DESIGN AND DEVELOPMENT OF ERGONOMICS MOUSE TRAY FOR OFFICE WORKERS

TIONG JING YIN
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2018

DESIGN AND DEVELOPMENT OF ERGONOMICS MOUSE TRAY FOR OFFICE WORKERS

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering

by

TIONG JING YIN
B051410161
941101-08-5512

FACULTY OF MANUFACTURING ENGINEERING
2018

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: **DESIGN AND DEVELOPMENT OF ERGONOMICS MOUSE TRAY FOR OFFICE WORKERS**

Sesi Pengajian: **2017/2018 Semester 2**

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Appendix B2

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Rujukan Kami (Our Ref) : UTeM.
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University Teknikal Malaysia Melaka
Hang Tuah Jaya, 76100 Durian Tunggal
Melaka.

11 June 2018

Tuan/Puan,

PENGKELASAN LAPORAN PSM SEBAGAI TERHAD LAPORAN PROJEK SARJANA MUDA KEJURUTERAAN PEMBUATAN : TIONG JING YIN

Sukacita dimaklumkan bahawa Laporan PSM yang tersebut di atas bertajuk "*Design and Development of Ergonomics Mouse Tray for Office Workers*" mohon dikelaskan sebagai TERHAD.

2. Hal ini adalah kerana ianya merupakan projek yang ditaja sepenuhnya oleh syarikat luar (ErgoWorks Sdn. Bhd.) dan hasil kajiannya adalah sulit.

Sekian dimaklumkan. Terima kasih.

Yang benar,

DR. RADIN ZAID BIN RADIN UMAR
Senior Lecturer
Faculty of Manufacturing Engineering
Universiti Teknikal Malaysia Melaka
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76100 Durian Tunggal, Melaka

Tandatangan dan Cop Penyelia

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Dr. Radin Zaid Bin Radin Umar
Fakulti Kejuruteraan Pembuatan,
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Melalui: YBhg. Prof. Madya Dr. Zamberi Bin Jamaludin
Dekan, Fakulti Kejuruteraan Pembuatan,
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Hang Tuah Jaya,
76100 Durian Tunggal, Melaka.

PER: STATUS MAKLUMAT TERHAD UNTUK MAKLUMAT DALAM PROJEK SARJANA MUDA OLEH TIONG JING YIN.

Adalah dimaklumkan bahawa Tiong Jing Yin (941101-08-5512) telah menganalisa laporan-laporan kami dalam menjayakan projek sarjana muda beliau. Sebahagian besar maklumat yang beliau gunakan adalah bersifat peribadi dan sulit, kerana melibatkan maklumat peribadi klien-klien kami. Oleh itu, diminta supaya laporan projek sarjana muda beliau diberi status "terhad".

Sekian, terima kasih.

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Signature : ……

Author's Name : TIONG JING YIN

Date : 11 June 2017

DECLARATION

I hereby, declared this report entitled "Design and Development of Ergonomics Mouse Tray for Office Workers" is the result of my own research except as cited in references.

Signature : .....

Author's Name : TIONG JING YIN

Date : 11 June 2017

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Degree of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:

…….....

(Dr. Radin Zaid Bin Radin Umar)

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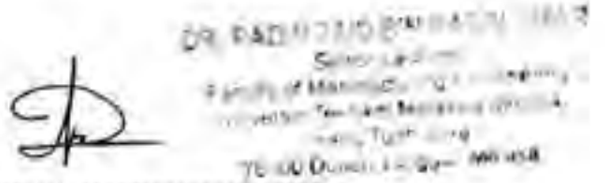

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(Dr. Radin Zaid Bin Radin Umar)

ABSTRAK

Beberapa penerbitan melaporkan kepada isu-isu muskuloskeletal dalam kalangan pekerja pejabat. Hanya sedikit usaha campur tangan memberi tumpuan kepada menyelesaikan masalah ini dari sudut kawalan kejuruteraan pandangan. Siasatan lanjut telah dijalankan antara pekerja pejabat dan didapati isu-isu yang berulang seperti miskin postur, pergerakan berulang-ulang, dan tempoh penggunaan tetikus boleh meningkatkan faktor risiko atas pekerja pejabat. Upper Limb Musculoskeletal Disorders(ULMDs) telah menjadi sangat biasa dalam kalangan pekerja pejabat. Projek ini bertujuan untuk merekabentuk dan membangunkan satu dulang tetikus prototaip yang kos efektif dan boleh memperbaiki postur pekerja pejabat bila menggunakan tetikus komputer. Metodologi ini dibahagikan kepada tiga fasa - fasa 1, Fasa 2 dan Fasa 3. Fasa 1 merangkumi kajian kesusasteraan, meneliti laporan-laporan penilaian profesional ergonomik yang dikumpul dari syarikat ergonomik. Fasa 2 adalah penilaian keperluan pekerja pejabat, spesifikasi Reka bentuk, produk conceptualization, mengumpul dimensi papan kekunci dan mengecil turun rekabentuk konsep dengan menggunakan ciri dan kaedah pemeriksaan dan mendapatkan maklum balas daripada profesional ergonomik. Di samping itu, Solidworks digunakan untuk melakukan simulasi dan analisis ke atas faktor tekanan dan keselamatan cadangan dulang tetikus. Analisis kos dibangunkan dengan menggunakan analisis Breakeven untuk mengira kuantiti dan kos breakeven prototaip polylactic asid (PLA) dan prototaip Aluminium. Selain itu, lima orang pakar-pakar profesional ergonomik akan dipilih untuk menguji dan menilai cadangan dulang tetikus. Kesimpulannya, ia adalah diperhatikan bahawa postur profesional ergonomik telah bertambah baik dan jarak antara menaip dan komputer tetikus telah dikurangkan. Hasil purata masa yang diambil oleh subjek untuk menyelesaikan tugasan yang diberi dengan menggunakan dulang tetikus yang dicadangkan adalah lebih pendek daripada masa yang diambil dengan menggunakan cara tradisional.

ABSTRACT

Several publications reported high prevalence of musculoskeletal issues among office workers. Only a few interventions efforts have focused on solving the problem from an engineering control point of view. Further investigations of office workers identified recurring issues such as poor posture, repetitive motion and duration of using mouse may increase the risk factors of Upper Limb Musculoskeletal Disorders(ULMDs). ULMDs are become very common in office working area. The aim of this project is to design and develop a prototype mouse tray that is cost effective and can improve the upper limb posture when using computer mouse. The methodology was segregated into three phases- Phase 1, Phase 2 and Phase 3. Phase 1 includes literature review, review reports of professional ergonomics assessments that collected from consulting ergonomic company. Phase 2 is need assessments of office workers, design specifications, product conceptualization, collecting dimensions of keyboard and narrowing down the conceptual design by using Pugh's screening method and getting feedback from professional ergonomics consultants. In addition, Solidworks software was used to do simulation and analysis on stress and safety factor of proposed mouse tray. Cost analysis was developed by using Breakeven Analysis to calculate the breakeven quantity and breakeven cost for PLA prototype and Aluminium prototype. Besides, five professional ergonomics consultants were selected to test and evaluate the proposed mouse tray. In conclusion, it was observed that the upper limb posture of the professional ergonomics consultants was improved and the distance between alphabet typing and computer mouse was reduced. The results of average time taken for subjects to complete the given task by using proposed mouse tray is shorter than the time taken by using traditional approach.

DEDICATION

Only

my beloved father, Tiong Bun Liang

my appreciated mother, Lim Tia See

my adored sisters, Lee Ling, Lee Kien and Shu Yin

for giving me moral support, money, cooperation, encouragement and also understandings

Thank You So Much & Love You All Forever

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Firstly, I would like to express my sincere gratitude to my supervisor, Dr. Radin Zaid Bin Radin Umar for his support, guidance, monitoring and encouragement throughout the whole study period. His encouragement helped me to concentrate on my research and complete my research successfully.

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Last but not least, I am grateful with the cooperation given by the technicians, Encik Ghazalan and Encik Hairudin for helping with the fabrication of prototype. I would also like to thank professional ergonomics consultants from ergonomic consulting company for providing input and feedback for this study.

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LIST OF ABBREVIATIONS

CCOHS	-	Canadian Centre for Occupational Health and Safety
EHRS	-	Environmental Health and Radiation Safety
EMG	-	Electromyography
MSD	-	Musculoskeletal System Disorder
NIOSH	-	National Institute of Occupational Safety and Health
PLA	-	Polyactic Acid
RMS	-	Root Mean Square
RULA	-	Rapid Upper Limb Assessment
ULDs	-	Upper Limb Disorders
USB	-	Universal Serial Bus
WRULDs	-	Work-related Upper Limb Disorder

CHAPTER 1

INTRODUCTION

1.1 Background

In the 21st century, computer has become an essential electronic device in daily life. Computer is defined as a gadget that takes instruction and perform the commanded instructions and operations accordingly. Computer able to store and process the data quickly, therefore increase the productivity of worker. Computer has been widely used in different places such as hospitals, banking sectors, business, marketing and etc. Chris (2014) found that computer is the device that commonly used in the workplace. According to Harvey & Peper (2010), the usage of mouse in a working day can equal or more than the time spent using a computer keyboard for working. As personal computer become more popular in working area, a dramatically increased in the number of office workers suffer from upper extremity musculoskeletal pain (Harvey & Peper,2010).

Reality Mine (2014) which is a technology data business that measure and collect consumers behavioural data. The statistics from Reality Mine shown that 64% of American used computer in the workplace during the week in year 2014 as shown in Figure 1.1. According to the statistics from the Organisation for Economic Co-operation and Development (2012), the average American spend approximately 1790 hours every year in work. Department of Statistics Malaysia (2010) stated that employees who use computer in workplace increased 91,660 persons in 2007, which has increased 10.2% as compared to 83,159 persons in 2006. Usage of computer in the workplace has risen dramatically, there

are 6 in 10 workers using a computer for their work in 2000 as compared to 3 in 10 workers in a decade earlier (Marshall, 2001).

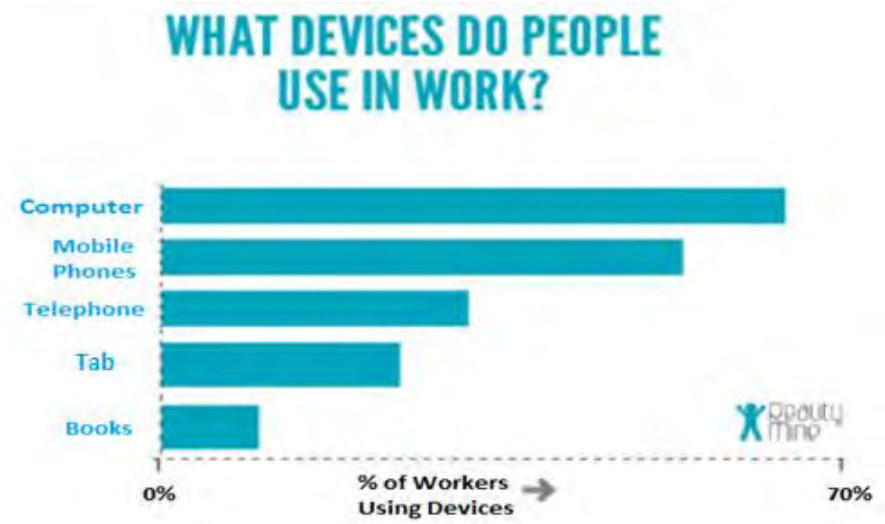

Figure 1.1: Type of device that American used in work in year 2014 (Reality Mine,2014)

Office workers are mostly key-in data, data processing, emailing and much more which mainly using computer mouse and keyboard typing. They conducting daily routines in front of computer for long hours. Majority office workers spend 5 to 8 hours on computer per day (British Psychological Society, 2012). Poor upper limb posture when using computer and mouse for a long period may increase the risk to injury. The more extreme posture or non-optimal posture when using mouse can cause discomfort in upper limbs (Harvey & Peper,2010). Upper limb disorders (ULDs) is become very common in office working area. ULDs are defined as the pain that involving from fingers to shoulder. From the European statistical data, it was found that 41.3% of office clerks is suffer from upper limb pain (Andriana et al., 2016). Therefore, an ergonomic design set-up in the workstation is important to ensure the comfort and safety for the workers. Ergonomic defined as a workstation designed that fits to human. According to Handbook of Industrial Engineering published by Salvendy (2001), ergonomic defined as the "the science of fitting workplace condition and job demands to the capabilities and inabilities of the worker", is an important element in a proper designed workstation.