**IT Project – Smart Mailbox**

**OVERVIEW**

As a team we discussed everyone’s project idea from assignment 1 as well the other possible project ideas. Collectively we decided to expand on an individual’s idea.

The project idea we are going to expand on is the Smart Mailbox Notifier.

The Smart Mailbox leverages your existing mailbox and home Wi-Fi internet in order to send you notifications whenever someone interacts with your mailbox by delivering letters and parcels.

An App installed on your smartphone will let you get notifications about any event happening on your mailbox. You will also be able to track mailbox trends (eg. Which day of the week has the highest triggers) and a custom speaker fitted next to the sensor will also let you play a custom audio file on mailbox trigger. This projects core system is a micro-controller with a Wi-Fi module, a speaker, as well as a smartphone app.

**MOTIVATION**

The demand for Home Automation has drastically increased in the past decade. According to Forbes, smart home device market is set to grow from $55 billion in 2016 to $174 billion by 2025. With the increasingly popular IoT (Internet of Things) devices becoming more and more mainstream and cheaper to buy, turning a lot of objects in your home such as your lights or your curtains smart has become the trend. The physical mailbox however does not have a lot of automation broadly available in the current market, we think there is a big potential to market an easy-to-install kit to monitor your mailbox wherever you are. Having the ability of monitoring your mailbox, in a world where mail is now a source for thieves trying to obtain information on property occupants, adds an additional layer of security.

**DESCRIPTION**

The Smart Mailbox Notifier's journey starts inside the mailbox. It is mounted on the inner top part of the letter box to keep it out of the elements and discreet.

Equipped with Light/Motion/Moisture/Temperature sensors, this mailbox notifier system will start capturing data as soon as you turn it on. Even before the mailman made a delivery, you will know exactly, at any time of the day how warm or humid your mailbox is, sending you incremental data every 15 minutes. The Mailbox Notifier case will be rugged, weatherproof, and waterproof to ensure optimal functionality.

A decent rechargeable battery will provide the sensor for up to 3 weeks of operation, and charging will only take around 2 hours, which lets you enjoy minimal downtime and a piece of mind. An easy-to-use app will be downloaded on your smartphone of choice (Android or iOS), and the pairing process is very simple. All you need to do is to initialize a Bluetooth connection to the device, which in return will let you enter your Home Wifi password to let it connect to the internet.

Once set up, push notifications will be automatically delivered to you anytime the mailbox is being triggered, or when a threshold of humidity and temperature is reached inside your mailbox.

A data warehouse in the cloud will keep all your data for the week. It will be able to tell you which time and day of the week was the most humid and warm, via accessible reports from the smartphone app.

The mailbox notifier system never rests and will be monitoring your mailbox throughout the night, in case of thieves or little animals are trying to get in.

Some challenges that will need to be overcome during the development of this product is the configuration/setup of the complete unit to be able to fit different size mailboxes. The use of a 3D printer gives flexibility here in being able to produce a number a different size cases to fit most common size mailboxes.

Another challenge the team will face is pushing their programming skills to new levels when programming and developing the microcontroller program. We believe the choice of microcontroller, along with the chosen language have a wealth of knowledge and support online that will aid the team in bringing this part of the project to life.

A smart home device would not be complete without it’s very own app and will arguably give the team the greatest challenge in the development of the product. To overcome this, the development of the app will be broken into manageable steps which are outlined in the following sections.

**TOOLS AND TECHNOLOGIES**

This project will use multiple components, such as:

* A micro-controller such as an ESP32, that has integrated Wi-Fi and Bluetooth.
* A micro-controller was chosen for its robust design. Having the ability to work in temperatures of –40°C to +125°C is an ideal choice for the Australian harsh climate.
* A micro-controller is also a powerful small piece of kit with a dual-core CPU capable of 80, 160 or 240mHz along with 512KB SRAM on chip memory.
* Power consumption is an important aspect when it comes to designing a standalone device without a hard-wired power source. Using a micro-controller with ultra-low power consumption aids tremendously in length of battery life.
* Cost – microcontrollers can cost as little as a cup of coffee.
* Lastly, having built in Wi-fi and Bluetooth eliminates the need for any extra radio modules. This has the benefit of keeping the complete kit as small as possible.
* A light sensor combined with a motion sensor, a moisture sensor and a temperature sensor.
* Preventing your mail being damaged or ruined by water ingress into the mailbox can be avoided with feedback on your mailbox environment using the moisture and temperature sensors.
* The motion sensor is used for mail deposit feedback.
* A 3D Printer to create the case.
* To keep the controller free from the elements it will be housed in a case that can be custom sized to fit all the controller parts.
* Arduino IDE in order to program the micro controller.
* With ample support, access to information online and simplicity, made Arduino IDE perfect for the task of programming.
* A Smartphone app (Both deployed to Android/iOS) that will receive data about the sensor such as notifications and battery life. C# language and Xamarin.Forms is the preferred choice of development tools as it can do cross-platform deployment.
* A database server to store the data from the sensor, and in return will let the smartphone app access it.

**SKILLS REQUIRED**

The required skills for this project are:

* A software developer proficient in C# and the Xamarin platform in order to produce the Android/iOS app.
* The development of the app will be split into several smaller steps across the team to utilise each individual’s skill set, these steps include; creating a mock up of the app and how we envision the app will look and operate, creating the graphic design/user interface of the app, programming of the app will be split into frontend and backend development.
* Ideally an experienced software developer would be employed to perform such as task as creating an app. But with members of the team studying programming along with having a keen interest in completing a challenging task such as this, we believe the foundations of an app can be generated by the team.
* Setting up communication to an external database on a server is another task that will provide a challenge and
* UX/Graphic design to create interface/graphics of the app.
* Adobe creative cloud provides access to an array of user-friendly tools that will be employed to create the base for an interactive, visual pleasing UI.
* A Digital marketing person to help promote the project.
* An important an essential part of any product deployment is promotion of the product to the ideal target market.
* According to (Strategy Analutics, 2017), smart home consumers are separated into seven different categories, Strugglers, Convenience seekers, Retired Renters, Greens, Affluent nesters, Impressers, and Early adopters. The three target markets this product is likely to appeal to is the Affluent nester, Impressers and Early adopters, which will be the focus when creating digital marketing content.
* Programming of the Micro-controller ESP32 along with the wiring and configuration of sensors.
* The final design structure is yet to be decided however during development of the product a simple breadboard configuration will be employed for testing and R&D.

**OUTCOME**

By putting on the market a smart mailbox notifier kit, this would help a lot of people at the office receive live data regarding their mailbox without being at home, which would also help with mail theft. This smart mailbox market does not have a lot of offerings, so by bringing an affordable and easy to install solution for existing mailboxes, this could potentially become as popular as smart LED lights or even spark ideas for future iterations of this product. As a team we are excited to come together to develop the project idea into fruition.

**References:**

New Customer Segmentation Improves Smart Home Marketing Strategies in Western Europe, (2017), Strategy Analytics. Available at: <https://www.strategyanalytics.com/strategy-analytics/news/strategy-analytics-press-releases/strategy-analytics-press-release/2017/04/12/strategy-analytics-new-customer-segmentation-improves-smart-home-marketing-strategies-in-western-europe#.WPdKxlKZPq1> (Accessed 16/07/2021).