CHAPTER 1

INTRODUCTION

1.1 GENERAL

Lean manufacturing is a leading manufacturing paradigm with a systematic approach used to identify and eliminate waste by focusing on production costs, product quality and delivery, and worker involvement. Lean attacks waste and waste is anything that is unnecessary and does not add value to the end product. Once identified, waste can be prioritized and eliminated in a manageable and structured manner (Orlando Valota, Yi Sun and Z Zhang, 2005). The tenet of lean production is elimination of waste both within the firm and across the supply chain (Womack & Jones, 1996). In the 1950s, Taiichi Ohno, developer of the Toyota Just-in-Time production system, created the modern intellectual and cultural framework for lean manufacturing and waste elimination. The focus of lean manufacturing is to identify and eliminate waste (non-value adding activities) by implementing lean practices and make the product flow at the pull of the customer in pursuit of perfection.

Further, (Womack and Jones, 1996) states that lean principles determine the goals of lean manufacturing and there is widespread agreement that lean manufacturing techniques make up the emergent new manufacturing paradigm. Lean manufacturing typically is considered the domain of large OEMs, but adopting a lean philosophy can also pay great dividends for smaller contract manufacturers and job shops (Patrick Waurzyniak, 2004). In curiosity, industrialist and members of association were contacted and asked about their views on this notion resulted in disparity among their opinion. This provoked interest in finding an answer on this difference of opinion and further led to examine the organisations’ preparedness and the likely challenges associated in adopting lean manufacturing practices by firms.
In addition to this, there is a dilemma among industrialists whether the lean techniques will suit Indian companies. (Badar Alam Iqbal, 2004) states that it is vital for the Indian firms to shed the obsession with economies of scale and learn to make the most out of existing capacities and machinery and in this respect the role of lean manufacturing is of strategic importance. Lean benefits include reduced work-in-process, increased inventory turns, increased capacity, cycle-time reduction, and improved customer satisfaction. Most of the lean techniques are Japanese in origin, emphasizing that many of these techniques are in fact common sense applied in a structured way (Prof David Little, Alastair McKinna, 2005).

1.2 MANUFACTURING INDUSTRY IN INDIA – AN OVERVIEW

Industries play a crucial role in India’s economic development. The industrial base has been widely expanded, covering broadly the entire range of consumer, intermediate and capital goods. Automotive, being one of the largest industries, facilitates the improvement in various infrastructure facilities like power, rail and road transport. Due to globalisation and rising demands of infrastructure, real estate and auto sectors, Indian steel has become one of the fastest growing industries. Over the years, the engineering industries, both light and heavy engineering, have registered an impressive growth rate and are having a strong base in production of various capital and consumer durable products. Light engineering is a diverse industry with the number of distinctive sub-sectors such as medical and surgical instruments; castings; seamless steel pipes and tubes; control instruments, electrical appliance, transformers, welding equipments, pumps and motors, etc. It is of high importance to the Indian economy and is the basis of almost all productive and business activities in the country. India's vast domestic market, skilled and technical manpower as well as low production and R&D costs have been making India a manufacturing hub.
1.2.1 Engineering Goods Manufacturing firms

Engineering is the largest among industrial sectors in India. It can be broadly categorized into two segments: heavy engineering and light engineering. The major end-user industries for heavy engineering goods are power, infrastructure, steel, cement, petrochemicals, oil and gas, refineries, fertilizers, mining, railways, automobiles, and textiles. Light engineering goods are essentially used as inputs by the heavy engineering industry. Importance of engineering industry in India can be gauged from the fact that it employs over 3 million people and accounts for nearly one-third each of productive capital, value added and output in the organized sector that contributes substantially to both the production and exports of engineering goods. The engineering goods sector is regarded by most economists as the engine of economic growth. Moreover, it is a known fact that manufacturing industry depends heavily upon the engineering goods manufacturing firms. A majority of SMEs operate in the light engineering industry comprising low-tech items such as castings, forgings, pumps, fasteners, auto components, bearings, electrical devices and instruments. Hence, this research study was carried-out focusing the Engineering Goods Manufacturing firms in India. A report issued by Engineering Export Promotion Council (EEPC) states that the engineering sector has emerged as the largest contributor to India’s merchandise exports, even ahead of gems and jewellery. Export of engineering goods crossed US $13 billion during April to October in 2006-07, an increase of 29% compared to corresponding period last year. At this rate, engineering exports would touch $ 24 billion in 2006-07 and this would be the highest among all items in overall merchandise exports from India. Two major reasons to take-up the study in this sector were, firstly, engineering goods sector plays an important role in economic development of the country. Secondly, majority of the firms fall under the batch type production category which has more suitable process characteristics for lean implementation. Engineering goods are defined to include main categories: Switchgears and Electrical items, Pumps and electric motors, and manufactured goods given in SIC Codes 3613 and 3621 (Appendix 8).
1.3 LEAN 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. 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. Today, lean manufacturing has become an increasingly important topic for manufacturing companies as they try to find ways to compete more effectively against global competition. Waste is defined as activities that do not add value to the product. Lean is an approach to achieve manufacturing excellence based upon the continued elimination of waste. Lean manufacturing utilizes techniques and principles that improve efficiencies of value added activities.

1.4 WIDESPREAD LEAN ADOPTION

Widespread lean adoption is the use of lean tools and techniques across the organisation to the degree in which it yields the benefit. Lean practices are not just for production management. Areas that need attention are production and inventory management, total organisational buy-in, total quality management with use of lean manufacturing techniques. The implementation process requires a lean transformation framework at the enterprise level and functional level. The benefits could be achieved with employee participation, supplier co-ordination and management support.

The keys to success include: a fundamental approach, systems thinking, leadership, a flair for strategy and recognition of the practical limits on resources (Quarterman Lee, 2007). Lean implementation is not simply use of tools and techniques. It requires lean principles that enable suitable work environment, organisational culture and employee participation. After an extensive review of previous studies, it was identified that there was no research study undertaken on lean adoption with reference to engineering goods manufacturing firms in India. Previous studies largely focused on implementing lean tools with lesser component
of managerial and cultural practices in lean adoption. Many researchers have quoted
that failure in lean implementation is due to lack of knowledge in sequence of
implementation, tools used and poor managerial perspective of enterprise. The
rationale behind this study was to develop a lean enterprise model with a broader
perspective that best suits the engineering goods manufacturing firms in India in
adopting lean manufacturing practices.

1.5 RESEARCH MOTIVATION

There is always pressure on the companies to produce faster, better and less
expensive with existing resources. This can be achieved only through adoption of
lean manufacturing practices. Studies conducted during the past decade on lean
implementation, found that the adoption of lean practices in manufacturing firms in
India are very much lagging. Peter Stroznjak (2001) states that still less than 20 percent
of manufacturers say they have widely adopted other lean practices such as lot-size
reduction, bottleneck removal and focused-factory production systems. Lean is vital
for the Indian firms to shed the obsession with economies of scale and learn to make
the most out of existing capacities and machinery and in this respect the role
of lean manufacturing is of strategic importance. Lean manufacturing would also lead
to higher volumes through lower costs and is the only option left for Indian firms to
attain competitiveness and to earn profit (Badar Alam Iqbal, 2004). Companies fail
in implementing lean practices due to selecting wrong tools and implementation
sequence, A typical reaction to this might be, “We tried to implement Lean, and
things got worse”(Jerry Kilpatrick, 2003). Lean theory is best utilized when it is tailor-
made and customized to meet the specific needs of an industry (Menaka S, 2007).

Based on the discussions made with few managers in manufacturing firms, it
was found that firms those implemented lean tools were successful in running their
business. (Oke A and Szwejczewski, 2005; Panizzolo, 1998; and Pullin, 2004) elucidate
that one way or the other lean manufacturing is a useful tool for directing organizational
performance. Proponents of lean manufacturing maintain that it enhances organizational
performance by removing waste, thereby reducing cost states (Womack et al., 1990, Creese, 2000; Roy et al., 2003). Firms cannot get the full benefit of lean adoption by implementing lean tools and neglecting other areas of manufacturing that leads to failure in lean implementation. As companies try to implement change to respond to competitive pressure, they tend to be one dimensional in their approach. It is clear that a more holistic approach is required for successful adoption of lean and to understanding the process of change. As not much is written on how to implement lean manufacturing, some firms stumble through with trial and error. (Brian Heymans, 2007), emphasizes the need to integrate a variety of elements in the change process. The above statements triggered to make an attempt to find ways to these unanswered questions and laid the basis for this research with an inclusion of multi-domain lean practices that facilitate firms for wider adoption of lean manufacturing practices. Finally, to develop a suitable lean enterprise model to successfully adopt lean practices in engineering goods manufacturing firms.

1.6 RESEARCH AIM

The aim of this study is to evolve a sector-specific Lean Manufacturing Practices (LMP) with special reference to engineering goods manufacturing firms, duly validated to show how it would lead to higher volumes of production through minimum use of resources and thus achieve competitive advantage through operational benefits.

1.7 RESEARCH QUESTIONS

The challenges in the following respects would appear to be highly appropriate for Indian industries such as:

(i) Identifying the prevailing deficiencies that prevent widespread adoption of lean manufacturing practices in engineering goods manufacturing units.

(ii) Outline the problems faced by the firms in adopting lean principles throughout the organization in order to reduce the manufacturing cycle time.
(iii) Identify how firms ensure they adopt lean manufacturing practices by eliminating many factors which include high cost of procurement and marketing, increasing cost of material, resistance to change, in the way of improving their competitiveness as part of ongoing practices to align with their product and process characteristics for organization’s success.

1.8 RESEARCH OBJECTIVES

The relevance of the research contributes to industry as well as academic viewpoints. This research study was carried-out with the following objectives.

1.8.1 Objectives of the Study

(i) To identify the key lean principles for engineering goods manufacturing firms that represents domain areas of lean manufacturing practices.

(ii) To explore the factors those are compelling the engineering goods manufacturing firms to implement lean tools and techniques.

(iii) To understand the obstacles faced by the engineering goods manufacturing firms while implementing lean principles.

(iv) To compare the differences between widespread lean firms and limited lean firms in their operational performance, benefits achieved and competitive advantage gained.

(v) To explore the combination of lean principles adopted by firms under lean domain areas to classify firms as balanced-lean firms and unbalanced-lean firms.

(vi) To suggest and recommend a Lean Enterprise Model (LEM) for successful adoption of lean practices by engineering goods manufacturing firms.

The research aims to respond to the challenges in widespread adoption of lean practices. By achieving the above mentioned objectives this research provides a structural model that help the firms to transform into a lean enterprise.