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ABSTRACT

In this project, this dining chair for child is designed to make parents easier to handle their child during in daily activities. The objectives for my project are to make the chair is suitable in any areas either at home or outside. Besides that, this project is designed to save of space when use or after use it. We can easier to carry and also storage the dining chair anywhere we want to go such as travelling and so on. This involves the process of designing the dining chair for child by considering the shape, the ergonomic factor and also the safety factors. Several methods and processes involved are conceptual design, material selection, cutting, drilling, welding and finishing. After all the processes had been done, this dining chair may help us to understand the fabrication and designing process that involved in this project.

ABSTRAK

Dalam projek ini, kerusi kanak-kanak ini direka untuk memudahkan ibu bapa dalam urusan penjagaan anak-anak dalam aktiviti seharian. Objektif dalam penghasilan projek ini adalah untuk menghasilkan kerusi makan yang sesuai yang sesuai digunakan di mana sahaja tempat samaada di rumah atau di luar rumah. Produk ini juga di reka untuk mengurangkan penggunaan tempat ketika mengunakan atau selepas mengunakannya. Ini juga dapat memudahkan penyimpanan kerusi makan ini ketika hendak dibawa bersiar-siar di luar kawasan rumah. Proses ini melibatkan proses mereka bentuk kerusi kanak-kanak dengan mengambil kira bentuk, factor-faktor ergonomik dan juga factor keselamatan. Selepas rekaan itu siap, ia telah dihasilkan kepada produk yang sebenar di mana rekaan tadi digunakan sebagai rujukan. Beberapa cara dan proses yang terlibat adalah rekaan konsep, pemilihan bahan, proses pemotongan, proses menebuk lubang, proses mengimpal dan kemasan.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT INTRODUCTION

This project presents design and fabricate of an adjustable and portable dining chair for child that considers safety, space and ergonomics factor. This dining chair would be different from existing dining chair in market nowadays. The Diploma final year project allocates the duration of one semester, this large man-hour project requires significant efforts of the student to participate. Basically the entire Portable and Adjustable Dining Chair project could be divided into three stages which are concept review and fabrication, designing and make finishing.

The Portable and Adjustable Dining Chair for Child is equipped by using all items and methods for instance rod hollow steel, aluminium sheet plate, steel rod and also skills in manufacturing processes MIG welding to join the parts, drilling, shearing and bending. The advantages of the proposed dining chair to be developed can be seen that it portable which can be easily storage, travelling and saves on spaces.

The process of fabrication is initiated from conceptual design stage by considering the advantages as well simplicity. In order to make safety and ergonomic factor will be taken. Practical fabrication and design involves the measurement, cutting the materials into required size and shape, assembly and making finishing.

1.2 PROBLEM STATEMENT

Most of the current dining chair in market nowadays just designs to make it look modern and beautiful but the functions not suitable for child used. Besides that the current product need a spaces when to used or storage, and also it difficult to transferable to another place like to go travelling.

It is important to further improve the current design of dining chair for child, so that is more efficient to use.

1.3 SCOPES OF THE PROJECT

a) Safety

i. Can attaches securely and safely to most of dining chair and ensure a good fit to either round, curved or square backed chairs, and it is secured in place with a strap.

ii. Mounting the chair is quick and easy to do, simply place the dining chair atop the chair, hook the arms onto the back.
iii. Also will includes with the plastic lining at the bottom of arms chair that will make sure the chair cannot slide down form the high chair.

b) Ergonomics

i. Easy to use and easy when handling based on the design and material being used to produced the product.
ii. The product is light in weight that made from hollow steel and sheet plate.
iii. Has a comfortable cushion and portability tray that parents can use it or not for their child.

iv. Can be use for children aged from about seven months to around three years of age.
v. It is portability when the chair folds flat for transport or storage.

c) Aesthetics need

i. Small size – That make it easy to use and storage for go travelling or after use it.
ii. Light in weight – That make it easy to carry and hold from one place to another.

d) Material considered

i. Rectangular hollow steel
ii. Rod hollow steel
iii. Aluminium sheet plate

1.4 PROJECT OBJECTIVES

There are two main objectives to achieve in this research which are:

i. Design and fabricate the adjustable and portable dining chair for child that suitable for any chair either round, curve or square back chair and also suitable for any areas.
ii. Design and fabricate the dining chair that can be folded flat for easy for storage and traveling.

1.5 PROJECT PLANING

This project started with made a research and literature review. It is from internet, magazines, public areas and my supervisor that related to my project title. All of this literature review takes about three week. I also do my schedule management for my project. This is done by using Microsoft Excel Worksheet using Gantt chart system.

The next week I have been submit my project title acceptance form and continue detail research in adjustable and portable dining chair that it takes a week to be done.

After all of literature review done, I must find out what are the advantages and problem or weakness about the current product in the market nowadays. After that I will sketch my ideas for making a new features design. I have sketched the three ideas before I decide the best ideas that I choose for PTA project. The sketching of the seat takes about two weeks to be done. The sketching done using manual sketched hand at A4 size paper.

After decide the best ideas that have been choose the sketching concept idea transfer into Auto CAD and SolidWork with actual dimension.

The next task is preparation of progress presentation or mid presentation, both of these tasks takes one week to be done. These mid presentations have been done at week seven. On this week I have to prepare the slide presentation and speech for the presentation.

The fabrication process is started on week eight. For the first fabrication is must fabricate the arms chair that have a hook for attaches at the backed chair between 30-40 cm height. After that I have make the ***'H'*** support and sit place that will be joint with the arms. For the finishing I will spray my product to make it look more smooth and beautiful. Fabrication stage is taking a much time to complete. This task scheduled takes several weeks to finish.

Lastly, the final report has been written and prepared for presentation. This will take about one week to prepared and accomplish. A report is guided by UMP thesis format and also guidance from supervisor. Due to any problems that student face, the management has agreed to extend the time of submission of the report and presentation. All task scheduled takes around fourteen weeks to complete.

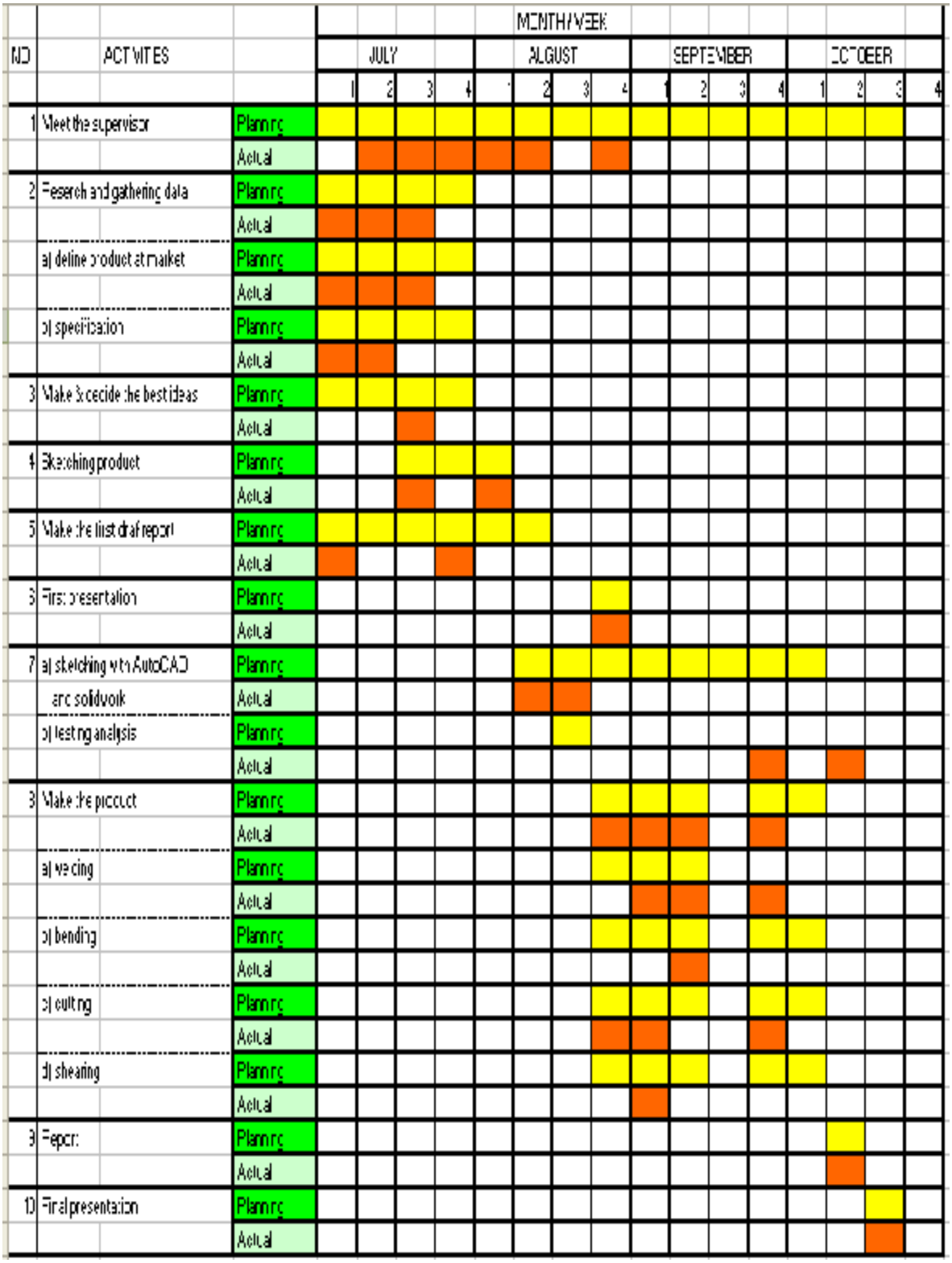

Table: 1.1 Gantt chart project

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Initially, the dining chair for child is designed as one product that height chair, look modern design and beautiful, and therefore difficult to move from one place to another.

Additionally, a design project for a new product or some feature of a product can be initiated by the desire to redesign it. Redesign is fostered by market demand for a new model or the desire to include a new technology in an existing product. Redesign can also be initiated to fix a problem with an existing product, reduce product cost, simplify manufacturing, and respond to a required change of materials or for many reasons. Often the desire to change the product design is the need of the product to be less expensive, to have new features or to last longer.

2.2 HISTORY OF DINING CHAIR FOR CHILD

This molded plywood chair is part of a suite of furniture the Eameses designed in 1946 specifically for children. This project reflects an increasing interest in the postwar period in creating modern furniture, toys, and other objects for the use and benefit of young children. While recalling their other popular plywood chairs of this period, the LCW (Lounge Chair Wood) and DCW (Dining Chair Wood), this chair is simpler in design and construction. It is comprised of a single piece of molded plywood, draped into a sturdy, durable form, built to withstand the rigors of playtime while providing comfort and support to young, growing bodies. The heart-shaped cutout in the center of the chair back is a reminder of the Eames' strong appreciation of folk art and culture, in this case, Charles' interest in Swedish folk art. Gift of Daniel Wolf, 1986. Molded plywood; H. 14 1/2 in. (36.8 cm), W. 14 1/2 in. (36.8 cm), D. 10 1/4 in. (26 cm). [1]

(a)

(b)

Figure 2.1: Child's chair

2.3 TYPES OF DINING CHAIR

Several Dining Chair for Child with various function have been found.

2.3.1 **High Chair Baby** - These high-rising youth chairs fit nicely at any table, giving your child the boost they need to reach their food. His or her feet are not supported to allow freedom of movement. Have a long legs that suitable used for height of dining table. This product is made from wood that easy to fabricate and more safely to use by children. (Figure 2.2)

Figure 2.2: High Chair Baby

2.3.2 **Custom Stain Chair** - With an oversized eating tray, you can fit a four course meal on it; or just allow extra space that mess that will surly result from an everyday meal. Made from wood that have smooth surface and provide the safety of child used. The children sit in this dining chair in an ergonomically correct position with a straight back and have a place to put their arms. His or her feet are not supported to allow freedom of movement. (Figure 2.3)

Figure 2.3: Custom Stain Chair

2.3.3 **BackGo Chair** – This product is lightweight and includes with padded back support that can be secured to chairs, floor, wheelchairs, and strollers. It also simple to use in a home, school or when traveling. But it have limitation for kids movement if use the strap and not suitable for kids that seven moths to one year of age. It made from mild hollow steel that has strength that can load heavy weight. Have a 30 cm height and 30 cm wide of BackGo chair. (Figure 2.4)

Figure 2.4: BackGo Chair

2.3.4 **Yeppi's Baby Chair** – Comfortable cushion and modern design. This product also has been design with a safety that it has wheels lock to keep chair in place. However, this product just suitable for baby that are one year and above and also suitable for home use only. It made from plastic that give it more light than steel that commonly used for design the product.(Figure 2.5)

Figure 2.5: Yeppi's Baby Chair

2.3.5 **High Chair** – Suitable used for all ages of child and have a comfortable seat that make from plastic. Not easy to damage because it make from steel. Have long legs that suitable use for whole dining table where ever like home or outside. However, the size of the design will need a space to use and storage. (Figure 2.6)

Figure 2.6: Baby Chair

2.4 JOINING METHOD

From our study, several joining process must be done to assembly, the process is:

2.4.1 WELDING PROCESS

MIG (Metal Inert Gas) or as it even is called GMAW (Gas Metal Arc Welding) uses an aluminum alloy wire as a combined electrode and filler material. The filler metal is added continuously and welding without filler-material is therefore not possible. Since all welding parameters are controlled by the welding machine, the process is also called semi-automatic welding.

The MIG-process uses a direct current power source, with the electrode positive (DC, EP). By using a positive electrode, the oxide layer is efficiently removed from the aluminum surface, which is essential for avoiding lack of fusion and oxide inclusions. The metal is transferred from the filler wire to the weld bead by magnetic forces as

small droplets, spray transfer. This gives a deep penetration capability of the process and makes it possible to weld in all positions. It is important for the quality of the weld that the spray transfer is obtained.

There are two different MIG-welding processes, conventional MIG and pulsed MIG:

a) Conventional MIG uses a constant voltage DC power source. Since the spray transfer is limited to a certain range of arc current, the conventional MIG process has a lower limit of arc current (or heat input). This also limits the application of conventional MIG to weld material thicknesses above 4 mm. Below 6 mm it is recommended that backing is used to control the weld bead.

b) Pulsed MIG uses a DC power source with superimposed periodic pulses of high current. During the low current level the arc is maintained without metal transfer. During the high current pulses the metal is transferred in the spray mode. In this way pulsed MIG is possible to operate with lower average current and heat input compared to conventional MIG. This makes it possible to weld thinner sections and weld much easily in difficult welding positions.

Gas Metal Arc Welding (GMAW) is frequently referred to as MIG welding. MIG welding is a commonly used high deposition rate welding process. Wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process.

2.4.2 MECHANICAL FASTENING

Two or more components may joined or fastened in such a way that they can be taken apart sometime during the products service life or life cycle. Numerous product (including mechanical pencils, watches, computers, appliances, engines, and bicycle) have components that are fastened mechanically. Mechanical fastening may be preferred over other methods for the following reasons, ease of assembly, maintenance, parts replacement, or repair, ease in creating design that require moveable joints, such

as hinges, sliding mechanism, and adjustable components and fixtures and lastly lower overall costs in manufacturing the product.

The most common method of mechanical fastening is by use of bolts and nuts. These operations are known also as mechanical assembly. Mechanical fastening generally requires that the components have holes through which the fasteners are inserted. These joints may be subjected to both shear and tensile stresses and should be designed to resist these forces.

2.4.3 DRILLING PROCESS

A drill is a tool with a rotating drill bit used for drilling holes in various materials. Drills are commonly used in woodworking, metalworking, construction and DIY.

The drill bit is gripped by a chuck at one end of the drill, and is pressed against the target material and rotated. The tip of the drill bit does the work of cutting into the target material, either slicing off thin shavings (twist drills or auger bits), grinding off small particles (oil drilling), or crushing and removing pieces of the workpiece.

Figure 2.7: Press Drilling Machines

A drill press Figure 2.7 (also known as pedestal drill,pillar drill, or bench drill) is a fixed style of drill that may be mounted on a stand or bolted to the floor or workbench.

A drill press consists of a base, column (or pillar), table, spindle (or quill), and drill head, usually driven by an induction motor. The head has a set of handles (usually 3) radiating from a central hub that, when turned, move the spindle and chuck vertically, parallel to the axis of the column. The table can be adjusted vertically and is generally moved by a rack and pinion; however, some older models rely on the operator to lift and reclamp the table in position. The table may also be offset from the spindle's axis and in some cases rotated to a position perpendicular to the column. The size of a drill press is typically measured in terms of *swing*. Swing is defined as twice the *throat distance*, which is the distance from the center of the spindle to the closest edge of the pillar. For example, a 16-inch (410 mm) drill press will have an 8-inch (200 mm) throat distance.