Industrial Internship Report on

IoT Smart Irrigation System

Prepared by

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Executive Summary
This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT). This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks' time. My project was (Tell about ur Project) This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

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1 Preface

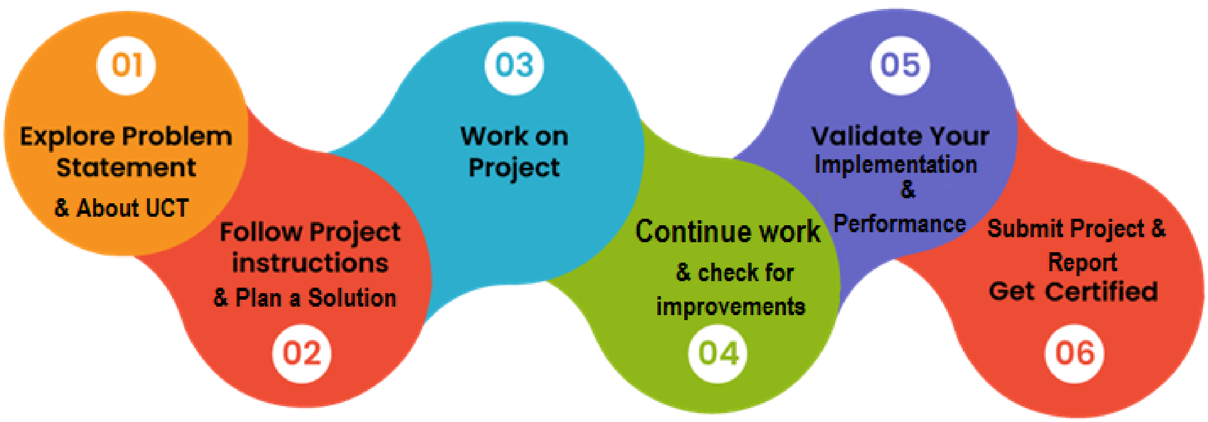
Summary of the whole 6 weeks' work.

About need of relevant Internship in career development.

Brief about Your project/problem statement.

Opportunity given by USC/UCT.

How Program was planned



Your Learnings and overall experience.

Thank to all (with names), who have helped you directly or indirectly.

Your message to your juniors and peers.

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

A company established in 2013 and working in Digital Transformation domain and providing Industrial solutions with prime focus on sustainability and RoI.

For developing its products and solutions it is leveraging various **Cutting Edge Technologies e.g. Internet of Things (IoT), Cyber Security, Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end** etc.

i. UCT IoT Platform (uct Insight)

UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable “insight” for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP, HTTP, Modbus TCP, OPC UA
- It supports both cloud and on-premises deployments.

It has features to

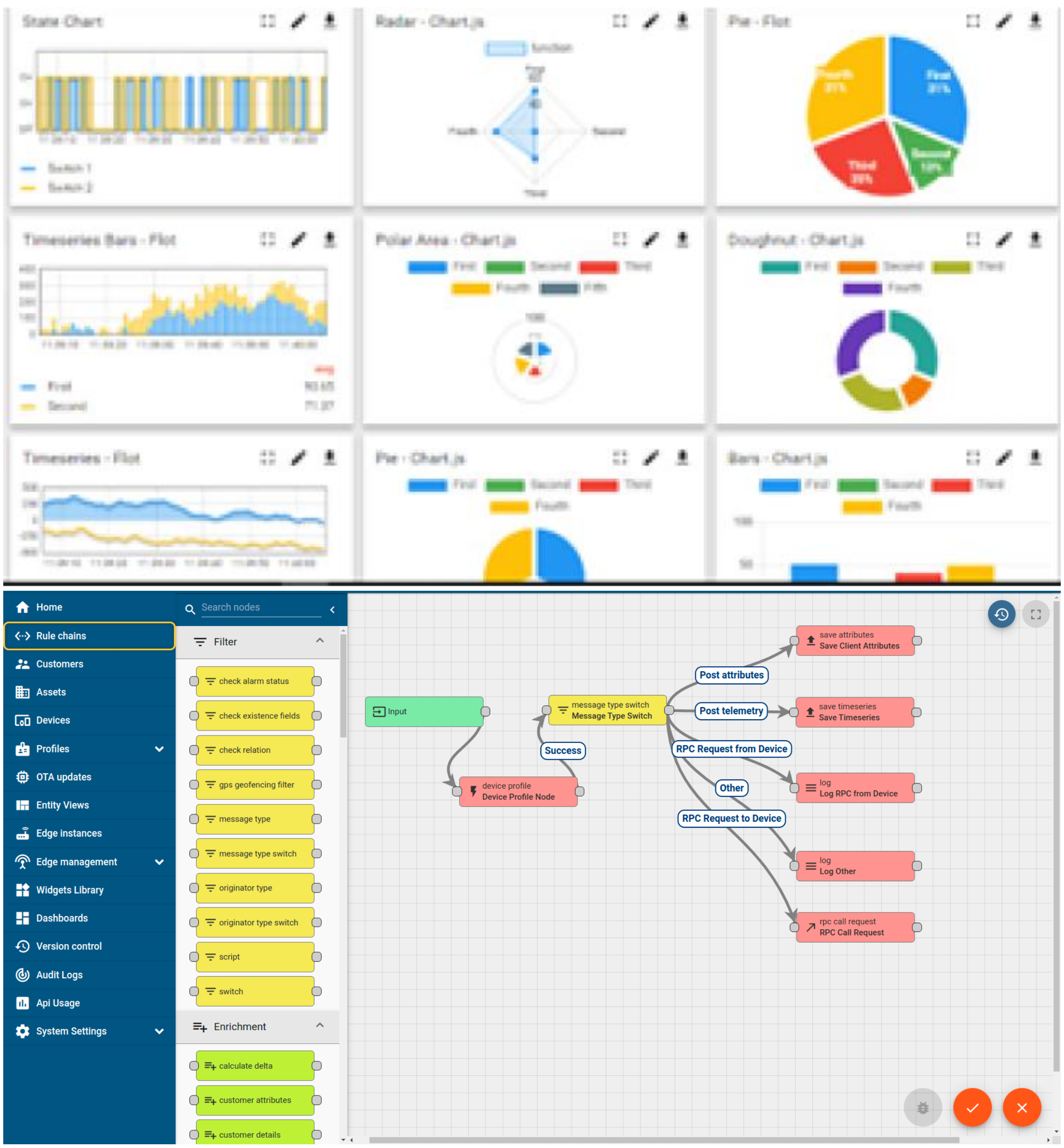
• Build Your own dashboard

• Analytics and Reporting

• Alert and Notification

• Integration with third party application(Power BI, SAP, ERP)

• Rule Engine



ii. Smart Factory Platform (FACTORY WATCH)

Factory watch is a platform for smart factory needs.

It provides Users/ Factory

- with a scalable solution for their Production and asset monitoring
- OEE and predictive maintenance solution scaling up to digital twin for your assets.
- to unleased the true potential of the data that their machines are generating and helps to identify the KPIs and also improve them.
- A modular architecture that allows users to choose the service that they what to start and then can scale to more complex solutions as per their demands.

Its unique SaaS model helps users to save time, cost and money.

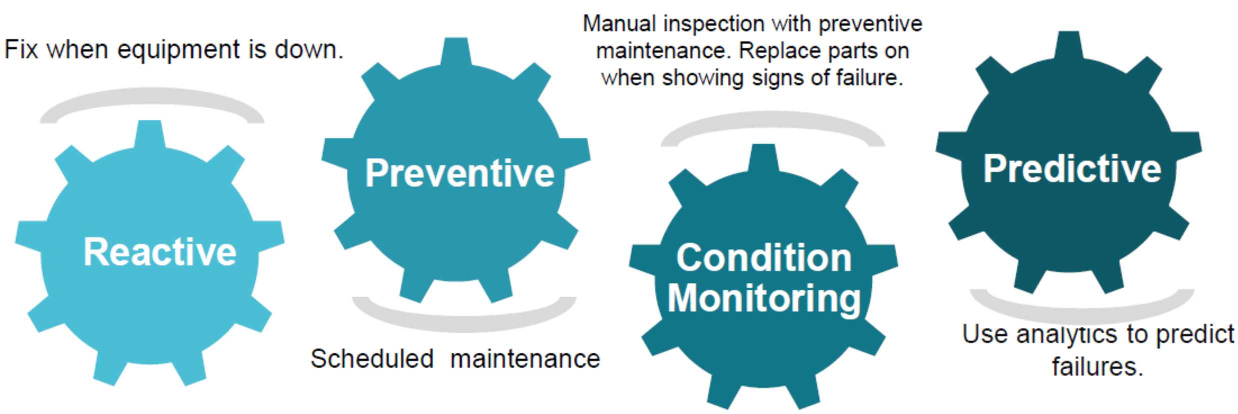
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i

iii. LoRaWAN based Solution

UCT is one of the early adopters of LoRAWAN teschnology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

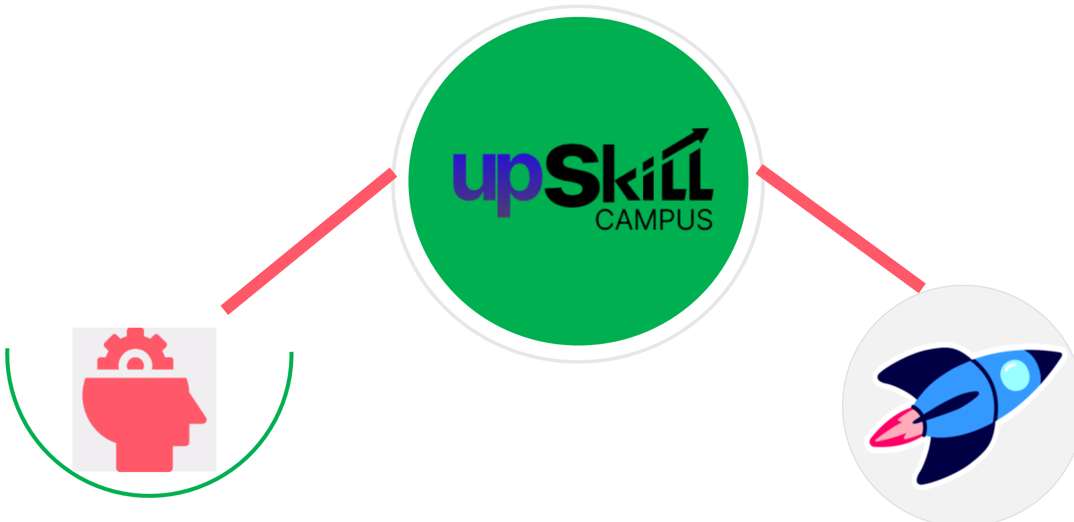
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.

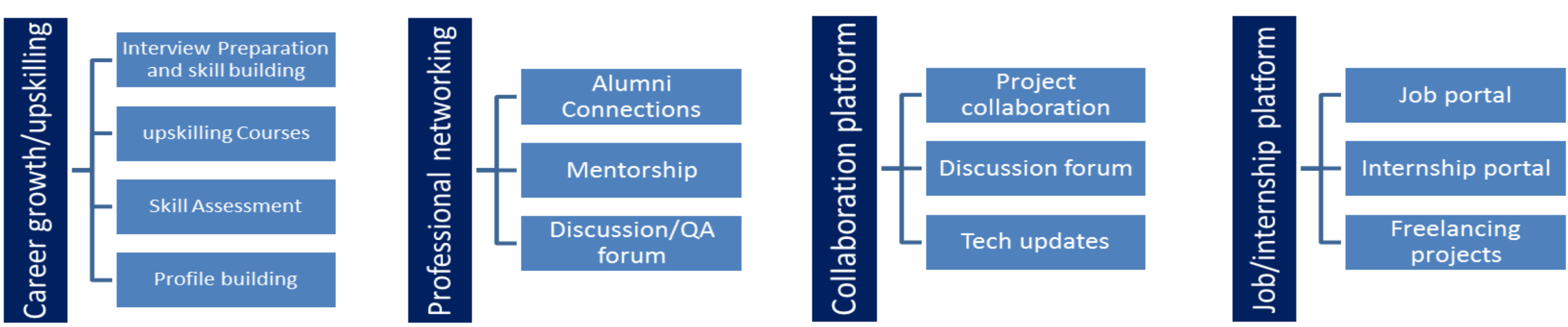
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year

https://www.upskillcampus.com/



2.3 The IoT Academy

The IoT academy is EdTech Division of UCT that is running long executive certification programs in collaboration with EICT Academy, IITK, IITR and IITG in multiple domains.

2.4 Objectives of this Internship program

The objective for this internship program was to

☛ get practical experience of working in the industry.

☛ to solve real world problems.

☛ to have improved job prospects.

☛ to have Improved understanding of our field and its applications.

☛ to have Personal growth like better communication and problem solving.

2.5 Reference

[1] Arduino

[2] NodeMCU

[3] Blynk

2.6 Glossary

Terms	Acronym

3 Problem Statement

In the assigned problem statement

Throughout the duration of this project, I undertook the task of designing and developing an innovative IoT-based irrigation system, aimed at revolutionizing traditional irrigation practices. This forward-looking system addresses the challenges associated with conventional irrigation methods by seamlessly integrating advanced IoT technology.

The central issue at hand revolves around the inefficiencies of existing irrigation techniques, which often lead to water wastage and suboptimal crop growth. In response, I endeavored to create a comprehensive solution that leverages IoT capabilities to monitor soil moisture levels in real-time and automatically adjust irrigation processes accordingly. This innovation not only enhances water usage efficiency but also contributes to the overall health and productivity of crops.

The anticipated outcome for this project encompasses the successful implementation of an IoT-driven irrigation system with fundamental functionalities. This includes real-time soil moisture sensing, remote control of irrigation processes, timely alerts and notifications, and a user-friendly interface for monitoring and management. The system strives to provide a seamless experience for farmers to optimize irrigation practices and achieve sustainable agricultural outcomes.

4 Existing and Proposed solution

Existing Solution: Traditional irrigation methods have been widely used for agriculture, relying on manual intervention and predetermined schedules. These methods often lack precision and adaptability, leading to uneven watering, water wastage, and suboptimal crop growth. Manual monitoring and intervention demand significant time and effort from farmers, limiting the efficiency of irrigation practices. Existing systems struggle to respond to dynamic changes in soil moisture levels and weather conditions, resulting in increased operational costs and reduced yield potential.

Proposed Solution: To overcome the limitations of traditional irrigation, I have envisioned an advanced IoT-based irrigation system as the proposed solution. This innovative system leverages IoT technology to create a smarter and more efficient approach to irrigation management. By integrating soil moisture sensors, real-time data analysis, and remote control capabilities, the proposed solution aims to revolutionize agricultural irrigation.

The system's key features include:

- **Real-time Monitoring:** The proposed system will continuously monitor soil moisture levels in real-time, ensuring that plants receive the precise amount of water they need for optimal growth.
- **Automated Adjustment:** Based on the collected data, the system will dynamically adjust irrigation processes, reducing water wastage and promoting water conservation.
- **Remote Control:** Through a dedicated mobile application, farmers can remotely control and manage irrigation operations from anywhere, reducing the need for physical presence on the field.
- **Alerts and Notifications:** The system will send timely alerts and notifications to farmers' devices, informing them about critical events such as low soil moisture levels or system malfunctions.
- **Data-driven Insights:** By analyzing historical irrigation data, the system will provide valuable insights into water usage patterns, plant responses, and overall system performance, allowing for informed decision-making.
- **Customization:** Farmers will have the flexibility to customize irrigation schedules based on crop types, soil conditions, and weather forecasts, optimizing irrigation for diverse agricultural needs

4.1 Code submission (Github link)

[Irrigation using Iot]

4.2 Report submission (Github link):

[Final_Report]

5 Proposed Design/ Model

The proposed IoT-based smart irrigation system consists of:

- Soil moisture sensors to collect real-time soil moisture data.
- A NodeMCU (ESP8266) microcontroller for processing and communication.
- The Blynk platform for remote control and data visualization.

5.1 .High Level Diagram (if applicable)

A water pump controlled through the microcontroller

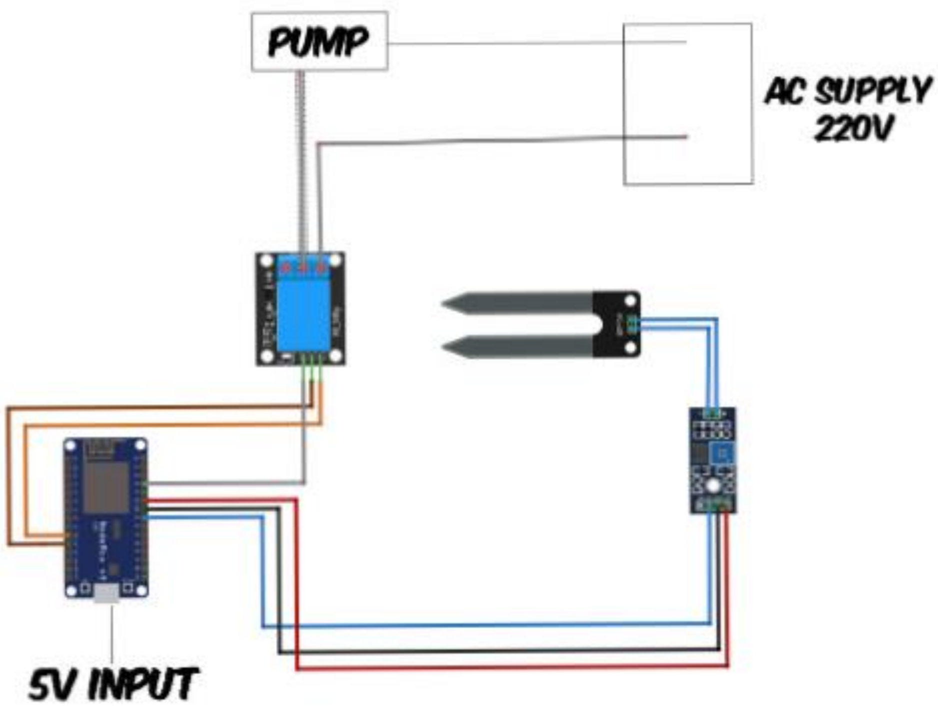


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

6 Performance Test

The performance test phase was crucial in evaluating the IoT-based smart irrigation system's effectiveness, accuracy, and responsiveness. The tests were conducted to ensure that the system meets its intended objectives and performs reliably under varying conditions.

6.1 Test Plan/ Test Cases

- Verify sensor accuracy by comparing readings with actual moisture levels.
- Test remote pump control through the Blynk app.
- Validate real-time data transmission to the Blynk app.
- Assess system's response to changing moisture levels.

6.2 Test Procedure

- Place the soil moisture sensor in varying moisture conditions.
- Use the Blynk app to remotely control the pump and monitor readings.
- Observe data updates in the app and compare with real-world conditions.

6.3 Performance Outcome

The system accurately reflects soil moisture levels, enabling precise irrigation adjustments. Remote pump control and real-time data transmission are successful. The system demonstrates efficient response to changing moisture conditions.

7 My learnings

Throughout the course of this project, I embarked on a journey that provided me with valuable insights and skills across various domains. The hands-on experience and challenges encountered significantly contributed to my growth and understanding in the following areas:

Technical Proficiency:

I developed a robust foundation in IoT integration, particularly in connecting hardware components like sensors and microcontrollers to a network. I gained proficiency in programming the NodeMCU (ESP8266) microcontroller, understanding its functionalities, and implementing data communication protocols.

Sensor Integration and Data Handling:

Working with soil moisture sensors introduced me to the intricacies of interfacing with sensors and interpreting their output. I learned how to calibrate and utilize sensor data effectively, translating analog readings into meaningful insights for automated irrigation control.

Problem-Solving and Troubleshooting:

Encountering challenges during the development phase improved my problem-solving skills. Debugging code, diagnosing hardware issues, and identifying communication errors sharpened my ability to analyze problems methodically and find effective solutions.

Project Management:

Managing this project required careful planning, time allocation, and task prioritization. I honed my project management skills by breaking down the development process into manageable steps, ensuring steady progress while meeting deadlines.

Agricultural Awareness:

The project deepened my understanding of sustainable agriculture and the role technology plays in improving practices. I learned about the significance of water conservation, the impact of precise irrigation on crop health, and how IoT solutions can contribute to sustainable farming.

Adaptability and Continuous Learning:

As I encountered new challenges and explored unfamiliar concepts, I realized the value of adaptability and continuous learning. Staying updated with emerging IoT trends and incorporating best practices ensured that my solutions were efficient and relevant.

8 Future work scope

In terms of future scope for the IoT-based smart irrigation system, there are several exciting avenues to explore that have the potential to further enrich its capabilities and user benefits.

Firstly, an area that could be expanded is the integration of predictive analytics. By incorporating advanced algorithms, the system could analyze historical data and weather forecasts to anticipate optimal irrigation schedules. This proactive approach would enhance water conservation and adaptability to changing conditions, thereby increasing crop yield.

Additionally, enhancing the user interface with more intuitive visualizations and graphical representations could improve user experience. Presenting real-time data in an easily understandable format would empower farmers to make informed decisions about their irrigation strategies.

Another aspect to consider is the integration of additional environmental sensors. Incorporating sensors to measure factors such as temperature, humidity, and light intensity would provide a more comprehensive understanding of the growing environment. This holistic data would contribute to better-informed irrigation decisions and potentially improve plant health.

Furthermore, exploring energy-efficient power sources such as solar panels could add sustainability to the system. This would reduce operational costs and reliance on conventional power sources, aligning the system with eco-friendly practices.

Optimization of the code and system architecture is an essential avenue for enhancing performance and maintainability. Refactoring the code to be more efficient and organized would not only improve overall system responsiveness but also facilitate easier future updates and modifications.

Integrating remote monitoring through camera modules presents another area of expansion. Enabling users to visually inspect crops remotely would provide valuable insights into plant health and growth, complementing the data collected by soil moisture sensors.

Moreover, exploring collaborations with agronomists and agricultural experts could enhance the system's effectiveness. By incorporating their insights and recommendations, the system could be fine-tuned to cater to various crop types, soil conditions, and regional requirements.

Finally, expanding the system's connectivity to encompass a broader range of communication protocols could enhance its compatibility with different IoT ecosystems. This would allow for seamless integration with other agricultural and smart home platforms, creating a more interconnected and versatile solution.