

PERPUSTAKAAN UMP



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AIR WITH FLIP TABLE

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ABSTRACT

In design process, many element must be consider such as customer needs, ergonomic and many more. To design something that already have in market, the customer needs is very important element to consider. One of the things that regularly used by human to sit is chair. Nowadays, many design of chair have in market. The chair with flip table is thing that commonly use in university and collage. The problem with the design of chair with flip table that use now is the site of flip table and the size of the chair. As we know, the chair just have one flip table only whether on left site or on the right site. In university, the chair with right site of flip table is usually use. It can give a problem to student who used the left hand to write. On the other hand, the design of new chair of flip table must consider this problem. The design must comfortable to all user beside it can save space.

ABSTRAK

Dalam proses rekacipta, pelbagai elemen perlu dipertimbangkan seperti keperluan pengguna, ergonomik dan lain-lain. Untuk merekacipta sesuatu yang sudah ada dipasaran, keperluan pengguna merupakan elemen terpenting untuk diambilkira. Salah satu barang yang digunakan oleh manusia untuk duduk ialah kerusi. Kerusi yang disertakan bersama meja kebiasaanya digunakan di universiti dan kolej. Masalah yang terdapat pada rekaan sekarang ialah keadaan meja pada kerusi tersebut. Seperti yang kita maklum, kerusi tersebut cuma mempunyai satu meja sahaja sama ada di sebelah kanan atau disebelah kiri. Kebiasaanya, di university dan kolej, kerusi yang mempunyai meja disebelah kanan sahaja digunakan. Hal ini akan mendatangkan masalah kepada pelajar yang menggunakan tangan kiri untuk menulis. Sehubungan dengan itu, rekaan kerusi yang baru perlulah mengambilkira masalah ini. Rekaan tersebut perlulah selesai digunakan oleh semua lapisan pengguna.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

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

Chair is one of the invention created by human for them to sit. Nowadays, chair can be obtained in many kind of material, such as steel, wood and plastic. Chair with flip table commonly used at class especially at university and collage. It can save space beside can make the class more comfortable.

1.2 Problem Statement

The design process enable us to follow a systematic approach to design. The most important step of the design process is identifying the customer need. When do design process we must to consider what innovation that we can make to approve the design to fulfill the customer needs. Before that, we must to know what is the problem of the product that have in the market such as the material, ergonomic of the design, the cost and so on.

The problem of the design of the flip table that usually use at the class nowadays :

- i. Just have one side of flip table.
- ii. Size of the chair is not suitable to people who has big size of body.

1.3 Project Objectives

- i. To design the chair with flip table that more comfortable to seat
- ii. To fabricate the chair frame (with flip table)

1.4 Project Scopes

- i. Improvement of the designed chair; especially for students' need and its function
- ii. The chair are using in class at university and collage
- iii. The size of chair can be more comfortable when sit
- iv. The design of flip table is comfortable to all user
- v. Fabricate the chair frame (with flip table)

1.5 Project Background

History shows to us that people create and design something to fulfill their needs. For example, people create telephone for easy to communicate. But the design of telephone always change to improve the usage.

The improved design of chair with flip table is used to provide student a better space to locate their goods during learning, lecture time and less area used in the lecture hall. The main focus of improved design is the site of flip table and size of the chair.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to explain about the design process to making product. Beside that, this chapter also story about the history of the chair and comparison between the material that usually use to making chair.

2.2 Design

Design is the planning that lays the basis for the making of every object or system. It can be used both as a noun and as a verb and, in a broader way, it means applied arts and engineering. As a verb, "to design" refers to the process of originating and developing a plan for a product, structure, system, or component with intention. As a noun, "a design" is used for either the final (solution) plan (e.g. proposal, drawing, model, description) or the result of implementing that plan in the form of the final product of a design process.

This classification aside, in its broadest sense no other limitations exist and the final product can be anything from clothing to graphical user interfaces to skyscrapers. Even virtual concepts such as corporate identity and cultural traditions such as celebration of certain holidays are sometimes designed. More recently, processes (in general) have also been treated as products of design, giving new meaning to the term *process design*.

The person designing is called a *designer*, which is also a term used for people who work professionally in one of the various design areas, usually also specifying which area is being dealt with (such as a *fashion designer*, *concept designer* or *web designer*).

Designing often requires a designer to consider the aesthetic, functional, and many other aspects of an object or a process, which usually requires considerable research, thought, modeling, interactive adjustment, and re-design. With such a broad definition, there is no universal language or unifying institution for designers of all disciplines. This allows for many differing philosophies and approaches toward the subject. However, serious study of design demands increased focus on the design process.

Source: <http://en.wikipedia.org/wiki/Design>

2.3 Typical step of design

A design process may include a series of steps followed by designers. Depending on the product or service, some of these stages may be irrelevant, ignored in real-world situations in order to save time, reduce cost, or because they may be redundant in the situation.

Typical stages of the design process include:

- Pre-production design
 - Design brief or Parti – an early often the beginning statement of design goals
 - Analysis – analysis of current design goals
 - Research – investigating similar design solutions in the field or related topics
 - Specification – specifying requirements of a design solution for a product (product design specification) or service.
 - Problem solving – conceptualizing and documenting design solutions

- Presentation – presenting design solutions

- Design during production
 - Development – continuation and improvement of a designed solution
 - Testing – in situ testing a designed solution
- Post-production design feedback for future designs
 - Implementation – introducing the designed solution into the environment
 - Evaluation and conclusion – summary of process and results, including constructive criticism and suggestions for future improvements
- Redesign – any or all stages in the design process repeated (with corrections made) at any time before, during, or after production.

These stages are not universally accepted but do relate typical design process activities. For each activity there are many best practices for completing them.

Source: <http://en.wikipedia.org/wiki/Design>

2.4 History of chair

The chair is of extreme antiquity, although for many centuries and indeed for thousands of years it was an article of state and dignity rather than an article of ordinary use. “The chair” is still extensively used as the emblem of authority in the British House of Commons and in public meetings. It was not, in fact, until the 16th century that it became common anywhere.

The chest, the bench and the stool were until then the ordinary seats of everyday life, and the number of chairs which have survived from an earlier date is exceedingly limited; most of such examples are of ecclesiastical or seigneurial origin. Our knowledge of the chairs of remote antiquity is derived almost entirely from monuments, sculpture and paintings. A few actual examples exist in the British Museum, in the Egyptian museum at Cairo, and elsewhere



Figure 2.1: Ancient Egyptian princess Sitamun*s chair

Source: http://en.wikipedia.org/wiki/History_of_the_chair

2.4.1 Egyptian chairs

In ancient Egypt chairs appear to have been of great richness and splendour. Fashioned of ebony and ivory, or of carved and gilded wood, they were covered with costly materials and supported upon representations of the legs of beasts or the figures of captives. Egyptians believed that the the chairs need to represent natural forms to avoid creating chaos in the universe, by creating an artificial object. This tendency is seen all over Egyptian art and manufacture. An arm-chair in fine preservation found in a tomb in the Valley of the Kings is astonishingly similar, even in small details, to that "Empire" style which followed Napoleon's campaign in Egypt.

The earliest monuments of Nineveh represent a chair without a back but with tastefully carved legs ending in lions' claws or bulls' hoofs. Others are supported by figures in the nature of caryatides or by animals.

2.4.2 Greek and roman chairs

The earliest known form of Greek chair dates back to six or seven centuries BCE. On the frieze of the Parthenon Zeus occupies a square seat with a bar-back and thick turned legs; it is ornamented with winged sphinxes and the feet of beasts. The characteristic Roman chairs were of marble, also adorned with sphinxes. The curule chair was originally very similar in form to the modern folding chair, but eventually received a good deal of ornament. The most famous of the very few chairs which have come down from a remote antiquity is the reputed chair of St. Peter in St Peter's Basilica at Rome. The wooden portions are much decayed, but it would appear to be Byzantine work of the 6th century, and to be really an ancient *sedia gestatoria*. It has ivory carvings representing the labours of Hercules.

A few pieces of an earlier oaken chair have been let in; the existing one, Gregorovius says, is of acacia wood. The legend that this was the curule chair of the senator Pudens is necessarily apocryphal. It is not, as is popularly supposed, enclosed in Gian Lorenzo Bernini's bronze chair, but is kept under triple lock and exhibited only once in a century. Byzantium, like Greece and Rome, affected the curule form of chair, and in addition to lions' heads and winged figures of Victory (or Nike) and dolphin-shaped arms used also the lyre-back which has been made familiar by the pseudo-classical revival of the end of the 18th century.

2.4.3 Medieval chairs

The chair of Maximian in the cathedral of Ravenna is believed to date from the middle of the 6th century. It is of marble, round, with a high back, and is carved in high relief with figures of saints and scenes from the Gospels—the Annunciation, the Adoration of the Magi, the flight into Egypt and the baptism of Christ. The smaller spaces are filled with carvings of animals, birds, flowers and foliated ornament. The Chair of St. Augustine, dating from at least the early thirteenth century^[1] is one of the oldest cathedrae still in use.

Another very ancient seat is the so-called "Chair of Dagobert" in the Louvre. It is of cast bronze, sharpened with the chisel and partially gilt; it is of the curule or faldstool type and supported upon legs terminating in the heads and feet of animals. The seat, which was probably of leather, has disappeared. Its attribution depends entirely upon the statement of Suger, abbot of St Denis in the 12th century, who added a back and arms. Its age has been much discussed, but Viollet-le-Duc dated it to early Merovingian times, and it may in any case be taken as the oldest faldstool in existence.

To the same generic type belongs the famous abbots' chair of Glastonbury; such chairs might readily be taken to pieces when their owners travelled. The faldisterium in time acquired arms and a back, while retaining its folding shape. The most famous, as well as the most, ancient, English chair is that made at the end of the 13th century for Edward I, in which most subsequent monarchs have been crowned. It is of an architectural type and of oak, and was covered with gilded gesso which long since disappeared.

Passing from these historic examples we find the chair monopolized by the ruler, lay or ecclesiastical, to a comparatively late date. As the seat of authority it stood at the head of the lord's table, on his dais, by the side of his bed. The seigneurial chair, commoner in France and the Netherlands than in England, is a very interesting type, approximating in many respects to the episcopal or abbatial throne or stall. It early acquired a very high back and sometimes had a canopy. Arms were invariable, and the lower part was closed in with panelled or carved front and sides—the seat, indeed, was often hinged and sometimes closed with a key.

That we are still said to sit "in" an arm-chair and "on" other kinds of chairs is a reminiscence of the time when the lord or seigneur sat "in his chair." These throne-like seats were always architectural in character, and as Gothic feeling waned took the distinctive characteristics of Renaissance work.

2.4.4 Chinese chairs

Before the Tang Dynasty (618–907 AD), the predominant sitting positions in the Han Chinese culture and neighboring cultures such as the Japanese Culture, Korean Culture, Turkic Culture in Central Asia and Tai Kadai Cultures to the southwest were the seiza and lotus position on the floor or sitting mats. A remarkable change happened during the Tang period, a period when China was in frequent contact with the Near East and other civilizations across Eurasia; thus resulted in many cultural exchanges.

This smaller, mobile folded stool developed into a more stationary, stately chair with high back. Higher seats first started to appear amongst the Chinese elite and their usage soon spread to all levels of society. By the 12th century seating on the floor was rare in China, unlike in other Asian countries where the custom continued, and the chair or more commonly the stool was used in the vast majority of houses throughout the country. The sedan chair was used at least as early as the Song Dynasty (960–1279) to transport nobles by slaves or lower ranking workers.

2.4.5 Renaissance

In Europe, it was owing in great measure to the Renaissance that the chair ceased to be a privilege of state, and became the customary companion of whoever could afford to buy it. Once the idea of privilege faded the chair speedily came into general use. We find almost at once began to reflect the fashions of the hour. No piece of furniture has ever been so close an index to sumptuary changes. It has varied in size, shape and sturdiness with the fashion not only of women's dress but of men's also. Thus the chair which was not, even with its arms purposely suppressed, too ample during the several reigns of some form or other of hoops and farthingale, became monstrous when these protuberances disappeared. Again, the costly laced coats of the dandy of the 18th and early 19th centuries were so threatened by the ordinary form of seat that a "conversation chair" was devised, which enabled the buck and the ruffler to sit with his face to the back, his valuable tails hanging unimpeded over the front. The early chair almost invariably had arms, and it was not until towards the close of the 16th century that the smaller form grew common.

The majority of the chairs of all countries until the middle of the 17th century were of timber (the commonest survival is oak)^[2] without upholstery, and when it became customary to cushion them, leather was sometimes employed; subsequently velvet and silk were extensively used, and at a later period cheaper and often more durable materials. . In Abraham Bosse's engraving (*illustration, left*), a stylish Parisian musical party of about 1630 have pulled their low chairs (called "backstools" in contemporary England) away from the tapestry-hung walls where they were normally lined up. The padded back panels were covered with needlework panels to suit the tapestries, or in other settings with leather, plain or tooled. Plain cloth across the back hid the wooden framing. Stools with column legs complement the set, but aren't *en suite*. In seventeenth century France the bergere chair became fashionable among the nobility and was often made of walnut.

Leather was not infrequently used even for the costly and elaborate chairs of the faldstool form—occasionally sheathed in thin plates of silver—which Venice sent all over Europe. To this day, indeed, leather is one of the most frequently employed materials for chair covering. The outstanding characteristic of most chairs until the middle of the 17th century was massiveness and solidity. Being usually made of oak, they were of considerable weight, and it was not until the introduction of the handsome Louis XIII chairs with cane backs and seats that either weight or solidity was reduced.

2.4.6 English chairs

Although English furniture derives so extensively from foreign and especially French and Italian models, the earlier forms of English chairs owed but little to exotic influences. This was especially the case down to the end of the Tudor period, after which France began to set her mark upon the British chair. The squat variety, with heavy and sombre back, carved like a piece of panelling, gave place to a taller, more slender, and more elegant form, in which the framework only was carved, and attempts were made at ornament in new directions.

The stretcher especially offered opportunities which were not lost upon the cabinet-makers of the Restoration. From a mere uncompromising cross-bar intended

to strengthen the construction it blossomed, almost suddenly, into an elaborate scroll-work or an exceedingly graceful semicircular ornament connecting all four legs, with a vase-shaped knob in the centre. The arms and legs of chairs of this period were scrolled, the splats of the back often showing a rich arrangement of spirals and scrolls. This most decorative of all types appears to have been popularized in England by the cavaliers who had been in exile with Charles II, and had become familiar with it in the north-western parts of the European continent. During the reign of William and Mary these charming forms degenerated into something much stiffer and more rectangular, with a solid, more or less fiddle-shaped splat and a cabriole leg with pad feet.

The more ornamental examples had cane seats and ill-proportioned cane backs. From these forms was gradually developed the Chippendale chair, with its elaborately interlaced back, its graceful arms and square or cabriole legs, the latter terminating in the claw and ball or the pad foot. George Hepplewhite, Thomas Sheraton and Robert Adam all aimed at lightening the chair, which, even in the master hands of Thomas Chippendale, remained comparatively heavy. The endeavour succeeded, and the modern chair is everywhere comparatively slight.

2.4.7 18th century chairs

Informal, *galante* manners and a new half-reclining posture that replaced the former bolt-upright demeanor of court and aristocracy in the age of Louis XIV went hand-in-hand with new commodious seat furniture, developed in Paris about 1720 (*illustration, right*). The new Rococo chairs were upholstered *à chassis*, on removable frames secured by clips, so that changes from winter to summer furniture could be effected without recourse to the *menuisier*. Off-season upholstered frames were stored in the *garde-meuble*. These early Louis XV chairs have backs upholstered *à la reine*, with the back in a flat panel that was ordinarily placed squared to the wall, so that the top-rails' curves complemented those of the *boiserie* panels behind them.

In the illustration, the symmetrical cusped and scrolling seatrails that flow into stubby **cabriole legs** of these comfortable low armchairs (*chauffeuses*) have their direct origins in Chinese lacquer tables (not chairs).

French fashions in chairs, as with everything else, radiated from Paris. From the late 1720s, fashionable "Louis XV" French chairs were constructed without stretchers, which interfered with the unified flow of curved seatrails into **cabriole legs** that generally ended in scroll feet. According to strict guild regulations in force until the Revolution, French chairmaking was the business of the *menuisier* alone, whose craft was conjoined with that of the upholsterer (*huissier*), both of whom specialized in seat-furniture-making in Paris. A range of specialised seats were developed and given fanciful names, of which the comfortable *bergère* ("shepherdess") is the most familiar. Walnut and beech were the characteristic woods employed; finishes were painted in clear light tones en suite with wall panelling, gilded (sometimes *rechampi en blanc*) or left in the natural color (*à la capuchine*), in which case walnut was the timber used.

Fruitwoods were popular for chairmaking in the provinces, where the *menuisier* might also be called upon to provide carved and moulded *boiseries* for rooms. Lyon, Bordeaux and Liège all produced characteristic variations on Paris models between ca. 1725 and 1780.

In the late 1760s in Paris the first Parisian neoclassical chairs were made, even before the accession of Louis XVI, whose name is attached to the first phases of the style. Straight tapering fluted legs joined by a block at the seat rail and architectural mouldings, characterize the style, in which each element is a discrete entity. Louis Delanois, Jean-Claude Sené and Georges Jacob were three leading chairmakers in the 1770s and 80s.

The 18th century was, indeed, the golden age of the chair, especially in France and England, between which there was considerable give and take of ideas. Even Diderot could not refrain from writing of them in his *Encyclopédie*. The typical Louis Seize chair, oval-backed and ample of seat, with descending arms and round-reeded legs, covered in Beauvais or some such gay tapestry woven with Boucher or Watteau-like scenes, is a very gracious object, in which the period reached its high-

water mark. The Empire brought in squat and squabby shapes, comfortable enough no doubt, but entirely destitute of inspiration. English Empire chairs were often heavier and more sombre than those of French design.

2.4.8 19th century chairs

The art nouveau school produced chairs of simplicity. The Arts and Crafts movement produced heavy, straight lined, minimally ornamented chairs. The most famous being the Michael Thonet Bendwood chair or the 'bistro chair' created in 1859 which has revolutionized the industry and is still being produced today.

2.4.9 20th century chairs

The 20th century saw an increasing use of technology in chair construction with such things as all-metal folding chairs, metal-legged chairs, the Slumber Chair, moulded plastic chairs and ergonomic chairs, recliner chairs (easy chair), butterfly chair, beanbag chairs, the egg or pod chair, plywood and laminate wood chairs, and massage chairs

Source: http://en.wikipedia.org/wiki/History_of_the_chair

2.5 Material in making chair

2.5.1 Plastic

Plastic is the general common term for a wide range of synthetic or semisynthetic organic amorphous solid^[1] materials used in the manufacture of industrial products. Plastics are typically polymers of high molecular mass, and may contain other substances to improve performance and/or reduce costs.

The word is derived from the Greek *πλαστικός* (plastikos) meaning *fit for molding*, and *πλαστός* (plastos) meaning *molded*.^{[2][3]} It refers to their malleability, or plasticity during manufacture, that allows them to be cast, pressed, or extruded into a variety of shapes—such as films, fibers, plates, tubes, bottles, boxes, and much more.

The common word *plastic* should not be confused with the technical adjective *plastic*, which is applied to any material which undergoes a permanent change of shape (plastic deformation) when strained beyond a certain point. Aluminium, for instance, is plastic in this sense, but not a plastic in the common sense; in contrast, in their finished forms, some plastics will break before deforming and therefore are not plastic in the technical sense.

There are two types of plastics: thermoplastics and thermosetting polymers. Thermoplastics will soften and melt if enough heat is applied; examples are polyethylene, polystyrene, polyvinyl chloride and polytetrafluoroethylene (PTFE). Thermosets can melt and take shape once; after they have solidified, they stay solid.

a) Manufacturing process

Plastic chairs are made in a number of ways, all of which involve metal molds carved into the desired shape. One of the most popular forms of furniture molding is known as rotational molding, in which a large metal mold is injected with plastic polymer powder. This is then heated to the melting point, and the mold is mechanically turned three-dimensionally in order to evenly distribute the polymers to the inside of the mold. After several minutes of spinning, the mold is cooled off and the rotation stops. The mold is opened and the new, completely hollow chair is removed.

b) Injection Molding

Injection molding is another method of plastic furniture making. Again, a metal mold is used, but this time the result is not hollow but solid plastic. This type of mold does not spin, but the polymers are heated at a predetermined rate and temperature. They're then poured into the mold and cooled. A certain amount of precision must be used with this type of molding process because if the plastic is

poured too slowly, it will dry too soon. If it is poured too quickly, the result will not be a uniform configuration of plastic. If done properly, the result is a plastic chair with no seams, molded all in one piece.

c) Gas Assisted Injection Molding

Injection molding can also be done with the help of gas that is blown at high velocity inside the mold, pushing the molten plastic out of certain parts of the mold. This creates channels in the plastic form that make the chair much more light in weight while at the same time maintaining its strength. All of the other aspects of injection molding remain the same, but the result is a chair with some parts that are hollow and other parts that are solid.

The plastics used in the chair-making process are usually a composite of several different types of plastics all blended together during the heating part of the molding process. This makes the chair much stronger than it might be if only one type of plastic was involved.

Source: <http://www.ehow.com>



Figure 2.2: Plastic Chair

Source: www.beach-chair.cn/plastic_chair.htm

2.5.2 Wooden Chair

Wood is an organic material; in the strict sense wood is produced as secondary xylem in the stems of trees (and other woody plants). In a living tree it transfers water and nutrients to the leaves and other growing tissues, and has a support function, enabling woody plants to reach large sizes or to stand up for themselves. However, wood may also refer to other plant materials with comparable properties, and to material engineered from wood, or wood chips or fibre.

People have used wood for millennia for many purposes, primarily as a fuel or as a construction material for making houses, tools, weapons, furniture, packaging, artworks, and paper. Wood can be dated by carbon dating and in some species by dendrochronology to make inferences about when a wooden object was created. The year-to-year variation in tree-ring widths and isotopic abundances gives clues to the prevailing climate at that time.

- Manufacturing process of wooden chair:

- **Step 1**

Cut rounded 2X4 lumber into four pieces, each 16 inches long. These will be your chair legs.

- **Step 2**

Cut a piece of flatter wood that is 15 inches thick into a twelve-inch square. This is your chair seat. Using your planing tool cut a “slope” into the back of the seat, so that the chair seat will have a three-fourths to one-inch “drop.”

- **Step 3**

Cut a piece of wood into a twelve-inch square for your chair back. How thick you want this piece of wood to be will be up to you, as you will know how thick or thin you want the back to be.