# DESIGN AND FABRICATION OF PORTABLE NOTEBOOK TABLE

MOHD AMIR ZAINI BIN NAZIFF

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Faculty of Mechanical Engineering
University Malaysia Pahang (UMP)

# ABSTRACT

'Portable Notebook Table' is an equipment that are use with notebook as a table. The fabrication of this product started with surveying in market about the product, specification analysis, concept designing, detail concept designing and fabrication of the product. Four (4) products were selected from the market for the analysis and investigation. Several concepts has been done and one of these concepts that is simple and portable has been choose to fabricate. The investigation was made in scope of the constraint that may occur for the development of the product and relevance of the product manufacturing processes. This product have been fabricate according to engineering method through many fabrication process such as welding, cutting, drilling and assembling. For development of this project and future works, some suggestion was made for upgrading the product. Result of the fabrication has been tested and analyze and it shows that it can support the weight of all types of notebook existed in market. The criteria of this product which is easy to carry to any places with comfort satisfied the problems for existing products in the market.

# ABSTRAK

'Portable Notebook Table' adalah satu alat yang digunakan sebagai tempat sokongan bagi computer riba. Proses penghasilan produk telah dimulakan dengan membuat tinjauan terhadap pasaran, penganalisan spesifikasi produk, reka bentuk konsep, reka bentuk kosep yang terperinci, dan penghasilan produk. Terdapat empat (4) produk di pasaran yang dikenal pasti dan di senaraikan untuk tujuan kajian dan analisis. Setelah dianalisis kesemua produk, beberapa konsep telah dihasilkan dan satu konsep yang menepati setiap kehendak dan menyelesaikan masalah telah dipilih.Kajian di buat dengan melihat kesesuaian produk terhadap proses pengeluaran dan halangan yang timbul seperti ketiadaan bahan serta keadaan mesin di dalam menghasilkan produk ini. Produk ini dihasilkan mengikut cara kejuruteraan seperti mengimpal, memotong, menggerudi dan mencantum. Beberapa cadangan telah dibuat untuk menambahbaik produk tesebut. Hasil fabrikasi produk ini telah diuji kekuatannya dan ia memberi keputusan yang memuaskan di mana ia dapat menyokong berat computer riba pelbagai jenis. Ciri-cirinya yang mudah untuk dia bawa ke mana-mana telah membuatkan projek ini berjaya menyelesaikan masalah produk yang sedia ada di pasaran.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Project Synopsis

### 1.1.1 General Project Synopsis

This project involves designing and fabricating a Portable Notebook Table. This table would be entirely different from existing table. Basically the entire Portable Notebook Table could be divided into 3 stages, which are research and development, designing and fabrication, and analysis.

The Portable Notebook Table is equipped by using all necessary items and method for fabrication. In this project, we need to fabricate and make sure the Portable Notebook Table is portable, strong, and it can fit easily into a notebook or laptops beg.

The process of development is initiated from designing the shape of the tripod and plate by considering the function as well. In order to produce user friendly product that is suitable to the consumer, consideration to the ergonomic factor is taken into account. It involves the measurement process before the materials are cut into pieces before joined together.

### 1.1.2 Specific Project Synopsis

This project title is Portable Notebook Table. This project involves the fabricated of the Portable Notebook Table. This project also involves the analysis of the Portable Notebook Table developed earlier with concerns regarding strength, material and cost. Modifications are required to give a different type of Portable Notebook Table that exists in the market. After that, testing is needed to be done to make sure the Portable Notebook Table is functional and to determine the strength of the table. Overall, the project will meet acquire skills of design, analysis and fabrication.

## 1.2 Problem Statement

The worlds of information technology have probably given the smart way in every aspect of work as well as education and entertainment. Notebook becomes a common device in people's life. People can use notebook everywhere, indoor and outdoor.

The concept of the Portable Notebook Table is to support a notebook as well as to keep the notebook from overheating. This table will be useful for anyone who are using notebook either indoor or outdoor. However, the existing products are big, complicated and heavy. People need something that are smaller, easy to carry, and simple but it still give a same function as existing one.

## 1.3 Project Scope

i. Literature Review: Valuable data are searched and gathered. Considering the shape of the table in terms of its complexity and method to produce.

ii. Sketching & Designing: Sketching and designing using Solidwork software in creating the design of the notebook table

iii. Fabrication: Fabricate and produce the table by using all necessary manufacturing process such as welding, cutting, grinding and etc.

iv. Testing & Analysis: Do the static analysis to each component using engineering knowledge and software.

## 1.4 Project Objectives

### 1.4.1 General Project Objectives

Diploma final year project objectives is to practice the knowledge and skill of the student that have been gathered before in solving problem using academic research, to born an engineer that have enough knowledge and skill. This project also important to train and increase the student capability to get know, research, data gathering, analysis making and then solve a problem by research or scientific research.

This project will educate the student in communication like in a presentation and educate them to defend their research in the presentation. The project also will generate students that have capability to make a good research report in thesis form or technical writing. This project also can produce and train student to capable of

doing work with minimal supervisory and more independent in searching, detailing and expanding the experiences and knowledge.

### 1.4.2 Specific Project Objectives

i. To design portable notebook table as simple as possible.
ii. To fabricate portable notebook table that is suite to its application which is for placing notebook.
iii. To make analysis for the product.

## 1.5 Project Hypotheses

The Portable Notebook Table has to be small and simple so that it will be more convenient to carry. In this case, foldable is the answer. Foldable here means the table can transformed from big to small and from small to be big. This table has a tripod which can be fold. The tripod gives a height where people will feel comfortable while using the notebook. A plate made from sheet metal is used as a platform to support the notebook and to prevent the notebook from overheating by providing flat surface with small holes for notebook ventilation.

## 1.6 Project Schedule

**Table 1.1: Gann Chart**

| Scope | Weeks | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Literature Study | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Design & Measurement Consideration | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Acquisition & Material Preparation | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Methodology Study | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Fabrication | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Evaluation & Improvement | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Report Writing | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Presentation | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

Planning Progress

Actual Progress

# CHAPTER 2

# LITERATURE STUDY

## 2.1 Introduction

Table is used as a place to put things such as books and laptop. The main concept is table used to support things which have variable of weight. There are many types of table for notebook in market such as fixed table, foldable table and portable table. These tables come with different size and design. It depends on what kind of purpose for the table. The meaning of portable is comfort and easy to bring anywhere. The function of this product is to support a notebook where there are no suitable place to put the notebook. For example, corridor, field, park, and room with tables those are already full. For easy to carry on anywhere this table was designed to be fordable, and can easily fit in a notebook's beg.

This product commonly produces by sheet metal and steel. This items has been chosen because strength, light in weight, easy to fabricate and long life. This portable notebook table also commonly fabricate using welding method such as MIG welding to joining part that been made by steel. This method has been chosen because can produce the durable, strong support for any notebook existed in market.

## 2.2 Theoretical Review

### 2.2.1 Balt Lapmaster (Mobile Laptop Table & Workstation)

Adjustable mobile laptop workstation accommodates a laptop computer, a small printer and accessory items for ease of access. Balt Lapmaster Laptop Table features easy height control of the work surface, with a fully adjustable copy holder. The Balt Lapmaster work surface (19"w x 14 1/2"d) can be rotated up to 180 degrees. Rotate the whole Lapmaster cart for right or left hand use. Weight load limit is 50 lbs. Includes two locking castors and two non-locking castors.

**Figure 2.1**: Balt Lapmaster (Mobile Laptop Table and Workstation)

### 2.2.2 Tabelz Portable Laptop Computer Stand

Tabelz Portable Laptop Computer Stands as shown on **figure 2.2** are designed to meet the specific needs of individual users both professional and personal. There are over 450 laptop computer sizes and users have unique needs rarely satisfied by a one-size-fits-all laptop stand. Tabelz offers 4 leg options and your choice of 7 Primary Table sizes allowing each customer to create the best fit for both laptop and user. Further customize your laptop with different color and style.

Although designed for commercial use, the contemporary styling, versatility and unique colors make it perfect for use on stage, at trade shows, in the field, in the studio, in the office or at home. Whether sitting or standing the Tabelz Portable Laptop Stand can be adjusted for optimum ergonomic comfort. The Tabelz Portable Laptop Stand is the perfect solution for any notebook computer user in any industry.

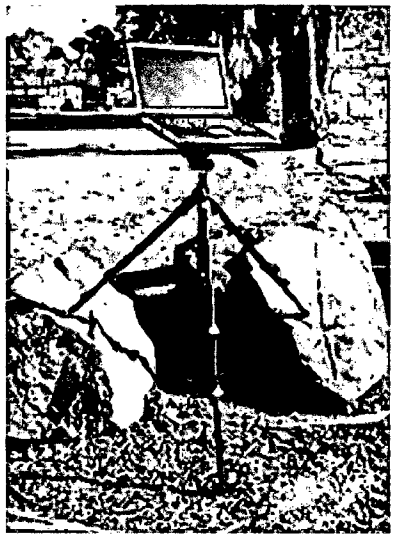

**Figure 2.2**: 'Tabelz' Portable Laptop Computer Stand

### 2.2.3 IKEA Laptop Table

This IKEA table is very simple and light weight. The plate is strong make it can stand only on one steel rod without bending. It aluminum plate can support almost all notebook that are existed in market.

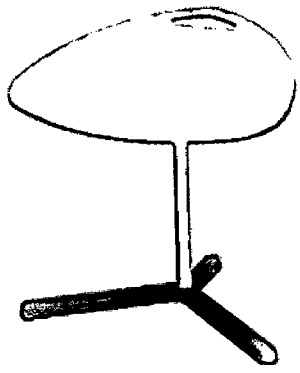

**Figure 2.3**: IKEA Laptop Table

### 2.2.4 Ultra-pod

This tripod is a camera gadget. The function of this tripod is to use with camera as a camera stand. This foldable tripod make it easy to carry to anywhere. To make sure it is strong, the material use is steel. Besides that, this tripod shape makes it stable and can give strong support.

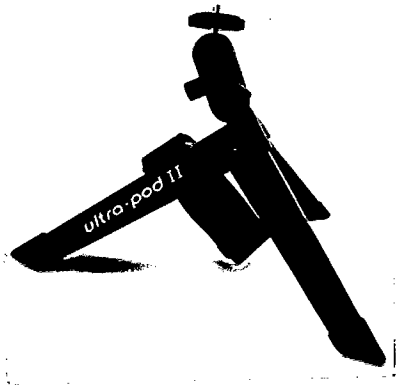


**Figure 2.4**: Ultra-pod

## 2.3 Technical Review

i. Tripod: A base support that give optimum height for user. It consists of three components that are joined together by a bolts and nuts. It is foldable and can fit into the notebook beg.

ii. Plate: Function similar as a cooler pad which supports the notebook. It prevents the notebook from overheating and keeps the notebook stable while in use with tripod.

## 2.4 Joining Method

The joining method that used is the permanent joint that is welding joint. The welding machine that is used is from GMAW or Gas Metal Arc Welding type.

### 2.4.1 Introduction and Theory of Gas Metal Arc Welding (GMAW)

Gas metal arc welding (GMAW), also known as metal inert gas or MIG welding, is a semi-automatic or automatic process that uses a continuous wire feed as an electrode and an inert or semi-inert gas mixture to protect the weld from contamination. As with SMAW, reasonable operator proficiency can be achieved with modest training. Since the electrode is continuous, welding speeds are greater for GMAW than for SMAW. Also, the smaller arc size compared to the shielded metal arc welding process makes it easier to make out-of-position welds (e.g., overhead joints, as would be welded underneath a structure).

The equipment required to perform the GMAW process is more complex and expensive than that required for SMAW, and requires a more complex setup procedure. Therefore, GMAW is less portable and versatile, and due to the use of a

separate shielding gas, is not particularly suitable for outdoor work. However, owing to the higher average rate at which welds can be completed, GMAW is well suited to production welding. The process can be applied to a wide variety of metals, both ferrous and non-ferrous.

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 Method of MIG Welding Process

In spray transfer, small, molten metal droplets from the electrode are transfer to the weld area at a rate of several hundred droplets per second. The transfer is spatter-free and very stable. High DC current and voltages and large-diameter electrodes are used with argon or argon-rich gas mixture used as the shielding gas. The average current required in this process can be reduced by using a pulsed arc, which superimposes high-amplitude pulses onto a low, steady current. The process can use in all welding positions.

In globular transfer, carbon-dioxide-rich gases are utilized, and globules are propelled by the forces of the electric-arc transfer of the metal, resulting in considerable spatter. High welding currents are used, making it possible for greater weld penetration and higher welding speed than are achieved in spray transfer. Heavier sections commonly are joined by this method.

In short circuiting, the metal is transferred in individual droplets (more than 50 per second), as the electrode tip touches the molten weld metal and short circuits. Low currents and voltages are utilized with carbon-dioxide-rich gases and electrodes made of small-diameter wire. The power required is about 2 kW.

### 2.4.3 The Advantages of MIG Welding

i. High productivity, because based on this machine the consumer no need to stop their work to change rods or chip and brush the weld frequently.
ii. Easy to learn and makes great-looking welds.
iii. Can weld on stainless steel, mild steel, and aluminum.

### 2.4.4 Drilling

Drilling machines are used for drilling holes, tapping, reaming, and small diameter boring operations. The most common machine is drill press, the major components of which are shown in (Figure 2.5). The workpiece is placed on an adjustable table, either by clamping it directly into the slots and holes on the table or by using a vise, which in turn is clamped to the table. The drill is lowered manually by a hand wheel power or by power feed at preset rates. Manual feeding requires some skill in judging the appropriate feed rate.

**Figure 2.5:** Drilling machine

Drills pressed usually are designed by the largest workpiece diameter that can be accommodated on the table and typically range from 150 to 1250mm. In order to maintain proper cutting speeds at the cutting edges of drills, the spindle speed on

drilling machines has to be adjustable to accommodate different drill sizes. Adjustments are made by means of pulleys, gear boxes or variable-speed motors.

The types of drilling machines range from simple bench-type drills used to drill small diameter-holes (Figure 2.6),. The distance between the column and the spindle center can be as much as 3m. The drill head of universal drilling machines include numerically controlled three-axis machines, in which the operations are performed automatically and in the desired sequences with the use of turret punch.

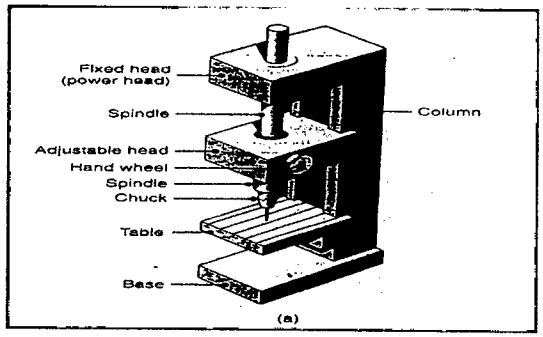


**Figure2.6:** Schematic components of a vertical drill press

# CHAPTER 3

# METHODOLOGY

## 3.1 Project Flow Chart

In fabrication of Portable Notebook Table, there is a planning of the overall progress to assure the project can be finish on schedule. For the diagram as shown figure 3.1, this project started with the literature review and research about the product. This is including a review concept of the table and types of portable notebook table use in various places. These tasks have been done through research on the internet, books and others sources..

After gathering all the relevant information, the project undergoes design process. In this step, from the knowledge gather from the review is use to make a sketch design that suitable for the project. After several design sketched, design consideration have been made and one design have been chosen. The selected design sketched is then transfer to solid modeling and engineering drawing using Solidwork program. The materials and the measurement needed for the table listed down and calculated to give an ergonomic shape of the portable notebook table.

After all the parts needed had been gathered, the project proceeds to next step that is fabrication process. The finished drawing and sketching is used as a reference by following the measurement and the type of materials needed. The fabrication process that involved is cutting, welding, drilling, punching and others. After every process was finished, the parts are checked to make sure it follows the requirement.