



# A STUDY ON ASPECTS OF LEAN MANUFACTURING PARADIGM

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## ABSTRACT

*The industrial model is shifting dramatically globally. The way we design and create products and use technological advances has shifted. As per recent patterns in output, products are subject to less product life, often changed configuration, limited batch sizes, and minimal inventory constraints on the operation. The weakening of the economy accompanied a protracted phase of unparalleled development immediately before the development of this concept. It is challenging to persuade production managers in periods of prosperity that waste reduction, quality enhancement and cost reduction are needed. However, with the slowdown of economic development, producers are starting to explore means of change. Lean development principles are ideal methods for waste management and profit enhancement administrators. Even if an expenditure is needed to learn the changeover, the effects predicted may be persuasive. Studies on the benefits of lean manufacturing state that the in a large manufacturing facility, it improves job efficiency in the plant and cuts processing times. This article provides a systematic overview of lean manufacturing concepts and tools for novice and expert researchers.*

**KEYWORDS:** *Kaizen ;Lean Manufacturing ; MUDA ;Kaizen Application*

## 1. INTRODUCTION

Currently, industrial organizations face the task of finding and introducing new operational and manufacturing strategies that help them succeed worldwide. Lean production is a proven and applied technique that needs to be taken into consideration for any business planning to remain successful. The production system originates in Lean Manufacturing; A model has been developed as a framework in other sectors and countries to become the associated quality management systems philosophy to the excellence in business. In brief, Lean is the systematic and normal implementation of a series of development technologies to improve manufacturing processes by eliminating all forms of waste, described as processes or practices utilizing more resources desired specifically; a new culture is a key to this model[1].

That tries to find a way to enhance the manufacturing facility both on the manufacturing side and in direct touch with everybody with the issues with which cooperation is treated as central and complete coordination with administrators, operators and managers. The main mission of Lean would be to improve the employee using the customer's goal as a focus. To achieve this goal, customers are provided with quality and reliable products that can be produced or services. The value of the company and product improvement is realized by eliminating waste in the organization. In other words, the organization uses its resources in the most efficient way possible [2].

## DESCRIPTION AND HISTORY

The industrial revolution and the launch of mass processing could be a suitable period for starting a lean manufacturing context. The Technological Revolution has transformed civilization profoundly. In the early 1800s, the industrial revolution. Machine-built products decreased rural workers' wages, and the garment industry's mechanization decreased workers' earnings. Any professional employees were successful during the period, and most employers exploited refugees and low-wage women for cheap labour. Industrialization had many advantages during this period, such as decreasing the production price of certain products; nevertheless, the time was complicated since the work was uncertain, global circumstances had shifted continuously, and many citizens might find themselves out of a job. Any employees have been upset by employment cuts attributable to mechanization[3]. Life was both difficult and risky in early factories. Many factories had the staff, and moving machines had no security, which could harm workers. When an injured employee cannot expect funding from his workplace or the government, the accident could contribute to unemployment and hardship directly. The plant life throughout the industrial revolutions was harmful due to the long shifts of day, brief breaks, and the steady smell of Sulphur in the air. During the initial industrial revolution, many manufacturing



workers argued that staff was not used to the daily hours of factory labour and monotony. Many, though, were inspired by the compensation offered to the industry to give up agricultural work. Industrial labour offered an incentive for modest savings to grow and was less uncertain than farming, which left citizens relying upon conditions. Expert jobs at the early plants could gain a premium salary, and some companies kept their employees going in slack periods only to make sure they were there as demands for production grew [4].

Early factories have had preparation issues. Employees could barely interpret and, therefore, could not comprehend written orders. The training was normally oral, if any. Employees usually master the position by gazing at someone who has served for longer. The staff has sometimes rejected reforms, which was an issue as proposals were made to standardize parts common to industrial manufacturing. In early factories, the morale of employees was a concern. Many employers felt that high salaries would decrease production because employees would quit working as soon as they had enough income. Adam Smith rejected this conviction and claimed that people might work more if they could earn more from jobs. Many businesses, like textiles, have used a parts rate structure connected to demand [5]. This approach worked well in early textile mills, forming a direct relationship between work and development. It has yet to succeed in industries like mining, where team effort is required. Henry Ford founded the Ford Motor Company in 1903, and his company manufactured medium-priced vehicles. Ford was in 1907 developed a light and cheap automobile for the General people. The first T Model by Ford, which was sold in 1908, expanded annually till the First World War. Ford had a group of youthful and skilled developers and mechanics who could play with manufacturing techniques, operating layouts, quality management and material handling [6]. In preparing for the development of its Model N vehicle, Henry Ford started his study with the idea of interchangeability. He believed it to be necessary to increase production performance through interchangeability. The modules' manual fitting must be separated to do this. Ford went too far to boast about the exact make of the piece inside his vehicle. Although strict procedures have been carried out in the manufacturing industry since the 1450s, Henry Ford was the person who integrated a full development chain. He constantly matched interchangeable parts with regular work in 1913 with movement transmission to establish what he referred to as the flow output [7].

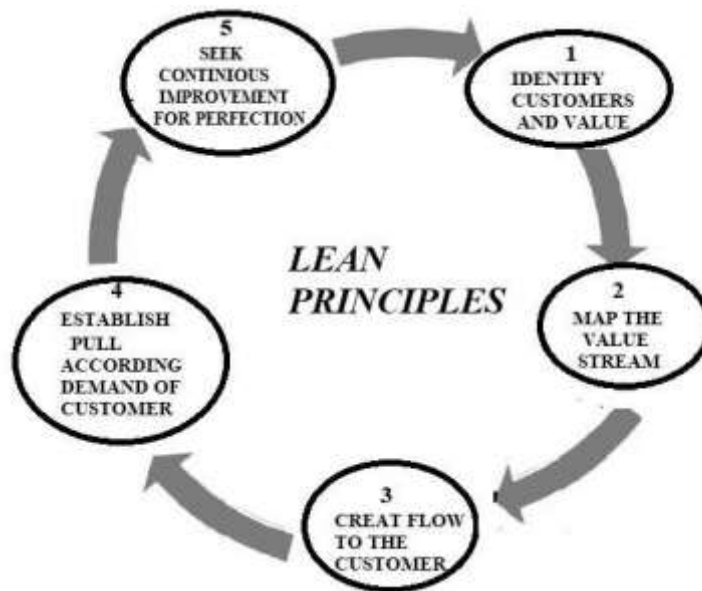
The Ford framework continued to fall and failed to alter the system as the world started to change. Ford's development, for example, relied on a labour force so anxious for resources and employment that it lost its integrity and self-esteem. The progress of the industry and the creation of trade unions brought tension with Ford's scheme. The development of goods has placed pressure on the Ford framework. The Ford factories could have reacted better to annual model updates, different shapes, and selections. General motors have adopted a more realistic stance and manufacturing methods for administering very large organizations. Around the 1930's, General Motors also became the leading automotive business company as Ford. However, even in the modern era, there were several aspects of Ford's production[8]. In the Allied success of World War II, the techniques of Ford were a key element. The T model was not just one hue. It was often restricted to a standard such that every Model T chassis was the same before development stopped in 1926. Virtually any system in the Ford Motor Business operated on a standard component number, and there were no changes. Ford seemed to miss his way as the universe needed diversity like product cycles for Model T. Other automobile producers replied to the need for a wide variety of products, each with several choices, but manufacturing processes, which have planned and produced measures with much more process time. Over time, they have been able to supply their manufacturing facilities with machines that operate faster, seemingly decreasing prices per process stage, yet constantly growing flow times and low inventory, such as engine machining lines. Moreover, the time gap between procedure phases and dynamic parts routing requires an increasingly advanced knowledge management framework resulting in the creation of computerized material requirement preparation (MRP) programmers [9].

Just after World War II, Toyota looked at this scenario, and a number of basic developments rendered it possible to guarantee both continuation of the process flow and a huge range of product offers. They revisited the initial Ford thinking and invented the manufacturing method of the Toyota device. This method effectively changed the manufacturer's attention from specific devices to the whole process into the flow of the component[10]. Via the installation of self-monitoring machines to guarantee efficiency, the lining up of machines in process series, the fast set up of each machine for producing small quantities of several pieces, and with every phase notifying the previous stage of their current needs of materials, Toyota concluded that it would also be possible to acquire low, high prices. Toyota concluded that control of details might be streamlined and even more detailed. Henry Ford was the first to genuinely incorporate the 'mass' production method, which generates vast volumes of standardized goods. Ford developed what he called the creation of flow, which requires the constant movement of components through the production phase. Ford used industrial manufacturing to produce and montage the parts of his cars. The industrial production method offers professionally equipped and interchangeable parts compared to craft manufacturing. This was a highly efficient operation Ford Motor Company manufactured many vehicles. The US military picked up the industrial manufacturing method of Ford after the Second World War [11].

Japan has played a significant part in the corporate world and has a good company culture with various continuous improvement tools for enhancing output (Kaizen tools). Toyota a couple of years after its establishment, it started making vehicles; the business was renamed Toyota and wanted to learn the established system Ford using, but the management of Toyota felt that the mass processing system implemented by Ford could not be used by Toyota while researching Ford's system of development. For mass manufacturing, at that time, the market of Japan was too limited and diverse[12]. The expectations of the consumer varied from small cars to luxury cars. The mass manufacturing method from Ford was based on development rather than consumer demand.



Toyota focused on designing a modern manufacturing process. They realized they could manufacture goods quicker, less expensive, improved quality, and more varied by using the correct machines with the actual volume needed and by incorporating new machines. They also confronted the dilemma of exchange between efficiency and competitiveness[13]. These experiments led to the developing of several innovative approaches recognized as the Toyota Manufacturing System. Lean development past had its beginnings in the industrial revolution and then the popular assembly line by Henry Ford. But Toyota produced the concept much later on with the method changes. Ford's concepts were extended by the Japanese car manufacturer, concentrating on cooperation and removing non-value-added practices. Lean production came into the full circle, mostly in the 1980s, with the fighting automakers recognizing the exponential rise of Toyota's productivity and importing their ideas with uneven engagement[14].



**Fig1**

The Japanese had the task of profiting from competitiveness. They started to research United States manufacturing processes, with special attention to Ford's efficient activities. In the sense of this survival, exactly, Toyota was the organization that utilized the quest for modern practical solutions most intensively. In 1949, following a lengthy strike, a market slump caused Toyota to lay off a large portion of its hand [15]. At the time, two young engineers from Lean Manufacturing were visited by the American automotive corporations, whom he considered to be the founder of Lean Manufacturing. At this point, the American framework called for cost savings by making vast cars but reducing the number of versions. They noted the static American structure did not apply to Japan and that the future would entail the development of tiny and low-cost vehicles. They concluded that all this would alone remove stocks and any excess, including the potential human use [16].

Starting from this laid the framework for the current management method, JIT/ Just in Time, also named TPS (Toyota Manufacturing System). The system articulated a very basic idea: produce what is required when customers ask for it. He recognized the necessity for constant flow transformation of the planned activities without delay, such that exactly what they need is delivered to the consumer, and his involvement in the schedule is minimized. Their first implementations were to dramatically decrease tool changing times and build the groundwork for the SMED method .Different techniques such as Kanban, Jidoka and the Poka-yoke method were established in line with JIT theory, which enriched the Toyota system. With the 1973 oil crisis and the losses of several Japanese firms, the JIT/TPS became prominent [17]. Toyota, which was emphasized by the other companies and the government of Japan, encouraged the concept to be applied to other industries as soon as a positive edge competently with the West continues to be taken by the Japanese industry. It should be remembered at this stage the JIT is a function of attempts to solve, increase competitiveness and eventually decrease prices, confirming that innovations emerge with more intensity in periods of crisis. Lean principles are given in Fig.1.Despite all this past, it was in the early 1990s that the Japanese model became great in the West. The manufacturing processes in Japan, Europe and the USA are systematic. The characteristics of a modern manufacturing method can be used globally in order to balance performance, versatility and consistency [18].

## CONCLUSION

Technicians, instructors and specialists in the industries may look to processes which refer to Lean, a method formed in a socio-industrial world that is now extremely beneficial for both industries and employees. The first exercise in lean thought, to eliminate wastefulness in the exchange of ideas, would like to clarify and demystify the concepts denominations in concluding a definition of the roots of Lean Manufacturing. Lean Manufacturing originates a culture which continues unchanged until today in



the quest for obsessed ways to enhance the factory's post-works and manufacturing lines, all closely linked to the issues and with full coordination, participation and contact between management. In this hunt, the concepts of quality were embraced, and the psychological improvement produced constantly was made, which would only happen years afterward in the factories. It refers to change for the better or advancement. This is an attitude of self-improvement through innovation and development. Process improvement needs ongoing small improvements started by employees. All workers should constantly search for how to improve personal skills and with other colleagues to enhance job satisfaction. Kaizen allows employees to take responsibility for their work as well as improves their motivation. Kaizen is primarily a bottom-up strategy for improvement.

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