

# PROJECT 2:

# DJJ50193

Diploma in Mechanical Engineering

<b>Title</b>	<b>Smart Automatic Cat Toilet</b>
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This report is submitted to the Department of Mechanical Engineering in partial fulfillment of the requirements for Diploma in Mechanical Engineering.

**SESSION 1: 2022/2023**

**DECLARATION OF ORIGINALITY AND OWNERSHIP**

**TITLE: SMART AUTOMATIC CAT TOILET**

1. We,

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are final year students of **Diploma in Mechanical Engineering, Department of Mechanical Engineering, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at Persiaran Usahawan, 40150 Shah Alam, Selangor.

2. We recognize that the 'project on' and intellectual property contained in it is our original work/design without taking or imitating any intellectual property rights of other parties.
3. We agree to relinquish ownership of the project to fulfill the requirements of the Diploma in Mechanical Engineering course.

Truthfully recognized by:

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Witnessed by,

KHAIRULNIZAM BIN KASIM ( ) No. Kad Pengenalan

As the supervisor of our team on

Date: .....

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## ACKNOWLEDGEMENT

First and foremost, we want to give thanks to God for providing us with the opportunity to complete this research and project.

In the competitive market of today, the early birds will win the race. Practice are connected through this endeavor. When it came to completing the assignment, our team worked hard. Nevertheless, it would not have been feasible without the help and support of several people and institutions. To everyone of them, we would want to offer our sincere appreciation.

We appreciate Mr. Khairulnizam Bin Kasim, our supervisor, for assisting us with project management, especially when it came to preparing the proposal and the manufacturing process. He gave us advice during our study, made helpful recommendations, encouraged us to finish our project research, and more. Additionally, our supervisor never gets tired of giving us valuable time to help us manage the given study, and he never let's us down when we ask for his guidance.

We are also appreciative of our fellow students who gave us significant moral support, offered suggestions to various areas of the report, and helped us finish it. Without their constant aid in completing this project report, we could not have accomplished what we achieved today.

We highly appreciate every helpful advice and comment given as we conduct our research and study for our project '**Smart Automatic Cat Toilet.**'

## ABSTRACT

Smart automatic cat toilet is a project that can benefit people who have cats as a pet. Because it's an interesting idea apart from the existing products on the market, we tried to make this project at a low cost but full of facilities that make it easier for pet owners. In addition to adding a weight sensor to identify excrement that is ready for disposal and a motion sensor to detect the existence of the cat after the cat has completed excreting, we have also introduced a new feature called coal storage that is intended to lessen the pungent smell of cat feces. In addition to saving money on litter-changing fees, this can also lower owner costs. A survey was carried out to find out people opinions regarding the smart automatic cat toilet. The results came out overwhelmingly great for our project. Some function can be controlled using the internet of things (IOT) to keep them up in the market.

**Keywords** : *weight sensor, motion sensor, coal storage, IOT*

# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

Cat litters are commonly used in-house and paired with a cat litter box. Additionally, in the present era, practically all cat owners provide a cat litter box inside the home since doing so increases the cat's safety compared to leaving it outside. Additionally, by doing this, we can keep the environment in the house clean by preventing the spread of cat wastes.

In order to keep their homes clean and prevent their cats' health from being contaminated, cat owners should keep a container of cat waste in every property. Additionally, it can save up the cat keeper's time from having to carry out routine or infrequent cleaning tasks..

## 1.2 Background

Modern cat litter bins are still not being used to their full potential, though. This occurs as a result of their continued usage of outdated cat waste containers that require manual cleaning. The majority of them claim that one of the reasons they continue to operate in the same manner is the high cost of ownership. As a result, Malaysians utilise automated cat litter boxes less frequently.

For this project, we intended to create an autonomous cat litter box that was also simple to use and reasonably priced. This device is entirely powered by electricity and is controlled with an Arduino Uno 3. This device may work automatically without the cat keeper's supervision, which can cut the human effort by the cat keeper to clean the cat litter box. The machine also features a motion sensor that detects when a cat is in the litter box. When the sensor notices that the cat has left, the machine will instantly start removing the

waste. As a result, a hygienic and welcoming environment may be maintained.

### 1.3 Problem Statement

- a) Cats, as we all know, have a propensity of leaving excrement wherever they go, at any time. The owner is concerned about where to clean up the cat's defecation, which is worrying. Due to the owner's cat's unrestrained defecation, the owner's home environment also becomes filthy and unpleasant. This inspired us to create a solution that allows cats to urinate without contaminating the owner's living space.
- b) The owner's limited time to clean the cat waste container is another issue that is frequently experienced. This is due to the fact that regular cleaning of the cat waste receptacle is required in order to prevent an unpleasant odor in the house.
- c) Next, bringing pets to work is typically not allowed. Due of this, pet owners often leave their animals at home while they are at work. Even when the owner is not there, the goods we create are committed to operating continuously. This will make it simpler for cat owners so they will not have to worry about their cat's hygiene when it needs to poo.

### 1.4 Objective

Listed below are the research objectives:

- a) Designing a cat waste container with a self-cleaning device that operates in accordance with a preset time.
- b) Limit the utilisation of workforce.
- c) Analyse if this initiative was successful in lowering the utilisation of human resources.

## 1.5 Scope and Limitation

In order to make this project a success, there are some limits that the project is made to adhere to. Listed below are the limitations imposed on the project:

- a) It has a cat presence motion detector installed that can estimate the timing of the motor movement to clear up the excrement to within 0.3 meter.
- b) The motor and other parts, such motion detectors, are moved by an Arduino-based control system.
- c) Give them a room to keep charcoal that can be used to get rid of the poo stink.
- d) Suited for usage inside and near power sources.
- e) The user is required to empty the faeces storage container themselves once it is full.

## 1.6 Rational

The purpose of the solution we developed is to keep the home's atmosphere and surroundings free of cat excrement and from smelling like cat poop. We know that cat feces stinks rather strongly if it is kept for an extended period of time without being cleaned up or removed, thus this product is crucial to making it simpler for the owner to clean the container of cat excrement.

1. Make it less time-consuming for cat owners to clean up cat feces.
2. The presence of cat waste ensures the cleanliness of the household space.
3. Prevent the unpleasant smell of cat excrement from permeating the home.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

In this chapter, we will study about the literature review for this project. This literature review is important to implement a project because with this literature review, we can identify the problems faced by existing projects in a systematic and thorough manner. In addition, this can also help us to find the best approach and research to achieve the goals of our project. We focus on the comparison between our product and the existing cat waste products.

### **2.2 Current studies**

Malaysia is a country with people who love animals, especially cats. The cat population is increasing day by day causing the problem of cat excrement. Smarter cats prefer dirt or soft sand, as this granular consistency makes it easier to bury their waste. This is why cats are naturally attracted to the taste of cat litter that sticks to their paws after defecating. The first cat litter box was created in the 1940s. Unfortunately, the smell associated with urine and feces is less pleasant for cat owners. In 1947, cat owners used clay to absorb urine and feces to reduce odor.

## 2.3 Preparation of existing products

### 2.3.1 Cat litter box with scoop toilet box



Cat Litter Tray Box With Scoop Toilet Box is one of the most popular cat litter boxes among cat keepers nowadays. This product is one of the cheapest and also easy to handle. The design of this product is also very simple and also includes a shovel to clean cat feces manually.

However, this product has some drawbacks such as the owner having to clean the cat's feces using a shovel provided by himself. As we know, cat poop smells quite strong so even though this product provides a shovel, it is still difficult to clean by yourself because of the unpleasant smell.

### 2.3.2 Semi-automatic cat litter box luxury cat t



Semi-Automatic Cat Litter Box Luxury Cat Toilet is a semi-automatic cat litter box that is very hot in the market. This cat litter box product is made of plastic material that is safe for the environment. This product is used by rotating the main part of its body to drop the cat feces found in it into the waste container found in the back.

However, due to its open design, the stench of feces will make the environment stink. In addition, the semi-automatic way of use makes pet cat owners have to spend time rotating the body part of the product to clean the feces. Next, the design of the sand storage part and the small and high space make the cat uncomfortable to defecate in the product.

### 2.3.3 MULTI-LAYER LITTER BOX



Multi-layer litter box is a litter box that has a sieve tray at the top of the base. This product is made with plastic material so it is light and easy to move. When you need to clean cat poop, you just have to lift the top tray. The solids will be trapped on the filter and the clean sand will fall back into the container. It is easy to use because it does not require a shovel and only needs to lift the filter tray to separate the waste of cat feces. This product is also popular among cat owners because of its cheap price and easy availability.

However, every product that is marketed definitely has advantages and disadvantages. The writing above has stated the benefits of the product, so now we will describe the disadvantages found in this product, among which is the material used, which is plastic that has a low quality material. This product is easily damaged or broken compared to products that use iron as an artificial material. In addition, this product does not have a high size. This will result in the sand coming out of the container after the cat finishes throwing, so the sand will litter the floor.

#### 2.3.4 LITTER BOX WITH A LEVER SCOOPING



Litter box with a lever scooping has a cleaning lever built into this product. When you pull the handle, the clean garbage will fall through the filter and the solid waste will be dropped into the trash can provided at the bottom. Garbage cans can be lined with plastic to facilitate disposal. This can make it easier for users because there is no need to clean the container of cat feces every time. This product also has an integrated carbon filter to control odors. The materials used are

Among the shortcomings found in this product is the narrow space for the cat to excrete, making it uncomfortable for the cat to use it. This causes the cat to not use this container often. In addition, the lever can get stuck with the frequency with which the cat owner uses it. This will make it difficult for the owner to buy a new litter box for the cat. Its reasonable price will be doubled if you have the problem of a lever that is often damaged or stuck.

### 2.3.5 LARGE LITTER BOX THAT SCOOPS ITSELF



Large litter box that scoops itself is an automatic product that has a scraper that pushes waste into a hidden compartment. So the house will not smell because the garbage is thrown into a box that has a container provided. In addition, the high walls prevent cats from throwing litter all over the floor and there is a paw cleaning ramp that can clean sand stuck to the cat's paws. Its large design is also suitable for owners who have several cats. Next, this product has LEDs for use by cats at night.

However, every product that is marketed definitely has disadvantages. Among the disadvantages of this product is that it does not have a large waste container, so cat owners need to clean the container of cat waste regularly. In addition, this product has a noisy sound during the filtering process. In addition, the gears used can wear out after a few years of use. The scraper used to separate cat poop and clean sand also doesn't scoop all the way to the bottom of the box. Next, the expensive price makes some cat owners unable to buy this product.

## **CHAPTER 3: METHODOLOGY**

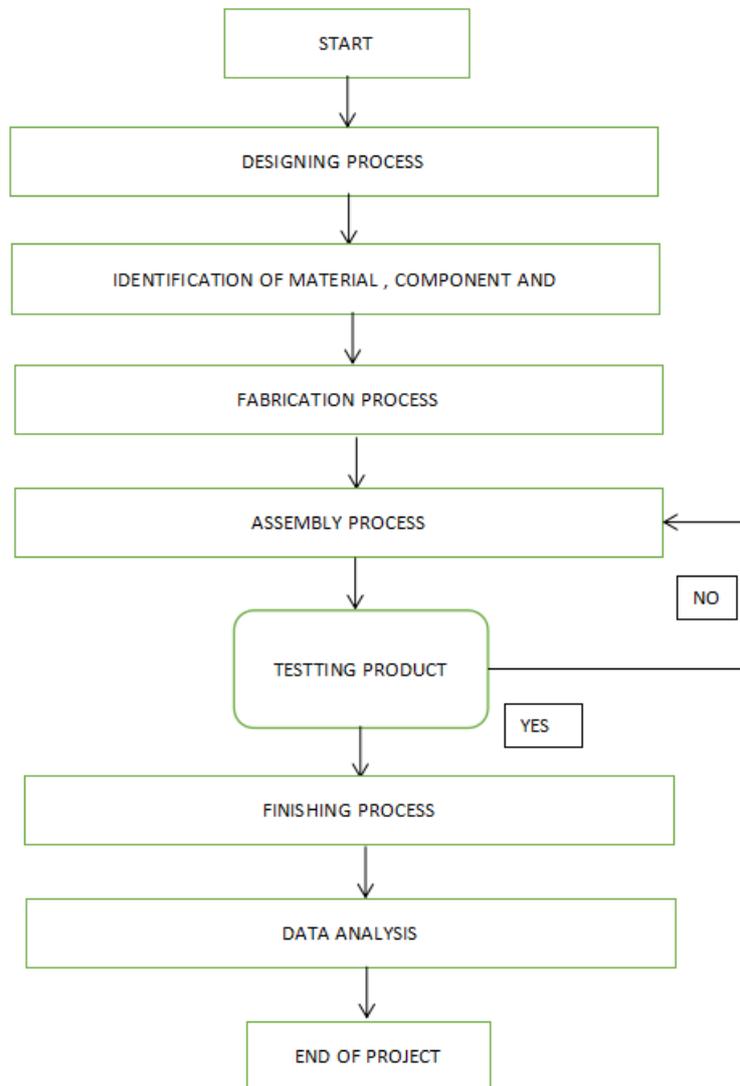
### **3.1 INTRODUCTION**

We were given an assignment to make a project based on the theme of IOT (Internet of Things) for this semester. Therefore, we have planned to create a product called SMART AUTOMATIC CAT TOILET. It is a product for the cat keepers out there who want to keep cats without any problems. This project was created to solve problems often faced by cat keepers, especially at home such as:

- Most cat owners face the same problem which is to clean the container of cat excrement regularly.
- Don't have time to clean the cat litter box.

## 3.2 PROJECT PLANNING

### WORK PRODUCTION PROCESS FLOWCHART



### **3.3 PRODUCT FUNCTION**

In general, our product that name 'Smart Automatic Cat Toilet' and cat keepers find the effectiveness of the application we provide to be quite helpful. Cats defecate, as we are all aware, like other animals do. Therefore, we develop our products to make life simpler for cat owners who might not have the time to clean their cat's litter box or have access to items like these. In order to keep cats from urinating or urinating everywhere within the house or even outside, cat owners must use this product. Users who own cats might find this product's feature to be more convenient. Once the cat has finished urinating, this product starts working automatically. Aside from that, it has a cat presence movement detector installed, which can locate cats within 0.3 metres and predict when they will move to pick up faeces. Other than that, using an Arduino as a control system to move the motor and other parts, such as motion detectors. Moreover providing a location to keep coal that can be utilised to get rid of the faeces smell. However has a Liquid Crystal Display (LCD), a display that shows the product's state right now. Lastly complete with foot pads made of synthetic grass to keep sand clean.

### **3.4 PRODUCT MATERIAL AND COMPONENTS**

In the manufacturing of this product 'Smart Automatic Cat Toilet', it is crucial to choose the right materials and components. because the materials chosen must be appropriate for contemporary use. Among the components and ingredients we purchase are :

1. Aduino Uno R3
2. HC - SR501 PIR Motion Sensor
3. Male to Male 30 cm Jumper Wire 40pcs
4. Female to Male 10 cm Jumper Wire 40pcs
5. Female to Male 10 cm Jumper Wire 40pcs
6. LCD 1602 16x2 Module
7. Breadboard (Mini)
8. Breadboard (Medium)
9. Aduino LLC Module LCD Adapter

10. Spray Can (Maroon)
11. Spray Can (Grey)
12. 2 Inch Stainless Steel Hinge
13. Stainless Steel Mesh 30 cm
14. 2GT Synchronous Wheel 1:3 Reduction Transmission Pulley Pulley
15. Double Layer Cat Little Mat
16. ESP32 WIFI Bluetooth Module IOT
17. Pancake Stepper Motor Nema
18. ABS Sheet DIY Handmade Building Plastic Board
19. KFL Self Aligning Pillow
20. Rectangular Hollow Cold Rolled
21. ABS Plastic Sheet White Board Vacuum
22. Zinc / GI Pan Head Machine Screw M4x35mm
23. HT Hex Nut - M2
24. HT Hex Nut - M2
25. HT Socket Cap Screw - M3x25mm

### 3.4.1 Aduino UNO R3



### 3.4.2 HC - SR501 PIR Motion Sensor



### 3.4.3 Male to Male 30 cm Jumper Wire 40pcs



### 3.4.4 Female to Male 10 cm Jumper Wire 40pcs



**3.4.5 Female to Female 10 cm Jumper Wire 40pcs**



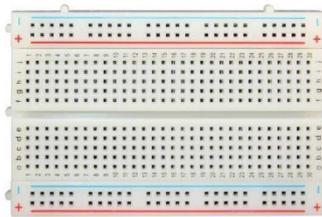
**3.4.6 LCD 1602 16x2 Module**



**3.4.7 Breadboard (Mini)**



### 3.4.8 Breadboard (Medium)



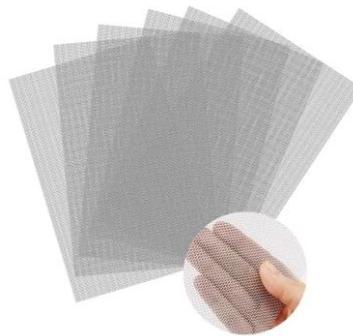
### 3.4.9 Arduino LLC Module LCD Adapter



### 3.4.12 2 Inch Stainless Steel Hinge



**3.4.13 Stainless Steel Mesh 30 cm**



**3.4.14 2GT Synchronous Wheel 1:3 Reduction Transmission Pulley Pulley**



**3.4.15 Double Layer Cat Little Mat**



### 3.4.16 ESP32 WIFI Bluetooth Module IOT



### 3.4.17 Pancake Stepper Motor Nema

Pancake Stepper Motor NEMA17



- Light in weight: 130g
- Suit for direct drive extruder
- Titan or Bondtech

Fabxible

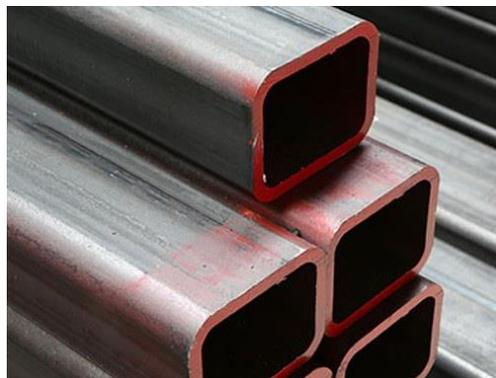
### 3.4.18 ABS Sheet DIY Handmade Building Plastic Board



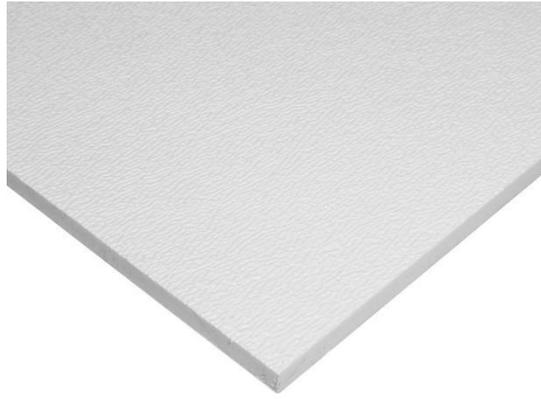
### 3.4.19 KFL Self Aligning Pillow



### 3.4.20 Rectangular Hollow Cold Rolled



### 3.4.21 ABS Plastic Sheet White Board Vacuum



**3.4.22 Zinc / GI Pan Head Machine Screw M4x35mm**



**3.4.24 HT Socket Cap Screw - M3x25mm**



PRODUK	KELEBIHAN	KEKURANGAN
 <p><b>CAT LITTER BOX WITH SCOOP TOILET BOX</b></p>	<ul style="list-style-type: none"> <li>- Cheap and easy to handle.</li> <li>- Very simple design comes with a shovel.</li> <li>- This product does not process cat feces after the cat defecates</li> <li>- Difficult to clean because of the rather strong smell of cat feces</li> </ul>	<ul style="list-style-type: none"> <li>- This product does not process cat feces after the cat defecates</li> <li>- Difficult to clean because of the rather strong smell of cat feces.</li> </ul>
 <p><b>SEMI-AUTOMATIC CAT LITTER BOX LUXURY CAT</b></p>	<ul style="list-style-type: none"> <li>- Made of plastic material.</li> <li>- Rotates the main part to drop cat feces.</li> <li>- The open design removes the smell of cat feces.</li> <li>- Automatic separate cleaning system.</li> </ul>	<ul style="list-style-type: none"> <li>- The open design removes the smell of cat feces.</li> <li>- Semi-automatic cleaning system.</li> </ul>
 <p><b>MULTI-LAYER LITTER BOX</b></p>	<ul style="list-style-type: none"> <li>- Made of plastic so it is light and easy to move.</li> <li>- Using a filter to separate clean sand and solids.</li> <li>- Cheap price and easy to find.</li> <li>- Has low product quality.</li> <li>- Does not have a high size.</li> </ul>	<ul style="list-style-type: none"> <li>- Has low product quality.</li> <li>- Does not have a high size.</li> </ul>

	<ul style="list-style-type: none"> <li>- Using the cleaning lever.</li> <li>- Trash cans can be lined with plastic.</li> <li>- Has an integrated carbon filter.</li> <li>- Has a narrow space.</li> <li>- The lever can get stuck</li> </ul>	<ul style="list-style-type: none"> <li>- Has a narrow space.</li> <li>- The lever can get stuck.</li> </ul>
	<ul style="list-style-type: none"> <li>- Has a scratcher</li> <li>- The high wall can prevent sand from coming out of the container.</li> <li>- The large design is suitable for owners who have several cats.</li> <li>- Has LED for night time.</li> <li>- Does not have a large disposal container.</li> <li>- Has a noisy sound.</li> <li>- The gears used can wear out. - the scraper does not scoop all the way down</li> <li>- The price is expensive.</li> </ul>	<ul style="list-style-type: none"> <li>- Does not have a large disposal container.</li> <li>- Has a noisy sound.</li> <li>- The gears used can wear out. - the scraper does not scoop all the way down</li> <li>- The price is expensive.</li> </ul>

### 3.5 STATISTICS

In this section, we created a google patform to do a little research on Malaysian people who have cats. The statistics we create use the google platform and are disseminated to the public to answer questions provided by us. The purpose of this google platform is to get a response from the majority of cat owners who do not use or have a smart automatic cat toilet at home.

Question link

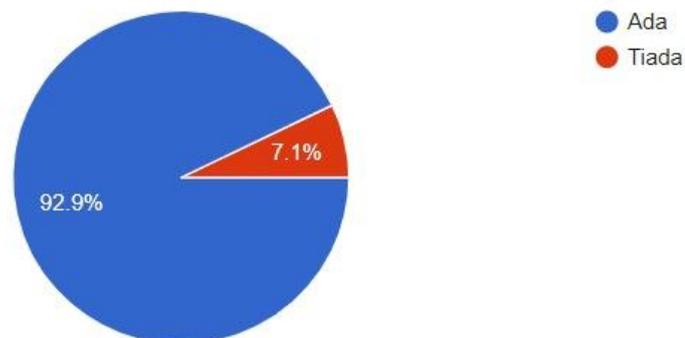
[https://docs.google.com/forms/d/e/1FAIpQLSfir2FbuC4mNkwRG\\_dPigPTpjIMHkboToakPSYIYKBF9XgaQ/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSfir2FbuC4mNkwRG_dPigPTpjIMHkboToakPSYIYKBF9XgaQ/viewform?usp=sf_link)

#### QUESTION 1

Do you have a cat at home ?

Anda mempunyai kucing di rumah?

14 responses



The majority who answered the given question had a cat and 7.1% of them did not have a cat.

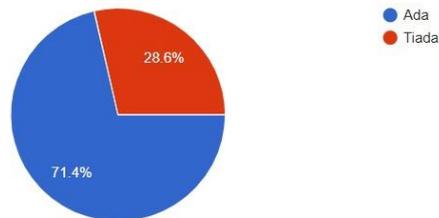


## QUESTION 2

Do you have a cat litter box at home ?

Anda mempunyai cat litter box( kotak najis kucing) di rumah?

14 responses



A total of 71.4% have a cat litter box at home but the rest do not. This proves that 28.6% of responders do not use a cat litter box at home as a necessary facility for animal husbandry.

## QUESTION 3

How often do you clean the cat litter box in a week?

Berapa kerap anda membersihkan cat liiter box ?cth: 4 kali seminggu

[Copy](#)

14 responses



The bar chart shows that 14.3% clean the cat litter box 2 times a week and 3 times a week, the rest clean according to their time. Cat owners who clean the cat litter box once a week will cause the probability of the cat getting sick because their feces have bacteria and are not good for the cat's health. For those who clean the cat litter box every day that is good but they need to be aware of their cat litter box to keep it clean.



#### QUESTION 4

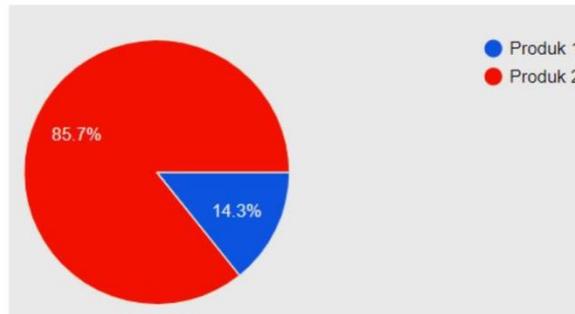
Which product are you using ?



PRODUK 1



PRODUK 2



We provide two products as an example to research which cat litter box product is used as their cat litter box. 85.7% of respondents use product 2 as their cat litter box. This proves that cat keepers do not use smart automatic cat toilets like the example of product 1 that we gave. This means they use energy and time to clean their cat little box.

## QUESTION 5

What features would you add if given the opportunity to improve the product selected above?

Mengapa anda memilih produk tersebut?

14 responses

Mudah

Murah dan berbaloi

Kerana ianya memberikan kemudahan pada pengguna spt jimat masa dan x perlu bersihkan dgn tenaga manusia

Murah kot

-

Murah

Harganya lebih murah dan tidak memerlukan penyelenggaraan yang terlalu rumit

Sebab mudah dan murah

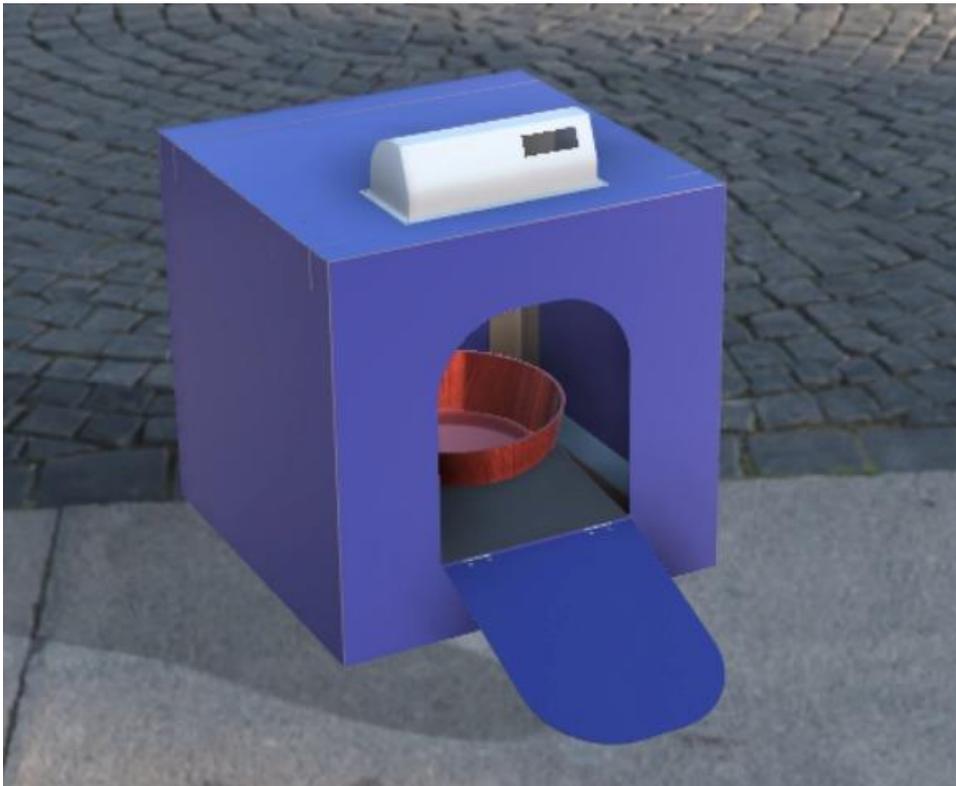
Produk tersebut sangat biasa dalam pasaran.

Most responders answered this question with the answer we expected, which is that they need a smart automatic cat little box.

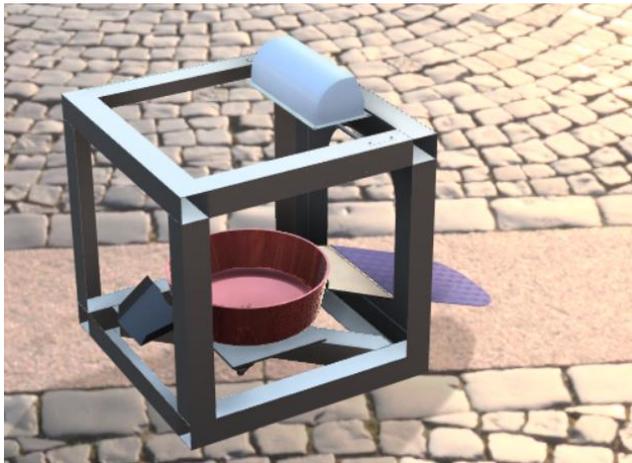
## CHAPTER 4 : PRODUCT DESIGN

The project design is displayed in this part. To produce isometric, orthographic, and 3D drawings that are a part of assembly and exploded, we use the Autodesk Fusion 360 software. All the components are combined in this drawing to create the design that will be our final result.

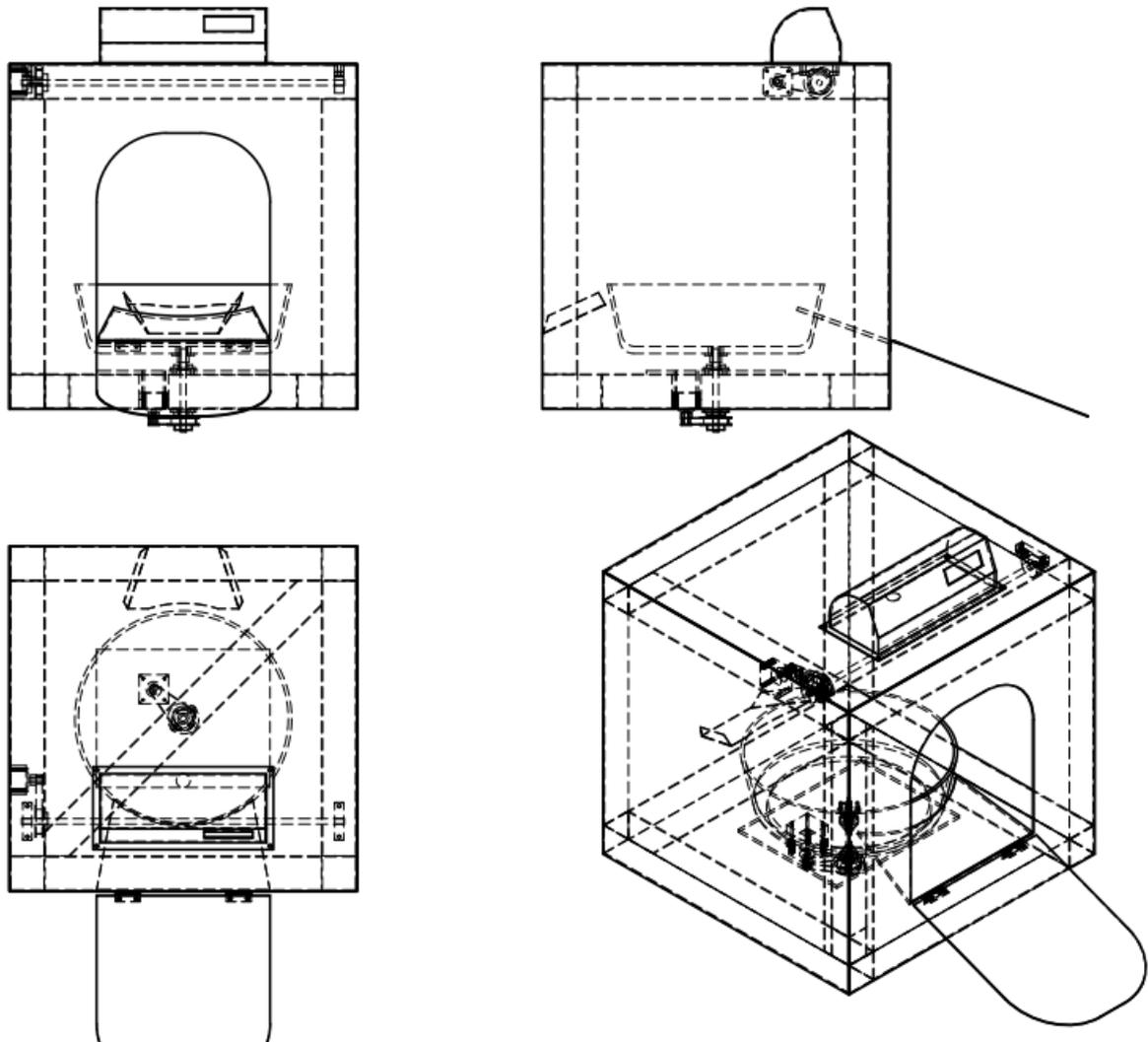
Render (Full)



Rendered (Without Cover)



Sketch Drawing (Fusion 360)



Product Image (In Process)



Product Image (Finished)



## **CHAPTER 5: CONCLUSION**

In our project 2, we have designed a container for cat excrement called 'SMART AUTOMATIC CAT TOILET'. These 2 projects are one of our efforts to make a product that can solve the problems we found after conducting research on cat keepers in the house. In order to perfect our product, a group of us have collected all the data required for this product from various sources such as websites, questionnaires, and others. The collected information will be carefully analyzed to be used as content for an important part of our proposal. In conclusion, what we can summarize is that we were able to solve the problem on our study well and it went smoothly. We have also achieved the objectives we set at the beginning of this project. We hope that the implementation of this project can have a positive impact on many parties and further solve the problems faced by them as we aim to.