# NALAIYA THIRAN - IBM PROJECT REPORT

**(19EC406T - Professional Readiness for Innovation, Employability and Entrepreneurship)**

**ON**

# SMART FARMER- IOT ENABLED SMART FARMING APPLICATION

***Submitted by***


**TEAM ID: PNT2022TMID47645**

| | |
|---|---|
| **VINOTH KUMAR** | **(911219106306)** |
| **DINESH .S** | **(911219106002)** |
| **DANIEL.S** | **(911219106301)** |
| **GOMATHI.PL** | **(911219106302)** |
| **SELVARAJ .S** | **(911219106305)** |


***in partial fulfillment for the award of the degree of***

## BACHELOR OF ENGINEERING

**IN**

## ELECTRONICS AND COMMUNICATION ENGINEERING


## MAHATH AMMA INSTITUTE OF ENGINEERING & TECHNOLOGY

( Affiliated to Anna University, Chennai)


## 2022-2023

# MAHATH AMMA INSTITUTE OF ENGINEERING & TECHNOLOGY

(Affiliated to Anna University, Chennai)

## BONAFIDE CERTIFICATE

Certified that this NALAIYA THIRAN – IBM PROJECT REPORT **“SMART FARMER- IOT ENABLED SMART FARMING APPLICATION”** is the Bonafide work of **“L.VINOTH KUMAR, S.DINESH, S.DANIEL, PL.GOMATHI S.SELVARAJ”** carried out in “PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP (NALAIYA THIRAN-IBM PROJECT)**”** during the Academic Year 2022-2023.

| | |
|---|---|
| **SIGNATURE** | **SIGNATURE** |
| **MR.K.PRAVEEN KUMAR** | **MR.A.ANTONY CRUZ** |
| **HOD&ASSISTANT PROFESSOR** | **PROFESSOR & HEAD OF** |
| **MENTOR** | **DEPARTMENT** |
| Department of Electronics & | Department of Electronics & |
| Communication Engineering | Communication Engineering |
| MAIET COLLEGE | MAIET COLLEGE |
| PUDUKKOTTAI 622 101 | PUDUKKOTTAI 622101 |

# CERTIFICATE OF EVALUATION

**COLLEGE NAME** **:** MAIET COLLEGE
**DEPARTMENT** **:** Electronics & Communication Engineering
**SEMESTER** **:** VII Semester

| SI. NO | NAME OF THE STUDENTS | TITLE OF THE PROJECT | MENTOR |
|---|---|---|---|
| 1. | L.VINOTH KUMAR | SMART FARMER- IOT ENABLED SMART FARMING APPLICATION | MR.K.PRAVEEN KUMAR HOD ASSISTANT PROFESSOR MENTOR |
| 2. | S.DINESH | | |
| 3. | S.DANIEL | | |
| 4. | PL.GOMATHI | | |
| 5. | S.SELVARAJ | | |

The report of the project work submitted by the above students in the partial fulfillment for the award of Bachelor of Engineering Degree in **ELECTRONICS AND COMMUNICATION ENGINEERING** of Anna University, Chennai was evaluated and confirmed to be the report of the work done by the above students and then evaluated.

Submitted for viva-voce held on

**(MENTOR)** **(EVALUATOR)**

# ABSTRACT

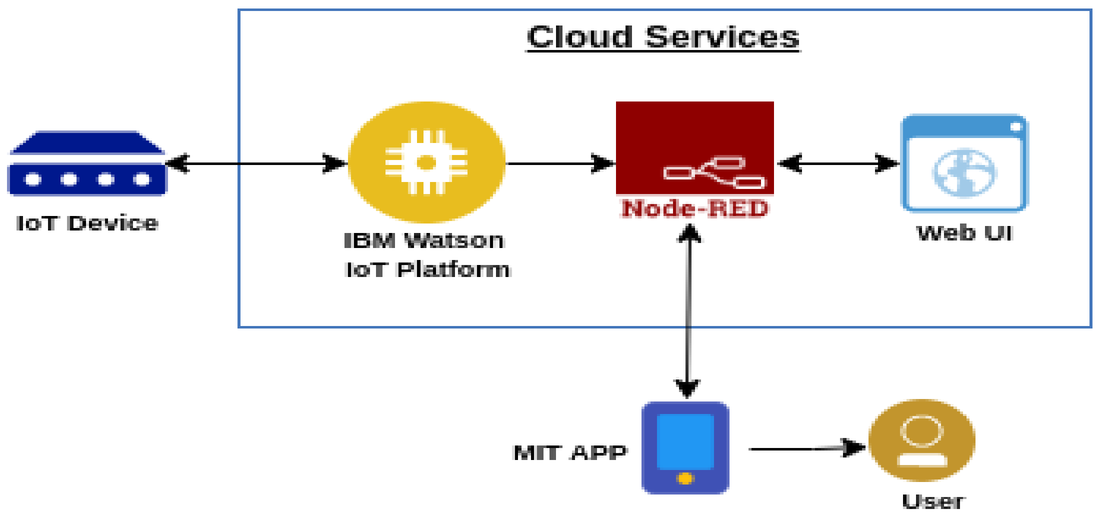
The growth of the global population coupled with a decline in natural resources, farmland, and the increase in unpredictable environmental conditions leads to food security is becoming a major concern for all nations worldwide. These problems are motivators that are driving the agricultural industry to transition to smart agriculture with the application of the Internet of Things (IoT) and the big data solutions to improve operational efficiency and productivity. The IoT is a integrates a series of existing state-of-the-art solutions and technologies, such as wireless of sensor networks, cognitive radio ad hoc networks, cloud computing, big data, and end-user applications. This study presents a survey of IoT solutions and demonstrates how IoT can be integrated into the smart agriculture sector. To achieve this objective, we discuss the vision of IoT-enabled smart agriculture ecosystems by evaluating their architecture (IoT devices, connect Communication technologies, big data storage, and processing), their applications, and the research timeline. In addition, we discuss trends and opportunities of IoT applications for smart agriculture and also indicate the open issues and challenges of IoT application in smart agriculture. We hope that the findings of this study will constitute important guidelines in research and promotion of IoT solutions aiming to improve the productivity and quality of the agriculture sector as well as facilitating the transition towards a future sustainable environment with an agroecological approach

# CHAPTER 1

# INTRODUCTION

## PROJECT OVERVIEW

The main aim of this project is to help farmers automate their farms by providing them with a Web App through which they can monitor the parameters of the field like Temperature, soil moisture, humidity and etc.. and control the equipment like water motor and other devices remotely via internet without their actual presence in the field.




## PURPOSE

Smart Farming has a real potential to deliver a more productive and sustainable agricultural production, based on a more precise and resource-efficient approach. However, while in the USA possibly up to 80% of farmers use some kind of SFT, in Europe it is no more than 24%.From the farmer's point of view, Smart Farming should provide the farmer with added value in the form of better decision making or more efficient exploitation operations and management. In this sense, smart farming is strongly related, to three interconnected technology fields addressed by Smart AKIS Network.

# CHAPTER 2
# LITERATURE SURVEY

## EXISTING PROBLEMS

The challenges of a smart agriculture system include the integration of these sensors and tying the sensor data to the analytics driving automation and response activities. When integrated, the use of data analytics can reduce the overall cost of agriculture and contribute to higher production from the same amount of area through precise control of water, fertilizer and light. Smart methods allow for farming on smaller and more distributed lands through remote monitoring, whether indoor or outdoor. To successfully deploy a smart agriculture system, consider setting up a communications network that can integrate a limited number of sensors across a large area of farmland. This will require third party network provisioning or setting up a private network consisting of access points and uplinks to a private backhaul network, which channels all the data traffic to centralized monitoring software or an analytics head-end system

- It is not a secure system.
- There is no motion detection for protection of agriculture field.
- Automation is not available

## REFERENCES

**[1] Smart Agriculture Using Internet of Things with Raspberry Pi**

**Authors:** Zuraida Muhammad,Muhammad azri Asyraf Mohd Hafez,Nor Adni Mat Leh,Zakiah Mohd Yusoff ,Shabinar Abd Hamid.

**Published Month & Year:** August 2020

The term "Internet of Things" refers to the connection of objects, equipment, vehicles, and other electronic devices to a network for the purpose of data exchange (IoT). The

Internet of Things (IoT) is increasingly being utilised to connect objects and collect data. As a result, the Internet of Things' use in agriculture is crucial. The idea behind the project is to create a smart agriculture system that is connected to the internet of things. The technology is combined with an irrigation system to deal with Malaysia's variable weather. This system's microcontroller is a Raspberry Pi 4 Model B. The temperature and humidity in the surrounding region, as well as the moisture level of the soil, are monitored using the DHT22 and soil moisture sensor. The data will be available on both a smartphone and a computer. As a result, Internet of Things (IoT) and Raspberry Pi-based Smart Agriculture Systems have a significant impact on how farmers work. It will have a good impact on agricultural productivity as well. In Malaysia, employing IoT-based irrigation systems saves roughly 24.44 percent per year when compared to traditional irrigation systems. This would save money on labour
expenditures while also preventing water waste in daily needs.

**[2] Smart Farming IoT based Future Agriculture**

**Authors:** Vijaya Saraswathi R, Sridharani J, Saranya Chowdhary P,Nikhil K, Sri Harshitha M, Mahanth Sai K

**Published Month & Year:** January, 2022.

Agriculture is backbone of any country. About 60% of our country's population works in agriculture or the primary sector. It contributes more to our country's GDP. It employs the majority of India's population. The internet of things research presents a framework in which farmers may obtain extensive information on the soil, crops growing in specific areas, and agricultural yield and productivity. By utilizing resource optimization and smart planning, this technology-based farming solution will assist farmers in making wise agricultural decisions. The development of IOT based intelligent Smart Farming using smart devices is changing the agriculture production by not only increasing the quality and yield but also to make farming cost effective. The goal of this smart Agriculture or farming is to get live data like temperature, soil moisture and humidity to monitor the surrounding environment. All of this is accomplished with the use of temperature, humidity, and moisture sensors. The system being proposed by this paper is done using microcontroller and various sensors. This system is capable of monitoring the parameters in various soil conditions.

**[3] Smart Farming System Using Iot for Efficient Crop Growth.**

**Authors :** M S D Abhiram, Jyothsnavi Kuppili, N.Alivelu Manga

**Published Month & Year :** May, 2020.

Smart agriculture is a farming system which uses IoT technology. This emerging system increases the quantity and quality of agricultural products. IoT devices provide information about nature of farming fields and then take action depending on the farmer input.Climate changes will have significant impact on agriculture by increasing water demand and limiting crop productivity in areas where irrigation is most needed. Irrigation system, rain fed agriculture, groundwater irrigation are some of the methods introduced to produce healthier crops which may not use water efficiently. In order to use water efficiently a smart system is designed. In the system farmer need not make the water flow into fields manually, but the system automatically does that efficiently. In this paper, an IoT based advanced solution for monitoring the soil conditions and atmosphere for efficient crop growth is presented. The developed system is capable of monitoring temperature, humidity, soil moisture level using NodeMCU and several sensors connected to it. Also, a notification in the form of SMS will be sent to farmer's phone using Wi-Fi about environmental condition of the field.In this paper, the system uses few sensors which gives the amount of moisture in the soil, the humidity and temperature of the region, and a rain detecting sensor which and can be used in deciding whether the crop is suitable for growing. All these sensors along with NodeMCU are connected to the internet and a smartphone.

**[4] An Systematic Approach on Monitoring and Advanced Control Strategies in Smart Agriculture.**

**Authors:** Syeda Iqra Hassan,Muhammad Mansoor Alam,Usman Illahi,Mohammed A.Al Ghamdi,Sultan H.Almotiri,Mazliham Mohid Su'ud.

**Published Year & Month :** January, 2021.

Automation in agriculture nowadays is the main focus and area of development for various countries. The population rate of the world is increasing rapidly and will be double in upcoming decades and the need of food is also increasing accordingly. To meet this rapid growth in demand, agriculture automation is the best solution. Improper use of nutrients, water, fertilizers and pesticides disturbs the agricultural growth and the land remains barren with no fertility. This research paper presents different control strategies used to automate agriculture such as: IoT, aerial imagery, multispectral, hyperspectral, NIR, thermal camera, RGB camera, machine learning, and artificial intelligence techniques. Problems in agriculture like plant diseases, pesticide control, weed management, irrigation and water management can easily be solved by different automated and control techniques mentioned above. This research paper reviews and observe the work of different researchers to present a brief summary about the trends in smart agriculture and also provides the work flow and revenue of smart agriculture system using technologies verified by researchers in their research papers.

**[5] IoT Based Smart Irrigation Monitoring and Controlling System**

**Authors:** Shweta B Saraf, Dhanashri H.Gawali.

**Published Month & Year:** January, 2018.

Interconnection of number of devices through internet describes the Internet of things (IoT). Every object is connected with each other through unique identifier so that data can be transferred without human to human interaction. It allows establishing solutions for better management of natural resources. The smart objects embedded with sensors enables interaction with the physical and logical worlds according to the concept of IoT. In this paper proposed system is based on IoT that uses real time input data. Smart farm irrigation system uses android phone for remote monitoring and controlling of drips through wireless sensor network. Zigbee is used for communication between sensor nodes and base station. Real time sensed data handling and demonstration on the server is accomplished using web based java graphical user interface. Wireless monitoring of field irrigation system reduces human intervention and allows remote monitoring and controlling on android phone. Cloud Computing is an attractive solution to the large amount of data generated by the wireless sensor network. This paper proposes and evaluates a cloud-based wireless communication system to monitor and control a set of sensors and actuators to assess the plants water need.

## PROBLEM STATEMENT DEFINITION

The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from a various sensors and it can be controlled automatically. When soil moisture sensor goes low the water pump will be on and it exceeds defined levels of the water motor will turn off automatically. We can constantly monitor the growth of a crop using ultrasonic sensor. PIR sensor detects the motion or unusual movement in the agricultural land. This device his very helpful to the former to monitor and control environmental parameters at their field. The farmers did not go to their field, they can remotely monitor and control using cloud.

| | |
|---|---|
| Who does the problem affect? | Persons who do Agriculture. |
| What are the boundaries of the problem? | People who Grow Crops and facing issues in monitoring and watering plants. |
| When does the issue occur? | When the weather condition is uncertain, it is difficult to decide whether to water the crop or not. |
| What is the issue? | In agricultural aspects, if the plant is not provided with sufficient water, the production of the crop will be affected to a great extent. Providing correct amount of |

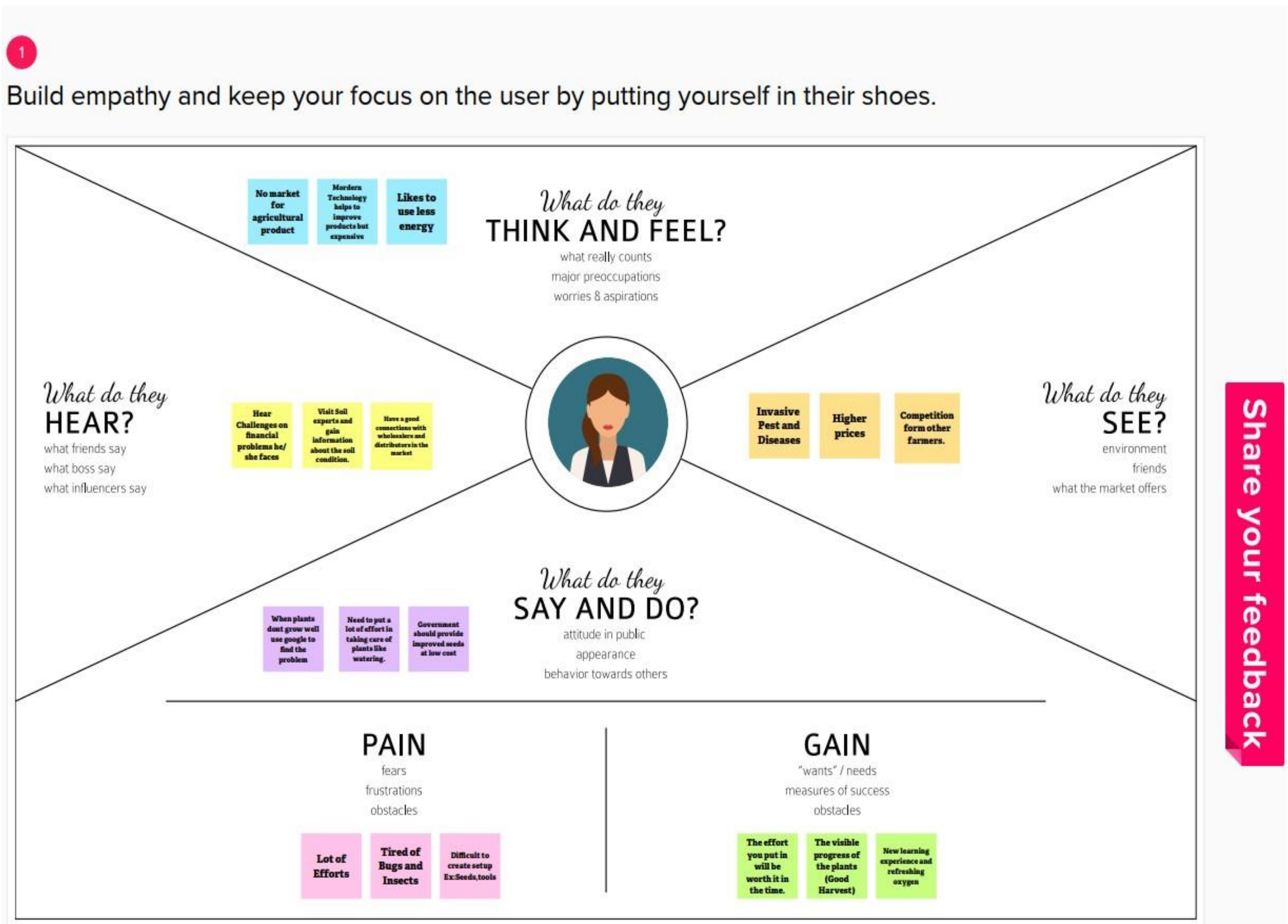
| | |
|---|---|
| | water is a challenge for the farmers. |
| Where does the issue occur? | The issue occurs in agriculture practicing areas, particularly in rural regions. |
| Why is it important that we fix the problem? | It is required for the growth of better quality food products. It is important to maximize the crop yield. |
| What solution to solve this issue? | This could be solved by monitoring the soil parameters, weather and climatic conditions and helping the farmer to make the correct decision |
| What methodology used to solve the issue? | Sensors, Weather API and mobile application could be used. The sensor values and weather data are used for the computation and the final decision whether to water the crop or not is taken using mobile application. |

# CHAPTER 3

# IDEATION AND PROPOSED SOLUTION

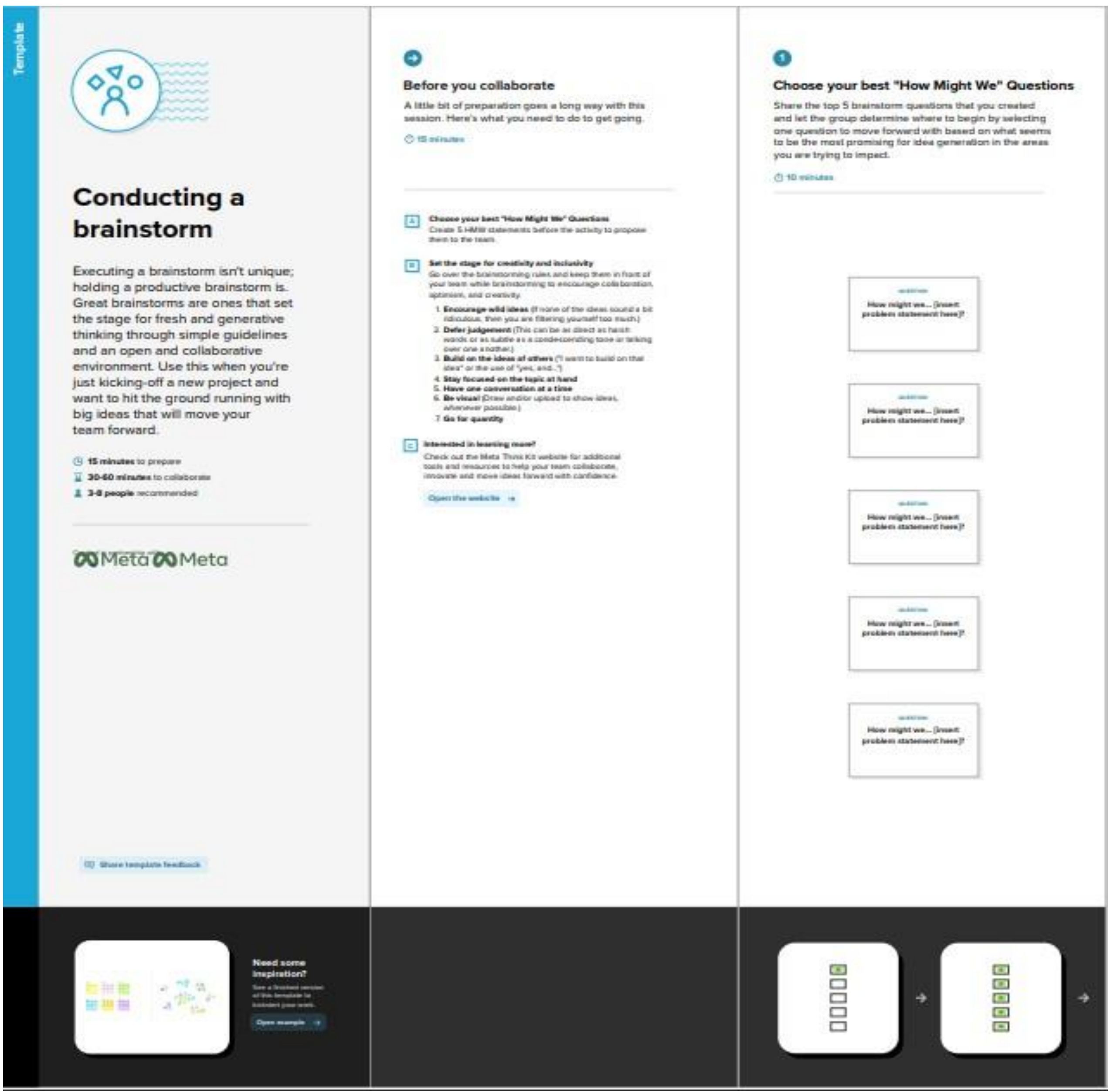
## EMPATHY MAP CANVAS

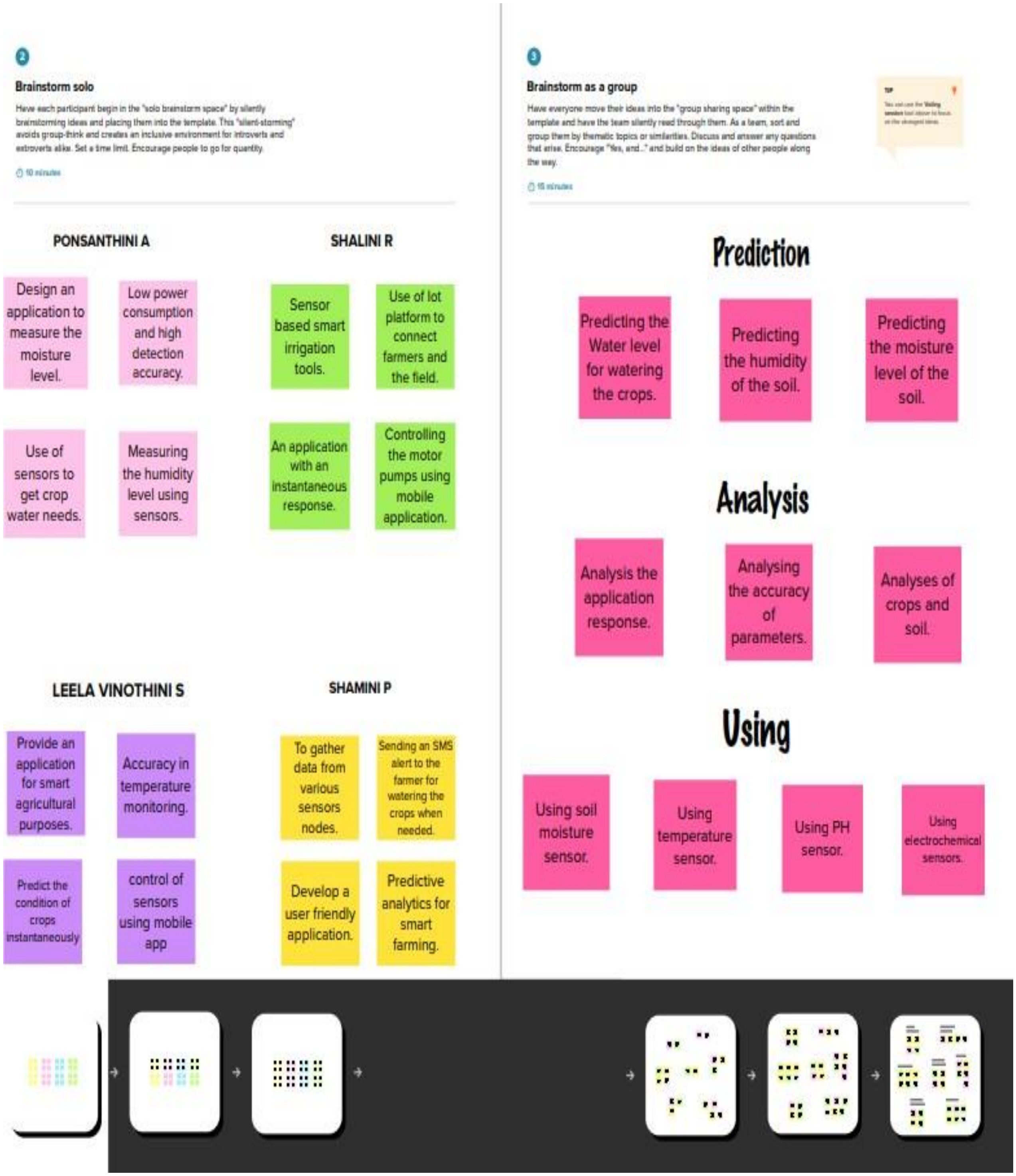
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users.Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



## IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.




2
Brainstorm solo
Have each participant begin in the "solo brainstorm space" by silently brainstorming ideas and placing them into the template. This "silent-storming" avoids group-think and creates an inclusive environment for introverts and extroverts alike. Set a time limit. Encourage people to go for quantity.
10 minutes
PONSANTHINI A
Design an application to measure the moisture level.
Low power consumption and high detection accuracy.
Use of sensors to get crop water needs.
Measuring the humidity level using sensors.
SHALINI R
Sensor based smart irrigation tools.
Use of Iot platform to connect farmers and the field.
An application with an instantaneous response.
Controlling the motor pumps using mobile application.
LEELA VINOTHINI S
Provide an application for smart agricultural purposes.
Accuracy in temperature monitoring.
Predict the condition of crops instantaneously
control of sensors using mobile app
SHAMINI P
To gather data from various sensors nodes.
Sending an SMS alert to the farmer for watering the crops when needed.
Develop a user friendly application.
Predictive analytics for smart farming.
3
Brainstorm as a group
Have everyone move their ideas into the "group sharing space" within the template and have the team silently read through them. As a team, sort and group them by thematic topics or similarities. Discuss and answer any questions that arise. Encourage "Yes, and..." and build on the ideas of other people along the way.
15 minutes
Prediction
Predicting the Water level for watering the crops.
Predicting the humidity of the soil.
Predicting the moisture level of the soil.
Analysis
Analysis the application response.
Analysing the accuracy of parameters.
Analyses of crops and soil.
Using
Using soil moisture sensor.
Using temperature sensor.
Using PH sensor.
Using electrochemical sensors.

## PROPOSED SOLUTION

| S.NO | PARAMETER | DESCRIPTION |
|---|---|---|
| 1. | Problem Statement (Problem to be solved) | Farmers should be in the farm field to monitor their crop field, if any emergency occurs for farmer to go outside there will be lack of irrigation in farm field which lead to damage in crops health |
| 2. | Idea / Solution description | Smart Farming has enabled farmers to reduce waste and enhance productivity with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automation of irrigation systems. Further with the help of these sensors, farmers can monitor the field conditions from anywhere. Internet of Things based Advanced Farming is highly efficient when compared with the conventional approach. We use a web/mobile application to help the farmer to decide whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps even when the farmer is far from the field. |

| | | |
|---|---|---|
| 3. | Novelty / Uniqueness | The approach of our system includes :<br>➢ Temperature parameter measurement<br>➢ Mobile Application to alert the farmer.<br>➢ Sensor based smart irrigation tools.<br>➢ Predict the condition of crops instantaneously |
| 4. | Social Impact / Customer Satisfaction | In our project, the Internet of Things (IOT) is used to collect data and communicate through the internet.<br>We hope that our project will be beneficial enough to be implemented in agricultural industries across India, saving the crops from dryness due to lack of proper irrigation |
| 5. | Business Model (Revenue Model) | A monthly subscription is charged to farmers for prediction and suggesting the irrigation timing based on sensors parameters like temperature, humidity, soil moisture. |
| 6. | Scalability of the Solution | Including sensors to monitor moisture, humidity,temperature and controlling the motor pumps for watering the crops from the mobile application. |

## PROBLEM SOLUTION FIT

### 1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0 5 y.o. kids

The customer for this product is a farmer who grows crops. Our goal is to help them, monitor field parameters remotely. This product saves agriculture from extinction.

### 6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

Using a large number of sensors is difficult. An unlimited or continuous internet connection is required for success.

### 5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper

The irrigation process is automated using IoT. Meteorological data and field parameters were collected and processed to automate the irrigation process. Disadvantages are efficiency only over short distances, and difficult data storage.

### 2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

The purpose of this product is to use sensors to acquire various field parameters and process them using a central processing system. The cloud is used to store and transmit data using IoT. The Weather API is used to help farmers make

decisions. Farmers can make decisions through mobile applications.

### 9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?

Frequent changes and unpredictable weather and climate made it difficult for farmers to engage in agriculture. These factors play an important role in deciding whether to water your plants. Fields are difficult to monitor when the farmer is not at the field, leading to crop damage.

### 7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Use a proper drainage system to overcome the effects of excess water from heavy rain. Use of hybrid plants that are resistant to pests.

### 3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

Farmers struggle to provide adequate irrigation. Inadequate water supply reduces yields and affects farmers' profit levels. Farmers have a hard time predicting the weather.

### 4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

BEFORE: Lack of knowledge in weather forecasting →Random decisions →low yield.
AFTER: Data from reliable source → correct decision →high yield

### 10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

Our product collects data from various types of sensors and sends the values to our main server. it also collects weather data from the Weather API. The final decision to irrigate the crop is made by the farmer using a mobile application.

### 8. CHANNELS of BEHAVIOUR CH

**8.1 ONLINE**
What kind of actions do customers take online? Extract online channels from #7

**8.2 OFFLINE**
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

ONLINE: Providing online assistance to the farmer, in providing knowledge regarding the pH and moisture level of the soil. Online assistance to be provided to the user in using the product

OFFLINE: Awareness camps to be organized to teach the importance and advantages of the automation and IoT in the development of agriculture.

# CHAPTER 4

# REQUIREMENT ANALYSIS

## FUNCTIONAL REQUIREMENT

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 Form Registration through Gmail |
| FR-2 | User Confirmation | Confirmation via Email Confirmation via OTP |
| FR-3 | Sensor Function for framing System | Measure the Temperature and Humidity Measure the Soil Monitoring Check the crop diseases |
| FR-4 | Manage Modules | Manage Roles of User Manage User permission |
| FR-5 | Check whether details | Temperature details Humidity details |
| FR-6 | Data Management | Manage the data of weather conditions Manage the data of crop conditions Manage the data of live stock conditions |

## NON-FUNCTIONAL REQUIREMENTS

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

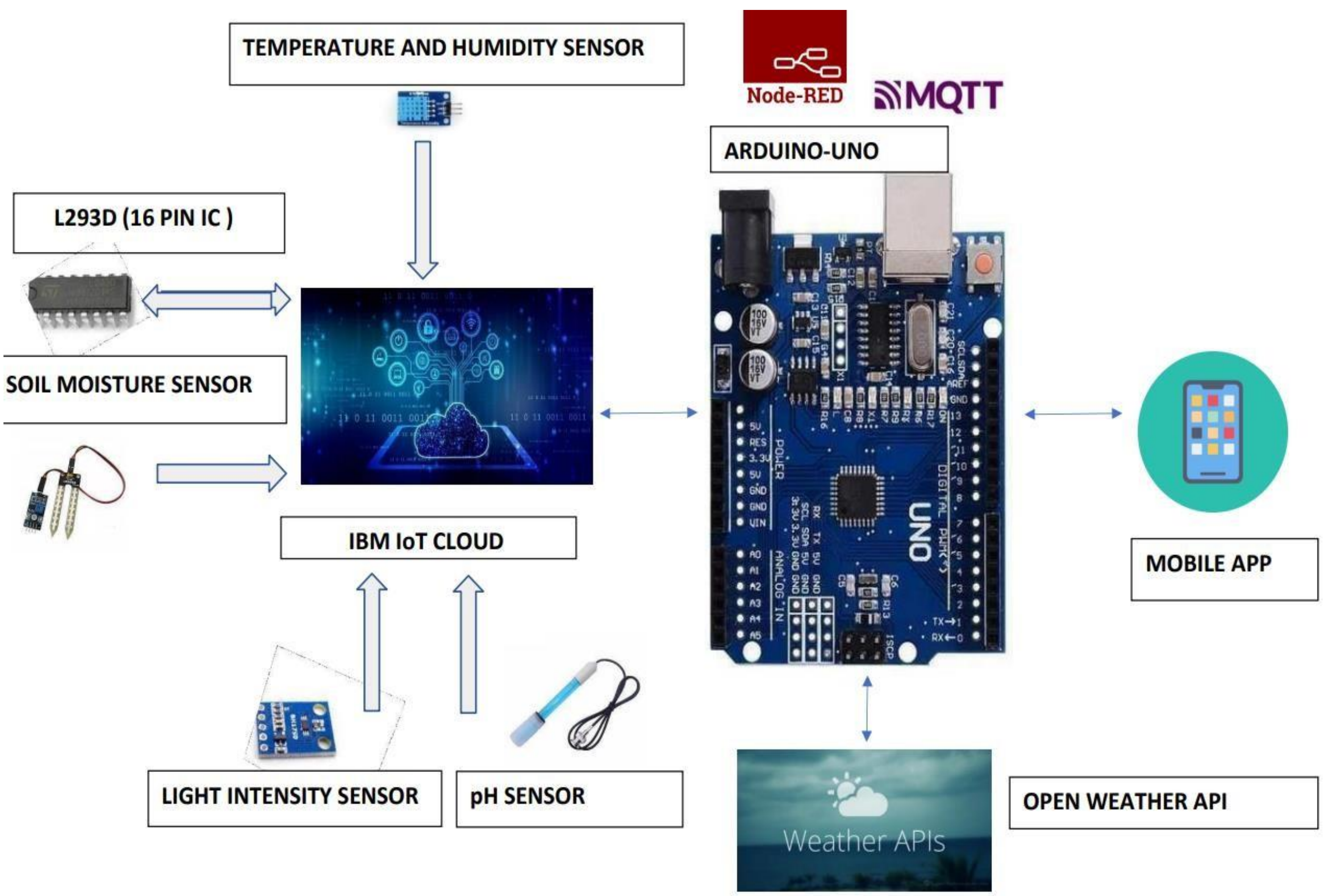
| NFR NO. | NON-FUNCTIONAL REQUIREMENT | DESCRIPTION |
|---|---|---|
| NFR-1 | Usability | User friendly guidelines for users to avail the features. Most simplistic user interface for ease of use. |
| NFR-2 | Security | All the details about the user are protected from unauthorized access.<br>Detection and identification of any misfunctions of sensors. |
| NFR-3 | Reliability | Implementing Mesh IoT Networks Building a Multi-layered defence for IoT Networks. |
| NFR-4 | Performance | The use of modern technology solutions helps to achieve the maximum performances thus resulting in better quality and quantity yields. |
| NFR-5 | Availability | This app is available for all platforms |
| NFR-6 | Scalability | Scalability refers to the ability to increase available resources and system capability without the need to go through a major system redesign or implementation |

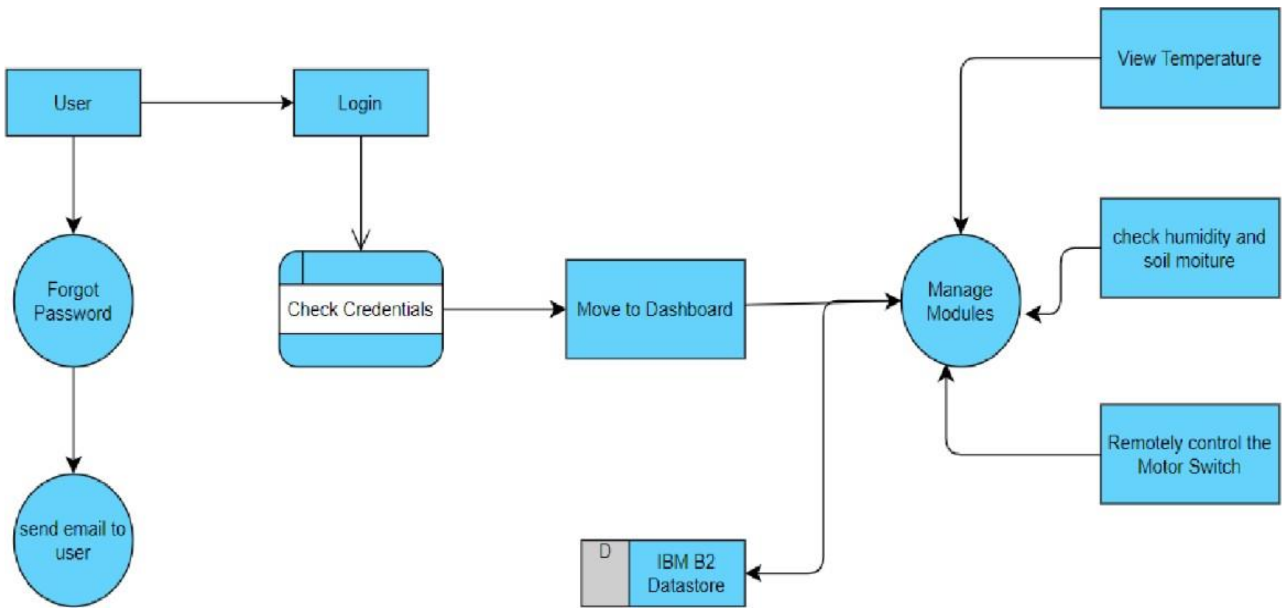
#### CHAPTER 5

# PROJECT DESIGN

## DATAFLOW DIAGRAM

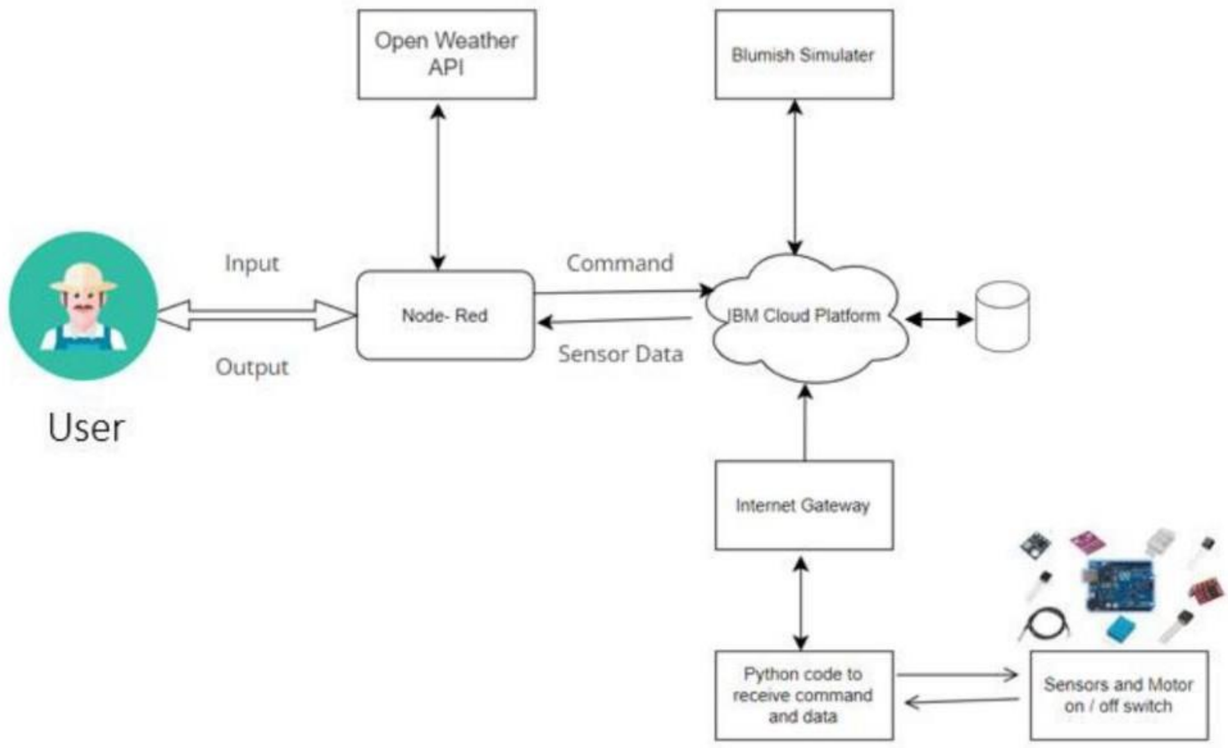
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.






## SOLUTION & TECHNICAL ARCHITECTURE

- The different soil parameters (temperature, humidity, light intensity, pH level) are sensed using different sensors and the obtained value is stored in IBM cloud.
- Arduino uno is used as a processing unit which processes the data obtained from sensors and weather data from weather API.
- Node red is used as a programming tool to wire the hardware, software and APIs. The MQTT protocol is followed for communication.
- All the collected data are provided to the user through a mobile application which was developed using MIT app inventor. The user could make decision through an app, whether to water the crop or not depending upon the sensor values. By using the app, they can remotely operate the motor switch.




## USER STORIES

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|---|---|---|---|---|---|---|
| Customer (Mobile user) | Registration | USN-1 | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account / dashboard | High | Sprint-1 |
| | | USN-2 | As a user, I will receive confirmation email once I have registered for the application | I can receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-3 | As a user, I can register for the application through Gmail | | Medium | Sprint-1 |
| | Login | USN-4 | As a user, I can log into the application by entering email & password | | High | Sprint-1 |
| Customer (Web user) | Dashboard | USN-5 | As a User can view the dashboard, and this dashboard include the check roles of access and then move to the manage modules. | I can view the dashboard in this smart farming application system. | High | Sprint 2 |
| | | USN-6 | User can remotely access the motor switch | In the smart farming app | High | Sprint 3 |
| Administrator | | | As a user once view the manage modules this describes the Manage system Admins and Manage Roles of User and etc. | | | Sprint 2 |

# TECHNOLOGY STACK

## COMPONENTS & TECHNOLOGIES

| S.NO | COMPONENT | DESCRIPTION | TECHNOLOGY |
|---|---|---|---|
| 1. | User Interface | How user interacts with application e.g. Web | MIT App Inventor |
| 2. | Application Logic-1 | Logic for a process in the application | Python |
| 3. | Application Logic-2 | Logic for a process in the application | IBM Watson IOT service |
| 4. | Application Logic-3 | Logic for a process in the application | IBM Watson Assistant |
| 5. | Database | Data Type, Configurations etc. | MySQL, NoSQL, etc. |
| 6. | Cloud Database | Database Service on Cloud | IBM Cloud |
| 7. | File Storage | File storage requirements | IBM Block Storage or Other Storage |
| 8. | External API-1 | Purpose of External API used in the application | Open Weather API |
| 9. | Infrastructure (Server/ Cloud) | Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration: | Local, Cloud Foundry |

## APPLICATION CHARACTERISTICS

| S.NO | CHARACTERISTICS | DESCRIPTION | TECHNOLOGY |
|---|---|---|---|
| **1.** | Open-Source Frameworks | List the open-source frameworks used | Technology of Opensource framework |
| **2.** | Security Implementation | Sensitive and private data must be protected from their production until the decision-making and storage stages. | Node-Red, Open weather App API, MIT App Inventor |
| **3.** | Scalable Architecture | scalability is a major concern for IoT platforms. It has been shown that different architectural choices of IoT platforms affect system scalability and that automatic real time decision-making is feasible in an environment composed of dozens of thousand | Technology used |

# CHAPTER 6

# PROJECT PLANNING & SCHEDULING

## SPRINT PLANNING & ESTIMATION

| TITLE | DESCRIPTION | DATE |
|---|---|---|
| Literature Survey & Information Gathering | Literature survey on the selected project is done by gathering information about related details on technical papers and web browsing. | 10 SEPTEMBER 2022 |
| Empathy Map | Prepared Empathy Map Canvas to combine thoughts and pains, gains of the project with all team members. | 08 OCTOBER 2022 |
| Ideation | Brainstorming session is conducted with all team members to list out all the ideas and prioritise the top 3 ideas. | 09 OCTOBER 2022 |
| Proposed Solution | Prepared the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc. | 28 OCTOBER 2022 |
| Problem Solution Fit | Prepared problem - solution fit document. | 30 OCTOBER 2022 |

## SPRINT DELIVERY SCHEDULE

## PRODUCT BACKLOG, SPRINT SCHEDULE, AND ESTIMATION

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint-1 | Simulation Creation | USN-1 | Connect Sensors and Arduino with python code | 2 | High | Leela Vinothini, Shalini, Shamini, Ponsanthini |
| Sprint-2 | Software | USN-2 | Creating device in the IBM Watson IoT platform, workflow for IoT scenarios using Node-Red | 2 | High | Leela Vinothini, Shalini, Shamini, Ponsanthini |
| Sprint-3 | MIT App Inventor | USN-3 | Develop an application for the Smart farmer project using MIT App Inventor | 2 | High | Leela Vinothini, Shalini, Shamini, Ponsanthini |
| Sprint-3 | Dashboard | USN-3 | Design the Modules and test the app | 2 | High | Leela Vinothini, Shalini, Shamini, Ponsanthini |
| Sprint-4 | Web UI | USN-4 | To make the user to interact with software | 2 | High | Leela Vinothini, Shalini, Shamini, Ponsanthini |

## PROJECT TRACKER, VELOCITY & BURNDOWN CHARTS

| Sprint | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (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 | 05Nov 2022 | 20 | 05 Nov 2022 |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 20 | 12 Nov 2022 |
| Sprint-4 | 20 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 20 | 19 Nov 2022 |

## VELOCITY

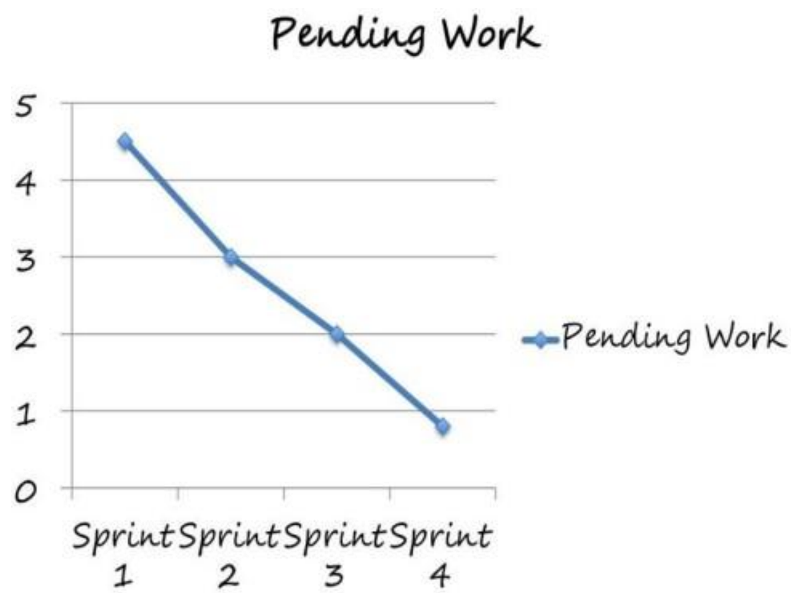
AV for sprint 1= Sprint Duration /velocity =12/6=2

AV for sprint 2= Sprint Duration/Velocity=6/6=1

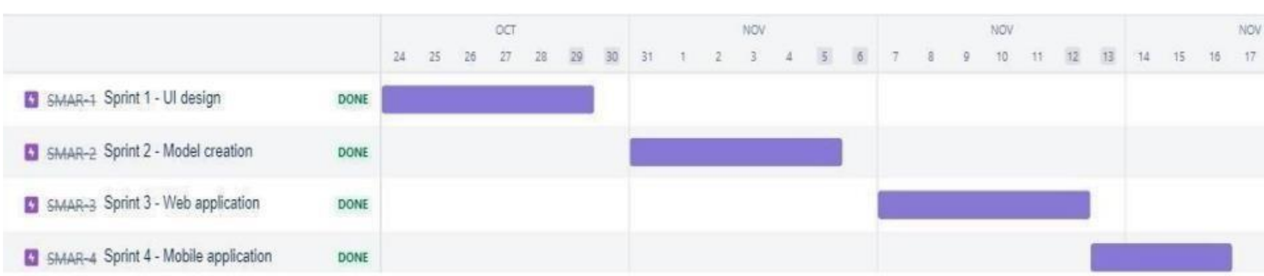
AV for Sprint 3=Sprint Duration/Velocity=6/6=1

AV for Sprint 4=Sprint Duration/Velocity=6/6=1

**BURNDOWN CHART**




**REPORTS FROM JIRA**




# CHAPTER 7

# CODING & SOLUTIONING

## FEATURE 1

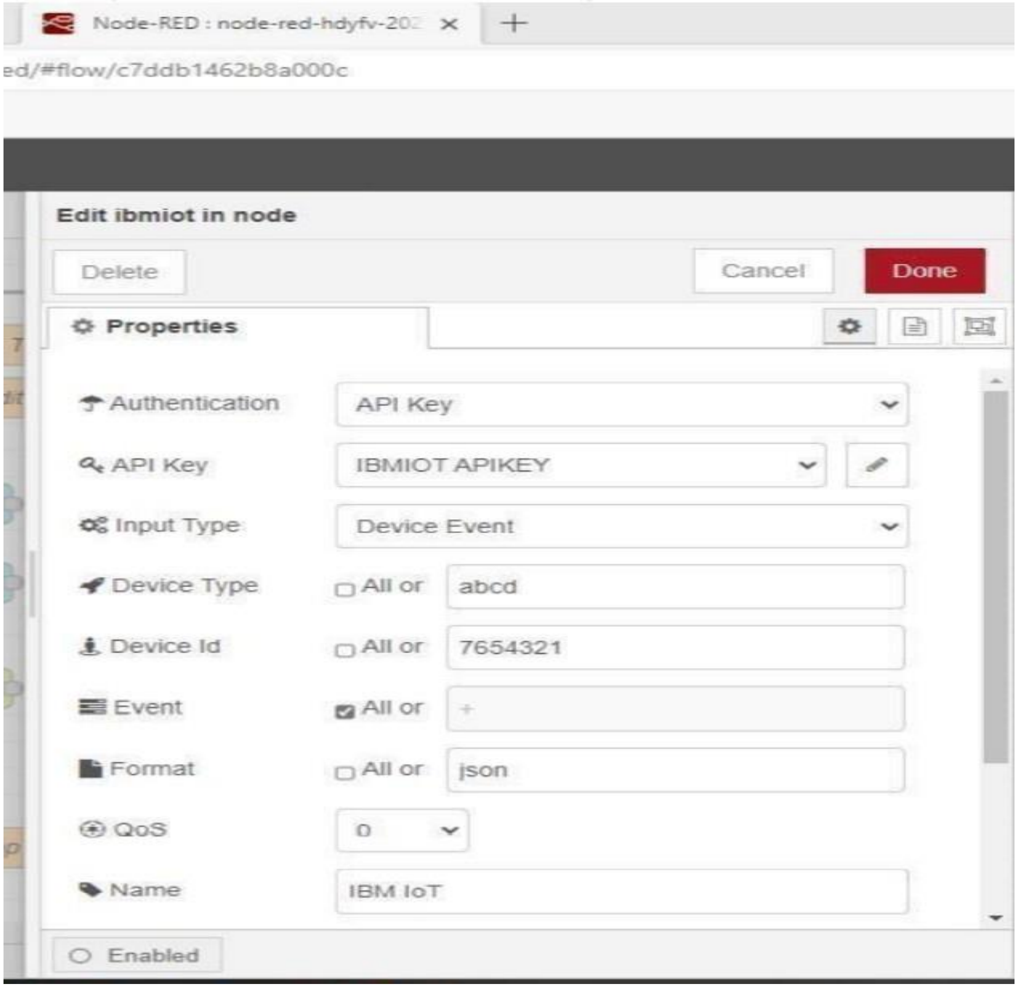
->Connecting the python code to the IBM Watson Cloud Platform

->Setting the organization id and token to make the connection with cloud

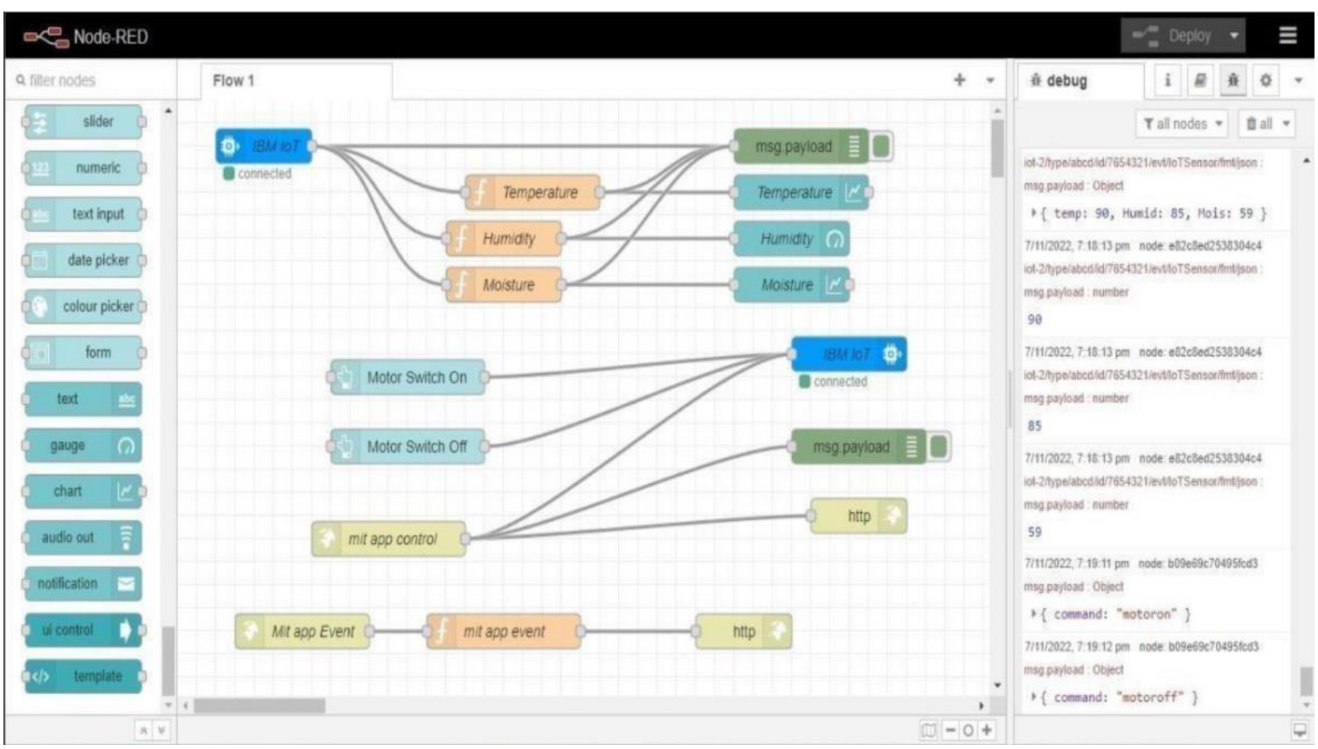
```
#Providing the IBM Watson Device Credentials
organization = "1xl08d "
deviceType = " abcd "
deviceId = "12"
authMethod = "token"
authToken = "12345678"
```

## FEATURE 2

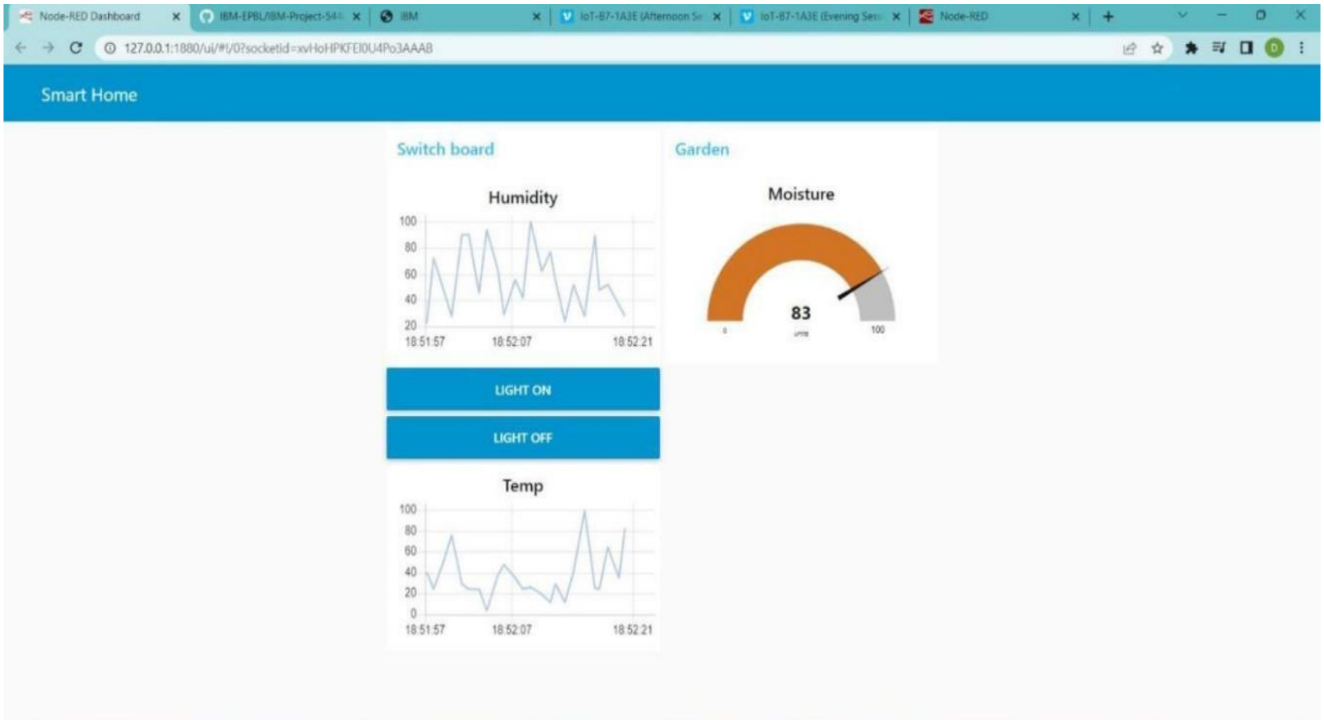
## CONFIGURATION OF NODE-RED TO SEND COMMANDS TO IBM CLOUD




## NODE RED-PROGRAM FLOW



# WEB APP UPI



Node-RED Dashboard
IBM
Node-RED
127.0.0.1:1880/ui/#!/0?socketid=xvHoHPKFEI0U4Po3AAAB
Smart Home
Switch board
Humidity
100
80
60
40
20
18:51:57
18:52:07
18:52:21
LIGHT ON
LIGHT OFF
Temp
100
80
60
40
20
0
18:51:57
18:52:07
18:52:21
Garden
Moisture
83
0
100

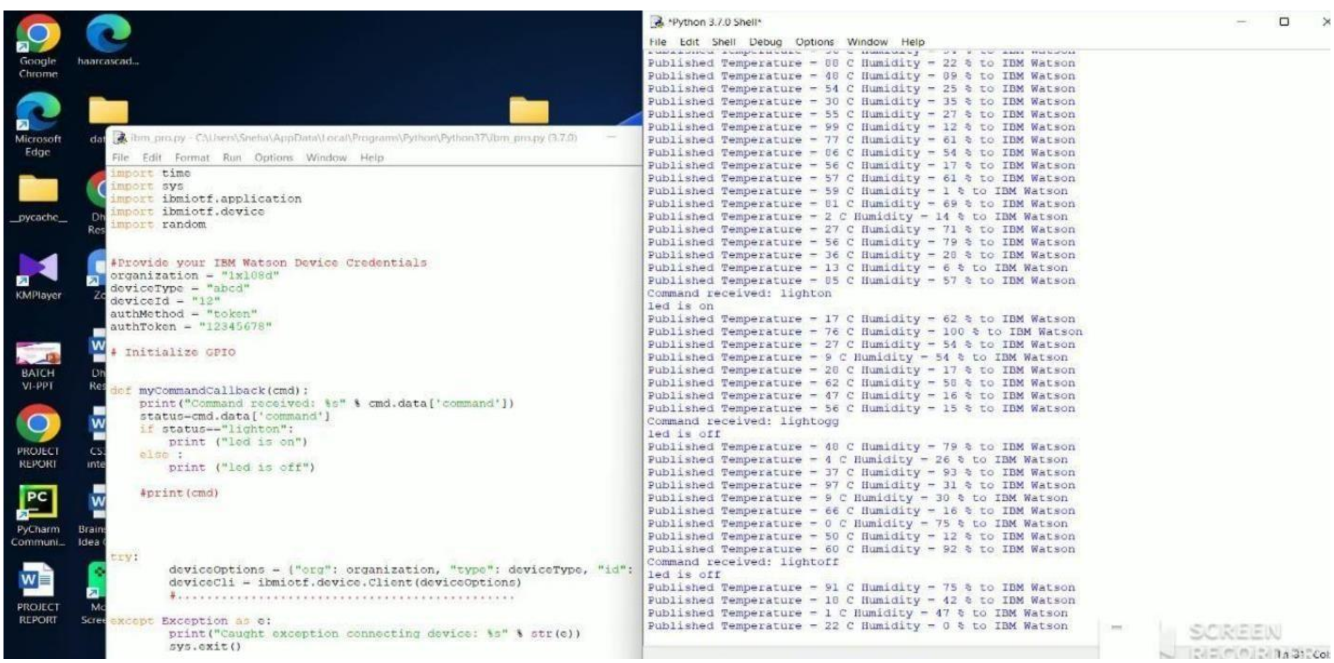
# CHAPTER 8

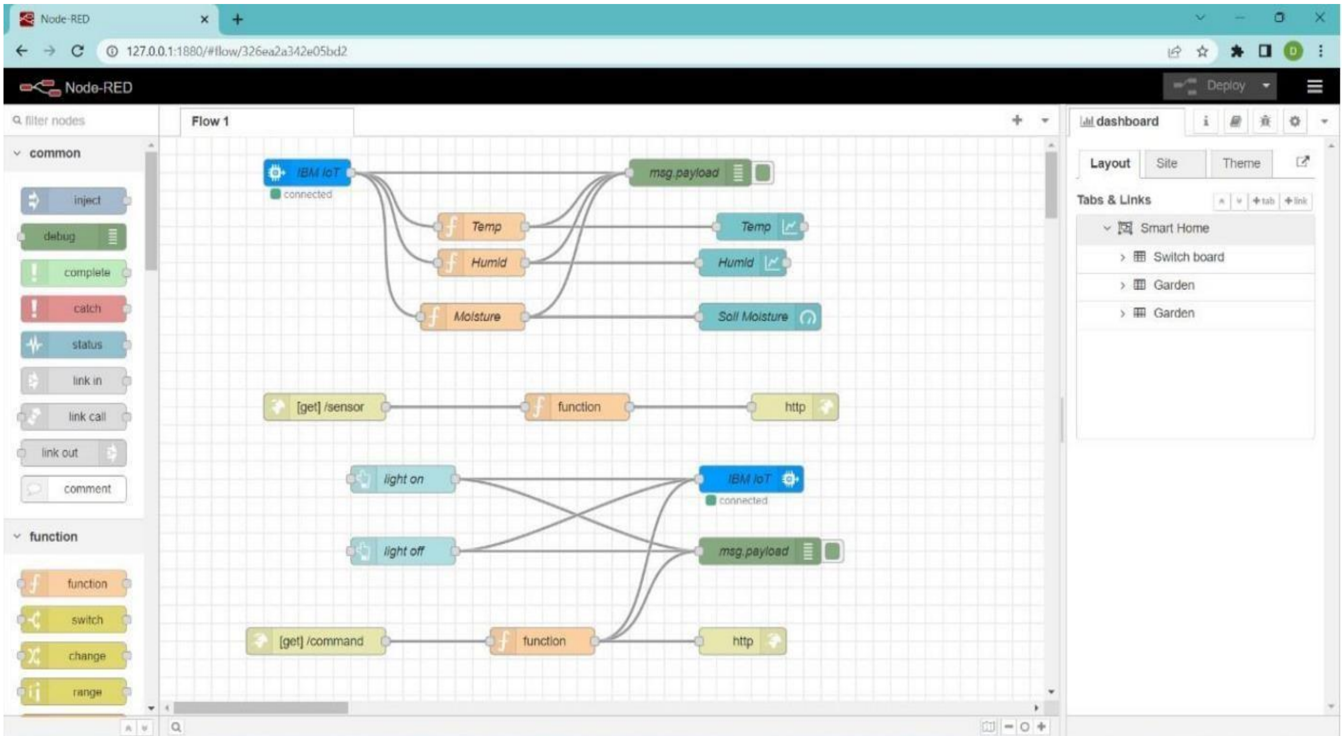
# TESTING

## TEST CASES

| TEST CASES | TEST SCENARIOS |
|---|---|
| TESTCASE 1 | Verify user is able to see the Login/Signup popup when user logged on to the app. |
| TESTCASE 2 | Verify the UI elements in Signup popup |
| TESTCASE 3 | Verify user is able to log into application with Valid credentials |
| TESTCASE 4 | Verify user is able to log into application with InValid credentials |
| TESTCASE 5 | Verify user is able to log into application with InValid credentials |

## COMMAND RECEIVED FROM NODE-RED






## USER ACCEPTANCE TESTING

## PURPOSE OF DOCUMENT

The purpose of this document is to briefly explain the test coverage and open issues of the Smart Farmer -IOT Enabled smart farming application project at the time of the release to User Acceptance Testing (UAT).

## DEFECT ANALYSIS

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

| Resolution | Severity 1 | Severity 2 | Severity 3 | Severity 4 | Subtotal |
|---|---|---|---|---|---|
| By Design | 10 | 4 | 2 | 3 | 20 |
| Duplicate | 1 | 0 | 3 | 0 | 4 |
| External | 2 | 3 | 0 | 1 | 6 |
| Fixed | 11 | 2 | 4 | 20 | 37 |
| Not Reproduced | 0 | 0 | 1 | 0 | 1 |
| Skipped | 0 | 0 | 1 | 1 | 2 |
| Won't Fix | 0 | 5 | 2 | 1 | 8 |
| Totals | 24 | 14 | 13 | 26 | 77 |

## TEST CASE ANALYSIS

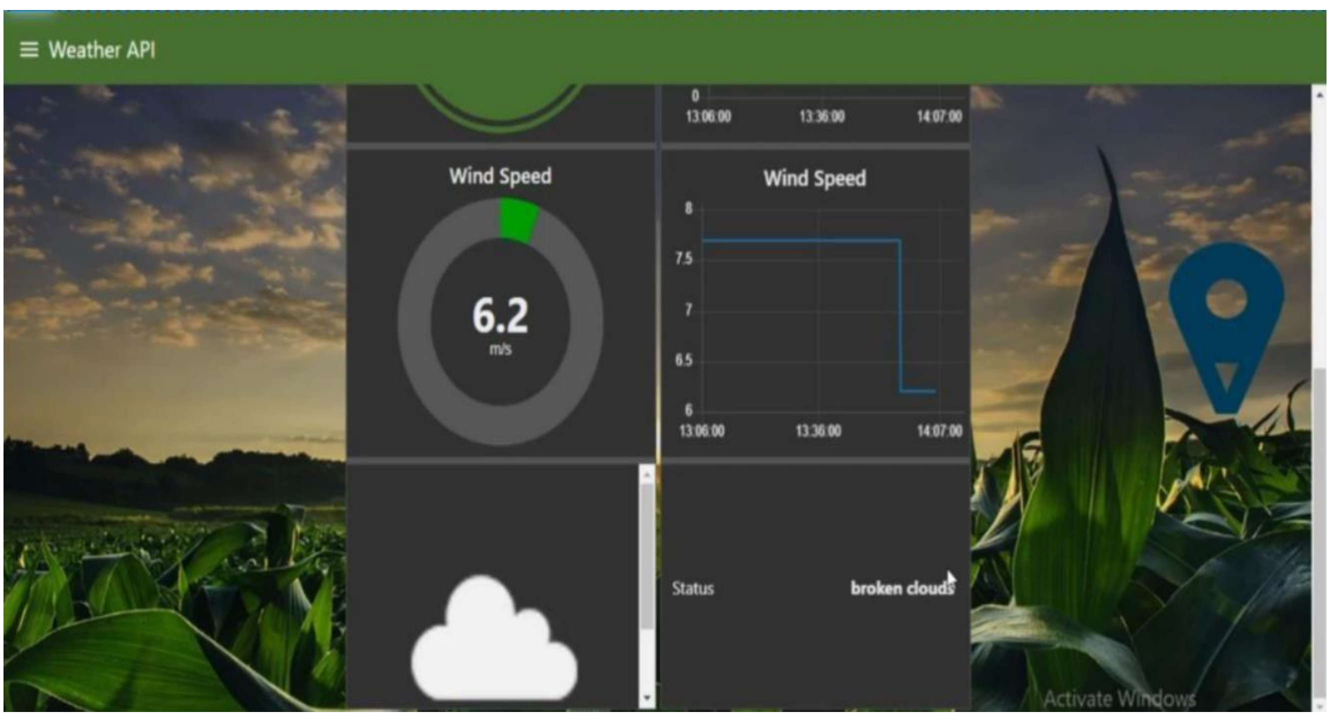
This report shows the number of test cases that have passed, failed, and untested

| Section | Total Cases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| Print Engine | 7 | 0 | 0 | 7 |
| Client Application | 51 | 0 | 0 | 51 |
| Security | 2 | 0 | 0 | 2 |
| Outsource Shipping | 3 | 0 | 0 | 3 |
| Exception Reporting | 9 | 0 | 0 | 9 |
| Final Report Output | 4 | 0 | 0 | 4 |
| Version Control | 2 | 0 | 0 | 2 |

# CHAPTER 9

# RESULTS

## 9.1 PERFORMANCE METRICS

# CHAPTER 10

# ADVANTAGES & DISADVANTAGES

## ADVANTAGES

Internet of things (IoT) facilitates the several advantages in day-to-day life in the business sector (for example in agriculture). Some of its benefits are given below:

- **Minimum Resources:** It allows farmers to maximize yields using minimum resources such as water, fertilizers, seeds etc.
- **Wireless Monitoring:**These improves data collection process and helps in wireless monitoring and control. Efficient resource utilization: If we know the functionality and the way that how each device work we definitely increase the efficient resource utilization as well as monitor natural resources.
- **Minimize human effort:** As the devices of IoT interact and communicate with each other and do lot of task for us, then they minimize the human effort.
- **Save time:** As it reduces the human effort then it definitely saves out time.

## DISADVANTAGES

As the Internet of things facilitates a set of benefits, it also creates a significant set of challenges.

- **Availability:** The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement. Moreover internet connection is slower.
- **Challenges:** The smart farming based equipment require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming
- **Privacy:** Even without the active participation on the user, the IoT system provides substantial personal data in maximum detail.
- **Complexity:** The designing, developing, and maintaining and enabling the large technology to IoT system is quite complicated.

# CHAPTER 11
# CONCLUSION

Smart farming is a modern farming management concept with IoT technology to increase the productivity in agriculture. With the use of smart farming, users can effectively monitor the crop field the quality, quantity of their crops and to irrigate the crops by using mobile application . Various parameters can be analyzed from the mobile application such as temperature, humidity and ph. IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled. IoT works in different domains of farming to improve time efficiency, water management, crop monitoring, soil management and control of insecticides and pesticides. This system also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming. Besides the advantages provided by this system, smart farming can also help to grow the market for farmer with single touch and minimum effort.

# CHAPTER 12

# FUTURE SCOPE

The project has vast scope in developing the system and making it more user friendly and the additional features of the system like:

- By installing a webcam in the system, photos of the crops can be captured and the data can be sent to database.
- Speech based option can be implemented in the system for the people who are less literate.
- GPS (Global Positioning System) can be integrated to provide specific location of the farmer and more accurate weather reports of agriculture field and garden.
- Regional language feature can be implemented to make it easy for the farmers who are aware of only their regional language.

# CHAPTER 13

# REFERENCE


**[1]** Zuraida Muhammad,Muhammad azri Asyraf Mohd Hafez,Nor Adni Mat Leh,Zakiah Mohd Yusoff ,Shabinar Abd Hamid. "**Smart Agriculture Using Internet of Things with Raspberry Pi"** Published in August 2020

**[2]** Vijaya Saraswathi R, Sridharani J, Saranya Chowdhary P,Nikhil K, Sri Harshitha M, Mahanth Sai K "**Smart Farming IoT based Future Agriculture"** Published in January, 2022.

**[3]** M S D Abhiram, Jyothsnavi Kuppili, N.Alivelu Manga" **Smart Farming System Using Iot for Efficient Crop Growth"** Published in May, 2020

**[4]** Syeda Iqra Hassan,Muhammad Mansoor Alam,Usman Illahi,Mohammed A.Al Ghamdi,Sultan H.Almotiri,Mazliham Mohid Su'ud"**An Systematic Approach on Monitoring and Advanced Control Strategies in Smart Agriculture"** Published in January, 2021.

**[5]** Dr. J. JegatheshAmalraj, S. Banumathi, J. JereenaJohn **"A Study On Smart Irrigation Systems For Agriculture Using Iot"** Published in International Journal Of Scientific & Technology Research Volume 8, Issue 12, December 2019

**5]** Shweta B Saraf, Dhanashri H.Gawali" **IoT Based Smart Irrigation Monitoring and Controlling System**" Published in January, 2018.

# CHAPTER 14

# APPENDIX

## SOURCE CODE

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "b84wgs"
deviceType = "abi"
deviceId = "12345678"
authMethod = "token"
authToken = "87654321"
# Initialize GPIO
 def myCommandCallback(cmd):
     print("Command received: %s" % cmd.data['command'])
     status=cmd.data['command']
     if status=="motoron":
        print ("Motor is ON")
    else :
       print ("Motor is OFF")
#print(cmd)
 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
```

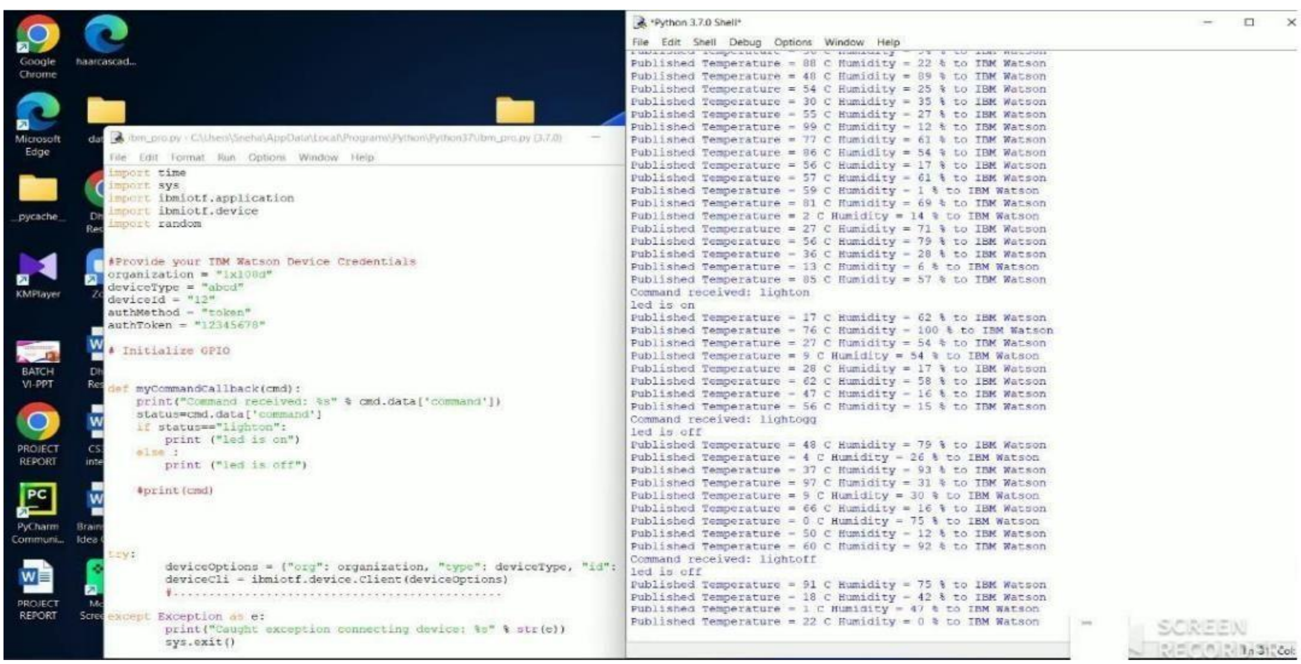
```
deviceCli.connect()
while True:
 #Get Sensor Data from DHT11

 Temp=random.randint(0,100)
Humid=random.randint(0,100)
data = { 'Temp' : Temp, 'Humid': Humid }

#print data def myOnPublishCallback():
    print ("Published Temperature = %s C" % Temp, "Humidity = %s %%" % Humid, "to IBM Watson")

success=deviceCli.publishEvent("IoTSensor","json",data,qos=0,on_publish=myOnPublishCallback)
 if not success:
   print("Not connected to IoTF")
 time.sleep(1)
deviceCli.commandCallback = myCommandCallback
```

**OUTPUT**



# MOBILE APP


10:22
Screen4
Moisture:
Temperature: 102
Humidity: 90
Light ON
Light OFF