

# Review Study on Lead Time Reduction Through Value Stream Mapping

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**Abstract:** In the present era of competitiveness, every manufacturing unit has been trying to go lean. In the process they use various types of lean tools as per the requirement of the process. Lean is a working philosophy designed to produce better products by using less resources to obtain more profit and has been applied to vast variety of manufacturing sectors. Value Stream Mapping (VSM) is a Special type of flow chart that uses symbols known as "the language of Lean" to depict and improve the flow of inventory and information. This tool has been used to document current lead time, inventory levels and cycle times to determine the ratio of value added to total lead time of the product line being analysed we have studied production process of one product and draw the current state value stream map. From the VSM analysis we found out the problems and gave some recommendations to improve the production lead time and provide a future state value stream map. And also we derive From This Review Paper different application of VSM

**Key words:** Lean, VSM (Value stream map), CVSM (Current state value stream map), FVSM (Future state value stream map), Lead Time.

## INTRODUCTION

The world is changing quickly, consumer expectations are high, and companies must be quick to adapt if they are to survive and thrive. Organizations need proven concepts for reducing lead time and the tools to do so if they are to remain competitive. Lean development is one such tool. Reductions in manufacturing lead time can generate numerous benefits, including lower work-in-process and finished goods inventory levels, improved quality, lower costs, and less forecasting error. More importantly, reductions in manufacturing lead time increase flexibility and reduce the time required to respond to customer orders. This can be vital to the survival and profitability of numerous firms, especially those experiencing increased market pressures for shorter delivery lead times of customized product. By recognizing the benefits of lean manufacturing using a pull system as opposed to a push system, the company made the decision to implement lean principles and promoting a pull system. The work focuses on the application of value stream mapping in lean transformation.

## LITERATURE REVIEW:

Value-stream mapping can be a communication tool, a business planning tool, and a tool to manage company change process. Creating a value stream map will allow the company to document current production lead time, inventory levels, and cycle times in order to determine the ratio of value-added to total lead time of the product family being analysed, creating a vision of an ideal value flow. In internal manufacturing context, operations can be classified as value adding (VA), non-value adding (NVA) and necessary but non-value adding (NNVA).

To sustain in this changing and developing market adoption of lean tool is must. Lean manufacturing is comprehensive set of techniques for waste identification and its elimination from processes in order to increase system flexibility, effectiveness and reduce costs. One of the most common and easy way to reduction Lead time is VSM technique.

Before giving definition of VSM we should understand what is value? Value of the product is measured at end users. Value of the product for customer is in terms of money, satisfaction, performance, service or elegance. To serve the best value to the customers company needs a customer requirement data. This data become helpful to make a right product for right customer with right specification at right time with right price. To make this entire system correct VSM is the most common and helpful tool to make entire stream valuable and to eliminate non-value adding activities.

Value Stream Mapping (VSM) is a set of methods to visually display the flow of materials and information. When ever there is a product for a customer, there is a value stream and the change lies in the seeing it. Value Stream map is also known as "Material and information flow mapping" in Toyota. It is developed as a outcome of the work done by Taiichi Ohno at Toyota in the 1960's -70's. VSM doesn't required a tough and tedious work it requires just a paper, pencil and eraser to draw it and brainstorming for improvements and comments.

In one project there are two value stream maps. A current state map(CVSM) and a future state map(FVSM). A current state value stream map shows what is the actual process at the beginning of a project. It identifies wastes and NVAs. The future state map shows what the process should look like at the end of the project? After that improvements are defined and are achieved by making changes in current system. This achieved FVSM will become CVSM for next project and this cycle continuously runs.

We can use VSM as a Lean method to identify the opportunities of improvements for future. VSM method is associated with production as well as with service sectors. It can be used for:

- Development of new product;
- Logistics and supply chain activities;
- Improving productivity hence profitability;
- Reduction in Lead Time and service time;
- Customer satisfaction;
- Developing efficient production technique.
- Layout/ equipment modification.

VSM is an analytical method and it is based on details, depending on the level of details, the VSM can address a process step, to one or to the production lines, or to the entire factory.

#### METHODOLOGY:

The methodology applied to implement Value Stream Mapping is basically having five steps. These all steps are overlaps to "DMAIC" (Define, Measure, Analyse, Improve, Control) approach. So we can say that VSM activities are an integral part of DMAIC approach. Here, we can see similarities between them

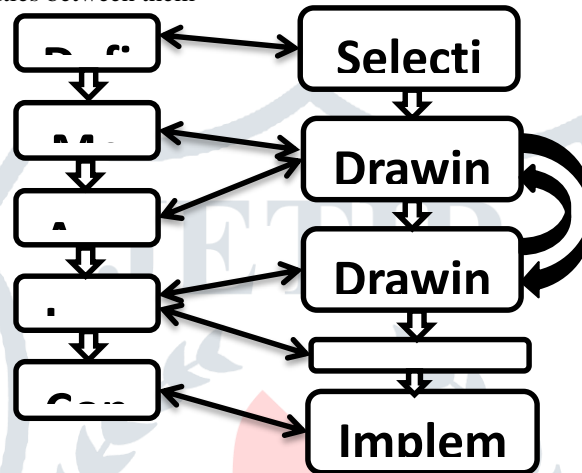


Fig.1 Relation between DMAIC and VSM methodology

- i. Identifying product family: To concentrate on one specific product for improvement.
- ii. Drawing current state value map (where we are): It includes all VA, NVA, NNVA activities. We can draw CVSM by using past data and customer feedback.
- iii. Drawing future state value map (where we want to reach): By Continuous analysing and brainstorming we can plot our target VSM.
- iv. 4. Work plan (route for success): Using lean tools (kanban, supply chain management, poka-yoke, MRP, etc) we have to plan the best promising way to achieve goal. There are some standard symbols used in VSM drawing for easy understanding. Some basic symbols are shown in fig(2).
- v. Implementation and Measure benefits (tasks for goal achievement): Last stage is about implementation of new techniques and measuring benefits achieved by them. This measurement helps us to conclude how much we succeed towards our target. Lagging in target achievement will be always there and it should be improved in next VSM.

Thus cycle of VSM will not stop after implementation of FVSM, it will become CVSM for next project and continuous improvement process will be carried out.

#### REVIEW OF RESEARCH ARTICLES:

1. **R.M. Belokar, Vikas Kumar and Sandeep Singh Kharb** represent a case study of automobile industry for improving quality and delivery with decreasing cost associated with NVAs. The problem they discussed was machine shops are facing delayed deliveries, long queues, and high work in process inventories, improper utilization. This problem increases overall cost of production. But the need for customized products/parts with reduced lead requires that products/parts to be produced in small batch sizes as per customer's requirement. So they arrange process flow according to their operation time and frequency of operation. They measuring cycle time and comparing it with takt time and as per difference measured between cycle time and takt time they try to manage layout, introduce new machines and arrange operational flow. Thus, traditional manufacturing system changes in to machine shop manufacturing system to adopt lean environment. By changing this they saved 67% of operation time.
2. **Ashish Chopra, Parveen kalra and C. S. Jawalkar (2014)** Are Applied VSM in electronics manufacturing operations. They research began with the identification of the processes involved in the identified product. The main objective was to reduce the waste and production lead time, next, a process at glance and a current value-stream map was created. A future-state value-stream map was then created which served as a goal for future lean activities. Reduction in the WIP was attempted by converting the push system to pull system and also through improvement of the process by incorporating kanban, kaizen and supermarket concepts. Implementing lean manufacturing system can increase the competitiveness of

a company in the global arena. The research results indicate that an overall reduction of 16.22 % was achieved in the processing time, 37.56 % in the lead time and 30% reduction in inventory. The increase in value added ratio was 33.65 %. Due to practical limitations, it was not possible to gauge the total effect of the improvement strategies presented in the study. The future work on lead time reduction in the company has been planned through the use of lean tools like- 5S, Kanban, Single Minute Exchange of Dies (SMED), Total Preventive Maintenance (TPM), Root Cause Analysis, Poka-yoke technique, JIT, Heijunka, Jidoka, and design of Standard Work elements. The complete success of the application of lean thinking in the extensive run depends on close understanding between the management and shop floor personnel.

3. **Santosh B. Dighe And Abhay Kakirde(2012)** They observed from the current state map that the total lead time for the product is 54 days, Inventory is 33 days and value added time is 0.55 Hrs and % VA is 0.07%. The difference between lead time and processing time shows that there are lots of non value activities in the process flow which is in the form of waiting for parts, moving parts from one station to another, setting up time and inventories. The process turns from push to pull. They Turned Process lead time reduces to 36.5 days, Inventory reduces to 22.4 days . Having the proper analysis tools is a key requisite for making significant improvements to a manufacturing system. But implementation is more than a matter of being right. An effective manufacturing manager must pull together a coherent plan and nurture it to fruition.
4. **Muhammad Abdus Samad, MD. SaifulAlam, and Nishat Tusnim (2012)** They Mentioned in project they worked with a trim manufacturing company. They focused on one of the company's main products, Woven tag that are used as accessory in readymade garments industries .The company is operating under the "make to order" strategy of lean manufacturing, meaning it does not keep a large inventory of finished parts and only creates a certain number of parts depending on customer demand. their primary project goal was to reduce the current lead time by at least 50%. In order to achieve that goal, we first had to document the current state of the production process. With the creation of an initial and final state VSM, we were able to draw conclusions based on the research and data we accumulated, and they were able to achieve the primary goal of the project.
5. **Ritesh R. Bhat, Prof. S. Shivakumar** derived a noticeable reduction in cycle time and increase in cycle efficiency with an application of Kanban- "pull" system in value stream map. The premise of Kanban is that material will not be produced or moved until a customer sends the signal to do so. In GHPL they introduce Make – to – Order inventory policy, for reduction in production lead time and to increase productivity. Hence, they improved value to the customer. After implementing kanban system approx 80% reduction in lead time was achieved as an outcome of the project
6. In The study of **Anupam Sihag Vinod Kumar and Umed Khod** Research Paper Lean production means continuous improvement, we must keep on changing the future state into current state for getting the better results. Value stream mapping helps in attaining the higher usage levels by the proficiency of shop floor practices. VSM tool has greatly proved to be a effective tool for eliminating waste in cycle time. This powerful tool only highlights process inefficiencies, transactional and communication mismatches but also guides about the improvement areas. On the shop floor time is money. If the time is wasted money is wasted. By applying the value stream mapping tool in a small scale automobile industry, a current state map is developed. By eliminating non value added activities. The future state value stream shows marked improvement in the process inventory, production lead time and processing time. In this study process inventory time reduced from 3 to 1 days resulting in improvement of 33.33%. Process lead time was reduced by 52.94% and the processing time was reduced by 80.69%.

#### SUMMARY:

In a competitive environment which progressively tightens every company claims to own the excellence and competitiveness hence, probabilities to win the competition become greater. These conditions forces manufacturing industry to reduce the waste and process lead time of their operations. For reduction of waste and process lead time lean manufacturing is used. "A systematic approach to identifying and eliminate waste through continues improvement by flowing the product at demand of the customer" (Ohno. T., 1988) is known as lean manufacturing. Value Stream Mapping (VSM) is a visualization tool oriented to the Toyota version of Lean manufacturing (Toyota Production System). It helps people to understand and streamline work processes and then apply certain specific product and company. Using of VSN we resolved the lead time reduction.

#### CONCLUSION

In this review paper we studied about the how to reduce a lead time of a product in different environment using value stream mapping and it is recovering a product's production path from door to door. In a process, non value added actions are identified in each step and between each step by their wastage time and resources. VSM is one of the lean tools to eliminate waste and improved operational procedures and productivity. This tool has been used to document current lead time, inventory levels and cycle times to determine the ratio of value added to total lead time of the product line being analysed we have studied production process of one product and draw the current state value stream map

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