

HUMAN REACH FOR SAFETY, CMFORT AND EFFICEINCY AT WORK

ROJA ABEDIAN KASGARI

UNIVERSITI TEKNOLOGI MALAYSIA

HUMAN REACH FOR SAFETY, COMFORT AND EFFICIENCY AT WORK

ROJA ABEDIAN KASGARI

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To my beloved Mother, Father and Brothers

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## ABSTRACT

In today's industry, resources, skills, innovation and technology, and strategic plans contribute to the increased productivity of a company. Among all these, workers are the main asset of a company, and companies need to ensure that they have good workforce health. Apart from safety, ergonomic aspects play an important role in determining the level of comfort in the workplace or jobs which workers are subjected to. Correct body posture is very important while doing everyday activities such as walking, sitting, bringing things or even during sleeping. Straight vertical alignment of the body from the top of the head, through the body's center, to the bottom of the feet is known as a correct body posture. If this value was used to determine the position for meter display as an example, it is possible for someone to have neck pain and back problems. This project is to determine the safety, comfort and efficiency at work. The project was conducted in two stages where the 1st stage was to determine the appropriate technique that would be used to determine the distance. Then, the technique would be tested.

## ABSTRAKT

Pada masa kini, bidang perindustrian, sumber, kemahiran, inorasi dan teknologi dan pelan yang berkesan menyumbang ke arah peningkatan pengeluaran syarikat. Pekerja – pekerja merupakan qset utama dalam sesebuah syarikat dan syarikat perlu memastikan mereka mempunyai kesihatan yang baik. Selain dari keselamatan, aspek ergonomic juga memainkan peranan yang penting untuk menentukan tahap keselesaan cli tempat kerja atau kerja apakah yang mereka lakukan. Postur badan yang betul adalah sangat penting ketika melalculen qlctiviti – aktiviti harian seperti berjalan, duduk, membawa barang dan juga ketika ticlur. Kedudukan badan yang tegak dari atas kepala, ke bahagian tengah badan. ke bawah kaki dikenali sebasai posture badan yang betul, jika postur badan tidak betul, berkemungkinan seseorang akan mengalami sakit tengkuk / leher dan masalah belakang badan. Projek ini adalah untuk menemtmukan keselamatan, keselesaan dan juga keefisian di tempat kerja. Projek ini terbahasi kepada dua peringkat di mana peringkat pertama adalah untuk menentukan teknik yang betul untuk menentukan jamk. Kemudiar, teknik itu akan di uji keberkesanannya.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

In recent years, the majority of factories pay attention to cut off cost in order to remain competitive. Factory managers have not wish to put their workers in dangerous work situation. They don't desire to see a strike in their factories. They are also afraid of any lawsuits against their factories if some workers get injured at workplaces. But at the same time, they prefer to see the factory survive and succeed in the competitive markets, and to do so, they have to continuously improve the productivity. And actually it's no doubt that focus on human reach for efficiency and safety and comfort at work is the most important way to save their cost.

Sometimes designers ignore or forget to consider the best human reach at work so employees may feel uncomfortable working at their work stations and they may hurt and injury themselves when they reaching for a tool. These hurts cause a lot of pains. The workplace involves equipment, workers, machines and so on, thus, workplace result in high risk in injuries to the workers. Beside injuries, factory managers may lose their experienced workers. Their workers might not fit very well to their jobs and may leave their jobs or even may cause a decrease in workers skill. These problems will effect on factory's productivity that may spend plenty of money for repayment claim from workers.



In addition, workplace should be fit with the body dimensions of the workers, because it could be effective to prevent errors, injuries, fatigues, pains and discomforts for workers. Indeed, workplace design is one of the main areas that can help to improve compatibility between situation and workers. In this case anthropometry that means the measurement and the study of human body dimensions play a main role.

A workstation is the place a worker occupies when performing a job. The workstation may be occupied all the time or it may be one of several places where work is done. Some examples of workstations are work stands or work tables for machine operation, assembly or inspection; a work tables where a computer is operated; a control console; etc. A well designed workstation is important in preventing diseases related to poor working conditions, as well as for ensuring that work is productive. Every workstation should be designed with both the worker and the task in mind so that work can be performed comfortably, smoothly and efficiently. If the workstation is properly designed, the worker should be able to maintain a correct and comfortable body posture. This is important because an uncomfortable work posture can cause a variety of problems, such as:

- Back injury;
- Development or aggravation of repetitive strain injuries;
- Circulatory problems in the legs

The main causes of these problems are:

- Poorly designed seating;
- Standing for long periods;
- Reaching too far;
- Inadequate lighting forcing the worker to get too close to the work.

The following are some basic ergonomic principles for workstation design. A general rule of thumb is to consider body size information, such as height, when choosing and adjusting workstations. Above all, workstations must be adjusted so that the worker is comfortable.

Departments are encouraged to purchase adjustable equipment for the reasonable accommodation of worker. Some workers may have special needs, such as left-handedness, color blindness, vision impairment, etc. The goal should be flexibility to accommodate the workers so that personnel may interface effectively with equipment. Equipment should be sized to fit the individual user.

Equipment, which is available, has adjustable components that enable the worker to modify the workstation to accommodate different physical dimensions and the requirements of the job. Ergonomically-designed walk station can reduce pain and injury, increase productivity, improve morale, and decrease complaints.

Equipment should be task specific to eliminate:

- (a) Static or awkward posture,
- (b) Repetitive motion,
- (c) Poor access or inadequate clearance and excessive reach,
- (d) Display that are difficult to read and understand, and
- (e) Controls those are confusing to operate or require too much force.

Therefore, machines that are selected should be appropriate for the types of tasks performed and be adaptable to multi-purpose use. Office workstations must be designed carefully to meet the need of the staff and to accomplish the aims of the facility.

This study aims to establish and define precisely the areas for comfort, safety and efficiency at work and tries to discuss about the relation of perfect work station with workspace and machine design to prevent the awkward postures and heavy exertion forces of workers that may cause injuries to worker and result in dangers for their safety. These factors are very useful to improve efficiency for human reach at work. In addition, design of standing and seated work areas is another factor that is discussed in this study that could be effective for worker's safety and comfort.

## **1.2 Background to the problem**

In daily life, people cannot grasp and reach an object if this object is too high on a wall. So, physical dimensions of a workplace must be fit to the body dimensions of workers.

Each year there are lots of injuries for workers that occur in factories. All these injuries would result in cost to workplaces. So, workstations design should be perfect otherwise, the workers may feel uncomfortable working at unaffordable stations and hurt themselves when they overextend their shoulder or bend forward and make curved too much in reaching to a tool.

Workers in many factories suffer from many injuries each year that make some problems such as low back pain, upper extremity (shoulders, fingers, arms, hands and wrists), lifting, back pain and hand tools problems. These problems many result in large amount of cost to a factory so; the productivity of the factory goes down.

## **1.3 Problem statement**

Keeping the body in an upright position requires considerable muscular effort that is particularly unhealthy even while standing motionless. It effectively reduces the blood supply to the loaded muscles. Insufficient blood flow accelerates the onset of fatigue and causes pain in the muscles of the legs, back and neck (these are the muscles used to maintain an upright position).

The worker suffers not only muscular strain but other discomforts also. Prolonged and frequent standing, without some relief by walking, causes blood to pool in the legs and feet. When standing occurs continually over prolonged periods, it can result in inflammation of the veins. This inflammation may progress over time to chronic and painful varicose veins. Excessive standing also causes the joints in the spine, hips, knees and feet to become temporarily immobilized or locked. This immobility can later lead to rheumatic diseases due to degenerative damage to the tendons and ligaments (the structures that bind muscles to bones).

Work station design is one of the main factors that can be useful to improve the fit between machines, workers and situations. Work stations that are not designed according to the anthropometric characteristics of the workers will force the workers to adopt awkward or inconvenient postures that are hard to maintain and full of stress to their body. In work station design, focus on standing and seated work area is very important to prevent of injuries and provides the worker's safety and their comfort.

Clearance problems are the main issues in work stations design. Some of clearance problems are: the space between equipment, the dimensions provided for the head, elbow, feet, legs and height and width of walkway. Inadequate clearance may force workers to adopt an awkward posture, hence discomfort for workers that may reducing productivity.

Sometimes workers need to extend their arms to grasp and reach a tool clearly harmful to their safety. Therefore objects and tools that need to be reached regularly must be located close to the worker's body and within the reach area of their body as possible.

Manual material handling including twisting motions of worker's torso, bending, lifting are also a main cause of low back pain among the workers.

#### 1.4 Objective of study

The health and safety representative should play an important role in ensuring that ergonomics is applied accordingly at workplaces. Efforts to ensure that equipment and jobs are designed or adapted to fit workers will help to prevent a variety of health problems caused by poor working conditions.

Therefore the main objectives of this project are:

- a) To determine the limit for reach for safety at work.
- b) To determine the limit for reach for comfort at work.
- c) To determine the limit for reach for efficiency at work.

The basic objective of this project is to determine the limit for reach for safety. This objective wants to study about the weakness among the employees; if these problems occur some losses will be faced; employees should take a medical leave; the factory will lose its employees, and so on.

Workplace safety is about preventing injury and illness to employees and volunteers in the workplace. Therefore, it's about protecting the nonprofit's most valuable asset: its workers. By protecting the employees' and volunteers' well-being, the nonprofit reduces the amount of money paid out in health insurance benefits, workers' compensation benefits and the cost of wages for temporary help. Losses could be due to the cost of lost-work hours (days away from work or restricted hours or job transfer), time spent in retraining programs and services that may suffer due to fewer service providers, stress on those providers who become the substitutes or, worse case, having to suspend or shut down a program due to lack of providers.

To make the workplace safer, the organization has to acknowledge which potential health and safety hazards are present. Or determine where and what and how a worker is likely to become injured or ill.

The second objective is to determine limit for reach for comfort. This objective will be used in the work station design as a main factor, but other factors such as worker's satisfaction could be added.

The work environment can impact on a person's performance in a number of different ways from the effects to health (heat stress, musculoskeletal disorders); effects that reduce the individual's ability to perform a task; to effects that cause dissatisfaction, resistance to change and uncooperative attitudes.

Workers need adequate working space to carry out the tasks they are responsible for. This means they need sufficient space to move about the work area and to access their work station(s) safely. They also need sufficient space to store work equipment including files and documents that they need to use for their work. Work spaces that are perceived by employees to be cramped have a negative effect on job satisfaction and efficiency, and on long-term sickness and absenteeism.

The third objective is to determine limit for reach for efficiency. This objective will try to help the companies overcoming problems that could be existed in this project.

Today, Ergonomics commonly refers to designing work environments for maximizing safety and efficiency. Biometrics and Anthropometrics play a key role in this use of the word Ergonomics. Engineering Psychology often has a specialty dealing with Workplace or Occupational Ergonomics.

Companies once thought that there was a bottom-line tradeoff between safety and efficiency. Now they embrace ergonomics because they have learned that designing a safe work environment can also result in greater efficiency and productivity. But it is in the design of the workplace as a whole where the greatest impact can be seen for both safety and efficiency. The easier it is to do a job, the more likely it is to see gains in productivity due to greater efficiency. Analogously, the safer it is to do a job, the more likely it is to see gains in productivity due to reduced time off for injury. Ergonomics can address both of these issues concurrently by maximizing the workspace and equipment needed to do a job.



## **1.5 Scope of study**

This study considers on human reach for safety, comfort, and efficiency at work. Machine designs, work station designs, design of standing and seated work areas may be carried out efficiently based on the data on reaches among workers. For this literature library of Universiti of Teknologi Malaysia was selected, since it has students from different races. Moreover it has a good distribution of different genders and ages. Thus, it is selected to carry out the study on the students.

## **1.6 Organization of thesis**

Chapter 1 illustrated the introduction and background of the human reach for comfort, safety and efficiency at work. Chapter 2, literature review will discuss about human reach some information on its theories. Chapter 3, include of methodology about how to carry out and implement the analysis. Chapter 4 provides the result of experiment and examination and analysis that in previews chapters have been used. Chapter 5 consists of discussion. Chapter 6 that is the last chapter is about project conclusion, recommendation and suggestion for future work. Next chapter provide the literature review of the area under investigation.

## **1.7 Conclusion**

This chapter provides an introduction on safety, comfort, and efficiency. The main purpose of this study is based on the problem statement that has been stated clearly in Chapter 2.