user's potential.
NFR-2	<b>Security</b>	As IBM CLOUDANT DB is used it is more safer to store the details of the medicine an name of the medicine and time so it can be efficiently and safely used by the user.
NFR-3	<b>Reliability</b>	Defect free. Higher accuracy rate. Performs correctly in every scenario.
NFR-4	<b>Performance</b>	Since IBM CLOUDANT DB is used to store the medicine name it send the medicine name to the IOT devices and notify through a voice command and thus in which it plays a very good performance.

**Table 4.2 Non-Functional Requirements**

## **5. PROJECT DESIGN**

### **5.1 Data Flow Diagrams**

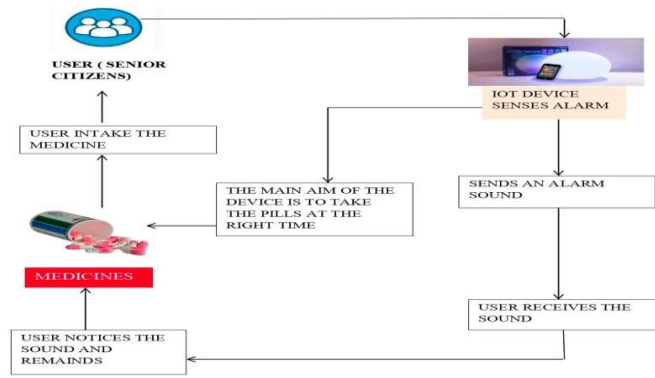
A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination.

Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one.

Like all the best diagrams and charts, a DFD can often visually “say” things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That’s why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

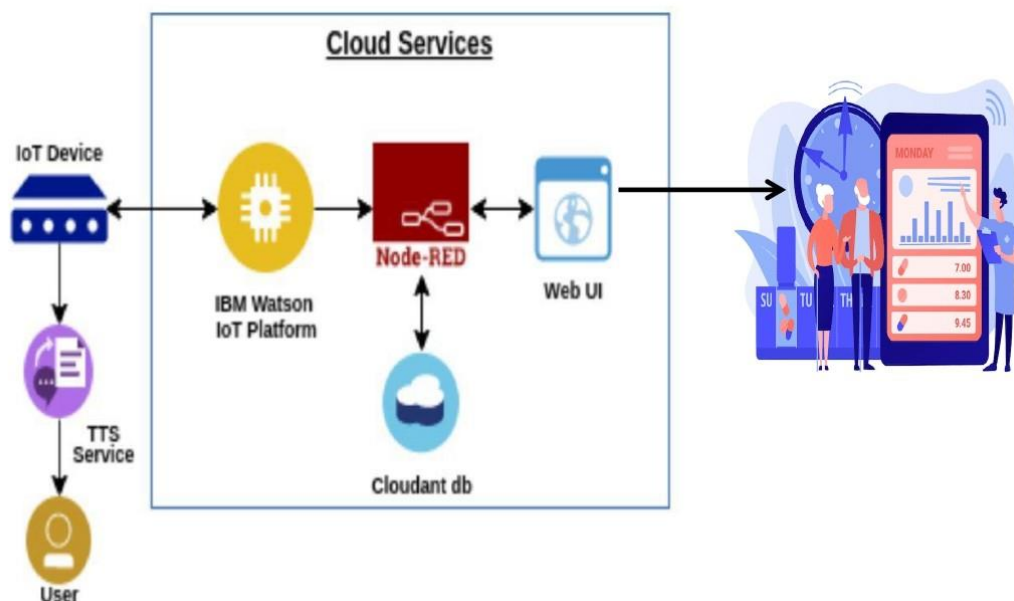
### **5.2 Solution & Technical Architecture**

Solution architecture is comprised of several complex processes and sub-processes. It plays a central role in an organization’s efforts to introduce and successfully implement new technology solutions. In the first step, solution architecture specialists closely look at how the different elements of business, information, and technology can be applied to solve a specific problem.



**Fig 5.2 Solution Architecture**

Next, they propose a combination of building blocks that provides the best possible fix. This process is very detail-oriented and serves as a connecting piece between enterprise architecture and technical architecture. It also requires a breadth of knowledge in the technical and business inner workings of the company. After solution architects have designed a solution for an existing problem, it is their job to manage the tasks and activities that are involved with its successful implementation.



**Fig 5.2.1 Technology Architecture**

## 5.3 User Stories

A **user story** is a short, simple description of a feature told from the perspective of the person who desires the new capability, usually a user or customer of the system.

User Type	Functional Requirement (Epic)	User Story Number	Personal Assistance for Seniors Who Are Self-Reliant	Acceptance Criteria	Priority	Release
Admin	Log in	USN-1	As an admin, I give a user id and passwords for ever users	I can manage user's account	Medium	Sprint -1
Caretaker's	Dashboa rd	USN-2	As an care taker, i will manage patients levels to monitor every day.	I can manage monitoring patient's	High	Sprint -2
Patient's	Log in	USN-3	As a patient, i will follow the every day medicine for told assistant	I can follow the caretakers/ assistant instruction	Medium	Sprint -2

**Table 5.3 User Stories**

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

‘Project planning’ is all about choosing and designing effective policies and methodologies to attain project objectives. While ‘Project scheduling’ is a procedure of assigning tasks to get them completed by allocating appropriate resources within an estimated budget and time-frame.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As an admin,I give a user Id and passwords for ever users	2	High	Balu
Sprint-2	Dashboard	USN-2	As an care taker, I will manage patients levels to monitor every day.	1	High	Anitha

**Table 6.1 Sprint Planning**

The basis of project planning is the entire project. Unlikely, project scheduling focuses only on the project-related tasks, the project start/end dates and project dependencies.

Sprint-2	Login	USN-3	As a patient,I will follow the everyday medicine for told assistant remainder to caretaker	2	Low	Lakshman
Sprint-3	Log in	USN-4	As a remainder,I will remaind everyday medicine to take correct time	2	Medium	Ebicia
Sprint-4	Dashboard	USN-5	As a helpline, I will help to patient's emergency situation	1	High	Rashmi

**Table 6.1.1 Sprint Planning**

Thus, a ‘project plan’ is a comprehensive document that contains the project aims, scope, costing, risks, and schedule. and a project schedule includes the estimated dates and sequential project tasks to be executed.

## 6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022		
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		

**Table 6.2 Sprint Delivery Schedule**

6.3 Reports from JIRA

Managing an open-source project with many different users coming from different parts of the world, it would be nearly impossible to operate without a flexible tool that can handle numerous tasks, their progress and current status. Jira takes care of all of that and even more. Jira allows to track the number of hours spent on every task by every user.

Another important feature is prioritizing tasks. In such a big community it is crucial to organize issues by how urgent they are. Otherwise, the most important things to do would get lost among many other minor tasks. Jira allows you to set the priority, so that everyone can see on which issues the most focus should be put.

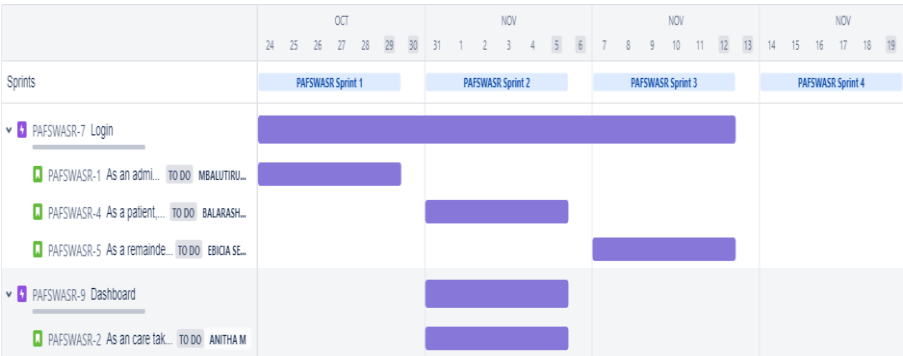


Fig 6.3 JIRA Report

A Jira workflow is a set of **statuses** and **transitions** that an issue moves through during its lifecycle and typically represents processes within an organization. What it means is that the successive stages of your task will be different depending on what workflow you choose to work in.

7. CODING & SOLUTIONING

7.1 Feature 1

- Set medication reminders once, and it will keep you up-to-date.
- Keep track of your medicine stocks.
- Set reminders for appointments.

7.2 Feature 2

Python time module allows to work with time in python.It allows functionality like getting current time.This module is import from the library. The system module provides us various funtions and variables functions and variables that are used to

manipulate different parts of the python runtime environment. It is used to connect the application. It is used to connect the IoT device. Random is used to select a random variable value. It is used to cloud authentication of packets of data stored in a cloud. It is used to enable authentication using identities and Organization name. Device type is mentioned as constants and Device id is mentioned as constant.

The authentication is validated by defining tokens method. The authentication token is specified for our app. Authenticator id is specified. Text to speech service called as a function with authenticator is equal to authenticator as an identifier and Text to speech service API call is used. Audio file is played with inbuilt open function in python. `audio_file.write` function with text to speech. `synthesize` identifier is specified.

The value of identifier is 'Just a sample audio file for the TTS service going to be created for our project!'. Voice is a constant with a value is specified. `accept` is a constant with value contains file. Finally the `getResult` function is used to obtain the output (voice output).

## 8. TESTING

Software testing is the process of evaluating and verifying that a software product or application does what it is supposed to do. The benefits of testing include preventing bugs, reducing development costs and improving performance.

There are many different types of software tests, each with specific objectives and strategies:

- **Acceptance testing:** Verifying whether the whole system works as intended.
- **Integration testing:** Ensuring that software components or functions operate together.
- **Unit testing:** Validating that each software unit performs as expected. A unit is the smallest testable component of an application.
- **Functional testing:** Checking functions by emulating business scenarios, based on functional requirements. Black-box testing is a common way to verify functions.
- **Performance testing:** Testing how the software performs under different workloads. Load testing, for example, is used to evaluate performance under real-life load conditions.
- **Regression testing:** Checking whether new features break or degrade functionality. Sanity testing can be used to verify menus, functions and commands at the surface level, when there is no time for a full regression test.

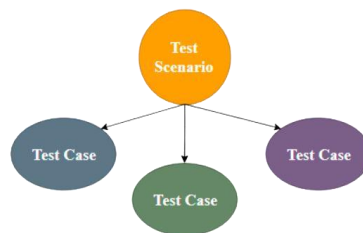
- **Stress testing:** Testing how much strain the system can take before it fails. Considered to be a type of non-functional testing.
- **Usability testing:** Validating how well a customer can use a system or web application to complete a task.

In each case, validating base requirements is a critical assessment. Just as important, exploratory testing helps a tester or testing team uncover hard-to-predict scenarios and situations that can lead to software errors.

Even a simple application can be subject to a large number and variety of tests. A test management plan helps to prioritize which types of testing provide the most value – given available time and resources. Testing effectiveness is optimized by running the fewest number of tests to find the largest number of defects.

## 8.1 Test Cases

The test case is defined as a group of conditions under which a tester determines whether a software application is working as per the customer's requirements or not.



**Fig 8.1 Test Cases**

Test case designing includes preconditions, case name, input conditions, and expected result. A test case is a first level action and derived from test scenarios. It is an in-details document that contains all possible inputs (positive as well as negative) and the navigation steps, which are used for the test execution process. Writing of test cases is a one-time attempt that can be used in the future at the time of regression testing.

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
APP Landing Page_TC_001	Functional	Landing Page	Verify user is able to access the landing page..	-	1.Scan QR and download apk. 2.Click Icon of app installed to open.. 3. Enter the Time in Set hour 4.Enter the number of times in Repeat Alarm 5.Enter the Medicine Name 6.Click SET REMAINDER I button	<a href="#">Cloudant_JSON</a> <a href="#">(medicine_details)</a>	Set medicine alarm pop up should display in Status bar	Working as expected	Pass	Excellent	N	BUG-12	Lakshman Prabhu
APP Landing Page_TC_002	UI	Landing Page	verify UI elements in Alarm pop up	-	1.Text Label 2.Buttons	<a href="#">Cloudant_JSON</a> <a href="#">(medicine_details)</a>	Application should show below UI elements: a.Fill details in Text Box b.SET REMAINDER I button	Working as expected	Pass	Good	N	-	Ethica Selvin

**Table 8.1 Test Cases**



Test case helps the tester in defect reporting by linking defect with test case ID. Detailed test case documentation works as a full proof guard for the testing team because if developer missed something, then it can be caught during execution of these full-proof test cases.

## 8.2 User Acceptance Testing

**User Acceptance Testing (UAT)** is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing is done.

The main **Purpose of UAT** is to validate end to end business flow. It does not focus on cosmetic errors, spelling mistakes or system testing. User Acceptance Testing is carried out in a separate testing environment with production-like data setup. It is kind of black box testing where two or more end-users will be involved.

UAT is performed by –

- Client
- End users

## 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	2	0	1	0	3
Duplicate	3	2	1	0	6
External	1	1	2	1	5
Fixed	1	2	1	0	4
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	7	5	5	1	18

**Table 8.2 Defect Analysis**

## 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	10	0	0	10
Client Application	10	0	0	10
Security	1	0	0	1
Outsource Shipping	2	0	0	2
Exception Reporting	3	0	0	3
Final Report Output	4	0	0	4
Version Control	2	0	0	2

**Table 8.2.1 Test Case Analysis**

## 9. RESULTS

### Developed - Python Script :

```

Python_Script_IBM_IOT.py - C:\Users\Admin\Downloads\Python_Script_IBM_IOT.py (3.7.0)
File Edit Format Run Options Window Help

import time
import sys
import idmloft.application
import timeit
import random

from ibm_watson import TextToSpeechV1
from ibm_cloud_sdk_core.authenticators import IAMAuthenticator

#providing IBM Watson device credentials
organization = "21110"
deviceType = "P8WASR"
deviceId = "P8WASR"
authMethod = "token"
authToken = "apikey:apikey"

authenticator = IAMAuthenticator('apikey:apikey')
text_to_speech = TextToSpeechV1(
    authenticator=authenticator
)

text_to_speech.set_service_url('https://api.eu-south-1.text-to-speech.watson.cloud.ibm.com/instances/56596c16-244f-4f8e-ba7d-6d4847d6d6d6')

with open('P8WASR.wav', 'wb') as audio_file:
    text_to_speech.synthesize(
        'This is a sample audio file for the TTS service going to be created for our project !',
        voice='en-US AllisonV0Voice',
        accept='audio/wav'
    ).get_result().content

```

**Fig 9.0 The Source Code Of Python Script**

```

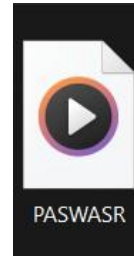
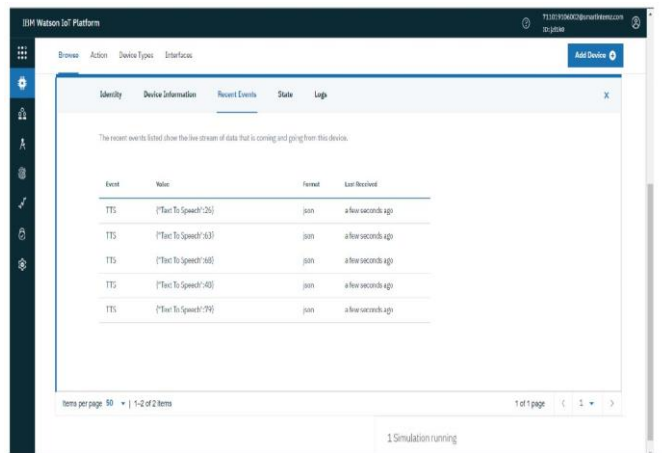
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.22000.1219]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Admin\Downloads>python Python_Script_IBM_IOT.py

C:\Users\Admin\Downloads>

```

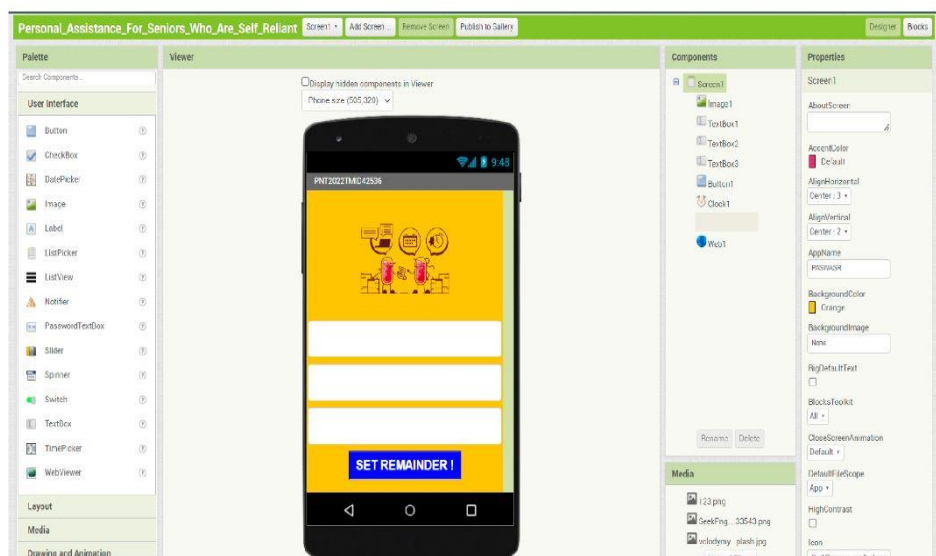
**Fig 9.0.1 The Module Runs Successfully**



➔ Even That Sample TTS Audio File Is Now Available Locally..

**Fig 9.0.2 IBM IoT Device Which Was Created Gets Connected Through The Script Developed**

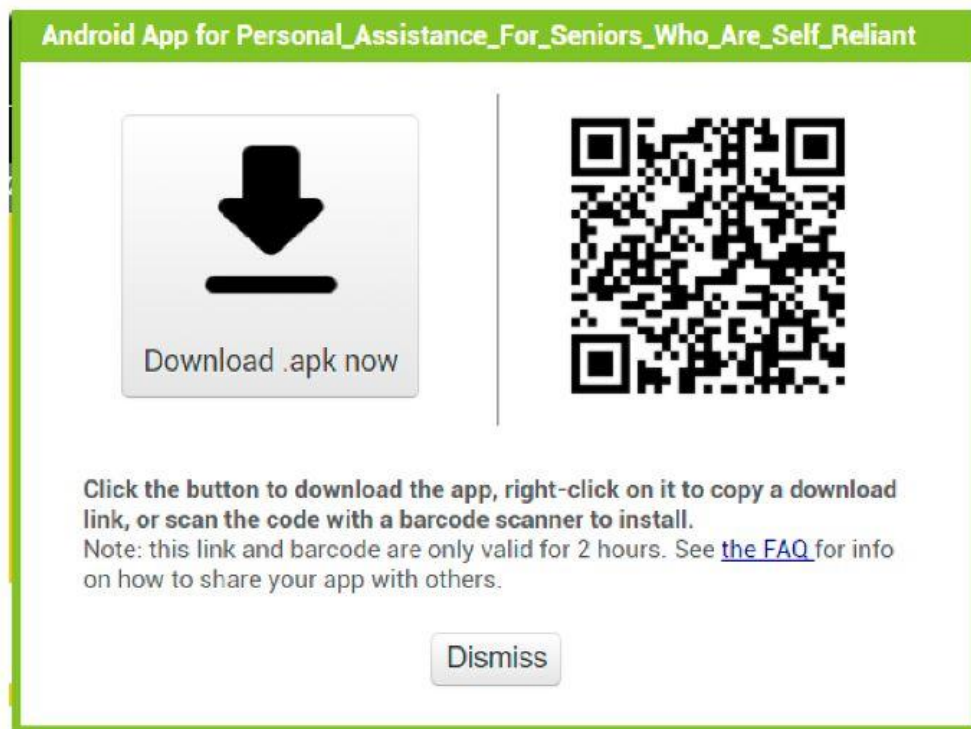
## **MIT-APP ( Alternative For Web UI ) :**



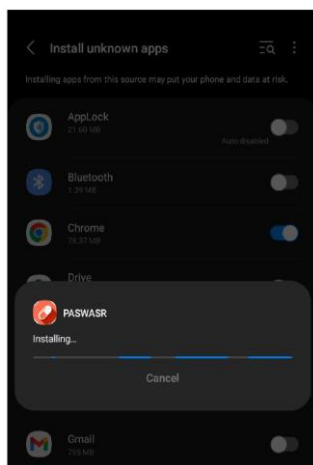
**Fig 9.0.3 We Have An App For Users To View And Connected Node-red UI Nodes**



## APP Working Demo ( App-Name :- PASWASR ):



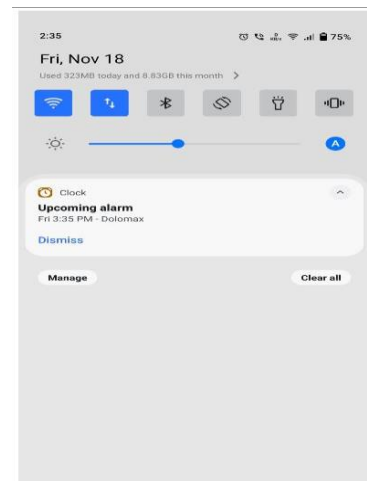
**Fig 9.0.5 Scan This “QR CODE” To Get The App**



**Fig 9.0.6 Install – Icon**



**Fig 9.0.7 Open Interface of App**



**Fig 9.0.8 Alarm is set**

## 9.1 Performance Metrics

Performance is important both from the purchasing perspective and the designer's perspective. When you look at the purchasing perspective, given a collection of machines, you'll have to be able to decide which has the best performance, the least cost, and also the best cost per performance ratio. Similarly, from a designer's perspective, you are faced with several design options like which has the best performance improvement, least cost and best cost/performance. Unless you have some idea about the performance metrics, you will not be able to decide which will be the best performance improvement that you can think of and which will lead to least cost and which will give you the best cost performance ratio. So, whether you're looking at the designer's perspective or purchaser's perspective, both of them need to have some knowledge about the performance metrics and both require these performance metrics for comparison.

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volumen Changes	Risk Score	Justification
1	ASSISTANCE FOR SENIORS WHO ARE SEL	Existing	No Changes	No Changes	No Changes	No Downtime Impact	No Changes	GREEN	No changes seen..
								</	

**Fig 9.1 Performance Metrics**

Response time (execution time) – the time between the start and the completion of a task is important to individual users. Throughput (bandwidth) – the total amount of work done in a given time is important to data center managers. We will need different performance metrics as well as a different set of applications to benchmark embedded and desktop computers, which are more focused on response time, versus servers, which are more focused on throughput.

If we have to maximize performance, we obviously need to minimize our execution time. Performance is inversely related to execution time.

$$\text{Performance} = 1 / \text{Execution time}$$

If a processor X is n times faster than Y, then,

$$\frac{\text{performance}_x}{\text{performance}_y} = \frac{\text{execution\_time}_y}{\text{execution\_time}_x} = n$$

## **10. ADVANTAGES & DISADVANTAGES**

### **Advantages**

- ❖ The system focuses on improving the rate of attendance at healthcare appointments.
- ❖ The personal phone notifications and reminders are a strong supporting tool in improving medication adherence strategies.
- ❖ The New England Healthcare Institute estimates that \$290 billion of healthcare expenditures could be avoided if medication adherence were improved.
- ❖ It supports an easy implementation as it is less expensive, reliable, scalable, accessible to anyone with smartphones, and do not require separate devices, packaging or extra hardware.

### **Disadvantages**

- ❖ Some patients reported that they never received a SMS reminder.
- ❖ It is possible that mobile phone numbers were entered incorrectly on patient records, or that those patients changed their phone numbers.
- ❖ Patients may not receive the SMS reminders due to incorrect data entry.

## **11. CONCLUSION**

After research was conducted, it was deduced that the consumption of medications was ranked as the one of the most important issues of the elderly that had to be tackled. In this case, the Medicine Reminder Application has been proposed to assist the elderly in remembering to consume their medicines without assistance from anyone around them.

Each module that has been proposed for the Medicine Reminder Application was looked into and carefully explained as well along with the identification of strength, weaknesses, opportunities, and threats that will be faced by the proposed Smart Medicine Reminder Application. The expected outcome of the proposed IoT-Based Smart Medicine Reminder Application was also explained in detail.

## **12. FUTURE SCOPE**

Future work that can enable other researchers to continue the work that has been proposed on the device include the use of IoT on the patient themselves without violating their privacy, where the health information gathered from the user will be cross-checked with the consumption of medicines to provide real-time health checks and updates

## 13. APPENDIX

### Source Code

```
import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

from ibm_watson import TextToSpeechV1

from ibm_cloud_sdk_core.authenticators import IAMAuthenticator


#Providing IBM Watson Device Credentials

organization = "jz11k0"

deviceType = "PASWASR"

deviceId = "PASWASR"

authMethod = "token"

authToken = "ebilacranibav"

authenticator = IAMAuthenticator('ybW5L7XKtrYn47GWjKNo2vG3teltpI9bc6LeHh0bV2S3')

text_to_speech = TextToSpeechV1(

    authenticator=authenticator

)

text_to_speech.set_service_url('https://api.au-syd.text-to-speech.watson.cloud.ibm.com/instances/98528c16-2a4f-414e-ba24-64d3472d69d8')
```



```
with open('PASWASR.wav', 'wb') as audio_file:
```

```
    audio_file.write(
```

```
        text_to_speech.synthesize(
```

```
            'Its Time To Take The Medicine:"{f.user input(Enter medicine  
name)}',{f.user input(Time)},{f.user input(Date)} }
```

```
            voice='en-US_AllisonV3Voice',
```

```
            accept='audio/wav'
```

```
        ).get_result().content)
```

### **Github link :**

<https://github.com/IBM-EPBL/IBM-Project-5018-1658745359>

### **Project Demo link :**

<https://www.youtube.com/watch?v=CSk8NFhSCyo>