**Tools and Technology**

*Hardware – Mailbox Controller*

This section covers the hardware required to achieve a functional Smart Mailbox prototype.

Due to time constraints the prototype controller was created with pared back features to allow the delivery of a functioning controller unit that provides data to our in-house designed webserver.

1. ESP32, Dual-core, 32-bit micro-controller with Integrated Wi-Fi and Bluetooth.

Chosen for its robust design and low power consumption, this microcontroller is powerful piece of kit for its size, with all the needed features integrated to handle the processing of the sensors in addition to having the ability to easily connect to your home Wi-Fi.

1. DHT11 Humidity and Temperature sensor module.

This sensor module combines temperature and humidity to provide feedback on the environment conditions inside the mailbox. With power consumption of only 0.3mA while operating, and with a range of 0 - 50°C.

1. PIR motion sensor.

Used to detect a mail delivery, this Pyroelectric sensor will detect motion inside the mailbox.

1. Micro-controller compatible Breadboard with wire jumpers, used for R&D of prototype.

During the R&D process, the use of this breadboard eliminates the need for soldering and allows for easy configuration changes.

1. AA batteries and battery pack and/or 5V power supply.

Batteries and battery pack is used to power the controller unit when place inside the mailbox. For R&D and testing, a 5v power supply is used.

1. Micro USB to USB-C cable to connect to microcontroller.

Used to connect PC to microcontroller for programming and debugging.

1. Arduino IDE 1.8.15.

Used to create sketches/programs. The IDE is also used to flash created programs to the microcontroller and provide a serial monitor for testing and debugging purposes.

1. Arduino to ESP32 boards manager package to enable the use of Arduino IDE on the microcontroller of choice.

Additional packages were required in the Arduino IDE t communicate with the chosen microcontroller.