

# Free research paper on the lean concept

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## **Abstract**

The use of a systematic approach which eliminates wastes by the creation of a flow that is determined by customer pull has greatly transformed process design in organizations. This approach is known as lean thinking while the process of deploying this methodology and achieving its aim is known as the Lean process. This paper describes the concept of the lean process and manufacturing with focus on the Toyota Production System. A brief history and background of the lean process is described and the background of the Toyota Production System is also described.

## **Introduction**

Several organizations today are making the lean process an integral part of their operations planning and improvement. The reason behind these decisions is essentially centered on the fact that lean thinking makes obvious what adds value by drastically minimizing everything else and also because

the application of the lean process into the Toyota Production System has made the company achieve steady growth that has transformed the company into one of the world's largest auto-manufacturer (Krafcik, 1988). The aim of this paper is to describe the lean process with focus on the Toyota Production System.

## **Background**

The concept of the Lean was derived from the Japanese Manufacturing industry. The name and concept can be said to have been derived by John Krafcik, who in 1988 brought about this concept during his master's program at the MIT Sloan School of Management and then wrote the article entitled, "Triumph of the Lean Production System," after completing his Master's thesis. Findings have shown that Krafcik's had already worked as an engineer in the Toyota company located in California before opting to go for his master's degree. It was the research work of Krafciks that the International Motor Vehicle Program continued at MIT that lead to the production of the international bestselling book named *The Machine That Change the World*. (Holweg, 2007) & (Krafcik, 1988)

The concept of the TPS originated from the approach founded by the founder of Toyota, in the person of Sakichi Toyoda, his son, and Taiichi Ohno (an engineer working with them). The main reason why the TPS was designed was to rule out all the possibilities of mura (also known as inconsistency), muri (also known as overburden), and muda (also known as waste). The Toyota Production System was developed between 1948 and 1975 by Eiji Toyoda and Taiichi Ohno. It spread through Japan and later to the western world where it got christened with various names such as Demand flow

technology, stockless Production, world class manufacturing, and Just In Time. Not until the 1970s did Toyota decided to give it a name. (Ohno, 1988) & (Monden, 2012)

The main concept of the lean process is the elimination of waste, and this consequently leads to the improvement of quality and huge reduction in time and cost of production (Holweg, 2007). However, the lean itself is popularly regarded as a set of tools that aids in the identification of waste and constant waste elimination. Some good examples of these set of tools are control charts, redesigning working cells, mixed model processing, multi-process handling, error-proofing, value stream mapping, single point scheduling, and SMED. (Reichhart & and Holweg, 2007)

A second concept of the lean manufacturing approach exists; this is usually referred to as The Toyota Way, the name came from the fact that it is the approach promoted by Toyota. In the Toyota Way lean manufacturing process, the focus is usually on how the flow or work smoothness can be improved. If the work flow and smoothness is improved then unevenness, also known as mura, will be constantly eliminated all through the system. It is noteworthy to mention that, unlike the above concept, this concept is not that dependent upon waste reduction. In this concept, the techniques employed to improve flow include the use of Heijunka box, use of Kanban for the production of “ pull”, and production leveling. (Reichhart & and Holweg, 2007)

The major difference between the two concepts stated above is in the prime approach taken to achieve the goal, and not the goal itself. One good reason why the Toyota way approach is preferred is chiefly because, unlike the first

approach that assumes a system wide perspective, it naturally takes a system-wide perspective. However, the shortcoming of the Toyota way approach is the fact that waste reduction occurs naturally as a consequence of the implementation of the smooth flow. The Toyota approach has always improved based on the fact that it responds and readjusts as problems arises in its own production facilities, so, it is the need that drives its improvement. The Toyota approach is thereby not based on any theoretical framework; rather, each step is usually built on previous ideas. The Toyota's main concept of the lean is not in the tools but in the minimization of the three types of wastes, namely; the unevenness (also known as mura), the overburden (also known as muri), and the non-value-adding work (also known as muda). It is also focused on the systematic exposure of problems and the employment of tools in situations in which the ideal cannot be achieved. The Toyota production systems tools are thereby made in such a way that they are adaptable to several situations. These points show why the Toyota production system may not be coherent with the lean method explained above. (Thun, 2010)

## **The Toyota Production System (TPS)**

The Toyota Production System is a foremost antecedent of the lean process (Thun, 2010). Another name for the Toyota Production System is the flexible mass production; however, it used to be referred to as the just-in-time production. It is an integrated socio-technical system made up of the practices and management philosophy of Toyota. It organizes the logistics and manufacturing processes of Toyota, this includes customers and suppliers interactions. This system has two pillar concepts, which are;

autonomation (smart automation) and flow or just-in-time (JIT). The JIT is the most famous pillar of the system and its aim is to produce and deliver the appropriate parts, in the appropriate amount, at the appropriate time by making use of the least essential resources. The JIT system minimizes inventory, and helps to prevent excess production. By employing the concept of the JIT problems get exposed quickly. Unlike other companies that shy away from problems and avoid potential disruptions by applying inventory in a way that makes these problems gets hidden, Toyota applies a kind of approach that quickly exposes the real problems in a production process. Toyota would rather take an approach that would reduce inventory rather than the one that increases it. (Towill, 2006)

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## **The Seven Wastes the TPS Eliminates**

Since the central theme of the lean process, right from its inception is to eliminate waste and thereby maximize value, the basic concept of the seven wastes had therefore been an essential part of the TPS right from inception at Toyota. It was this central theme and the ideas behind the 7 wastes that have been responsible for the Toyota Production System which later led to the concepts and methodology of the lean. Every single one of the seven wastes relates with certain wasteful activities that are found in every typical services and manufacturing.

- Excess Production: Any resources that are unnecessarily expended are considered as waste. It used to be a common practice in manufacturing to produce products when they are not needed. This usually is as a result of either poor production planning, control, or improper incentive systems for excess productions.
- Idleness or Wait Time: This usually occurs as a result of queues within processes or if there isn't a good synchronization between activities such as the time required for carrying out a value added process. This will make one process wait or stay idle for the other process to be completed. As one of the process/resources waits for the other process, time is being wasted. All the time spent by any process in idleness while awaiting the other process to complete its own task represents lost productivity and capacity, and would lead to an increase in the lead time to the customers.
- Inventory: Holding inventories does not add values to the customers; it is short lead times that add such values. Holding inventories such as that of raw materials and that of finished goods requires, and only holds down,

capital. Since the goal of lean is to achieve things that add value, such as short lead times, it sees holding inventories as waste.

- Transportation: Regardless of whether transportation is seen as a waste or as value added the aim of lean is the minimization of the costs of transportation.

- Excessive Processing: This usually comes up whenever the processing operation of an individual can either be eliminated or can actually be merged into other processes. A good example of this is the packaging process which adds no value to a product.

- Motion: The reason behind the creation of the cellular manufacturing techniques was to achieve an elimination of motion. The elimination of motion will make production activities to be carried out in a small work space which would be able to merge multiple operations with minimal movements between each of these operations.

- Defects: Lean manufacturing focuses on total quality techniques and strive to always ascertain that all processes and activities delivers top value. In recent times, the desire to achieve reduction of waste and the elimination of defects has led to the creation of the six sigma techniques. The combination of the six sigma tools with the lean framework is what has now been termed as The Lean Six Sigma. (McBride, 2003)

Lean experts are clamoring for the addition of the “untapped talents of the human capital in the organizations” as the 8th waste to the lean methodology. (Miller, 2005)



## **Conclusion**

The lean manufacturing process originated from the Toyota Production system, and it has rapidly spread into a lot of other industries and niches that goes beyond the automotive industry. The impacts of lean thinking on the industrial circles have been quite immense, over the last few decades; also, the lean approach itself has experienced a lot of development over this period. Although, many believe that the Lean Process is same as the Toyota Production System, however, the fact that the Lean process is the deployment of the TPS into other contexts and industries have brought about some acknowledged differences between the two. The differences are thereby as a result of implementation, due to the need that situations in various industries and contexts vary. The lean application has no doubt brought about more success to the industries and organizations where it has been deployed; however, there are two major shortcomings that has brought about its criticism. The lean application is devoid of human integration and its applicability is only limited to high-volume repetitive manufacturing environments.

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