



**NATIONAL TECHNICAL UNIVERSITY COLLEGE OF  
MALAYSIA**

## **Just In Time Practice and Management**

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

By

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Faculty of Manufacturing Engineering

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## KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

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## **ABSTRACT**

This research explores the Just-In-Time (JIT) practices and management and presents the results of a questionnaire survey conducted in Klang Valley. It is found that the manufacturing firms have successfully practiced elements related to manufacturing, manpower and human resource, supplier and quality aspects. In addition, the reasons and benefit of those particular elements also forwarded to the respective companies to identify how JIT has affected the manufacturing environment and productivity. The applicability of the JIT manufacturing concept in Malaysia also discussed.

## **ABSTRAK**

Kajian ini bertujuan meninjau amalan dan pengurusan Just-In-Time (JIT) dan mempersembahkan keputusan kajian soal selidik yang dijalankan di Lembah Klang. Didapati syarikat perkilangan dengan jayanya mengamalkan elemen-elemen yang berkaitan dengan pengeluaran, sumber manusia, pembekal dan kualiti. Tambahan pula, sebab-sebab dan manfaat dari pelaksanaan elemen-elemen berkenaan khususnya disampaikan kepada syarikat-syarikat pengeluaran untuk mengenalpasti bagaimana JIT berkesan dalam persekitaran pengeluaran dan produktiviti. Kesesuaian amalan konsep pengeluaran JIT di Malaysia juga dibincangkan.

# **DEDICATION**

For my beloved parents

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

Just in time manufacturing has great deal of attention world-wide in the last two decades. Most research has examined the practice and management in many countries. It highlighted the competitive pressure, for both foreign and domestic, fuelling the need for change in order to achieve effective manufacturing strategies. Based on past research, practitioners have implemented JIT elements in their firms with success where it has penetrated effectively and efficiently into the new global markets. Those organizations contemplating the implementation of JIT should direct their efforts and resources to successfully implement the JIT method.

This research project will focus on the JIT methods that are currently used in Malaysia. Companies that are currently following JIT methods will be chosen to conduct a survey where a list of questions seeking information such as company's profile, elements of JIT methods that are practiced, the reasons and benefit of that particular elements will be forwarded to the respective companies. The data or findings are then compiled to determine the degree of success of JIT methods in Malaysia.

As a future engineer it is hoped that by executing this project, it will help promote JIT production system as a strategic and productive method that will upgrade the effectiveness of various manufacturing operation found in companies. The fundamental understanding on JIT manufacturing system is also highlighted to the companies that are interested in adopting the JIT method in their daily operation.

## 1.2 Objective and Scope

The main objective of this research was to organize overall picture of Just In-Time(JIT) practice and management in Klang Valley. This includes identifying the profile of companies, assessing the reasons for implementation and the benefits associated with their adoption of JIT. The aim of this study was examine broadly the process of JIT and discusses the practices that constitute JIT manufacturing as it has been adopted in Malaysian industries. It may help in establish principle elements of the Just-In-Time approach to manufacturing operations in this country. The objectives of this research are as follows:

- a) Determine the Just-In-Time activity in manufacturing industries mainly in Klang Valley (i.e. automotive and electronic industries).
- b) To identify certain areas to successfully implement JIT system and to conduct analysis to why certain elements are not successful.
- c) To identify how JIT has affected the manufacturing environment and productivity performance.

The survey has been done to manufacturing firms such as automotive industries, electrical and electronic industries. Just-in-time is encompassing philosophy considering in its implementation in some areas as illustrated below and will be considered as scope of this research:

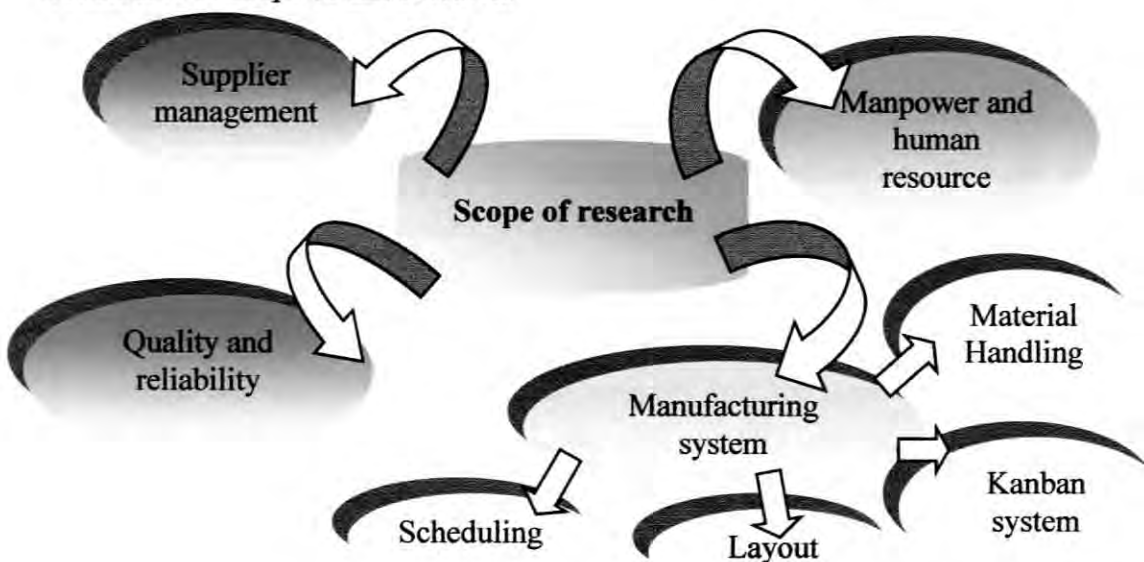


Figure 1.1: Scope of research



### 1.3 Problem Statement

Just in time production techniques were pioneered by the Toyota Motor Company and were widely applied in Japan during the 1970's in the automotive and electronic industries. These include: reduction of setup time, lot size reduction, buffer stock removal, multifunctional workers, dedicated production line, standardization of process and product, JIT purchase of raw materials, autonomous inspection, automation, scheduling, etc. Many of these techniques have been practiced in manufacturing industries and others. Several researchers have studied and reported on the success of these techniques in industries around the world.

In Malaysia the JIT production technique has been around for some time. As the economy grows, the country will face global challenge where it has to compete with other developing countries and emerging markets in various sectors. One of the key areas in the Malaysian economy is the Manufacturing sector. The manufacturing sector is one the biggest contributor to the Malaysian economy. As a developing nation, Malaysia has come to realize the importance of JIT. JIT manufacturing is a philosophy by which an organization seeks continually to improve its products and processes by eliminating waste. There are many benefits if the JIT method is applied. There are five major potential benefits of JIT manufacturing system, they are: reduction in inventory; quality improvement; increased productivity; increased profit; and improved competitive position.

In Malaysia there so many manufacturing industries that produce various products where the JIT manufacturing system has been implemented but their actual numbers are not known. The complete data such as number of companies, and types of industries that implement the JIT manufacturing system is not readily available. It is assumed that the JIT manufacturing methods that are applied and practiced is found in large and medium scale industries. The methods used and practiced by these companies are also not readily available.

Principle elements of JIT are the elements used to define the steps and methods used to access the effectiveness in the overall manufacturing system. The JIT philosophy is identified as the elimination of waste and continuous improvement in manufacturing system. Some of the elements that address elimination of waste and continuous improvement are usage of 'PULL' scheduling, 'Kanban' system, material handling, quality circles, 'Kaizen', layout and flow design, multifunction workforce, reduce setup times and lot sizes, production smoothing, preventive maintenance and supplier.

The reasons for implementing the JIT manufacturing system by Malaysian companies is unclear as the data is not readily available but it is assumed that the following possible reasons can be considered:

- i) reduce Inventory
- ii) improve product quality
- iii) increase profit margin
- iv) regain and maintain market share

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 History of Just-in-Time**

Just-In-Time is a Japanese manufacturing management method developed in the 70's. It was first adopted by Toyota manufacturing plants by Taiichi Ohno. The main concern at that time was to meet consumer demands. Because of the success of JIT management, Taiichi Ohno was named the father of JIT. After the first introduction of JIT by Toyota, many companies followed up and around the mid 70's, and JIT gained extensive support, which was widely used by many companies.

One motivated reason for developing JIT and some other better production techniques was that after World War II, Japanese people had a very strong incentive to develop a good manufacturing technique which would help them rebuild their economy. They also had a strong working ethic which was concentrated on work rather than on leisure, and this kind of motivation was what drove Japanese economy to succeed.

Before the introduction of JIT, there were a lot of manufacturing defects for the existing system at that time. This included inventory problems, product defects, risen cost, and large lot production and delivery delays. The inventory problems included the unused accumulated inventory that was not only unproductive, but also required a lot of effort in storing and managing them. In the case of the product defects, manufacturers knew that it only took one single product defect to destroy the producer's reputation; therefore they must create a "defect-free" process. Lastly, the existing system did not manage well for fast delivery request, so, there was a need to

have a faster and reliable delivery system in order to handle customers' needs. Therefore, the JIT manufacturing management was developed based on these problems. (Schroeder,2000)

## **2.2 Definition of Just-In-Time(JIT)**

JIT is not about automation. JIT eliminates waste by providing the environment to perfect and simplify the processes. JIT is a collection of techniques used to improve manufacturing operations. It can also be a new production system that is used to produce goods or services. The American Production and Inventory Control Society (APICS) have the following definition of JIT:

*"A philosophy of manufacturing based on planned elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product, from design engineering to delivery and including all stages of conversion from raw material onward. The primary elements include having only the required inventory when needed; to improve quality to zero defects; to reduce lead time by reducing setup times, queue lengths and lot sizes; to incrementally revise the operations themselves; and to accomplish these things at minimum cost."* (APICS ,1992)

## **2.3 Philosophy of Just-in-time**

Just-In-Time is a manufacturing philosophy which leads to producing the required items, at the required quality and in the right quantities at the precise time as they are required. It is an approach to achieving excellence in elimination of waste. In this case waste can be thought of as all things that don't add value to the product. Overproduction, Inventory, defect products, transport and waiting time are some examples of what can be waste according to JIT and types of waste determined in figure 2.1. (Chase et.al, 1998)

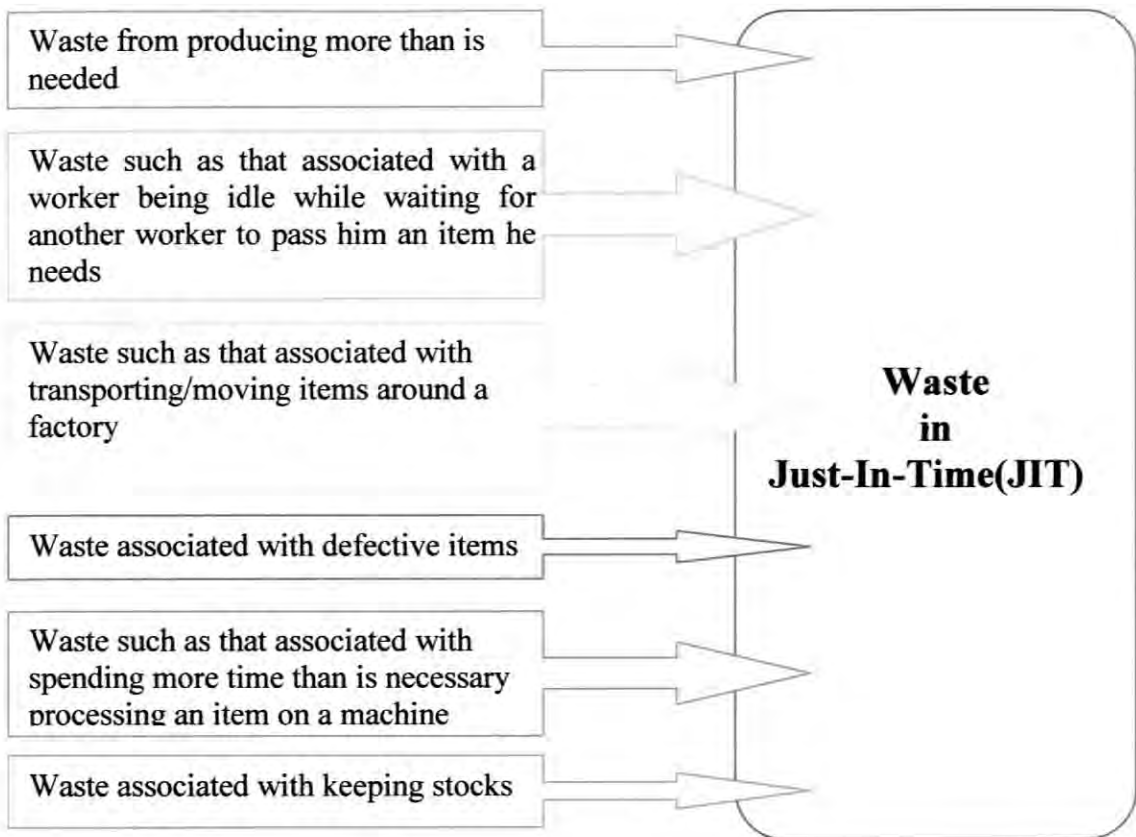


Figure 2.1: Categories of waste in Just-In-Time

Just-In-Time manufacturing is a system of enforced problem solving. Managers have the choice between putting a huge effort in finding and solving causes of production problems, or they can learn to live with an intolerable level of interruptions in production. As everybody knows, the situation in which one has to put huge efforts is highly undesirable, and therefore the system is called enforced. (Chase et.al, 1998)

## **2.4 Elements of Just-In-Time**

### **2.4.1 Scheduling**

In JIT the master schedule, or final assembly schedule, is planned for a fixed period of time, say one to three months into the future, to allow work centers and suppliers to plan their respective work schedules. Within the current month, the master schedule is leveled on a daily basis. In other words, the same quantity of each product is produced each day for the entire month. Furthermore, small lots (preferably lot size equals one) are scheduled in the master schedule to provide a uniform load on the plant and suppliers during each day. The advantage of this kind of master scheduling is that it provides nearly constant demands on all downstream work centers and suppliers. (Demmy,1988)

### **2.4.2 Kanban System**

JIT uses a simple parts withdrawal system, called "Kanban," to pull parts from one work center to the next. Parts are kept in small containers, and only a specific number of these containers are provided. When all the containers are filled, the machines are shut off, and no more parts are produced until the subsequent (using) work center provides another empty container. Thus, work-in-process inventory is limited to available containers, and parts are only provided as needed. The final assembly schedule pulls parts from one work center to the next just in time to support production needs. If a process stops because of machine breakdown or quality problems, all preceding processes will automatically stop when their parts containers become full. (Im and Lee,1989)

Kanban are printed cards in clear plastic cases. Every item or box of items that flows through its production process carries its own kanban. Kanban come off of items that have been used or transported and go back to the preceding processes as

orders for additional items. There are two kinds of kanban; one is 'Parts withdrawal kanban' and another is 'Production instruction kanban'. Withdrawal kanban are for communication between processes. Production instruction kanban are for communication inside processes. Operators remove withdrawal kanban from parts and material they have used. Those kanban send back to the preceding processes to withdraw additional items. Production instruction kanban come off of items that the following processes have withdrawn. They go back into their processes as instructions to make additional items to replace the ones that have been withdrawn. (Zhiwei et al,1994)

### **2.4.3 Setup Time and Lot Size Reduction**

The objective of JIT is to produce parts in a lot size of one. In many cases, this is not economically feasible because of the cost of setup compared with inventory carrying cost. The JIT solution to this problem is to reduce the setup time as much as possible, ideally to zero. The setup time is not taken as given; rather, it is considered a cause of excess inventory. Low setup times result in small, economical lot sizes and shorter production lead times. Driving down the setup time for machines is a key to the JIT system. With shorter lead times and less material in process, the production system is also much more flexible to changes in the master schedule. (Zhiwei et al,1994)

### **2.4.5 Workforce**

With an emphasis on quick changeovers and smaller lots, multifunction workers are required. Cross-training is needed so that workers can switch from one machine to the next and so that they can perform their own setup and maintenance. This requires a broader range of skills than traditional manufacturing. JIT requires not only broader skills but much greater teamwork and coordination since inventory

is not available to cover up problems in the system. The entire production system must be more closely coordinated by the workers. (Yasin and Marwan, 1996)

#### **2.4.6 Layout design**

The layout of the plant is much different with JIT since inventory is held on the shop floor and not put in a storeroom between processes. Inventory is kept out in the open, so it is readily available to the next process. Since inventory is typically kept low only a few hours or days of supply plants can be kept much smaller because of the reduced storage space needed. One comparison showed only one-third the space was needed when compared with conventional plants. (Lulu,1990)

#### **2.4.7 Quality**

Quality is absolutely essential with a JIT system. Not only do defects produce waste; they can also grind the production process to a halt. Since there is no inventory to cover up for mistakes, perfect or nearly perfect quality is required by a JIT system. JIT, however, facilitates improved quality since defects are quickly discovered by the next process. Quality problems rapidly gain plant wide attention as the production line stops when problems occur. A JIT system is designed to expose errors and get them corrected rather than covering them up with inventory. (Demmy,1988)

#### **2.4.8 Supplier**

Finally, supplier relations are radically changed by a JIT system. Suppliers are asked to make frequent deliveries (as many as four times per day) directly to the production line. Suppliers receive Kanban containers; just as in-plant work centers do, since suppliers are viewed as an extension of the plant. Changes in shipping procedures and close proximity of suppliers are often required to integrate suppliers effectively with JIT procedures. Suppliers are also required to deliver perfect quality goods. (Schroeder,2000)