UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF BALLOT BIN TO REDUCE CIGARETTE BUTTS WASTAGE

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in fulfillment of the requirements for the degree of
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DECLARATION

I declare that this choice an item entitled “Development of Ballot Bin To Reduce Cigarette Butts Wastage” is the result of my own research except as cited in the references.

Signature : 

Name : AIZUDDIN HUSAINI BIN BAHAREN

Date : 28/1/2022

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours.

Signature : .....

Supervisor Name : MAHANUM BINTI MOHD ZAMBERI

Date : 28/1/2022

DEDICATION

For this project, I sincerely dedicated to my parents, Baharen Bin Idrus and Jawariah Binti A. Ghani, my supervisor, Mahanum Binti Mohd Zamberi, and my colleagues, Nik Muhammad Amin Bin Nik Amran, and Tuan Ismail Bin Tuan Zakaria for their guidance and encouragement to complete this project. Wtihout them I would never have completed this work.

ABSTRACT

Cigarette butts are the most frequent kind of litter, as an estimated 4.5 trillion worldwide cigarette butts are thrown away. There are many types of chemicals that are involved in making cigarettes including substances that can be harmful to health and can also pollute the environment. Uncontrolled disposal of cigarette butts can cause a serious impact on the environment such as open burning and can also threaten marine life. The main objective of this project is to create alternative cigarette ash containers for the public environment to reduce cigarette butts littering behaviour in effective and efficient. Several proposed prototypes were planned during the research period. Autodesk Inventor, Computer-Aided Design (CAD) software, an online survey questionnaire to obtain feedback from the society on the features and functions of the Ballot Bin, as well as the Arduino system were the methodologies used to make the prototype. To build this prototype, several phases were required to ensure the prototype development process was done smoothly and systematic in order to optimize the time and cost. To ensure that this Ballot Bin has the potential to reduce cigarette butts littered in the public area, social activities were conducted for 4 weeks by placing the Ballot Bin in public area to collect the number of smokers that used Ballot Bin daily for 5 days in a week. At the end of the study, by placing this Ballot Bin, cigarette disposal in public areas was reduced by 47% based on the involvement of the smokers and the weight of collected cigarette buts. After several analysis and discussions regarding the parameters that were determined to achieve the objectives of this device, the invention of the Ballot Bin and social activities held were confirmed as one of the solutions that can contribute to the reduction of cigarette butts wastage.

ABSTRAK

Puntung rokok merupakan sampah yang paling kerap dibuang. Sejumlah 4.5 trilion puntung rokok di seluruh dunia dibuang. Terdapat banyak jenis bahan kimia yang terlibat dalam pembuatan rokok termasuk bahan yang boleh membahayakan kesihatan dan juga boleh mencemarkan alam sekitar. Pembuangan puntung rokok yang tidak terkawal boleh menyebabkan kesan serius terhadap alam sekitar seperti pembakaran terbuka dan juga boleh mengancam kehidupan laut. Objektif utama projek ini adalah untuk mewujudkan bekas abu rokok alternatif untuk persekitaran awam untuk mengurangkan tabiat membuang sampah dengan cara yang berkesan dan cekap. Beberapa prototaip yang dicadangkan dirancang semasa tempoh penyelidikan. Autodesk Inventor, perisian Computer-Aided Design (CAD), soal selidik tinjauan dalam talian untuk mendapatkan tindak balas dari masyarakat umum tentang ciri-ciri dan fungi Ballot Bin, serta sistem Arduino adalah metodologi yang digunakan yang digunakan untuk membuat prototaip. Untuk membina prototaip ini, beberapa fasa diperlukan untuk memastikan proses pembuatan protoaip dihasilkan dengan baik dan sistematik supaya memerlukan masa dan kos yang diperlukan adalah minimum. Untuk memastikan bahawa Ballot Bin ini berpotensi untuk mengurangkan pembuangan putung rokok dia kawasan awam, aktiviti sosial telah dijalankan selama 4 minggu dengan meletakkan Ballot Bin di kawasan awam untuk bagi mengumpul jumlah penggunaan Ballot Bin secara harian selama 5 hari dalam satu minggu. Pada akhir kajian, dengan meletakkan Ballot Bin ini, pembuangan putung rokok di kawasan awam telah dapat dikurangkan sebanyak 47% berdasarkan penglibatan parap perokok dan berat kutipan putung rokok. Selepas beberapa analisis dan perbincangan mengenai parameter yang ditentukan untuk mencapai objektif peranti ini, penciptaan Ballot Bin dan aktiviti sosial yang diadakan telah dipastikan sebagai salah satu penyelesaian yang boleh menyumbang kepada pengurangan pembuangan puntung rokok.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

%	-	Percentage
CAD	-	Computer-Aided Design
IoT	-	Internet of Things
UTeM	-	Universiti Teknikal Malaysia Melaka
UIGM	-	Universitas Indonesia Green Metric World Ranking
SDG	-	Sustainable Developement Goals
HoQ	-	House of Quality
PBA	-	Portable Beach Ashtray
USB	-	Universal Serial Bus
LCD	-	Liquid Crystal Display
SD	-	Secure Digital
GPS	-	Global Positioning System

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

Smoking has been a common habit nowadays. with smokers generally ranging in age from young to old generation. Smoking, in addition to harming the environment, poses a significant chance of causing harm to people. Cigarette smoke contains harmful chemicals that can degrade air quality. Not only that, cigarette butt could cause environmental pollution if it is not disposed of in the right way.

After the invention of the cigarette in the 9th Century, the cigarette has become one of the most demanding products all over the world. Statistics say that 6.5 trillion cigarettes are sold each year (National Geographic, August 2019). The significant demand for a cigarette from the consumer making the manufacturers consistently producing cigarettes. Therefore, in this modern era, a design that can change human behavior regarding littering can become very helpful to the community.

Littering is one of that behavior that could cause damage to both human civilizations and environments. Cigarette littering, specifically, can be categorized as hardly disposable materials since cigarette butts are made of plastics materials. Because of that, cigarette littering could cause environmental issues, affecting the earth's ecosystem, health level, and increment of cleaning costs (Rath et al., 2012). Yet, littering is remaining as a common attitude that can be seen in public places.

The design implementation to make trash bins and ashtray can affect that cigarette littering behavior. According to Montazeri et al., (2015), choosing the green color can be

efficient for recycling. In the study, 88% of participants utilized the recycling bin when it was green, whereas just 52% utilized it when it was grey.

To build a design that can be durable for a long time, especially in conditions exposed to sunlight, ultraviolet and high humidity conditions are at risk of damaging the body structure of the design. While in the planning process, the selection of suitable materials plays a very important role. Material selection must be based on mechanical properties such as strength, malleability as well as the ability to withstand corrosion. By taking into account these aspects, the selection of suitable materials can be done well. The wrong choice of material can reduce the lifespan of the design.

The objective of this project is to present an alternative ashtray for the outdoor environment, where cigarette littering behavior commonly happens. Specifically, the new design of the ashtray aims to change the behavior of cigarette littering, encourage smokers to dispose of the cigarette butts into the ashtray that is provided. To make this happens, the ashtray is designed. By judging from this point of view, this alternative gives a great advantage to change the perspective of people where the design aims to give sustainable actions to overcome the cigarette littering issue.

1.2 Problem statement

For time being, due to excessive cigarette consumptions in daily life and bad ethics towards disposal of cigarette butts, the world is now facing a major issue regarding hygiene, specifically cigarette butts littering. Furthermore, a single cigarette butt takes about 18 months to 10 years to decompose. The cigarette butts are full of toxins that could damage the living organisms under the ground when they leach into the ground and waterways.

In addition, there were about 4.5 trillion cigarettes discarded worldwide, contributing them to be the most littering item on earth (Slaughter et al., 2011). This happened when the consumers lack the ethics to dispose of cigarette butts into the correct channel. Many ashtrays have been placed at the smoking area, and public areas to reduce the cigarette littering issue. The cleaning cost could be higher since extra cost needs to spend.

This project's key is designing an alternative ashtray to attract smokers to throw cigarette butts into it. By doing this design, subconsciously will reduce cigarette littering and change their behaviour to be more responsible regarding the disposal of cigarette butts. At a certain time, this alternative prototype could help to reduce environmental pollution.

1.3 Research objective

These below are the objectives that were achieved:

a) To design an alternative ashtray using CAD software and fabricate prototype
b) To develop and implement the Internet of Things (IoT) in the alternative ashtray.
c) To attract society's participation in public area regarding cigarette butts disposal program.

1.4 Scope of research

The scope of the study are as follows:

a) To develop a comprehensive overview of the current issue regarding cigarette butt littering.

b) From the comprehensive overview, this study proceeds to create a design by using CAD software (Autodesk Inventor). The parameters involving the dimension, colour, and material selection.

c) To submit an online survey focusing on the design suitability for the alternative ashtray. The survey is determined by the parameter and aesthetic value.

d) To come out with a design using the Internet of Things (IoT) on an alternative ashtray. This scope involving the application of the Arduino system into the design.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

During this current era, research regarding cigarette littering behaviour is made to solve the cigarette butt littering issue. The existing issue could cause a lot of damage to the environment and ethics, resulting in a bad habit lifestyle for future generations. With more exposure towards solving this issue, several ways or alternatives had been done. There are a lot of prototypes were produced, involving varieties of aspects that have been gathered together in terms of engineering and society awareness.

To get a better solution, the researching process on cigarette butt continues. The best way to solve this issue is to come out with a simple design and fabricate a prototype to create attraction and awareness of cigarette butt littering without maximizing the required cost. Figure 2.2 shows the literature review in Ishikawa Fishbone Diagram to create Ballot Bin.

2.2 Environmental impact

Any change to the environment, whether negative or positive, as a result of a facility's actions, products, or services is referred to as an environmental impact. To put it another way, the impact of people's behaviours on the environment. When unstable organic chemicals, for example, are released into the environment, the result is pollution in the form of smoke, which is a bad consequence.

Another activity that could cause damage to the environment is improper waste disposal to water and soil, such as accidental spills of chemicals. By this activity, can leads to ocean acidification that damage the marine ecosystem.

2.2.1 Flammable cigarette substances

Cigarette littering is one of the factors that could cause environmental issues. Thrown cigarette butts that are full of flammable substances, contributing to open burning especially in an open area. Cigarette butts can easily ignite a spark since they are flammable materials when exposed to high temperatures in open areas. Thus, when the cigarette butts are thrown into dry leaves or flammable materials in the field of the estate, it donates to the statistics of open burning. Statistics show that 1443 cases mentioned in Figure 2.1 were recorded since 26 February 2019 that 879 from it was bushes fire, 235 cases from a dumpster fire, 188 cases from garden, and 141 cases were from wildfire (Harian Metro, 28 February 2019).

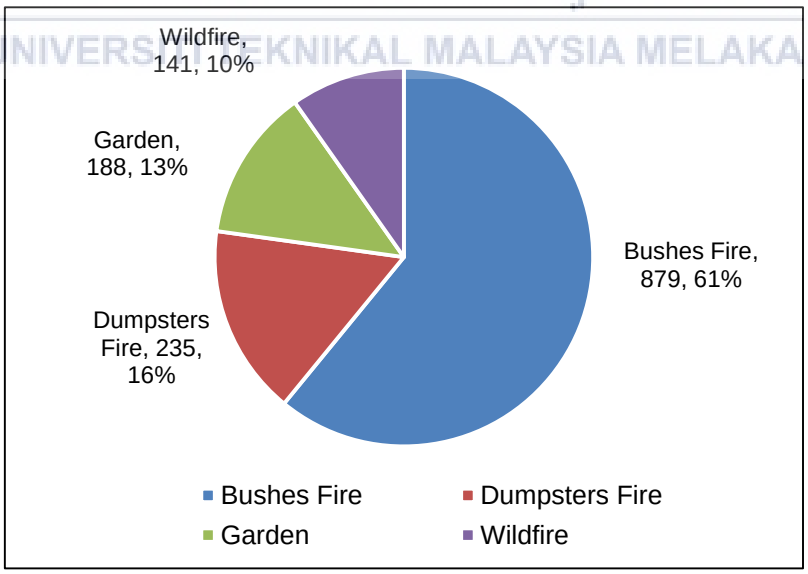

Figure 2.1 Pie Chart of Statistical Data on Open Burning Cases

(Retrieved from Harian Metro, 28 February 2019)

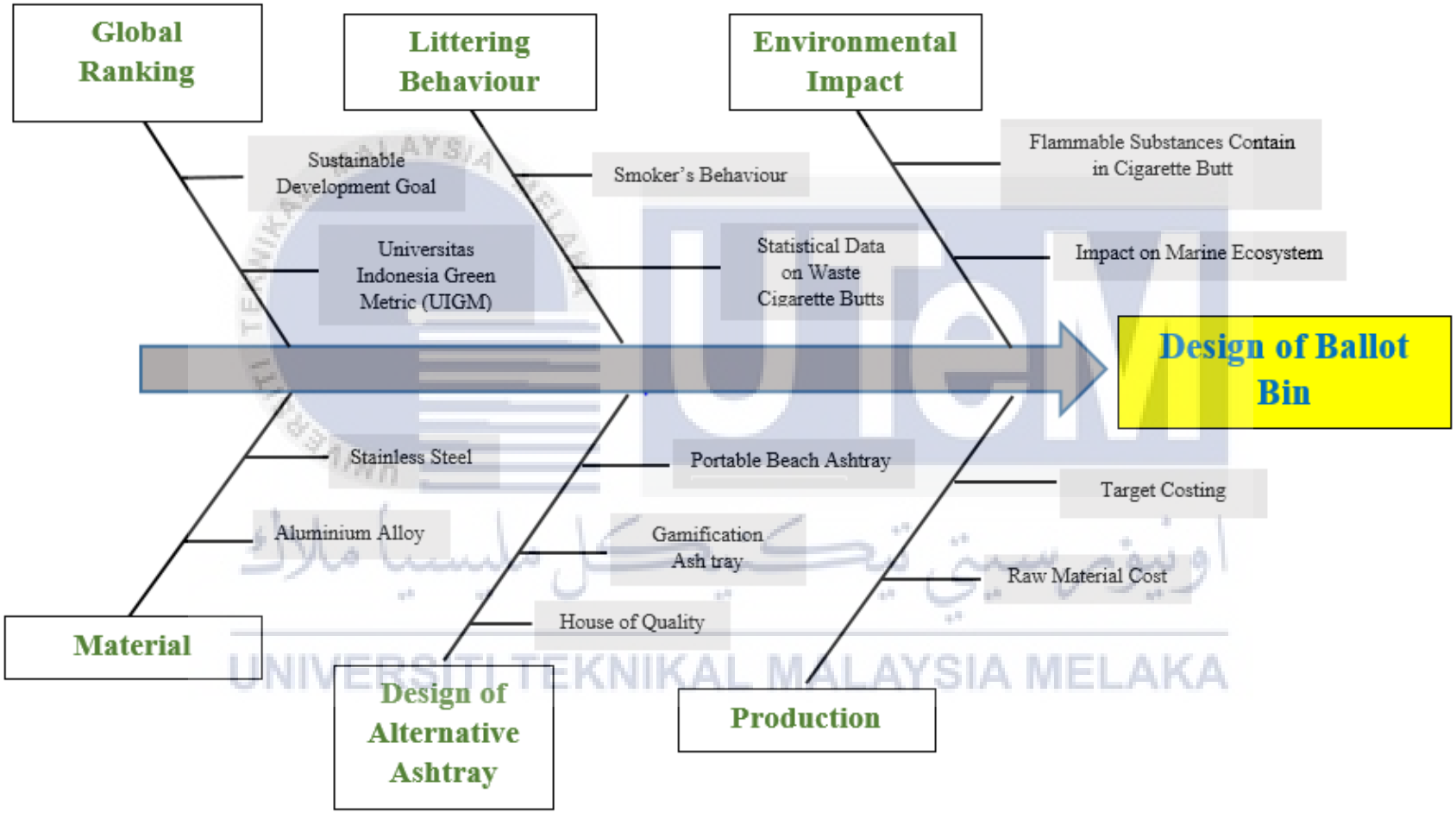

Figure 2.2 Ishikawa Fishbone Diagram of Designing Ballot Bin

2.2.2 Impact on marine ecosystem

The habits of cigarette butts littering by smokers that increasing shows towards the collection of the cigarette butts. Toxic chemicals contained in cigarette butts can cause negative consequences to the marine ecosystem. Many processes, such as ocean acidification and plastic waste dispersion including cigarette butt, are damaging marine ecosystems and putting marine animals in danger (Kungskulniti et al., 2018).

Cigarette butts carried by rain flow into drainage channels and eventually into the oceans, where the chemicals in the cigarette butts may cause a variety of problems for the marine environment, including aquatic flora and wildlife. Toxic heavy metals such as lead, cadmium, and other heavy metals leach from cigarettes and butts, polluting coastal marine habitats (Dobaradaran et al., 2020). According to Wilcox et al., (2016) one of the main contribution to the danger marine lives are of entanglement, ingestion, and chemical pollution .

2.3 Littering behaviour

Littering is an activity or habit of throwing any kind of trash in a small quantity, into random places rather than throwing it into provide places. Because the habit costs authorities in cleaning expenses, it is illegal. It also gives a negative impression of a location. Fast-food packaging, cigarette butts, old drink bottles, chewing gum wrappers, broken electrical equipment components, toys, broken glass, food scraps, and green wastes are among the most often littered items. Littering creates an unpleasant appearance as well as environmental issues. It also reflects a person's carelessness and other careless tendencies when it comes to controlling environmental cleanliness (Qamar et al., 2020).