SMART FARMER - IOT ENABLED SMART FARMING APPLICATION

PROJECT REPORT

Submitted by

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Team ID	PNT2022TMID34458
Project Name	SMART FARMER - IOT ENABLED SMART FARMINGAPPLICATION
Team Members	MUGESHWARAN.G (Team Leader) ISRAVEL KEWIN CLINT.P (Team Member 1) BLESSWIN.K.SAMUEL (Team Member 2) VIJAY.S (Team Member 3)

1. Introduction:

Digital technologies like the Internet of Things (IoT) are reshaping agriculture. When it comes to farming, what is IoT? The IoT connects “dumb” devices. IoT is all about data.

Data is becoming a valuable resource for our world. Farmers may become more intelligent and safe by using data from gadgets to adapt to changing conditions more readily and farm more efficiently.

To free up resources, farmers can use the ability to monitor agricultural conditions and infrastructure from afar.

Many sectors and industries have adopted IOT to reduce errors and improve performance in manufacturing, energy, health care, and communication. Farm devices can collect and deliver data remotely to their owners using IoT.

Farmers can save time and money using IOT to keep tabs on-farm operations and efficiency, make more informed decisions about boosting productivity, and respond more quickly to changing conditions. In this case, it is putting data ahead of the farmer’s intuition.

At rough's water supply, the amount of fertilizer to use on a crop, and which ewe to check when lambing are all thingsa farmer could know about. Smart agriculture is necessary since 70% of the farming time is spent monitoring and analyzing crop status rather than performing actual field laborgiven the industry's size, it needs various technology and precise solutions toensure sustainability while reducing environmental damage. Sensors and communication technologies have provided farmers with a remote sight of their fields, allowing them to watch what is happening without leaving home.

Wireless sensors make monitoring crops inreal-time with greater precision and, more importantly, detecting the early stages of undesirable Conditions easier.

This is why "smart agriculture uses innovative equipmentand kits from seeding to crop harvesting, storage, and transportation.

The operation is smart and cost-effective due to its accurate monitoring capabilities and prompts reporting using a variety of sensors.

Various autonomous tractors, harvesters, robotic weeders, drones, and satellites supplement agriculture equipment. Sensors can be instantly deployed, started collecting data, and made available for further online study

. By enabling precise data Collection at each area, sensor technology allows crop and site-specific agriculture".

IOT and its apps are only scratching the surface of what they cando and have yet to impact people's lives significantly, and everyone can see this.

However, given the recent rise in IoT technology in agricultural applications, we can expect it to play a significant role.

1.1 Project Overview:

The main aim of this project is to help farmers automate their farmsby 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 internetwithout their actual presence in the field.

1.2 Purpose:

Smart Farming has a real potential to deliver a more productive and sustainableagricultural 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 withadded value in the form of better decision making or more efficient exploitationoperations and management. In this sense, smart farming is strongly related, to three interconnected technology fields addressed by Smart AKIS Network.

2. LITERATURE SURVEY:

Abstract:

An IOT-based farming system is referred to as smart agriculture. A greater variety and higher quality of agricultural goods are produced under this new approach. IOT devices offer details about the characteristics of farming fields and then act in response to input from the farmer. A sophisticated IOT- based method for tracking the atmosphere and soil conditions for productive cropgrowth is given in this study. Using Node MCU and a number of sensors attached to it, the built system is capable of monitoring temperature, humidity, and soil moisture level. Additionally, an SMS message regarding the field's environmental state will be transmitted to the farmer's phone over Wi-Fi.

Introduction:

The objective of this outline is to present an IoT-based smart farming system that will give farmers access to real-time information about soil moistureand environmental temperature at a very low cost, allowing for real-time monitoring. Following the investigation, it was discovered that each crop field has unique qualities that can be assessed independently in terms of both quality and quantity. Important elements that determine a soil's appropriateness and capacity for a particular crop include soil type, nutritional content, irrigation flow, pest resistance, etc. In light of conventional farming practices, farmers must frequentlycompute the agriculture plot during the crop life to have a better understanding ofthe crop circumstances.

As a result, smart agriculture is required because farmers spend 70% of their time monitoring and comprehending crop conditions rather than working in thefields. Wireless sensors make it easier to continuously monitor crops with greater accuracy and, most crucially, allow for the early detection of unfavorable states.

This is why modern agriculture uses sophisticated equipment throughout theprocess, from planting to crop harvesting to storage and transportation.

The process is made smarter and more cost-effective by timely reporting using sensors, which have accurate monitoring capabilities. Agriculture equipment iscurrently supplemented by a variety of autonomous tractors, harvesters, roboticweeders, drones, and satellites.

Sensors may be deployed and begin gathering data quickly. This data is then almost immediately available online for additional investigations. Sensor allowsaccurate data gathering for each site, which is essential for the application of scientific crop and site- specific agriculture.

EXISTING WORKS:

Monitoring the state of the climate.

The weather stations that incorporate numerous smart farming sensors are arguably the most well-liked smart agricultural technology. They are spread outaround the area and gather various environmental data before sending it to the cloud. The measurements offered can be used to map the climate conditions, select the suitable crops, and implement the necessary improvements (i.e. precision farming)

All METEO, Smart Elements, and Pycno are a few instances of these agriculturalIOT devices.

Automation in greenhouses.

In order to manage the greenhouse environment, farmers frequently require manual intervention. They can obtain precise real-time information on greenhouseparameters including illumination, temperature, soil quality, and humidity thanks to the usage of IOT sensors.

Weather stations can autonomously change the conditions to reflect the specifiedparameters in addition to sourcing environmental data. In particular, automation systems for greenhouses operate on a similar concept. Examples of IOT agriculture products that offer such features are Farmapp and Growlink.

Another intriguing device that makes use of smart agriculture sensors is GreenIQ. You can remotely control your irrigation and lighting systems with thisintelligent sprinkler controller.

Crop administration

Crop management tools are an additional IoT product category in agricultureand a component of precision farming. They should be set up in the field to gather information pertaining to crop farming, such as temperature and precipitation as well as leaf water potential and general crop health, just as weather stations.

So you can successfully stop any diseases or pests that could reduce your crop's output, you can keep an eye on your crop's growth and any irregularities. Arableand Semios are excellent examples of how this use case might be put to use in practice.

Precision agriculture

Precision farming, also referred to as precision agriculture, is all about effectiveness and making precise data-driven decisions. It's also one of the mostpopular and successful IoT uses in agriculture.

Farmers may gather a wide range of metrics on every aspect of the field ecosystem and microclimate with IoT sensors, including illumination, temperature, soil quality, humidity, CO_2 levels, and pest infestations. With the aid of this information, farmers can more accurately predict the water, fertilizer, and pesticide requirements of their crops, cut costs, and produce better, healthiercrops.

For instance, CropX creates Internet of Things (IoT) soil sensors that assess soil moisture, temperature, and electric conductivity, allowing farmers to tailor their practices to the particular requirements of each crop. When combined with GIS information, this technology aids in producing accurate soil maps for each fields.

Similar services are provided by Mothive, which assists farmers in reducingwaste, increasing yields, and improving farm sustainability.

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Drones used in agriculture

The use of agricultural drones in smart farming is arguably one of the most exciting developments in agritech. Drones, also referred to as unmanned aerial vehicles or UAVs, and are more effective in gathering agricultural data than satellitesand aircraft. Aside from surveillance, drones are also capable of carrying out a wide range of jobs that formerly needed human labour, such as planting crops, eradicating pests and diseases, spraying for agriculture, monitoring crops, etc.

For instance, DroneSeed creates drones to plant trees in sparsely wooded areas.Such drone use is six times more productive than using human labour. A SenseFly eBee SQ agriculture drone, which is reasonably priced, employs multispectral image analysis to gauge the health ofcrops.

Predictive analytics for intelligent agriculture

Predictive data analytics and precision agriculture go hand in hand. Despite the fact that IoT and smart sensor technology are a gold mine for extremely relevantreal-time data, using data analytics enables farmers to make sense of it and makekey forecasts, such as when to harvest crops, the likelihood of illnesses and pests, yield volume, etc. Farming, which is fundamentally very dependent on weather, is made more controlled and predictable with the aid of data analytics tools. For instance, the Crop Performance platform enables farmers to access crop volume and quality as well as their susceptibility to adverse weather circumstances like floods and drought in advance. Additionally, it enables farmers to choose the ideal amount of nutrients and water for each crop.

Solutions like SoilScout, when utilized in agriculture, help farmers save up to50% on irrigation water, lessen the loss of nutrients due to overwatering, andprovide actionable information regardless of the time of year or weather.

Total farm management programmes

The so-called agricultural productivity management systems might be seen as anexample of a more advanced approach to IoT products in agriculture. They oftencomprise numerous on-site sensors and IoT devices for agriculture, as well as a robust dashboard with analytical tools and built-in accounting and reporting functions.

This enables remote farm monitoring and streamlines the majority of commercialprocesses. Farm Logs and Cropio both offer related solutions. Other notable prospects include vehicle tracking (or even automation), storage management, logistics, etc., in addition to the IoT agriculture use cases that havebeen described.

Comprehensive farm management programmes

The so-called agricultural production management systems can be viewed as a more intricate method of utilizing IoT devices in agriculture. A comprehensive dashboard with analytical capabilities and built-in accounting/reporting functionsis typically included together with a variety of farm IoT devices and sensors that are deployed on the premises.

By streamlining the majority of corporate procedures, this provides remote farm monitoring capabilities. FarmLogs and Cropio are examples of comparable solutions. In addition to the IoT agriculture use cases mentioned, other significantprospects include logistics, storage management, vehicle tracking (or even automation), and so on.

COMPONENTS:

Based on data from many sensors, including temperature, humidity, soil moisture and soil nutrients, this gadget monitors the farm or greenhouse and informs the farmer of the current circumstances in order for him to act quickly. The farmers' prompt actions will enable them to boost their farming production and make proper use of natural resources, which will also make our product environmentally friendly. By carefully monitoring the various current conditions,our product will improve the crops' quantity and quality. It is an Internet of Things device that uses the "Plug and Sense" idea. On a laptop or a smartphone, you can view real-time data for many metrics.

Different

Components:

Breadboard

DHT11 Temperature and Humidity Sensor

SoilMoisture Sensor

LEDs

Passive buzzer

Power Supply-Power Bank
IBM Cloud

Watson IoT

PlatformNode-Red

IBM CloudantDB

CONCLUSION:

The technology and materials we employed to produce our porotype allowed us to create an effective and accurate solution for farmers that was alsoaffordable, as evidenced by our results and a literature review of other studies. Which was affordable and simple for farmers to install. With the user-friendly app and various alarm mechanisms, we can therefore draw the conclusion that this prototype will undoubtedly assist farmers on tiny acreage to successfully monitor their crops.

2.1 Existing problem:

Farmers need to deal with many problems, including how to:

Cope with climate change, soil erosion and biodiversity loss. Satisfy consumers' changing tastes and expectations. Meet rising demand for more food of higher quality. Invest in farm productivity. Adopt and learn new technologies. Stay resilient against global economic factors.Inspire young people to stay in rural areas and become future farmers.

2.2References:

1. https//:www.researchgate.net
2. https//:www.wikipedia.org
3. https//:www.rapidonline.com
4. https//:www.schematics.com
5. https//:www.batteryuniversity.com

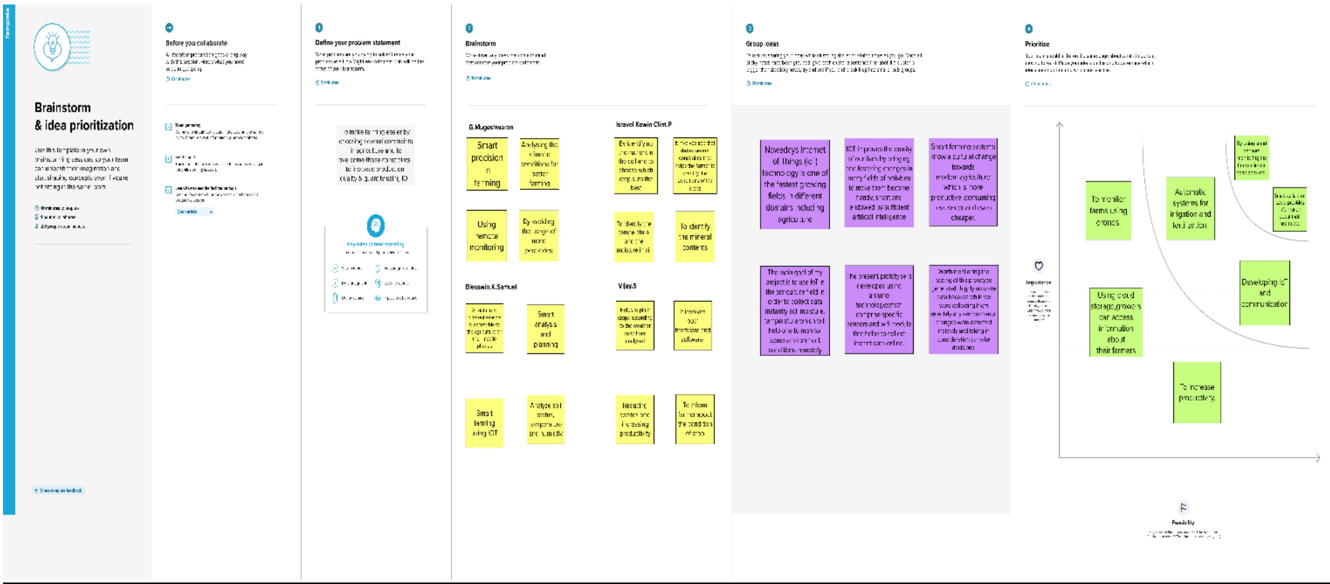
2.3Problem Statement Definition:

Farmers are to be present at farm for its maintenance irrespective of the weather conditions. They have to ensure that the crops are well watered and the farm status is monitored by them physically. Farmer have to stay most of the time in field in order toget 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.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:

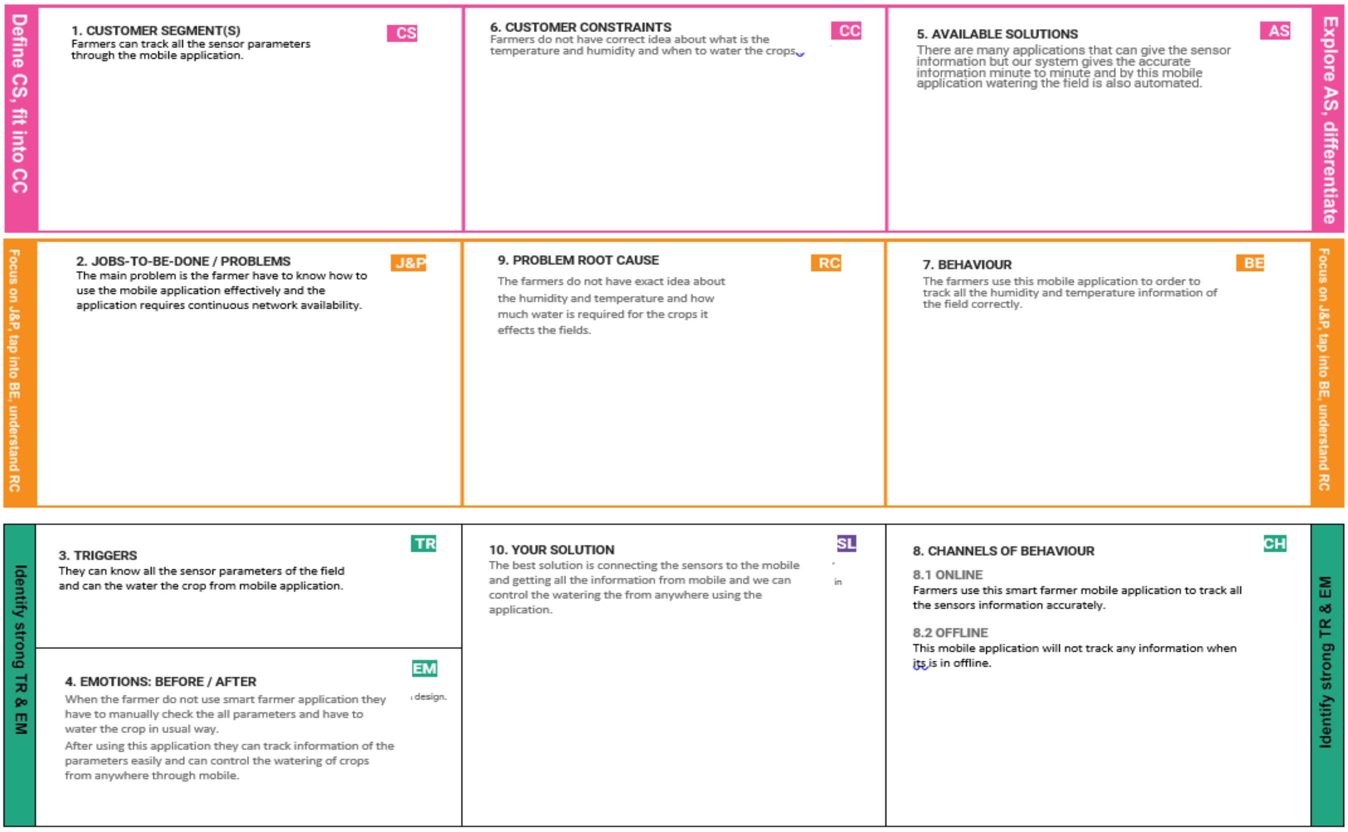
3.2 Ideation & Brainstorming:



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors to reduce man work.
2.	Idea / Solution description	Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. By this way it makes the farming more effective and easy to work.
3.	Novelty / Uniqueness	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.
4.	Social Impact / Customer Satisfaction	By using this kind of sensors and advanced technology we can produce more yield without effective man work. It makes the goods with high yield and thus satisfaction to the customers.
5.	Business Model (Revenue Model)	As per business model it reduces the man work and provides better yield with advanced sensors and thus it gains more profit.
6.	Scalability of the Solution	Scalability is another requirement that should be considered while designing a smart farming platform. Scalability in smart farming refers to the adaptability of a system to increase the capacity, for example, the number of technology devices such as sensors and actuators.

3.4 Problem Solution fit



Who does the problem affect?	Persons who do Agriculture.
What are the boundaries of the problem?	People who Grow Crops and facingIssues in monitoring and watering plants.
What is the issue?	In agricultural aspects, if the plant isnot provided with sufficient water, the production of the crop will be affected to a great extent. Providingcorrect amount of water is a challenge for the farmers.
When does the issue occur?	When the weather condition is uncertain, it is difficult to decide whether to water the crop or not.
Where does the issue occur?	The issue occurs inagriculture 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 cropyield.
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 areused for the computation and the final decision whether to water the crop or not is taken using mobile application

4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration by creating a new user name and password
FR-2	User Confirmation	Confirmation via EmailConfirmation via OTP
FR-3	User login	Login using the credentials we have used during registration.
FR-4	User permission	Smart Farming with IoT relies increasingly on smart technology for the management of agricultural enterprises. And it does so in order to increase the quality and quantity of the products.
FR-5	Using the intelligent system	IoT and AI solutions can get integrated into autonomous tractors to help collect real-time data about soil health, including water levels, temperature, and weather.

4.2 Non-Functional requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It is very user friendly, any people with less knowledge also can easily understand as it is Remote Management. With farms being located in far-off areas and distant lands, farmers enable this for better solution.
NFR-2	**Security**	Smart farming, which involves the application of sensors and automated irrigation practices, can help monitor agricultural land, temperature, soil moisture, water level, humidity and weather. This would enable farmers to monitor crops from anywhere.
NFR-3	**Reliability**	It has good consistency and Accuracy as it actively helps farmers to better understand the important factors such as water level, Weather, Humidity and soil moisture.
NFR-4	**Performance**	The performance of smart farming is high and it is very efficient as it is very easy to understand and has a high security and scalability.
NFR-5	**Availability**	This smart farming is enabled at any system like laptop, mobile phone, desktop, Gis and user friendly.
NFR-6	**Scalability**	Smart farming refers to the adaptability of a system to increase the capacity, the number of technology devices such as sensors and actuators, while enabling timely analysis.

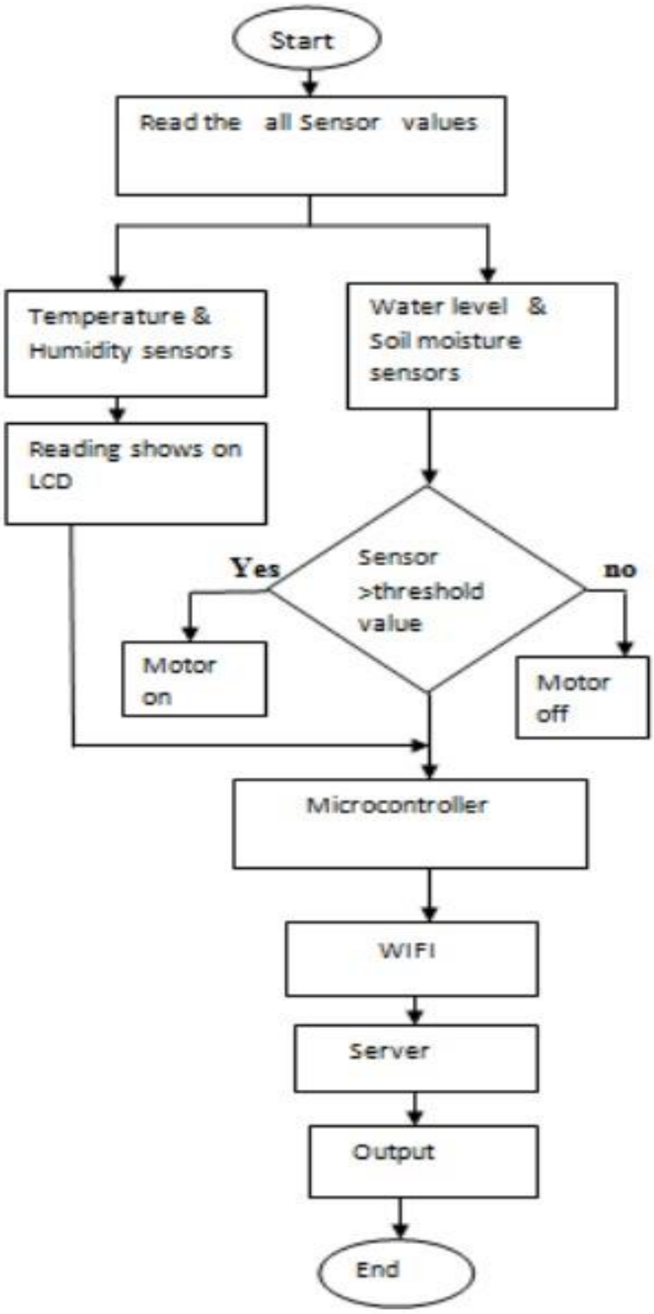
5. PROJECT DESIGN

Processes are something that are often overlooked in our industry, but are absolutely essential for a number of reasons.

They help you create a repeatable template for a winning formula.

They help your team understand how to move through a project in the correct way.

5.1Data Flow Diagrams:



5.2 **Solution & Technical Architecture:**

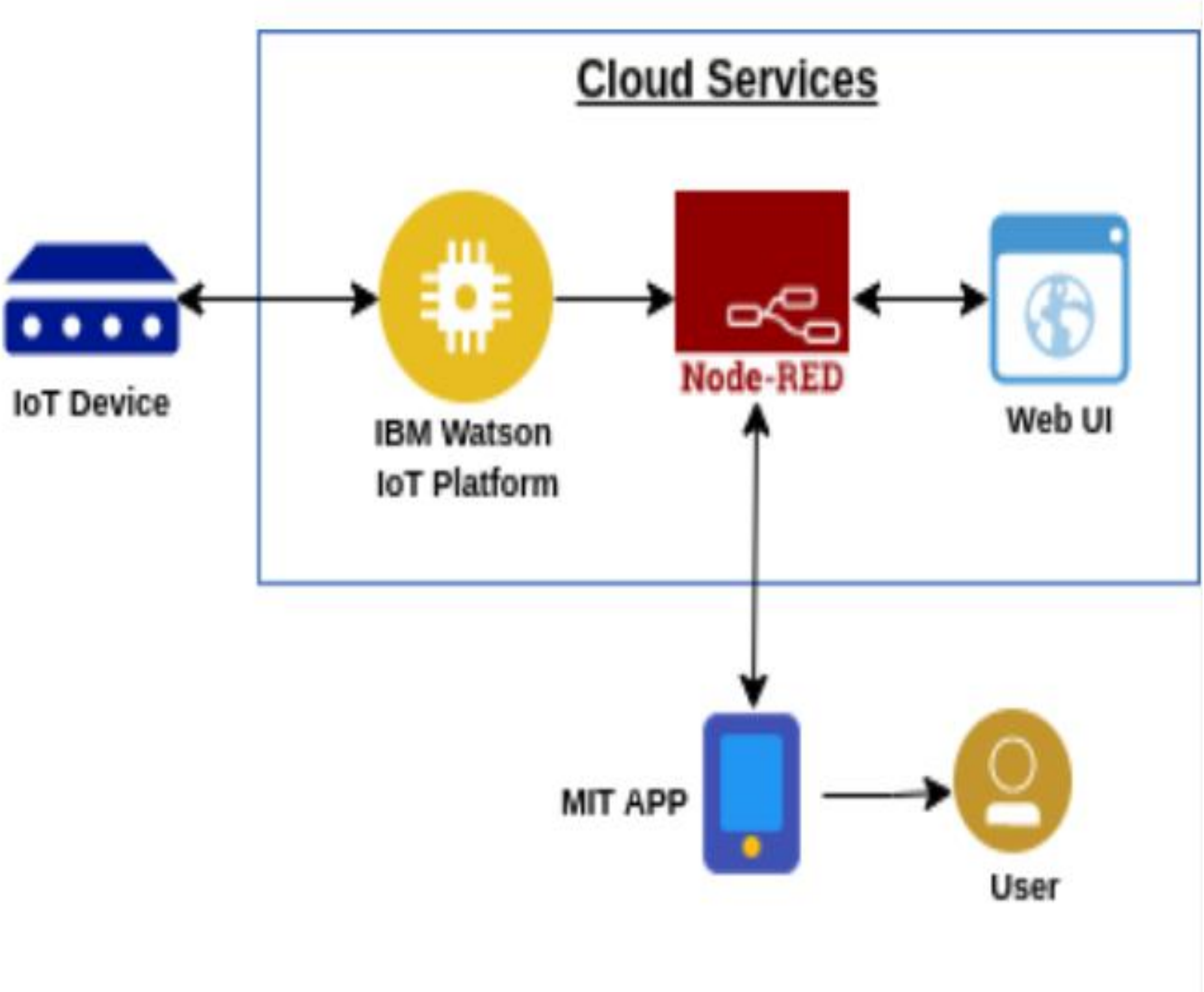


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI, Node-RED, MIT app	IBM IoT Platform, IBM Node red, IBM Cloud
2.	Application Logic-1	Create Ibm Watson IoT platform and create node-red service	Ibm Watson, ibm cloudant service,ibm node-red
3.	Application Logic-2	Develop python script to publish and subscribe to IBM IoT Platform	python
4.	Application Logic-3	Build a web application using node-red service	IBM Node-red
5.	Database	Data Type, Configurations etc.	MySQL
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant
7.	File Storage	Developing mobile application to store and receive the sensors information and to react accordingly	Web UI,python
8.	External API-1	Using this IBM Weather API we can track the weather in the agriculture land and based on the weather reading the sensors will activate	IBM Weather API
9.	External API-2	Using this IBM Sensors it detects the weather, humidity, soil fertility and provides the activation of motors to web UI	IBM Sensors
10.	Machine Learning Model	Using this we can derive the object recognition model	Object Recognition Model
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Server Configuration	IBM cloudant, IBM IoT Platform

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	MIT app Inventor	MIT License
2.	Security Implementations	IBM Services	Encryptions, IBM Controls
3.	Scalable Architecture	sensor-IoT Cloud based architecture	cloud computing and AI
4.	Availability	Mobile, laptop, desktop	MIT app
5.	Performance	Detects the water level, soil growth, humidity, weather	sensors

5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority
Customer (Mobile user)	Download the database	USN-1	As a user, I can register for the application by entering my email, mobile, password and conforming my password	I can access my account / dashboard	High
	Acknowledgement	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
	Register	USN-3	As a user, I can register for the application through email, password and conforming the password	I can register & access the dashboard with facebook Login	Low
	Login	USN-4	As a user, I can log into the application by entering email & password	I can login by using the credentials which I used above while registering.	High
	Dashboard	USN-5	As a user, I can open the dashboard and monitor the activity in the farm land	I can login by using the credentials	High
Customer (Web user)	The functional requirements are same as mobile user	USN-6	Web user provides the user friendly platform to access and monitor the functionalities in the farm	I can login by using the credentials	High
Customer Care Executive	The functional requirements are user friendly.	USN-7	As a user, if we face any technical issue we can receive the details and can log to monitor the farm	I can login by any device	Low

6. PROJECT PLANNING & SCHEDULING

The definition of a sprint is a dedicated period of time in which a set amount of work will be completed on a project. Its part of the agile methodology, and an agile project will be broken down into a number of sprints, each sprint taking the project closer to completion.

6.1 Sprint Planning & Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation Creation	USN-1	Connect sensors, Arduino andesp8266	2	High	Mugeshwaran, Isravel Kewin, Blesswin
Sprint-1	Software and Hardware	USN-2	Connect the hardware with IBM Cloudand API Integration	2	High	Mugeshwaran, Blesswin, Vijay
Sprint-2	Software	USN-3	Establishing Node-Red connection	2	Medium	Isravel Kewin, Blesswin
Sprint-2	Software	USN-4	Connecting application with Node-Redand further application development	2	High	Mugeshwaran, Isravel Kewin, Blesswin, Vijay
Sprint-3	Software	USN-5	Web Application development for project (Login page with Firebase)	2	High	Mugeshwaran, Isravel Kewin, Vijay
Sprint-4	Testing	USN-6	Develop an application with MIT App Inventor (Login page with Firebase)	2	High	Mugeshwaran, Isravel Kewin, Blesswin, Vijay

6.2 Sprint Delivery Schedule:

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint StartDate	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	1	27Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	2	03 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	1	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	2	17 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint).Let’s calculate the team’s average velocity (AV) per iteration unit (story points per day)

Total Sprint Points=80
Total Sprint=4

Average Velocity = 80/4 =20

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development Methodologies such as Scrum. However, burn downcharts can be applied to any project containing measurable progress over time.

https://www.visual-paradigm.com/scrum/scrum-burndown-chart/

https://www.atlassian.com/agile/tutorials/burndown-charts

Reference:

https://www.atlassian.com/agile/project-management

https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software

https://www.atlassian.com/agile/tutorials/epics

https://www.atlassian.com/agile/tutorials/sprints

https://www.atlassian.com/agile/project-management/estimation

https://www.atlassian.com/agile/tutorials/burndown-charts

7. CODING & SOLUTIONING

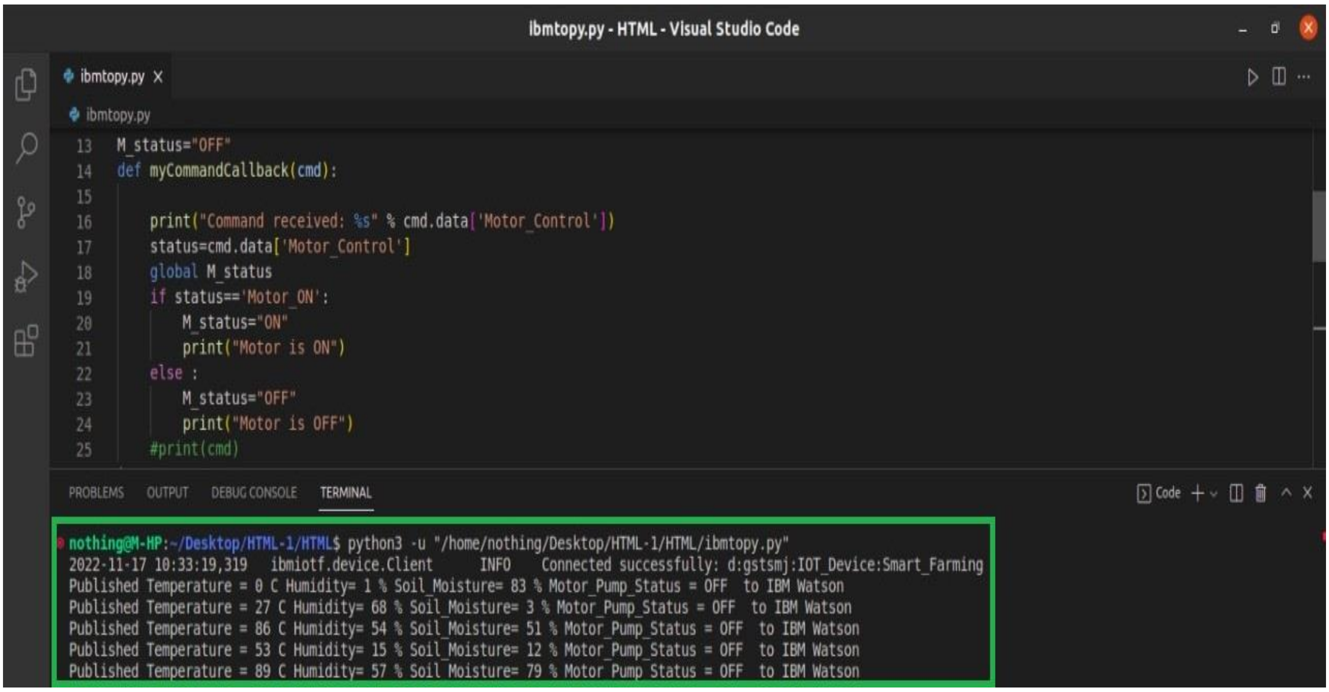
(Explain the features added in the project along with code):

7.1 Feature 1 (coding and result):

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "Organization ID"
deviceType = "Device Type"
deviceId = "Device ID"
authMethod = "token"
authToken = "Your Authentication Token"
# Initialize GPIO
M_status="OFF"
def myCommandCallback(cmd):

    print("Command received: %s" % cmd.data['Motor_Control'])
    status=cmd.data['Motor_Control']
    global M_status
    if status=='Motor_ON':
        M_status="ON"
        print("Motor is ON")
    else :
        M_status="OFF"
        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()
```

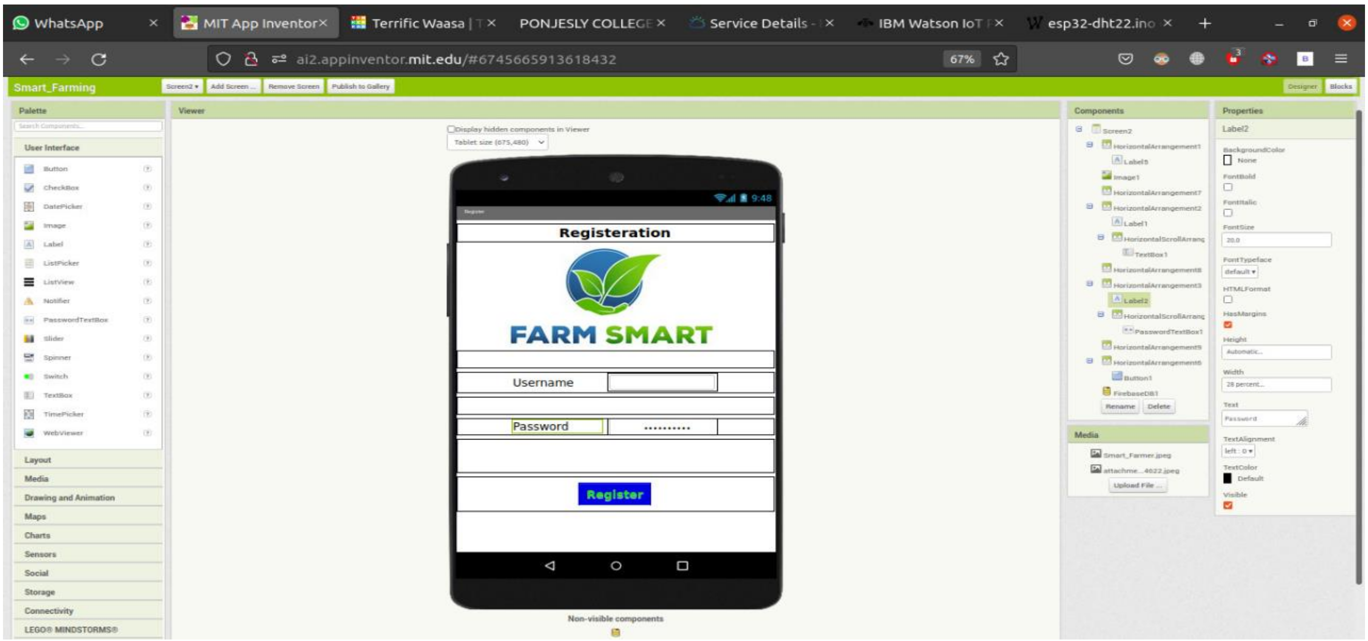
```
while True:
        #Get Sensor Data from DHT11
        temp = random.randint(0, 100)
        Humid=random.randint(0,100)
        S_Mois=random.randint(0,100)

        data = {'Temperature' : temp, 'Humidity': Humid ,'Soil_Moisture' :
S_Mois,'Motor_Pump_Status' : M_status }
        #print data
        def myOnPublishCallback():
            print("Published Temperature = %s C"  % temp,
"Humidity= %s %%" % Humid, "Soil_Moisture= %s %%" % S_Mois,
"Motor_Pump_Status = %s " %M_status, "to IBM Watson")
        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(2)
        deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

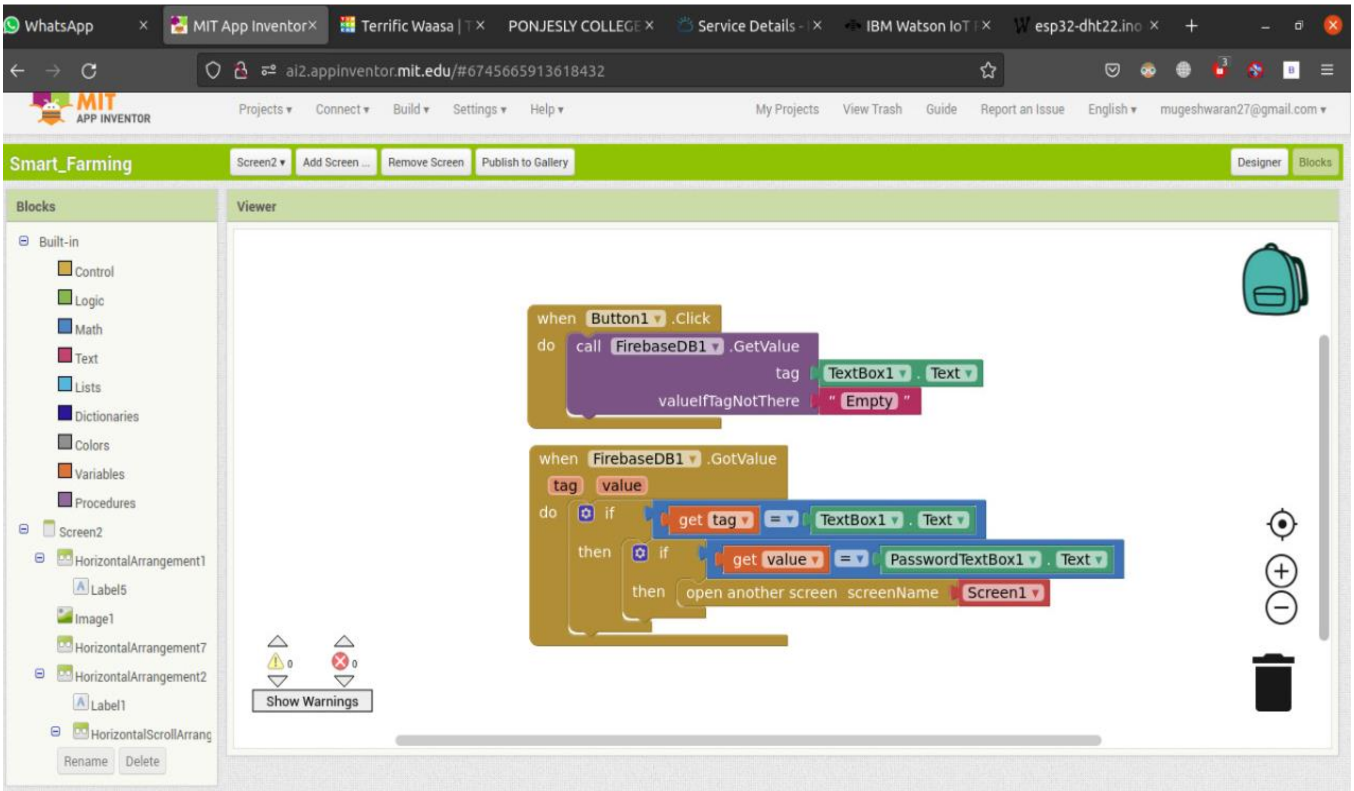
Output:



7.2 Feature 2: (MITAPP INVENTER)

For Screen 1:





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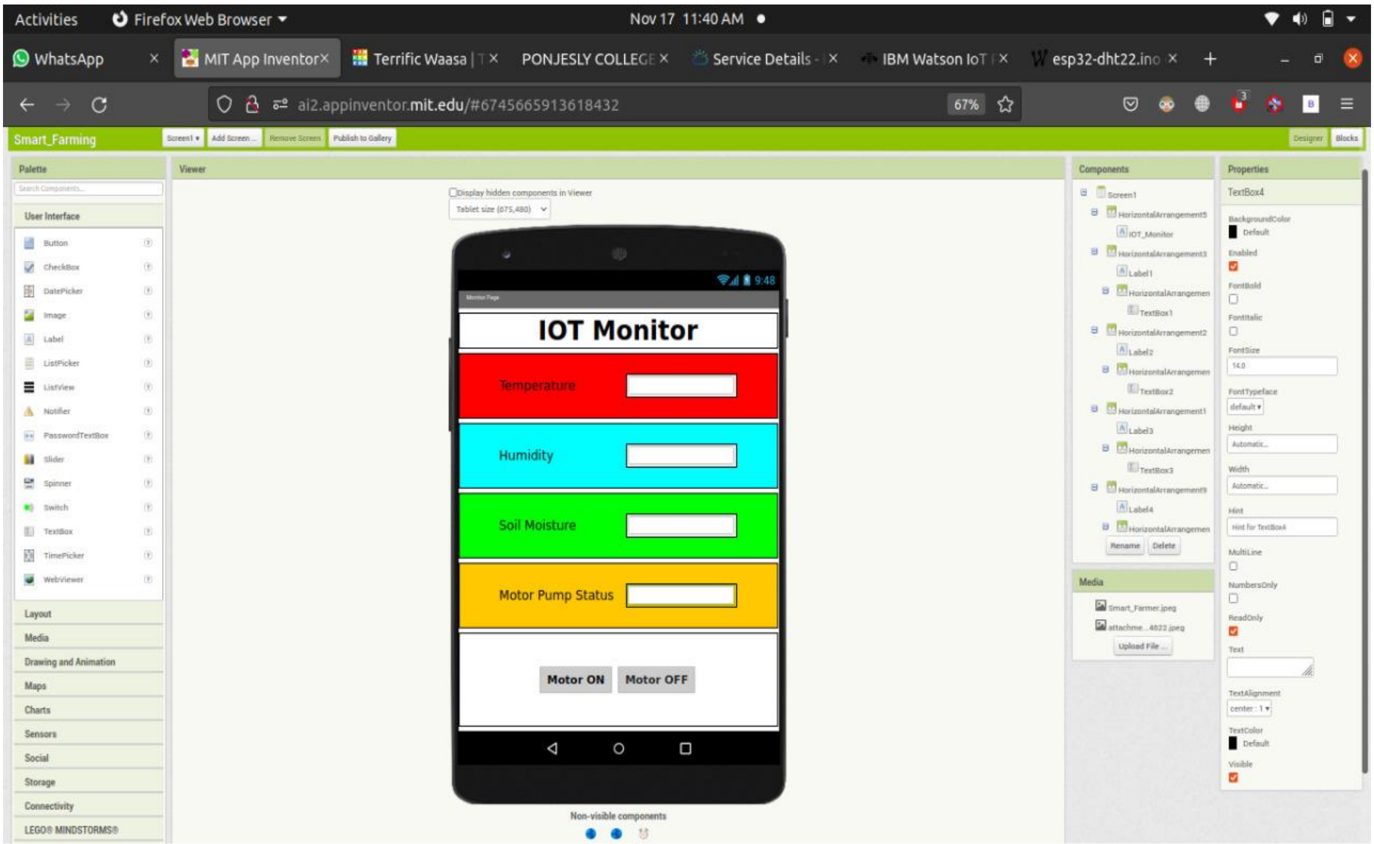
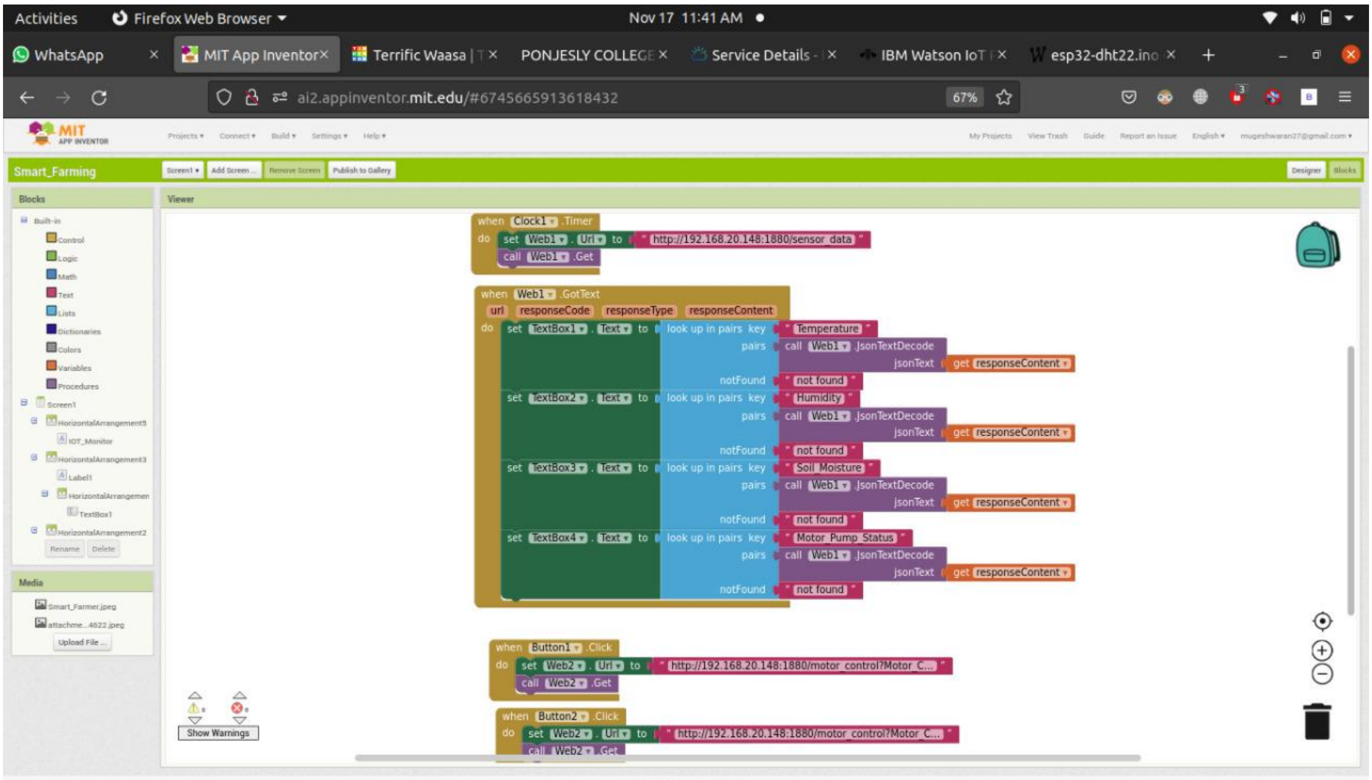
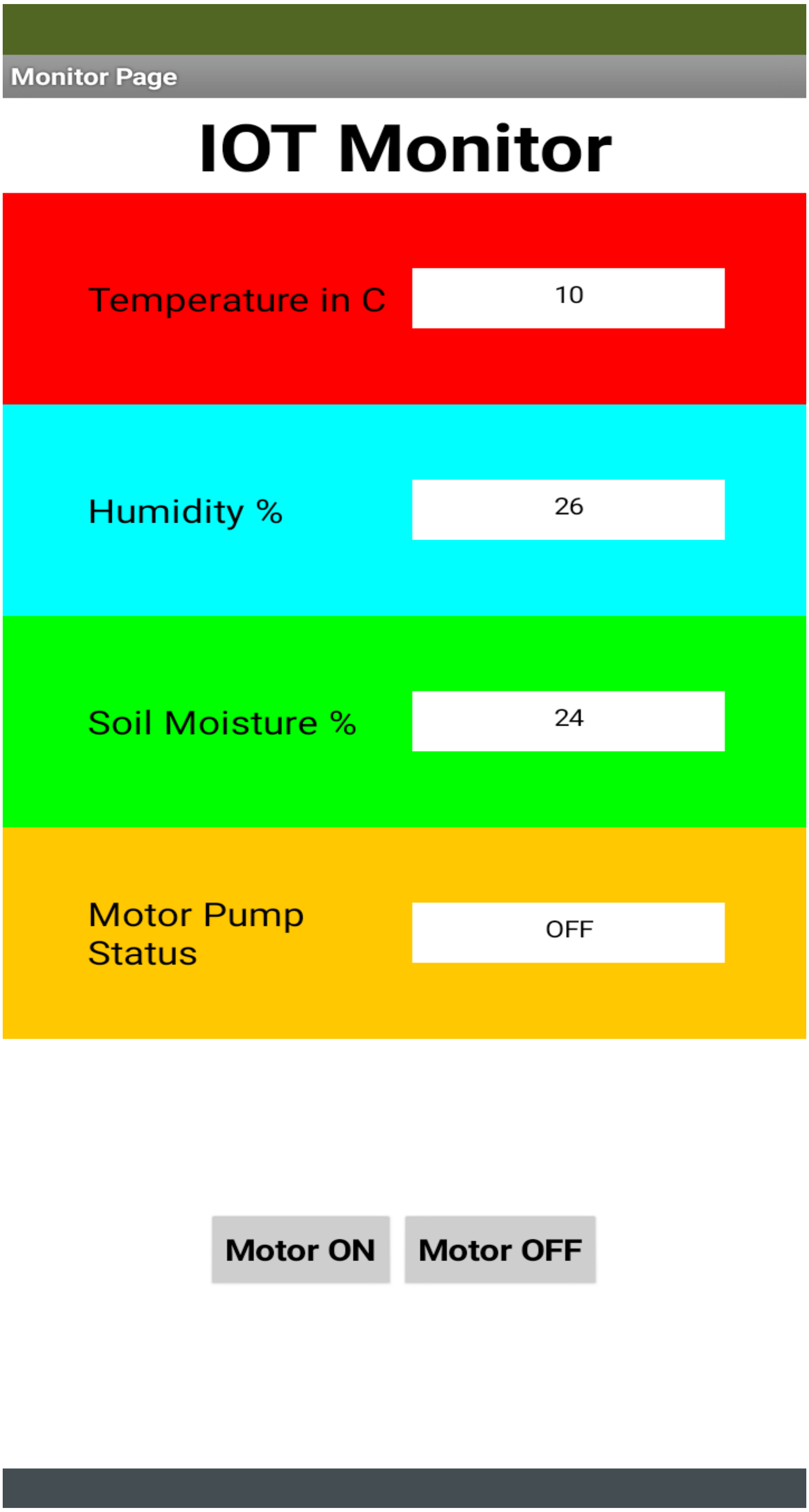




For Screen 3:


12:36
55%
Register
Registeration
FARM SMART
Username
Username
Password
Password
Register

For Screen 4:



Monitor Page
IOT Monitor
Temperature in C
10
Humidity %
26
Soil Moisture %
24
Motor Pump Status
OFF
Motor ON
Motor OFF

8. TESTING:

Test cases help guide the tester through a sequence of steps to validate whether a software application is free of bugs, and working as required by the end-user. Learning how to write test cases for software requires basic writing skills, an attention to detail, and a good understanding of the application under test (AUT).

8.1 Test Cases:

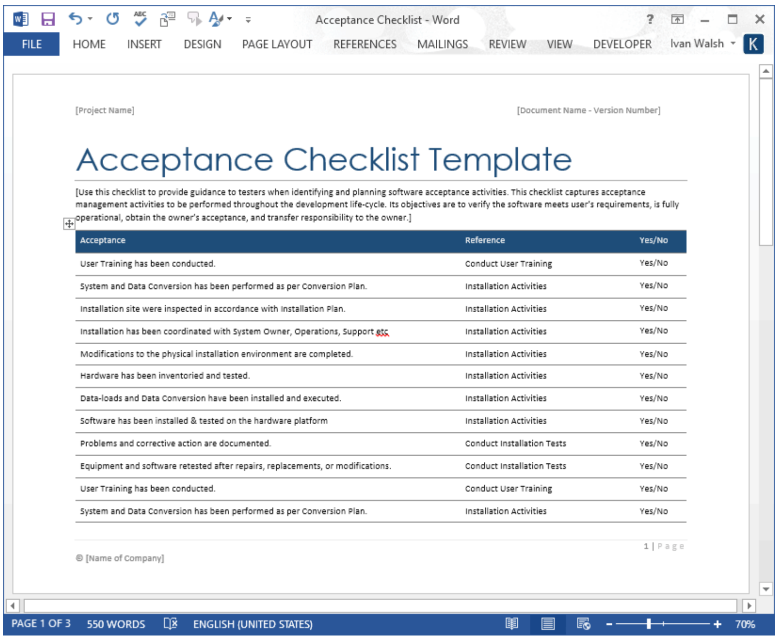
Step	Procedures	Expected Result	Result
1	Insert admin, username, and password	Save the insert data into database	Success
2	Insert correct username, password for login	Verify the admin	Success
3	Click 'Register,' 'Login' button	Application redirect admin to Login page after register and Main page after login	Success
4	Repeat step 2 and 3 for login using false username, password	Application display error message	Success
5	Update Admin Account	New update data saved into database	Success
6	Log Out Account	Log out redirected to Login page	Success
Precondition		No credentials are currently login	
Post-condition		New and updated Admin name, username, and password saved in database	

Based on Table 1, only authenticated users are allowed access to the application.

S.No	Action	Inputs	Expected Output	Actual Output	Test Browser	Test Result	Test Comments
1	Launch application	https://www.facebook.com/	Facebook home	Facebook home	IE-11	Pass	[Priya 10/17/2017 11:44 AM]: Launch successful
2	Enter invalid Email & any Password and hit login button	Email id : invalid@xyz.com Password: ******	The email address or phone number that you've entered doesn't match any account. Sign up for an account.	The email address or phone number that you've entered doesn't match any account. Sign up for an account.	IE-11	Pass	[Priya 10/17/2017 11:45 AM]: Invalid login attempt stopped
3	Enter valid Email & incorrect Password and hit login button	Email id : valid@xyz.com Password: ******	The password that you've entered is incorrect. Forgotten password?	The password that you've entered is incorrect. Forgotten password ?	IE-11	Pass	[Priya 10/17/2017 11:46 AM]: Invalid login attempt stopped

8.2 User Acceptance Testing:

UAT consists, in practice, of people from the target audience using the application. The defects they find are then reported and fixed. This scenario iswhat most closely resembles "the real world." The process allows users to "Get their hands dirty" with the application. They can see if things work as intended.



Acceptance Checklist - Word

FILE HOME INSERT DESIGN PAGE LAYOUT REFERENCES MAILINGS REVIEW VIEW DEVELOPER Ivan Walsh

[Project Name] [Document Name - Version Number]

Acceptance Checklist Template

[Use this checklist to provide guidance to testers when identifying and planning software acceptance activities. This checklist captures acceptance management activities to be performed throughout the development life-cycle. Its objectives are to verify the software meets user's requirements, is fully operational, obtain the owner's acceptance, and transfer responsibility to the owner.]

Acceptance	Reference	Yes/No
User Training has been conducted.	Conduct User Training	Yes/No
System and Data Conversion has been performed as per Conversion Plan.	Installation Activities	Yes/No
Installation site were inspected in accordance with Installation Plan.	Installation Activities	Yes/No
Installation has been coordinated with System Owner, Operations, Support etc	Installation Activities	Yes/No
Modifications to the physical installation environment are completed.	Installation Activities	Yes/No
Hardware has been inventoried and tested.	Installation Activities	Yes/No
Data-loads and Data Conversion have been installed and executed.	Installation Activities	Yes/No
Software has been installed & tested on the hardware platform	Installation Activities	Yes/No
Problems and corrective action are documented.	Conduct Installation Tests	Yes/No
Equipment and software retested after repairs, replacements, or modifications.	Conduct Installation Tests	Yes/No
User Training has been conducted.	Conduct User Training	Yes/No
System and Data Conversion has been performed as per Conversion Plan.	Installation Activities	Yes/No

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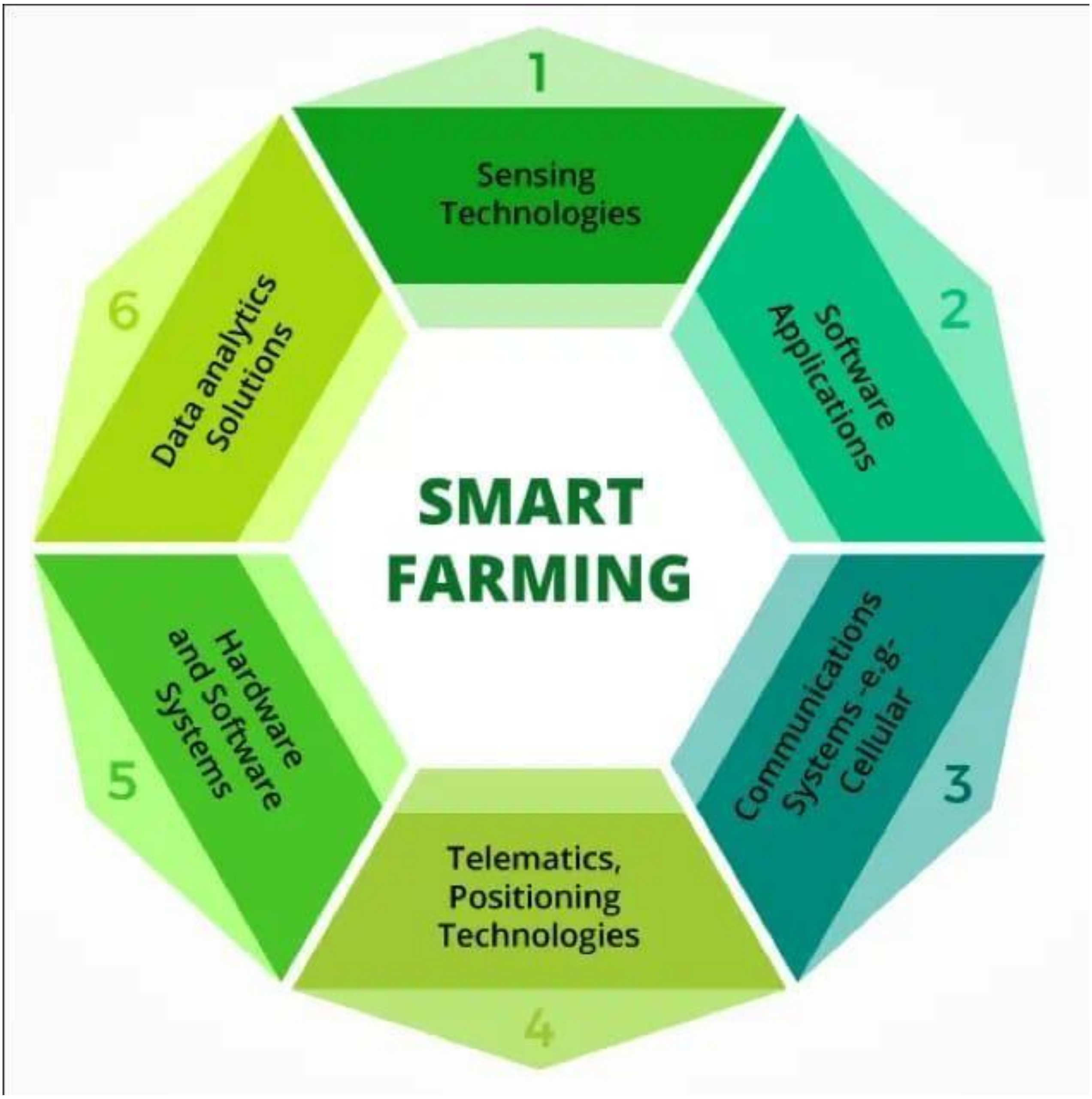
PAGE 1 OF 3 550 WORDS ENGLISH (UNITED STATES) 70%

9. RESULTS:

9.1 Performance Metrics:



10. Advantages & Disadvantages:

Advantages:

- Farms can be monitored and controlled remotely.
- Increase in convenience to farmers.
- Less labour cost.
- Better standards of living.

Disadvantages:

- Lack of internet/connectivity issues.
- Added cost of internet and internet gateway infrastructure.
- Farmers wanted to adapt the use of WebApp.

11. CONCLUSION:

Thus the objective of the project to implement an IoT system in order to help farmers tocontrol and monitor their farms has been implemented successfully.

12. FUTURE SCOPE:

From a business perspective, farmers are seeking ways to improve profitability and efficiency by on the one hand looking for ways to reduce their costs and on the other hand obtaining better prices for their product. Therefore they need to take better, more optimaldecisions and improve management control. While in the past advisory services were based on general knowledge that once was derived from research experiments, there is an increasing need for information and knowledge that is generated on-farm in its local-specific context. It is expected that Big Data technologies help to achieve these goals in a better way.

13. APPENDIX:

Source Code:

The source code has been uploaded in GitHub. To refer the final source code click SOURCE CODE

GitHub & Project Demo Link:

The GitHub Link: GitHub

The Project Demo Link: Demo Link