



**Faculty of Mechanical and Manufacturing Engineering
Technology**

**USING TIME STUDY TO IMPROVE PRODUCTIVITY OF
FURNITURE COMPANY**

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**Bachelor's Degree in Manufacturing Engineering
Technology (Product Design) with Honours**

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**USING TIME STUDY TO IMPROVE PRODUCTIVITY OF
FURNITURE COMPANY**

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in fulfillment of the requirements for Bachelor of Manufacturing Engineering
Technology (Product Design) with Honours**

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I declare that this thesis entitled “Using Time Study to Improve Productivity of Furniture Company” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : 8/1/2020

DEDICATION

To my beloved parents, who have been my source of strength and inspiration and gave me support in terms of moral, spiritual, emotional and financial.

To my supervisors Dr. Hung Yu Ching @ Muhammad Hung and TS. Mohd Razali bin Md Yunos for their guidance and support.

APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Product Design) with Honours. The member of supervisory is as follow:

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ABSTRACT

A case study to improve the productivity of the production process in Hon Wei Furniture Sdn. Bhd. is carried out. The objective of this case study is to identify problems that affecting the productivity, to study the process time for the making of ABK-1890 Bookshelf and to recommend and suggest suitable solutions for the problem. In this case, ABK-1890 Bookshelf is chosen as the model of furniture to be studied and Stopwatch Time Study was carried out where the time taken for the processes are taken, recorded and analyzed. The following steps are used to complete this case study: *Select*, *Record*, *Examine* and *Develop*. *Select* is to select the type of model to be studied; *Record* is to observe and record all the data related to the process; *Examine* is to examine each information collected; and lastly *Develop* is to propose solutions for productivity improvement. After the Time Study, problems that affecting the productivity of the production are identified, such as the machine setting, transportation between stations, process flow, the edging process and the condition of the working space. Several solutions are then proposed to solve the problems, including create database for machine setting, alter method of transportation and edging process, improve factory layout and improve the neatness of working space by using 5S. Edging process is simulated in the ARENA software and the improved system is proposed in the simulation. Suggestions made are aim to reduce process time, eliminate non-value added activities, and improve operator's utilization percentage.

Keywords: Time Study, Work Measurement. 5S, Arena simulation, Productivity improvement, Furniture manufacturer.

ABSTRAK

Kajian kes untuk meningkatkan produktiviti sistem di Hon Wei Furniture Sdn. Bhd. telah dilaksanakan. Objektif kajian kes ini adalah untuk mengenalpasti masalah yang menjejaskan produktiviti sistem, mempelajari masa yang diperlukan dalam pembuatan ABK-1890 Bookshelf dan mencadangkan jalan penyelesaian masalah yang dikenalpastikan. Dalam kes ini, ABK-1890 Bookshelf telah dipilih sebagai model kajian dan Stopwatch Time Study telah digunakan di mana masa untuk proses pembuatan telah diambil, dicatat dan dianalisis. Langkah-langkah berikut telah dilaksanakan bagi melengkapkan kajian kes ini, iaitu Select (Pilih), Record (Rekod), Examine (Periksa) dan Develop (Kembang). Select (Pilih) adalah untuk memilih sasaran model untuk kajian kes ini; Record (Rekod) adalah untuk memerhati dan mencatat segala informasi yang berkaitan dengan proses tersebut; Examine (Periksa) adalah untuk memeriksa informasi yang dikumpulkan; dan akhir sekali Develop (Kembang) adalah untuk mencadangkan jalan penyelesaian bagi meningkatkan produktiviti sistem. Selepas kajian Time Study, masalah yang menjejaskan produktiviti sistem telah dikenalpasti, iaitu setting mesin, pengangkutan antara stesen, pengaliran proses, proses edging dan keadaan tempat kerja. Beberapa cadangan telah dikemukakan termasuk mencipta database untuk setting mesin, mengubah cara pengangkutan dan proses edging, memperbaiki susun atur kilang dan memperbaiki kekemasan tempat kerja dengan 5S. Proses edging telah disimulasikan dalam Arena dan sistem yang telah diperbaiki juga dikemukakan. Cadangan yang dikemukakan fokus dalam mengurangkan masa proses, menghapuskan aktiviti yang tidak bermanfaat dan meningkatkan peratusan penggunaan pekerja.

Kata Kunci: *Time Study, Work Measurement, 5S, Simulasi Arena, Peningkatan produktiviti sistem, Pembuatan perabot*

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CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter, the basic concern about this project will be discussed, where the background of Time Study and 5S will be proposed. Apart from that, the purpose, problem statement and the scope of project will be explained in this chapter.

1.1 Background of Project

Several problems and challenges are faced by the manufacturing institution nowadays. Problems such as global economic impact, wastage of resources, resources deficiency, misuse of natural resources and environmental contamination will indirectly affecting the cost of production (Zahraee, 2016). Manufacturers were forced to practice new management system in order to minimize the cost of production and improve the product quality so that they will not be eliminated in this competitive international market (Guerrero et al., 2017). Hence, productivity improvement is very important in the organization to ensure the survival and competition in the manufacturing industries (Nallusamy & Muthamizhmaran, 2016). Apart from that, by improving productivity, profit of the company will be increased too although the amount of resources remain unchanged. Enhancement of productivity assists in achieving customers' satisfaction as well as reducing cost and time of production (Moktadir et al, 2017).

One of the tool to enhance the productivity is the Time Study. With the application of Time Study, non-value added activities (also known as wastes) can be recognized and removed (Nallusamy & Muthamizhmaran, 2016). Time Study designed to establish the most efficient way to implement the repetitive job and to quantify the time taken by the operator to accomplish a given job in a definite workspace (Nallusamy & Muthamizhmaran, 2016). During the application, the steps of *Select, Record, Examine, Develop* can be used as a guideline in order to achieve the objectives (Moktadir et al., 2017).

The concept of 5S opened a new era in system improvement when it was introduced by the Japanese. It consists of 5 Japanese words: *Seiri* (Sort), *Seiton* (Set in Order), *Seiso* (Sanitize), *Seiketsu* (Standardize) and *Shitsuke* (Sustain). This method helps a company to achieve a well-organized workplace in order to reduce non-value added activities, increase productivity and quality of the product (Jain et al., 2014). However, 5S approach has to be practiced consistently and in long term, as standardization and continuous policies are required to achieve the aim of 5S (Randhawa & Ahuja, 2017).

Then, in order to improve the efficiency in calculation and analysis, a helping hand from software simulation will be a great bonus. This is because the traditional methods in determining the cycle time and bottleneck of the system might take a longer time and higher cost. Therefore, with the application of computer simulation, the system behaviour can be identified in a way of more cost effective and minimize risk (Abrishami, Zeraatkar, Esrafilian, Vafaei, & Zahraee, 2018).

In this project, a local furniture company was selected as the target of case study. Table 1.1 shows the details of the company where this case study conducted.

Table 1.1 Details of case study company

Name of company	Hon Wei Furniture Sdn. Bhd.
Registration number	0223591-M
Date of registration	23 rd August 1991
Location of company	Industrial Estate in Bukit Pasir, Muar, Johor
Number of staff	Approximately 100 people
Type of product	Wood furniture (knock-down or semi knock-down)

The reason we choose this company is because this company is a medium-scaled furniture company with an incomplete operational system. With an increasing number of customer's requirements, an effective system which helps to improve productivity is significant for them to continue expanding their company. Figure 1.1 and Figure 1.2 shows the main entrance of the company.



Figure 1.1 Hon Wei Furniture Sdn. Bhd
Source: Ong, March 22, 2019.



Figure 1.2 Main entrance of Hon Wei Furniture Sdn. Bhd
Source:, Ong, March 22, 2019.

1.2 Problem Statement

The production time is the major problem faced by Hon Wei Furniture Sdn. Bhd. that affecting the productivity of the company. After the short interview with the production manager and observation of the production department, it is necessary to reduce the time taken to produce the products. This problem happened due to the following reasons:

- Layout of the factory causing the inconvenience of transportation of parts between stations.
- Process flow of the production and assembly line is affected due to the lack of standard operating procedure.
- Idleness of the operators and machines due to lack of training and communication problems.

1.3 Objective

In this research, the following objectives are to be achieved:

- To identify problems that affecting the productivity
- To study the process time for the making of ABK-1890 Bookshelf
- To recommend and suggest suitable solutions for the problem

1.4 Scope and Limitations

The implementation of Time Study in the furniture company production system will be the main concern in this project. The followings are several limitation faced in this project:

- The manufacturing process of the company is different for each model of furniture produced by the company
- The process time for the process is different for each model of furniture produced by the company
- The solution will only be proposed without actual actions to practice it.

1.5 Summary

In short, a case study about productivity improvement is carried out in Hon Wei Furniture Sdn. Bhd. Time study is used in the conducting of this case study. Problems occurred in the company such as layout of the factory that affecting the movement of the process, process flow of the which is affected by the lack of SOP and idleness of the operators and machine are the problems affecting the productivity of the company. Objectives of this case study is to study the process time for each process in the making of ABK-1890 Bookshelf, to identify problems that affecting the productivity and to recommend and suggest a suitable solution for the problem. However there are some limitations in conducting this case study which the manufacturing process and time taken for each processes are different for each model of furniture produced by the company. Besides that, the solution of the problem will only be a proposal but not practical.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Chapter of Literature Review will discussed about 7 subtopics, including previous studies, productivity, time study, 5S, Lean Design Management, Software support (Arena Simulation Software), and also Case study in Hom Wei Furniture Company.

This project is mainly about a case study involving the increasing of process productivity. The case study will be conducted in Hon Wei Furniture Sdn. Bhd. Time study is carried out where time taken for each process to complete is recorded. Arena Simulation Software will be used as the tool to simulate the suggested improvement of the process. At the same time, the concept of 5S and lean design management will be pertained to improve the productivity of the production process.

2.1 Previous Studies

This sub-chapter consists of the summary of the case studies carried out previously by others. By referring to the previous studies gives a clearer understanding about the topic. Previous studies are summarized based on their title, author(s), year of publish, objective, methodology, results and conclusion.

2.1.1 Previous Studies on Work Study

(Mishra, 2015) in the study entitled “Productivity Improvement in Shoe Making Industry by Using Method Study” proposed the area of improvement in the area to increase the productivity of a company (the name of the company was not stated). Mishra used Method Study with the steps of Select, Record, Examine, Develop, Define, Install and Maintain to carry out this project. In this study, the number of product produced weekly was increased from 560 to 580; number of product produced annually increased from 28800 to 30240 while the profit per year increase from 12960000 to 1360800.

Another project carried out by (Patel, 2015) successfully reduced the cycle time in a bearing manufacturing company by around 4 to 5 seconds per one ring. Besides that, the overall equipment effectiveness was 6.9% while the time consuming activities were found in the manufacturing line. In this case, motion and time study (Select, Record, Examine and Develop) were used to achieve the objectives of (1) demonstrating cycle time from the current project based on machine hours and (2) calculating Overall Equipment Effectiveness and its improvement.

Furthermore, Time Study was used in the project entitled “Productivity Improvement by work and time study technique for each energy-glass manufacturing company” carried out by (Duran et al., 2015). The objectives of this study were (1) to evaluate the efficiency of tea glass model and (2) to compare actual time and standardized time. This project is succeed where the factor of inefficiency was determined (the waiting time), and the efficiency was increased by 53% while the model production capacity of 237 is reached.

In the study of “Productivity Improvement Through Lean Deployment & Work Study Methods” by (Kulkarni et al., 2014), an overview of productivity improvement methodology involving Work Study Methods and Lean Manufacturing Tools was studied. Roles of Work

Study and Lean Tools in improving productivity are mentioned in the project. As in conclusion, method study is suitable to be done firstly to define problems in the system by obtaining the accurate results from the study. Next, bottleneck analysis is the best way to further specified the problem Then, advanced time study are applied to find out the details of the problem existing in the system. Finally, lean tools are used to classify and obtain the most efficient solution in order to improve productivity as well as profit.

Last but not least, (Nallusamy, 2016) studied the examples of previous studies on motion and time study. The author then concluded the basic procedure of the study and summarized the findings. As conclusion, time and motion study are the best tool to identify non-value added activities in the manufacturing process. Indirectly, cycle time of the process is reduced and the productivity of the process is increased. Besides that, motion and time study is also suitable to calculate the actual time taken for each processes and eventually helps to obtain the accurate finishing time of a certain product.

2.1.2 Previous Studies on 5S

(Pasale & Bagi, 2014) found out that much time was wasted in the process of setting up rather than the actual machining time in Sunmill Industries. This is caused by misplaced and unorganized of material where workers took time to search for the needed material. Hence 5S (Seiri, Seiton, Seiso, Seiketsu and Shitsuke) is applied to this company, resulting a 28% decrease in the machine setting time.

A literature review on 5S is conducted by (Randhawa & Ahuja, 2017). The study showed that 5S approach is very important in the sustained growth of the organizations. 5S was the essential foundation and can be applied together with other quality tools for example Kanban System, Lean, Total Quality Management.

In the study of “Integrated Approach to Productivity Improvement using 5S” by (Marathe et al., 2017), 5S was implemented in a mechanical spring manufacturing company to solve the problems of deficient inventory management, low productivity and excess material usage. As the results, total machine idle time was reduced from 5.5 minutes to 1 minute. Not only that, the workers can identify different types of raw material easier with the help of colour codification.

Last but not least, 5S approach was implemented in the Krishna Plastic Company by (Rojasra & Qureshi, 2013). The objective of this project was to improve the productivity of the company. With the implementation of 5S methodology, the efficiency of production line was improved from 67% to 88.8%. 5S also helps to provide better usage of working environment, reduction of accidents and pollution as well as prevention of losing tools.

2.2 Productivity

Productivity can be defined as the ratio of an output to the unit of the entire input used in generating the output (Duran et al., 2015). It is a standard of efficiency where a company manages to transform its existing resources or inputs into finished goods or outputs (Singh & Singhal, 2016). Improvement of productivity is very important in determining the survival of a company, at the same time achieving breakthroughs of tasks (Mishra, 2015). Productivity normally diverges from production. Production pays attention to the augmentation of the output over a given period of time; productivity concerns with the ratio of output to an input (Kulkarni et al., 2014). According to (Meenakshisundaram & Patil, 2016),

Productivity can be improved by using any of the following methods: Total Quality Management, Kaizen, Work Study, 5S, Six sigma, Line Balancing and so on. However, not