

# A BROAD STUDY ON LEAD TIME REDUCTION USING VALUE STREAM MAPPING TECHNIQUES IN MANUFACTURING INDUSTRIES

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**ABSTRACT:** This paper is an attempt to study the detailed application of value stream mapping in manufacturing industries. Value Stream Mapping has the reputation of discovery waste in manufacturing, production and business processes by identifying and removing or streamlining value-added steps and eliminating non-value-added steps. The non-value actions are recognized in each step and between each step by their waste of time and resources. The Manufacturer goal is to satisfy the customer with the exact product, quality, quantity, and price in the shortest amount of time. It can only be achieved if the company is able to generate and to apply effective and efficient processes in each of its line of their business. For this purpose lean tools are used because lean focus on the continuous improvement of a company towards the ideal through the relentless reduction of waste. Value Stream Mapping is a powerful lean tool for identifying the waste and this paper defines model of Value Stream Mapping and various literatures related on VSM and will be useful for new research in current field. The reengineered process is flow charted in its future state with process steps and information flows redesigned, simplified and made less luxurious. These papers address the application of lean manufacturing concepts to the manufacturing industry. The papers considered for reference was collected from the peer reviewed journals with high impact factor.

**Keywords** -lean manufacturing, lead time, quality filter mapping.

## I. INTRODUCTION

Shortage of materials, finances, and human resources were faced by Manufacturers in Japan. The problems that Japanese manufacturers were faced with differed from those of their Western counterparts. These situation resulted in the birth of the lean manufacturing concept. Toyota Motor Company, led by its president Toyota recognized that American automakers of that era were out-producing their Japanese counterparts; in the mid-1940s' American companies were outperforming their Japanese counterparts by a factor of ten. In order to

make a move toward improvement early Japanese leaders such as Toyota Kiichiro, and Taiichi Ohno devised a new, disciplined, process-oriented system, which is known today as the Toyota Production System, or Lean Manufacturing. After some testing, the Toyota Production System was developed and refined between 1945 and 1970, and is still growing today all over the world. The basic fundamental idea of this system is to minimize the utilization of resources that add no value to a product. The benefit of using this method allows anybody to "see" both process flow and interactions flow within the process or value stream, Because of this ability to gather, analyze and present in order in short period of time, this method has rapidly gained popularity in the process of continuous improvement. The most significant goal of Value Stream Mapping method is that identifies opportunities for development for future periods of Time. VSM is an analytical way, and is based on particulars, depending on the level of details, the VSM can address only to a process step, to one or the production lines, or to the entire factory. Value Stream Map is a gathering of all the actions, the add-value ones, as well as the non value measures, which are necessary for a full process of a product through the industrial flow, from the raw material to the consumer. The final intend of the Value Stream Map is to recognize all types of wastes in the value flow and to get rid of all these wastes.

## II. Methodology of VSM

Manufacturing procedure is done with a pencil and paper using a variety of method signs of VSM to visualize the flow of material and in order as a product takes its way in manufacturing line. Mapping is done keeping in view of the lean manufacturing principles which are the backbone of VSM. These principles are:

- Define value from your customer's perspective.
- Identify the value stream.
- Eliminate the seven deadly wastes.
- Make the work flow.
- Pursue to perfection level.

The planned methodology is given as a flow chart (Fig. 1), which starts from current state map and its analysis. Finally it is concluded with the future state, analysis and implementation. To start civilizing output by identifying waste and then removing it by implementing lean principle in the Industry there is no other tool better than VSM. 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 permit the company to file present manufacture lead time, inventory levels, and cycle times in order to decide the ratio of value-added to

whole lead time of the product family being analyzed, creating a vision of an ideal value flow.

The goal of VSM is to recognize, show and reduce waste in the process. A modern system operates with timing of step-by step actions. There are quite a few significant steps to getting started with your value stream mapping process. That are shown in the (Fig. 1).

The procedure examination is carried out by collecting the data from various enquiries with knowledge in shop floor, workers and directly participating in measuring the time of various processes.

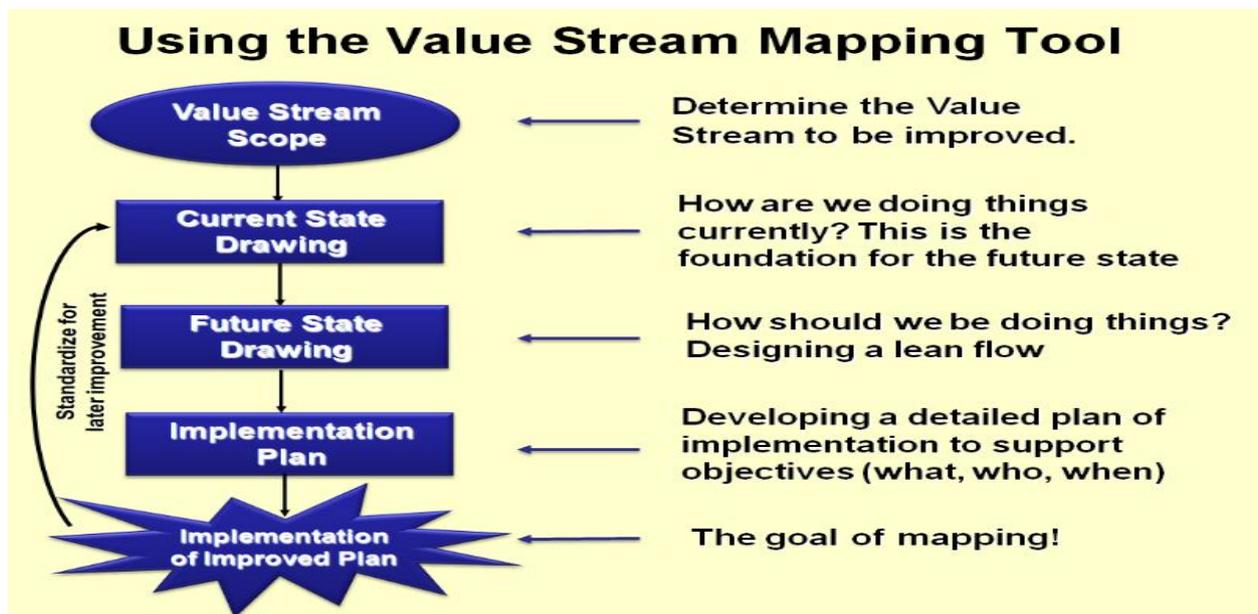


Fig- 1 VSM Methodology

### III. LITERATURE REVIEW OF VSM IN CASE INDUSTRIES

The following are the to the point review of literatures on lean developed concepts.

1. Ashish Chopra et.[1] Describes Lean is a working idea designed to produce better products by using less income to obtain more profit and has been applied to vast variety of manufacturing sectors; however, very less work have been done in the electronics industry in India, hence study mainly focuses on this area. This paper presents a case study on Value Steam Mapping (VSM) come up to using lean values (reduction of wastes, popularly terms as muda in the Japanese context) in the electronics field. 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.

2. Emil and mihai [2] present a strategy used to create an image about the informational and material flows of products and services. Value Stream Mapping is not a job that covers a detailed period of time; instead it is a working methodology to differentiate activities that add value compared with the non-value additional, and is addressing to all workers, to the management, suppliers and customers. Value Stream Mapping methodology cannot be used by itself, that is why for obtaining this improvements are needed other methods like Kaizen, 5 S, Total Productive Maintenance, Setup reduction and others
3. Florin Buruiana, Mihaela Banu [3] introduced Value Stream Map is used as an improving method to progress in implementing 'lean thinking' and as a leading formula in the improvement activities. As an improvement tool, VSM simplifies the measurement

- of times without added-value, so the calculation of lean coefficients is much easier and it is possible to improve the operative actions with strategic results.
4. G Saranya, Mr. S.B. Nithyananth [4] have implemented value stream mapping is supportive in lean implementation and to build up the road map to undertake improvement areas to overpass the gap between the existing state and the proposed state of a manufacturing firm. In This paper they compares the current state and future state of a manufacturing firm and witnessed 20 % reduction in TAKT time, 22.5 % reduction in processing time, 4.8 % reduction in lead time, 20 % improvement in production, 9 % improvement in machine utilization, 7 % progress in man power utilization, objective improvement in workers skill level, and no vary in the manufactured goods and semi ended product inventory level.
  5. J Dinesh et. [5] introduced VSM is a useful tool for process analysis and improvement by identifying and eliminating time spent on non-value-added activities. By using Value Stream Mapping the process time and value added and nonvalue added activities are identified. Lead time is reduced by improvement made in the pump industry. VSM have been proven to be a greatly useful tool to eliminate some waste in a cycle and find there are more waste for you to eliminate in next series, through which lean becomes a habit or culture
  6. . Mimnun Sutana and Mazarul Islam [6] suggested that to remain competitive in the global market the most important task for garnment industry is to reduce the lead time which is also important for long term stable development.
  7. Muhammad Abdus Samad etl [7] introduced Value Stream Mapping 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. Value Stream Mapping Purpose is to provide optimum value to the client through a complete value creation process with minimum lead time. For this reason they have tried to explain how the lead time can be summary by using lean tools properly
  8. Nitin Pandhia and Sanjeev Vermaa [8] introduced Value Stream Mapping is a significant tool for implementing lean idea. VSM is a process to explain the flow of substance and in order through the manufacture system. The ratio of value additional to total lead time is determined by documenting the present lead time, inventory levels, and cycle times. Value added behavior make the product more closely to the customer requirement. Non Value added behavior does not create customers value, and anything that does not constitutes to value is defined as Waste.
  9. Rahani Ar, Muhammad al-Ashraf [10] described a case where Lean Production (LP) principles were adapted for the process sector of an automotive part manufacturing plant. Value Stream Mapping (VSM) is one of the key lean tools used to identify the opportunities for various lean techniques. The difference of the before and after the LP initiatives in decide managers potential profit such as reduced production lead-time and lower work-in-process inventory. As VSM involves in all of the process steps, both value added and non-value added, are analyzed and using VSM as a visual tool to help see the hidden waste and sources of waste
  10. . Rubidzayi Muvunzi . al [10] Inroduced Using the valu stream mapping, Productivity increased from 20,220 tiles per month to 28,350 tiles per month, In the tile manufacturing industry. There was reduction of defects from 245 defective tiles per day to 10 defects thus saving the company up to \$4419.9 per month. Raw materials were saved which contributed to 168 miles per day which translates to \$2993.76 per month. Lead time reduction from 8467 seconds to 5657 instant that is by 46.8 minutes, which contribute up to 12% of production time.

#### IV. CONCLUSION

A VSM technique is introduced to control the production and raw material delivery using some processes, Value Stream Mapping (VSM) proves to be a distinguished technique which provides a company with a blueprint for strategic planning to organize the principles of Lean Thinking for their transformation into a Lean Organization. Stocks have been summary from side to side VSM which recognized the improvement points and kanban cards which eliminated administrative inefficiencies. By implementing the kanban cards wastes of unnecessary inventory were reduced, excessive transportation and idle times applicable to every production and layout design. VSM objective was to find the non-value added time and cut those as much as possible. By using the VSM it can reduce the WIP by convert the push system to pull system. VSM ropes the lean supply chain and identifies possible opportunities for permanent improvement to eliminate waste. Culture change is a long term philosophy is highlighted as the foundational for Toyota and other companies to sustain success. The effectiveness of Value Stream Mapping is exposed when the team goes to the production method, talks to workers and observes how the product is actually made from the beginning to the end. Value Stream Mapping must be drowning in such a way that can be understood by anyone: all the operators, the management, suppliers and the customer. Only on this condition the team can discover the real problems from the current process flow and create a vision of how the process should look like by making improvements.

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