1. Introduction.

This a final year, academic level 8 within Waterford Institute Of Technology a third level University Institution. The award for completion is a Higher Diploma in Computer Science.

1.1 Acknowledgement

First and foremost, I would like to thank my Project Supervisor Mr. Richard Lacey who guided me in doing this project. He provided me with invaluable advice and helped me in difficult periods.
His motivation and help contributed tremendously to the successful completion of the project. Besides, I would like to thank all the lecturers who helped me by giving me advice and providing the equipment which I needed. At last but not in least, I would like to thank everyone who helped and motivated me to work on this project.

1.2 Background

The reason I decided to do an IOT project was that at the very start of the pandemic when everyone went into lockdown I was forced t work from my bedroom 8 hours a day working then I had to complete college work for another 2 hours a day, then I would have to sleep in the room for another 8 hours, what I found was that the oxygen levels in the room became very poor and I was actually having trouble breathing and sleeping.

I began explaining this to one of my work colleagues and they said that they had experienced a similar problem and what they did was invest in good quality house plants to clean the air.

The only problem I would have to face is that I would have to maintain these plants which I had very little knowledge about, but following advice from my friend I would learn very quickly.

In order for me to help and maintain these plants I needed to invent some type of smart system that would monitor and feed the plants when I am not around.

The final project for the H.Dip was the perfect opportunity to do this and with this in mind the next step was to research different ideas in order to make a project proposal.

2. Project Research.

I researched 2 different online projects that had similar problems to my own, each problem was solved by using a raspberry pi but was usually outdoors in one case the author built their own garden.

2.1 The Raspberry Pi Powered garden.

This IOT system functions using the following processes:

A Raspberry Pi is used to relay useful information of the garden, such as luminosity, and humidity from various sensors and relay this information into a cloud database.

Once the information is in the cloud, it can be accessed from anywhere using a smartphone app that the author built.

The following are some of the key features of the garden :

- Real-time feedback of the garden's various sensors
- Database of the garden's health status
- Global monitoring and operating capacities

In this project they used Google's Firebase as the intermediary of their IOT system, to create their own free cloud database.

They then used MIT's App Inventor to create a smartphone application which is compatible with the Firebase database and the Raspberry Pi.

It can also communicate with the database with the help of a free Python library.

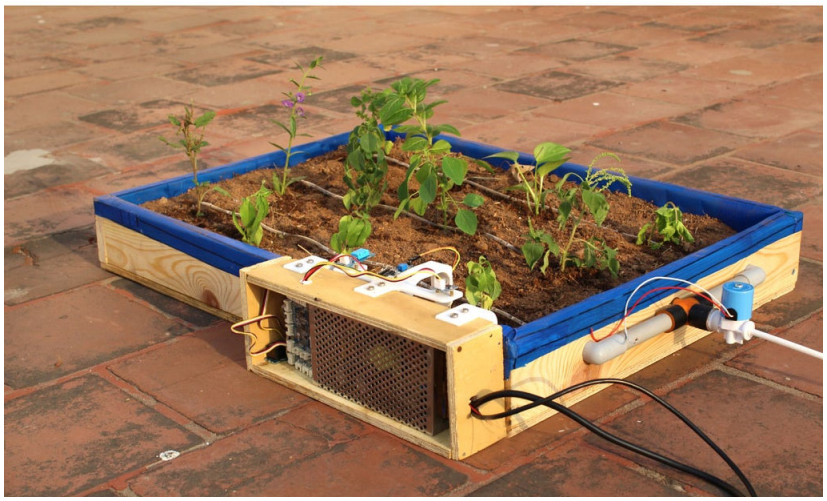

Figure 1 - The Raspberry Pi Powered Garden.

2.2 The Automated Garden System Using A Raspberry PI.

This type of system uses a program called a MudPi.

A MudPI is an open source garden system the author made to manage and maintain garden resources, it is built on a Raspberry Pi.

A Debian operating is loaded onto the raspberry pi and MudPi application is then downloaded, the user can then add specific sensors to specific pins.

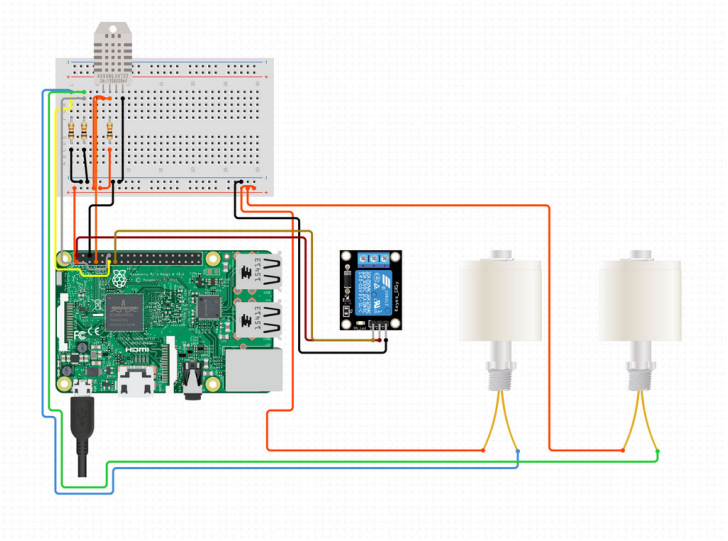

Figure 2 - Example Circuit Diagram.

The sensors then relay information back to the user over the Wifi.

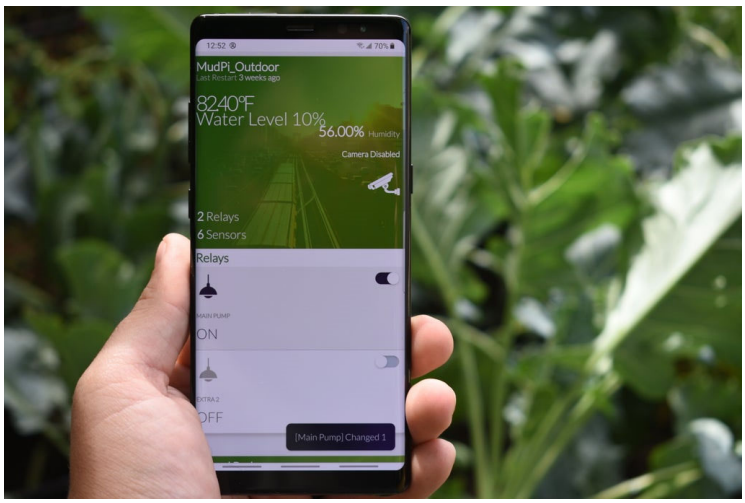

Figure 3 – A MudPi Application

Upon researching these 2 systems I able to put a project proposal together.

3. Project Proposal

This project is an application of green technologies for sustainable living. An indoor garden will be created, where plants (Snake Plant, Peace Lilly and Spider) will help clean and recycle the air. The technological solution will measure the oxygen and carbon dioxide levels in the air, and display this using an android application. Building on this idea, other fruit and vegetables will be grown with the aid of robots to assist with irrigation by using thresholds for dryness and wetness.
This project is broken into 2 parts, the hardware, and the software.
The hardware includes different sensors to measure different quantities in the garden then the first piece of software will run on a Raspberry Pi that will interface and read the sensors then a native Android app will be built to monitor and display these values of the garden.

An analysis of green technologies based on IOT solutions will be carried to identify potential solutions and features for my project. These include:

1. The Raspberry Pi Powered Garden.
2. The Automated Garden System Built Of Raspberry PI For Outdoors or Indoors.

3.1 Technologies.

Hardware Requirements

1. A main mother board e.g. (Raspberry Pi, Arduino).
2. Sensors (light sensor, soil/moisture sensor, CO2 sensor).
3. Water pump.
4. LCD screen.

Software Requirements

1. Android Studio (Kotlin or Java).
2. Database (Firebase or MongoDB).

There are many different software lifecycles that could be used in this project, but for the purpose of this document I am going use either Kanban or SCRUM and implement a Trello board to monitor the progress of this project.
The whole idea is that all parts of the project be broken into can smaller tasks where I plan, build, test, and review, then put all finished pieces together at the end to create the finished product.
The software design methodology I will use in this case is the Waterfall method a.