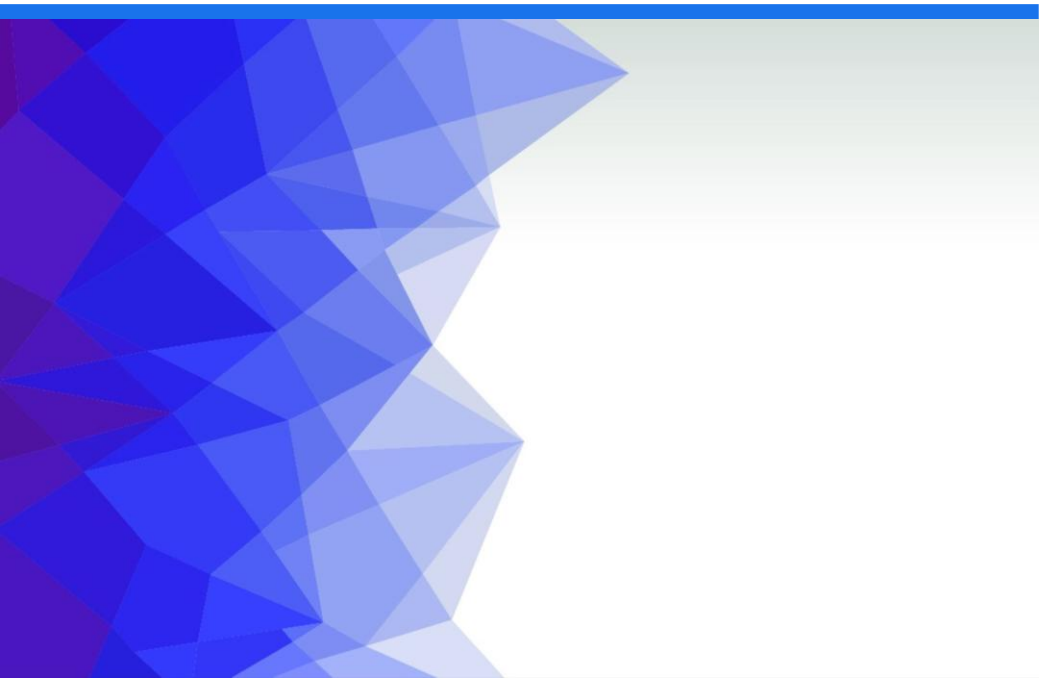
IOT BASED AGRICULTURAL POLE SENSOR

BY: ALYAZID IDRISSI



plan of delivery

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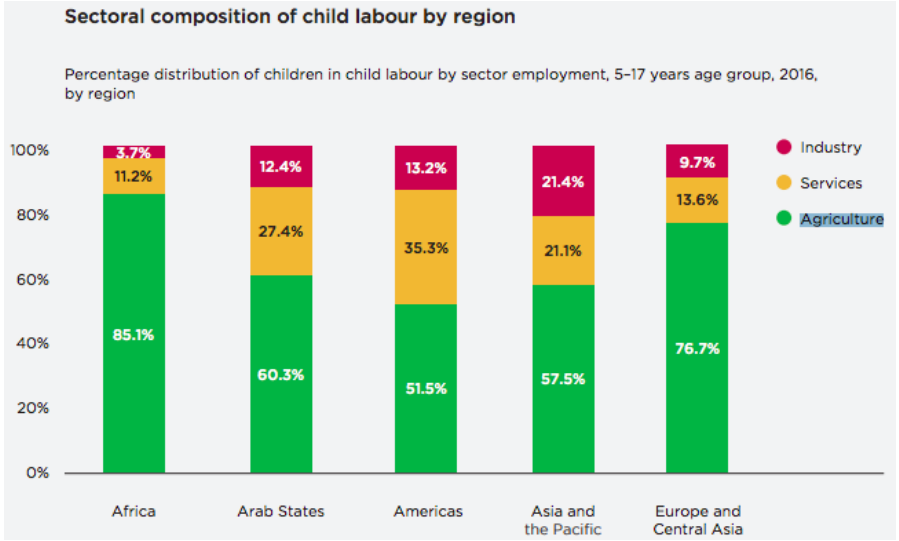
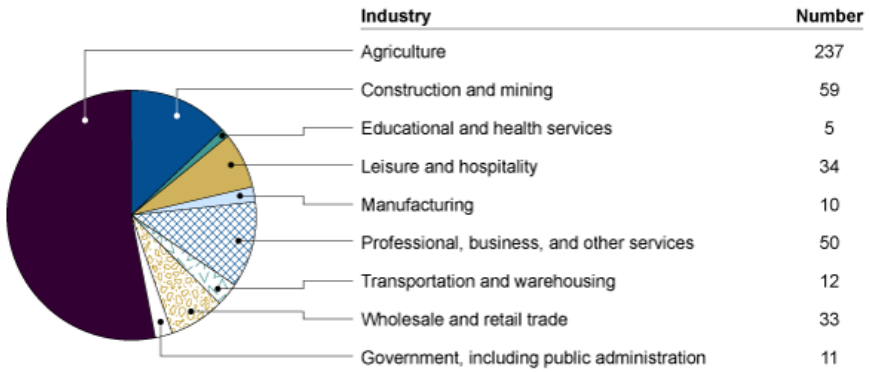
Introduction and reasoning



(international-partnerships.ec.europa.eu, n.d,2022)

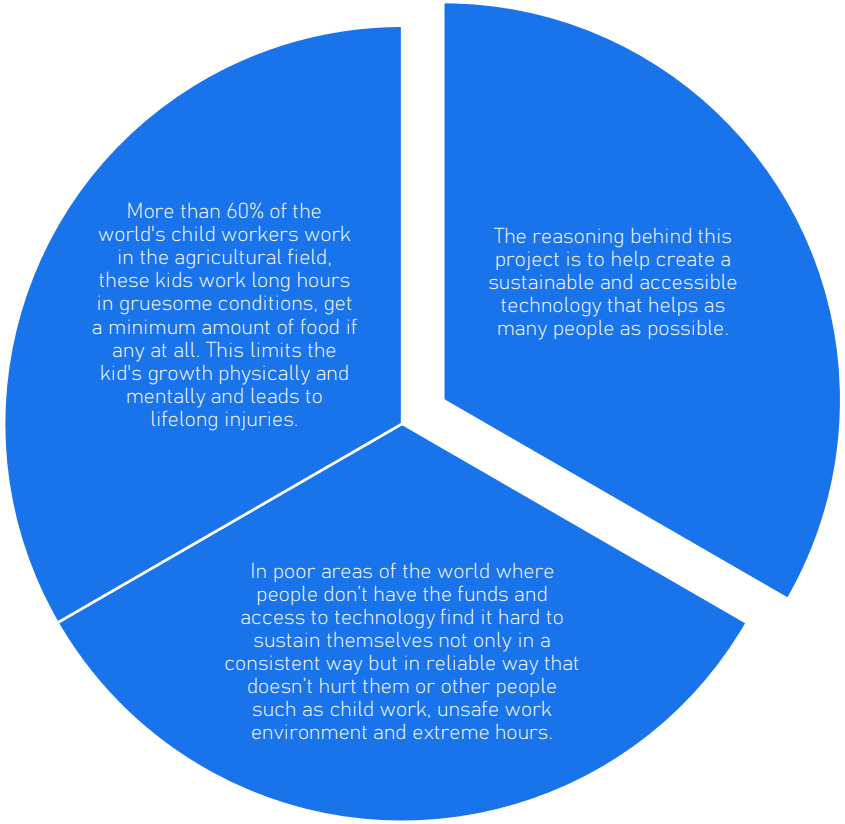


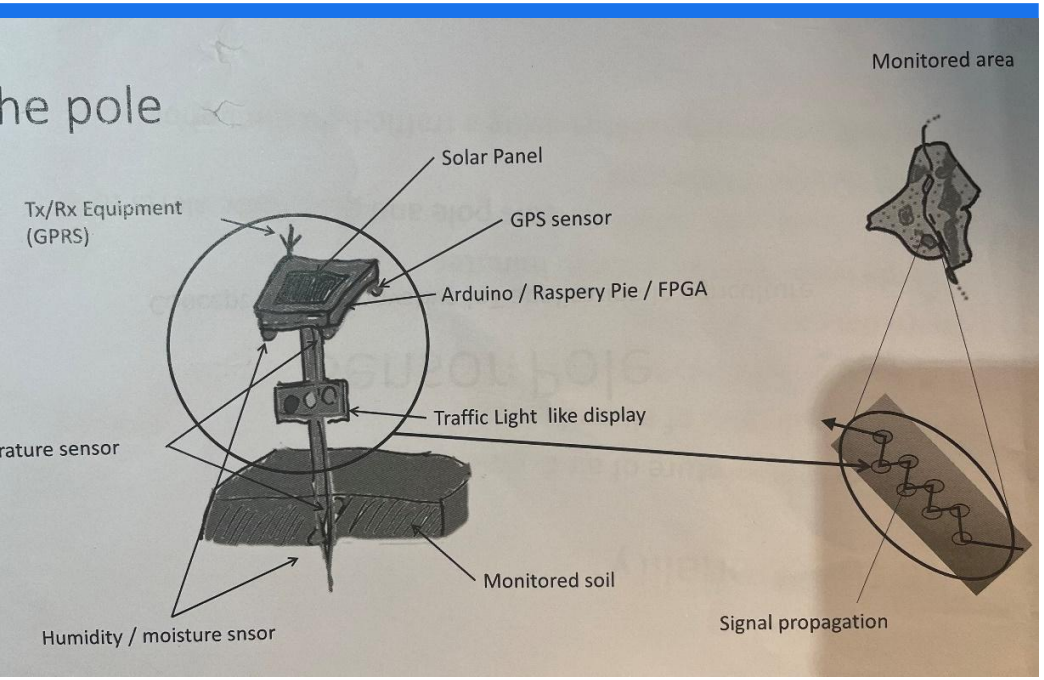
Industry	Number
Agriculture	237
Construction and mining	59
Educational and health services	5
Leisure and hospitality	34
Manufacturing	10
Professional, business, and other services	50
Transportation and warehousing	12
Wholesale and retail trade	33
Government, including public administration	11

Source: GAO analysis of Census of Fatal Occupational Injuries data. | GAO-19-26

Note: The total for fatalities for the period was 452. However, one fatality was excluded because of unpublishable data.

(Office, n.d, 2022))





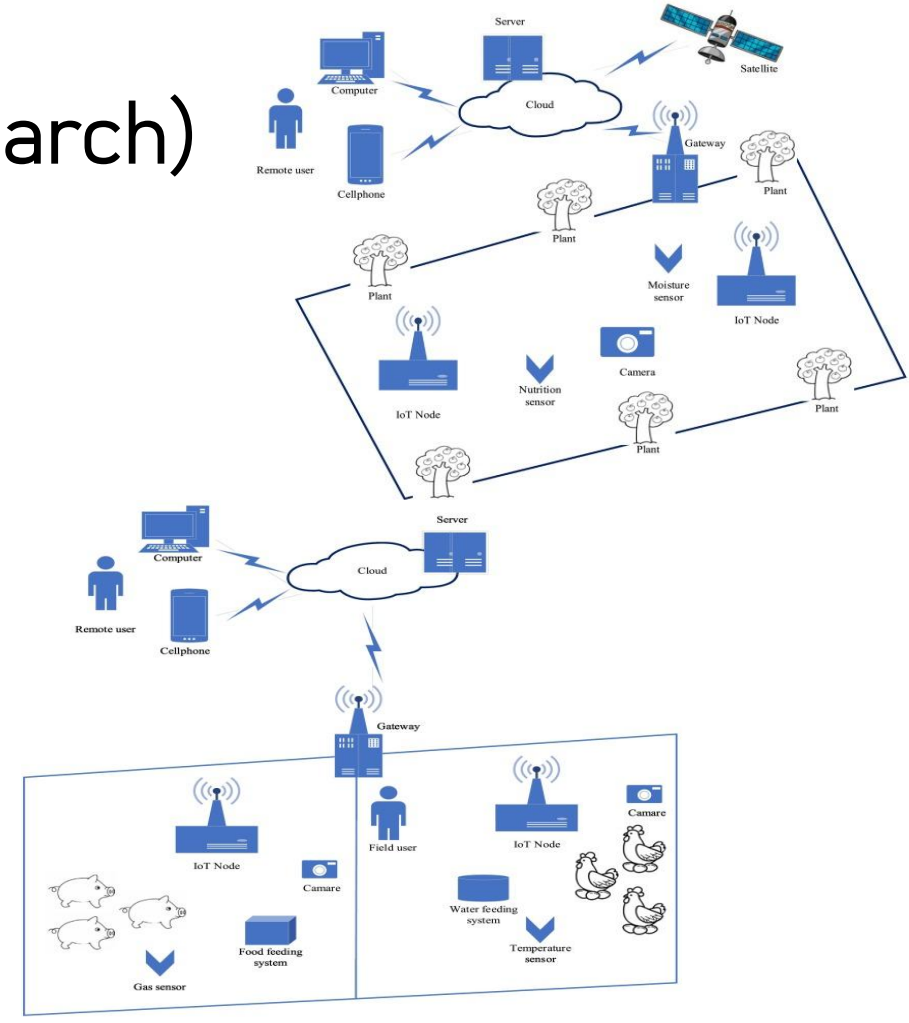
the objectives

- The objectives of this project is to design an IOT based agricultural pole sensor, this pole sensor must be able to do the following:
  - Measure temperature of air and ground
  - Measure humidity of air and ground
  - Measure of light intensity (UV)
  - Share data and position
  - Provide reading every 15-30 minutes
  - Communicate with other sensor poles and propagate alerts to a central station if detected
  - Signal location overall status using a traffic-light metaphor
- This technology must also be cheap, accessible and easy to implement in multiple areas.

IOT based agriculture (Background Research)

This technology brought agriculture to a new era, by not only lowering labor cost, increasing farmers income, and overall improving the quality of the products. This technology truly brought agriculture to the modern world. Not only that but overall, this technology increased yield quantity and quality and made the process that much more efficient. (What Is IoT in Agriculture? Farmers Aren't Quite Sure despite $4bn US Opportunity - Report, 2018)

Internet of things agriculture is agriculture that uses the internet, cameras, sensors, and motherboards among other things to monitor the agricultural field in real time. This technology allows to user to check temperature, humidity, and other data immediately allowing for consistent monitoring of the plants. (Xu et al., 2022)

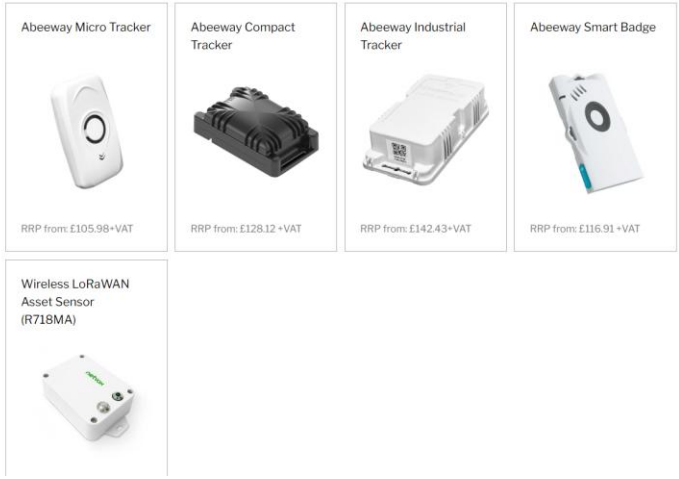


(Xu et al., 2022)

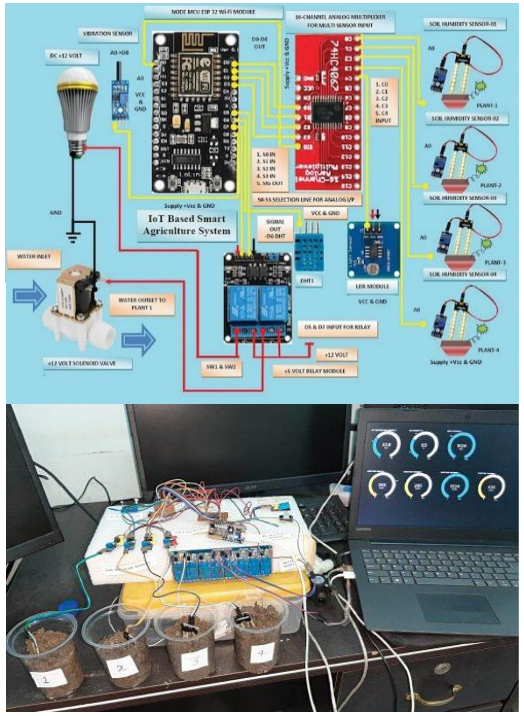
Similar Existing Products

- There is one critical problem with all the products mentioned its that they are not only not accessible to everyone but cost a lot making them not a viable option for everyone.
- Open-source project offer a much cheaper and simple alternative but lack the fit and finish of a proper design making them unusable in real word uses

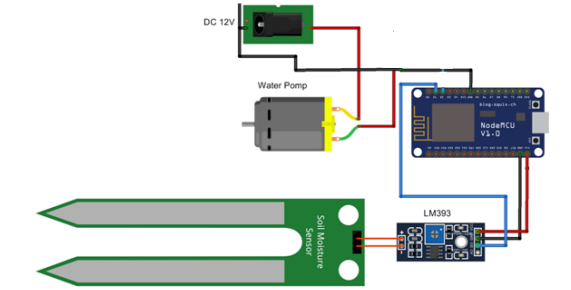
(Wittra, 2022)

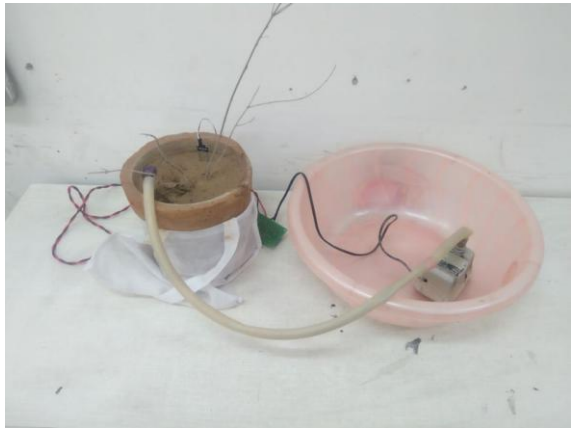


(Alliot technologies, 2022)



(RSInnovators, 2022)



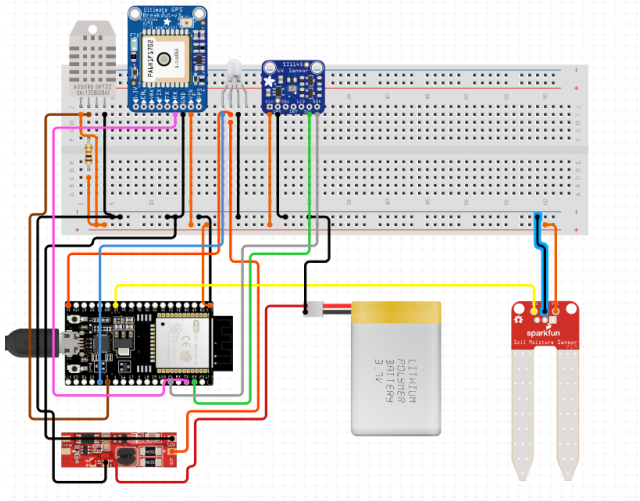


(Low-Cost Smart Agriculture System By J Jangir and Shukla, 2022)

The Hardware and Design

- The hardware being used will consist of two main components:
- The server
- The sensor pole
- The server will only use a raspberry pi 4 connected to a router. The server has an estimated cost of 85£
- The sensor pole will use the following components:
  - ESP32 – DevKitC
  - DHT22/11 Humidity and Temperature Sensor
  - 10K Ohm Resistor
  - Adafruit Ultimate GPS Breakout
  - LED - RGB Addressable
  - Lithium Polymer Battery
  - Soil Moisture Sensor
  - Lipo Battery Charger Module
  - SI1145 Digital UV Index
  - Flexible solar panel

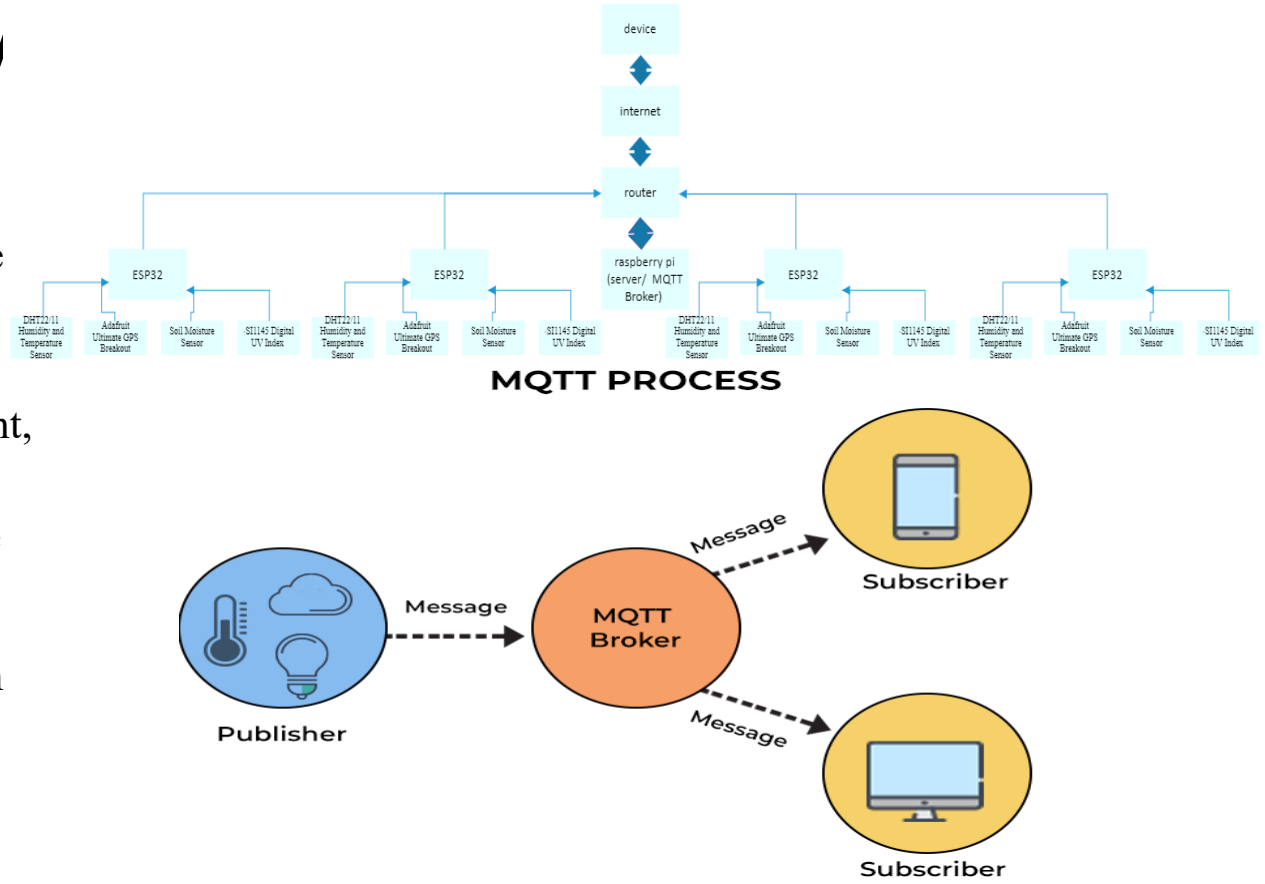
  The server has an estimated cost of 65£



- A case for both the sensor pole and the PI will need to be made.
- The case for the PI is a rather simple design that only must cover the PI.
- The case for the sensor pole has many complication. As not only does it have to be water sealed and resistant to element, but also must have transparent windows for the different sensors and detectors.
- Both cases will be 3D printed and tested in different iterations.

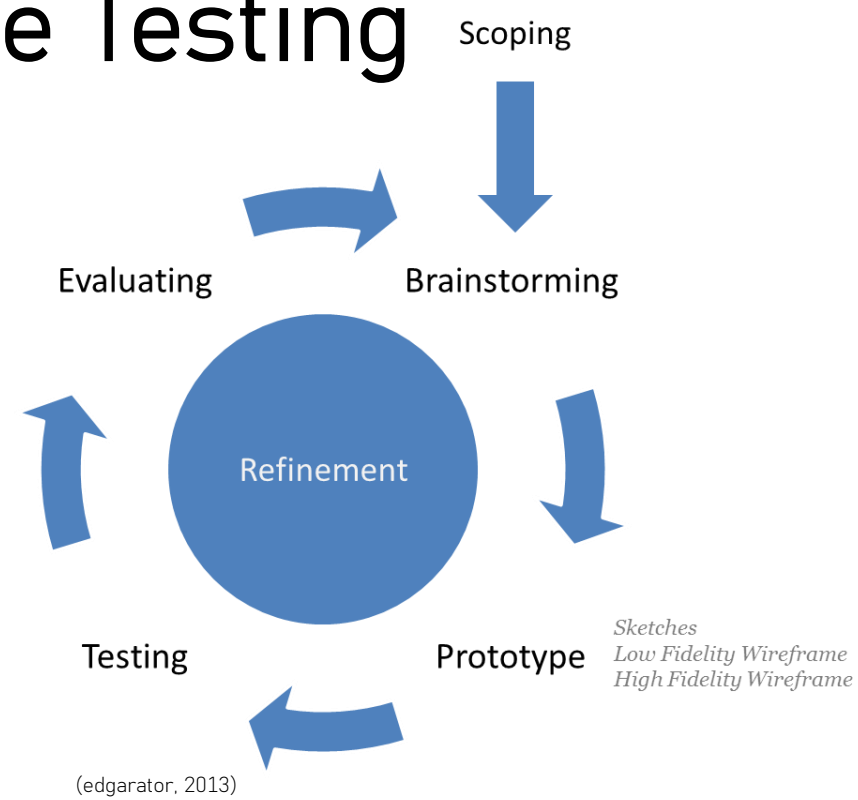
Programing and Softw

- Using the Arduino IDE, the raspberry pi connected to the same network as the pole sensors will use an MQTT protocol to send and receive data from the sensor pole. The data includes humidity, charge, temperature, UV light, GPS location, among others. This data will than be uploaded to a server that can be checked anywhere in the world.
- The programing will also allow the pole sensors using an LED to display the signal strength allowing for easier deployment not to mention periodic reading every 10 to 15 minutes to conserve the battery of the sensor pole to the max.



(BasuMallick, 2022)

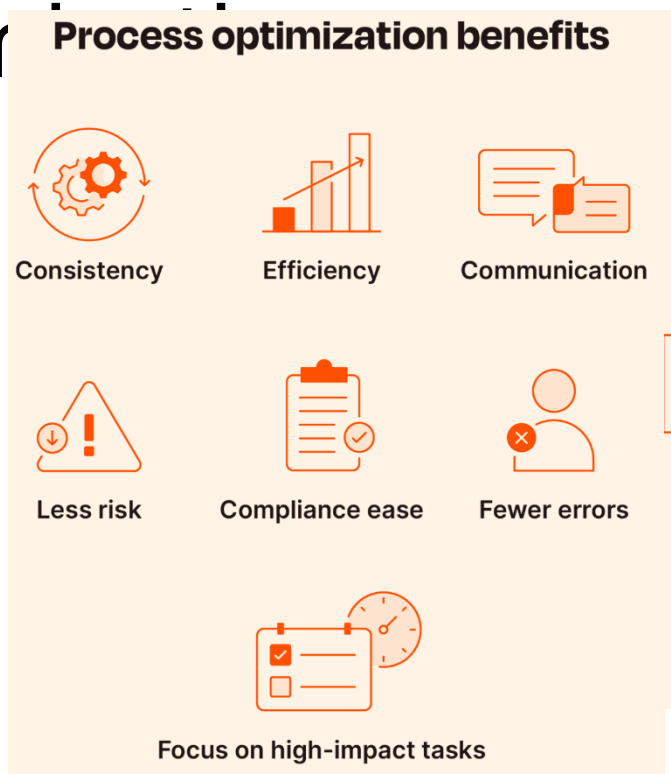
The Testing



- The testing will consist of two main parts
  - The proof of concept
  - Endurance testing
- The proof-of-concept testing is the initial part of testing, it will consist of testing the equipment features and if they all work as intended.
- The second the endurance testing will consist of putting the equipment through harsh and though conditions to check if the equipment can withstand the working conditions meant for it

Improvement and optim

- The testing phase will more than likely show multiple areas of improvement for the equipment. Use that data collected the equipment can be improved on and optimized.
- Areas where it is expected to be optimized are:
  - Battery life
  - Signal connection
  - Range
  - Accuracy
  - Cost
  - Types of data collected

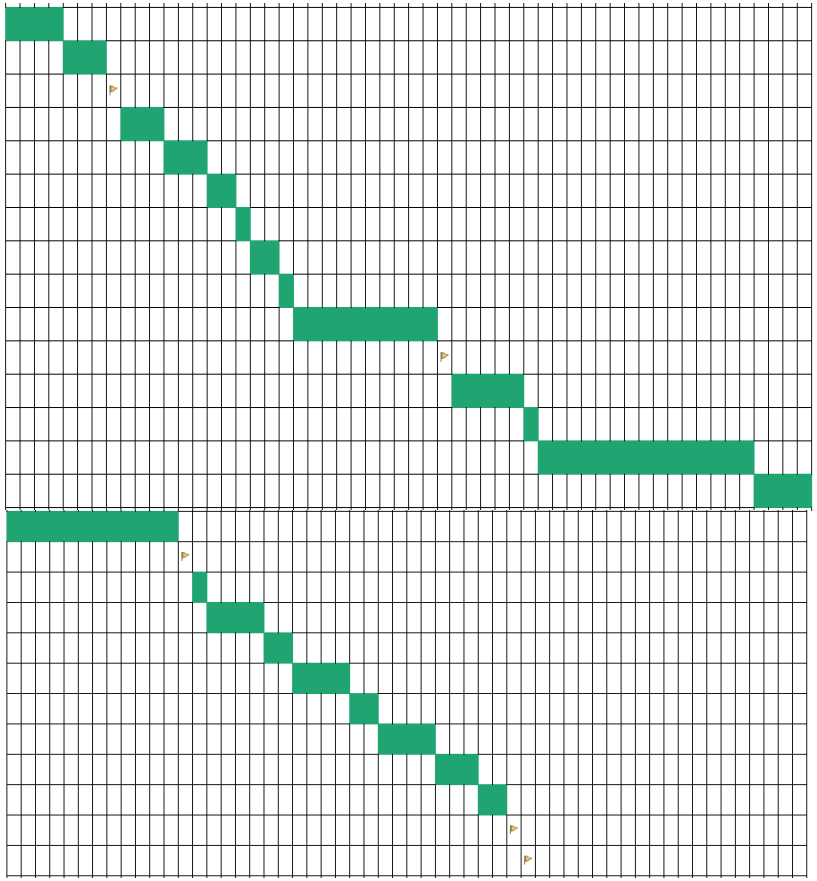


(Emley, 2022)

Progress so Far

- As per the Gantt chart made at the beginning of the project all the parts and decision have been made, currently the design of the casings and the assembly and collection of parts is being done.
- The parallel collection of parts and design of casing causes the project to be ahead by about 20 days which leads to more room for improvement.
- The Raspberry PI has been requested from the control teacher.
- The pole sensor parts have been ordered.

write code for the app	On Track	25/12/2022	14/01/2023	20
request funds to buy needed items	On Track	14/01/2023	17/01/2023	3
design finished	Milestone	17/01/2023	18/01/2023	1
buy motherboard, cables, water sealants, sensors, solar panels, etc.	On Track	18/01/2023	21/01/2023	3
print 3D design for the outer shell and motherboard enclosure in a 3D printer	On Track	21/01/2023	24/01/2023	3
install motherboard and sensors into the outer shell	On Track	24/01/2023	26/01/2023	2
connect all cables and sensors to motherboard, battery pack, and solar panel	On Track	26/01/2023	27/01/2023	1
coat the sensitive electronics with anti-moisture	On Track	27/01/2023	29/01/2023	2
upload code to motherboard	On Track	29/01/2023	30/01/2023	1
make at least three sensor poles	On Track	30/01/2023	09/02/2023	10
prototyping finished	Milestone	09/02/2023	10/02/2023	1
test the sensor poles and their ability	On Track	10/02/2023	15/02/2023	5
collect data from the test	On Track	15/02/2023	16/02/2023	1
use data collected from tests to improve the sensor poles	On Track	16/02/2023	03/03/2023	15
keep testing and improving until satisfactory results are achieved	On Track	03/03/2023	18/03/2023	15
keep testing and improving until satisfactory results are achieved	On Track	03/03/2023	18/03/2023	15
testing finished	Milestone	18/03/2023	19/03/2023	1
create a word document and structure it appropriately	On Track	19/03/2023	20/03/2023	1
write down the process of making the sensor pole	On Track	20/03/2023	24/03/2023	4
add literature review	On Track	24/03/2023	26/03/2023	2
discuss achieved results	On Track	26/03/2023	30/03/2023	4
discuss use cases	On Track	30/03/2023	01/04/2023	2
discuss any possible future improvements	On Track	01/04/2023	05/04/2023	4
add all the writing in a structured manner and refine the final writing	On Track	05/04/2023	08/04/2023	3
add pictures and referencing	On Track	08/04/2023	10/04/2023	2
writing finished	Milestone	10/04/2023	11/04/2023	1
project submitted	Milestone	11/04/2023	12/04/2023	1



Conclusion and Future Plans

- In the future it is hoped that we can keep improving the technology making it more sustainable and more accessible for as many people as possible compared to the current technology that is expensive and hard to deploy.
- And finally, we want to thank you for your attention and time.

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