**Project Description**

The group project is to develop a “Smart Mailbox” that aims to track and secure incoming mail and packages. The project involves developing an app installed smartphone to receive notifications and monitor the status of their mailbox. The top current information technology trends include mobile apps, automation, artificial intelligence, and smart technology – all of which are part of developing the Smart Mailbox project (Linchpin, 2021). Specifically for the Smart Mailbox project, the app will need to monitor light, motion, sound, temperature, number of parcels, and basic requests such as accepting or rejecting an incoming parcel. Developing an app requires knowledge of common modern coding languages such as HTML5, Java, C++, Objective-C, Swift or C# (Portal, 2017) or web development skills in React, or Redux. It also requires proficiency in Microsoft .Net Framework, MVC, SQL server and other software such as Node.js or Tomcat. To create an adaptable app with the many operating systems, such as Android, Windows, or iOS, it will also require the application of a “cross-platform tool” (Portal, 2017). Moreover, the app will need to capture information and store this information within the app which requires knowledge of server developments.

A consistent passion throughout the group is all things technology but becoming software engineers was particularly common and ranks #11 in IT occupations according to Burning Glass Technologies. In the software engineer roles, the main tasks involved are designing, developing, testing, and delivering software solutions that is also necessary to deploy this project. In software engineering, experience with Java, SQL, HTML5 are most popular, with knowledge of SQL ranking the #1 most sought-after skill from employers. For group members that are interested in software and production engineering, the skills and experience with programming languages, frameworks and tools developed from this project will contribute to their ideal job. This project also requires the ability to work collaboratively and effective communication (ranked #1 in demand from employers) to plan and execute a project within a timeframe – building experience that can be applied to any career, whether it is in IT or another field.

In addition to the software, a hardware component is also needed to be sourced and put together for this project. Sourcing the best fit hardware will require researching skills and the ability to analyse pros, cons, and risks to give the team the best chance to develop a successful product. These researching and analytical skills are commonly found in all the ideal jobs of the team members including Business Analysts and Infrastructure Architects.

**Aims**

**“To secure all incoming parcels”**

In order to meet this aim, we need to create a smarter and more secure mailbox. For this reason, the most important part of this project is the hardware component. To safely secure all parcels, the mailbox itself has to be solid, durable, and be functional. Without the physical mailbox, we would not be able to receive and secure any mail. The first goal would be to research and source components for the mailbox that fit this criterion to start the build.

Once the physical component of the project has been developed, the next goal would be to add the light, motion, temperature, and moisture sensors to allow mail to be received and protect the mail once it’s been delivered. This will also be the first step to making the mailbox “smart”. Again, research and sourcing the right components to meet these needs are crucial. These sensors allow the mailbox to detect if a delivery is being made and automatically open the doors to accept the delivery or keep the doors locked to reject the delivery. The sensors will also be required to detect harmful temperatures and moisture levels that will damage the mail. This will be the second most important part of the project.

Finally, the last goal is to create an app that will allow us to have all the information at our fingertips. The app will be used to send the data from the mailbox to the owner and permit the owner to accept and reject deliveries, monitor the light, motion, temperature, and moisture levels wherever they are. It will also store this information to be accessed at any time. The app is the final part to making the mailbox “smart”, however the app is no use if the hardware components are not yet built – therefore the app can be the final goal of the project if time permits.

**Tools and Technologies**

Software

The project to create a smart mailbox will require a programming software to develop the app. For this project, we decided to utilise Node.js as it is powerful and fast to develop at a low cost. Moreover, our team member Richard has had much experience with this software in his role as a system administrator.

Hardware \*copied from Jason’s draft – once finalised I can make final edit

Hardware – This section will cover the hardware required to achieve a functional Smart Mailbox prototype.

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

Previous experience within the team using an Arduino microcontroller is limited. Jason has previous experience with programming micro-controllers using LUA, his work exposes him to debugging micro-controllers. However, it has been several years since he has worked with programming micro-controllers.

1. DHT11 Humidity and Temperature sensor module.

No team member experience working with these humidity and temperature modules.

1. Single pole, single throw, (SPST) Microswitch.
2. Micro-controller compatible Breadboard with wire jumpers, used for R&D of prototype.
3. AA batteries and battery pack.
4. Micro USB to USB-C cable to connect to microcontroller.
5. Arduino IDE 1.8.15.
6. Arduino to ESP32 boards manager package to enable the use of Arduino IDE on the microcontroller of choice

**Risks** \*Just a few dot points – once everyone’s added their risks and I can do the final edit (just so we don’t double up on writing paragraphs)

Adruino board risks/disadvantages:

* No understanding of the AVR microcontroller
* Sketches and shields can be difficult to modify
* No debugger for checking scripts
* No experience of C or professional development tools

(Kanda, 2021)

Temperature sensor risks/disadvantages:

* Limited temperature range
* Short shelf life
* Fluctuations in temperature (slow response) (World, RF Wireless World, 2012)

Motion sensor risks/disadvantages:

* Can the motion sensor detect motion from inside the mailbox
* Passive motion sensors do not operate above temperatures of 35 degrees Celsius
* Passive motion sensors detect motions within the “line of sight” and cannot detect motions outside of the “line of sight regions”
* Passive motion sensors cannot detect very slow motions
* Motion sensors may be triggered by any moving objects which may trigger too many false notifications (World, 2012)

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