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Toyota Production System as a Benchmark to Improve Business Productivity

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Abstract:-The paper aims to prove that Toyota Production System is the best benchmarking system to improve the efficiency and productivity of business. The Toyota Production System (TPS) is an integrated socio-technical system, developed by Toyota that comprises its management philosophy and practices. The TPS organizes manufacturing and logistics for the automobile manufacturer, including interaction with suppliers and customers. The system is a major precursor of the more generic "lean manufacturing". Taiichi Ohno and Eiji Toyoda, Japanese industrial engineers, developed the system between 1948 and 1975.Originally called "just-in-time production", it builds on the approach created by the founder of Toyota, Sakichi Toyoda, his son Kiichiro Toyoda, and the engineer Taiichi Ohno. The principles underlying the TPS are embodied in The Toyota Way. Toyota's supplier development practises are analysed. The competitiveness of Toyota and the source of Toyota's competitive strength and the way in which Toyota can be used for effective benchmarking is verified. The applicability of lean operation in retail pricing and operation strategy along with the strategies that helped to increase the capacity through TPS is evaluated for improving efficiency in production. For this, a mix of strategic methods are adopted through TPS by reducing the cost of product and judicious use of resources thereby playing the role of a responsible corporate citizen.

Keywords: Kaizen, Kanban, 5S, JIT, Taki-Time, Poka-Yoke.

I. INTRODUCTION

The Toyota Production System (TPS), the main source for Lean programmes , is the universally applicable and accepted system that has proven the test of time in improving business productivity. The roots of TPS were formed with the establishment of the Toyota Motor Company by Kiichiro Toyoda in 1937 and the Honsha Plant being built in 1938. To some, Toyota might seem surprisingly open with its Lean TPS information. After all, Lean TPS is the primary reason for Toyota's success and recent dominance in the auto industry. The Lean formula is well-published, but every day is filled with countless make-or-break decisions. And each of those decisions takes hard work and a gut check to make the right one. Tracking down the source of a problem and fixing it for good may take hours of work and lots of frustration. Overcoming this through lean was the success of Toyota.

TPS improves quality in products and processes. Overall, TPS uses several lean methods to help reduce errors and improve quality: Kaizen, 5S, 5 Whys, and Poka-Yoke. These tools help workers spot inefficiencies, errors, or potential defects and empowers them to stop the assembly line so that defects are not included in the final product. TPS reduces waste, increasing efficiency and reducing costs. The high-quality and cost-competitive products Toyota produces are directly linked to Toyota's ability to reduce waste throughout the production process. Just-In-Time (JIT), Kanban, Taki-Time, and Kaizen are used to spot waste. Areas that have wasted movement, overproduction, underproduction, inefficient transportation, unnecessary inventory, and defects are identified and improved until waste is eliminated. TPS improves customer satisfaction by providing products that are free of defects. TPS succeeds because it puts the customer first. The company's zero-defect policy and continuous effort to reduce costs enables the company to deliver quality at a price customers can afford. TPS improves all aspects of safety for employees and customers. TPS is a safety-conscious system that works to reduce risks in the workplace as well as those found on the road. 5S helps employees spot and eliminate hazards, while Kaizen enables employees to stop the production line and eliminate errors that may increase risks while driving. Toyota always strives to retain their benchmarking status. Hence it can be used as a standard to improve business productivity.

II. LITERATURE REVIEW

According to Marksberry (2012), the paper uses a new method for analyzing Toyota's supplier development practices by mathematically representing and analyzing Toyota's organizational documents.

Toyota production system (TPS) is one of the most benchmarked business improvement strategies in modern industry. It is also important to how Toyota replicates TPS at suppliers. The purpose of this paper is to investigate the evolution of TPS and its in-house capabilities by evaluating organizational documents using latent semantic analysis (LSA). The findings shows that Toyota targets processes, rather than whole systems, in assisting Suppliers Toyota's approval does encourage minor day-to-day kaizen. Finally, this work reports that the Toyota Way for suppliers does not have to be adopted by suppliers, but does represent "A Way" to interact with suppliers to drive both culture and productivity Simultaneously.

Fujimoto (2012) in his article, the evolution of Production systems: .Exploring the sources of Toyota's competitiveness, analyses the formation process the sources of Toyota's Competitive Strength. The present paper explores both the functions and origins of the Toyota-style manufacturing system simultaneously. It concludes that the source of Toyota's competitive strength can be explained in part by the "product architecture" perspective and also shows that manufacturing contains three layers of organizational capability: manufacturing (*monozukuri*) capability, improvement (*kaizen*) capability, and evolutionary capability. This is done through a generic analytical framework that is applicable to a wide range of different industries. "Competitiveness," uses the concepts of "closed" and "open" to indicate the level of competition within the industry, whether there is international competition, whether the industry is regulated or protected by the government. Products are typically developed by a "mix and match" and designed for generic use across different products where significant effort upfront to ensure the component design is applicable to many different products and models, and in this way manufacturers are saved a great deal of effort coordinating their design and assembly of finished products. "Production expansion accompanied by model diversification" was a distinguishing characteristic of the post war Japanese auto industry.

An article by Vasilash (2003), Who do you benchmark? Some answers from GM manufacturing, the highlights answers to many questions in such a way that it shows perfect examples of each keyword in the question. Benchmarking is done on the basis of setting those answers as the base standard for comparison. IT highlights "Take your future in a new direction". As said by TROY a Clarke, Benchmarking is the most powerful tool that exists. And hence it is better to have a strong understanding of what others are doing to be competitive in the market. The following are the questions and answers that is discussed in this article,

- Fit and finish-Audi
- Operating System Benchmark- Toyota
- Flexibility-Honda
- Interior-Volkswagen

Thus the article is very useful in comparing the various benchmarking criterion for different brands which can help to improve the quality and productivity of business.

The article Integration of Lean Operation and Pricing Strategy in Retail by Noda (2015) clarify whether lean can be successfully applied to retailing and how to develop a competitive advantage by introducing lean to retailing. The study provides a better understanding of lean operation and stable pricing such as everyday low price for developing an alternative business model to successfully compete with large retailers. It was found that lean can be successfully applied to retailing and stable pricing becomes a driver for successful implementation of lean operation. The study stresses importance of integration of marketing and operation as a corporate strategy to develop a suggested model.

Lean Operation: "Lean production is generally described from two points of view, either from a philosophical perspective related to guiding principles and overreaching goal , or from the practical perspective of a set of management practices, tools, or techniques that can be observed directly . "The main objective is to eliminate waste by reducing or minimizing supplier, customer, and internal variability. Lean production not only as a production system, but also as an integrated system in a whole business structure. To clarify the factors of lean operation in retail is of importance where study on low cost was mainly focused by lean production. The three aspects to transform its business model includes marketing transformation, operational transformation and support business transformation.

However, it is said that it is difficult for the retail industry to introduce lean. Moreover, in manufacturing industry, production process is managed smoothly with little variation. This model can improve business performance by creating price advantage for sales growth and cost advantage for low cost.

This article Strategies for increasing productivity in production systems by Pergher et al (2013) aims at a set of strategies can be adopted to increase the capacity constraints in production systems, when the constraint is internal the factory and not is in the market. To serve this purpose will be presented strategies that includes theory of Constraints, Lean Manufacturing and Total Productive Maintenance. The objective set of practical strategy that can be used to increase the capacity and productivity of production systems according

to the needs of each manufacturing system. The strategies include 25 strategies that help to eliminate bottlenecks and ensure continuous performance improvement. The strategies include:

Strategy 1: Eliminate all periods of time lost in the bottleneck. An hour lost on bottle neck is an hour lost in the whole system and being bottleneck should operate 24 hours a day.

Strategy 2: Improved processing times per unit. Perform continuous improvement actions in the working methods and the optimum use of the potential of the equipment.

Strategy 3: Deliver improvements in the power system engineer. The goal should be to synchronize the timing of food resources with the speed of processing of the resource itself, seeking continuous system flow.

Strategy 4: Improve the quality control system.

Strategy 5: Making the contracting out or outsourcing of work from the bottle. In other words, implies subcontract or outsource in order to purchase additional capacity.

Strategy 6: Buy additional capacity.

Strategy 7: Relocation of the operations previously performed in the neck for other non-bottleneck machines that are operating with a surplus of capacity. The goal this point is to divide the operation of the bottleneck in smaller sub-operations and redistribute them.

Strategy 8: Make improvements in the maintenance of machine bottleneck and critical system resources.

Strategy 9: Conduct analysis and layout changes.

Strategy 10: Synchronize the system from the bottleneck and protects the capacity of the bottleneck using the buffer immediately prior to the drum.

Strategy 11: Raise the TEEP of the resource bottleneck. His discussion is central to the capacity calculation because it determines the theoretical and not practical capacity of the equipment.

Strategy 12: Increase the availability (A) of the resource bottleneck.

Strategy 13: Oriented approach to product development.

Strategy 14: Modify existing products to reduce the processing time.

Strategy 15: Conduct analysis and improvement of the bottleneck applying the sub systems and techniques of TPS.

Strategy 16: Conduct analysis of restriction from seven losses in the TPS is analyzed.

Strategy 17: Conduct analysis of improvement in the ergonomic point of view of the operation. Time and motion study, derived from scientific management are recommended.

Strategy 18: Make improvements in the productive system as a whole.

Strategy 19: Evaluate the application of first principle of TOC that says to not to focus in the balancing of the capacities and yes to focus the synchronization of the flow.

Strategy 20: Evaluate the application of second principle TOC that says the value marginal of the time in the resource bottleneck is equal to the rate of profit of the products processed for the bottleneck.

Strategy 21: Apply the third principle TOC that says the marginal value of time in a resource bottleneck is not negligible.

Strategy 22: To consider the fourth principle of TOC that statements that the level of use of a resource pass is not controlled for the restriction of the system.

Strategy 23: Apply the fifth principle of TOC that statement the resources must be used and not only activated. The use concept mentions the activation to it of resources that contribute positively for the performance of the company that is to generate profits for the Company.

Strategy 24: Apply the sixth principle indeed the lot of transference does not need to be, and many times do not have to be, equal to the lot of process.

Strategy 25: Apply the seventh principle that says the process batch should be variable. The process batch should be variable along the route of manufacture and over time.

It is reasonable to assume that the lot in process can vary throughout the route of manufacture due to the impact of the statistical fluctuations of the system and the different capacities of the resources.

A single case study research in one of the plant of Toyota Motor Corporation located in the Aichi province in Japan (Eisenhardth , 1989; Yin, 2003). Within this context, we studied the practice of process improvement. The reason to choose this company is due to the fact that Toyota Production System (TPS) was not easy to replicate in the occidental automobile's industry (Schroeder & Robinson, 1991; Spear & Bowen, 1999). Some simple arguments point out that the reason for Toyota Production System's success lies in its cultural roots. Meanwhile authors argued that this particular characteristic (the TPS) can be considered as a set of

capabilities which generate a strong competitive advantage (Fujimoto, 1994; Takeyuki, 1995)

In the paper Responsible Operations through Materials' Conservation – An Overview of Techniques and Trends, Rajashekharaiah (2015) initially brief on operations and manufacturing priorities which includes all the issues related and how the changes happened in the competition over time across the countries. The main strategy is to adopt to a best practice by mixing various selected strategies for achieving the goal. The aim include reduction in the total cost of the product by finding out the various probable reasons that may lead to price hike, re-examination of material strategies to bring down the cost and reduce the consumption of raw materials. Hence this paper highlights practices, approaches and techniques to reduce consumption of materials and thus become a responsible corporate citizen. It also includes a list of popular strategies that focus on material conservation. Such kind of a study would warrant strategies to appeal to conserve materials by a mix of strategies which helps in saving products of the nature like fast depleting ores, wood and petroleum products which helps to play the responsible corporate citizen.

III. FINDINGS AND SUGGESTIONS

Companies that pursue and emulate TPS best practices have seen much success as a result of this highly effective manufacturing philosophy. Some of the benefits include:

- Identify and enhance customer perceived value
- Decrease waste and cost in the manufacturing process
- Improve product quality and on-time delivery
- Develop a competitive world class manufacturing operation

The TPS is a system that has given companies a blueprint for manufacturing excellence. Techniques such as Poka Yoke, Kanban, and SMED are concrete well understood techniques to minimize waste and eliminate errors, they are components of the overall TPS. These techniques are not the definition of TPS rather they are a result of TPS. By codifying and understanding the relationship of manufacturing practices and end customer value TPS allowed Toyota to grow into a world class manufacturing company. The TPS model is simple on its surface; focus first on finding ways to improve in one area, then another, until every process or area has been considered, and then think through connections among them to reduce friction and inefficiencies. It is not just about moving faster, but also improving quality and conservation of resources by judiciously using them without any wastage.

IV. CONCLUSION

All the key factors that are the reasons for the success of Toyota and those companies who can be benefitted by adopting the Toyota Production System has been analyzed. The Competitive strength and the mix of strategies resulting in development of unique effective ideas that can improve the business productivity is evident in this paper. TPS has been one of the major reasons behind the success of many companies. Its adoption has helped many companies to overcome defects, automation, quality assurance, timely delivery, good retail and good relationship with suppliers. Many companies are adapting to the TPS way, but the real gain is in adopting the success of the system developed by TPS. The aim of the Toyota production systems is to provide the customers with highest quality products at the lowest possible cost. The production concepts incorporate quality at each production stage. The Just in Time approach seeks to get the right information about the market demand and the production is adapted to the demand. The JIT systems leads to efficient inventory systems and only the required quantities are procured in the production systems. The Kanban systems enable the working of the JIT system by providing the information about the raw materials and keep a check on quality. To ensure that the JIT system works, Toyota has implemented systems to motivate employees and empower them. The Toyota production system is very efficient that has made Toyota a competitive and profitable company. Since the 1950s Toyota created the concept of continuous material flow, process standardization and a pull system that is market responsive. It took the company decades to refine the concepts such as JIT and make the production system more functional. The TPS is characterized by cross organizational planning and long term objectives. This production system relies on technology and the integration of all manufacturing activities. The focus on meeting customer needs made the TPS highly successful the creation of the JIT philosophy allowed the company to eliminate wastages and inventory to make the company more profitable.

Toyota’s supplier network and supply chain is another source of the company’s competitive advantage. To conclude, the result is a continuous stream of small changes that result in ongoing improvements. Because the changes are small, they can be quickly and economically implemented. Because they are continuous, over a short period of time they'll add up to significant improvements.

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