UNIVERSITI TEKNIKAL MALAYSIA MELAKA

IMPLEMENTATION PROBLEMS IN LEAN MANUFACTURING: A STUDY ON MANUFACTURING INDUSTRIES

Thesis submitted in accordance with the requirements of the Malaysia Technical University of Melaka for the Degree of Bachelor of Manufacturing Engineering (Manufacturing Process)

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ABSTRACT

This report is discussed the implementation problems in Lean Manufacturing companies. A survey was conducted for the data gathering to company which implemented Lean manufacturing. The result shows that there are a lot of challenges or problems face by companies in their business to implement Lean Manufacturing and maintaining the overall operational system.

ABSTRAK

Kajian ini membincangkan cabaran serta masalah yang dihadapi oleh industri pembuatan yang melaksanakan pendekatan 'Lean Manufacturing'. Kajian soal selidik telah dijalankan dan dianalisis untuk mendapatkan maklumat kajian. Keputusan kajian menunjukkan bahawa terdapat pelbagai jenis cabaran atau masalah yang dihadapi namun mereka mempunyai jalan atau cara yang tersendiri untuk mengatasi masalah bagi meningkatkan prestasi keseluruhan operasi pembuatan melalui 'Lean Manufacturing'.

APPROVAL

This thesis submitted to the senate of UTeM and has been accepted as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process). The members of the supervisory committee are as follow:

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DECLARATION

I hereby, declare this thesis entitled "Implementation Problems in Lean Manufacturing: A Study on Manufacturing Industries" is the results of my own research except as cited in the reference.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLE

CHAPTER 1
INTRODUCTION

1.1 Background

In global, effective work organization has been recognized as a major factor behind the success of industrial or manufacturing firms. The work organization is crucial factor for competitiveness, employment and quality of working life. In particularly work organizations have to support and stimulate, through technical information and analysis to perform the effective work organization.

However, to be successful in implementing Lean Manufacturing, the company has to face many challenge and problem. This study is focus on the challenge face by manufacturing industry in Malaysia which implemented Lean Manufacturing. In addition, the study look forward what are the tools and techniques used by respondents companies to manage the challenge or problems while been successful Lean Manufacturing implementation company.

Like many improvements programs for work organization, lean manufacturing organization is considered one of the effective work organizations. Lean manufacturing can help to reduce waste 40 percent, cut costs by between 15 and 70 percent, decrease space and inventory requirements by 60 percent, push productivity up between 15 and 40 percent whilst changeovers by 60 percent (Ferch, 1998).

1.2 Objectives

The objectives of this study are:

i) To understand the principles and concepts of lean manufacturing.

ii) To identify and analyze any related issues and industrial common challenges or problems in lean manufacturing implementation in Malaysia.

iii) To identify and analyzed the common problems solution used by Malaysia companies toward successful Lean Manufacturing implementation.

1.3 Scope of Study

This study is performer to identify the common problems and solutions of lean manufacturing among manufacturing companies in Malaysia. Survey is conducted to companies which implemented lean manufacturing using postal questionnaire. The duration of this study is December 2006 to February 2007.

The companies are identified through directory of MIDA. The number of respondents is twenty six for each organization. The data ware analyzed using SPSS programming and presented in figure, table and chart.

1.4 Importance of study

The important of this study are:

i. The view that a lean manufacturing is characterized by looking their common problems and common solutions in lean manufacturing.

ii. The analyses whether the lean manufacturing concept will have the solutions, will entail particular difficulties in its implementation and will create specific risk or advantages to the manufacturing industry in Malaysia.

iii. Exploratory comparing and contrasting the theoretically derived concept with the realities of lean manufacturing implementation problems.

iv. The methodology through which data was collected, followed by a presentation of the empirical study. In the analysis that follows we compare and contrast the current Common implementation problem and before common problem, in an effort it develops a concept applicable to industries in Malaysia.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction to Lean Manufacturing

Lean Manufacturing can be defined as a systematic approach to identifying and eliminate waste (non-value-added activities) through continuous improvement by following the product at the pull of the customer in pursuit of perfection. In lean production, the value of a product is defined solely by the customer. The product must meet the customer's needs at both a specific time and price. The thousands of mundane and sophisticated things that manufacturers do to deliver a product are generally of little interest to customers (Henderson and Evans, 2000).

To view value from the eyes of the customer requires most companies to undergo comprehensive analysis of all their business processes. Identifying the value in lean production means to understand all the activities required to produce a specific product, and then to optimize the whole process from the view of the customer. This viewpoint is critically important because it helps identify activities that clearly add value, activities that add no value but cannot be avoided, and activities that add no value and can be avoided (Henderson and Evans, 2000).

2.2 Objectives of Lean Manufacturing

Lean Manufacturing, also called Lean Production, is a set of tools and methodologies that aims for the continuous elimination of all waste in the production process. The main benefits of this are lower production costs; increased output and shorter production lead times. More specifically, some of the goals include:

1. **Defects and wastage** - Reduce defects and unnecessary physical wastage, including excess use of raw material inputs, preventable defects, and costs associated with reprocessing defective items and unnecessary product characteristics which are not required by customers.

2. **Cycle Times** - Reduce manufacturing lead times and production cycle times by reducing waiting times between processing stages, as well as process preparation times and product/model conversion times.

3. **Inventory levels** - Minimize inventory levels at all stages of production, particularly works-in-progress between production stages. Lower inventories also mean lower working capital requirements.

4. **Labor productivity** - Improve labor productivity, both by reducing the idle time of workers and ensuring that when workers are working, they are using their effort as productively as possible (including not doing unnecessary tasks or unnecessary motions).

5. **Utilization of equipments and space** - Use equipment and manufacturing space more efficiently by eliminating bottlenecks and maximizing the rate of production though existing equipment, while minimizing machine downtime.

6. **Flexibility** - Have the ability to produce a more flexible range of products with minimum changeover costs and changeover time.

7. **Output** - Insofar as reduced cycle times, increased labor productivity and elimination of bottlenecks and machine downtime can be achieved, companies can generally significantly increased output from their existing facilities.

2.3 The Benefit of Lean Manufacturing

Most of these benefits lead to lower unit production costs - for example, more effective use of equipment and space leads to lower depreciation costs per unit produced, more effective use of labor results in lower labor costs per unit produced and lower defects lead to lower cost of goods sold (Bozdogan *et. at.*, 2000).

In a 2004 survey by Industry Week Magazine, Malaysian companies implementing lean manufacturing reported a median savings of 7% of Cost of Goods Sold (COGS) as a result of implementing lean. The companies believe that the savings many actually are higher for companies in Vietnam considering the higher levels of waste which they typically have compared to Malaysia based manufacturers. Another way of looking at Lean Manufacturing is that it aims to achieve the same output with less input such as less time, less space, less human effort, less machinery, less material, less cost (James P. Womack & Daniel T. Jones: *Lean Thinking,* Simon & Schuster, 2004).

When a Malaysia equipment manufacturing company, Lantech, completed the implementation of lean in 2004, they reported the following improvements compared to their batch-based system in 2000 (Denton and Hodgson, 2000):

1. Manufacturing space per machine was reduced by 45%.
2. Defects were reduced by 90%
3. Production cycle time was reduced from 16 weeks to 14 hours - 5 days; and
4. Product delivery lead time was reduced from 4-20 weeks to 1-4 weeks.

Lean is most widely used in industries that are assembly-oriented or have a high amount of repetitive human processes. These are typically industries for which productivity is highly influenced by the efficiency and attention to detail of the people who are working manually with tools or operating equipment. For these kinds of companies, improved systems can eliminate significant levels of waste or inefficiency. Examples of this include wood-processing, garment manufacturing, automobile assembly, electronics assembly and equipment manufacturing.

Since Lean Manufacturing eliminates many of the problems associated with poor production scheduling and line balancing, Lean Manufacturing is particularly appropriate for companies that don't have ERP systems in place or don't have strong material requirements planning (MRP), production scheduling or production allocation systems in place. This is particularly significant in Malaysia where the companies believe that many private Vietnamese manufacturing companies are operating.

Significantly below their potential capacity or experiencing a high level of late deliveries, due to problems with their current production scheduling and production management systems. Lean Manufacturing is also appropriate in industries for which it is a strategic priority to shorten the production cycle time to the absolute minimum as a source of competitive advantage for the company (Termed, 1998)

Recently, some companies in Malaysia have actively conducted training and implemented lean methods to eliminate process inefficiencies. This resulted in an improvement to their production and service lead times. For example, Toyota Ben Thanh, a service center of Toyota in Malaysia, has implemented lean methods to significantly reduce the process time for its automobile maintenance service from 240 minutes to 45-50 minutes per car, and as a result, increased the total number of cars processed at each service center from 4-6 cars up to 16 cars per day. Toyota Ben Thanh achieved significant reductions in the process lead time by successfully eliminating unnecessary waiting time, inefficiencies of physical motions and process flow (Hellsten & Klefsjo 2000).

2.3 Key Principles of Lean Manufacturing

Key principles behind Lean Manufacturing can be summarized as follows (Wormack & Jones, 1996):

1. Recognition of waste - The first step is to recognize what does and does not create value from the customer's perspective. Any material, process or feature which is not required for creating value from the customer's perspective is waste and should be eliminated. For example, transporting materials between workstations is waste because it can potentially be eliminated.

2. Standard processes - Lean requires an the implementation of very detailed production guidelines, called Standard Work, which clearly state the content, sequence, timing and outcome of all actions by workers. This eliminates variation in the way that workers perform their tasks.

3. Continuous flow - Lean usually aims for the implementation of a continuous reduction flow free of bottlenecks, interruption, detours, backflows or waiting. When this is successfully implemented, the production cycle time can be reduced by as much as 90%.

4. Pull-production - Also called Just-in- Time (JIT), Pull-production aims to produce only what is needed, when it is needed. Production is pulled by the downstream workstation so that each workstation should only produce what is requested by the next workstation.

5. Quality at the Source - Lean aims for defects to be eliminated at the source and for quality inspection to be done by the workers as part of the in-line production process.

6. Continuous improvement - Lean requires striving for perfection by continually removing layers of waste as they are uncovered. This in turn requires a high level of worker involvement in the continuous improvement process (Womack & Jones, 1996)

2.5 History of Lean Manufacturing

U.S manufacturers have always searched for efficiency strategies that help reduce costs, improve output, establish competitive position, and increase market share. Early process oriented mass production manufacturing methods common before World War II shifted afterwards to the results-oriented, output-focused, production systems that control most of today's manufacturing businesses.

Japanese manufacturers re-building after the Second World War were facing declining, human, material, and financial resources. The problems they faced in manufacturing were vastly different from their Western counterparts. These circumstances led to the development of new, lower cost, manufacturing practices. Early Japanese leaders such as the Toyota Motor Company's Eiji Toyoda, Taiichi Ohno, and Shingeo Shingo developed a disciplined, process-focused production system now known as the "Toyota Production System", or "lean production." The objective of this system was to minimize the consumption of resources that added no value to a product.

The "lean manufacturing" concept was popularized in American factories in large part by the Massachusetts Institute of Technology study of the movement from mass production toward production as described in The Machine That Changed the World, (Womack, Jones & Roos, 1990), which discussed the significant performance gap between Western and Japanese automotive industries. This book described the important elements accounting for superior performance as lean production. The term

"lean" was used because Japanese business methods used less human effort, capital investment, floor space, materials, and time in all aspects of operations. The resulting competition among U.S. and Japanese automakers over the last 25 years has lead to the adoption of these principles within all U.S. manufacturing.

Many of the concepts in Lean Manufacturing originate from the Toyota Production System (TPS) and have been implemented gradually throughout Toyota's operations beginning in the 1950's. By the 1980's Toyota had increasingly become known for the effectiveness with which it had implemented Just-In-Time (JIT) manufacturing systems. Today, Toyota is often considered one of the most efficient manufacturing companies in the world and the company that sets the standard for best practices in Lean Manufacturing. The term "Lean Manufacturing" or "Lean Production" first appeared in the 1990 book *The Machine that Changed the World.* Lean Manufacturing has increasingly been applied by leading manufacturing companies throughout the world, lead by the major automobile manufactures and their equipment suppliers. Lean Manufacturing is becoming an increasingly important topic for manufacturing companies in developed countries as they try to find ways to compete more effectively against competition from Malaysia (Womack & Jones, 1996).

Most of the basic principles of lean manufacturing date back to at least say the following about carrying unnecessary inventory. "You call them goods; but, if you do not take care, they will prove evils to some of you. You expect they will be sold cheap, and, perhaps, they may be bought J for less than they cost; but, if you have no occasion for them, they must be dear to you. Remember what Poor Richard says, 'Buy what thou hast no need have, and ere long thou salt sell thy necessaries.' In another place he says, 'Many have been ruined by buying good penny worth's'." Henry Ford cited Franklin as a major influence on his own business practices, which included Just-in-time manufacturing. The concept of waste being built into jobs and then taken for granted was noticed by motion efficiency expert Frank Gilbreth, who saw that masons

bent over to pick up bricks from the ground. The bricklayer was therefore lowering; and raising his entire upper body to get a 5 pound (2.3 kg) brick but this inefficiency had been built into the job through long practice. Introduction of a non-stooping scaffold, which delivered the bricks at waist level, allowed masons to work about three times as quickly, and with less effort.

Frederick Winslow Taylor, the father of scientific management, introduced what are now called standardization and best practice deployment: "And whenever a workman proposes an improvement, it should be the policy of the management to make a careful analysis of the new method, and if necessary conduct a series of experiments to determine accurately the relative merit of the new suggestion and of the old standard. And whenever the new method is found to be markedly superior to the old, it should be adopted as the standard for the whole establishment" *(Principles of Scientific Management,* 1911). Taylor also warned explicitly against cutting piece rates (or, by implication, cutting wages or discharging workers) when efficiency improvements reduce the need for raw labor: "after a workman has had the price per piece of the work he is doing lowered two or three times as a result of his having worked harder and increased his output. Workers will not drive improvements they think will put them out of work. Shigeo Shingo, the best-known exponent of single-minute exchange of die (SMED) and error-proofing or Poka-yoke, cites *Principles of Scientific Management* as his inspiration (Andrew Dillon, translator, 1987. *The Sayings of Shigeo Shingo: Key Strategies for Plant Improvement).*

American industrialists recognized the threat of cheap offshore labor to American workers during the 1910s, and what is now called lean manufacturing was explicitly regarded as a countermeasure. Henry Towne, past President of the American Society of Mechanical Engineers, wrote in the Foreword to Frederick Winslow Taylor's *Shop Management* (1911), "We are justly proud of the high wage rates which prevail throughout our country, and jealous of any interference with them by the products of