



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**A STUDY ON THE APPLICATION OF VALUE STREAM
MAPPING IN INDUSTRY**

This report submitted in accordance with the requirements of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering
(Manufacturing Design) with Honours.

by

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I hereby, declared this report entitled “A Study on the Application of Value Stream Mapping in Industry” is the result of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) with Honours. The member of the supervisory committee is as follow:

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ABSTRACT

Lean Manufacturing (LM) is a philosophy to eliminate waste in the production. The seven types of wastes that revealed by this philosophy are overproduction, waiting, transporting, inappropriate processing, unnecessary inventory, unnecessary motion and defect on the product. Value Stream Mapping (VSM) is a tool of lean manufacturing where it helps to understand the streamline work processes. Value Stream Mapping also able to identify the sources of wastes and suggest on how to eliminate it. The purpose of this study is to investigate the application of Value Stream Mapping at the factory which declares implement the VSM in their business. A manufacturing company based on car carpet manufacturing was selected as the venue of material gathering for this study. Interview, observation and site visit are the method that was conducted to gain the sufficient information. The finding of this study shows that the implementation of VSM was upgraded the manufacturing performance.

ABSTRAK

Lean Manufacturing (LM) adalah satu falsafah untuk menghapuskan pembaziran dalam produksi. Tujuh jenis pembaziran yang dinyatakan oleh falsafah ini adalah seperti pengeluaran berlebihan, menunggu, mengangkut, pemprosesan yang tidak sesuai, inventori yang tidak penting, pergerakan yang tidak penting, dan kecacatan pada produk. Value Stream Mapping (VSM) merupakan satu kaedah dalam Lean Manufacturing di mana ia membantu dalam memahami aliran proses kerja. Value Stream Mapping juga mampu mengenalpasti punca – punca kewujudan pembaziran dan mencadangkan bagaimana untuk menghapuskannya. Tujuan kajian ini adalah untuk mengkaji penggunaan VSM di kilang yang menyatakan melaksana VSM dalam urusan mereka. Sebuah syarikat pembuatan berasaskan pembuatan karpét kereta telah dipilih sebagai tempat mengumpul maklumat untuk kajian ini. Sesi temubual, pengamatan dan juga lawatan merupakan kaedah yang telah dilakukan untuk mendapatkan informasi yang dikehendaki. Dapatan daripada pembelajaran ini menunjukkan pelaksanaan VSM telah meningkatkan prestasi pembuatan.

DEDICATION

For my beloved family

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LIST OF ABBREVIATIONS

CPI	-	Continuous Process Improvement
CT	-	Cycle Time
DFM	-	Design for Manufacturer
ERP	-	Enterprise Resource Planning
FG	-	Finish Good
FIFO	-	First-In-First-Out
GCISB	-	Grand Carpet Industries Sdn. Bhd.
GM	-	General Motor
GT	-	Group Technology
JIT	-	Just-In-Time
LH	-	Left Hand
LM	-	Lean Manufacturing
LPS	-	Lean Production System
NVA	-	Non-Value Adding
NNVA	-	Necessary Non-Value Adding
PP	-	Production Planner
RH	-	Right Hand
TPS	-	Toyota Production System
TQM	-	Total Quality Management
VA	-	Value Adding
VSM	-	Value Stream Mapping
WIP	-	Work In Progress

CHAPTER 1

INTRODUCTION

1.1 Introduction

Without any doubt, peacefulness of this country is a major factor motivating investors around the globe to establish their base. Nowadays, industrial seems to be the most profitable sector throughout the nation. This sector, however, developing too fast so that every industrial related entrepreneurs has to keep their pace up. In manufacturing industry, the major turn off factor is wastage. In order to keep the industry grows, there are two simple rules have to be obeyed, eliminated the waste and speed up production. In this case, Lean manufacturing offers the best solution to eliminate wastages, so that will also reduce the manufacturing cost.

Lean manufacturing is the technical term for what is more popularly called the "Toyota Production System." It is a philosophy of efficiency that shortens the time between customer order and factory shipment by eliminating waste when it is properly implemented. Lean manufacturing provides a system for identifying and eliminating waste. But the emphasis is on cutting within the job, not the person, and then redistributing personnel to be more efficient. The benefits of lean manufacturing include strong commitment to innovations by employees, continuous improvement, and increased efficiency with respect to production cost and quality control (Anonymous, 2004).

The core concepts of lean manufacturing include kaizen (continuous improvement techniques), just-in-time delivery, "pull" systems, building to order, quality at the

source, value stream mapping, and teamwork. Lean manufacturing, however, is not just a collection of concepts and practices that firms can "copy and paste" into their businesses. It is a system of concepts and practices that reinforce each other, and it requires the understanding of the entire system to benefit the firm. The concepts and practices of lean manufacturing create a work environment where all employees can understand the existing practices, make suggestions for improvement, and implement these changes (Jankowski, 2006).

Value Stream Mapping (VSM) is one of the Lean Manufacturing tool. VSM is a visual representation of the material and information flow of a particular product family (Tapping *et al*, 2002). VSM consists of the creation of a current state map and a future state map. The current state map charts the present flow of information and material as a product goes through the manufacturing process. Its purpose is to help understand how a product currently flows. The future state map is a chart that suggests how to create a lean flow. The future state map uses lean manufacturing techniques to reduce or eliminate wastes and minimize non-value added activities. The future state map is used to help make decisions and plan future process improvement projects.

A particular process may appear to be a problem, but when looking at the entire manufacturing process it may not be a problem at all. Value stream map will help identify the source of the real problems and will help show wastes and more importantly help identify the sources of waste.

1.2 Problem Statement

The main finding of this study is to identify the application of Value Stream Mapping (VSM) in companies which implemented lean manufacturing. Value Stream Mapping (VSM) is one of the tools that lie in Lean Manufacturing (LM). However, the benefits come out from implementation of VSM in lean manufacturing is unknown.

1.3 Objectives

The objectives of this study are:

- 1) To understand the principles and concept of lean manufacturing.
- 2) To study the application of Value Stream Mapping in manufacturing industry.
- 3) To recommend improve needs based on Value Stream Mapping on productivity of manufacturing industry.

1.4 Scope of Study

This study is focus on the implementation of LM project at Grand Carpet Industries Sdn Bhd (GCISB) by applying VSM to accomplish the LM goals. This project was started on January 08 until June 08. A line, mini forming line had been selected for this study where VSM had been applied to this line. The type of product which produced at this line is boot trim for Vios (Toyota), Civic (Honda), GEN 2 and Waja (Proton).

1.5 Important of Study

By the end of the project, these studies are expected to:

- 1) Be able to provide and promote the companies to implement VSM.
- 2) Offer respondent apply VSM as an alternative way in productivity improvement.
- 3) Become as an academic reference.

CHAPTER 2

LITERATURE REVIEW

This chapter will brief generally about lean manufacturing, the history of lean manufacturing, and the seven wastes and also about value stream mapping. This chapter also will support the next chapter in this study.

2.1 Introduction to Lean Manufacturing

Lean Manufacturing is a systematic approach to identify and eliminate waste through continuous improvement by flowing the product at the pull of the customer. It is a proven methodology for analyzing and improving the flow of information and materials in a manufacturing environment, resulting in a dramatic increase in customer satisfaction, employee involvement and company profitability.

At the heart of lean is the determination of value. Value is defined as an item or feature for which a customer is willing to pay. All other aspects of the manufacturing process are deemed waste. Lean manufacturing is used as a tool to focus resources and energies on producing the value-added features while identifying and eliminating non-value added activities (Anonymous, 2004).

2.2 The Principles of Becoming Lean Manufacturing

Lean is eliminating wastes from a manufacturing system. The problem arises in how manufacturing facility becomes lean. Below are the five steps of lean manufacturing (Womack & Jones, 1996).

2.2.1 Define the Value

The critical starting point for lean thinking is value. Value is the information or product that the customer is willing to pay for and can only be defined by the ultimate customer. The value is defined by the customer and created by the producer. From the customer's standpoint, this is why the producer exists (Womack & Jones, 1996). Many producers only want to make what they are already making and customer really wants. When the customer no longer accepts what they are given, producers tend to use techniques such as lowering pricing or offering a variation of the same in order to entice buyers to purchase their product. The first step in lean thinking is to determine what the value is in terms of the customer.

2.2.2 Identify the Value Stream

The second step in lean thinking is to identify the value stream. A value stream comprises all of actions, both value added and non-value added, required to bring a product from raw material into the hand of the customer (Duggan, 2002). A value stream map is a tool used to chart the flow of materials and information from the raw material stage, through the factory floor, to the finished product. The purpose of the map is to help to identify and how and when they will implement the improvements that make it easier to meet the customer demand (Tapping *et al*, 2002).

2.2.3 Flow

The third step is flow. Flow is the progressive achievement of tasks along the value stream so that the product proceeds from raw material into the hands of the customer with no stoppages, scrap, or backflows (Womack & Jones, 1996). Once started, product will advance through a manufacturing plant without stopping. A product should seamlessly move forward from process to process without having to wait. Value added time to the product needs to be maximized and non-value added time minimized. In order to accomplish this, the product must continually be undergoing processing until finished. Efforts need to be directed at eliminating all impediments to continuous flow.

2.2.4 Customer Pull

The fourth step is customer pull. Customer pull is the concept of letting the customers pull the product from you as needed rather than pushing products onto the customer (Womack & Jones, 1996). Pull is only making what customer wants and only when the customer wants it. There is no forecasting or stocking. The idea is that nothing is made until it is needed, and then made as quickly as possible. Pull is created by having the ability to design, schedule, and make exactly what the customer desires when the customer wants it.

2.2.5 Pursue Perfection

The final step is perfection. There is no end to the ability to reduce costs, scrap, mistakes, space, etc. perfection is an unachievable goal and therefore, there is always room for more improvement. Lean is always working towards improvement.

2.3 History of Lean Manufacturing

After World War II, Eiji Toyoda and Taiichi Ohno at the Toyota Motor Company in Japan pioneered the concept of Lean production (Carr, 2005). Toyota Motor Company developed their original moving assembly line called Toyota Production System (TPS) to keep material flow continuously.

The TPS was developed and promoted by Toyota Motor Corporation and is being adopted by many Japanese companies in the aftermath of the 1973 oil shock. Though the main purpose of the system is to reduce costs, the system also helps increase the turnover ratio of capital and improves the total productivity of a company as a whole (Monden, 1983).

The Toyoda family originally owned a big textile company in Japan. After World War II, the Toyoda family decided to start new venture from Toyota Automatic Loom Company to a Toyota Motor Company. The Toyota Automatic Loom Works was the product of the inventive and entrepreneurial genius of Sakichi, who perfected Japan's first power-driven loom and held numerous patent for automatic looms and textile production. Sakichi sold his automatic loom patents to finance a research of automobile manufacturing system with his son Kiichiro. In the mean time, General Motors (GM) and Ford assembly plants had located in Japan. Therefore, challenging the new automotive venture for the Toyoda Group was considered a risky business. The eldest son of Sakichi, Kichiro Toyoda, was in charge of loom production. He had a great interest of the automotive engine as well. He had studied Western automotive industry to modify their management into Toyota's way of automobile assembly line. Even though conditions to make competitive automobile products against Western automobile products were extremely difficult, both the Toyoda family and Taiichi Ohno were trying to modify number of ideas and skills imported from the Western countries. Kiichiro was trying to modify higher production quantities into smaller production quantities in order to match with Japanese economy size at that time. In addition to the smaller production quantities, Kiichiro was trying to establish Toyota cars as fuel-efficient vehicle that

would match Japanese narrow streets and tight expenditure of Japanese people (Yamahita, 2004).

The Japanese have defined that anything prevents the flow of material is called “Muda” which means “Waste” in Japanese language. Toyoda and Ohno realized they had to get the most out of each worker, and that would happen only if the workers knew how to do many different tasks effectively. After World War II when Japanese manufacturing industry was suffering from a poor quality production system, Toyoda Motor Company started to develop their own efficient production principal (Gates,2004).

Talking about the history of Lean, should not forget about Henry Ford. Because it is not too much to say that he initiated to pioneer the foundation of lean production system in manufacturing industry. Henry Ford is well known as a pioneer of Ford Motor Company also known by pioneer of “Mass Production”. After World War I, Henry Ford and General Motors’ Alfred Sloan moved world manufacturing from centuries of craft production- led by European firms- into the age of mass production. Largely as a result, the United States soon dominated the global economy (Yamahita, 2004).

Henry Ford knew that he could keep the prices of his products low by reducing the production cycle by using their assembly line. However, Ford made a dramatic wrong turn at his new Rouge complex. He maintained the assembly track but rearranged his fabrication machinery into process villages. He proceeded to run a push schedule in which growing fluctuations in end customer demand and persistent hiccups in upstream production were buffered by a vast bank of finished units forced on the dealer network and equally vast buffers of parts at every stage of production upstream from assembly. Thus "flow" production became mass production and the opportunity to carry lean thinking to its logical conclusion was lost.

The focus on the Ford flow production system was getting their automobiles out and keeping all machines and equipment busy all the time. They did not pay attention whether the next process was ready for producing more products or not. Eventually, they

produced excess inventory all the time. Unfortunately, Ford Motor Company failed to develop an efficient production system from the original vision of Henry Ford's plan (Scullin, 2005).

2.4 Waste

Waste is anything other than the minimum amount of equipment, materials, parts, space and worker's time, which are absolutely essential to add value to the product. Taiichi Ohno is known as the father of lean manufacturing, he has identified seven types of waste (Anonymous, 2006a).

Waste elimination is one of the most effective ways to increase the profitability of any business. Processes either add value or waste to the production of a good or service. The seven wastes originated in Japan, where waste is known as "muda." "The seven wastes" is a tool to further categorize "muda" and was originally developed by Toyota's Chief Engineer Taiichi Ohno as the core of the Toyota Production System, also known as Lean Manufacturing. To eliminate waste, it is important to understand exactly what waste is and where it exists. While products significantly differ between factories, the typical wastes found in manufacturing environments are quite similar. For each waste, there is a strategy to reduce or eliminate its effect on a company, thereby improving overall performance and quality (Braider, 2003).

2.4.1 Types of Waste

The 7 waste that had been explicit by the Thaiichi Ohno are as follows (Braider, 2003):

- a) Overproduction** – Over-production is making anything ahead of demand. An example of over-production would be making drawings before they are needed.