

Project Proposal (Adam Newman)

by Adam Newman

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Assignment

BEng / HND Electrical & Electronic Engineering

BEng Embedded Electronic Systems

Research Proposal

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Submission date: 28/10/2024

Contents

1. Introduction 4

1.1 Overview 4

1.2 Purpose of the Project..... 4

2. Background and Literature Review 5

2.1 Existing designs 5

2.2 Summary of the Design..... 7

2.3 Requirements 7

2.4 Ethics Report..... 7

3. Project Design..... 8

3.1 Development Method 8

3.2 Design 8

3.3 Data Collection 9

3.4 Ethical Implementation 10

3.5 Project Impact 10

3.6 Analyses..... 10

4 Resources 11

4.1 Resources required.....11

5 GANTT Chart 12

6 References..... 13

Table of Tables

Table 1 - Literature Review on current Designs and Components..... 6

Table 2 - Component List 9

Table 3 - Data Analyses 10

Table of Figures

Figure 1 - GANTT Chart..... 12

List of Acronyms

COTS	Commercial Off the Shelf
CSM	Common Safety Method
DC	Direct Current
LED	Light Emitting Diode
MISSU	Mountable Interactive Safety Storage Unit
PCB	Printed Circuit Board
PIC	Programmable Interface Controllers
UK	United Kingdom
V&V	Verification and Validation

References

Document	Ref.
Ethics Form	1
GANTT Chart	2

Working Title:

Design and implementation of a mountable interactive safety storage unit for delivery of domestic parcels.

1. Introduction

1.1 Overview

- 1.1.1 This is a proposal document which focuses and highlights the build of a safety storage unit for delivery of domestic parcels. The purpose of this product is to prevent households from missing parcels and speed up the process of delivery. The physical design of the MISSU will be designed with the use of a DC power supply, PIC Microcontroller, Keypad, LED's and an electronic locking mechanism.

1.2 Purpose of the Project

- 1.2.1 With 96 million parcels being delivered every week on average within the UK [1]. According to consumer research conducted by GOPHR [2], from a group of 3000 people they found that 66% of UK adults miss a delivery at least once a month.
- 1.2.2 This is an issue for both sides of the process, those delivering and those receiving the parcel. At inconvenient times throughout the day a task may occur that requires those receiving the parcel to leave the house – resulting in a failed delivery.
- 1.2.3 The delivery company then needs to reprocess this delivery to another day to which may be an inconvenience again to the receiver. Depending on which courier is in use will depend on the method of redelivering. However, missed deliveries still require space in transport and storage for redelivery. Where costs to facilitate this could significantly be reduced. These missing merchandises cost customers roughly £320 million, with Wales being the most affected within the UK.[4]
- 1.2.4 This product proposes to eradicate miss parcels for those who use the MISSU. The MISSU will provide a removable unit that is securely mounted to the external walls of a domestic building. With a changeable keypad access method for those who are provided the combination.
- 1.2.5 The projects' goal is to successfully design, create, test the MISSU to finally interact with the courier service to analyse the success and potential improvements required. Providing a smooth, stress-free delivery to the receiver and potential profit gains to the courier service.
- 1.2.6 The project is to follow the populated GANTT [Ref 2] chart listing the schedule of deliverable for the products design cycle from early stages of development to final testing of the development within the given deadline of June. These deliverables will contain 6 main overall deadlines: Project Proposal, Interim Viva, Final Report, Final Viva, Poster and Questionnaire.

2. Background and Literature Review

2.1 Existing designs

2.1.1 There are existing designs within the field for a parcel box. However, none that are electronic and removable have struck the market successfully. The solely mechanical design tends to be more popular for the American audience. Which has seen 17% of Americans have had their parcels stolen within a 3-month period, totalling \$8 billion in parcels stolen within 2023 [3].

2.1.2 For the UK citizens between the year of 2021-2022 this number was around 8 million parcels being lost or stolen. This has seen the largest increase of stolen parcels of 5% compared to previous years, with the Welsh being the most affected [4].

Table 1 - Literature Review on current Designs and Components

Literature Review on Current Designs and Components		
Literature review sources	Description:	Relevance:
[5] Buy INMOZATA Wall Mounted Parcel Box Outdoor Weatherproof Delivery Box Smart Parcel Drop Box for Secure Multiple Large Delivery Packets & Mails Receiving (Beige) Online at desertcart Bermuda	Current design of a parcel box available. This is a mechanical design with no electronic features. Using a hatch that allows you to insert parcel and removed using a key.	This is a similar concept to the proposed design of the MISSU but not an electronic version. This is a fixed mounted unit and will take time to be removed.
[6] Alibaba.com	Current design of a parcel box available. This is a mechanical design with no electronic features. Using a hatch that allows you to insert parcel and removed using a key.	This is a similar concept to the proposed design of the MISSU but not an electronic version. This is a fixed mounted unit and will take time to be removed.
[7] 5 Keypad Access Control Security Systems: Buyer's Guide (butterflymx.com)	This is a website found on the internet comparing different types of keypads available.	As the product will be using keypads. This is relevant to see what variety of keypads are available for the product design.
[8] Digital Keypad Security Door Lock using Arduino (circuitdigest.com)	For the purpose of relevant designs. The MISSU will consider similar design as seen in the link provided. As the MISSU is a new product to the market but uses the same principle of that of a safe [8].	The MISSU will use a similar design to that of a safe. Using a microcontroller as appose to an Arduino. Access to the parcel for insert and removal will use the keypad for a keypad match.
[9] Designing An MCU Based Electronic Safe Locker (electronicsforu.com)	For the purpose of relevant designs. The MISSU will consider similar design as seen in the link provided. As the MISSU is a new product to the market but uses the same principle of that of a safe [8].	The MISSU will use a similar design to that of a safe. Using a microcontroller similar to the safe found in the link [9]. Access to the parcel for insert and removal will use the keypad for a keypad match.

2.2 Summary of the Background

- 2.2.1 No current product exists on the market for this design and will allow users to minimise the risk of missing, damaged or stolen parcel. Reducing the overall number of those affected by this issue. However, the flaw here would be exposed brackets on the external wall of a domestic building which may find some households unable to store the unit due to terrace build houses. Exposed brackets could cause obstruction to civilians walking by.

2.3 Requirements

- 2.3.1 The product will follow a set of requirements to successfully deliver the scope of work quoted.
- 2.3.2 The set of requirements will be delivered in a separate document providing functional and non-functional requirements for production and delivery of the MISSU.
- 2.3.3 Requirements will consider but not limited to the use of batteries used within confined spaces and time periods, variety of parcel dimensions, potential contingencies for power failure of the unit, safety of the user, electrical function and safety testing.

2.4 Ethics Report

- 2.4.1 Components used, to be that of an ethical consideration. Considering material, production, environment, product use/purpose, product life span when considering components and material.
- 2.4.2 Project shall follow the statement of Ethical Principles, published by the engineering council and the royal academy of engineering [10].
- 2.4.3 Product to follow all relevant standards of that of an electrical safety [11] and mechanical nature where applicable.
- 2.4.4 An Ethics Form [Ref 1] is completed in preparation of the project.

3. Project Design

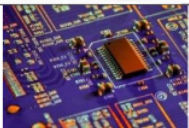
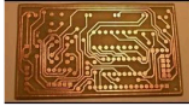
3.1 Development Method

- 3.1.1 The development methods used to support MISSU through design cycle is the waterfall methodology through a V&V lifecycle.
- 3.1.2 The waterfall methodology will require each phase of the products lifecycle to be cascaded sequentially through each design stage. This method is appropriate to the design due to it being produced by an individual within minimum stages to track in parallel to each other. Where one stage is complete, the other will commence. Allowing for a simple method of tracking all deliverable with high success rate.
- 3.1.3 Design Stages consisting of the following deliverables but not limited to:
- Requirements
 - Design implementation
 - Verification
 - Testing
- 3.1.4 Further development methods would be use of the Kanban system. Where a set of deliverables follow stages of – to do, in progress and complete.
- 3.1.5 This method is useful to the project as it allows for further understanding of each phase status from start to completion. Keeping the engineer accountable for the products deliverables to deadlines.
- 3.1.6 The Kanban method will clearly identify risks to the project's timescale in accordance with the deadline of completion.
- 3.1.7 No development software apart from Microsoft Office will be required for the project as the budget does not allow for this. Nor is it necessary for the use of a small project at a minor design stage.

3.2 Design

- 3.2.1 The design of the product will require COTS components from trusted providers.
- 3.2.2 During the design, a complete evaluation of applicable components will be conducted to ensure ethical, quality, applicability and within budget components are selected.
- 3.2.3 Component selection is listed but not limited to table... selection may change during design and evaluation.
- 3.2.4 Evaluation will be conducted using a feasibility study and material CSM.

Table 2 - Component List

Component selection		
Image	Component	Description/Reason
	Keypad	Used for user to provide correct combination, activating the lock system, allowing access to the storage unit.
	Motors	To activate the locking mechanism for the mounting bracket and lid.
	Cables	To allow for a conductive path for the electrical/electronic circuit.
	PIC Microcontroller	Programmed to carry out the tasks that are written and installed onto it. Supporting the functional design of the circuit.
	Storage box	Storage area for parcels.
	PCB board	Support assembly of electronic components and connections.
	Electronic Components	To support electronic design.
	Battery Pack	Rechargeable battery pack to provide power to the unit.

3.3 Data Collection

3.3.1 Data Collection and methods would be carried out during the project design. These methods are but not limited to, questionnaires, research, test results and the qualitative and quantitative method.

3.4 Ethical Implementation

- 3.4.1 To support the ethical implementation of the project, an ethical form [Ref 1] will be submitted.

3.5 Project Impact

- 3.5.1 The impact of the MISSU will of a positive affect on society as it looks to eradicate the issue of stole/lost and missed parcels.
- 3.5.2 MISSU will have a positive effect on the delivery companies' efficiency and profit spent on redelivering and storing missed parcels.
- 3.5.3 MISSU will also have a positive effect on suppliers' profit from potential refund of goods.
- 3.5.4 MISSU will contribute to the environment due to fuel consumption and greenhouse gasses as the effort to transport missed parcels will be diminished.

3.6 Analyses

- 3.6.1 Analyses reports will be conducted on but not limited to – table 3

Table 3 - Data Analyses

Analyses of data	
Questionnaire	Questionnaire will be submitted to the public using a questionnaire site. Answers will be provided in statistical format where applicable. This will be supported with a descriptive analysis summarising the data. The use of charts will support data collected.
Feasibility Study	The use of a feasibility study will show if the project is within budget and appropriate for its purpose.
Testing	Functional and non-functional test report will be conducted and provided through a PTS and PTR.

4 Resources

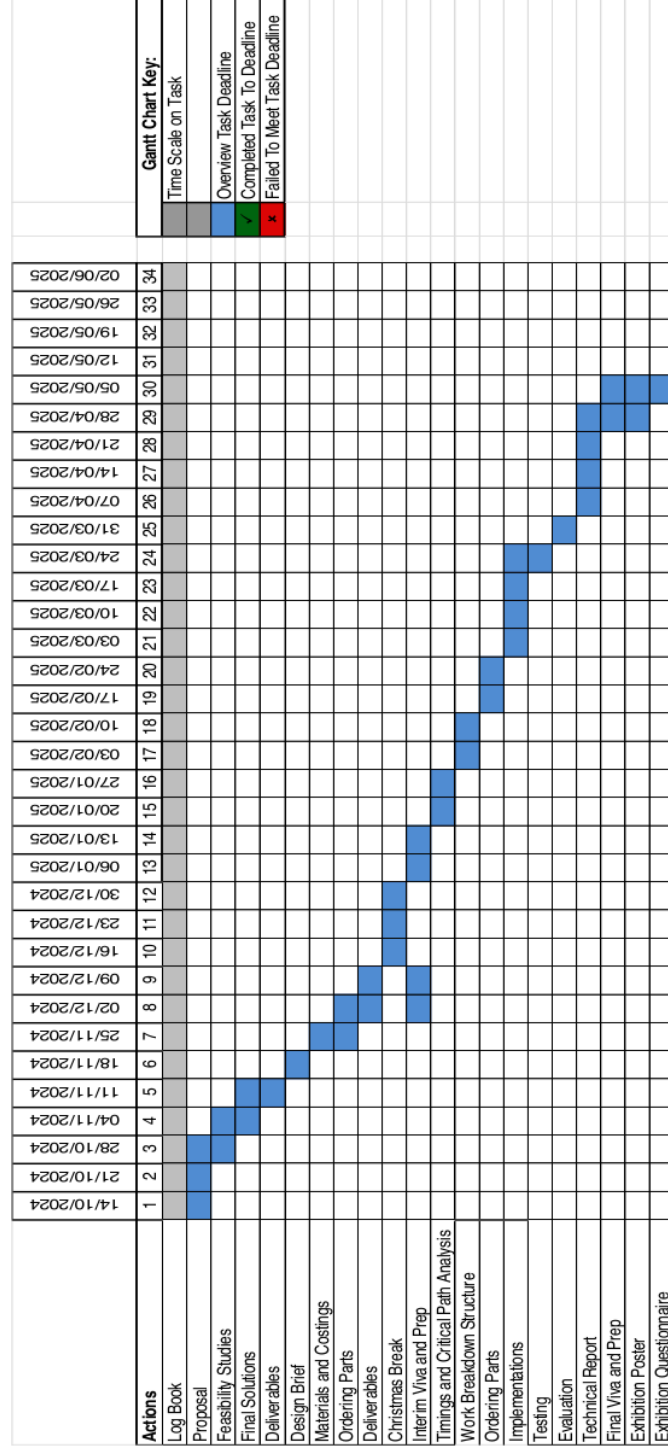
4.1 Resources required

4.1.1 Resources required throughout the project are but not limited to – listed within table 4.

Table 4 - Resources Required

Resources Required	
Microsoft Office	To carry out documentation to support delivery of deliverables.
Proteus	Simulate circuit design.
Easy PC	Produce PCB design.
Internet Access	Carry out research and purchase of items.
Hand Tools and Electrical Tools	Manufacture the circuit design and unit.
UWTSD Tutors	Guidance and Support

5 GANTT Chart – Subject to Change



6 References

- [1] Shiply. UK Delivery and Courier Industry Statistics. [Online] available from: [UK Delivery And Courier Industry Statistics - Shiply](#) Accessed on 25/10/2024.
- [2] GOPHR. How many people still miss deliveries despite working from home?. [Online] available from: [Working at Home: How Many Deliveries Are Missed? | Gophr](#) Accessed on 25/10/2024.
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- [4] INDEPENDENT. UK sees 'largest increase' in lost or stolen parcels as 8m go missing in one year. [Online] available from: [UK sees largest increase in lost or stolen parcels as 8m go missing in one year | The Independent](#) Accessed on 25/10/2024.
- [5] DC. Wall Mounted Parcel. [Online] available from: [Buy INMOZATA Wall Mounted Parcel Box Outdoor Weatherproof Delivery Box Smart Parcel Drop Box for Secure Multiple Large Delivery Packets & Mails Receiving \(Beige\) Online at desertcart Bermuda](#) Accessed on 25/10/2024.
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- [8] Circuit Digest. Digital Keypad Security Door Lock using Arduino. [Online] available from: [Digital Keypad Security Door Lock using Arduino \(circuitdigest.com\)](#) Accessed on 25/10/2024.
- [9] Electronicsforu. Designing An MCU Based Electronic Safe Locker. [Online] available from: [Designing An MCU Based Electronic Safe Locker \(electronicsforu.com\)](#) Accessed on 25/10/2024.
- [10] Engineering Council. Statement of Ethical Principle. [Online] available from: <https://www.engc.org.uk/standards-guidance/guidance/statement-of-ethical-principles/> Accessed on 25/10/2024
- [11] Health and Safety Executive. Electrical Safety. [Online] available from: [Electrical safety - HSE](#) Accessed on 25/10/2024.

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

71 /100

PROJECT PROPOSAL - ACCA6020 INDEPENDENT PROJECT

Student Adam Newman

Mark

71%

Intro / A&O (400 words)		
A very good general introduction to the problem.	20	70
Background to the Project / Literature Review (400 words)		

A good level of reference sources cited with a detailed description and justification for the project	20	72
Project Design (500 words)		
Clear statement of which development methods are to be used and why they are appropriate; Clear statement of which tools are to be used and why they are appropriate; Clear description of how data collected will be analysed Very clear detail of general intent and what tools to use.	30	70
Resources / Planning (200 words)		
List of any deliverables; Clear diagram showing both timing and resource use; Completed ethics form; Limited and relevant appendices	15	70

Good detail in the Gantt chart		
Document Presentation		
Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit Generally well written and presented. However don't use that particular style of layout for the major project – make sure you read the major project guide.	15	72
TOTAL	100	71%

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13
