



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**APPLICATION OF VALUE STREAM MAPPING (VSM)  
IN MANUFACTURING INDUSTRY**

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

By

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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 Management) with Honours. The members of the supervisory committee are follow:

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## **ABSTRACT**

This report has focused on the application of Value Stream Mapping (VSM) in a manufacturing industry. VSM is a visual way of representing the flow of information and materials in the production of product. VSM helps managements to visualize information and material flow also can see the relationship between information and material flow. It helps to identify the Seven Wastes that occur in production processes. Through Microsoft Visio 2007 software, the documentation of VSM can be clearly show and management of the company can take benefits from its. Literature review show about the theories that get from journal and books be an important point to make reference and ensure this project success. Hence, the scope of this project was focus on one main product at manufacturing company. For conduct this project, some methodologies are planned due to the objectives and factory visit was a first step for observing the production system. Some necessary data such as cycle time, numbers of operators, setup time, and others is collected to create current state VSM. After that, the current state VSM analyzed and several wastes been identified such as transportation, defects, overproduction and others. From the analysis, a future state VSM has been develop. Some recommendation has been propose in order to ensure this project can give the benefits to industry and people.

## ABSTRAK

Laporan ini telah tertumpu pada penggunaan Value Stream Mapping (VSM) di dalam industri pembuatan. VSM ialah salah satu cara untuk melihat aliran maklumat dan bahan-bahan dalam penghasilan produk. VSM membantu pihak pengurusan untuk melihat aliran ini dan juga untuk melihat perhubungan dan perkaitan antara aliran maklumat dan bahan. Ianya membantu untuk mengenal pasti “Tujuh Pembaziran” yang berlaku di dalam proses pengeluaran. Melalui perisian Microsoft Visio 2007, dokumentasi VSM boleh dilihat dengan jelas dan pihak pengurusan dapat mengambil faedah melaluinya. Ulasan terdahulu telah dibuat sebelum ini menceritakan tentang teori yang didapati dari jurnal dan buku yang menjadi rujukan untuk memastikan projek ini berjaya. Seterusnya, skop projek ini akan tertumpu kepada satu produk utama di kilang pengeluaran. Untuk menjalankan projek ini, beberapa kaedah telah dirancang untuk mencapai objektif dan lawatan ke kilang adalah langkah pertama untuk melihat sistem pengeluaran. Di samping itu, beberapa data seperti masa pemasangan, jumlah operator, masa penyediaan dan pelbagai lagi telah di kumpul sebagai penyelidikan untuk VSM dan seterusnya memastikan projek ini siap dengan jayanya. Kemudian segala data yang dikumpul akan dianalisis dan akhirnya beberapa pembaziran dapat dikesan seperti pengangkutan, kecacatan, lebihan pengeluaran dan lain-lain. Data yang dikumpulkan digunakan untuk membangunkan VSM masa nyata dan setelah itu analisis telah dibuat untuk membangunkan VSM masa akan datang. Beberapa cadangan telah dikemukakan untuk memastikan projek ini memberi manfaat kepada industri dan juga orang ramai.

## **DEDICATION**

*To my beloved mother, father and friends, thank you for the support and encouragement.*

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## LIST OF ABBREVIATIONS

MESB	-	Multitone Electronics Sdn Bhd
TPS	-	Toyota Production System
VSM	-	Value Stream Mapping
EPE	-	Every Part Every
NVA	-	Non-Value Adding
NNVA	-	Necessary but Non-Value Adding
VA	-	Value-Adding
WIP	-	Work in Process
CT	-	Cycle Time
CO	-	Changeover Time
LT	-	Lead Time
VCT	-	Value-Creating Time
TT	-	Takt Time
VALSAT	-	Version of the Value Stream Mapping Tool
FIFO	-	First In First Out
PSM	-	Projek Sarjana Muda
BOM	-	Bill of Material
QC	-	Quality Control
VDU	-	Visual Display Unit
PPC	-	Production Planning & Control

# CHAPTER 1

## INTRODUCTION

This report described a project on identifying the seven wastes that occur in production processes of the Pager component manufacturing based on value stream mapping method.

### 1.1 Background

Lean thinking, a concept that is based on the Toyota Production System (TPS), extends continuous improvement efforts to reduce the costs of serving customers beyond the physical boundaries of a manufacturing facility, by including suppliers, distributors and production system that support the manufacturing function. These improvements and cost reductions are achieved by eliminating the wastes (muda) associated with all activities performed to deliver an order to customer. Wastes are defined as “all activities that consume resources (add costs to the product) but contribute zero value to the customer.” According to Toyota Production System (TPS), the seven (7) wastes had been described by Mr. Ohno are:

- i. Overproduction
  - Finished product more than customer demand
- ii. Waiting
  - Idle time or machine downtime
- iii. Transport
  - Distance of the materials movement that has no value
- iv. Inappropriate processing
  - Process on the product that adds no value



- v. Unnecessary inventory
  - Raw materials or components more than production demand
- vi. Unnecessary motion
  - No value movement of the operator or equipment
- vii. Defects
  - Rework or scrap

Value Stream Mapping (VSM) is a lean tools ad technique used to analyse the flow of materials and information currently required to bring a product or services to a customer. At Toyota, where the technique originated, it is known as “Material and Information Flow Mapping”. It is a powerful visualisation tool for mapping the mapping the complete manufacturing process from door-to-door, including both material and information flow. This visual representation facilitates the process of lean implementation by helping to identifying the value-adding steps in a value stream and eliminating the non-value adding steps, or wastes (muda).

VSM process requires development of maps a Current State Map and a Future State Map. In the Current State Map, one would normally start by mapping a large-quality and high-revenue product family. By drawing and analysing the “current state map”, improvement activities can be focused in those areas which will result in the greatest benefit to process flow. In addition to prioritising incremental improvements, VSM can be used as a strategic Continuous Improvement tool, by creating an ambitions future state based on Lean Manufacturing principles.

Based on the analysis of the Current State Map, one then develops a Future State Map by improving the value-adding steps and eliminating the non-value adding steps (waste). According to Rother & Shook, there are seven (7) guidelines, adapted and modified based on the concept of Lean Thinking, that can be followed when generating the Future State Map for a lean value stream (Rother & Shook, 1999, p. 44-54);

- i. Produce to tact time
- ii. Develop continuous flow

- iii. Employment of pull systems between different work centres when continuous flow is not possible
- iv. Schedule based on the pacemaker operation
- v. Produce different products at a uniform rate (Level the production mix)
- vi. Level the production load on the pacemaker process (Level at production volume)
- vii. Develop the capability to make “every part every (EPE) <time period>”

## 1.2 Problem Statement

Companies can increase productivity in a variety of ways. The most obvious methods involve automation and computerization which minimize the tasks that must be performed by employees. Recently, less obvious techniques are being employed that involve ergonomic design and worker comfort.

The effects toward the number of operator are analysed to optimize workstation in obtaining the best productivity line. A proper production line is analysed to optimum the time and cost used in product assembly job and contribute to improve the productivity, but the improper production line may reduce its productivity.

For Multitone Electronics Sdn. Bhd. (MESB), all products that have been used to produce the Pager must be pursuing the specifications at a right time, right quality and in the right quantity. They also require delivering the finish good product to their customer at the right time. For this situation, they do not have a method that can be used as a monitor to review their production processes from the beginning to shipping process. In this case, a Value Stream Mapping (VSM) is a visual way of representing flow information and materials in the production of product that included the delivery time.

### 1.3 Objective

The objective of this project is to identify the seven wastes that occur in production processes of the Pager component manufacturing based on value stream mapping method.

The objectives of study are:

- i. Create a Value Stream Mapping (VSM) for current production processes
- ii. Identify the waste that occur in production processes
- iii. Analyze current state mapping for create future state mapping for improvement.

### 1.4 Scope

This research was creating in three parts. First, create the current state mapping according the existing process flow for production of product and second identify the seven wastes that occur in production processes. Lastly, this project will propose the future state mapping for improvement. This research will be focus on main product only which is Pager.



**Figure 1.1:** Pager RPR750

## 1.5 Project Outlines

Based on the thesis for Projek Sarjana Muda (PSM) I, an organization has been constructed for the process flow of completion in order to fulfill course of Degree in Universiti Teknikal Malaysia Melaka (UTeM). Below shows the format of the organization:

- I. Chapter 1 represents the introduction of the project conducted which is background, problem statement, objectives, scope and project outlines. In this chapter, it explains clearly how the subtopics influence each other in this project.
- II. Chapter 2 represents the literature review on the background and basic information about the value stream mapping. By understand the basic concept and method of value stream mapping; it may enhance the progress of this project.
- III. Chapter 3 represents the methodology used for conduct this project. This chapter included the planning of the research, flowchart, and the sources of data.
- IV. Chapter 4 shows the analysis and presentation of data that have been collected in the production processes. The current state map is show in this chapter.
- V. Chapter 5 represents the discussion on the result of the study. It is stressing the significance and implementations of the findings of this project.
- VI. Chapter 6 presents the conclusion of the whole study and recommendation for future research.

## **CHAPTER 2**

### **LITERATURE REVIEW**

In this chapter, some background and basic knowledge of value stream mapping will be review. Besides that, this chapter will be describing topics that related to value stream mapping analysis and measurement methods. Some of previous research and studies were included into this chapter to support the development of ideas for value stream mapping concept and design.

#### **2.1 History of Lean Manufacturing**

As stated earlier, After World War II Japanese manufactures were faced with the dilemma of vast shortages of material, financial, and human resources. The problems that Japanese manufacturers were faced with differed from those of their Western counterparts. These conditions resulted in the birth of the “lean” manufacturing concept. Toyota Motor Company, lead by its president Toyoda recognized that American automakers of that era were out-producing their Japanese counterparts; in the mid-1940’s American companies were outperforming their Japanese counterparts by a factor of ten. In order to make a move toward improvement early Japanese leaders such as Toyoda Kiichiro, Shigeo Shingo, and Taiichi Ohno devised a new disciplined, process-oriented system, which is known as the “Toyota Production System”, or “Lean Manufacturing”.

## **2.2 Lean Manufacturing**

According to (NIST-MEP Lean, 2000), Lean manufacturing defined as “A systematic approach to identifying and eliminating waste (non-value added activities) through continuous improvement by allowing the product to flow in response the pull of the customer in pursuit of perfection”. The basic ideas behind the lean manufacturing system, which have been practiced for many years in Japan, are waste elimination, cost reduction, and employee empowerment. The Japanese philosophy of doing business is totally different than the philosophy that has been long prevalent in the US. The traditional belief in the west had been that the only way to make profit is to add it to the manufacturing cost in order to come up with a desired selling price (Taiichi Ohno, 1997; Monden, 1998).

On the contrary, the Japanese approach believes that customers are the generator of the selling price. The more quality one builds into the product and the more service one offers, the more the price that customers will pay. The difference between the cost of the product and this price is what determines the profit (Taiichi Ohno, 1997; Monden, 1998). The lean manufacturing discipline is to work in every facet of the value stream by eliminating waste in order to reduce cost, generate capital, bring in more sales, and remain competitive in a growing global market. The value stream is defined as “the specific activities within a supply chain required to design, order and provide a specific product or value” (Hines and Taylor, 2000).

## **2.3 Waste Removal Inside Companies**

The use of waste removal to achieve competitive advantage inside organizations was pioneered in the 1980s by Toyota’s chief engineer, Taiichi Ohno, and Sensei Shigoe Shingo and is oriented fundamentally towards productivity rather than towards quality. The reason for this is thought to be that improved productivity leads to leaner operations which help to expose further waste and quality problems in the system. Thus the systematic attack on waste is also a systematic assault on the factors that are underlying poor quality. According to Monden Y. (1993), there are three types of

operation that are undertaken in an internal manufacturing context. These can be categorized into:

- i. Non-Value Adding (NVA)
- ii. Necessary but Non-Value Adding (NNVA)
- iii. Value Adding (NA)

### **2.3.1 Non-Value Adding (NVA)**

Non-value adding is pure waste and involves unnecessary actions which should be eliminated completely. Examples would include waiting time, stacking intermediate products and double handling.

### **2.3.2 Necessary but Non-Value Adding (NNVA)**

Necessary but non-value adding operations maybe wasteful but are necessary under the current operating procedures. Examples would include walking long distances to pick up parts; unpacking deliveries; and transferring a tool from one hand to another. In order to eliminate these types of operation it would be necessary to make major changes to the operating system such as creating a new layout or arranging for suppliers to deliver unpacked goods. Such change may not be possible immediately.

### **2.3.3 Value-Adding (VA)**

Value-adding operations involve the conversion or processing of raw materials or semi-finished products through the use of manual labour. This would involve activities such as; sub-assembly of parts, forging raw materials and painting body work.

## **2.4 The Seven Wastes**

(Monden, 1993) has stated the method involves the identification of value adding and wasteful activities based around Mr. Ohno's seven wastes as shown below:

- i. Overproduction
- ii. Waiting
- iii. Transport
- iv. Inappropriate processing
- v. Unnecessary inventory
- vi. Unnecessary motion
- vii. Defects

### **2.4.1 Overproduction**

Overproduction is regarded as the most serious waste as it discourages a smooth flow of goods or services and is likely to inhibit quality and productivity. Such overproduction also tends to lead to excessive lead and storage times. In addition, overproduction leads to excessive work-in-progress (WIP) stocks which result in the physical dislocation of operations with consequent poorer communication. This state of affairs is often encouraged by bonus systems that encourage the push of unwanted goods. The pull or kanban system was employed by Toyota as a way of overcoming this problem.

### **2.4.2 Waiting**

When time is being used ineffectively, then the waste of waiting occurs. In a factory setting, this waste occur whenever goods are not moving or being worked on. This waste affects both goods and workers, each spending time waiting. The ideal state should be no waiting time with a consequent faster flow of goods. Waiting times for workers may be used for training, maintenance or kaizen activities and should not result in overproduction.