POLITEKNIK SULTAN HAJI AHMAD SHAH

3R SMART TRASH BIN

NAMA	NO. PENDAFTARAN
SITI NURSOLEHA BINTI SARINGAN	02DKM18F2003
MUHAMMAD FIRDAUS BIN KHAIRUDDIN	02DKM18F2005
MUHAMMAD LUKMAN NUR HAKIM BIN MAZUKI	02DKM18F2027

DEPARTMENT MECHANICAL ENGINEERING

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Mekanikal

DEPARTMENT MECHANICAL ENGINEERING

DIS 2020

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : 3R SMART TRASH BIN (3RSTB)

SESI : DIS 2020

1. Kami, **1. SITI NURSOLEHA BINTI SARINGAN (02DKM18F2003)**
2. MUHAMMAD FIRDAUS BIN KHAIRUDDIN (02DKM18F2005)
3. MUHAMMAD LUKMAN NUR HAKIM BIN MAZUKI (0DKM18F2027)

Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Haji Ahmad Shah**, yang beralamat di **Semambu, 25350 Kuantan, Pahang.** (Selepas ini dirujuk sebagai "Politeknik tersebut')

2. Kami mengakui bahawa 'Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/ reka cipta asli kami tanpa mengambil atau meniru mana-mana harta intelek daripada pihak-pihak lain.

3. Kami bersetuju melepaskan pemilikan harta intelek 'Projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk penganugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui oleh yang tersebut;

a) SITI NURSOLEHA BINTI SARINGAN
(No. Kad Pengenalan:- 000125-01-0262) .……

b) MUHAMMAD FIRDAUS BIN KHAIRUDDIN
(No. Kad Pengenalan:- 001112-06-0425) …….……

c) MUHAMMAD LUKMAN NUR HAKIM BIN MAZUKI
(No. Kad Pengenalan:- 000423-01-1087) ……

Di hadapan saya,EN. MOHD NAIM BIN MARZUKI (841121-02-5391) ……

Sebagai penyelia projek pada tarikh: ……

ACKNOWLEDGEMENT

Grateful to the Divine presence and blessings on our great patron Prophet Muhammad SAW, we were able to complete the final project with excellence within the stipulated period of two semesters without facing any difficult problems as a condition for the awarding of the Diploma in Mechanical Engineering for the Dec 2020 session. say to all parties involved directly or indirectly especially our supervisor EN. MOHD NAIM BIN MARZUKI who has given us a lot of guidance, advice, encouragement and constructive criticism so that we managed to complete this final project report. Not forgetting also to friends and family members who helped a lot in terms of views and finances in completing this final assignment. With this we are grateful to Allah SWT then complete this final project. We hope that this report can serve as a guiding example to the relevant parties in the future.

Finally, we would also like to thank the management of Sultan Haji Ahmad Shah Polytechnic, thank you for providing all the facilities such as the use of laboratories and equipment.

ABSTRAK

Projek ini diterapkan dari pemerhatian berdasarkan 3R (Reduce, Reuse, Recycle). Oleh itu, muncul idea untuk merancang tong sampah bertemakan 3R yang dapat membantu memupuk minat masyarakat dalam menjaga kebersihan setempat. Selanjutnya, terdapat beberapa ruang kajian yang telah ditetapkan dalam projek ini adalah merancang tong sampah moden dengan penggunaan sensor. Seterusnya, projek ini diinovasikan khas untuk kertas hanya kerana kertas adalah bahan yang selalu digunakan di pejabat. Tong sampah yang digunakan dalam projek ini mestilah berkebolehan untuk menyimpan kertas bersaiz A4. Penyelidikan metodologi digunakan untuk merancang proses pengeluaran projek dengan menggunakan carta alir sebagai panduan untuk perancangan, pengeluaran dan pengujian projek. Hasilnya, keseluruhan projek berjaya dihasilkan pada kadar rata-rata lebih terjamin untuk memudahkan proses mengumpulkan kertas sebelum dikumpulkan untuk dikitar semula. Berdasarkan hasil ini, hasil analisis dan perbincangan yang telah dilakukan dapat disimpulkan bahawa 3R SMART TRASH BIN (3RSTB) dapat memudahkan proses pengumpulan kertas dengan lebih kemas dan teratur serta dapat meningkatkan disiplin diri dari segi kebersihan kepada penggunanya.

ABSTRACT

The project is applied from observations based on 3Rs (Reduce, Reuse, Recycle). Therefore, the idea arose to find a 3R -themed trash bin that can help cultivate community interest in keeping the place clean. Further, some of the study spaces that have been identified in this project are modern barrel barrels with the use of sensors. Next, the project was innovated specifically for paper simply because paper is a material that is often used in the office. The bins used in this project must be capable of storing A4 size paper. Methodological research is applied to the project production process by using flow charts as a guide for project planning, production and testing. As a result, the entire project is produced at a more secure average rate for the paper processing before being collected for recycling. The results of this search, the results of analysis and discussion that have been done can be concluded that 3R SMART TRASH BIN (3RSTB) can use the paper collection process more neatly and orderly and can improve self -discipline in terms of hygiene to its users.

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SYMBOL LIST

SYMBOL	
v	Volt
L	Litre
MHz	Megahertz
mA	Miliamp

ACRONYM LIST

3RSTB	3R Smart Trash Bin
LED	Light Emitting-Diode
CAD	Computer Aided Design
PIR	Passive Infrared
I/O	Input and Output
DC	Direct Current
SMPS	Switched-Mode Power Supply
USB	Universal Seriel Bus
PSU	Power Supply
DRAM	Dynamic Random Access Memory
CPU	Central Processing Unit

CHAPTER 1
INTRODUCTION

1.1 PROBLEM IDENTIFICATION

Rubbish (municipal solid waste) considered as a useless substance and does not bring any benefits but can even be harmful if stored. Thus, often the waste is disposed of and piled up in landfills either using proper disposal techniques or vice versa. Garbage can be categorized into two, namely domestic waste and non-domestic waste (Ridwan Lubis, 1994). Domestic waste is waste products disposed of from the home or kitchen. Such as bottles, glasses, beverage cans, plastic bags and even food waste. Non-domestic waste is waste products generated from industry, construction sites, market, and offices. These materials consist of various types including sales waste, waste disposal and waste from the manufacturing process. In Malaysia, people often throw garbage no matter where, as-long-as there is a chance. As a result, we can see everywhere there is garbage no matter at home, office, shop, roadside and in the river. This is because of the irresponsible attitude of some people who like to throw garbage everywhere. So, all parties must work together to overcome the problem of garbage disposal. Cooperation from various parties is greatly appreciated in overcoming this problem to the grassroots.

1.2 BACKGROUND RESEARCH

He said action and responsibility should be taken by everyone towards reducing waste generation every day because the cost incurred by the government for waste management is very high. For example, the cost of waste management for seven states under the management of SWCorp, namely the Federal Territory of Putrajaya and Kuala Lumpur, Johor, Malacca, Negeri Sembilan, Pahang, Kedah, and Perlis reach RM2 billion every year.

Dr. Mohd Pauze Mohamad Taha,
Deputy (SWcorp).

1.3 PROBLEM STATEMENTS

- Based on a report from the chief auditor of POLISAS, Mr. Mohd Naim informed that innovation is important if it has an impact on management or systems and can improve the quality of the environment.

- The 3R bins in the office are too small for A4 size paper storage.

- The existing 3R bins are less attractive and not equipped with modern technological features.

- Based on the MRC auditor's report, Polisas needs to produce more innovations that contribute to 3R (Reuse, Reduce and Recycle) activities.

1.4 OBJECTIVE

The objective of the study was to:

- Innovate 3R bins with a modern concept and with new features and functions.

- Fabricate the 3R trash bin by applying the installation of automatic sensors to measure the trash when full, sensors to open and close the trash bin lid and produce audio after the trash is filled into the trash bin.

- Test in terms of capacity the number of A4 papers that can be filled into the bin.

1.5 RESEARCH QUESTIONS

The research question is basically a specific question that the Researcher wants to answer based on the objectives of the study. It should be written in the form of a question. If the research question involves hypothesis testing (for example making

comparisons, Determining the existence of relationships, making predictions and so on), such hypotheses need to be stated.

The research questions are as follows:

Question

Why are we required to isolate solid waste at home?

Answer

- The government will make it compulsory to segregate solid waste at home from September 1, 2015. The implementation of this matter is based on the Regulations under the Solid Waste Management and Public Cleansing Act 2007 (Akta 672).
- Through the application and cultivation of 3R practices and the segregation of household solid waste it is hoped that the community will appreciate solid waste as a new source that can be used as an alternative to the source of natural raw materials in the manufacture of a product. This will indirectly ensure that natural resources are managed wisely and sustainably for the benefit of future generations and the environment.

1.6 SCOPE OF THE RESEARCH

- The height of the 3R bins will hold a total of 6 ½ paper rims which is 3250 pieces at a time.

- The maximum thickness that can be inserted of A4 paper is only 25 pieces at a time. These bins are produced for A4 size paper storage only.

1.7 THE IMPORTANCE OF THE STUDY

The importance of the study is also referred to as the significance of the study to briefly describe the importance or value and contribution / implications of the study conducted. By adopting 3R (reducing, reuse and recycling), we can avoid wasting the world's resources. Loss of resources is ultimately called "limited resources".

For example, the amount of oil is limited from which we can make plastic and aluminum ore to make beverage cans. By practicing 3R we can save limited resources in the future as well as reduce the amount of waste with the following tips.

1. **Reduce** - Reduction

   Just buy what you need:

   Reduce unnecessary purchases. Do not buy items that are rarely used. Buy locally made items.

2. **Buy reusable products***:*

   Buy items in bottles (glass) and rechargeable batteries.

3. **Buy a versatile cleaner:**

   This reduces the purchase of various types of detergents for each use.

4. **Buy less packaged items:**

   Less packaging will reduce waste disposal. Support paper packaging.

5. **Sell or donate unused items (in good condition)**:

   Do not store, disposes, or burn unused items.

6. **Buy non-toxic products:**

   Most toxic products such as engine oils, polishes, paint and pesticides cannot be reused. Finish using toxic substances before disposing of the container.

7. **Use alternative ingredients to replace harmful / toxic substances:**

   Washing using soda mixed with vinegar and olive oil with lemon is a good furniture polish.

1.8 DEFINITION OF TERMS / OPERATIONS

The definition of this term is to present the conceptual and operational definitions of Terminology or unique concepts used in the study conducted to Assist the reader's understanding. The definition of a term is important in a study because it can avoid any

confusion to the reader. Apart from that, the definition of Terms can also explain the true meaning of researchers on the use of a Term in their study.

1.8.1 Reduce

It refers to the reduction of the quantity of waste generated at the source, by reducing the amount of product and the type of product used. It also refers to the reduction in the use of natural resources. This means we need to pay attention to the items purchased, produced, and discarded.

1.8.2 Reuse

It refers to the repeated use of goods, and in doing so waste generation and disposal can be reduced.

1.8.3 Recycle

“Recycling” refers to putting something in a cycle. We recycle by separating waste, and then passing it on to organizations or factories that are recycling it into new products for our use. The international symbol for recycling is the Mobius Loop, a special circle that suggests a continuous cycle.

1.9 SUMMARY

This chapter can be summarized as many studies done to strengthen the reason to improve the existing 3R Trash Bin to increase the use and maximize the amount of recyclable waste to ensure environmental cleanliness and encourage profitable communities to practice cleanliness because cleanliness is part of faith.

CHAPTER 2
LITERATURE RESEARCH

2.1 INTRODUCTION

3R rubbish bins are intended to collect waste materials for recycling. The 3R rubbish bin is also a smart rubbish bin where it is able to signal by turning on the lights and also produce sound automatically when the rubbish exceeds the quantity provided. To achieve the main objective, two engineering elements have been combined between mechanical and electrical components. For electrical components, the idea to produce a trash bin that can automatically signal is based on infrared technology. Electrical components that involve moderate control are such as Arduino Uno, Ultrasonic Sensor, light emitting indicator (LED) and even Buzzer to produce sound. In addition, the use of trash bin cover will be produced based on the size of the type of waste disposed of.

2.2 STUDIES THAT HAVE BEEN CARRIED OUT BY RESEARCH FIRST

- Proper waste disposal techniques or ways can help to save more space in the bin and can further increase the rate of paper in the bin.

- The concept of Recycling is the process of acquiring or turning some or of all the material from waste for reuse. According to Tapas K. Das (2005), recycling is an industrial chemical, mechanical and biological process used to convert waste into recycles, feedstock and reusable energy.

- Composition of recyclable materials in general, recyclable terms refer to the properties or characteristics of goods that can be exchanged from one item to another through processes, programs and can be collected, processed and subsequently produced raw materials or products (Muhamad Awang et al., 1999). According to Tapas K. Das (2005), recycling is not just a waste

management strategy alone, but also an important strategy to reduce the environmental impact of industrial processes.

- Recycling in Malaysia Troubled, garbage becomes a big and serious problem when the world community begins to carry out the process of development and progress in various fields. This situation is also associated with the increasing purchasing power of Malaysians and in turn contributes to the increase in

- Amount of waste generated. To overcome this problem, one of the Steps taken is a recycling program which is usually done in conjunction with a reuse program also a reduction known as 3R (Reduce, Reuse, Recycle).

- Importance of Research Through the study produced there are many interests for individuals, society, and the country. This is because the design of existing bins is too simple and ordinary. Thus, improve by applying auto sensor to produce sound when garbage exceeds the prescribed dosage to facilitate users. There are several interests to the individual. Among them, individuals who have a conducive environment are seen to reflect one's personality. When an individual maintains and maintains cleanliness, the surrounding society will view a person as an individual with excellent character.

2.3 THEORY (INCLUDES FORMULA)

This project has several concepts that will be created. Among them are:

I. Place a slot in the trash that has an automatic opening feature. This feature is made using an Arduino sensor system which detects movement and will continue to open the lid.

2.4 STUDY OF DESIGN SPECIFICATIONS IN MARKET

In Malaysia, there are many rubbish bins of different colors and have been categorized according to their respective but we still do not care about it and dispose of rubbish at will. There are 3 types of recycled waste provided by the government to dispose of recyclable waste. Among the bins available in Malaysia are:

2.4.1 Plastic Trash

These recycling bins are colored blue, brown and orange to symbolize different uses. These bins are available in sizes of 50 liters, 120 liters, 240 liters, 360 liters and 660 liters. Blue recycling bin for all colored and colorless papers such as newspapers, magazines, books, catalog paper sheets, brochures, calendars, cards, envelopes, and cardboard boxes excluding tissue paper and dirty paper.

Figure 2.1: 120L & 240L barrel size

Figure 2.2: 660L barrel size

Figure 2.3: 50L & 120L barrel size

- **Steel Trash**

Steel bins are often found in office wall areas. Garbage bins like this are segregated according to colors such as blue for plastic, orange for cans and yellow for paper.

Figure 2.4: Steel trash can

2.5 STUDY THE COMPONENTS TO BE USED

2.5.1 Arduino Uno

Arduino Uno is one of the developments of ATmega28-based microcontroller kits. Arduino Uno is one of the boards of the Arduino family. There are several types of Arduino boards such as Arduino Nano, Arduino Pro Mini, Arduino Mega, Arduino Yun, and others. But the most popular is the Arduino Uno. The Arduino Uno R3 is the latest

and greatest series from the Arduino USB series. This module has been equipped with various ways that allow to help the microcontroller to work, just connect to the power supply or connect via USB cable to PC. The Arduino Uno board has 14 digital input / output pins, 6 analog inputs, a 16MHz ceramic resonator, USB connection, power input plug, ICSP header, and a reset button.

- Microcontroler ATmega328
- Catu Daya 5V
- Teganan Input (rekomendasi) 7-12V
- Teganan Input (batasan) 6-20V
- Pin I/O Digital 14 (dengan 6 PWM output)
- Pin Input Analog 6
- Arus DC per Pin I/O 40 mA
- Arus DC per Pin I/O untuk PIN 3.3V 50 mA
- Flash Memory 32 KB (ATmega328)0.5 KB digunakan oleh bootloader
- SRAM 2 KB (ATmega328)
- EEPROM 1 KB (ATmega328)
- Clock Speed 16 MHz

Figure 2.5: Arduino Uno

2.5.2 Buzzer

Buzzer is an electronic component that serves as a transformer of electrical current that vibrates in producing a sound like a speaker. However, the buzzer function is simpler than the speakers which serve as markers, reminders, alarms, bells, as voice notifications and others. Buzzer is also used as a sound output (beep) because the force produced is very small compared to using speakers.

- Material: ABS

- Color: Black
- Size:9x11.8mm (L x D)
- Ratedvoltage:5VDC
- Operating voltage:4–7V

Figure 2.6: Buzzer

2.5.3 Light Transmitter Indicator (LED)

It is a type of semiconductor diode that produces non-coherent light with a narrow spectrum when applied electric voltage forward through the p-n junction. This principle is known as electrolysis.

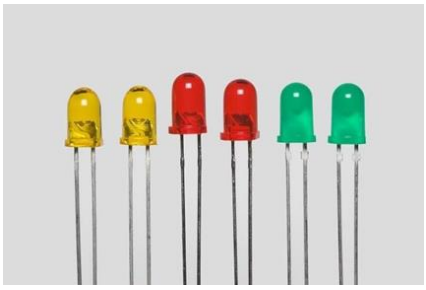


Figure 2.7: LED

2.5.4 Sensor Ultrasonic

Sensor ultrasonic developed using ultrasonic wave characteristics. Ultrasonic wave is a mechanical wave with a higher vibration frequency than the sound wave produced by the vibration of the transducer chip under voltage excitation, it has the characteristics of high frequency, wavelength, small diffraction phenomenon, especially good direction can be rays and diffusion direction. Ultrasonic penetration of liquids and solids is particularly good in opaque solids, which can penetrate dozens of meters in depth. Ultrasonic waves have found impurities or interfaces that will produce incredible reflections to produce echoes, moving objects can produce Doppler effects.

Figure 2.8: Sensor ultrasonic

2.5.5 Servo Moto

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

Figure 2.9: Servo Motor

2.5.6 Jumper Wire

Jumper wires are simply wire that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires. Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power. Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

.

Figure 2.10: Jumper Wire

2.5.7 Regulator Step Down 5v

Dc to DC power converter which steps down voltage (while drawing less average current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, por the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter`s output (load-side filter) and input (supply-side filter). Switching converters (such as buck

converter) provide much greater power efficiency as DC-to-DC converters than linear regulator, which are simpler circuits that lower voltages by dissipating power as heat, but do not step-up output current. Buck converter can be highly efficient (often higher than 90%), making them useful for tasks such as converting a computer`s main (bulk) supply voltage (often 12v) down to lower voltage needed by USB, DRAM and the CPU (5V, 3.3V or 1.8V see PSU).

Figure 2.11: Regulator Step Down 5v

2.5.8 Arduino Nano

The Arduino Nano is a small, complete, and the breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack and works with a Mini-B USB cable instead of a standard one.

Figure 2.12: Arduino Nano

2.6 CONCLUSION

The final conclusion of this chapter, we will be able to know a little about the concepts and theories that are often said by a handful of people who care about the issues that are hotly debated today. In addition, we can also find out about the action that will be imposed if it violates the instructions and laws and besides that we can also find out about fines and acts if fine.

CHAPTER 3
METODOLOGI

3.1 INTRODUCTION

Designing is a method used to produce a project. The methodology is to help and innovate an invention in producing a creative and innovative product to achieve the project objectives. In producing a project, there are several steps that need to be taken before the project is completed. The steps are very important in implement this project to ensure that this project is successfully completed. These steps need to be done in full precision in order to produce a quality and efficient project

3.2 FLOW CHART

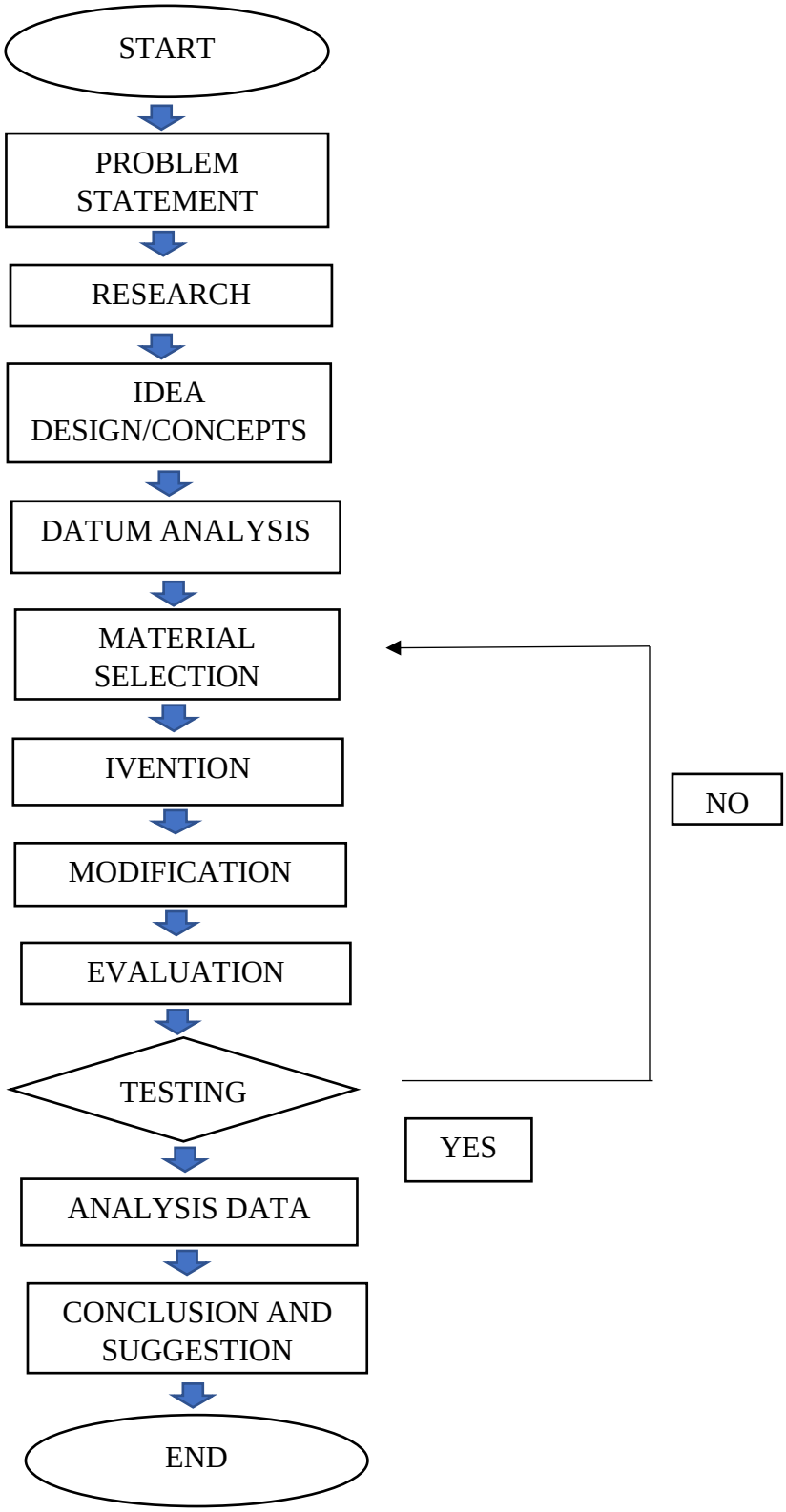


Table 3.1: Flow chart for Final Year Project

Flowchart is very important to illustrate the sequence of operations to finish the work. It uses symbol to represent of a process. Each of steps in the process is represented by different symbol and contains a short description of the process step. The top of the flowchart will begin with start.

Then it followed by literature review. On this step it will discuss about the currently method use. Apart from that, there is list of advantages and disadvantages of each method. By doing so, know that which one is the efficient and which one is take short time in collecting.

3.3 PRIME CONCEPT

The concept of PRIME work includes five phases namely problem statement, to Identify the problem of a study. Next, research to make Research the previous product. Innovation is an upgrade from previous products. Testing is done to ensure that the product produced is successful.

P = Problem
R = Research
I = Invention
M = Modification
E = Evaluation

3.3.1 PROBLEM (P)

- Based on the report from the chief auditor of POLISAS, Mr. Mod Naim informed that innovation is important if it has an impact on management or systems and can improve the quality of the environment.

- The 3R bins in the office are too small for A4 size paper storage.

- The existing 3R bins are less attractive and not equipped with modern technological features.

- Based on the MRC auditor's report, Polisas needs to produce more innovations that contribute to 3R (Reuse, Reduce and Recycle) activities.

3.3.2 RESEARCH (R)

Based on the research done, it was found that the existing bins used are only more suitable for outdoor areas. Therefore, the existing bins are less ifesen used for use
"Indoor".

Among the many types of bins, especially 3R bins do not have many new design options and advantages. The results of this study found that 5S practices are not widely practiced around the office, most of which dispose of garbage without segregation into its types. Therefore, with the formation of the idea to improve the existing bins to better, can help office workers practice 5S Practices while maintaining cleanliness and reduce waste of materials to make the earth safer and better for us human.

3.3.3 INVENTION (I)

I. Germination of ideas

This method is carried out in groups where new ideas will be discussed and to conduct for this project.

a. Design Concept Analysis

The title of the project is to design and analysis the Box Garbage 3R Auto Sensor. The objective of the project is to design a 3R Trash Box to make improvements to the trash can. The scope to be achieved is to design waste box improvements for office use and analysis in terms of materials used as well as the costs that need to be taken into account to complete the garbage box. The project got ideas from the existing 3R bins which are less attractive and seem inefficient to use for office use. So, this trash bin is designed to increase the interest of the community to maintain cleanliness with fun. Various design concepts are done before settling the final concept.

The final concept selected uses user-friendly Reduce, Reuse & Recycle. This concept uses compression and sensor methods. The result of the concept is included in AutoCAD. The selected material is also evaluated in terms of cost effective but at the same time has good precision. There are three idea concept have been analysis:

1. **Idea Concept 1**

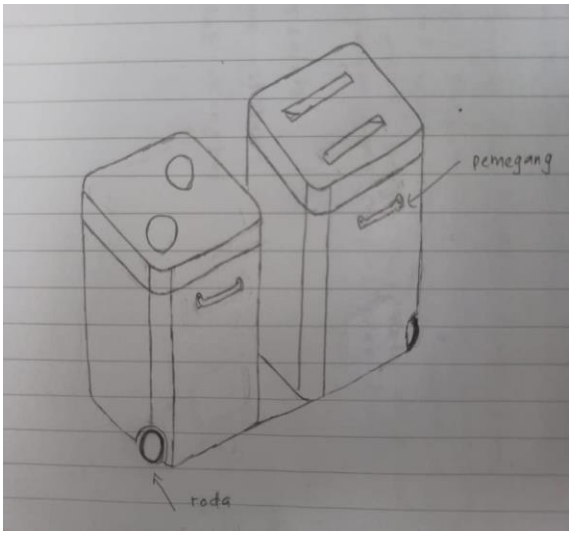


Figure 3.1: Idea concept 1

Advantages*:*

- Simple design.
- Use materials that are easy to obtain.

Disadvantages:

- Irrelevant ideas
- It is better if the barrels and site are not once divorced.

2. **Idea Concept 2**

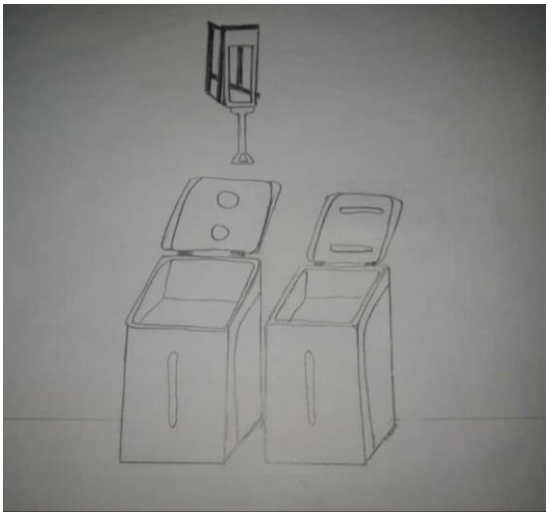


Figure 3.2: Idea concept 2

Advantages:

- Makes it easier for users to dispose of trash.
- Futuristic design.

Disadvantage:

- Difficult to move.
- Improper size and space consuming.

3. Idea Concept 3

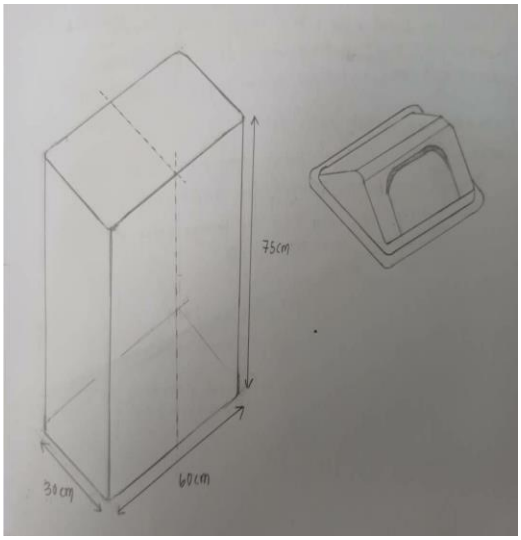


Figure 3.3: Idea concept 3

Advantages:

- Portable cover.
- Sensors detect waste types.

Disadvantages:

- Design that does not change from the existing design.
- Sensor ideas are quite impossible to make.

4. **Idea Concept 4**

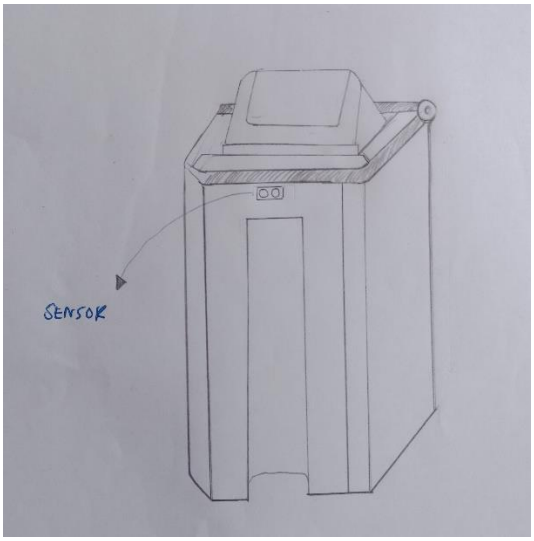


Figure 3.4: Idea concept 4

Advantages:

- Static not moving.
- Auto sound signal after garbage disposal.
- Auto open the door when into the garbage.

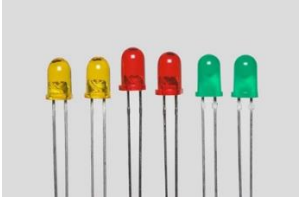
Disadvantages:

- Cannot move and be taken anywhere.
- Concentrated on one area only.

II. CONCEPT SELECTION

In making a project selection, certain aspects and factors are very important to emphasize among them in terms of material selection, functions, cost, and safety. The materials used should be appropriate to the product to being produced. The concept selection is made in comparison with other design concepts. In this way, it can distinguish the advantages and disadvantages of each idea concepts.

Table 3.2: Material Selection

No.	Material	Functional
1.	Arduino Uno 	To open-source electronics platform based on easy-to-use hardware and software.
2.	Buzzer 	An audio signal in a circuit when a voltage is applied to it.
3.	Sensor Ultrasonic 	Is an electronic advice that measures the distance of target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal
4.	LED 	Semiconductor device that emits light when an electric current is passed through it. Light is produced when the particles that carry the current combine together within the semiconductor material.

5.	Wire 	That have connector pins at each end, allowing them to be used to connect two points to each other without soldering
6.	Servo Motor 	To receive a control signal that represents a desired output position of the servo shaft and apply power to its DC motor until its shaft turn to that position.
7.	Regulator Step Down 	Is supplied to the output load, and it returns to the inductor.
8.	Arduino Nano 	To gives detailed information about an Arduino Nano board, and microcontroller board.

a. Matrix Assessment Schedule

Evaluation and selection are analysed by comparing in the concept with the reference concept (Datum). This is done by awarding points to the value of each concept in orders to determine the best concept. This method is called Matrix Evaluation Method. The result is determined in the form of the advantages and disadvantages. Thus, any weaknesses determined in the selected design concept can be improved.

Table 3.3: Matrix Assessment Analysis

No.	Criteria	Interest criteria	Concept 1	Concept 2	Concept 3	Concept 4	Concept reference
1.	Efficiency	5	-	-	-	-	D
2.	Commercial design	4	S	S	S	S	A
3.	Cost	4	-	-	-	+	T
4.	Comfortable	4	+	-	+	+	U
5.	Endurance	5	+	S	S	+	M
6.	User friendly	4	+	+	+	+	0
7.	Total +		3	1	2	4	0
8.	Total -		2	3	2	1	0
9.	Total Overall		4	-2	0	12	0
10.	Total Actual		4	-9	0	8	0

As the result, Concept 4 has been selected as the main concept compared to other sketch concepts.

b. Computer Aided Design

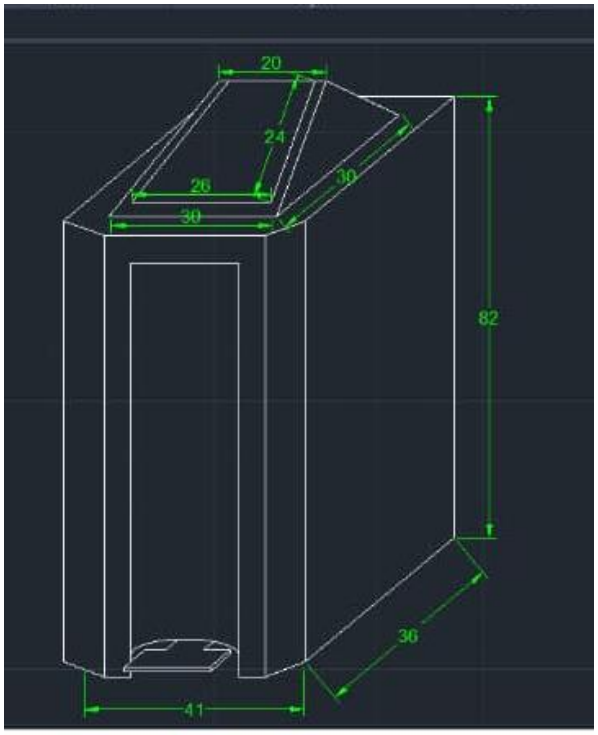


Figure 3.5: Computer Aided Design

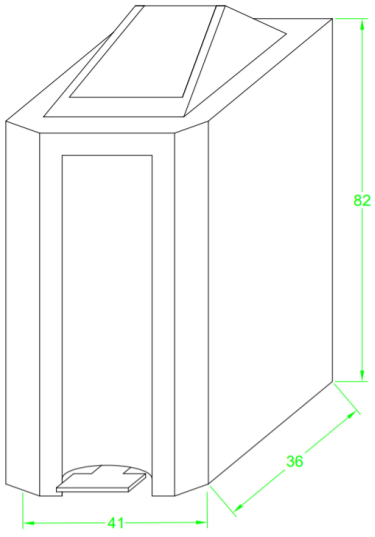


Figure 3.6: Front View

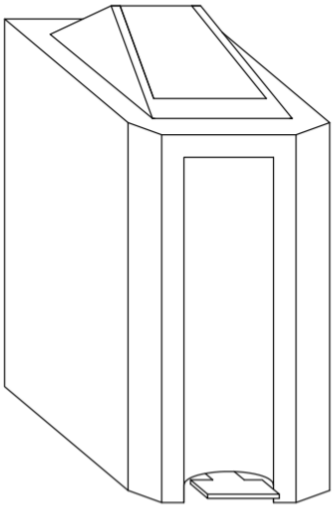


Figure 3.7: Side View

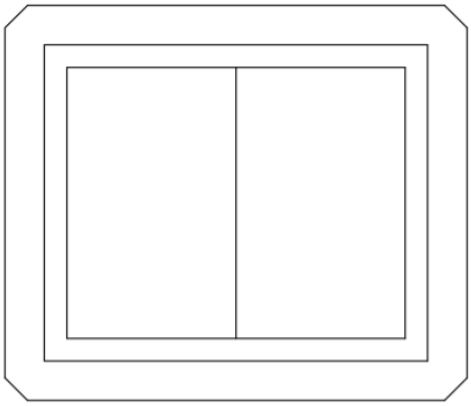


Figure 3.8: Top View

III. MATERIAL SELECTION

The materials selection is very important in aspects of environment or ability depending on the usability of project. It also can help to estimate the total price to fabricate the project.

Table 3.4: Material Selection

Bill.	Material	Functional
1.	Hot Glue Gun 	Use continuous heating elements to melt the adhesive. Can dry strong and quickly, reducing the time delay before the product is ready.
2.	Soldering Iron 	Is hand tool used to heat solder, supplies heat to melt solder so that it can flow into the joint between two workpieces
3.	Solder 	Is a metal alloy used to create strong permanent bonds; such as copper joining in circuit boards and copper pipe joints
4.	Drill Gun 	Tool primarily used for making round holes or driving fasteners.
5.	Rivet Gun 	Used on rivet`s factory head (the head present before riveting takes place), and bucking bar is used to support the tail of the rivet.

6.	Cutter Acrylic 	Used to cut any types of material especially for material of acrylic, plastic also polyvinyl chloride (PVC)
7.	Laptop 	Used to programming Arduino.

a) Bill of Materials

Table 3.5: Bill of Material

Bill	Items	Price (RM)	Quantity	Total (RM)
1.	**Tong Sampah**	136.00	1	136.00
2.	**Servo Motor**	140.00	1	140.00
3.	**Arduino Uno**	35.90	1	35.90
4.	**Jumper Wire 30cm**	4.60	5	23.00
5.	**Regulator Step Down 5v**	10.50	1	10.50
6.	**Aluminium Blind Rivet 1/8”**	3.00	2	3.00
7.	**PVC Insulating Tape**	0.70	2	1.40
8.	**Sensor Ultrasonic**	5.00	3	15.00
9.	**Adapter 12v**	20.00	1	20.00
10.	**LED 10mm**	1.50	2	3.00
11.	**Buzzer**	2.40	1	2.40
12.	**Suis**	1.00	1	1.00
13.	**Arduino Nano**	3.00	1	3.00
Total				**RM 394.20**

IV. MANUFACTURE

a) Circuit Diagram 1

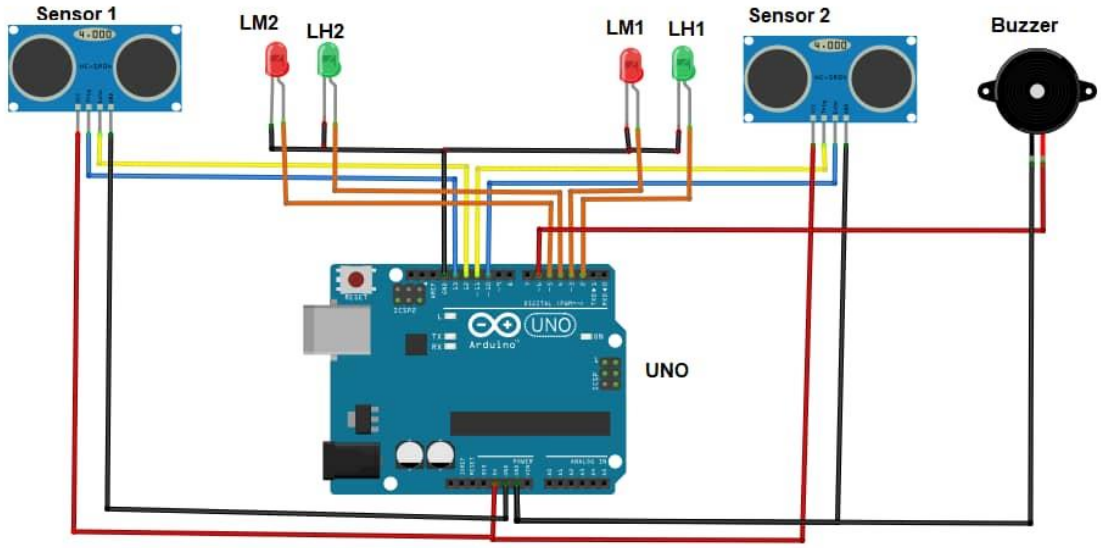


Figure 3.9: Circuit Diagram 1

Figure 3.9 above shows the connection circuit for Sensor 1 and 2 of the Arduino Uno which measures the full waste point and is connecting with a buzzer in order to provide a signal by generating a beep and has also been connected with a LED for light lighting. This circuit was built to facilities the automatic waste disposal system during the installation of the system.

b) Circuit Diagram 2

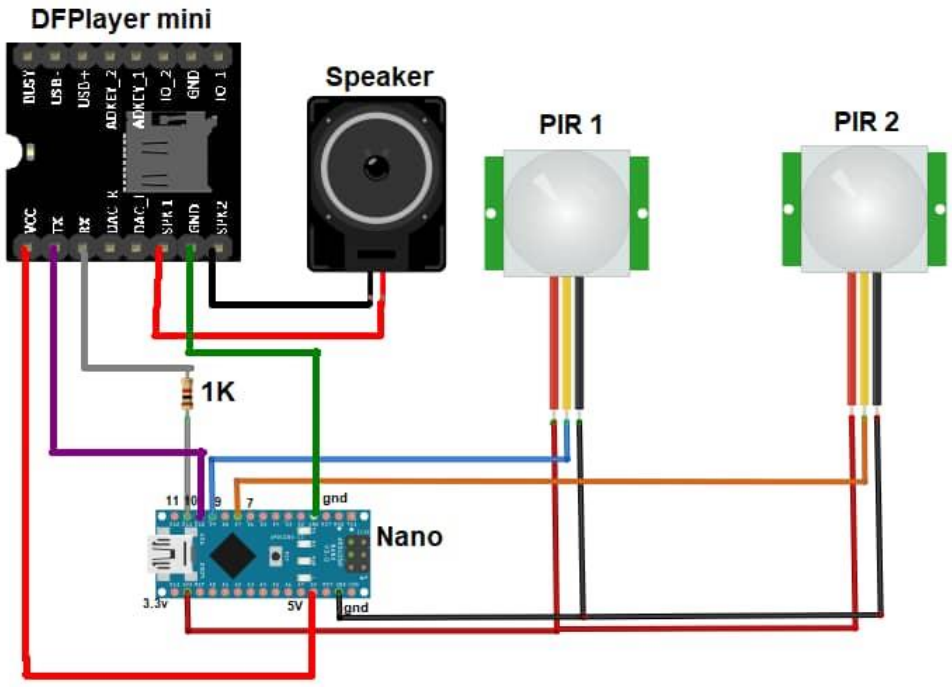


Figure 3.10: Circuit Diagram 2

Figure 3.10 above shows the connection circuit from the Arduino Nano to the Speaker as well as the DF Player Mini also Sensor Infared Detector. This circuit is built because to produce sound as well as audio that we have programmed in coding. This is also be used as a guide in the event of a wire break or wire installation.

3.3.4 MODIFICATION (M)

(i) Design Modification

Related to project design modifications based on data weaknesses that have been taken during the experimental process to make the product better.

(ii) Re-Testing

The testing process is a very important process in the production of a project. This process should be done so that any improvement can be made immediately before it is too late. The project must be test to make sure it can follow the sunlight.

3.3.5 EVALUATION (E)

(i) Testing (Procedure)

When the design is complete, the tool needs to be tested to get the space saving effectiveness. The test of the product created is to determine whether the sensor used is working properly and the wheels used are capable of carrying a barrel load to move.

- The test procedure is an important process to do after the project has been completed. This procedure is done to test the safety, durability, efficiency, and others of a project. These measures need to be carried out before being sold to foreign markets.
- Ensure project materials are in a safe condition for the testing process to be performed.
- Make sure the components on the project material are in good condition.
- Start testing by putting paper in the trash.
- Test whether the sensor to detect full extent works.
- Test how many A4 paper can be filled until it reaches the full limit.
- Readings are taken and recorded in the table.

(ii) Data

Data Analysis Methods briefly describes the methods that will be used to organize, process, and analyze the data that has been collected to answer the objectives of the study. In addition, data analysis can also provide other information that can provide enlightenment to the issues studied. In the process, our group uses Words.

3.4 CONCLUSION

Nowadays, the practice of throwing rubbish in the rubbish bin is very less applied in society. Among them from the point of view of the office area, some civil servants do not have an attitude of love for cleanliness and tidiness. That is why 5S Practice was created. This practice is one of the efforts to maintain the cleanliness and tidiness of a place. With improvements to the existing bin system, we can cultivate the interest of users to use the bin because there are new features and more futuristic design. In conclusion, practicing cleanliness is a noble practice both religiously and socially. Therefore, we hope that our 3R box can help raise the spirits for people to be more sensitive to cleanliness in the future.