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Supply Chain Management

Term Project Report

Lean Supply Chains:

An overview of the usefulness of Lean Thinking in Supply Chain Management

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# Lean Thinking, Six Sigma and the Theory of Constraints

There’s no secret that waste in business is detrimental. While this sentiment is elementary in nature, many companies have a hard time practically identifying and eliminating waste from their operations. The “Lean” philosophy is a methodical thought process centered around waste reduction and perfected processes. Many organizations have already benefited from this mindset, but proper understanding of its usefulness will serve to improve not only manufacturing operations (as they’ve traditionally been employed to do), but all processes whether the company provides goods or services.

The first key in taking advantage of Lean fundamentals is to recognize that it’s not just an initiative or program, but an utter change in the way business is conducted. Lean, Six Sigma, and the Theory of Constraints are ultimately about improving processes to perfection. With this in mind, each facet of this philosophy can be expanded within each focus of the aforementioned toolsets. Lean, for instance, is primarily concerned with identifying and eliminating waste of all types. Six Sigma is commonly paired with the term Lean to describe the specific elimination of a certain type of waste; namely, defects. The theory of constraints forces an organization to be viewed from a systems perspective with the elimination of constraints in mind.

Six Sigma essentially describes a benchmark all processes should aim to achieve. While perfection might be more idealistic than realistic, having a goal of at most 3.4 defects out of a million opportunities to provide a good or service is about as close as some statisticians believe processes can get to perfection. This is the basis for quality management and serves to reduce the total amount of waste in a system.

The Theory of Constraints basically describes every system as being held back from perfection due to the sum of its constraints. The primary take away from this perspective is ensuring that a proper view of the entire system is identified and that the strength of the system is limited to the constraints therein.

Each of these vantage points describes a different way of viewing the same concept. Overall, to achieve the highest performing process, a methodical way of attacking the roadblocks will serve to guide the focus of the decision makers. The remainder of this text will describe an application to the aforementioned tools to an integral part of every business: The Supply Chain.

# How Lean, SS, and TOC relate to Supply Chain Management

Lean, Six Sigma, and TOC have been applied to the manufacturing world for decades. The overall philosophy of process improvement evolved in this sphere logically as most manufacturing facilities are comprised of well-defined process steps. It wasn’t until recently that business leaders started to understand the true strength of lean thinking for all processes, whether for manufacturing or not.

The supply chain of any enterprise is ultimately a compilation of process steps to fulfill customer demand. Within the supply chain, there are likely manufacturing steps that Lean can easily be applied to, but outside of the manufacturing functions, lean can still be used to improve the efficiency of the total supply chain. Communication practices might be wasteful along with return policies. Logistical methods could be improperly designed as well as inventory practices. These are just a few examples of places where lean thinking can drastically improve the performance of the entire supply chain.

As the supply chain improves, so does the individual participants of the supply chain. This parallels the underlying theme of the Theory of Constraints and again, is a reminder that a proper view of the entire system is required to improve the entire system. Applying Lean to the supply chain requires managers to collaborate across enterprises for the good of the whole system. If, for example, one company within an entire supply chain seeks to maximize its specific business metrics without considering their effect on the whole, that company might be limiting itself in the long run (Batching for economies of scale, Information hoarding, etc.).

As the supply chain is strengthened, there becomes certain competitive advantages available to propel the participants of the supply chain to a new level of success. Before this advantage can be realized though, an understanding of the types of wastes that can be eliminated is necessary. The following section helps in describing some of these wastes.

# Typical Wastes and How to Reduce/Eliminate Them

Anything that costs time or money, but doesn’t create value from the customer’s perspective is considered to be a waste. The emphasis of this definition should be “from the customer’s perspective”. Organizations exist to supply a customer with what they demand; nothing more or less. It’s common to see organizations wastefully processing their goods or services without understanding what the customer truly wants. One way developed within the Lean philosophy to remember common types of wastes is to follow the acronym D.O.W.N.T.I.M.E. in identifying unnecessary practices of an organization. The following discussion describes the meaning of each waste represented by the letters of the acronym.

## D - Defects

Defects generally mean imperfections or low quality in the product that has already been made or the service that has been performed. These mistakes generally require additional time, resources, and money to fix. In a manufacturing process, a defect might involve a defective part that has to be remade or reworked. Some causes that lead to a defective product are poor documentation, poor design and undocumented design changes. Other machinery and consumer factors like lack of standards, weak or missing processes, misunderstanding customer needs and uncontrolled inventory levels can contribute to defects.

Completely eradicating any form of waste is impossible, but defects can certainly be limited by the application of standardized work plans, more stringent quality control at all levels, a full understanding of work requirements and customer needs, and simple job aids such as checklists.

## O – Overproduction

In simple words, overproduction is to manufacture a product or deliver a service before it’s actually required. Overproduction is costly to a process because it prohibits the smooth flow of materials and actually degrades quality and productivity. Overproduction may occur when there is no proper Forecasting model or if it is just-in-case (as opposed to just-in-time) production, when there is no clarity in customer needs and poorly applied automation.

A proper forecasting method shared among the entire supply chain, understanding customer needs, and implementing well-established procedures would help resolve overproduction.

## W – Waiting

Waiting results from delays in flow. For example, waiting occurs whenever work has to stop as there is a delay from one procedure to the other or if there are unbalanced workloads and no proper communication from one procedure to another. Reasons like work absences, insufficient staffing, and delayed information sharing can also be reasons for wastes due to waiting time.

In most cases where downstream operations are not balanced, workers have to wait for a bottleneck to be cleared. One way to address this is to provide adequate staffing to handle the workload at the bottlenecks.

## N - Non-Utilized Talent

Not (or under) utilizing people's talent, skill and knowledge can have a detrimental effect on an organization. Companies can experience great benefits when recognizing the value of skills and improvement ideas from all levels of the supply chain and can suffer when not effectively engaging each member of the supply chain in the process. This kind of waste is typically seen where there is improper task assignment, lack of teamwork, poor communication, poor skill management and insufficient training.

Key solutions include empowering your employees and smaller enterprises within the supply chain, eliminating micromanaging and increasing collaborative training and planning. Failing to fully utilize existing talent can be seen as an opportunity cost.

## T – Transportation

The nature of wasteful transportation is common sense for most people. This waste ultimately describes the unnecessary movement of goods or information throughout the supply chain. The waste can be caused by improper and isolated planning, non-optimized shipping routes, and full truck load policies.

## I - Inventory Excess

Excess inventory increases lead times, consumes productive floor space, delays the identification/rectification of problems, and inhibits communication. By achieving a seamless flow between work centers, many supply chains have been able to improve customer service and slash inventories and their associated costs. Moving from batch processing to single piece flow can address work in progress inventory. Just in time manufacturing strategies can address final goods inventory.

## M - Motion Waste

Any excess movement, whether by employees, machines, or computer programs that doesn’t add value to the product, service or process is a waste in motion. This can take place in a manufacturing plant or business offices because of poor process design and controls, poor workstation/shop layout, shared tools and machines, workstation congestion and lack of standards.

The solution here is to re-arrange layouts to decrease the distance between stations and make it easier to reach things that are often used. Reducing the time taken for the processes to occur, or eliminating non-value added activities can help address motion waste.

## E- Excess Processing

Waste due to Excess Processing can occur when steps are repeated without requirement. This kind of waste can be from creating an excessive report to approval/sign off from high levels of hierarchy. For example, in order to approve a leave, an approval from one/two level managers would be sufficient rather than from 4-5. Re-entering data and duplicating data, Over-designed equipment, misunderstanding of the customer's needs and human error can all lead to excess processing waste.

Excess processing wastes can increase your costs and result in wasted time and resources. In order to address this waste, one must first standardize processes, empower employees and eliminate unnecessary documentation, sign-off procedures and meetings. The business should know when to stop.

# Efforts to Establish the Lean Supply Chain:

In addition to the quick suggestions included in the previous section, below is a list of possible actions that can be performed to approach a perfect supply chain.

## Eliminate All Waste in the Supply Chain So That Only Value Remains

As mentioned above, organizations need to identify and eliminate the 8 wastes in order to deliver the product/service to the consumer quicker and with less money.

## Consider Advancements in Technology to Improve the Supply Chain

Technology can be used to improve not only manufacturing and communication processes, but also things information sharing and inventory levels. For Example, in a retail environment like JC Penney RFID tags can improve inventory management, payment and of course, asset protection. RFID implementation enables store managers to use what is known as “smart shelves”. Smart shelves are retail shelves that continuously track inventories of tagged items and automatically initiate reordering when stocks reach a specified level. Additionally, multiple readers can be placed at multiple locations to create a network that can correlate information from the data collected from all the readers, which is called “asset tracking.” Asset tracking allows managers to determine the location of an item and identify if that item is in the right location or not. Another example of technology advancements is by use of telematics sensors. UPS estimates that saving only one daily mile driven per driver saves the company $30 million. These are savings that can be passed on to the customer, reinvested into the supply chain, or enjoyed as producers’ surplus.

By using technology advancements an organization can achieve a reduction in production cost and lead time.

## Make Customer Usage Visible To All Members of the Supply Chain

All the steps involved in the supply chain should coordinate with each other in order to achieve the end goal of satisfying the end user’s expectations. In order to achieve this, the requirement of the consumer should be visible to all members of the supply chain.

## Reduce Lead Time

Reducing inbound and outbound transportation logistics gets us closer to customer demand which results in reduced reliance on forecasting, increased flexibility, and reduced waste of ”overproduction”.

## Create a Level Flow/Level Load

Level load is a way of production smoothing or production leveling. It is a way of reducing unevenness in operations which reduces wastes. So leveling the flow of material and information results in a lean supply chain with much less waste at all important points in the system.

## Use Pull Systems

Using a pull system reduces waste within a company since no overproduction occurs. This also frees up space in the workplace and reduces the cost of storing excess inventory.

## Collaborate and Use Process Discipline

When all members of the lean supply chain can see if they are operating in concert with customer need consumption, they can better collaborate to determine root causes of constraints and develop appropriate solutions to solve them.

## Focus on Total Cost of Fulfillment

Make decisions that will meet customer expectations at the lowest possible total cost, no matter where they occur along the supply chain. This means eliminating decisions that benefit only one part of the stream at the expense of others. This can be achieved when all partners of the lean supply chain share operational and financial benefits when waste is eliminated.

# An Example of Lean SCM in Real Life

While lean philosophies can be employed beyond the manufacturing world, one of the most pertinent implementations of lean stems directly from the creators of the concept, Toyota. To truly drive home the benefits of Lean thinking, this case is discussed below.

Toyota is one of the top car manufacturers in the world. It has achieved success through its application of its Toyota Production System (TPS). The development of TPS began with Kiichiro Toyoda, first CEO of Toyota, making the company’s objective to use small car lots and continuously reduce costs by eliminating wastes. Toyota’s success was further enhanced by its second CEO Eiji Toyoda. Eiji was responsible for the numerous improvements in Toyota’s manufacturing processes. Furthermore, Toyota began applying and modifying the concepts of continuous material flow, process standardization and waste principles in order to achieve greater efficiency in its supply chain. Today, Toyota is applying a “pull system” and just-in-time concepts to its Toyota Production System. TPS has been the key to Toyota’s success because it embodies its applicable concepts to make up its “lean” supply chain.

TPS acknowledges wastes as any interference that disturbs the flow of production. Toyota has identified eight wastes similar to the aforementioned wastes in this paper:

1. Overproduction of inventory
2. Time on hand because of equipment and systems malfunctions, bottlenecks in operations, and slow flow of information through supply chain
3. Unnecessary conveyance of information, parts, and inventory
4. Over processing product by applying non-value added operations
5. Excess of inventory
6. Unnecessary motion of employees when performing day-to-day duties
7. Defects in production and delivery performance
8. Unused employee creativity which leads to losing new ideas, skills, and improvements to current processes

Moreover, these wastes can generally be applied to the automotive industry as a whole. The underlying wastes that have the greatest impact in this industry are overproduction, excess inventory, time on hand, and defects in production. Overproduction of inventory leads to excess of inventory. When there is a lack of information of demand throughout the supply chain, production can be excessive, thus leading to excess inventory. The surplus of inventory primarily impacts holding costs for the company. Defects in production is another waste that leads to numerous costs, deficiencies in product quality, and reduced customer satisfaction. Lastly, the waste of time on hand is driven by the disruptions in supply chain processes that cause production to stop or slow down.

Toyota has been able to mitigate its identified eight waste by fundamentally establishing close relationships with its suppliers. By building a close relationship with its suppliers, Toyota was able to change the flow of information from vertical to horizontal throughout the supply chain. Furthermore, Toyota also changed the perspective of its suppliers to an all-together effort where information is shared throughout all of its suppliers. On average, Toyota’s vehicles are composed of 30,000 parts. By having a horizontal flow of information throughout the supply chain, it allowed Toyota to capitalize on “just in time” delivery of its 30,000 parts. The application of JIT has led to higher quality products with fewer defects, reduced handling, and storage costs. Another example of Toyota’s close relationship with suppliers is the cross-functional teams it has created. These cross-functional teams are in-house and out-house departments that work together on improving production processes in order to reduce defects, improve lead times, and capitalize on outside ideas from its suppliers.

As of today, Toyota is heavily relying on its suppliers to help improve its “lean” supply chain. Further efforts, with supplier reliance, that have enhanced Toyota’s “lean” supply chain are the inclusion of suppliers in meetings held at the Toyota New Global Architecture (TNGA) and the creation of the RESCUE system. TNGA’s main focus is to improve production processes by smart sharing and total optimization collaboration with various suppliers. On the other hand, the RESCUE system was created with suppliers because of the 2011 earthquake in Japan. The earthquake devastated approximately 75% of Toyota’s profits because many of its Japan based suppliers suffered damages to their production plants. This lead to a widespread shortage of parts that persisted for weeks. As of result of the damages caused by the earthquake, Toyota built the RESCUE system with its suppliers in order to be able to quickly respond and recover from unexpected disasters. The RESCUE system is primarily a database that shares supply chain information with all suppliers with the goal of identifying issues in the supply chain that will negatively impact its manufacturing processes.

Toyota has seen great success with its application of “lean” thinking. Toyota is a magnificent example of how “lean” can also be applied to other areas other than manufacturing. Toyota has established a competitive advantage in the automotive industry because of its “lean” supply chain. Its various efforts of adding value-added processes, eliminating non-value processes, and application of JIT have established Toyota as a world class leader in its industry. Toyota’s unique application of “lean” to not only its manufacturing process, but to its entire supply chain has set itself apart and is the driving force of its continued success.

# Conclusion

In conclusion, Lean philosophies don’t only serve manufacturing processes, but all processes in general. One could argue that the typical process of waking up and getting dressed for work every morning could be made leaner, or the process of going grocery shopping might be made leaner. Overall, as long as waste is being identified and eliminated to improve the efficiency of a process, lean fundamentals are being employed. With respect to supply chain management, the biggest takeaways from having a lean mindset is global or systems thinking and customer-expectation-based decision making. As long as these two considerations are driving the efforts of waste reduction, the supply chain will approach its optimal design and perfect metrics.

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