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**ERGONOMICS STUDY OF TABLET ARM CHAIR IN
TUTORIAL ROOM ENGINEERING FACULTY**

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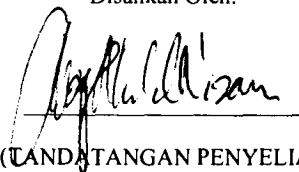
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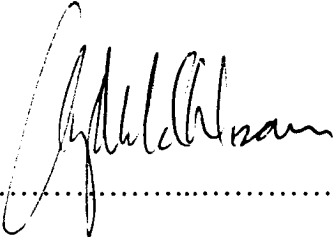
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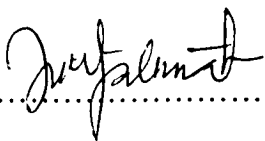
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APPROVAL SHEET

This project report attached here to, entitles “ **ERGONOMICS STUDY OF TABLET ARM CHAIR IN TUTORIAL ROOM, ENGINEERING FACULTY**” prepared and submitted by **SITISALMIAH BT AYUB (13597)** as a partial fulfilment of the requirement for the Degree of Bachelor of Engineering with Honours in Mechanical and Manufacturing Engineering is hereby read and approved by:

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*This project report is dedicated to my beloved mother and father,
my dearest brothers and sisters
for their love and support*

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ABSTRACT

This ergonomics research is to investigate and measure the design of tablet arm chair in tutorial room, Engineering Faculty, UNIMAS. The study collected data to gather information about the tablet arm chair that did not consider ergonomics aspects such as comfort, safety and health. Survey will be done on the 50 students of Engineering Faculty by distributed questionnaire. The data collected will be analyzed using graph and chart from Microsoft Excel. From the result there are many weaknesses concerning the design such as too light and easily tumble, table are too short, cause of back pain and not suitable for left handed student. Some suggestions are made to overcome the weakness stated such as adjustable height of table and chair, adjustable angle of backseat and prepared the table for left handed student. The faculty need tablet arm chair with good ergonomics aspects to prevent long term effect such as back bone problem and that lead to an abnormal posture, lack of efficiency and other related problem. The research will come out an idea of the new conceptual design of tablet arm chair according to the students needs from the questionnaire and the result.

ABSTRAK

Kajian ergonomik terhadap kerusi tutorial dengan meja di bilik tutorial fakulti kejuruteraan bertujuan untuk mengetahui dan mengumpul data mengenai rekabentuk nya yang tidak menekankan aspek ergonomik yang berkaitan dengan kesihatan, keselamatan dan keselesaan. Kaedah yang digunakan adalah kaedah survei ke atas 50 orang pelajar fakulti kejuruteraan dari soal selidik yang telah diedarkan. Data yang telah di kumpul di analisis menggunakan graf dan carta dari Microsoft Excel. Daripada keputusan yang diperolehi, dapat di kenalpasti kelemahan yang terdapat pada kerusi ini seperti terlalu ringan dan mudah tumbang, meja yang terlalu pendek, menyebabkan sakit belakang dan kurang sesuai untuk pelajar menulis dengan tangan kiri. Cadangan untuk menangani masalah ini telah di cadangkan seperti kerusi dan meja dapat di ubah ketinggian dan sudut untuk bersandar mengikut keselesaan pelajar dan juga mencadangkan meja yang dapat di tukar dari kiri ke kanan dan sebaliknya untuk pelajar yang menulis dengan tangan kiri. Aspek ergonomic perlu di ambil berat oleh fakulti agar kesan jangka panjang seperti masalah tulang belakang yang membawa kepada postur yang tidak normal, kecekapan berkurang dan masalah lain yang berkaitan. Kajian ini juga di sertai dengan konsep rekaan terbaru kerusi tutorial dengan meja mengikut cadangan dan kehendak pelajar daripada analisis yang telah di buat.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Ergonomics is the scientific discipline concerned with designing according to human needs, and the profession that apply theory, principles, data and methods to design in order to optimize human well-being and overall system performance. [1]. Ergonomics draws many disciplines in the study of humans and their environments including anthropometry, biomechanics, mechanical engineering, industrial engineering and so on. Anthropometry is one of the important points to be study in ergonomics research. Anthropometry is deals with body measurement including body size, shape, size, strength and working capacity. [3]

Ergonomics has two distinct aspects to be considered which are study and research to determine specific student behavior and characteristics of their condition while in sitting

posture that needed to know for engineering design. Secondly is the application and engineering which are to design the tool, environment or work tasks to fit the student need.

To deliver better product, the complexities of design must to be understand to search a way to be improved [2]. In Oxford Dictionary, definition of design is a 'conceiving a mental plan for; making a preliminary sketch, picture'. According to Hollin & Pugh (1990) design is a 'multidisciplinary iterative process that takes an idea or market need forward into a successful product' [2]. Design also has important point to make sure it is true to described about the design. The points are creative, multidiscipline process, need to be iterative, evolutionary and serve human needs [2].

1.1 Objectives

The objectives of this project are to measure the ergonomics aspects of tablet arm chair in tutorial room, Engineering Faculty and to come out with a new conceptual design. Thus, the factor of the non-comfortable followed anthropometry of the student are been studied to measure the current design of tablet arm chair in ergonomics aspect. This can be done by survey method to student FK on the design problem, ergonomics aspect and also their suggestion to improve the quality design.

1.2 Scope

These studies are focus on the tablet arm chair in tutorial room Engineering Faculty, UNIMAS. Tablet arm chair are usually being used in classroom. There is variety of design in market. But not all the product is suitable for each person. Therefore, these studies are focus on the design of the product, ergonomics aspect that must be considered and also the improvement of the design from student perspectives.

1.3 Contribution of the Study

Based on this study, it focuses on the ergonomics of tablet arm chair in FK. This study will provides some information about this product and can help to improve the design for future work in final year project. This study will provide some new ideas to designing a better product by considering ergonomic part that is essential to future work designer.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to Ergonomic

2.1.1 Ergonomics History

Ergonomics terms are from Greek words which are *ergon* (work) and *nomos* (natural laws). Ergonomics entered in the modern dictionary when Wojciech Jastrzębowski used the term in his articles “based upon the truths drawn from the Science of Nature” in 1857. [4]

In 1987, Christensen finds out that the significance of a “good fit” between humans and tools was probably realized early in the development of the species [5]. Australopithecus Prometheus also selected pebbles tools and made scoops from antelope bones in a clear display of selecting or creating objects to makes easier to accomplish the task. [5]. Hammers, axes and plows are improved of it effectiveness over centuries in the

work environment. Machine such as spinning jenny and rolling mills were developed in the Industrial Revolution in late 18th century to improve work processes. Bernadino Ramazinni (1633-1714) was the first physician whose write about work-related injuries and illnesses in his 1700 publication, *De Morbis Artificum (Diseases of Worker)* [5].

In early 1900's, industry production still depend on the human power or motion [5]. To improve worker productivity, ergonomics concepts were developed by Scientific Management. Frederick W. Taylor is the pioneer of the ergonomics concepts by evaluated jobs to determine the best way the workers can performed. He did the shoveling task by matching the shovel with the types of material that was being moved to increased worker production at Bethlehem Steel [5].

In World War II period, ergonomics aspect have been emphasizes in producing military related products [5]. During this time, more human machine interaction was interested as the effectiveness of sophisticated military equipment. Design concepts of machine must fit to the size of soldier and logical control button evolved. After World War II, worker safety also had been concerned as well as productivity of the worker. The variety of areas in research such as;

During this time, area of knowledge of the ergonomics can be divided into two. Knowledge that involved human behavior and attributes are called cognitive ergonomics

and second is an industrial ergonomics which is the area of knowledge involved physical aspects of the workplace and human abilities [5].

2.1.2 Definition of Ergonomics

Ergonomics also called as human engineering and human factors is the scientific discipline which is concerned with designing according to human needs, applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance [4].

Ergonomics can be classified into five key elements. This key element include help relieve stress, anxiety, tension and to correct posture for better health. In classroom environment, this key factor is very important to consider getting a better performance when learning in comfortable environment without ergonomics stress. This study is recommended about the prevention of the stress condition when sitting on the tablet arm chair in tutorial room, FK. It included posture perfect position and comfortable by relieve the body of stress and tension.

2.2 Design

2.2.1 Definition of Design

What is design? There are many definitions of what is design is. In the following formal definition of design;

'design establishes and defines solutions to and pertinent structures for problem not solved before, or new solutions to problems which have previously been solved in different way.[10]

Design is an activity that translates the idea into something useful such as car, furniture, building and so on [10]. The need of the user begin a good design which is finding what customer expectation and that was the first stage in proceed to the other stage. Scientists can invent technologies, manufacturers can make products, engineers can make them function and marketers can sell them, but only designers can combine insight into all these things and turn a concept into something that's desirable, viable, and commercially successful and adds value to people's lives [10].

Good design requires both analysis and synthesis [10]. Analysis here mean that approach complex problem into manageable part by using appropriate disciplines of science and engineering science and also computation tools that is necessary. Synthesis is the identification of the design elements that will comprise the product, decomposition into part and the combination of the part solutions into a total workable system.

2.2.2 Furniture design

To design the furniture, the basic design consideration must be an important thing to know that include the function of the product, structural requirement, material to be used appearance and method to produce it. For the function of product, it must serve the purpose in been designed. This requires a study be made of the factors involved so it can be sized properly and high strength to function effectively. For sofa in example, it must have

its seat the proper height off the floor and seat must comfortable depth and the angle of the back and the arm used must be considered.

Material selection is one of the important aspects to designing the furniture. It must familiar with the advantages and limitation of the list of material being used. Most material used in construct the furniture is wood and the fabrics. Plastics laminates also can be used the unit are exposed to the unusually hard wear. Plywood with the outer veneer also provides a superior construction material. Other material often used is ceramics, plastics, glass, metal, cane and textiles.

2.3 Posture Studies and sitting

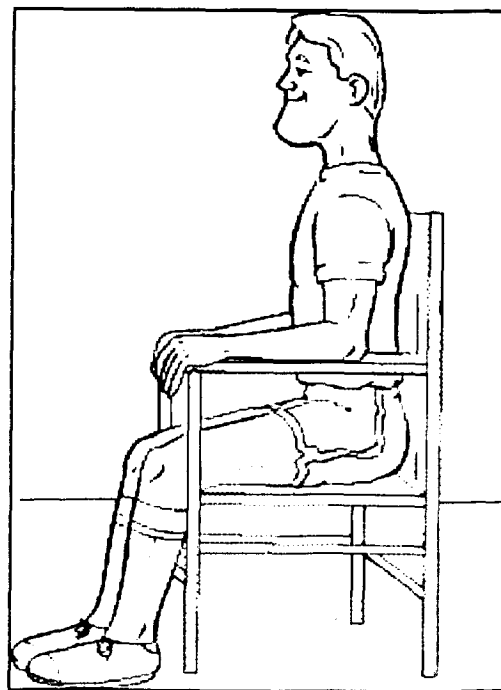


Figure 2.3(a) Sitting Position (*adapted from my.clevelandclinic.org*)

Posture is defined as the relative orientation of the parts of the body in space [6]. Posture also the position where the whole body hold upright against gravity while standing, sitting or lying down. Minimize the strain and stress of the supporting muscles and ligament are the aim in a good posture while the body stand, walk, sit and lie during movement or weight bearing activities.

Appropriate posture to be considered is to keep bones and joints in the correct alignment so that the muscles are being used properly. Good posture in sitting must have all the character such as back and shoulders are in the straight position and the buttocks should touch the back of the chair [6].

From the figure 2.3 (a), three normal back curves should be present while sitting. Sit at the end of the chair and slouch completely can meet this requirement. Body weight must be distributed evenly on both hips and knees also bend at the right angle. Knees should be higher than hips and legs should not cross to be sitting in good posture. Feet also must be flat on the floor and avoid sitting in the same position not more than 30 minutes.

While sitting, a few elements must be pointed to have a good posture while sitting on the chair. The first element is adjustability of the seat height. Adjustability of the chair can allow the student to adjust the height according to their height so that their feet are on the floor. Next element is the seat depth adjustability. To achieve this element, backrest in-out adjustability or sliding seat pan should be use. Furthermore, a shorter seat pan is necessary to allow small people to use the chair's backrest and the deeper one suitable for taller student.