



Development Prototype of Smart Mailbox That Send Email to User When Parcel Barcode Being Scanned

Mohamed Fakhruzzaman Mohamed Firdaus¹, Kamarul-Azhar Kamarudin^{1*}

¹Faculty of Mechanical and Manufacturing Engineering,
University Tun Hussein Onn Malaysia, Batu Pahat, 86400, MALAYSIA

*Corresponding Author Designation

DOI: <https://doi.org/10.30880/rpmme.2022.03.01.089>

Received 01 Dec 2022; Accepted 01 April 2022; Available online 30 July 2022

Abstract: The rise of internet usage worldwide has created a new phenomenon of consumer behaviour, in which the consumers' attention has been shifted to online purchasing. Lots of courier recruit part time delivery workers and paid by commission based depend total parcel they send. Because of this commission based earning, often courier will throw customer parcel or left parcel near the house's gate if no one come out to pick up the parcel. These situations will lead to missing parcel and parcel being stole. This project will focus on developing a smart mailbox's system that send email to user when parcel's barcode being scanned. The project will use Arduino Uno as the microcontroller and the smart mailbox will be fabricate using aluminium and acrylic. With help of smart mailbox's system, parcel delivery can be done faster than before. This is because courier do not need to wait for customer to come out and take their parcel. In future, smart mailbox can be improve more on safety such as use locking system.

Keywords: Smart Mailbox, Phenomenon, Barcode

1. Introduction

In 2020, Malaysia e-commerce market value is \$4.46 billion according to Hootsuite with average of a person spend around \$341[1]. Revenues for e-commerce continue to increase year by year. According to ecommerceDB, the biggest player in the Malaysian e-commerce Market is huawei.com with revenue of US\$ 81 million in 2020 followed by apple.com with US\$ 78 million and Zalora.com.my with US\$ 56 million [2]. Malaysia's e-commerce market is expected to reach US\$12.6 billion by 2024 with increasing at a compound annual growth rate of 14.3% between 2020 and 2024 [3]. E-commerce includes a wide range of economic activities such as retail stores, online banking, logistics digital content and others. All these activities can occur in all the three main transaction categories which are business to business, business to customer and customer to customer[4].

*Corresponding author: kamarula@uthm.edu.my

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Figure 1.1: Value of E-commerce Market in Malaysia [5]

Because of the high demand on e-commerce the courier companies need to recruit more delivery workers to make sure their service can maintain at the best condition. Often people complain that their items broke in the parcel because parcel being thrown, Other than that, parcel was left near house’s gate that will increase the chance of parcel missing or damage due to rain or being take away by animals.

The purpose of this study is to come up with an idea to solve the problems that occur. Smart Mailbox will help to decrease or eliminate problems that happen nowadays. With Smart Mailbox, rider will be paid full commission on all the parcel they take because they will not have to return the parcel again to the warehouse or thrown inside customer house. This is because, they just need to scan and drop the parcel inside the Smart Mailbox and it will be count as delivered. Customer also will get a notification about their parcel inside the Smart Mailbox.

The internet of things (IoT) describes the future where every day physical objects will be connected to the internet and be able to identify themselves to other devices. IoT is a new revolution of the Internet and it will effect in a large number of applications such as smart living, smart home, healthcare systems, smart manufacturing, environment monitoring, and smart logistics [6]. Internet of Things can also be considered as a global network which allows the communication between human to human, human to things and things to things, which is anything in the world by providing unique identity to every object. Malaysia delivery system does not change and remain same for the last 5 years. With the development of Smart Mailbox’s system, it can be the first effort to use internet of thing for courier customers in Malaysia delivery system.

2. Methodology

The design process is a series of steps that need to be followed when trying to solve a problem and design a solution for something. It is a methodical approach to problem solving. The process generally starts with a problem and ends with a solution, but the middle steps can vary. If there is problem happened during the analysis or testing, the step will be repeated to the early one. A design process flowchart can help clarify and streamline any design project by improving communication and eliminating waste and downtime. This is because, the time management is well organised.

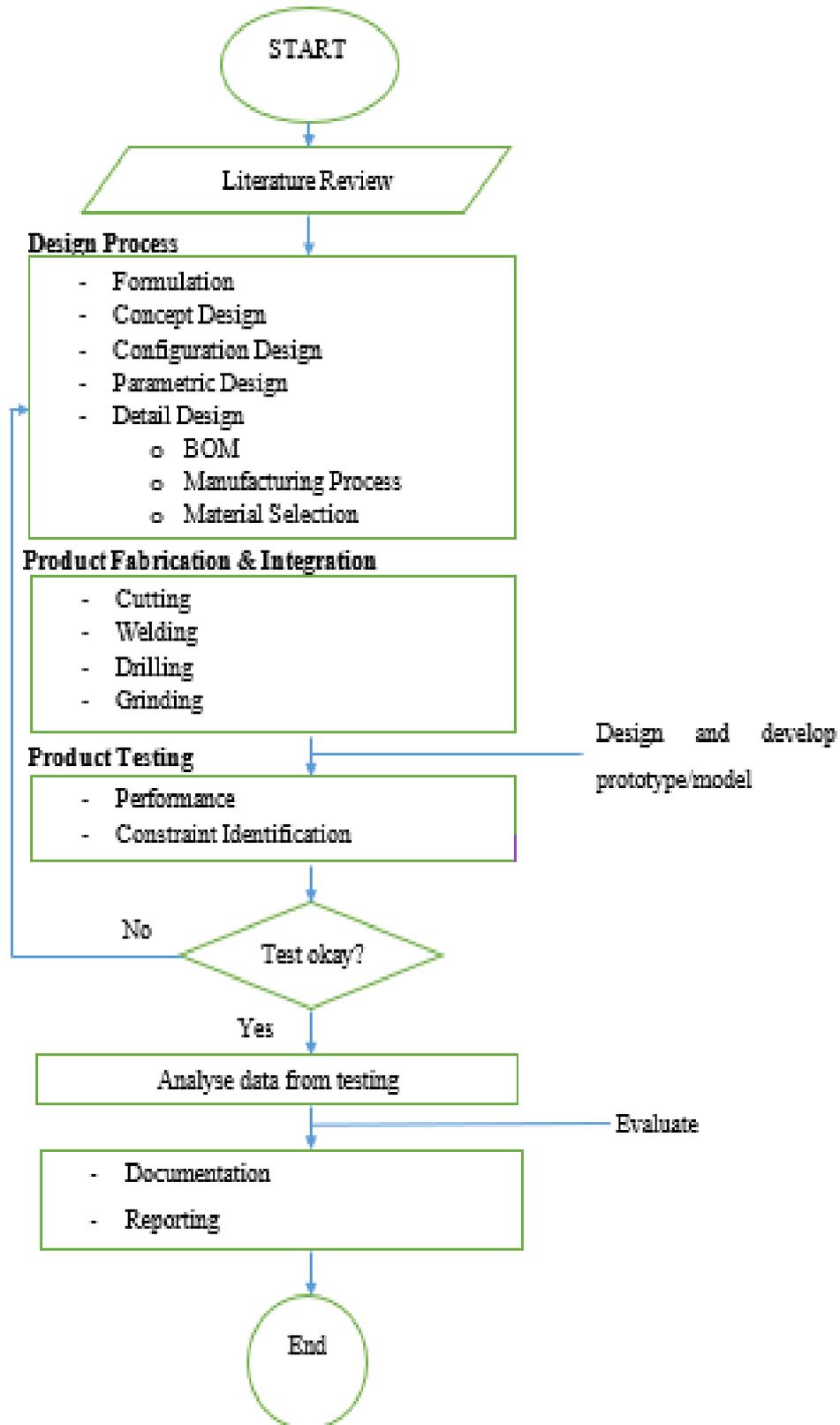


Figure 2.1: Project Flowchart

3. Materials and Component

The frame of this project uses hollow aluminium bar. This material is selected because of its availability and sustainability. Moreover, it is also complying with the strength needed to withstand the load present. Aluminium are known with its anti-corrosion. Next, the cover of the mailbox uses acrylic. This material is selected because of its flexibility.

Table: 3.1: Material Selection

No	Materials	Image
1	Hollow Aluminium Bar	
2	Acrylic Sheet	

Table: 3.2: Classification of Components

Components	
Mechanical:	Non-Mechanical:
1. Microcontroller	1. Frame
2. Scanner	2. Parcel Holder
3. Cable	3. Door / Lid
4. Power Supply	

The components that are used in this project was chosen due to their availability and suitable to create an affordable smart mailbox. Table 3.3 below shows component that being used in the project.

Table 3.3: Specification of Components

No	Function	Component Name	Picture
1	Microcontroller	Arduino UNO	
2	Cable	USB Type B	
3	Power Supply	Power bank	
4	Parcel Holder	Canvas Bag	
5	Scanner	Barcode Reader	
6	Apps	No Apps. Use website	-

4. Results and Discussion

4.1 3D Drawing of the prototype

Prototype of Smart Mailbox was drawn using Solidworks software. The height of prototype is 60 cm, the width is 30 cm and the length also 30 cm. This prototype is built to make sure it can function successfully.

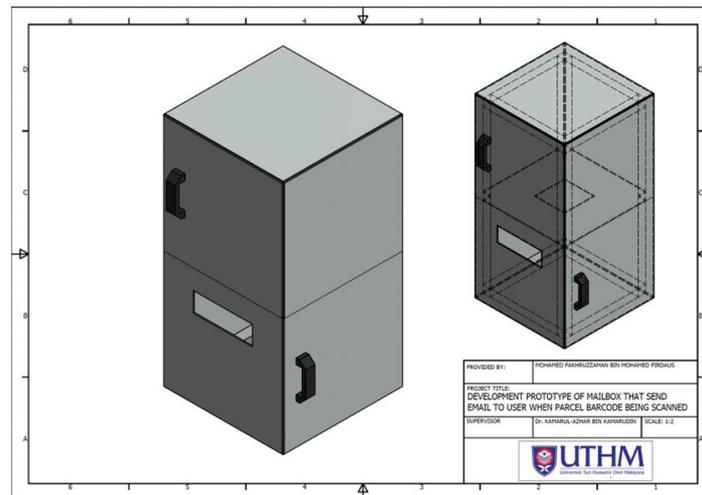


Figure 4.1: 3D Drawing

4.2 Project Circuit

In this circuit, there will be 3 main components which are Arduino as brain of the system, USB host shield as usb reader to connect barcode scanner with Arduino UNO and last one is NodeMcu ESP8266 uses to do data transfer using WIFI protocol. Figure 4.9 below shows how the components connected in a circuit.

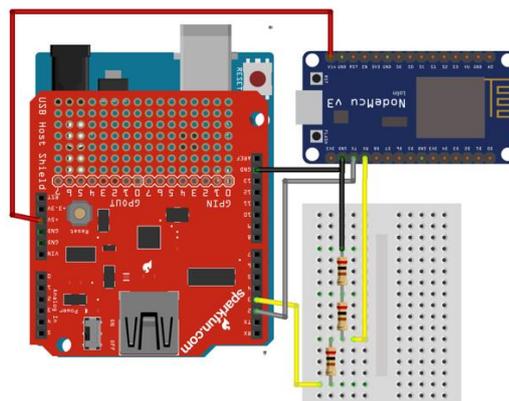


Figure 4.2: Circuit Diagram

4.3 Smart Mailbox Prototype

The project was successfully done when the creation of a prototype that's called "Smart Mailbox" is completed with the help of the project's supervisor. The project used components such as aluminium hollow bar, small door hinge and door holder to complete the product. The whole project costs a total of RM336.08 to prepare the materials and components including the cost of testing the system. The prototype is in a good condition and well functioned to scan the parcel barcode and send email notification to the users.

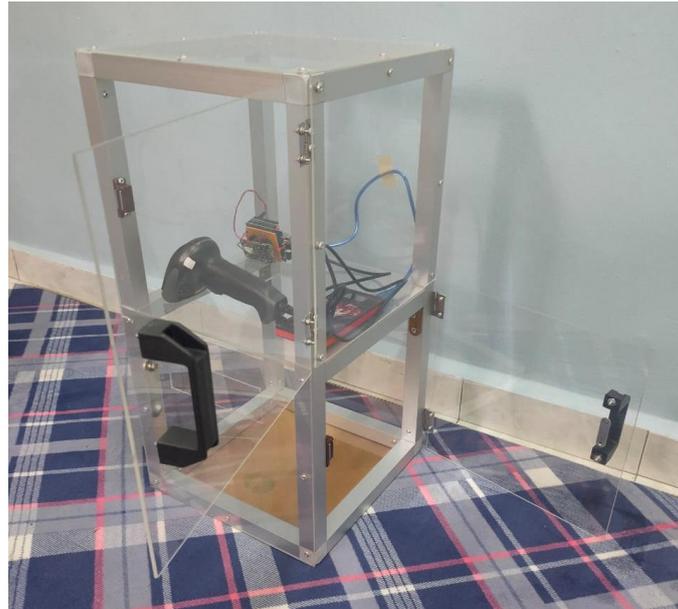


Figure 4.2: Smart Mailbox Prototype

4.4 Result

The project achieved the objective by proving the smart mailbox's system can scan the barcode and send email notification to the email that been fill on the website provided. Besides that, the project also achieved the second objective which is to fabricate a prototype of smart mailbox.

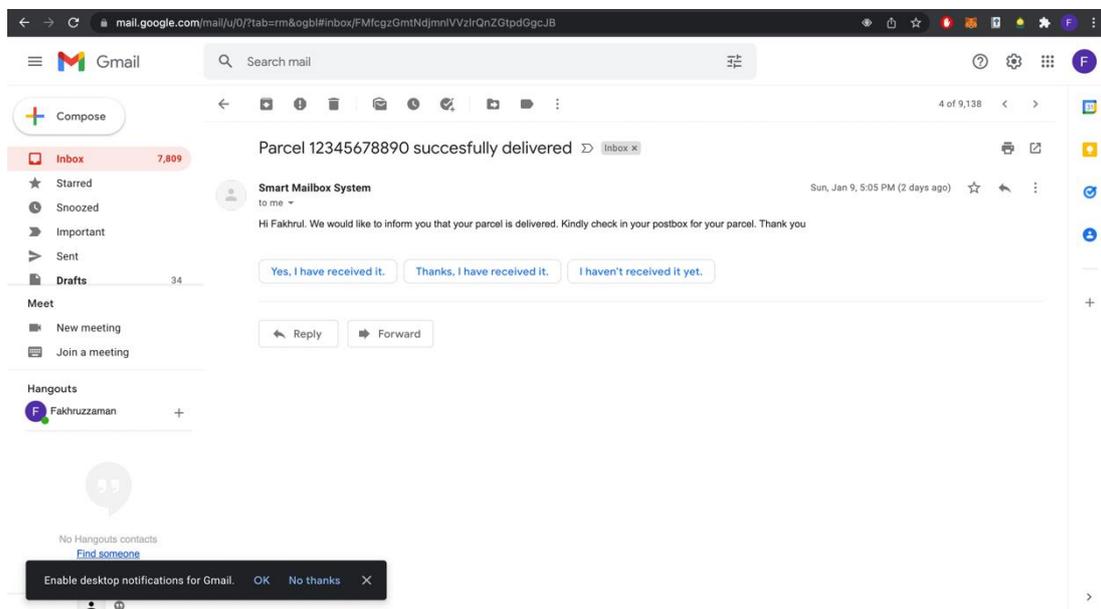


Figure: 4.4: Email sent by the Smart Mailbox's system to the user

5. Conclusion

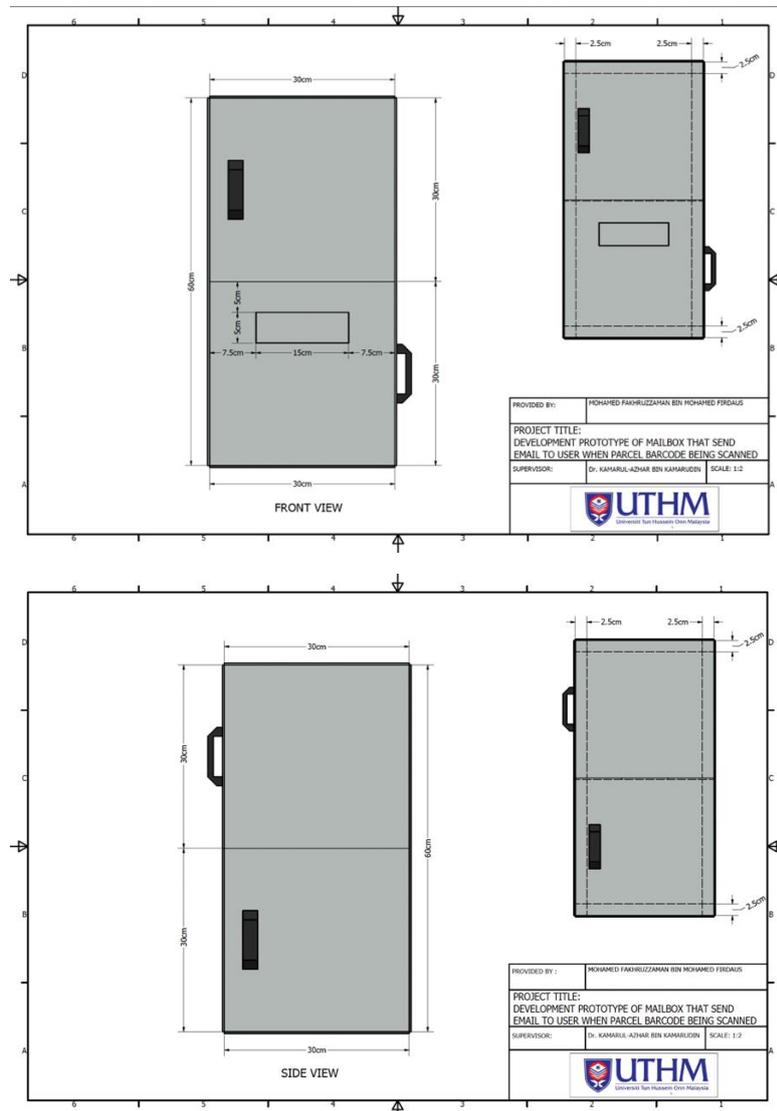
As a conclusion, the project of the smart mailbox that was done during the 14 weeks that given was a success knowing that the objectives were reached even though some failures were encountered along the way. Designing and developing a new system of mailbox was executed successfully. Also, the most important thing is, it functions very well in terms of scanning the barcode and sending notification to

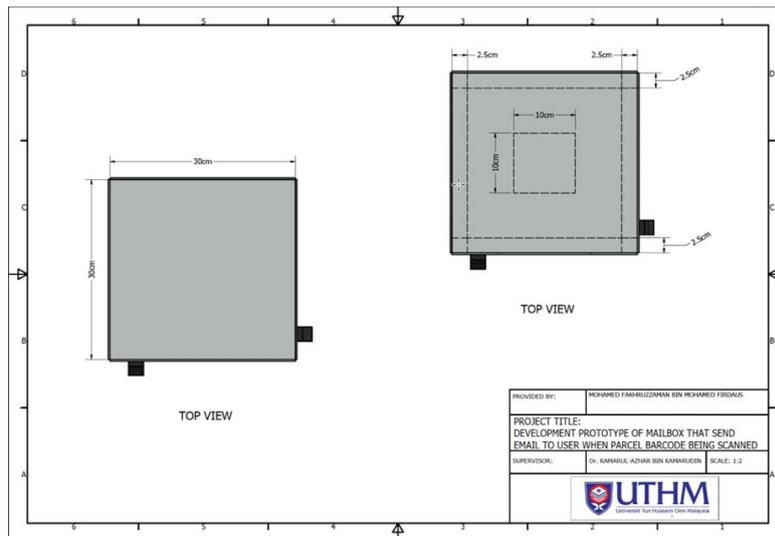
the user email. Other than that, the expenses of the project considering everything including Arduino Uno, aluminium hollow bar, acrylic, fabrication, coding and everything else was about RM336.08. The price is quite reasonable considering the material used and fabrication cost.

Acknowledgement

This research was made possible by supports from the family, supervisor and friends. The authors would also like to thank the Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia for its support.

Appendix A





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