Universiti Teknikal Malaysia Melaka

DESIGN AND DEVELOPMENT OF ERGONOMICS TABLE

Khor Chin Ee

Bachelor of Mechanical and Manufacturing Engineering Technology (Product Design) with Honours.

2018

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: DEGISN AND DEVELOPMENT OF ERGONOMICS TABLE

SESI PENGAJIAN: **2018/19 Semester 1**

Saya **KHOR CHIN EE** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐ SULIT (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

☐ TERHAD (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐ TIDAK TERHAD

Yang benar,

.....
KHOR CHIN EE
Alamat Tetap:
68,PERSIARAN MERBUK,
TAMAN SRI NIBONG,
14300 NIBONG TEBAL,
PULAU PINANG.

Tarikh:

Disahkan oleh penyelia:

.....
MOHD HIDAYAT BIN AB RAHMAN

Tarikh:

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare this thesis entitled –Design and Development of Ergonomics Table" is the results of my own research except as cited in references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Author's Name : .....

Date : .....

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality as a partial fulfillment of Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.

Signature : …….

Supervisor‘s Name : ……

Date : ……

DEDICATION

Specially dedicated to my beloved parents

ABSTRACT

Ergonomics and design have made a greatest relation in producing an artefact or creating a workplace. With the popularization and application of computer, the application of the computer table is much higher compared to the application of computer in our daily life. In order to meet the requirements of new features, its structure is also constantly changing. In this project, a survey of questionnaire was done and also the anthropometric data have been collected. The dimensions of current computer table are then collected and the deficiencies of the current computer table in PLM CATIA Studio, FTK, UTeM have been focused on RULA analysis. Consequently, the problems of the current computer table have been detected through the results of RULA analysis. A new structural design of the computer table has been begun, and comfortableness of computer table has been designed, in order to make it meet the requirements of ergonomics. After the design phase, the structure and shaping have to be compact and beautiful, in order to lead a convenient and comfortable experience for the user. A product of the new design of ergonomics computer table is made and has been focused on RULA analysis as to define the improvement between both tables. Last but not least, the comparison between the current computer table and the new ergonomics computer table were analyzed. The improvement of the new ergonomics computer table was identified and reduced the injuries and disorders. A further investigation on better working posture when using a computer table is required, while further improvement for the product design of new ergonomics computer table is needed, and then applying the ergonomics design aspect in our life.

ABSTRAK

Ergonomik dan reka bentuk telah membuat hubungan yang besar dalam menghasilkan artifak atau mewujudkan tempat kerja. Dengan popularisasi dan penggunaan komputer, penggunaan meja komputer jauh lebih tinggi berbanding aplikasi komputer dalam kehidupan seharian kita. Untuk memenuhi keperluan ciri-ciri baru, strukturnya juga sentiasa berubah. Dalam projek ini, kaji selidik soal selidik telah dilakukan dan juga data antropometri telah dikumpulkan. Dimensi meja komputer semasa kemudiannya dikumpulkan dan kekurangan meja komputer semasa di PLM CATIA Studio, FTK, UTeM telah diberi tumpuan kepada analisis RULA. Dengan itu, masalah meja komputer semasa telah dikesan melalui hasil analisis RULA. Reka bentuk struktur baru meja komputer telah dimulakan, dan keselesaan meja komputer telah direka, untuk memenuhi syarat-syarat ergonomik. Selepas fasa reka bentuk, struktur dan bentuk harus kompak dan cantik, untuk memberi pengalaman yang mudah dan selesa bagi pengguna. Satu prototaip reka bentuk meja komputer ergonomik yang baru dibuat dan telah memberi tumpuan kepada analisis RULA untuk menentukan peningkatan antara kedua-dua meja. Akhir sekali, perbandingan antara meja komputer semasa dan meja komputer ergonomik baru telah dianalisis. Peningkatan meja komputer ergonomik baru telah dikenal pasti untuk mengurangkan kecederaan. Penyiasatan lanjut mengenai postur bekerja yang lebih baik apabila menggunakan meja komputer, penambahbaikan untuk reka bentuk prototaip meja komputer ergonomik baru juga diperlukan, dan kemudian menerapkan aspek reka bentuk ergonomik dalam kehidupan kita.

ACKNOWLEDGEMENTS

I would like to thank everyone who had contributed to the successful completion of this project. I would like to express my gratitude to my supervisor, Mr Hidayat bin Ab Rahman for me this opportunity for taking this title as my final year project, which is "Design and Development of Ergonomics Table". His invaluable advice, guidance and his dedication allowed me to complete my final year project smoothly. Besides that, I would like to send my gratitude to all my beloved friends who gave me ideas on the mechanism when I faced difficulties and always encouraged me. Most importantly, I would like to dedicate my special appreciation to my family for their endless support throughout my university life. Last but not least, I am indebted to all the lecturers that have thought me throughout my degree life in University Teknikal Malaysia Melaka.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ICT	-	Information and Communication Technology
WMSDs	-	Work-related Musculoskeletal Disorders
ULDs	-	Upper Limb Disorders
US	-	United State
FTK	-	Fakulti Tecknologi Kejuteraan
UTeM	-	Universiti Teknikal Malaysia Melaka
PLM	-	Product Lifecycle Management
CATIA	-	Computer-aided Three-dimensional Interactive Application
MSD	-	Musculoskeletal Disorder
IPMS	-	Integrated Product Materials Selection
RULA	-	Rapid Upper Limb Assessment
OSHA	-	Occupational Safety and Health Administration
M	-	Mean
SD	-	Standard Deviation
DPDT	-	Double Pole Double Throw

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION BACKGROUND

Nowadays, computer usage plays an important role in our life where a lot of things can be done by using it. The pace of changing in computer technology and Information and Communication Technology (ICT) has been remarkable where the technology was improved rapidly. Even the technology has been improved, the pc particularly desktop computer, which is also known as personal computer that only dedicated for normal use at just one place on a desk or table due to its size and power supply requirements. The most common configuration of a desktop computer has a central processing unit, motherboard, disk storage, a keyboard and mouse for input whereas computer monitor, speakers and infrequently printer for output.

Traditionally, a large number of humans in the workforce who constantly works in front of a computer and are desk-bound normally in sitting posture. The ergonomics posture of human body for these activities should consider as safety and health to get comfortable position. The comfortable position during these activities is important especially coupled with long hours of work so that it can avoid from ergonomics risk factors or injuries.

However, to chase the improvement of this technology, people usually disregard about the conformity of table as long as they can use the table to do the computer work. This situation most probably will cause ergonomics risk factors or injuries if they work for a long term. The uncomfortable of body posture that perpetually works in front of a computer and are desk-bound will occur of Work-related Musculoskeletal Disorders (WMSDs) at the neck and

upper limb, such as carpal tunnel syndrome, tendonitis, thoracic outlet syndrome, and tension neck syndrome. Figure 1.1 shows the flow of how the injury can occur.

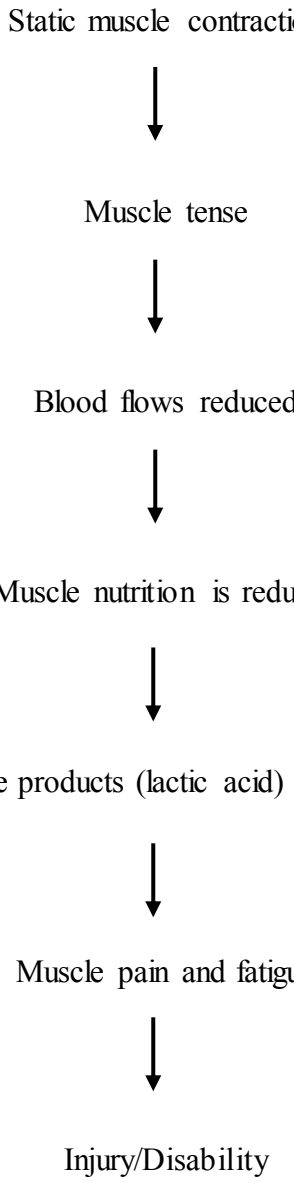

Figure 1.1: The flow of how the injuries occur

Source: OSHA (2000)

Research on ICT and Upper Limb Disorders (ULDs) has shown that practical injury, pain and discomfort at the upper limbs, neck and shoulder surges with occurrence and period of exposure to computer use (Bernard, 1997; Punnet and Bergqvist, 1997; Evans and Patterson, 2000). According to NIOSH, 1997, long-term interaction between users and computer usages will cause contact stress for wrist, arm, neck, shoulders and lower back as well as tiring eyes and headache. These associations have proven evidently by studies despite in design studies, case definition and terminology and data collection (Schierhout and Myers, 1996; Silversides, 1997; Harrington et al, 2000).

The ergonomics knowledge has been improved progressively and has been taken into consideration in designing a new product. For example, design of an adjustable table based on the anthropometric data that had been collected. From ergonomics knowledge, the ergonomics risk factors while using the new product or doing computer work can be reduced its possibilities from injury. This knowledge is the main focus in completing this project. The analysis of the computer table will be taken by using anthropometric data and then the process of new design of ergonomics computer table will be proceed based on the result analysis in this project.

This project is focus on the new design and development of ergonomics computer table that based on anthropometry data of students from FTK, UTeM. Those students that selected are the frequent users, mainly students from FTK, UTeM who usually use the PLM CATIA Studio's computer table. So, the improvement of the new design and development of ergonomics table will be based on the collection data from those students to complete this project.

1.2 PROBLEM STATEMENT

After the observation and experienced in using the computer at the PLM CATIA Studio, FTK, UTeM, it can be defined that an ergonomics design of an ergonomics computer table is very important in finding comfortably of workplace while doing the computer job for a long period without having any ergonomics risk factor or injuries. The current computer table in PLM CATIA Studio, FTK, UTeM does not follow the rules of ergonomics while building this table. These will cause ergonomics risk factors for those who use this computer table for a long period such as neck injury, shoulder pain, low back pain, contact stress and awkward posture.

1.3 OBJECTIVE

The main objective of this study is to propose a design and develop a new ergonomics table for PLM CATIA Studio, FTK, UTeM. To achieve this, several objectives will be outlined such as:

a) To collect anthropometric data of those students who are the frequent users of PLM CATIA Studio, FTK, UTeM.

b) To study and analyze the current computer table at PLM CATIA Studio, FTK, UTeM.

c) To make improvement of the current computer table for good working posture.

d) To design and develop a new ergonomics computer table that good for working posture based on the collected anthropometric data of students.

1.4 SCOPE

This project studies on the sitting and standing postures of users of current computer table in PLM CATIA Studio, FTK, UTeM. The collection data includes the current computer table and the current chair while the anthropometric data include the posture of students. The following tasks will be covered in this project which includes:

a) Development of anthropometric data.

b) Analyze the posture based on anthropometric data for student FTK, UTeM.

c) Develop an optimize solution of ergonomics computer table according to the posture analyzed by using CATIA software.

d) Development of ergonomics computer table using CATIA software.

1.5 EXPECTED RESULT

The expected result for this project is to design and develop a new ergonomics computer table at PLM CATIA Studio, FTK, UTeM.