

The toyota production system analysis



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The Toyota Production system is an anomalous manufacturing approach developed by Eiji Toyoda and Taiichi Ohno. The Toyota production system was flourished out of demand after the World War II, the market was small for Toyota and they made different varieties of vehicles on the same assembly line. Thus flexibility was a vital thing to their operations. This helped Toyota to discover a production system which focuses on eliminating waste of time and raw material from every step of production process to get higher quality, greater productivity, improved customer responsiveness and better utilization of equipment and space.

Evolution of The Toyota way

The concept mass production and lean production reflect ways of thinking about production. The production system in Ford developed by Henry Ford and all the system subsequently developed systems by other automobile manufacturers reflected the mass production for most of the 20th century. The rise of the Japanese manufacturing industry gave birth to a new approach to the production system by eliminating the waste and reducing the cost.

The root of evolution of lean manufacturing is from Henry Ford's moving assembly line. Henry Ford helped Ford to make historical transformation by introducing moving assembly line to build automobiles. Henry Ford believed in continuous flow of material and it quickly developed into mass production. In 1908 Ford first produced its economical motor cars; the strategy behind Ford was to manufacture mass quantities of one simple car in one colour to satisfy the demands.

Eiji Toyoda on studying the Ford's production system in River Rouge manufacturing facility found that the manufacturing system has various flaws in it. The factors which made Eiji to develop a new production system in Toyota are

Workers Rift

The Ford production system kept the workers and machines busy always. The workers were depressed with the mass production. The workers disliked the workload on them, no worker wanted to be at the plant, this mentality of the workers reduced their involvement towards the work. The worker's Unions fought with the management continuously to reduce the working hours. Due to these the workers became less committed to the company. Japanese wanted an approach of building quality products and gave emphasis on continuous improvement through worker's involvement.

Quality

Many inherent flaws were found in the Ford production system. With the current standards the defect rates became very high. Due to less involvement of the workers, there was minimum work organization in the production system. There was no improvement in the production process without active participation of the worker in the manufacturing. Lots of equipments were involved to produce large amount of products. The inspection and quality test of these large amounts of products was average due to large batches of products. Many of the finished products were defective and required lot of technicians to fix the substandard products.

Overproduction

Eiji Toyoda was detached from the overproduction strategy which was followed By Ford. Ford production system produced surplus products and the machines in the company were running continually. The excess finished goods are stored as stock until demand arises.

Flexibility

The Ford system lacked flexibility, during 1927 when ford switched from the Model T to Model A, the whole manufacturing process was stopped and the factory was shut down for a period of six months. The company could specialize and produce one product in large numbers but when a new variety of the product was introduced the company was into chaos. Flexibility was much needed for mass production in Ford.

Push System

Ford followed the push manufacturing system. In this type of manufacturing system, the products are manufactured without prior forecast of the requirement of the product, and then the product is pushed to the next step. The next step may be selling the product into the market or the next internal process. The main drawback of this system is over production. This happens mainly due to the lack of analysis of the requirement or planning. This process leads to wastage. The Ford Company had a large stock of the products at the end for which there is no actual demand. To sell those stocks which have no demand in the market, the company has to create the requirement by promotion and advertisement.

Waste

The entire workplaces were disorganised and out of control . The process steps in manufacturing were based on large volumes, with interruption in between the process made these products to wait in the inventory. This delay caused inefficiency, waste of time, material and man power. The Ford production system had several other wastes among which the excess of products produced due to mass production strategy and defects or errors in the products are consider as the major waste by Eiji Toyoda.

Henry Ford preached the effectiveness of creating a production system with continuous material flow through the whole process of manufacturing, standardizing processes, and eradicating waste. This was not completely followed and practiced by his company. Toyota saw this as a major flaw in the mass production system in Ford. During that time Toyota did not want to create waste in its production system as it lacked capital, warehouse and factory space. Unlike Ford, Toyota manufactured variety of automobiles. But Eiji Toyoda was determined to use Henry Ford's Ideology of continuous material flow to develop a production system of one-piece flow, this system was flexible to vary according to the customer demand and same time it was efficient too.

Together with the preaching's of Henry Ford, Toyota Production System was evolved by adding the concept of pull system, which was influenced by the operation methodology in the American super markets. Toyota Production system emerged as a unique manufacturing system which didn't follow Ford's mass production system. Eiji Toyoda, Taiichi Ohno and his

contemporaries implemented these to work on Toyota Company after various trial and errors.

Elements of Toyota production system:

There are two main factors in Toyota Production System. First is hard and also known as the technical part of TPS. The other is soft and also known as people related part. The manufacturing related process is considered to be the technical part and the systems involved in manufacturing are Just-in-time and kanban. Whereas, the people related part includes Jidoka, Kaizen and the human element. TPS was created and developed by three prominent people such as Sakichi Toyoda the founder of Toyota group, his son Kiichiro Toyoda and a production engineer by the name of Taiichi Ohno.(Source: Handout-Taiichi Ohno and the Toyota Production System). The main focus of TPS was to reduce the cost through eliminating the waste or Muda, either identified as material or the action that were not useful to the process. Each element TPS has been explained below.

Just-in-time

It is defined as the coordinated and fast movement of parts throughout the production system and supply network to meet customer demands. (Nigel Slack, Stuart Chambers and et al., 2007, operations management, pp 465). It is probably the basis of TPS. Just-in-time is launched primarily to eliminate wastes. The principle of Just-in-time is to produce 'only necessary products, at the necessary time and in the necessary quantity.' Just-in-time is adopted to make the production process smoother. US supermarkets inspired Ohno to implement Just-in-time. If Just-in-time is achieved throughout the

organization, then the inventory can be completely eliminated hence the factory will not require any stores and warehouses.

Kanban

kanban means 'signboard' in Japanese language and it is a tool to control production quantity effectively. Kanban is used to overcome the problem which Toyota faced with Just-in-time. Kanban is used to achieve high level of outsourcing for Toyota. In this kanban system, some kind of order card is used to ease the supply of inventory between processes in the production line. There are two types of kanban cards namely Withdrawal kanban and Production kanban. 'Withdrawal kanban is also known as conveyance and is used when going from one process to other process. Whereas Production kanban is used to order production of the portion'(Source: Handout-Taiichi Ohno and the Toyota Production System). In kanban system there are fixed number of containers and each container is having fixed quantity of parts. After that each container are attached with withdrawal kanban and production kanban. At last using Ohno's formula, total numbers of containers and the number of parts each container is holding is calculated. So this calculation will give maximum amount of inventory which will be present in the system. This inventory is used to hold the process together. So kanban is used to connect all the process in the production line.

The human element and Jidoka

Jidoka is described as 'humanizing the interface between operator and machine'. If we look at Toyota's philosophy then it says that machine is used to serve operator's purpose. Jidoka has three main parts that is machine

jidoka, live stop authority and visual control. (Nigel Slack, Stuart Chambers and et al., 2007, operations management, pp 465). In most of the manufacturing companies labours are taken for granted, they are treated as factors of production. No one care about their feelings, values and beliefs. But the human element had played an important role in the TPS. Here the people are made to think and give their suggestions to improve any kind of process in the company and hence TPS is also called as 'Thinking Production System'. Jidoka is nothing but Toyota's commitment towards empowerment. Jidoka is mainly used to correct the problem in the production line. When worker find any problem in the production line, he will pull the card called 'andon' card. This will set off alarm system and also set off the andon electric light board. Because of this all workers and supervisors will come to know that there is a problem in the production line and should be rectified as soon as possible.

Kaizen is also one of the most important elements of TPS and it is also known as continuous improvement. The main motive of kaizen is to involve the employees in every aspect of the organisation so that everyone will suggest with their own ideas in eliminating wastes and make things easier and efficient. If waste is removed, the company will get high productivity and profitability. The most important part of kaizen is '5 whys' means ask 'why' 5 times when encountered with any problem.

Contribution of Taiichi Ohno:

'Even though many concepts were developed by Sakichi, Kiichiro and Eiji, Ohno is the one who streamlined the concepts and developed into a formal system'(Source: Handout-Taiichi Ohno and the Toyota Production System).

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He is the one who educated the people of Toyota to familiarise with the concepts of TPS and implemented the system. He tried all the possibilities while developing JIT to make it perfect. Even though JIT was inspired from US supermarkets Ohno made several experiments to make it feasible for a car manufacturing company. He urged the managers to visit the manufacturing works each day and to get back at least a single idea for kaizen. Ohno believed in people, he developed creativity within the workers and assigned responsibility inside them and developed lifetime employment concept. This made workers more committed to the company. He also made compulsion to wear same uniform for both workers and supervisors. So that no one's feeling will be hurt.

The main contribution of Ohno was that he re-examined the wrong wastes. He strongly believed that if any process that involves workers or the work without need then it is a waste and should be removed as soon as possible. So for this reason he re-examined the wrong waste and increased the productivity. He provided clear understanding of waste and work. According to Ohno waste is the needless, repetitious, movement that must be eliminated as soon as possible. There are two types of work. Non value added and value added work. He also utilized the full work system. (Taiichi Ohno, 1978, Toyota Production System: beyond large scale production, pp 46-58).

Toyota's Human Resource Philosophy

The human resource integration was very much an important part of the Toyota Production System. Toyota believes its employees to be the catalysts of growth. Toyota ensures equality in growth and promotional opportunities

among its staff. Toyota also focuses on maintaining a stable relation with its employees to achieve the long term goals of the Toyota Company.

Toyota's organization was precisely structured. The company had a wide range of departments which were further subdivided into several teams. The flat structure meant that any employee at any rank could come up with his idea of improvement. Toyota laid stress on the multifunctional abilities of the work force. They were made to work across different areas. This made their job interesting, thus highly motivating them. The multifunctional skills of the employees also proved to be handy during times of demand fluctuation.

Employees were trained to meet the sudden fluctuations in the market. They were made flexible to work on any kind of a demanding situation. This kind of a flexible approach applied to people working in all areas. The work force thus learnt to work in co-operation with their co-workers.

Workers were well trained before being assigned with their respective roles. Training was so essential in building the individual as well as the company's overall performance. Recruits were trained until they get familiar with Toyota's production system. As members were trained on cross-functional areas they easily adopted to any given role. Mobility of workers thus paved way to effective utilizations of the company's resources. Toyota was also considerate in recruiting disabled persons and placing them at different positions in the company. The company was again very focused in providing employment to women. Provision of flexible working hours and child care facilities at the work place helped women perform to their full potential.

Greater emphasis was laid on team work and the work force was empowered with appropriate responsibilities. Employee's Team acquire skills from their leaders and were also encouraged to come up with their ideas on improvement. Kaizen which means continuous improvement was the vital quality each member had to possess. Toyota thus built in culture to achieve its goals through team work. Jidoka which meant automation with a human touch was a part of the company's culture which helped to anticipate active workforce involvement. Employees were given greater responsibilities and the company had full faith in their abilities to perform. Workers were given full hand to control operations under their production line.

The work force union was recognized and encouraged by Toyota. They work on coordination with each other. Matters of conflict were solved at the grass roots in the lowest level of the company. The company ensured equality in treatment and provided similar benefits to all. The pay system was common across the company. The facilities were open to all regardless of the individual's position in the organization. Health care benefits and pensions systems were also made common. Toyota ensured a healthy work force on the whole. Medical services were also provided to the family members of the work force thus proving to be socially concerned. The work force was entitled for paid leaves during periods of illness. They were also well paid for working overtime to reach production targets. The company also kept constantly working on worker safety and made sure to ensure a safety work environment.

Toyota fills in its vacancies by promoting the existing members of the organizations. As the job gets more demanding the company expects its

members to perform accordingly. Promotional policies are aimed at acknowledging skills exhibited by work force. A fair policy is ensured during promotional activities. Toyota believed effective communication could lead to the accomplishment of their objectives. The work force was encouraged to share their thoughts with their co-workers. Effective communication was carried out through company newsletters and notice boards. Views of all the staff were adhered to irrespective of the positions they hold. The members also have an advisory board whose representatives chose by election. The board holds meeting with the Toyota's executives to discuss on issues. The board serves as a platform between the employees and the company ensuring good communication. The board thus could be used to arrive a general opinion on major decision making processes.

Toyota has greatly benefited by its unique HR way. Empowerment of its employees has been the core of their HR philosophy. Making employees participate in their day to day activities has helped them be an innovative company. This has also helped them earn employee loyalty. Employee safety was consistently reviewed. This not only created job satisfaction but also increased the morale of the workers. The workforce thus turned out to be reliable and was focused in improving the productivity. Toyota was keen on developing a long term association with its work force. Every member of Toyota was thus assured of a safe job if they performed consistently. This motivated them to keep improving consistently. Toyota's policy of cross training its employees in different production helped obtaining a multi-skilled force. Effective and efficient use of its resources was made possible as a result. A team working environment resulted in a flexible workforce. Toyota

having approved its employee union and the way they dealt with worker concerns helped them work in harmony with the workforce. Vacancies were filled in by promoting the existing workforce thus motivating them to work harder. Recruiting the disabled, empowerment of women employees helped Toyota gain a reputation as an ethical employer. Thus Toyota has benefited in different facets with their HR policy in line.

Industrial culture

Industrial culture plays a vital role in the success of any organisation.

Industrial culture varies between countries. Industrial culture in organisations decide the success of failure of them, even though they have the same machinery, technology, raw materials and even the same pool of potential employees. Also the relationship between workers and the managers play a vital role in the development of any organisation. The organisation with a high degree of relationship is said to achieve success even in short amount of time.

Japanese Industrial culture

Managing people is the advantage which the Japanese companies have over their western counterparts. According to the Japanese, people are the organisation's most valuable asset. They give more importance for their employees and have a good relationship with them. They emphasized more on the flexibility and teamwork. The workers are mostly multi-talented and could perform any work assigned. People are organised in teams and members could change their roles within their team. The workers are given responsibility of running and improving their workshop. Employee at any

level has the right to make improvements. Dedication to personal change and need to learn new things is the main culture of the Japanese. To avoid any levels of discriminations at work, the workers and the superiors are given the same uniform and power. Suppliers are greatly valued and there is a mutual understanding between the organisation and the suppliers. The Japanese firms had a smooth relationship with the suppliers as to have their products delivered at the right time and in the right amount. Just-In-Time is the strategy which they opted for instead of 'Mass production'. Another major issue followed was identifying the root cause for any problems that arises leads to the complete elimination of the problem and stopping it from repeating in the future. Long term success is the main idea followed, which is a theme followed by effective managers. So managers of the Japanese organisation were more competent.

Western Industrial culture

The major difference between the Japanese culture and the western culture are the ways of handling things. People are not given much importance. Workers are not given freedom to express their views and ideas. Managers play a vital role in the company. Managers of Western countries looked to attain success in a short amount of time and they were not interested about the long term goals or benefits. Payment systems are used as part of management strategies to maintain and extend their control over work. On top of all the change, most U. S. manufacturing operations are wholly understaffed in technical areas. Automobile companies in the western countries were not flexible enough.

There were more non-technical personnel performing non-value adding jobs. While the Japanese organisations followed Just-In-Time strategy in their manufacturing plants, the Western countries followed Mass production. Mass production increased the work-load on the workers and the machines. In western automobile companies if any problem arises they try to find a quick solution instead of trying to find out the root cause and eliminating it completely.

Advantages

The major advantage of implementing TPS is the reduction or complete elimination of seven wastes. The seven wastes are overproduction, delay/waiting, transportation, motion, inventory, space and errors. By doing this, Toyota was able to manufacture a car fully, in just five days, while other competitors took nearly 30 days for the same process. Some of the other advantages of implementing TPS can be stated as follows,

Pull System

The pull system reciprocates with the actual usage of materials or products at each process of manufacturing. The one-piece flow methodology builds the process only when there is a demand or need. The whole process was driven by the requirement in the market.

Stability

This activity is aimed at creating stable workstations capable of consistent production. It reduces changeover times, developing standardized work

sheets, developing mistake-proofing procedures, solving quality problems and using 5S procedures to clean up and organise the workplace.

Continuous flow

It improves product flow from station to station in a continuous flow, while maximizing flexibility for changeovers. Even when there is a lag in a process at one system, the whole process stops and when the error is rectified at a particular station, the process continues. This avoids any over-ride in the system. This helps to produce a flawless product to enhance the quality measures.

Synchronous production system

By implementing TPS, the organisation can produce sequenced delivery for selected commodities so that these parts come to the assembly line in exact sequence in which they will be needed.

Challenges in Implementation of TPS:

Even though many organisations might have benefited from the TPS, it has always been a challenge for many western organisations. The important factor for the failure of organisations even after implementing TPS is the industrial culture. In order to implement the TPS successfully the organisations have to undergo a complete shift of change over from the way things are organised and controlled. It also requires entire change in the value system.

For the successful implementation, an organisation requires a firm leader to demonstrate the techniques, a long-term commitment to work force to

inspire their best efforts and aggressive management. The organisations need to rethink every employee's role on an almost continuous basis and be willing to change these roles on a continuous basis. The biggest challenge is the time it takes for the implementation. It takes at least two years and involves a wide range of changes. Even after successfully implementing these changes, things first become even worse than before. It may still require some changes and time for the successful implementation of TPS.

For people who are enthusiastic about applying TPS concepts in their organisations, there is no ready-made models of success. Companies implementing TPS need to make serious long-term investments to educate their culture so employees can adapt to use many of the Toyota way principles. For example it took years for General Motors to implement TPS in its Delphi project. It took years to penetrate the old-line union culture of these former GM divisions. For successful implementation of TPS, it needs the commitment of top management to provide to middle managers that it could work by just doing it. To manage change, it sometimes requires the organisation to 'just do it' and then deal with the consequences.