

THE ROUND WARDROBE

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## ABSTRACT

Wardrobe was the place to keep clothes. Every wardrobe has various features and designs. Usually conventional wardrobe shape is rectangular. Most wardrobes are placed inside the bedroom and placed near the wall or wall vertex. Usually the clothes is placed in clothes compartment or hanged and this will caused difficulty to choose and pick clothes. To overcome this problem a new type of wardrobe is designed. This wardrobe is in round shape and it can be rotate in 360 degree to overcome the problem where the user need to spend more time to find, to choose, to pick and further to hanged back their clothes to its original place. This design also consider contact time while picking the clothes. Firstly, there have four concept of round wardrobe is designed. However, concept number four is selected after having true scoring and screening process later this concept is modelled in actual dimension in solid work. As a pilot modelling it have been scale 1:4 has been chosen to simplify the analysis process. This product later involved in various processes such as material selection, measuring, grinding, assembly and finishing. The advantage of this new product is, it comes in round shape, can be rotated and in the aspect of space, this product can be placed anywhere in clothing room. This wardrobe has achieved the objective successfully.

## ABSTRAK

Almari pakaian adalah tempat untuk menyimpan pakaian. Setiap almari pakaian mempunyai pelbagai ciri dan rekabentuk. Biasanya bentuk almari pakaian konvensional ialah segi empat tepat. Kebanyakan almari pakaian berada di dalam bilik tidur dan diletakkan di dinding atau bucu dinding. Biasanya pakaian diletakkan di petak pakaian atau digantung dan ini akan menyebabkan kesukaran untuk memilih dan mengambil pakaian. Untuk mengatasi masalah ini jenis, baru dari almari pakaian direka. Almari pakaian ini berbentuk bulat dan boleh berputar 360 darjah. Untuk mengatasi masalah di mana pengguna perlu menghabiskan lebih banyak masa untuk mencari, memilih, mengambil dan seterusnya untuk digantung kembali pakaian mereka ke tempat asalnya. Reka bentuk ini juga mengambil kira masa untuk mengambil baju. Pertama, terdapat empat konsep bulat almari pakaian direka. Walau bagaimanapun, konsep keempat dipilih selepas pemarkahan benar dan proses saringan yang kemudiannya konsep ini dimodelkan dalam dimensi sebenar dalam kerja-kerja pepejal. Sebagai pemodelan perintis, ia telah di nisbahkan 1:4 telah dipilih untuk memudahkan proses analisis. Produk ini kemudiannya terlibat dalam pelbagai proses seperti pemilihan bahan, mengukur, pengisaran, pemasangan dan kemas. Kelebihan produk baru ini, ia datang dalam bentuk bulat, boleh diputar dan dalam aspek ruang, produk ini boleh diletakkan di mana-mana sahaja di bilik pakaian. Almari pakaian ini telah mencapai objektif dengan jayanya.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 INTRODUCTION**

For this chapter, it is about discussion of the project background, problem statement, objective of the project, and lastly scope of the project.

#### **1.2 PROJECT BACKGROUND**

Wardrobe was the place to keep clothes not to be contaminated from dirt such as dust. It also functions as a safe place for clothes from destructive insects attack such as cockroach. Apart from that too, wardrobe is one interior decoration that is important to human because it is only place to keep clothes. It can also help people save time to keep and choose a dress that being liked him.

#### **1.3 PROBLEM STATEMENT**

- i. Difficult in selecting the clothes
- ii. Need big space to place the wardrobe
- iii. Only placed at room corner and fix

#### **1.4 OBJECTIVE**

- i. To design the product that use only small space in the room.
- ii. To design the product not only located in the corner.
- iii. To design the product that easier the user in choosing the clothes.

#### **1.5 SCOPE**

- i. Fabricate the round wardrobe.
- ii. The purpose of product is only focusing on clothing room.
- iii. Fabricate the round wardrobe can be rotated.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

This section is about the literature review of the project. In this chapter, there is a history and type of Wardrobe. Besides that, it consists with the design which were available at the market.

#### 2.2 TYPES OF WARDROBE

##### 2.2.1 Wardrobe A



**Figure 2.1:** Wardrobe A

A wardrobe is a specially designed wardrobe for clothes in the room alone. This type of wardrobe usually owned by the affluent because the cost for creating this wardrobe is higher than normal wardrobe. This wardrobe has same area with clothing room area. It was in the side wall of clothing room and its position is fixed.

The advantages of this wardrobe is can keep the clothes in large quantities . It is also very suitable for women and men who love in making the clothes as a collectible thing.

The disadvantages of this wardrobe is, if the clothes is too much it will looks messy and not organized. It is also easily accessible by pests such as cockroaches.

The material used to manufacture this product consist of:

- a) plywood
  - Plywood is first thing to consider to make a wardrobe. plywood typically used for wall or shelf malleable than wood. In the other hand, plywood more expensive than wood so it can reduce costs and be sold at a reasonable price.
- b) Wood:
  - Wood is an important material in the process of making wardrobe. wood used as poles to the wardrobe as the wood is stronger than plywood.
- c) Round hollow bar(mild steel) :
  - Hollow round bar is used to make points concerning clothing. it is stronger than other materials so it can handle heavier loads

### 2.2.2 Wardrobe B



**Figure 2.2 :Wardrobe B**

Wardrobe B is a wardrobe designed for single people. This is because the closet is not too big and not too small, so it is suitable for groups. In addition they are portable and is ideal in the bedroom. The size of this cabinet is 180cm high and 90cm wide. Price is very reasonable because of cost in making this wardrobe is not too expensive.

Advantages of this wardrobe is soft, not too big, it's easy for us to change its position and can keep their clothes neatly and orderly.

Disadvantages of this wardrobe is easily contaminated with dirt, dust and easily accessible by pests such as cockroaches.

The material used to manufacture this product is consist of :

a) Plywood

- To create a wardrobe of B all of the material used is plywood. Even so it remains as a long lasting material as previously noted it had been swept away with shellac that will make it last longer.

b) Round hollow bar (Aluminium)

- Hollow round bar is used as a place for foul clothes. It is made of aluminum so it's lightweight and does not rust. It is also very suitable for the whole wardrobe is made from plywood.

### 2.2.3 Wardrobe C



**Figure 2.3:** Wardrobe C

Wardrobe C is a wardrobe designed for those who are not concerned with the design. This wardrobe measures 200cm high and has a width of 80cm wide. This cupboard with two doors and one drawer. This cupboard is usually placed in the bedroom.

Advantages of this wardrobe is, has doors and drawers, it can protect clothing from dirt and dust contaminated with pests infestation. In addition, it can store clothing has been ironed due to store clothes that have been ironed must use the hangers.

The disadvantages of wardrobe is, it could not keep the clothes in large quantities.

The material used to manufacture this product is consist of :

- a) Round Hollow bar(mild steel)
  - Hollow round bar is used as a place for foul clothes. It is located at the middle of cupboard. This type usually used mild steel so that it can handle heavy loads. Even if it is rusty, we can apply a thin layer of paint in order to prevent them from rusting
- b) Plywood
  - This plywood had been covered by thin layer of plastic.This layer functioned as a protector in protecting the plywood from expansion when it contact with water.
- c) Wood
  - Wood functioned as a pillar.It is also funtioned in supporting the rack and also to make the drawer sloth.

#### **2.2.4 Wardrobe D**



**Figure 2.4:** Wardrobe D

Wardrobe D is a wardrobe designed for those who love the uniqueness and diversity. Unique wardrobe looks for a sensible lot of places to store clothing or parts. For example, at the bottom is a place to put the slippers or barefoot while the side is a place to put jewellery or souvenirs and clothing that has been folded. In the center is a place to put clothes using hangers.

Advantages of this wardrobe is, it can store large numbers of clothes, unique and interesting.

Disadvantages of this wardrobe is easily contaminated with dirt, dust and easily accessible by insect pests.

The material used to manufacture this product is consist of :

- a) Round hollow bar(Aluminium)
  - Hollow round bar is used as a place for foul clothes.It is made of aluminum so it's lightweight and does not rust. It is also very suitable for the whole wardrobe is made from plywood.

b) Plywood

- Plywood is first thing to consider to make a wardrobe. plywood typically used for wall or shelf malleable than wood. In the other hand, plywood more expensive than wood so it can reduce costs and be sold at a reasonable price.

c) Wood

- Wood is an important material in the process of making wardrobe. wood used as poles to the wardrobe as the wood is stronger than plywood

## 2.3 MATERIAL SELECTION

### 2.3.1 Round hollow bar(mild steel)

A round hollow bar is a flat metal rod that has been rolled to a round shape. This round bar has been used in my wardrobe project as a pillar and the circular part that can be rotated.



**Figure 2.5:** Round hollow bar,[5]

### 2.3.2 Square Hollow Bar(Mild Steel)



**Figure 2.6:** Square hollow bar

This type of material is used to be the frame for the door. It is selected because the stand is preferred to be tough and strong.

### 2.3.3 Plywood

In my wardrobe project, I have used this plywood as a basement and the top of wardrobe. This plywood is in circular shape, it same goes to upper part and lower part.

### 2.3.4 Bearing

Bearing is rotating part in my project. It is located a center of plywood. It is functioned in smoothing the movement of wardrobe when it rotates.

### 2.3.5 Perspek

Perspek used in covered the door part. All the wardrobe door covered by perspek.

## **CHAPTER 3**

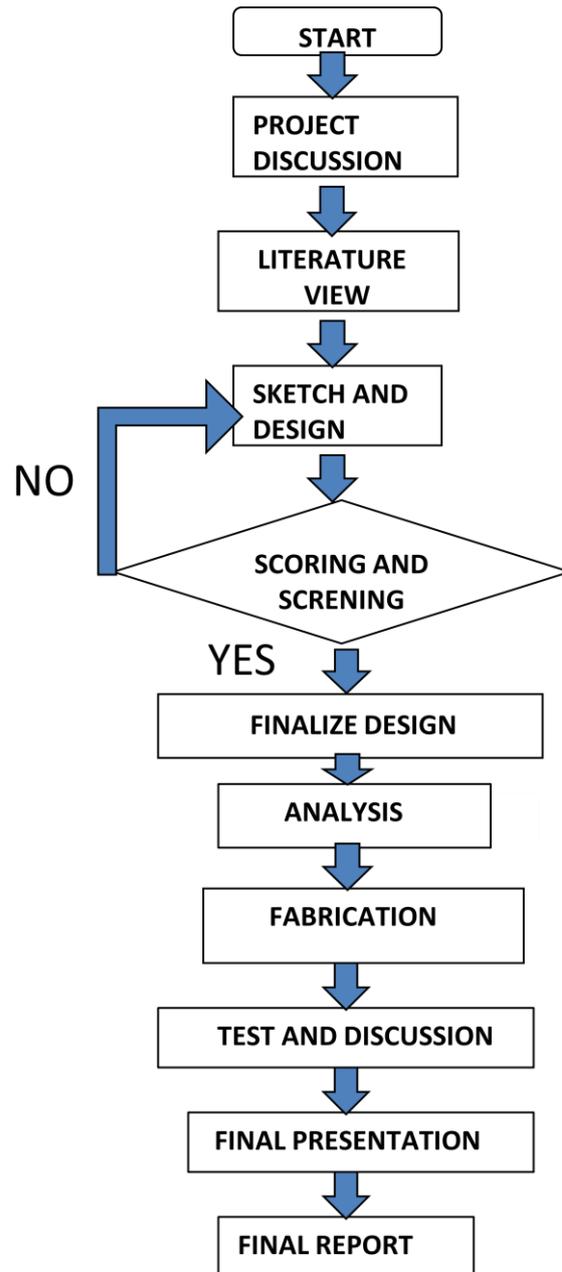
### **METHODOLOGY**

#### **3.1 INTRODUCTION**

A methodology is instantiated and materialized by a set of methods, techniques and tools. A tool is any instrument or apparatus that is necessary to the performance of some task. A methodology does not describe specific methods; nevertheless it does specify several processes that need to be followed. It also allows others to replicate our study and run new and different studies that are based on our methodology.

#### **3.2 FLOW CHART**

A flowchart is a common type of diagram, that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting these with arrows. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.



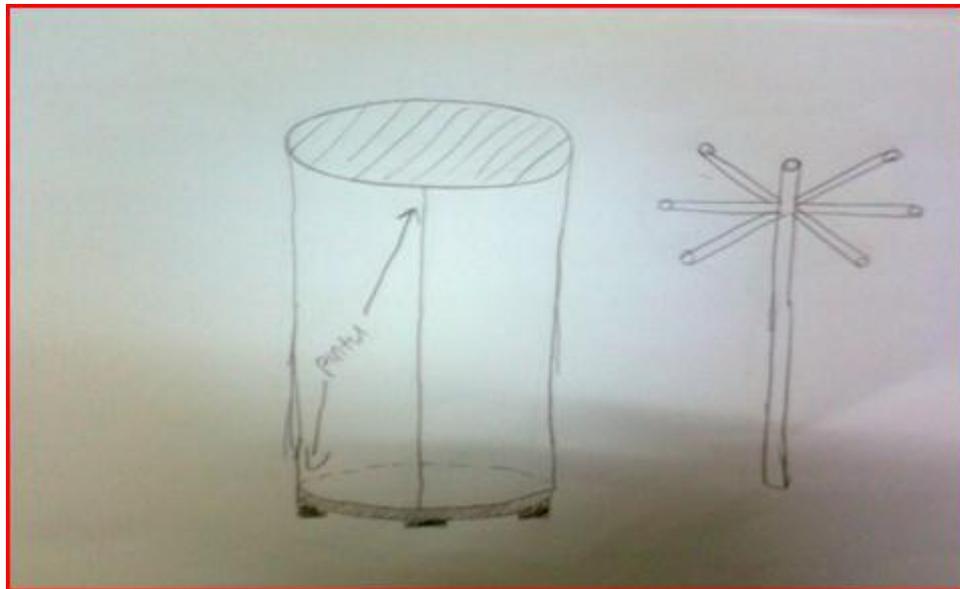
**Figure 3.1:** Flow Chart.

### 3.3 DESIGN GENERATION

Product design is concerned with the efficient and effective generation and development of ideas through a process that leads to new products. Product Designers conceptualize and [evaluate](#) ideas, making them tangible through products in a more systematic approach. Their role is to combine art, science and technology to create tangible three-dimensional goods. This evolving role has been facilitated by [digital](#) tools that allow designers to [communicate](#), visualize and [analyze](#) ideas in a way that would have taken greater [manpower](#) in the past.

Product design is sometimes confused with industrial design, industrial design is concerned with the aspect of that process that brings that sort of artistic form and usability usually associated with craft design to that of mass produced goods

#### 3.3.1 First Design



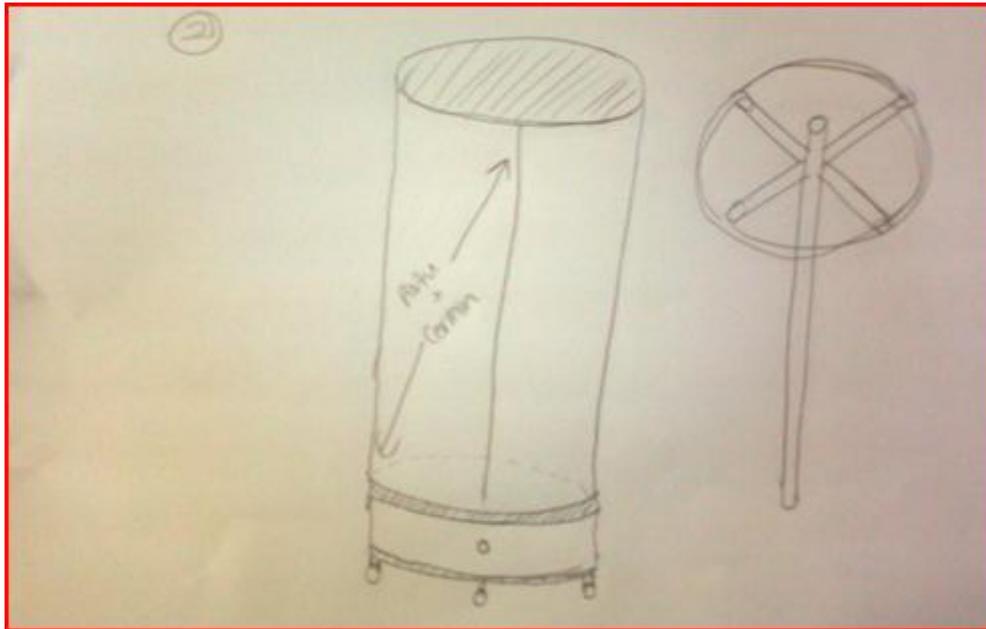
**Figure 3.2:** First Design

#### **Advantages :**

- i. Easy to take the clothes because the rod in the middle can rotate.

**Disadvantages :**

- i. Cannot keep many clothes.
- ii. The Wardrobe cannot be rotated

**3.3.2 Second Design**

**Figure 3.3:** Second Design

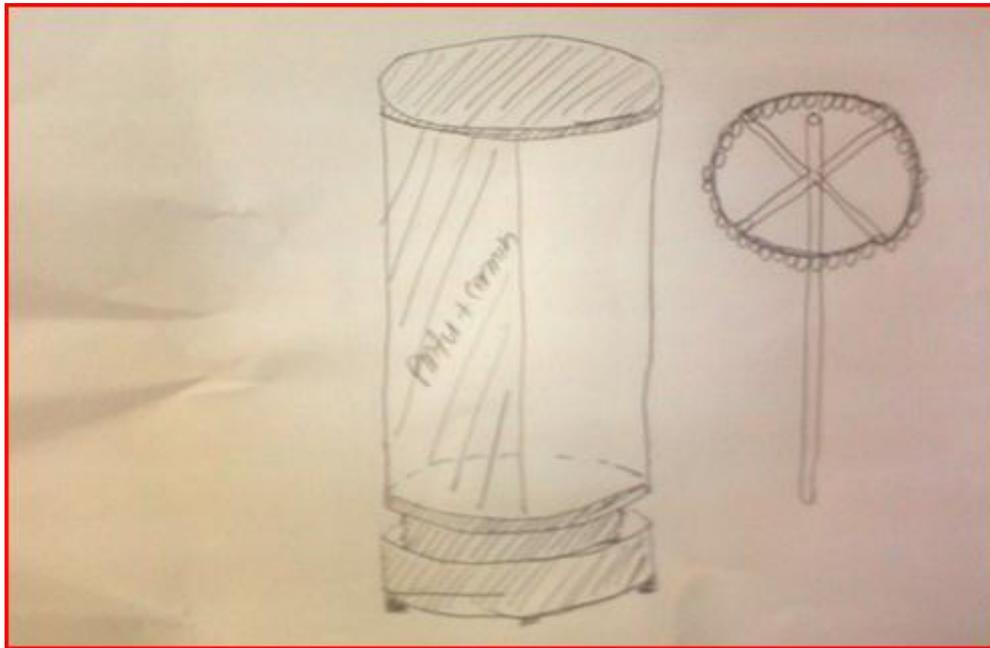
**Advantages :**

- i. Easy to take the clothes because the rod at the middle can rotated.
- ii. Have a drawer.

**Disadvantages :**

- i. The wardrobe can't be rotated
- ii. Hard to fabricate

### 3.3.3 Third Design



**Figure 3.4:** Third Design

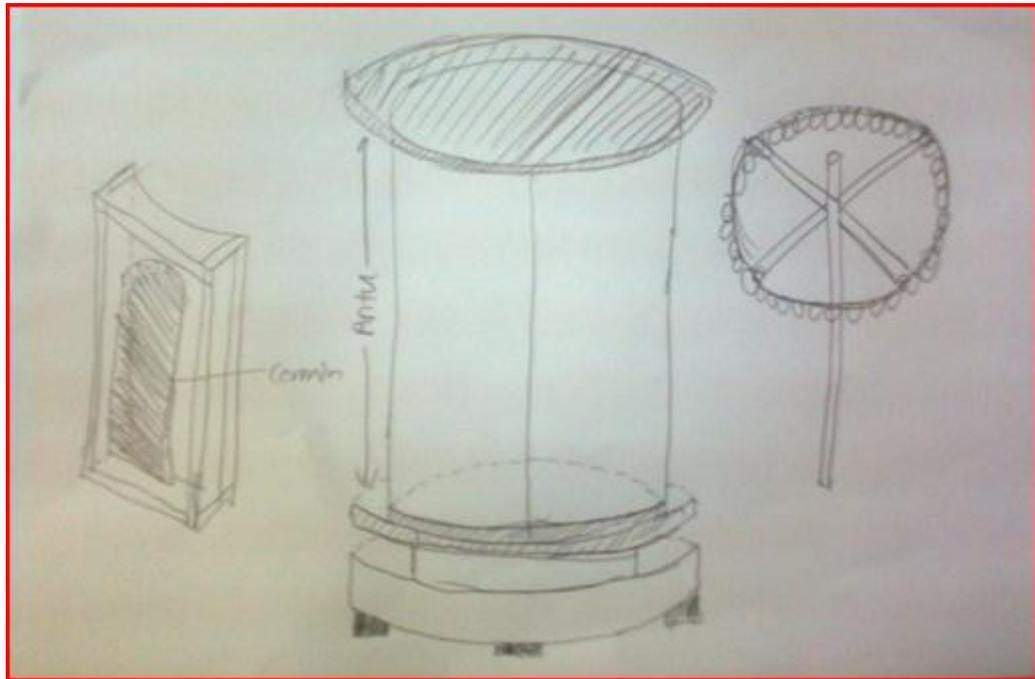
#### **Advantages :**

- i. The wardrobe can be rotated.
- ii. Can hang large number of cloth
- iii. Round bar that located at the middle make internal part able to rotate.

#### **Disadvantages :**

- i. Higher cost and hard to fabricate.

### 3.3.4 Fourth Design



**Figure 3.5:** Fourth Design

#### **Advantages :**

- i. Easy to take the clothes because the rod in the middle can be rotated.
- ii. Can protect the clothes from the pests such as cockroaches,
- iii. Can put many clothes.
- iv. The wardrobe can be rotated.
- v. Can protect clothes from contaminated with dirt and dust.

#### **Disadvantages :**

- i. Higher cost and hard to fabricate

### 3.4 CONCEPT SCREENING AND SCORING

When making decisions about alternative systems that may be used in various situations in the workplace, a problem that is often faced is that there are many different people with many different opinions.

Concept Screening uses a simple matrix to assist in choosing between a number of options, as in the table below, and is typically done with a representative team of cross-functional people. Then examines each option (or 'concept') and compares it against each criterion to give it a relative score. Each option then has its score totaled to show its overall score relative to the base option.

If one option scores much higher, then this is clearly likely to be the best choice. However, before rejecting other options, you can consider how they may be improved. For example a low-scoring choice may have its score significantly increased at relatively low cost.

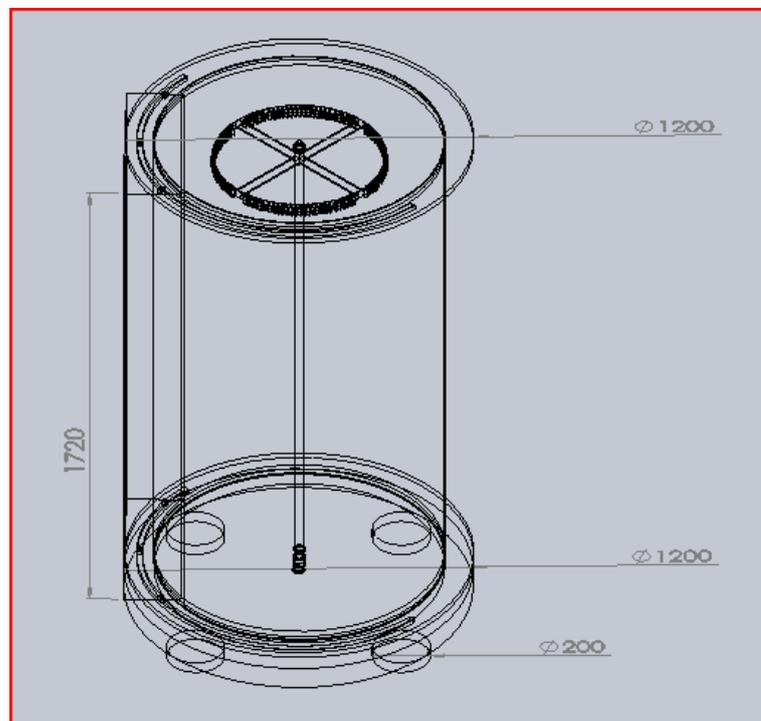
**Table 3.1:** Concept Screening

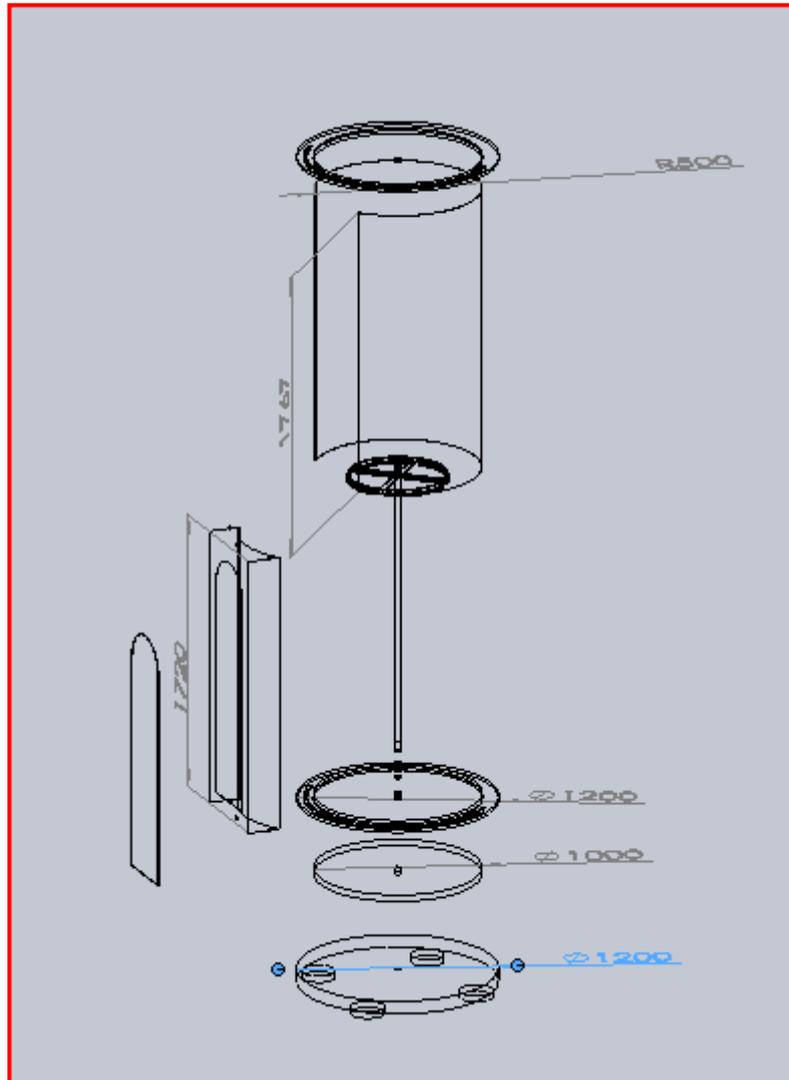
SELECTION CRITERIA	CONCEPT				REF
	Concept 1	Concept 2	Concept 3	Concept 4 (Datum)	
Mass	-	-	-	-	0
Attractive	-	0	-	+	0
Ease of manufacture	+	+	0	-	0
Space optimization	+	+	-	+	0
Safety	-	-	+	+	0
Space usage	-	-	+	+	0
	Plus	2	2	2	4
	Same	0	0	1	0
	Minus	4	3	3	2
	Net	-2	-1	-1	2
	Rank	4	3	2	1
	Continue?	NO	YES	YES	YES

**Table 3.2: Concept Scoring**

		CONCEPTS							
		REF.		Concept 2		Concept 3		concept4	
SELECTION CRITERIA	WEIGHT	RATING	WEIGHT SCORE	RATING	WEIGHT SCORE	RATING	WEIGHT SCORE	RATING	WEIGHT SCORE
Mass	5%	5	0.25	3	0.15	2	0.1	4	0.2
Attractive	20%	3	0.6	3	0.6	2	0.4	4	0.8
Ease of manufacture	15%	2	0.3	3	0.45	2	0.3	1	0.15
Space optimization	35%	3	1.05	4	1.4	2	0.7	4	1.4
Safety	15%	2	0.3	1	0.15	3	0.45	3	0.45
Space use	10%	3	0.3	2	0.2	4	0.4	4	0.4
Total score		2.8		2.95		2.35		3.4	
Rank		3		2		4		1	
Continue?		No		No		No		Develop	

### 3.5 FINALIZED DESIGN

**Figure 3.6: Design Selected in Solid Work drawing**



**Figure 3.7:** Exploded View Selected in Solid Work Drawing

### 3.6 PRODUCT DESIGN SPECIFICATION

**(a) Product title**

Round Wardrobe

**(b) Purpose**

To design and fabricate the round wardrobe

(c) **New or special features**

- Easy to use.
- The wardrobe can be rotated.
- Easy to take the clothes.

(d) **Competition.**

Will compete against standard wardrobe.

(e) **Relationship to existing products line.**

Generate from existing product.

(f) **Functional performance**

- The rod at the middle can be rotated
- Can put 111 hangers
- Easy to choose and take the clothes

### **3.7 FABRICATION**

Fabrication is an act of making the products or objects from raw materials. The act of constructing something (as a piece of machinery). Metal fabrication is a value added process that involves the construction of machines and structures from various raw materials. A fab shop will bid on a job, usually based on the engineering drawings, and if awarded the contract will build the product. The fabricator may employ or contract out steel detailers to prepare shop drawings, if not provided by the customer, which the fabricating shop will use for manufacturing. Manufacturing engineers will program CNC machines as needed.

### 3.7.1 Measuring

In [science](#), measurement is the process of obtaining the magnitude of a [quantity](#), such as length or mass, relative to a [unit of measurement](#), such as a meter or a kilogram. The term can also be used to refer to the result obtained after performing the process.

A tape measure or measuring tape is a flexible form of ruler. It consists of a ribbon of cloth, plastic, fiber glass, or metal strip with linear-measurement markings. It is a common measuring tool. Its flexibility allows for a measure of great length to be easily carried in pocket or toolkit and permits one to measure around curves or corners.



**Figure 3.8:** Measuring

### 3.7.2 Cutting

Cutting is the separation of a physical object, or a portion of a physical object, into two portions, through the application of an acutely directed force. An implement commonly used for cutting is the [knife](#) or in medical cases the [scalpel](#). However, any sufficiently sharp object is capable of cutting if it has a [hardness](#) sufficiently larger than the object being cut, and if it is applied with sufficient force. Cutting also describes the action of a [saw](#) which removes material in the process of cutting.

Cutting is a [compressive](#) and [shearing](#) phenomenon, and occurs only when the total [stress](#) generated by the cutting implement exceeds the ultimate [strength](#) of

the material of the object being cut. The simplest applicable equation is  $stress = force/area$ : The stress generated by a cutting implement is directly proportional to the force with which it is applied, and inversely proportional to the area of contact. Hence, the smaller the area (i.e., the sharper the cutting implement), the less force is needed to cut something.

When referring to propagating plants, [cutting](#) is one of the methods that can be used. It involves cutting a part of the plant typically a healthy shoot, with sharp and sterile scissors or any other cutting device, and then placing the removed part in water. Some cuttings do not require water. Certain shoots when cut are able to grow when placed in vermiculite or potting soil. However, the former is the easiest to do as most shoots when cut from the main plant need time to grow roots, and then they are able to be transferred to potting soil.

Floor cutting disc machine will be used to cut all the material following the measuring that have taken during measuring process.

A band saw uses a blade consisting of a continuous band of metal with teeth along one edge. Work pieces are fed into the cutting edge on vertical machines.



**Figure 3.9:** Cutting



**Figure 3.10:** Disc Cutting Machine

### 3.7.3 Joining (Welding)

Welding is a [fabrication](#) or [sculptural process](#) that joins materials, usually [metals](#) or [thermoplastics](#), by causing [coalescence](#). This is often done by [melting](#) the work pieces and adding a filler material to form a pool of molten material (the *weld pool*) that cools to become a strong joint, with [pressure](#) sometimes used in conjunction with [heat](#), or by itself, to produce the weld. This is in contrast with [soldering](#) and [brazing](#), which involve melting a lower-melting-point material between the work pieces to form a bond between them, without melting the work pieces.

To join all the material into the part of trolley, welding process will be the selected process. Shield Metal Arc Welding (SMAW) will be used for joining process.



**Figure 3.11: Joining**

### 3.7.4 Finishing

Surface finishing is a broad range of [industrial processes](#) that alter the surface of a manufactured item for achieve a certain property. Finishing processes may be employed to: improve appearance, adhesion or [wet ability](#), [solder ability](#), [corrosion resistance](#), tarnish resistance, chemical resistance, [wear resistance](#), [hardness](#), modify [electrical conductivity](#), remove burrs and other surface flaws, and control the surface [friction](#). In limited cases some of these techniques can be used to restore original dimensions to salvage or repair an item.

Surface finishing processes can be categorized by how they affect the work piece:

- Removing or reshaping finishing
- Adding or altering finishing

All the broken metal will grinder by grinder machine to make the smooth surface and edge of angle.