SmartFarmer - IoT Enabled Smart Farming Application

Team ID

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GitHub Repositories

IBM-Project-26051-1659982306

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CHAPTER 1
INTRODUCTION

1.1 PROJECT OVERVIEW

Agriculture plays an important role in country's economy and provides a largescale employment to the people. However, agriculture is highly dependent upon weather and climate. For example, changes in temperature, soil moisture, carbon dioxide may result in low yield of crops. It is Significant to monitor environmental parameters to manage crop growth and increase the agricultural production yield. The sensed information is not only important for decision making but also for evaluating impacts of agricultural practices on environment.

Nowadays, it is more necessary than ever to increase the crop yields food grain production. Cloud connected, wireless system aid in this crop yield maximization, which automates day-to-day agricultural tasks and real time monitoring for smart decision-making.

1.2 PURPOSE

- Need for technology to monitor important parameters like soil moisture, temperature, Humidity etc. to improve the cultivation process.
- Need for technology to monitor weather of particular area with reliable source to save the crops at the time of natural calamities like flood, cyclone etc.
- Development of certain techniques to reduce the workforce, energy and time for cultivation.
- Development of a feasible method to control the electrical equipment in the farm from any part of the world.

CHAPTER 2
LITERATURE SURVEY

2.1 EXISTING PROBLEM

- Controlling the device from longer distance from web application.
- Getting the weather data from weather station.
- Transfer of node data to the gateway at faster rate.
- Unavailability of data such as PH level, potassium, Nitrogen etc related to the soil.

2.2 REFERENCES

- C.H. Chavan and V. Karnade "Wireless Monitoring of Soil moisture, Temperature and Humidity using Zigbee in Agriculture" presented at International Journal of Engineering Trends and Technology (IJETT) ,vol-11, May-2014.
- Karan Kansara and Vishal Zaweri "Sensor Based Automated Irrigation System with IOT" presented at International Journal of Computer Science and Information Technologies, vol-06, 2015.
- Archana and Priya "Design and Implementation of Automatic Plant Watering System" presented at International Journal of Advanced Engineering and Global technology, vol-04, Issue-01 , Jan-2016.
- Ms. Swapnali B.Pawar, Prof. Priti Rajput, Prof. Asif Shaikh "Smart Irrigation System Using IOT And Raspberry Pi" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 08 | Aug 2018.
- Neha K. Nawandar, Vishal R.Satpute "IoT based low cost and intelligent module for smart irrigation system" Computers and Electronics in Agriculture, Volume 162, July 2019.

- J. Karpagam, I.Infranta Merlin, P. Bavithra, J. Kousalya “Smart Irrigation System Using IoT” 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS).

2.3 PROBLEM STATEMENT DEFINITION

Here we have created a problem statement to understand the customer's point of view. The Customer Problem Statement template helps us to focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you will also be able to empathize with your customers, which helps you better understand how they perceive your product or service. The sample of this is and what it means is given below.

I am	Describe customer with 3-4 key characteristics - *who are they?*	Describe the customer and their attributes here
I'm trying to	*List their outcome or "job" the care about - what are they trying to achieve?*	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way – *what bothers them most?*	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists – *what needs to be solved?*	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view – *how does it impact them emotionally?*	Describe the emotions the result from experiencing the problems or barriers

The problem statement for this project is shown below:

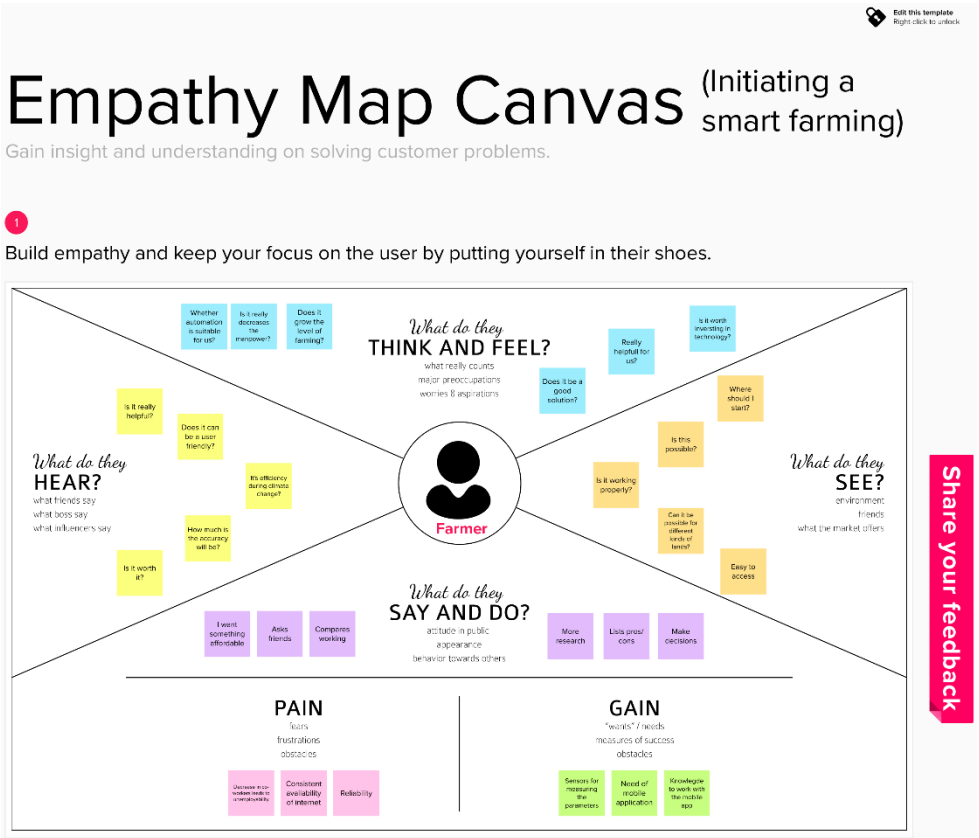
Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	A farmer	who needs to work smarter than harder hence found an easy way to monitor the parameters of the crop often and to manage the water pump accordingly to water the field	It requires the physical presence on the site	The measuring results should be accurate	Depart from other work holds

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 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.

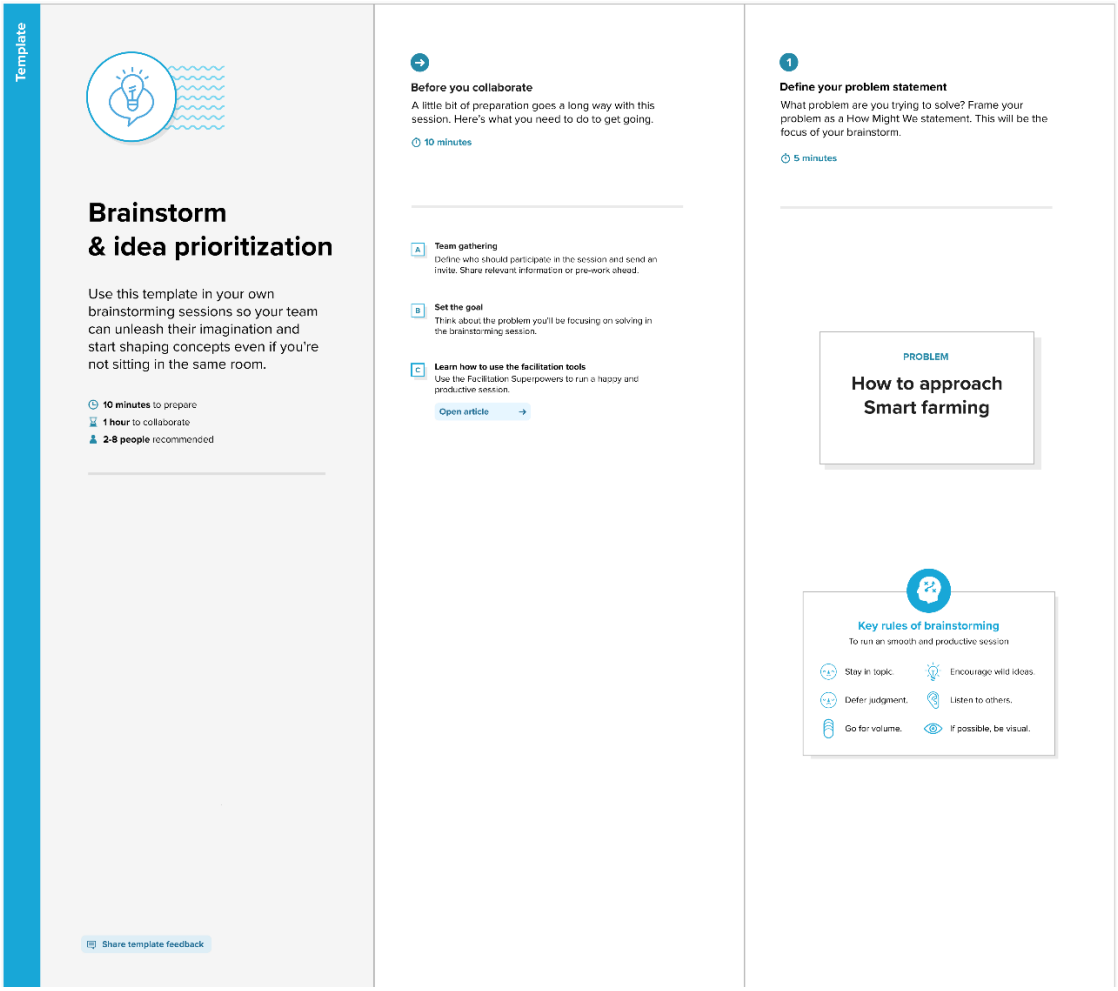


3.2 IDEATION & BRAINSTORMING

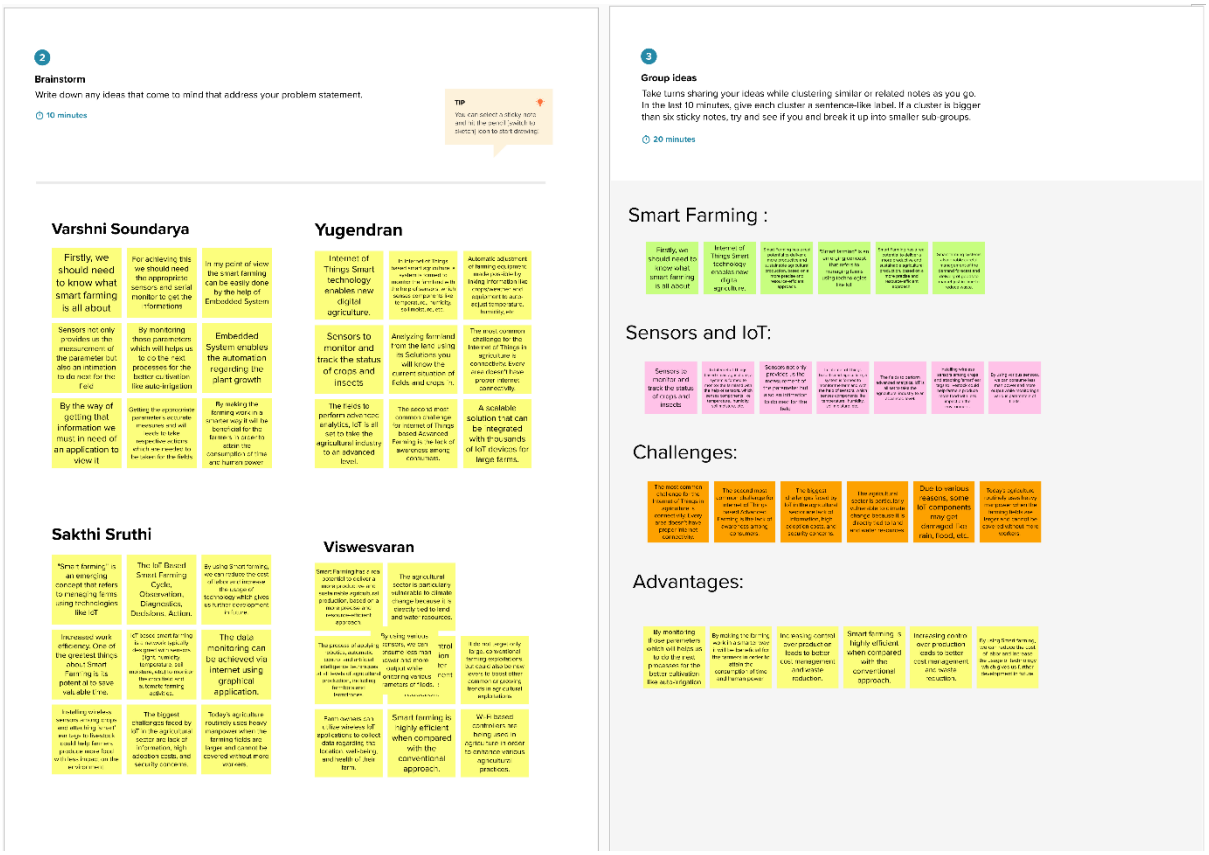
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich number 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 are not sitting in the same room.

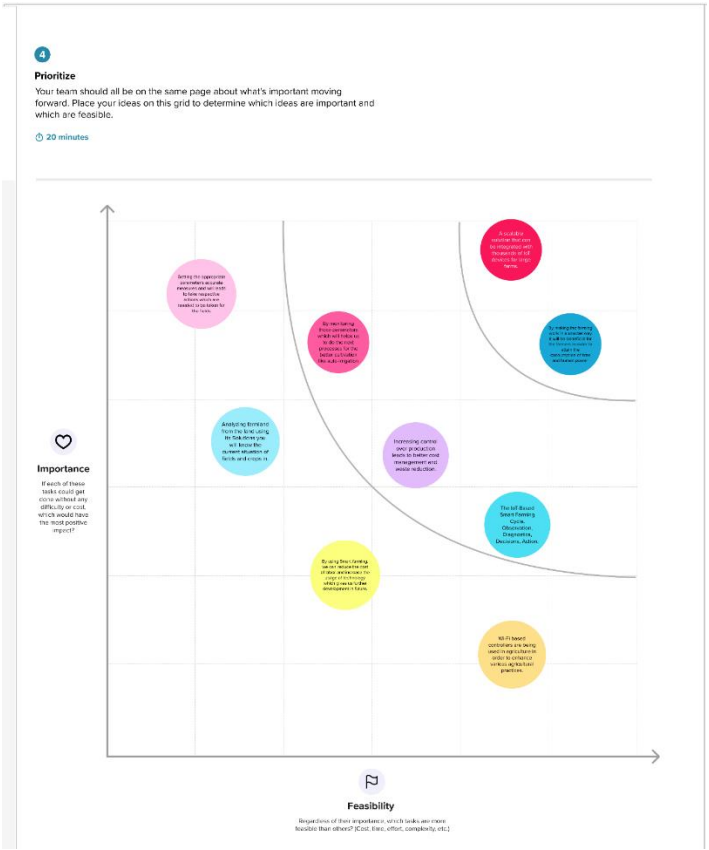
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization

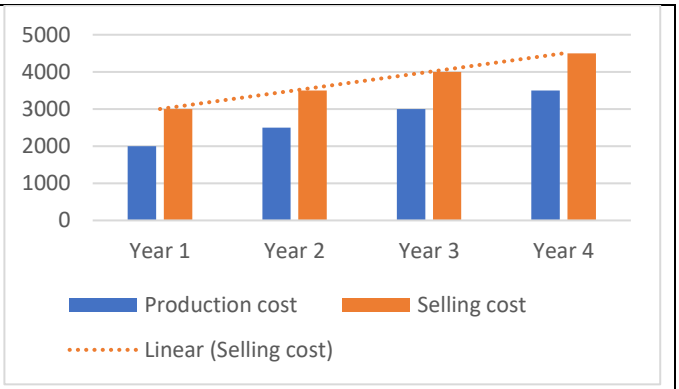


3.3 PROPOSED SOLUTION

Project team shall fill the following information in proposed solution template.

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To facilitate the farmer's work easy, by way of helping them to make the agriculture activities much smarter.
2.	Idea / Solution description	◆ IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors. ◆ Farmers can monitor all the sensor parameters by using a mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers. ◆ They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself. ◆ Similarly, they can also sprinkle the liquid type insecticides by rain pipe system and weedicides by the piping system. ◆ Also, they will be able to know the plant's lifetime by using the some of the parameters

		of his field. So that it will help him to make further decisions as per need. ◆ Along with it all, he can also be able to control the Animal Repeller system which is kept in the field.
3.	Novelty / Uniqueness	◆ By getting to observe all the parameters of the field with the help of the mobile application, farmer can easily control the motors and irrigate the field ◆ Rain pipe system for sprinkling liquid type insecticides ◆ Piping system for spraying weedicides across the field ◆ Predicting plant's lifetime to make further decisions. ◆ Animal Repeller system to protect the field
4.	Social Impact / Customer Satisfaction	◆ This solution helps a lot of farmers as well as the persons who are all taking care of the plantations ◆ It will become a needed one for the one who wants to save time, manpower and do the work in a smarter way
5.	Business Model (Revenue Model)	◆ We can get a better profit on this. Since, we are providing an easiest way for the farmers to reduce their work holds

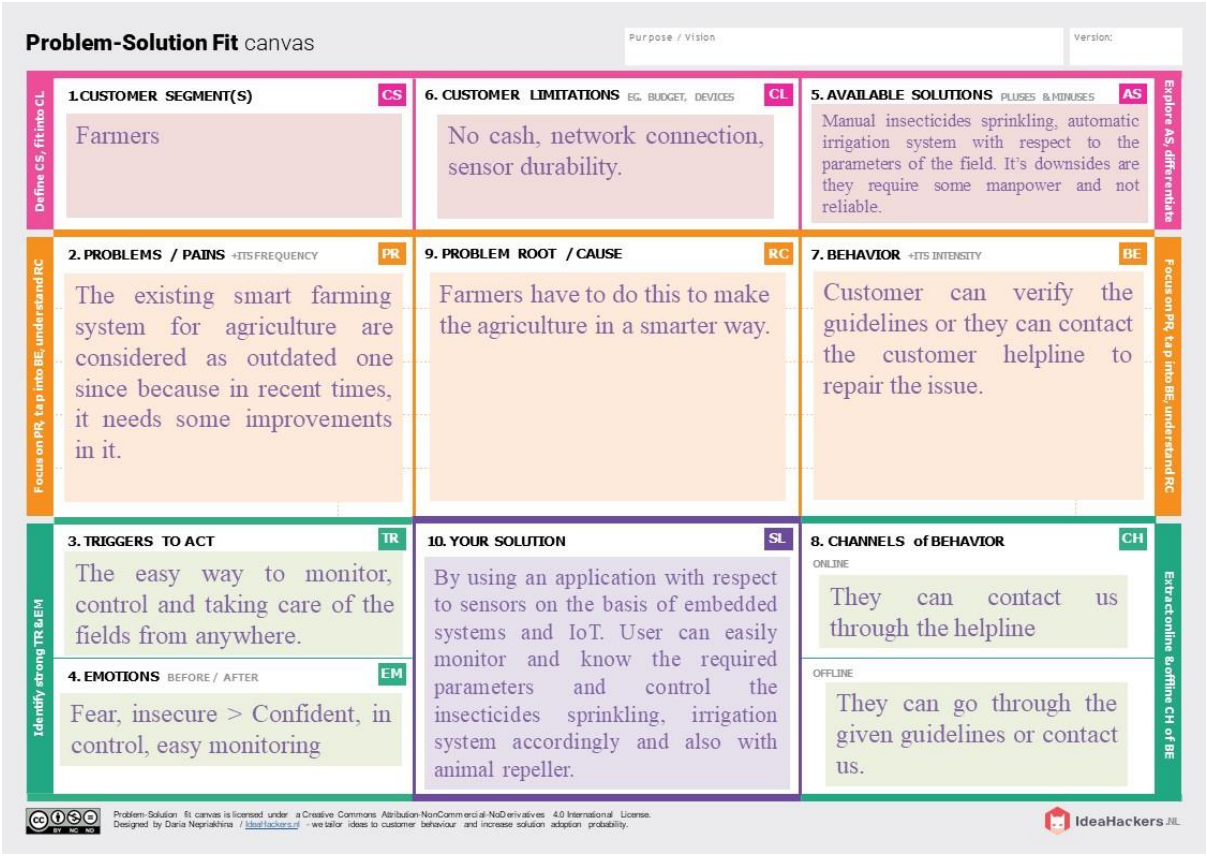
		
6.	Scalability of the Solution	This solution is scalable, but it is based upon the user that how frequently they are using this

3.4 PROBLEM SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why

Purpose:

- Solve complex problems in a way that fits the state of your customers.
- Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- Sharpen your communication and marketing strategy with the right triggers and messaging.
- Increase touchpoints with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
- Understand the existing situation to improve it for your target group.


Problem-Solution Fit canvas
Purpose / Vision
Version:
Define CS, fit into CL
1. CUSTOMER SEGMENT(S)
CS
Farmers
6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES
CL
No cash, network connection, sensor durability.
5. AVAILABLE SOLUTIONS PLUSES & MINUSES
AS
Manual insecticides sprinkling, automatic irrigation system with respect to the parameters of the field. It's downsides are they require some manpower and not reliable.
Explore AS, differentiate
Focus on PR, tap into BE, understand RC
2. PROBLEMS / PAINS +ITS FREQUENCY
PR
The existing smart farming system for agriculture are considered as outdated one since because in recent times, it needs some improvements in it.
9. PROBLEM ROOT / CAUSE
RC
Farmers have to do this to make the agriculture in a smarter way.
7. BEHAVIOR +ITS INTENSITY
BE
Customer can verify the guidelines or they can contact the customer helpline to repair the issue.
Focus on PR, tap into BE, understand RC
Identify strong TR & EM
3. TRIGGERS TO ACT
TR
The easy way to monitor, control and taking care of the fields from anywhere.
4. EMOTIONS BEFORE / AFTER
EM
Fear, insecure > Confident, in control, easy monitoring
10. YOUR SOLUTION
SL
By using an application with respect to sensors on the basis of embedded systems and IoT. User can easily monitor and know the required parameters and control the insecticides sprinkling, irrigation system accordingly and also with animal repeller.
8. CHANNELS of BEHAVIOR
CH
ONLINE
They can contact us through the helpline
OFFLINE
They can go through the given guidelines or contact us.
Extract online & offline CH of BE
Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.
Designed by Daria Nepriakhina / Ideahackers.nl - we tailor ideas to customer behaviour and increase solution adoption probability.
IdeaHackers.NL

CHAPTER 4
REQUIREMENT ANALYSIS

4.1 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 Email Registration through Phone number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User credentials check	Based upon the credential of the user, they will be proceeded
FR-4	External interface	The interfaces which connect the application, and the motors is done by IoT
FR-5	Transaction processing	Transaction of the data will be done via IoT from the application to IBM Cloud
FR-6	Reporting	The user can view the parameters result in the application and can control and do the further steps via same application

4.2 NON-FUNCTIONAL REQUIREMENTS

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

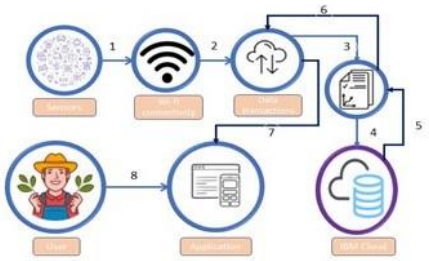
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User can easily learn how to access the application platform. Since, it is designed in a user-friendly manner

NFR-2	**Security**	It has some security for the users to maintain certain privacy like the collecting data and storage of those data
NFR-3	**Reliability**	The database update process must roll back all related updates when any update fails
NFR-4	**Performance**	Performance of this is always depends upon the users that how frequently they are using it
NFR-5	**Availability**	Its availability is quite excellent. If it experiences any technical issues, it will be notified to the users about it suddenly
NFR-6	**Scalability**	The processing of the data and the transactions will be done in an efficient way

CHAPTER 5
PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

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.



1. The measured characteristic data values of the soil will be measured by the help of the sensors will be collected.
2. The collected data will be then transferred to the IBM Cloud by the use of Wi-fi connectivity support.
3. This transferred data will be then saved to the IBM Cloud.
4. Then the data will be transferred by the data transaction and will be available on the application
5. Again, if the user configures and starts the app. The data(s) will readily displayed in the app.

5.2 SOLUTION & TECHNICAL ARCHITECTURE

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

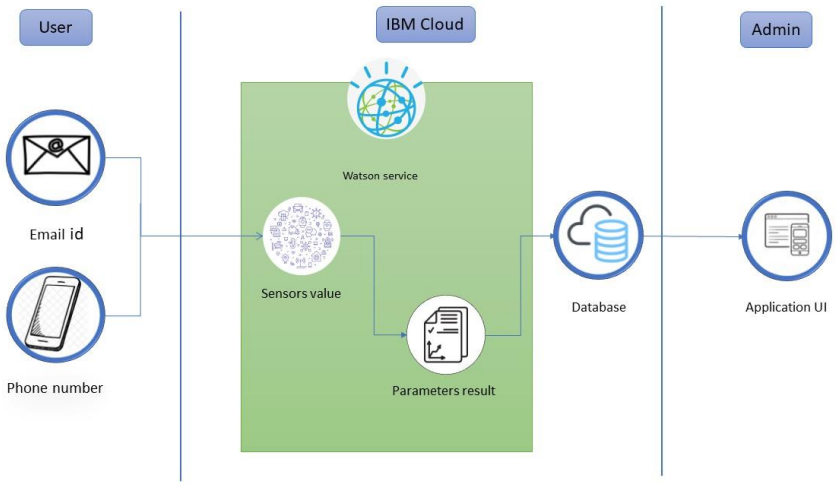


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web Application/Mobile App	Node-Red/MIT 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 Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration:	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	MIT App Inventor, Node-Red
2.	Security Implementations	It has some security for the users to maintain certain privacy like the collecting data and storage of those data	Encryptions
3.	Scalable Architecture	The processing of the data and the transactions will be done in an efficient way	MQTT
4.	Availability	Justifying the availability of application	Free availability of the application
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Can access a possible number of requests per second based upon the number of users it can be varied

5.3 USER STORIES

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

Sensors and wifi

1. Initially we need to connect the sensors to the arduino board

2. DTH11 sensor measures the humidity and temperature

3. Soil moisture sensor detects the moisture content in the soil

4. All these parameters are sent to the arduino controller and the collected data will be passed on to the cloud and get stored

IBM Watson Platform

1. It is an IOT Based data accumulation and simulation software that is used to apply for IoT and automation services

2. It connects the arduino hardware to the IBM cloud account and logs each and every data to the cloud

Node- Red

1. It is a wire frame network tool in order to interconnect the parameters :

2. 1. IBM Watson IoT platform

   2. Web UI

   3. MIT App

3. It creates a connection between these three nodes and passes the data to each other till the user's end

MIT App inventer

1. It is a basic and user friendly front and backend designer for applications

2. It uses block coding for back end purposes and block assembling for front end development

User interaction with the software

1. The farmer(user) will interact with the application in the smartphone in order to monitor and control their fields through the "Smart Farmer using IoT" project

2. They can monitor and control the filed parameters from everywhere through the internet

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
IoT devices	USN-1	Sensors and Wi-fi module	I can access my sensors, motors/dashboard	High	Sprint-1
Software	USN-2	IBM Watson IoT platform, Workflow for IoT scenarios using Node-Red	To review the parameter's value	High	Sprint-2
Registration and Login Dashboard	USN-3	To develop an application using MIT app interface As a user, I can register for the application by entering my email, password, and confirming my password.	Development's effectiveness	Medium	Sprint-3
Web UI	USN-4	User interaction with the software	User can access the app. for the services.	High	Sprint-4

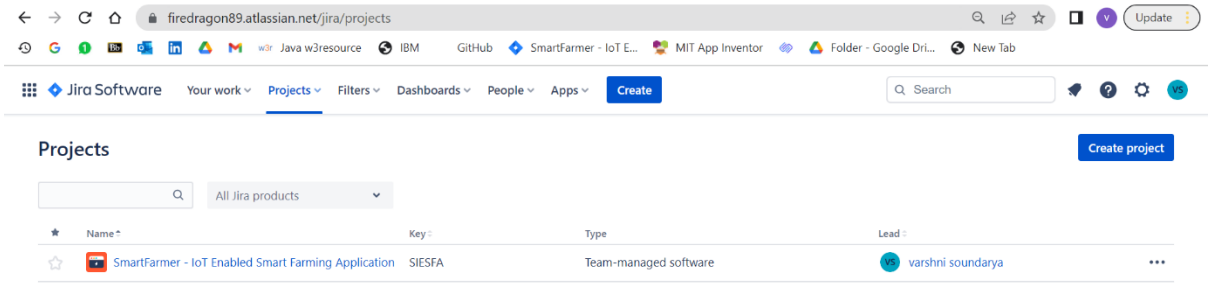
6.2 SPRINT DELIVERY SCHEDULE

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	15	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	18	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	15	19 Nov 2022

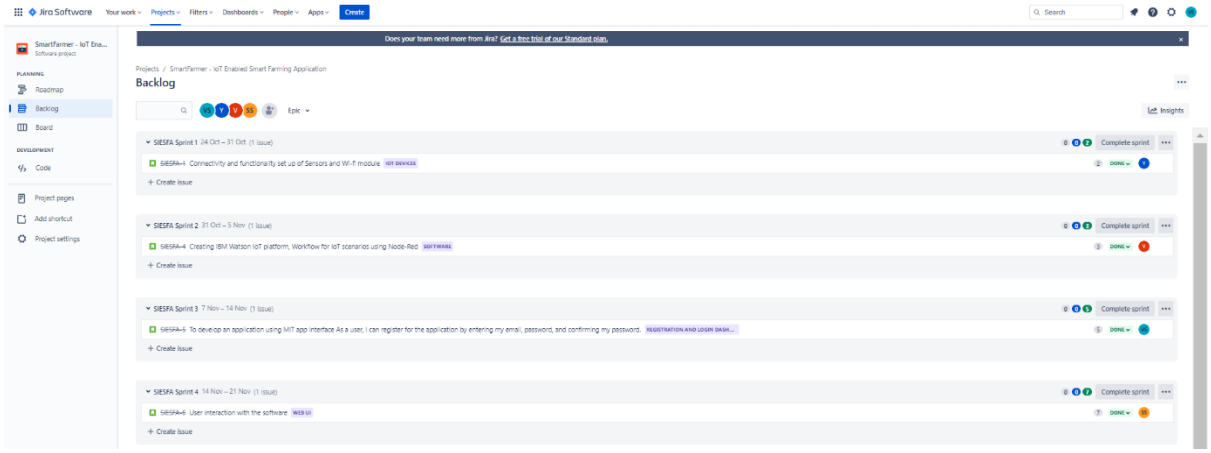
6.3 REPORTS FROM JIRA

Jira is a proprietary issue tracking product developed by Atlassian that allows bug tracking and agile project management.

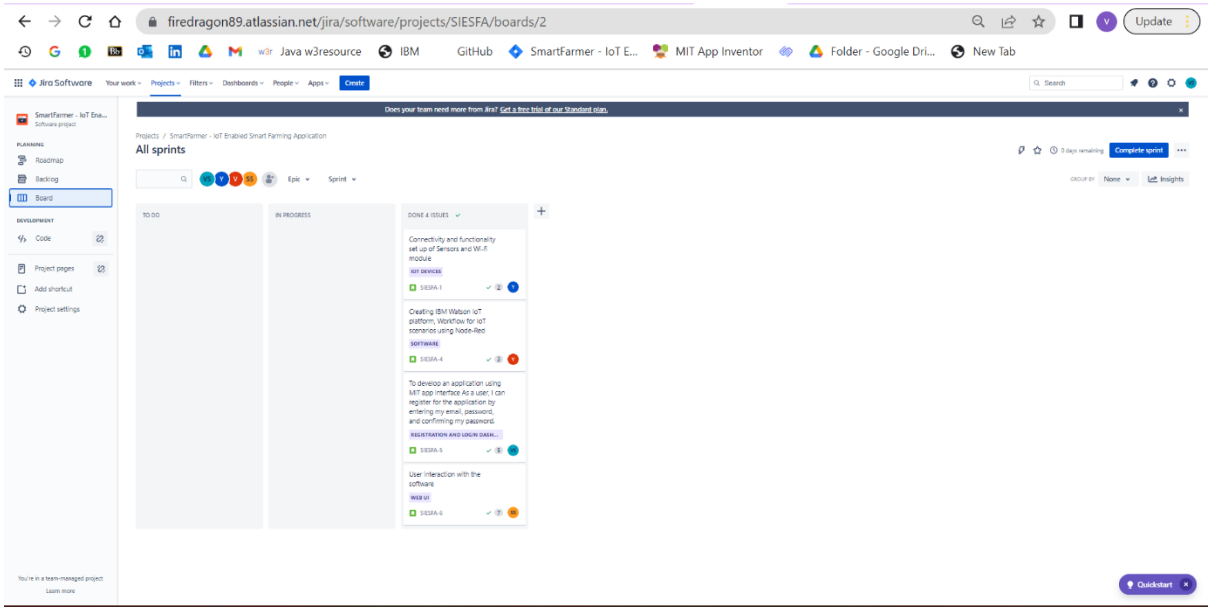
Step 1: First we have an account in Jira software and created a new project in it



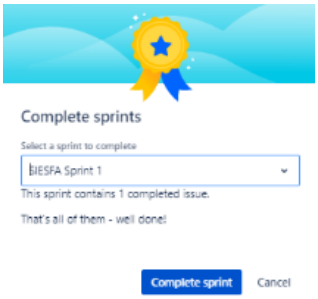
Step 2: We created the sprints, assigned it to the team members with a time limit

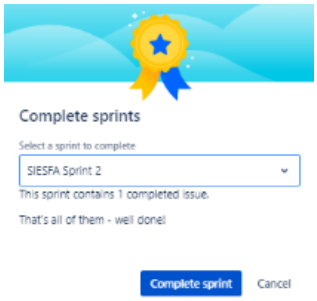


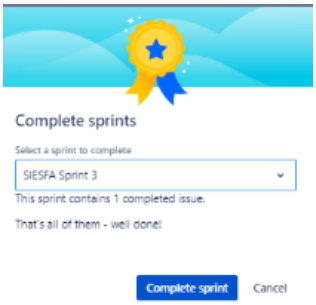
Step 3: We upgraded our progress by completed it

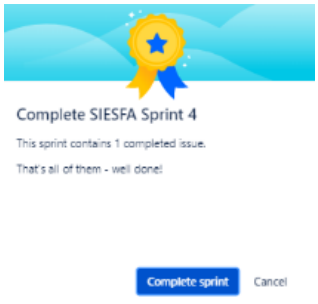


Step 4: By completing the sprints we have received the badges for each one of them









CHAPTER 7
CODING & SOLUTIONING

7.1 FEATURE 1 - CONNECTIVITY AND FUNCTIONALITY SETUP OF SENSORS AND WI-FI MODULE

Explanation:

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 by the help of Arduino UNO via internet without their actual presence in the field.

Project flow:

- The parameters like temperature, humidity, and soil moisture are updated to the Watson IoT platform
- The device will subscribe to the commands from the mobile application and control the motors accordingly
- APIs are developed using Node-RED service for communicating with Mobile Application
- A mobile application is developed using the MIT App inventor to monitor the sensor parameters and control the motors.

IoT Simulator:

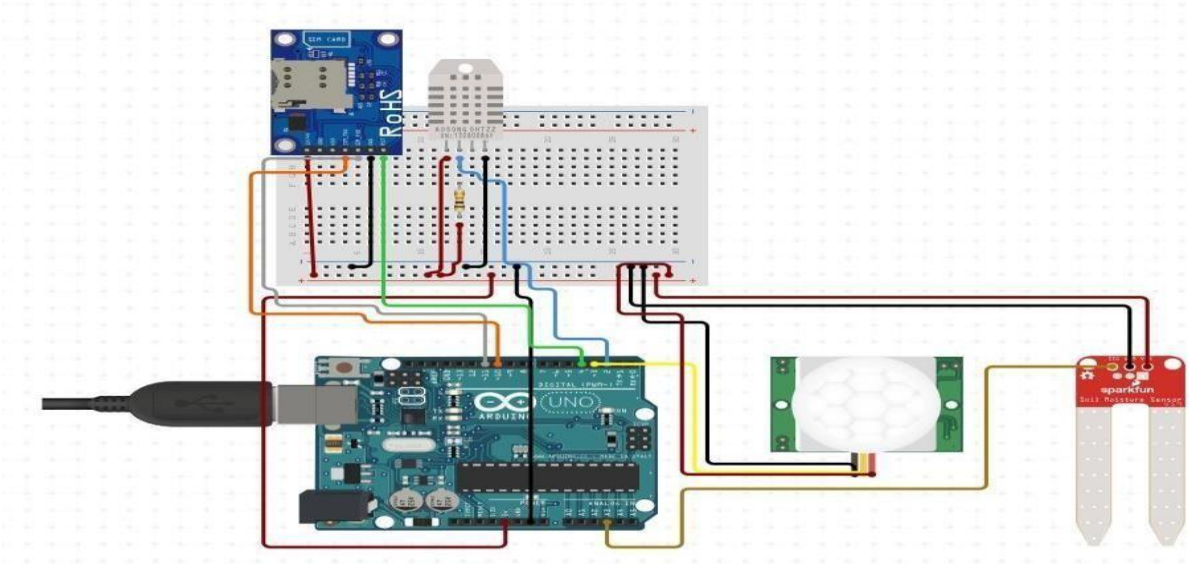
- In our project in the place of sensors we are going to use IoT sensor simulator which give random readings to the connected cloud.
- We need to give the credentials of the created device in IBM Watson IoT Platform to connect cloud to simulator.

OpenWeather API:

- OpenWeatherMap is an online service that provides weather data. It provides current weather data, forecasts and historical data to more than 2 million customers.
- **Steps to configure:**
- Create account in OpenWeather
- Find the name of your city by searching
- Create API key to your account
- Replace “city name” and “your API key” with your city and API key in below red text

  api.openweathermap.org/data/2.5/weather?q={city name}&appid={your API key}

Circuit connection:



Code:

//include libraries #include <dht.h>

#include <SoftwareSerial.h>

//define pins

#define dht_apin A0 // Analog Pin sensor is connected SoftwareSerial mySerial(7,8);//serial port of gsm

```
const int sensor_pin = A1; // Soil moisture sensor O/P pin int pin_out = 9;
//allocate variables dht DHT;
int c=0;

void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT pinMode(3, OUTPUT); //PIN 3 as OUTPUT pinMode(9, OUTPUT);//output for pump
}
void loop()
{
if (digitalRead(2) == HIGH)
{
digitalWrite(3, HIGH); // turn the LED/Buzz ON delay(10000); // wait for 100 msecond digitalWrite(3, LOW); // turn the LED/Buzz OFF delay(100);
}
Serial.begin(9600); delay(1000);
DHT.read11(dht_apin); //temprature float h=DHT.humidity;
float t=DHT.temperature; delay(5000); Serial.begin(9600);
float moisture_percentage;//moisture int sensor_analog;
sensor_analog = analogRead(sensor_pin);
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
float m=moisture_percentage; delay(1000);
if(m<40)//pump
{
while(m<40)
{
digitalWrite(pin_out,HIGH);//open pump sensor_analog = analogRead(sensor_pin);
```

```
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
m=moisture_percentage;
delay(1000);
}
digitalWrite(pin_out,LOW);//closepump
}
if(c>=0)
{
mySerial.begin(9600); delay(15000); Serial.begin(9600); delay(1000);
Serial.print("\r"); delay(1000); Serial.print("AT+CMGF=1\r"); delay(1000);
Serial.print("AT+CMGS=\"+XXXXXXXXXX\"\r"); //replace X with 10 digit
mobil e number
delay(1000); Serial.print((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String)"Moisture="+m);
delay(1000);
Serial.write(0x1A); delay(1000);
mySerial.println("AT+CMGF=1");//Sets the GSM Module in Text Mode
delay(1000);
mySerial.println("AT+CMGS=\"+XXXXXXXXXX\"\r"); //replace X with 10
digit mobile number
delay(1000); mySerial.println((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String)"Moisture="+m);
// message format
mySerial.println(); delay(100); Serial.write(0x1A); delay(1000);
c++;

}

}
```

7.2 FEATURE 2 - CREATING IBM WATSON IOT PLATFORM, WORKFLOW FOR IOT SCENARIOS USING NODE-RED

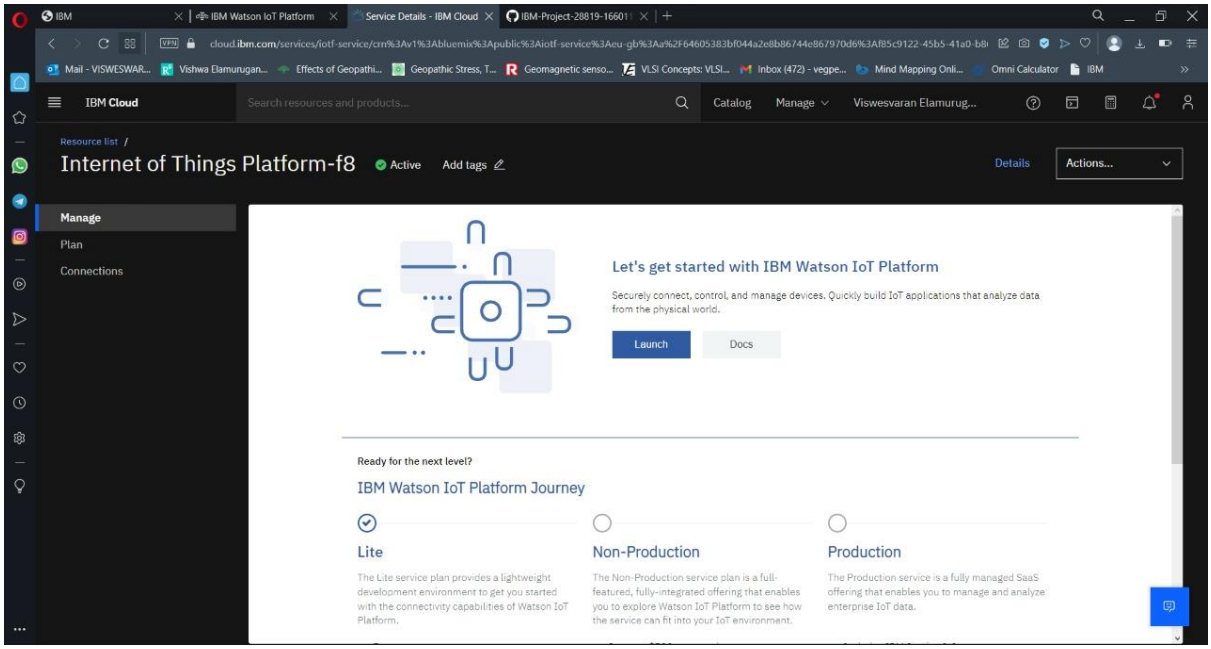
7.2.1 CREATING IBM WATSON IOT PLATFORM:

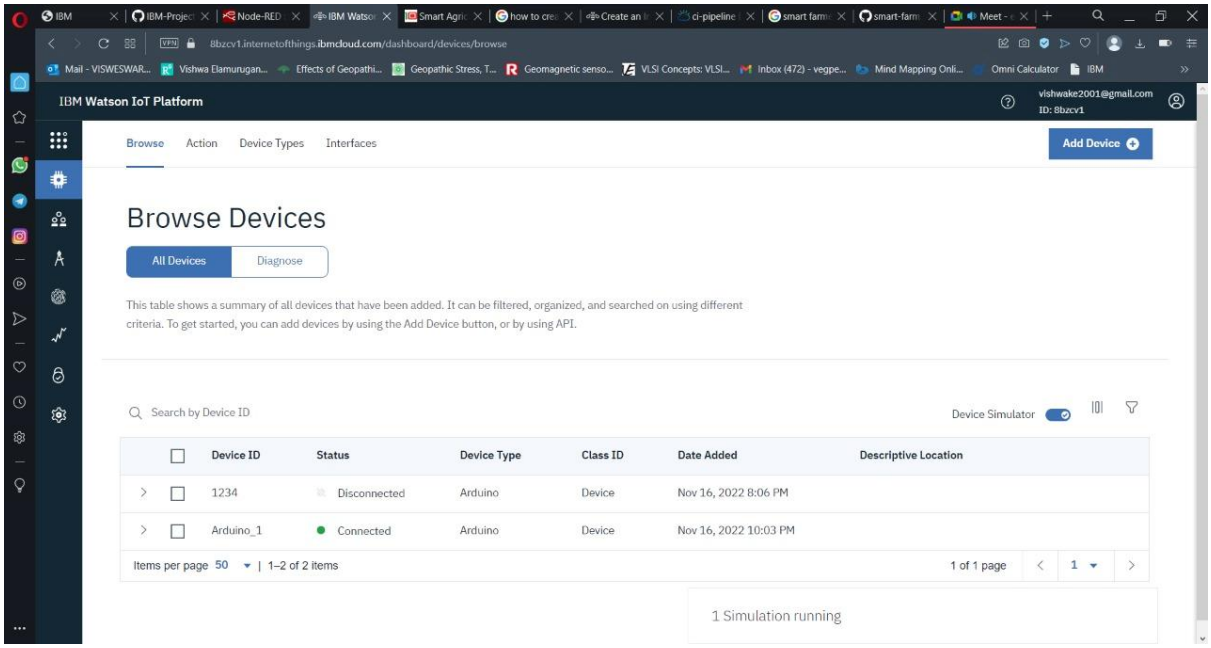
Explanation:

A fully managed, cloud-hosted service with capabilities for device registration, connectivity, control, rapid visualization, and data storage. IBM Watson IoT Platform is a managed, cloud-hosted service designed to make it simple to derive value from your IoT devices.

Steps to configure:

- Create an account in IBM cloud using your email ID
- Create IBM Watson Platform in services in your IBM cloud account
- Launch the IBM Watson IoT Platform
- Create a new device
- Give credentials like device type, device ID, Auth. Token
- Create API key and store API key and token elsewhere.





7.2.2 NODE-RED:

Explanation:

Node-RED is a flow-based development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs, and online services as part of the Internet of Things. Node-RED provides a web browser-based flow editor, which can be used to create JavaScript functions.

Installation:

- First, install the Node
- open command prompt
- Type ->npm install node-red

To Run the application:

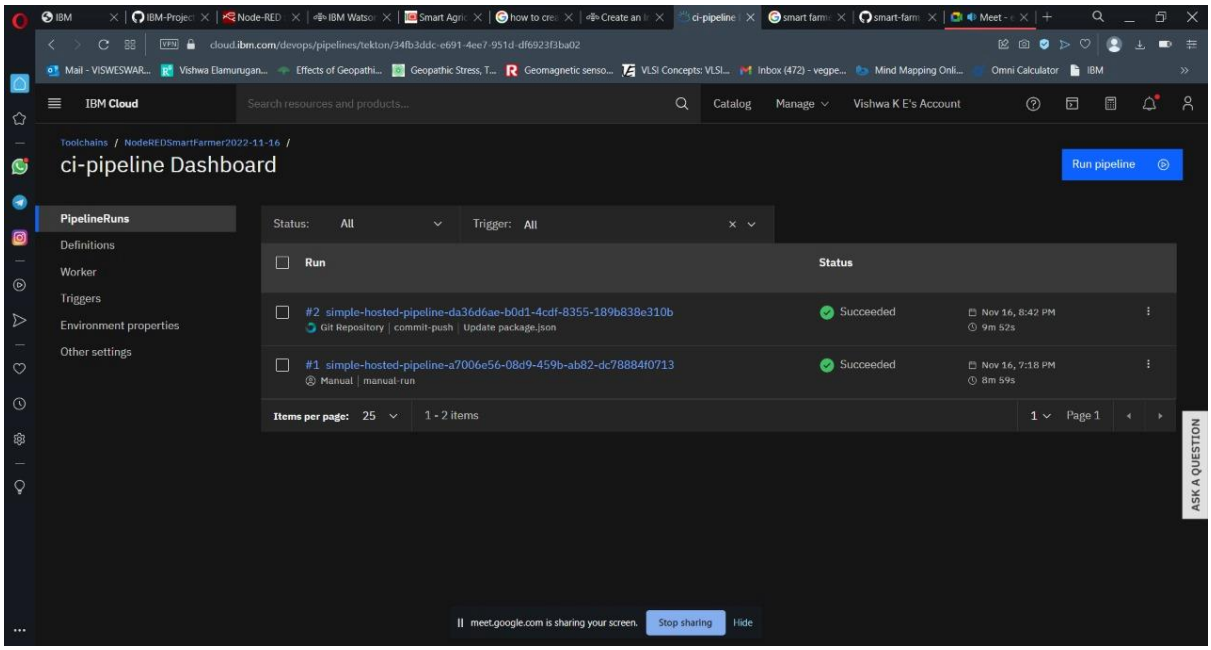
- open command prompt
- And then type “node-red”
- Now open http://localhost:1880/ in the browser

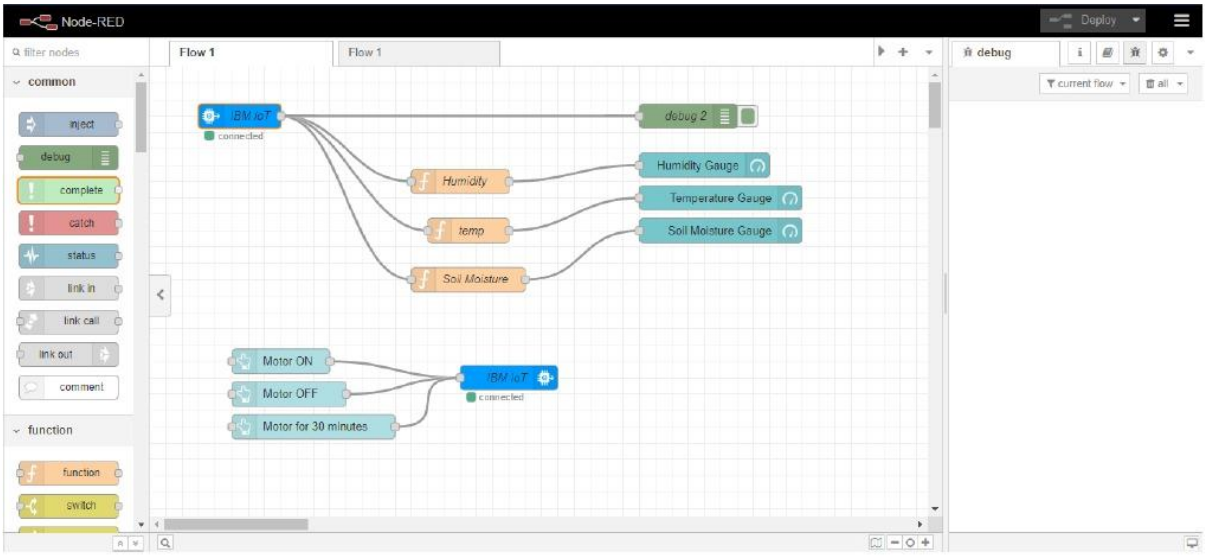
Installation of IBM IOT nodes and Dashboard nodes for Node-Red:

To connect to the IBM Watson IOT platform and create the web UI, these nodes are required

1. IBM IoT Node

2. Dashboard Node





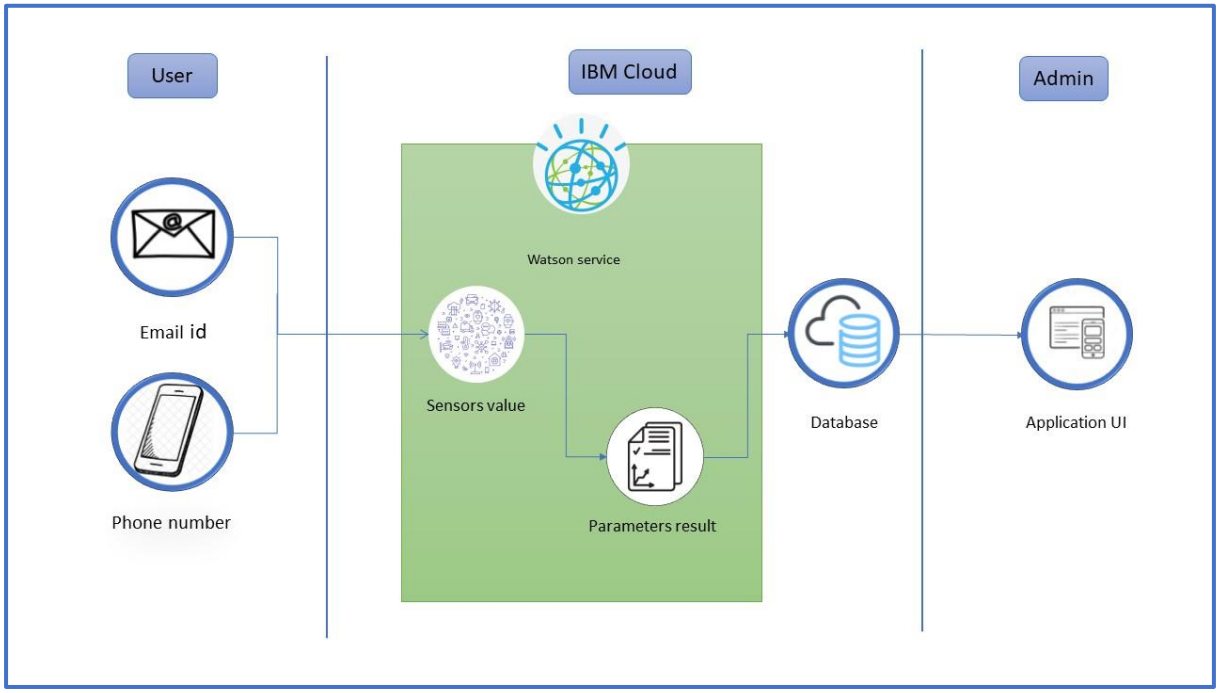
CHAPTER 8

TESTING

8.1 TEST CASES - BY DEVELOPING AN APPLICATION USING MIT APP INTERFACE

Developed mobile application's working procedure:

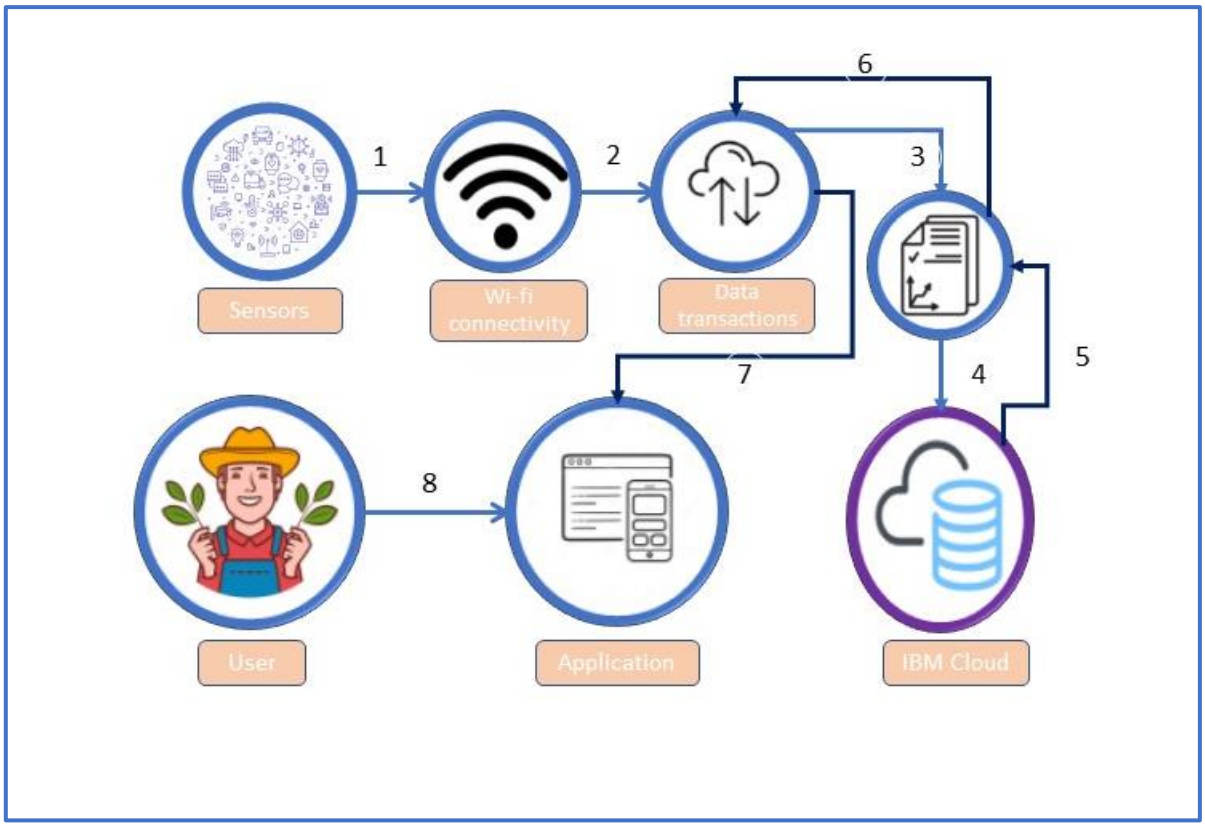
1. The user will provide their registered with their username in the format of email or phone number and a password which should be provided as the user credentials for the login purpose
2. Using sensors, the parameters result will be collected by the help of Watson Cloud and will be stored in a database
3. Then the data will be transferred by the data transaction and will be available on the application
4. Again, if the user configures and starts the app. The data(s) will readily be available in the app as shown below



DATA DERIVATION PROCESS

Explanation:

1. The measured characteristics data values of the soil will be measured by the help of the sensors will be collected
2. The collected data will be then transferred to the IBM Cloud using Wi-fi connectivity support
3. This transferred data will be then saved to the IBM Cloud
4. Then the data will be transferred by the data transaction and will be available on the application
5. Again, if the user configures and starts the app. The data(s) will readily be available in the app



8.2 USER ACCEPTANCE TESTING - USER INTERACTION WITH THE SOFTWARE

Explanation:

- 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.
- Farmers are to be present at farm for its maintenance irrespective of the weather conditions. They must ensure that the crops are well watered and the farm status is monitored by them physically. Farmer must stay most of the time in field in order to get a good yield. In difficult times like in the presence of pandemic also they have to work hard in their fields risking their lives to provide food for the country.
- To improve the farmer's working conditions and make them easier, we introduce IoT services to him in which we use cloud services and internet to enable farmer to continue his work remotely via internet. He can monitor the field parameters and control the devices in farm.
- Here are the testing proofs for testing of our mobile application which are provided on the next page

Defect Analysis:

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved and the detailed data is presented.

Resolution	Severity 1	Severity 2	Severity 3	Subtotal
By Design	1	1	0	2
Duplicate	0	0	0	0
External	1	1	0	2
Fixed	1	1	1	3
Not Reproduced	0	0	0	0
Skipped	0	1	0	1
Won't Fix	0	0	0	0
Totals	3	4	1	8

Test Case Analysis:

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

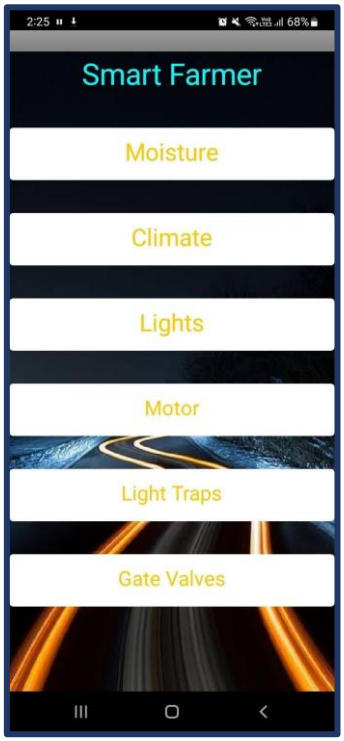
Section	Total Cases	Not Tested	Fail	Pass
Print Engine	0	0	0	0
Client Application	5	0	0	5
Security	1	0	0	1
Outsource Shipping	3	0	0	3
Exception Reporting	5	0	0	0
Final Report Output	4	0	0	4
Version Control	2	0	0	2
Total	20	0	0	15

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS

DEVELOPED MOBILE APPLICATION:



CHAPTER 10
ADVANTAGES AND DISADVANTAGES

10.1 ADVANTAGES

- Communicating the device at larger distance through web application. It will play an important role in reducing the manpower and travelling expenses of a farmer.
- Monitoring the parameter like temperature, humidity etc will play an important role in improving the growth of the plant.
- Integrating the weather station to the web browser will provide the details of status of the cloud, wind speed etc. It will allow the farmer to prevent their plants from natural calamities.

10.2 DISADVANTAGES

- Since the real time sensor will be connected to the controller, the controller requires continuous supply of internet to transfer the data.
- Non availability of weather prediction for long period of time. Since the long weather prediction require additional payment to open weather.

CHAPTER 11
CONCLUSION

The various parameters like temperature, humidity etc were monitored using web application. The data from weather station like wind speed, temperature, humidity etc were displayed in the web browser. The device like motor, light etc can also controlled by the web application.

CHAPTER 12
FUTURE SCOPE

- The various data of soil nutrients is not added in the web browser, that can be added to the web application.
- Long range forecast is not available in the web application, it can also be added to provide accurate information about weather.
- Controlling the device through mobile application and voice will play important role in enhancing this project.
- Providing the GPS and GIS information will also improve productivity of the farmer.

CHAPTER 13

APPENDIX

13.1 SOURCE CODE

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {
    "identity": {
        "orgId": "8bzcv1",
        "typeId": "Arduino",
        "deviceId":"12345"
    },
    "auth": {
        "token": "12345678"
    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %
cmd.data['command'])
    m=cmd.data['command']

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
```

```
    temp=random.randint(-20,125)
    hum=random.randint(0,100)
    myData={'temperature':temp, 'humidity':hum}
    client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
client.disconnect()
```

13.2 GITHUB AND PROJECT DEMO LINK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urned off
Motor\"}","payloadType":"json","topic":"","x":360,"y":1100,"wires":[["931972
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4d.b46e58","name":"","group":"4816d4ed.17cd7c","order":1,"width":0,"height"
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background-repeat: no-repeat;\n background-attachment: cover;\n background-
size: 100% 100%;\n background-color:white;\n}\nh1 {text-align:
center;}\n</style>\n\n</head>\n<body >\n\n
\n</body>\n</html>","storeOutMessages":true,"fwdInMessages":true,"resendO
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cd7c","order":3,"width":0,"height":0,"name":"","label":"STATUS","format":"{
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320,"wires":[["28b6c56c.7c90fa","d39f2592.828328","df5cd1c.32f5f3","72ff78

c1.363498","387ca108.2b5d1e","a6c2d3b9.af258"]]},{"id":"28b6c56c.7c90fa",
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background-color:white;\n}\nh1 {text-align:
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seUTC":false,"colors":["#1f77b4","#aec7e8","#ff7f0e","#2ca02c","#98df8a","#
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id=\"myFrame\" width=\"140\" height=\"140\" src =
\"\"></iframe>\n\n<script>\n(function(scope) {\n // watch msg object from
Node-RED\n scope.$watch('msg', function(msg) {\n // new message received\n
var x = document.getElementById('myFrame');\n x.setAttribute('src',
msg.payload); \n
});\n})(scope);\n</script>\n\n\n\n","storeOutMessages":true,"fwdInMessages":t
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spread","x":410,"y":560,"wires":[]}]

13.2 GITHUB & PROJECT DEMO LINK

- **GITHUB LINK:**
  https://github.com/IBM-EPBL/IBM-Project-26051-1659982306
- **DEMO LINK:**
  https://photos.app.goo.gl/Q829aijrN71Jbbu86