DESIGN AND FABRICATION OF PRINTER TABLE

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

This chapter explained about the project objective, project background, project scope and problem statement that been conducted.

1.1 BACKGROUND

The main purpose for this project is to design and fabricate the printer table. The most common form of the printer desk is a variant of the ergonomic desk, having wheel to make the table ease to move, extra pocket space at the side of table and sufficient layer to keep printer paper or any document. This project also to developed an exist product in the market. This project also can create a creative idea and how to make the perfect design for the product and suitable for the costumers. As a Diploma student I must show the skill that I had learn since semester 1 to finish my product? It's including skills of using machine, drawing the products and others else before produce a new product. This final year project also makes me dependent and more responsibility in doing my work. In this project there are specific materials that use such as aluminium rods and sheet metal as a main material for printer table.

1.3 PROBLEM STATEMENT

There are problems are commonly faced by the computer table users. Below the list of problem that occur such as:

- Limited of space to store items.
- The height is too low to the most of user.
- Difficult to change the position of the printer table.

1.4 OBJECTIVE

The objective of the project is to design and fabricate a printer table with higher mobility and stability at a lower manufacturing cost:

- To design and fabricate a printer table that has extra feature.
- To make sure the printer table convenient to use.
- To improve the printer table that has been manufactured before by adding wheel to make sure it's easy to move.

1.5 PROJECT SCOPE

This project is limited within the following scopes, which are:

i. Fabricate a printer table at 860mm height, 700mm length and 500mm width.
ii. Fabricate a printer table that is easy to move by using 4 wheels.
iii. 3 layer of table, so it could be keep a lot of thing.
iv. Fabricate a pocket that is 290mm height, 260mm length and 500mm width.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter explains the review of market survey and past research effort related to printer table. Reviews of other relevant research studies are also provided. The literature has been studied on types of printer table, material usage and fabrication methods.

2.2 TYPES OF PRINTER TABLE

In the market, there are many type and design of the printer table. The famous types of the table are roller and no roller type. This roller printer table is more facilitate to the user. It is because, this table is removable. But certain people also like the no roller type. No roller type is more stable and it can't move when using the printer. So it didn't interrupt the user when used it. About the design, there are many characteristic are provided to attract the costumer to buy it.

2.2.1 Roller Type

2.2.1.1 LEMPS Printer Table

Lemps printer table is a table that only at high 30cm and has two layer of table. Therefore, it is limited to keep document or printer paper. The material use is available in chrome steel frame with wood as the table. All edge of the printer table is furnished with safety corner cap. Besides, it builds in with the wheel to make it easy to move its position.

Table 2.1: LEMPS Printer Table overview

ADVANTAGES	DISADVANTAGES
Easy to move / handle	Limited layer of rack
Small, light	Material low durability
Easy to manufactured	

Cost RM52

Size 380mm x 420mm x 360mm (H x L x W)

Figure 2.1: LEMPS Printer Table

2.2.2 No Roller Type

2.2.2.1 Slide able Shelves

A slidable shelf is a printer table that completely made up using wood. The design is more as a shelf because it has a shelf door and slide able shelf's layer. The slide able side much convenient to the user during corporate the printer. However, the printer table does not has a wheel, so it is difficult to move the table. Besides, it has a limited layer of rack to keep things or document.

Table 2.2: Slide able Shelves overview

ADVANTAGES	DISADVANTAGES
Easy to manufactured	Limited layer of rack
Small, light	Difficult to move
	Material low durability

Cost	RM68
Size	500mm x 460mm x 380mm (H x L x W)

Figure 2.2: Slide able Shelves

2.2.2.2 Under Computer Table

A under computer table is a printer table that completely made up using wood. The table only at high 30cm and has two layer of table. Therefore, it is limited to keep document or printer paper. Moreover, the printer table does not have a wheel, so it is difficult to move the table. Besides, it has a limited layer of rack to keep things or document.

Table 2.3: Under Computer Table overview

ADVANTAGES	DISADVANTAGES
Easy to manufactured	Limited layer of rack
Small, light	Difficult to move / handle

	Material low durability

Cost	RM42
Size	360mm x 420mm x 340mm (H x L x W)

Figure 2.3: Under Computer Table

2.3 TYPES OF MATERIAL

2.3.1 Chromed Steel

Chromed steel is a metal which make up by adding 2% carbon and 10% to 12% chromium to molten steel. Steel is popular with its high strength and hardness properties, the addition of Chromium improves its wear and rust resistance. The Chromium will combine with oxygen to form an invisible passive film. If the metal is scratched and disrupted the passive film, oxide will build up quickly to recover the exposed surface, thus protecting it from further oxidation corrosion. Moreover, Chromium which is a bright metal, gives shiny and attractive effect to steel while

preventing the building-up of rust. Besides, Chromed steel is magnetic and good heat and electricity conductor.

Because of the high corrosion resistance property, Chromed steel is widely used in making of cutlery, cooking pots, sink, bearing as well as construction field.

Figure 2.4: Printer table made from chromed steel

Source: Writebest

2.3.2 Stainless Steel

The three main types of stainless steels are austenitic, ferritic, and martensitic. These three types of steels are identified by their microstructure or predominant crystal phase.

Austenitic steels have austenite as their primary phase (face cantered cubic crystal). These are alloys containing chromium and nickel (sometimes manganese and nitrogen), structured around the Type 302 composition of iron, 18% chromium, and 8% nickel. Austenitic steels are not hard enable by heat treatment. The most familiar stainless steel is probably Type 304, sometimes called T304 or simply 304. Type 304 surgical stainless steel is austenitic steel containing 18-20% chromium and 8-10% nickel.

Ferritic steels have ferrite (body cantered cubic crystal) as their main phase. These steels contain iron and chromium, based on the Type 430 composition of 17% chromium. Ferritic steel is less ductile than austenitic steel and is not harden able by heat treatment.

The characteristic orthorhombic martensite microstructure was first observed by German microscopist Adolf Martens around 1890. Martensitic steels are low carbon steels built around the Type 410 composition of iron, 12% chromium, and 0.12% carbon. They may be tempered and hardened. Martensite gives steel great hardness, but it also reduces its toughness and makes it brittle, so few steels are fully hardened.

There are also other grades of stainless steels, such as precipitation-hardened, duplex, and cast stainless steels. Stainless steel can be produced in a variety of finishes and textures and can be tinted over a broad spectrum of colours.

Figure 2.5: Stainless Steel Plate

2.3.2 Aluminium

Aluminium (also known as aluminium) is the most abundant metal element in the earth's crust. And it's a good thing too, because we use a lot of it. About 41 million tons are smelted each year and employed in a wide arrange of applications. From auto bodies to beer cans, and from electrical cables to aircraft skins, aluminium is a very big part of our everyday lives.

Aluminium is a lightweight, highly conductive, reflective and non-toxic metal that can be easily machined. The metal's durability and numerous advantageous properties makes it an ideal material for many industrial applications.

Figure 2.6: Aluminium Plate

2.3.3 Mild Steel

Mild Steel is one of the most common of all metals and one of the least expensive steels used. It is to be found in almost every product created from metal. It is weld-able, very durable (although it rusts), it is relatively hard and is easily annealed. Having less than 2 % carbon it will magnetize well and being relatively inexpensive, can be used in most projects requiring a lot of steel. However when it comes to load

bearing, its structural strength is not usually sufficient to be used in structural beams and girders. Most everyday items made of steel have some milder steel content. Anything from cookware, motorcycle frames through to motor car chassis, use this metal in their construction.

Figure 2.7: Mild Steel Square Hollow

2.4 TYPES OF CASTOR

2.4.1 Lockable Castor with Bearing

This castor designs with a bearing and lockable device. The bearing allows this castor to be moved 360° movement easily. This institutional castor is ideal for any light duty application where the castor must be totally immobile when the castor brake is applied. It has a unique brake which locks both the wheel and the swivel bearing at the same time. “Total-Lock” brake insures that the swivel castor will not turn when the wheel is locked. This combination of wheel brake and swivel lock is essential for safety in some applications. It can support the load capacity up to 300 pounds per castor.

Table 2.4: Lockable castor with bearing overview

	Cost	RM8.50
	Size	50mm - Radius

Figure 2.8: Lockable castor with bearing

2.4.2 Non-lockable Castor with Bearing

This castor designs with a bearing to improve its mobility in 360° movement direction. The castor bracket is makes of stamped stainless steel, thus is high corrosion resistance. The swivels bearing is standard with a seal and grease fitting. Besides, this castor is ideal for use under wet or corrosive environment. It can support the load capacity up to 300 pounds per castor. However, it does not have a lockable device, so it is limited to be fixed in a static condition.

Table 2.5: Non-lockable castor with bearing overview

Cost	RM6.00
Size	50mm - Radius

Figure 2.9: Non-lockable castor with bearing

2.4.3 Non-lockable Castor without Bearing

This castor also known as rigid plate mount castor. It does not have both bearing and lockable device. Thus, it is unable to be locked in a completely static condition. Besides, due to the absent of bearing, it is limited to forward and backward movement only, instead of 360° direction turning. In another word, it is comparative lower mobility.

Table 2.6: Non-lockable castor without bearing overview

Cost	RM7.00
Size	50mm - Radius

Figure 2.10: Non-lockable castor without bearing

2.5 STABILITY

The term “Stability” refers to the resistant of an object to change of position or condition, which is not easily moved or disturbed. In another word, stability refers to the resistance to disturbance of equilibrium. When discuss about stability of an object, it always concern about its centre of gravity. Centre of gravity is a point at which all body’s mass is equally balanced of equally distributed in all direction. The figure 2.12 shows the centre gravity of an object. The factors in increasing the stability of an object included:

i. Centre of gravity falls within the base of support; Decrease in stability when centre of gravity becomes near to edge of base.
ii. Larger base.
iii. Greater weight.
iv. Lower of centre gravity.
v. When anticipating an oncoming force,
    - Place centre of gravity near the side of base of support expected to receive force.
    - Extending base of support in direction of expected force.
vi. Increase the friction between the contact surface of object and ground.

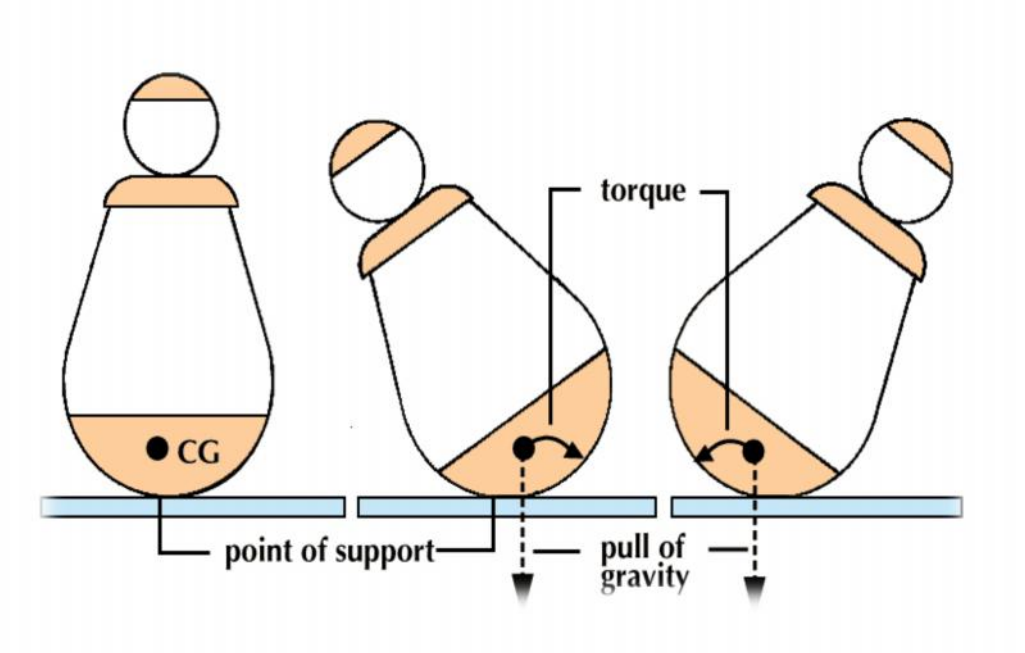

Figure 2.11: Centre of gravity

Source: Britannica.com

2.6 MOBILITY

The term Mobility is also known as Degree of freedom (DOF) of an object. In mechanics, DOF is the number of parameter that defines the configuration of a mechanical system. The degree of freedom of a body is the number of independent parameter that define the displacement and deformation of the body. This is the fundamental concept relating to systems of moving bodies in mechanical engineering, aeronautical engineering, robotics, and structural engineering.

Taking examples to explain about the degree of freedom, the position of a single car moving along a track has one degree of freedom, because the position of the car is defined by the distance along the track. Skidding or drifting is a good example of an automobile's three independent degrees of freedom. The position of rigid body in space is defined by three

components of translation and three components of rotation, which means that is has six degrees of freedom.

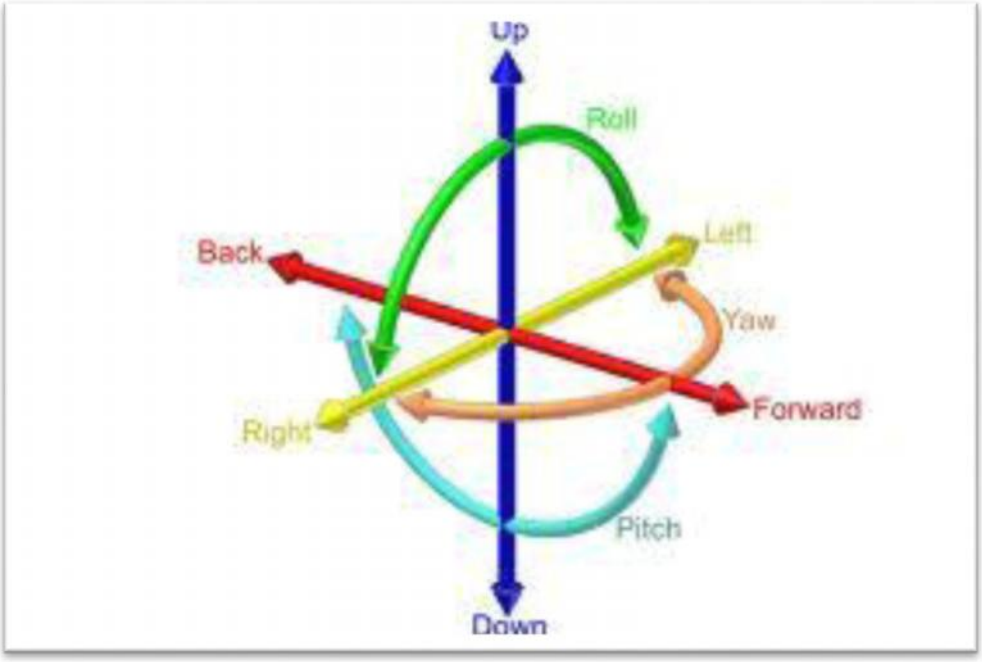

Figure 2.12: Six degree of freedom

Source: johnclarkeonline.com

2.7 TARGET USERS

Nowadays, whiteboard is widely used in human daily life especially for education and meeting purpose. Many offices, meeting rooms, schools, universities and tuition centres are using whiteboard in sharing of information. In all of these whiteboard usages, the users are mostly adult with the average age above 20 years old.

From the studied, it found that the average height of a Malaysian male adult is 1.647m and Malaysian female adult is 1.533m. This result was obtained through measurement which conducted in the year of 1996. The

graph explaining the relationship between the average heights with body weight is shown in Figure 2.14 with the explanation of BMI value.

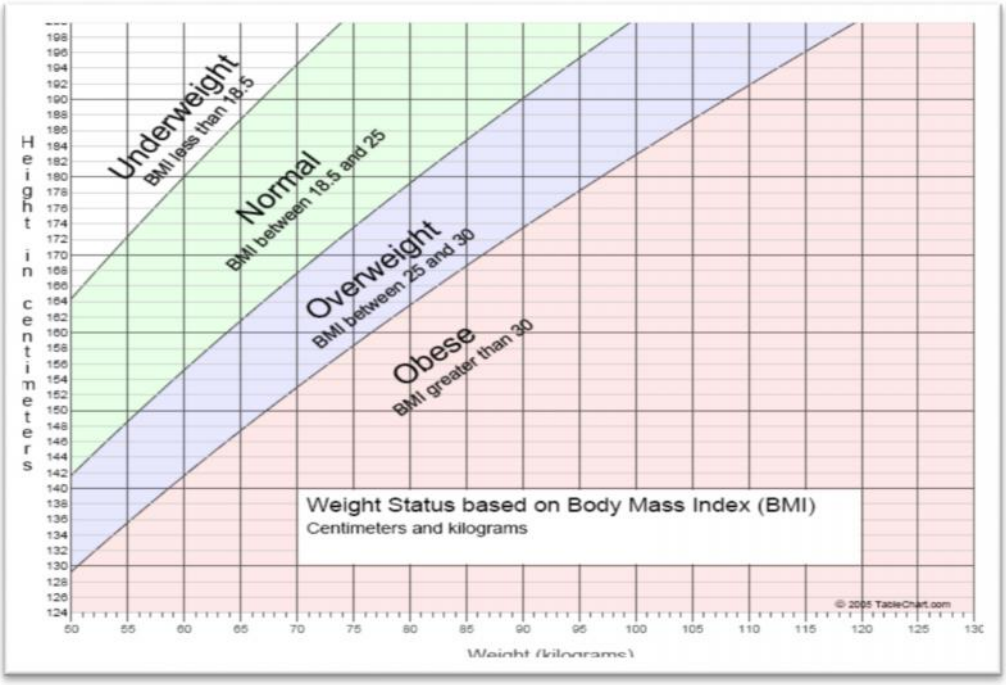

Figure 2.13: Graph of height to weight

Source: chartsgraphsdiagrams.com

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter discusses about the concept designs that have been develop during concept generation. The designs had undergoes concept selection and lastly the finalization stage before proceed to fabrication of product. It also explained about the tools and fabrication planning for the project.

3.2 CONCEPT GENERATION

3.2.1 Concept 1

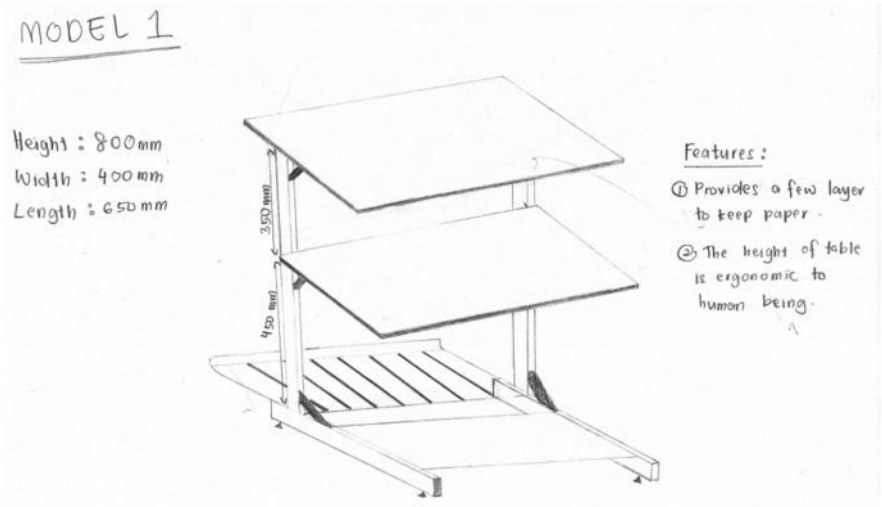

Figure 3.1: Concept 1

The concept of this printer table is three layer of printer table and multi-keeping document. It's has 800mm height, 400mm width and 650 length. Moreover, it also has an extra place at the backside of printer table. However, it does not design with a castor to make it easy to move.

3.2.1 Concept 2

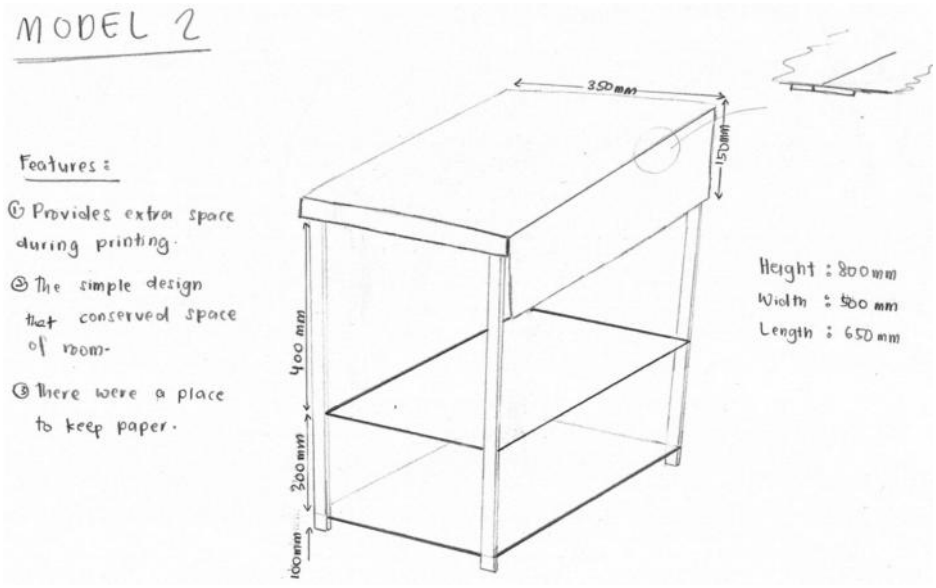

Figure 3.2 : Concept 2

The concept of this printer table is also about the three layer of printer table and multi-keeping document. It's has 800mm height, 400mm width and 650mm length. The extra feature of this concept is folded table that could be extended and ready an extra workplace during printing. However, it does not design with a castor to make it easy to move.

3.2.1 Concept 3

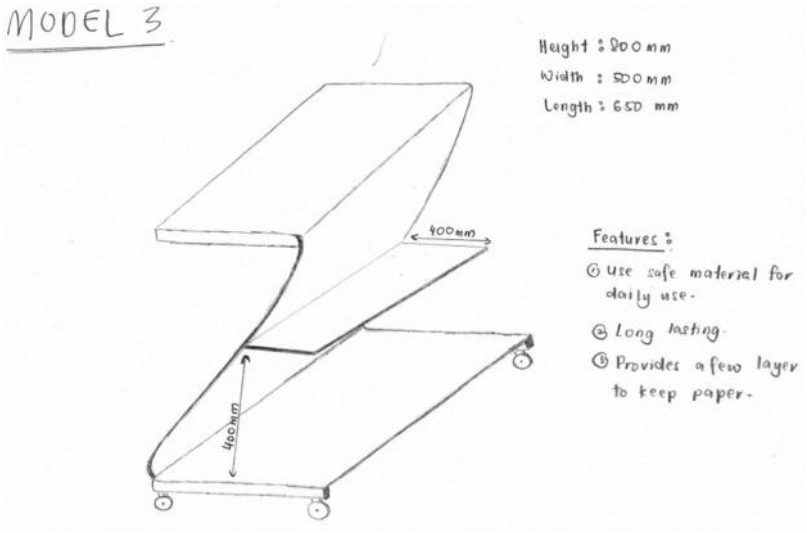

Figure 3.3 : Concept 3

The third concept is more embed appearance features, but it still functional as a printer table. It's has 760mm height, 450mm width and 650 length. It does designed with a castor to make it easy to move.

3.2.1 Concept 4

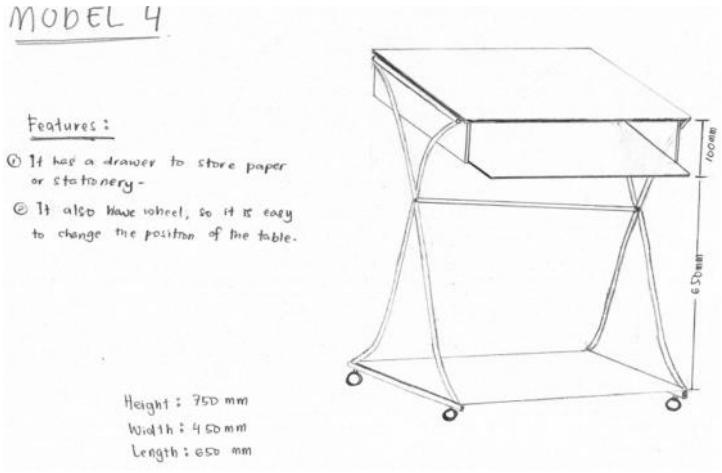

Figure 3.4 : Concept 4

This concept is more designed as a table shape without embed an appearance concept. It's has 780mm height, 460mm width and 580 length. It does design with a castor to make it easy to move. Besides it also has a withdraw as an extra features.

3.2.1 Concept 5

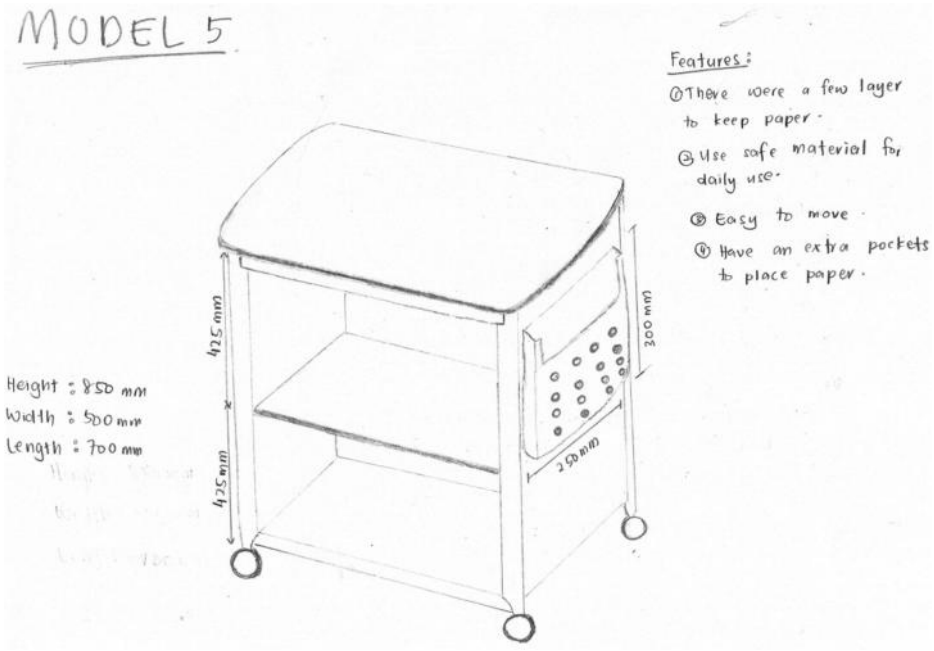

Figure 3.5 : Concept 5

The concept of this printer table is about the three layer of printer table and multi-keeping document. It's has 780mm height, 460mm width and 580 length. It does design with a castor to make it easy to move. Moreover, it has an A4 pocket at the left side of table as an extra feature.

3.3 CONCEPT SCREENING

The objective in carried out concept scoring is to make comparison among concept designs in order to improve the concept. Comparison is made in the aspects of board stability, mobility, writing tools storage site, consideration of user height and estimated manufacturing cost. In this concept scoring, I had chosen mobile double-sided stand whiteboard as the reference. The result is shown in Table 3.1.

Table 3.1: Concept screening

	SCORING OF THE MODEL					
SELECTION CRITERIA	1	2	3	4	5	Reff.
Appearance	0	0	1	1	1	0
Multi-layer of rack	1	1	1	1	1	0
Easy to move / handle	0	0	1	1	1	0
Durability	0	0	0	-1	1	0
Ease of manufacture	0	1	-1	-1	-1	0
Available cost of product	0	-1	-1	-1	-1	0
Pluses	1	2	3	3	4	
Sames	5	3	1	0	0	
Minuses	0	1	2	3	2	
Net	1	1	1	0	2	
Continue ?	No	No	No	No	Develop	

Notes:

+ = Better than reference

- = Worse than reference

0 = Same as reference

3.4 CONCEPT SELECTION

Referring to the result of concept scoring, ranking number 1 goes for concept 5, ranking number 2 goes for concept 1,2 and 3, then followed by concept 4. Hence in deciding my final concept, I would like to fabricate the best printer table with the combination of advantages between concepts ranking 1 and 2. For the aspect of total writing surface, concept 2 shows a better result but for the aspect of consideration of user height, concept 3 can perform better. Thus, by combining the advantages, a new final design concept is obtained and is shown in figure 3.5.

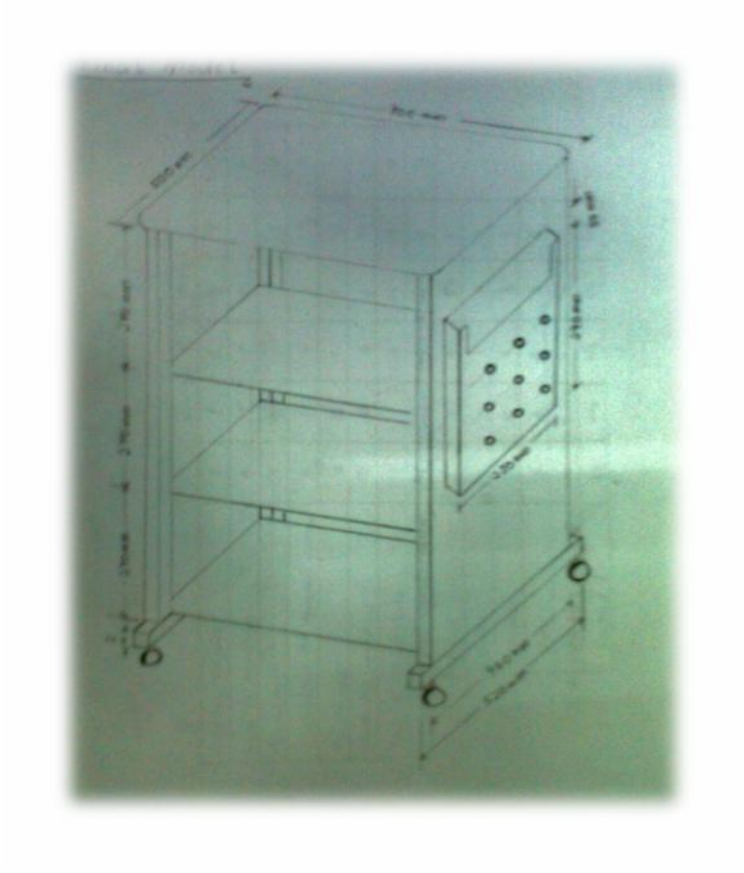

Figure 3.6: Final design concept

3.5 CONCEPT FINALIZATION

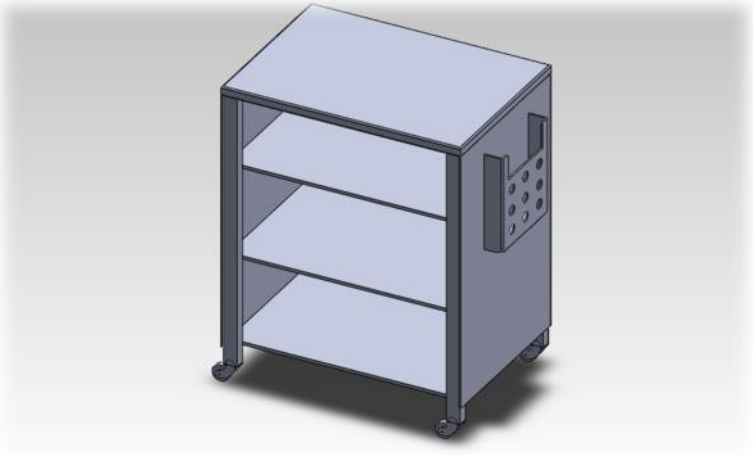

Figure 3.7: Final design

The final design consists of three layer table (860mm height, 700mm length and 500mm width), an A4 size pocket at the right side of table and four wheel at each supporting legs. This design believes will result in good mobility and stability.

3.6 MATERIAL SELECTION

Table 3.2 : List of material

No.	TYPE OF MATERIAL	SIZE MATERIAL (mm^2)	DIMENSION (mm^3)	QUATITY
1.	Mild Steel	50.8 × 50.8	810 × 50.8 × 50.8	4
2.	Mild Steel	50.8 × 50.8	380 × 50.8 × 50.8	6
3.	Mild Steel	50.8 × 50.8	520 × 50.8 × 50.8	2
4.	Stainless Steel	3	500 × 700 × 3	1
5.	Stainless Steel	3	380 × 680 × 3	3
6.	Stainless Steel	3	290 × 50 × 3	2
7.	Stainless Steel	3	290 × 230 × 3	1

3.7 FABRICATION

3.7.1 Fabrication flow

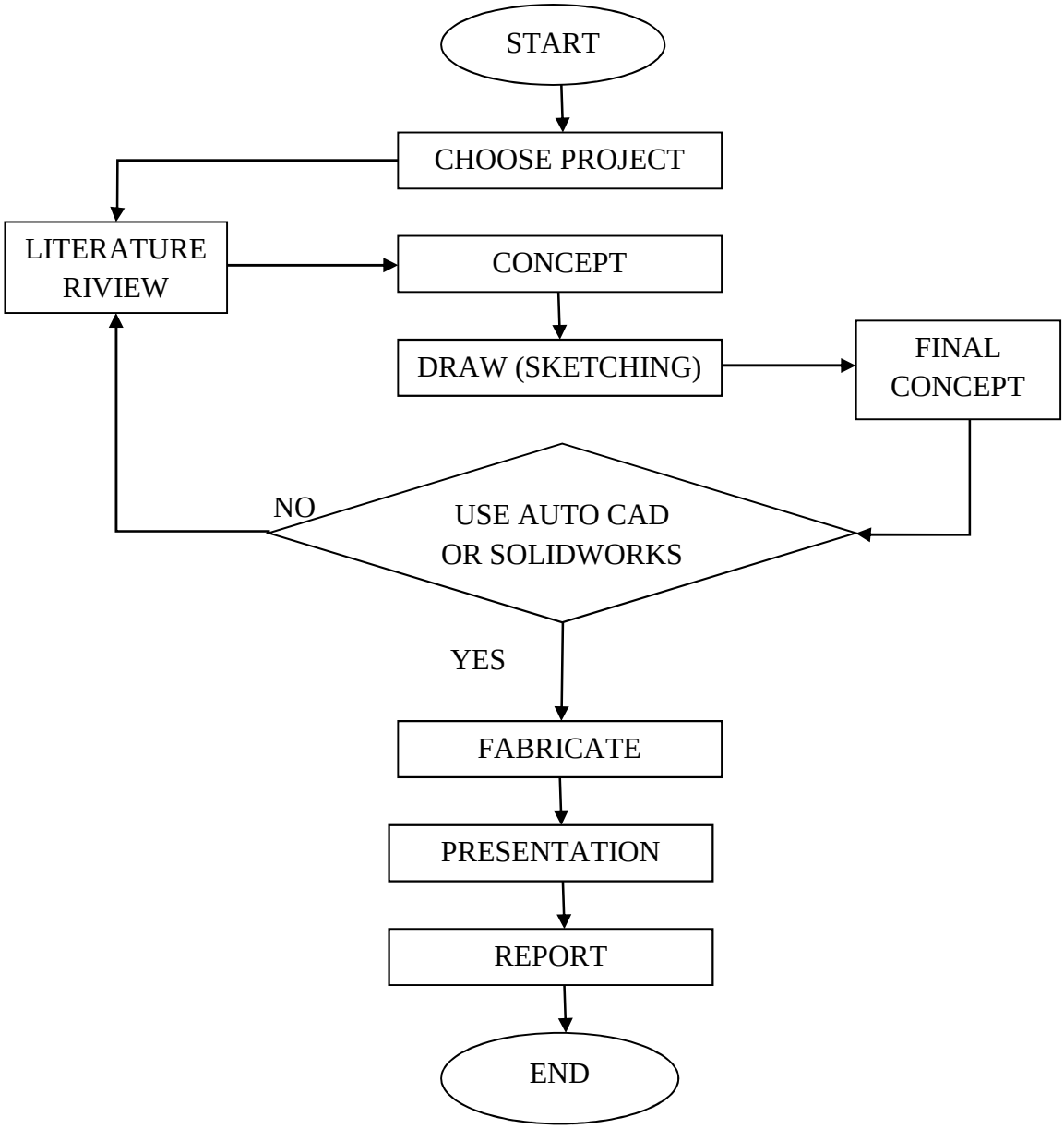

Figure 3.8: Flow chart of the project

Figure 3.7 shows the flow chart of the process that involves during the fabrication of the printer table. The processes are begin with the start and go to the title selection choose of the student. After the title

has been choosing, we go to the literature review. In the literature review, we will find 4 different type of the product that already has been in the market as a review for our project. On the concept generation, here we will know what is the best concept that we should put in our product.

After we have done make concept generation, then we have to sketch our own product based on the concept generation that we made before this. To get the finalize concept for out PTA product. After we get our finalize concept, we have to draw our product using the Solid Work software. If the drawing is failure, we will go back to the literature review, and back to the concept generation process again to find the mistake. If the drawing is going smooth without problem, then we will fabricate our product.

When all the fabrication process is done, we will present our product to the panel. The last step for this flow chart is submitted the report to our supervisor to approve that we have done make our Final Year Project.

3.7.2 Fabrication process

i. Firstly, cut two square hollow of mild steel at 520 mm, four pieces at 810 mm and another six pieces at 380mm.

Figure 3.9: Cutting process

ii. Then, use wire welding to build the printer table's frame.

Figure 3.10: Joining Process

iii. Cut the sheet metal plate according to the required dimension by using miter cutter and grinder machine.

Figure 3.11 : Cutting Process

iv. Drill a hole to the part that needs to be assembling with drilling machine.

v. Bend a bit for each side for riveting.

vi. Lastly, all the part will be assemble by riveting it by insert rivet into the hole that has been drill earlier.

vii. Screw wheel to the base of the printer table's frame.

3.7.2.1 Dimension measuring

Dimensional measurement is the process of estimating the extent of some specific attribute of an given object, such as its length or depth relative to some standard (unit of measurement), such as a meter or inch. A determination of the dimensions, magnitude, or capacity of anything. Measurement is not limited by physical quantities, but can extend to quantifying almost anything imaginable. Examples of measurement range from length, width, and depth to determining the amount of uncertainty of measurements.

Figure 3.12: Measuring Tape

3.7.2.2 Material cutting

During material cutting process, miter cutter is used to cut hollow square mild steel. The machine is a power tool used to make a quick,

accurate crosscut in a work piece, at 45 degrees. Common uses include framing operations and the cutting of moulding. Most miter cutter is relatively small and portable, with common blade sizes ranging from eight to twelve inches.

The miter cutter makes cuts by pulling a spinning circular blade down onto a work piece in a short, controlled motion. The work piece is typically held against a fence, which provides a precise cutting angle between the blade and the longest work piece edge. In standard position, this angle is fixed at 90°.

Figure 3.13: Cutting Process

Moreover, shearing cutter machine also has been used to cut sheet metal. Shearing machine, also known as die cutting, is a process which cuts stock without the formation of chips or the use of burning or melting. Strictly speaking, if the cutting blades are straight the process is called shearing, if the cutting blades are curved then they are shearing-type operations. The most commonly sheared materials are in the form of sheet metal or plate, however rods can also be sheared. Shearing-type operations include blanking, piercing, roll slitting, and trimming. It is used in metalworking and also with paper and plastics.

Figure 3.14: Stamping Machine

3.7.2.3 Shape forming

Bending refer to the behaviour of subjecting an external load perpendicular to the longitudinal axis of a slender structural element. Bending can occur locally in all objects. To make the term of Bending more precise, engineers refer to the bending of rods, bending of beams, bending of plates, bending of shells and so on based on the shape of the structural element.

In a horizontal beam loaded at middle and supported at the ends, the material at the over-side of the beam is compressed while the material at the underside is stretched. There are two types of internal stresses developed by lateral loads, which are shear stress (parallel to lateral loading plus complementary shear stress on planes perpendicular to the load direction), compressive stress (develop at upper region of beam) and tensile stress (develop at lower region of beam).

Figure 3.15: Bending machine

Source: endmillwebsite.com

3.7.2.4 Drilling

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid material. It cuts by applying pressure and rotation onto the work piece through using a drill bit, which will form chips at the cutting edge. Chips may be long spirals or small flakes, depending on the material and process parameters.

There are variety of drill bits and every different drill bits result different hole making. For example like a centre drill, it is used to provide a starting hole for a larger sized drill bit; for step drill, it is used to produces holes of two or more different diameters; for core drill, it is used to enlarge an existing hole. Hence, selection of drill bits for drilling is one of the factors an operator should always concern. There are two types of holes can be produced by drilling, which are through-holes (drill exits the opposite side of work) and blind-holes (drill does not exit work on opposite side).

Figure 3.16: Drilling machine

Source: endmillwebsite.com

3.7.2.5 Material joining

Welding is a fabrication process that joins materials, usually metals or thermoplastics by causing coalescence with pressure and heat. The concept is to melt the metal and adding a filler material to form a small pool of molten material, which cools and become a strong joint.

Many energy sources can be used for welding, which includes gas flame, electric arc, laser, electron beam, friction and ultrasound. Besides, welding can be performed in various environments, like open air, underwater, or even outer space. However, welding is considered as a hazardous activity which may lead to burns, vision damage and inhalation of poisonous gases and fumes. Hence safety precaution like wearing face mask in carrying out welding is important.

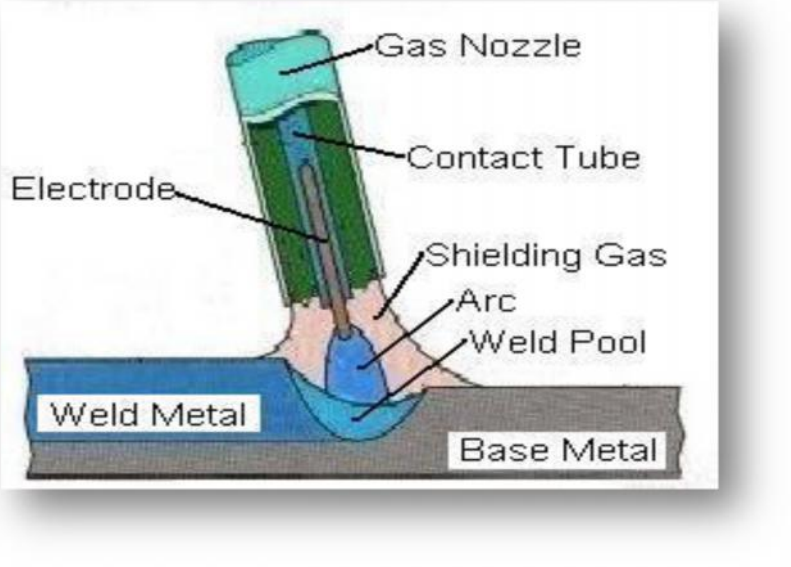

Figure 3.17: MIG welding

Source: weldingengineer.com

3.7.2.6 Finishing

Finishing processes is to improve appearance, adhesion or wettability, 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. An unfinished surface is often called mill finish.

Surface finishing processes can be categorized by how they affect the workpiece. For example, the process could be doing by removing or reshaping finishing and altering finishing. Mechanical processes may also be categorized together because of similarities the final surface finish.

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter will further verify about the fabricated finalize concept. Explanation regarding about design of the product with more specific data such as details like weight and its working mechanism is provided as well. Cost analysis will be explained in this chapter.

4.2 RESULT

There was a lot of printer table that have been design out there. So, as for my final year project, I decided to fabricate a printer table. I have been conducted a questionnaire about my project to some of UMP students. The survey was given to student from Faculty of Manufacturing Engineering and Faculty of Electrical and Electronic Engineering. The result have been showed as followed.

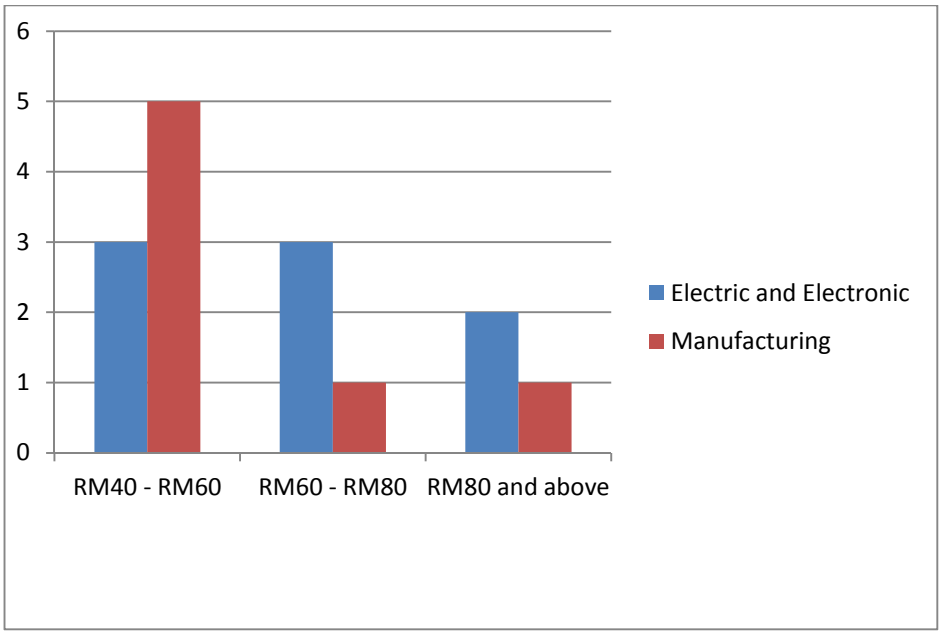

Figure 4.1: Price of the product

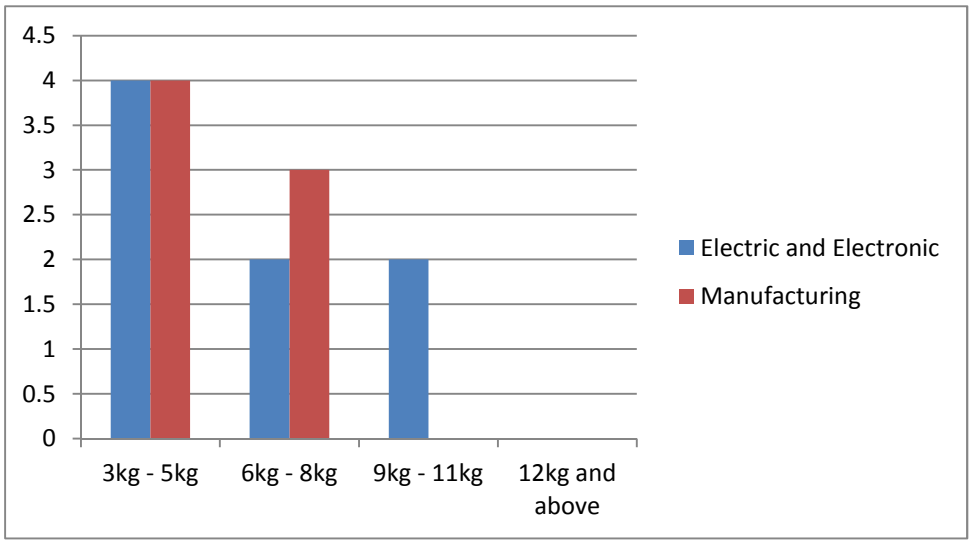

Figure 4.2: Weight of the Product

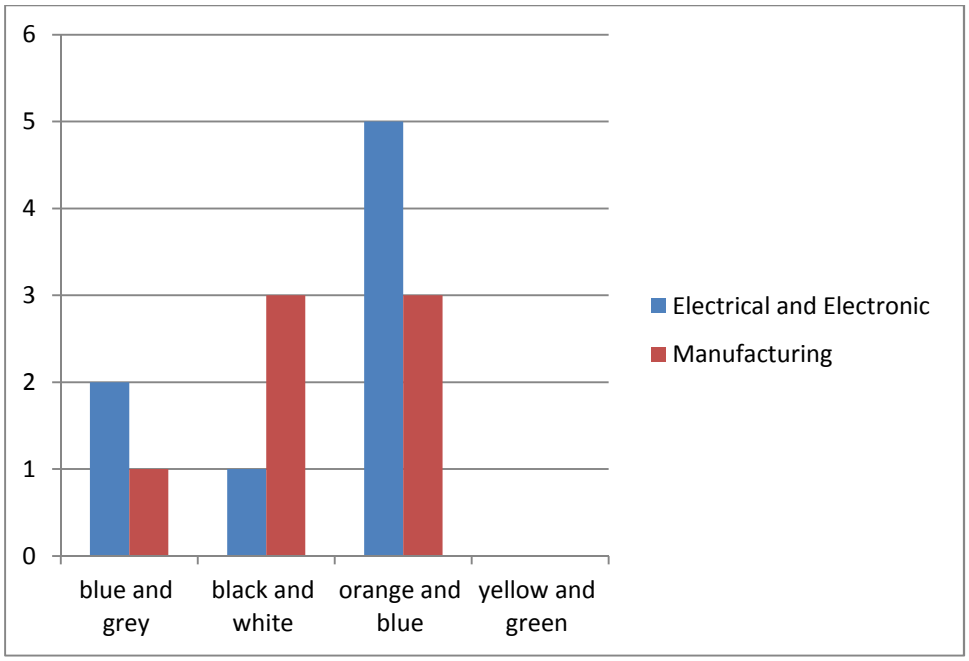

Figure 4.3: Colour of The Product

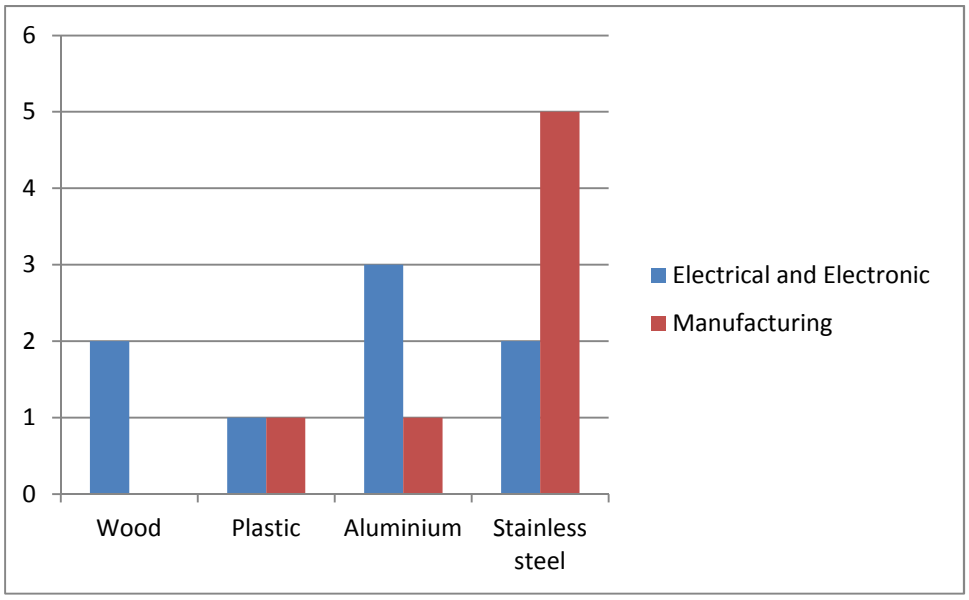

Figure 4.4: Material use of The Product

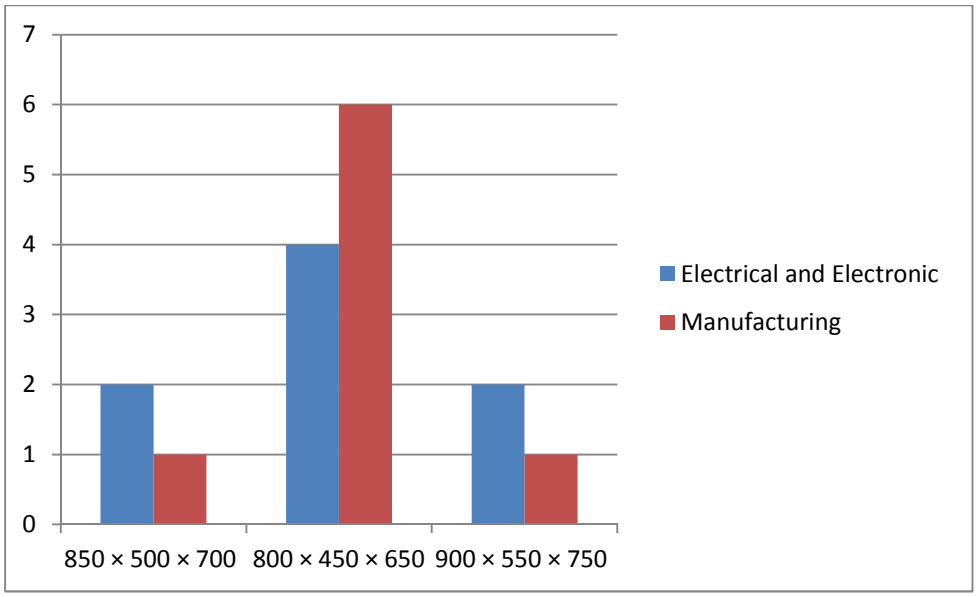

Figure 4.5: Size of The Product (in mm)

As we can see on the chart, there were 53% preferred price range from RM 40 - 60, 27% choose RM 60 - 80 and 20% choose RM 80 and above. For the weight of product, 53% preferred 3 – 4 kg, 34% choose 6 – 8 kg, 13% choose 9 – 11 kg and 0% for 12 kg and above. The range for colour is orange and blue has been choosing about 53%, black and white is 27%, blue and grey is 20% and yellow and green 0%.

The material was choose by the students are plastic about 13%, wood is 13%, aluminium is 27% and stainless steel is 47%. Therefore, the final material used to fabricate the product is stainless steel. Lastly, the size of the product are 800mm × 450mm × 650mm is 67%, 850mm × 500mm × 700mm is 20% and 900mm × 550mm × 750mm is 13%.

As a result, the printer table is painted with blue oil based paint and orange spray. This table consist four tyres thus it can move the rack easily. The upper part is suggested to keep a printer because at the height of the product is convenient for a user during printing process. The middle part is used to store printing paper or any document paper. Lastly,

the lower part is used to keep printer ink. The arrangement of the paper or the stationary is depend on the user.

Figure 4.6: Printer Table

4.2.1 STRESS ANALYSIS

This analysis is to calculate how many load this printer table can sustain. Its analysis is based on its actual size.

Figure 4.7: Analysis at the frame and plate

Stress to be analysis is on the bottom part. Since it has four tyres to support, it, the distribution force acting on the plate surface area will be divided by four.

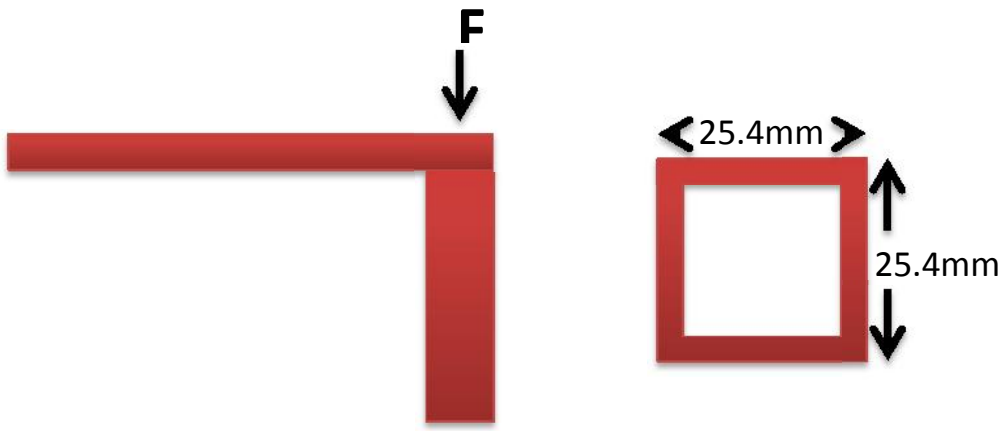

Figure 4.8: Hollow squares from side view

Assume that distribution force is 2kN.

$A = (25.4 \times 25.4)\ (10^{-3})$

$= 6.452 \times 10^{-4}\ m^2$

$\sigma = P/A$

$= 500 / (6.452 \times 10^{-4})$

$=$ **0.775 Mpa**

Refer to Table in Mechanics of Material, 6th Edition, Mc Graw Hill (pg.A12)

Tension stress, $\sigma_y = 250$ MPa

$F = (1/4)(2000)$

$= 500$ N

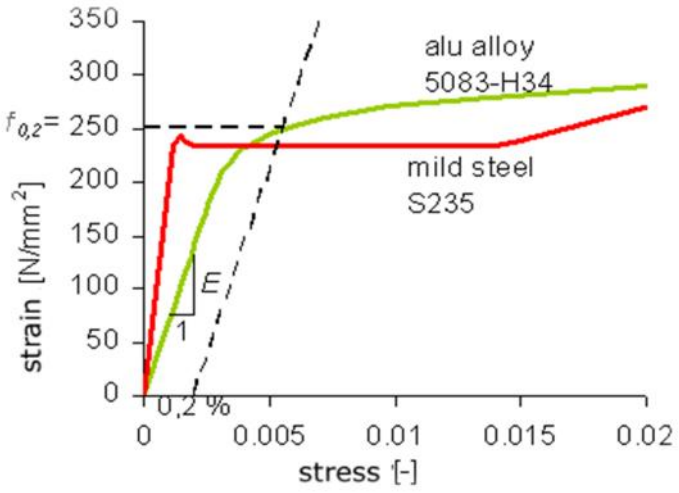

Figure 4.9: Stress and Strain Graph

4.2.2 Compare with yield stress

Yield strength for mild steel = 250 Mpa
Maximum tensile stress = 0.775 Mpa

Result: Tensile stress < yield strength

4.2.3 Analysis from the result

From the result above in 4.2.1, we know that the tensile stress is less than the yield strength. It proves us that the plate with the support from frame and tyres can sustain the load. As long as it did not exceed the yield strength because whenever it reaches or exceed the yield strength, the metal will undergo plastic deformation and will result in failure. Since the size of the fabrication has been scale down to half of its actual size, means it also can sustain half of the load from the actual size that is 200kg.

4.3 DISCUSSION

The problem faced during fabrication and defects that occurs during fabrication are specifically mentioned.

4.3.1 TYPE FO DEFECTS

There are plenty of defects that occur during the fabrication of the chemical racks. Some of the defects occur due to the error of machine while others are mainly due to lack of fabrication skills. The types of defects in the product are as below:

a) Due to lack of skills in handling the Metal Inert Gases welding, sometimes there is hole when there is over heat during welding.
b) In addition, the rack is not perfectly 90 degree straight because due to lack in welding skills.
c) Not only that, there are some gap between each hollow square that are join by the welding because it is no accurately cut by the chop saw.
d) The gaps also occur because burring process is not perfectly done well. Thus, during welding, the burr distract the joining of the hollow square and that result show that the frame not perfectly straight.

4.4 PROBLEM FACED

During fabrication, the biggest problem faced is the material selection. The material selections supposed to be done in a week. However, the material is not sufficient in the store. Thus, this leads in the delay of fabricating because the stock arrives the next week of the schedule time. Not only that, nozzle of the MIG welding always stuck

with the melting wire, this also the affect the fabricating schedule. The other problem faced is the machining tool such as portable grinder and hand drill are very difficult to get in the lab since there are so many students using it at the same time. If the problem is not going to be settled, it will also bring difficulties to the other students in the future.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This final chapter emphasizes on conclusion and recommendation regarding about the fabricated project. The conclusion covers the throughout conclusion of all the process involved in producing the chemical rack. Recommendations are given in order to improve the product in future.

5.2 CONCLUSION

As a conclusion, the objectives of fabricating printer table are achieved except the extra pocket to keep a document. This is because the material is not sufficient and it is only enough to be used only for the wall to prevent the paper from fall off the table. The printer table will help the user to use the printer conveniently. Moreover, it also help the user storing document in term of arrangement and labelling. This is because, the table provide an enough space to place for users to put label for the document that their storing. The printer table can be move easily during cleaning or any situation that needed to move the table. I have faced a lot of troubles and obstacles while I am fabricating this printer table. The breakdown of several important machines such as MIG welding machine at Pekan Mechanical lab has given enormous amount of

pressure. I was struggling with time in order to finish up my project right on time. I have given all of my hard work, knowledge that I have gained so far and mechanical skills that I have developed to manufacture this product. I have learned a lot along the way I am fabricating the printer table related to machining skills, self-discipline and time management.

5.3 RECOMMENDATION

There are some recommendations and ideas that can be applied onto the printer table in order to improve the function of the product and make it more useful. The recommendations are as below:

i. Design

The design can be improved by using tyres with large surface area because the larger the surface area will reduce the stress that action towards the surface area.

ii. Raw material

The weight of the printer table can be reduced if material such as Perspex is used to replace the plate with thickness 3mm.

iii. The design of the printer table will be modified to have a hole to keep wire to prevent mess.

iv. More combination of colours for the printer table.

v. Adjustable rack height for keeping documents.

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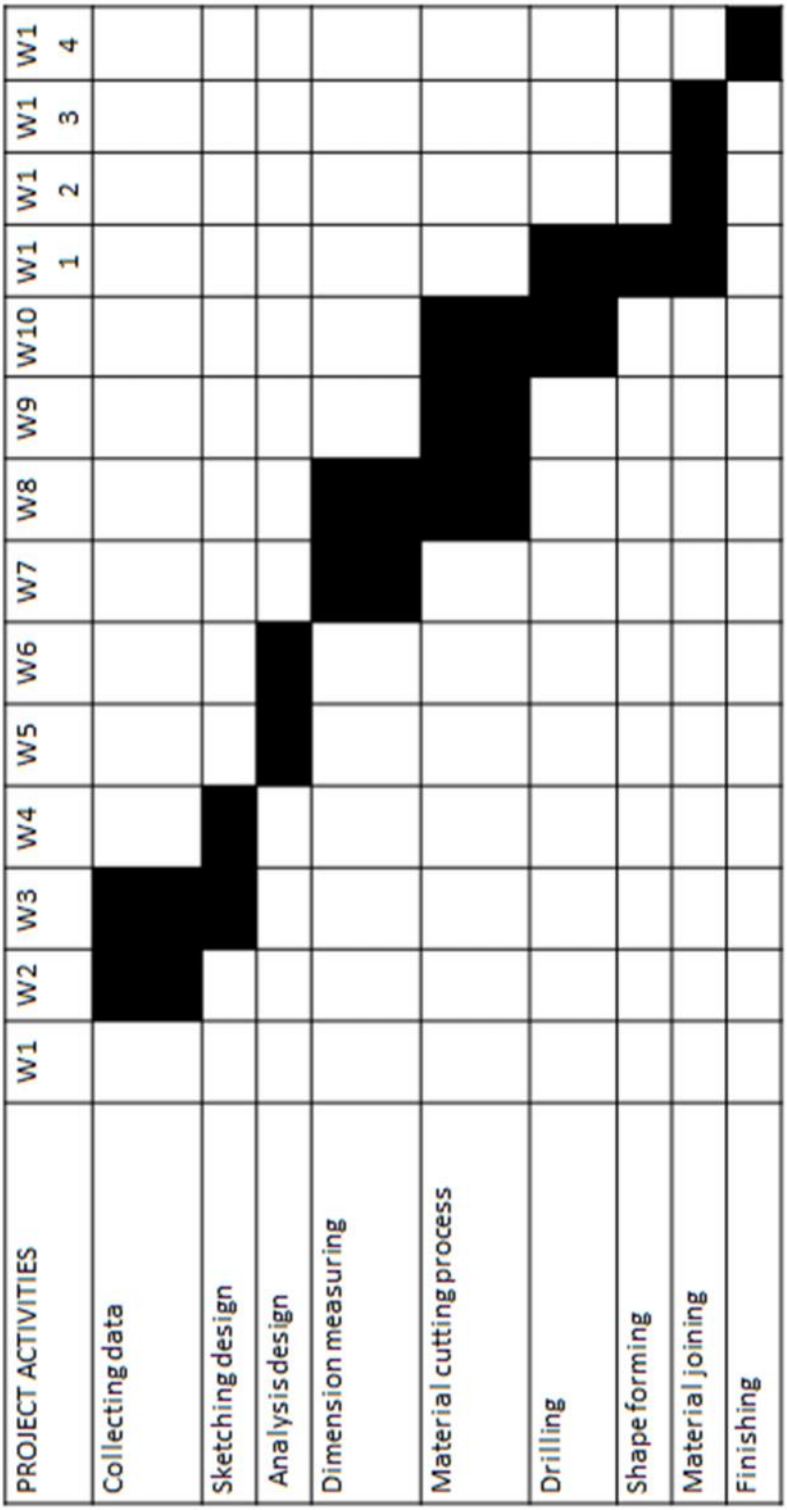
APPENDIX A


PROJECT ACTIVITIES
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W1 1
W1 2
W1 3
W1 4
Collecting data
Sketching design
Analysis design
Dimension measuring
Material cutting process
Drilling
Shape forming
Material joining
Finishing

APPENDIX B

QUESTION SURVEY FOR PRINTER TABLE

FACULTY :

YEAR :

GENDER : ☐ MALE ☐ FEMALE

1. What is your printer at home/room/office?

☐ PIXMA E610 ☐ PIXMA X927 ☐ SAMSUNG ML-2164

☐ HP DESKJET INK 2515 Others : _____

2. Do you have a table to keep your printer ?

☐ YES ☐ NO

3. How frequently do you change your printer table position ?

☐ Monthly ☐ 6 months ☐ 3 years and above

☐ 3 months ☐ annually

4. Do you prefer moveable printer table?

☐ YES ☐ NO

5. What is the price range you think is reasonable for a printer table.

○ RM40 to RM60 ○ RM60 to RM80 ○ RM80 and above

6. What is the weight range you think is suitable for a printer table do you look for.

○ 3 to 5 kg ○ 6 to 8 kg ○ 9 to 11 kg ○ 12 kg and above

7. What is colour would you choose for your printer table.

○ red and white ○ black and white ○ blue and grey ○ yellow and green

8. How long do you expect your printer table lasting.

○ 1 – 2years ○ 3 – 4years ○ 5 – 6years ○ 7 – 8years

9. What type of material would you like your printer table to be made of ?

○ plastic ○ wood ○ stainless steel ○ aluminum

10. Do you look for a printer table that has a hole to keep wires in order to prevent mess.

☐ YES ☐ NO

11. Do you prefer to bug a multi-function printer table that can keep printer paper and computer as well.

☐ YES ☐ NO

12. What is the size of printer table that you prefer.

○ 800mm × 450mm × 650mm ○ 900mm × 550mm × 750mm

○ 850mm × 500mm × 700mm

13. In your opinion, do you think this product is suitable for you ?

☐ YES ☐ NO

14. Will you recommend this product to your friend/colleagues ? Please state the reason why if no.

☐ YES ☐ NO

_____

_____

_____

15. Is there other criteria/specifications you look for when buying printer table ? Please state the criteria/specifications that you look for if you say yes.

☐ YES ☐ NO

_____

_____

_____

SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion this project is satisfactory in term of scope and quality for the award of the degree of Diploma of Mechanical Engineering.

Signature :
Name of Supervisor : MR WAN ANUAR BIN WAN HASSAN
Position : TUTOR
Date : 14th JUNE 2013

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature :
Name : HADIANATUN SAADIAH BINTI JASNI
ID Number : MB 11147

Date : 14 JUNE 2013

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My sincere thanks go to all my classmate and members of the staff of the Mechanical Engineering Department, UMP, who helped me in many ways and made my stay at UMP pleasant and unforgettable. Many special thanks go to member engine research group for their excellent co-operation, inspirations and supports during this study.

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ABSTRACT

Creativity of idea is very important in designation. It is because, idea very important to produce a quality, interesting and unique product. As a new product for customer, this printer table is design followed need characteristic such as easy to handle, multifunction and attractive. In this project, main objective is to create and design a new product based on the existing product in the market. This project are using of various kind of mechanism that have in mechanical laboratory such as aluminum square hollow rod, wheel, welding, rivet and sheet metal. These printer table projects are need multiple method like measurement, marking, cutting, joining and assembly process. This process are important because its involve student skill of using a tool and machine. Besides that, it also can make a student learn something new to increase a creativity of thinking and think to produce interesting product for the future market. This product also must have a characteristic like toughness. It also must be analysis at first to know its strength and what the problem happened on this product. These projects make the student more discipline, punctuality, create a leadership skills and have a good planning in order that can practice it in real situation at the work place.

ABSTRAK

Kreativiti idea adalah penting dalam melaksanakan sesuatu tugas. Hal ini kerana, kreativiti idea seseorang individu itu mampu menghasilkan produk yang berkualiti, menarik serta unik. Tambahan pula produk ini dihasilkan berdasarkan inovasi permintaan pengguan. Mejamesin pencetak ini adalah reka bentuk yang menekankan ciri-ciri seperti berikut, mudah untuk mengendalikan, pelbagai fungsi dan menarik. Dalam projek ini, matlamat utama adalah untuk melaksanakan inovasi terhadap produk yang sedia ada di pasaran. Projek ini menggunakan pelbagai jenis mekanisme yang ada dalam makmal mekanikal seperti keluli segi empat sama sisi, roda, kimpalan, rivet dan lembaran logam. Selain itu, projek ini juga memerlukan pelbagai teknik seperti pengukuran, penandaan, memotong dan proses pemasangan. Proses ini adalah penting kerana yang melibatkan kemahiran pelajar menggunakan alat dan mesin. Disamping itu, ia juga memdedahkan pemikiran pelajar terhadap sesuatu yang baru untuk meningkatkan kreativiti berfikir dalam untuk menghasilkan produk yang menarik untuk pasaran masa depan. Produk ini juga mesti mempunyai ciri-ciri seperti kekukuhan yang tinggi. Pengiraan analisis bagi mengetahui ketahanan produk telah dilaksanakan. Akhir sekali, projek ini sangat membantu dalam mendisiplin pelajar menepati masa, mewujudkan kemahiran kepimpinan dan mempunyai perancangan yang baik supaya boleh mengamalkannya dalam keadaan sebenar di tempat kerja.

TABLE CONTENT

CHAPTER 4 RESULTS AND DISCUSSION

CHAPTER 5 CONCLUSION

LIST OF TABLES

LIST OF FIGURES