

A Review & Methodology of Value Stream Mapping

¹Palak P. Sheth, ²Vivek A. Deshpande

¹Post Graduate Scholar, ²Associate Professor

¹Industrial Engineering, G. H. Patel College of Engineering & Technology, V. V. Nagar, Anand, India

²Mechanical Engineering Department, G. H. Patel College of Engineering & Technology, V. V. Nagar, Anand, India

palaksheth8482@gmail.com, vivekdeshpande@gcet.ac.in

Abstract—Today, Lean is the buzzword for every organization. Lean means identifying and eliminating waste (Muda in Japanese meaning non –value added activities). An important activity in the journey for lean is the effective management of the flow of products and services through the number of activities involved for providing value to the customer known as value stream. This required a detailed understanding of all the processes involved so that waste can be identified and eliminated. Value Steam Mapping is a powerful lean tool for identifying the waste and this paper defines concept of Value Stream Mapping and various literatures related on VSM and will be useful for new research in current field.

Index terms -Lean Manufacturing, Value Stream, Value Stream Mapping Methodology

I. INTRODUCTION

In a competitive market every organization is striving hard to get more work done in less time. The aim of any organization has been to continuously minimize waste and maximize flow which would ultimately lead to customer satisfaction by providing right product at the right time in the right quantity and the right quality at a reasonable price [1]. This can be achieved by adopting lean manufacturing system which is more than a cost reduction program. It aims at eliminating wastes which could be in the form of overproduction and inventory, movement of material, waiting and delays, over processing, motion, rework and defects[2]. Lean Manufacturing is a systematic approach to eliminate wastes and improve process. It is based on identifying and reducing waste coupled with continuous improvement. "Lean," is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination [2].

Value Stream Mapping is in one of the lean tool came into existence after the success of Toyota Production System (TPS) in Japan. It was developed by the Toyota Company between 1960 and 1970. [3] VSM is a powerful lean tool for identifying and eliminating the waste. Before giving the definition of VSM it is important to understand what Value and Value Stream is. Focus on value in the context of what the customer/end-user is prepared to pay for. To carry out this activity the company needs to understand what the customer requires in terms of features and performance, and how much they are willing to pay for the product. The outcome of this activity is a clear understanding of what products the customer requires. These requirements may not be feasible immediately, but it provides a true representation of customer need [4]. Value Stream is all the actions (both value added and non-value added) currently required to bring a product through the main flows essential to every product 1) The production flow from raw material into the arms of the customers 2) the design flow from concept to launch.

Value Stream Mapping (VSM) is visualization and streamlines work processes using the tools and techniques of Lean Manufacturing. VSM help to identify, demonstrate and decrease waste in the processes. Waste being any activity that does not add value to the final product. VSM can serve as a blue print for Lean Manufacturing.

VSM was introduced to achieve the following objectives:

- Reduce non-value added activity
- Reduce Lead time
- Maximize machine, men and space utilization.
- Increasing productivity

Before Start to draw VSM typical symbols are used shown in Fig (1).

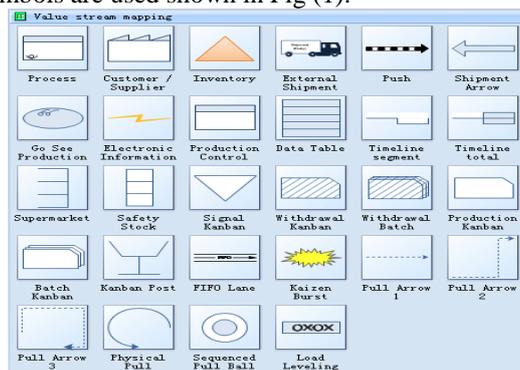


Fig. 1-VSM Symbols

II. LITERATURE REVIEW

Saranya and Nithyananth [5] have tried to identify areas of wastes and these can be reduced or eliminated using lean techniques from the crankshaft assembly supply chain of two wheeler manufactures in south India. They conclude their work in terms of lead time, reducing WIP, Carrying cost from the current process to proposed process. William et al. [6] have implemented VSM in a bread manufacturing firm. Current state and Future state of manufacturing firm are compared: 40% reduction in non-value added activity, increased throughput time. Renu et al. [7] have been applied lean approach in manufacturing industry. VSM was the main tool used to identify the opportunities for various lean techniques. This paper resulted in reduced lead time and WIP inventory. Senthil Kumar and Sampath [8] made a case study of VSM implementation in T-shirt production industry and reduce WIP level by changing the layout of production process will increase the profit 20-22% from an existing level. Yang-Hua Lian et al. [9] have presented in their paper that, the concept for value stream maps of a system using simulation and reduce the lead time and WIP inventory. Nitin and Sanjiv [10] have applied VSM in Gearbox manufacturing industry and find out the takt time and after that implementation effect of VSM is reduced cycle time, waiting time. Vinodh et al. [11] made a case study of VSM implementation in Indian crankshaft manufacturing company and gives results in reduced lead time, WIP and processing time. Several researchers have used VSM for different areas for improve production, inventory control, WIP reduction. W.M.Goriwando et al. [12] explain value stream mapping in pharmaceutical industry. The LCO line is taken for the case study. Then find the non-value added activity and applying line balancing concept and resulted in reduce in cycle time and reduce in lead time. This gives the motivation for research project.

Abbett and Payne [13] explain a case study in aircraft manufacturing industry. They draw current and future state maps were developed with the objective of reducing lead time and improving productivity according to customer requirements. Rambidzayi Muvunzi et al. [14] this paper aimed to reduce the waste between the processes. So, draw a current state map and also indicate waste as a kaizen blitz and draw a seven waste ranking chart and then reducing the processing time and draw a future state map using supermarket pull system and reducing the lead time and improving the productivity.

III. VALUE STREAM MAPPING METHODOLOGY

There is a standard methodology for Value Stream Mapping which can be used in different fields like engineering, manufacturing, management and other supporting processes in the organization.

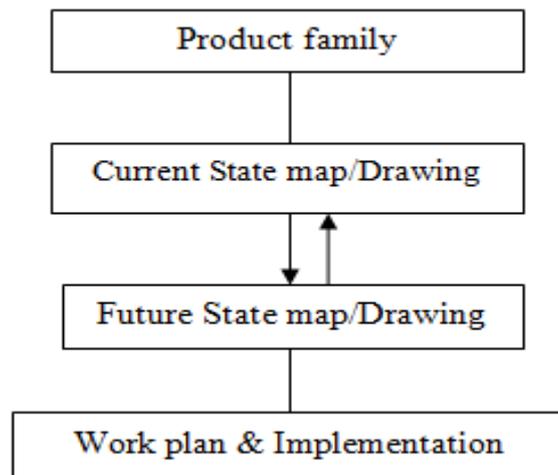


Fig. 2- VSM Methodology

1. Identify a Product Family

Two methods for selecting/identifying a product family:

- For identifying the product family uses a PQPR (Product Quantity / Product Routing) matrix.
- Based on high demand by customers compared to other customers.

2. Draw a Current State Map

Before starting the current state map create a team and that team collects all the data required for the current state map. Following steps have to follow to draw a current state map.

1. Understand the customer demand.
2. Map the process flow
3. Map the information flow
4. Map the material flow
5. Map the information flow
6. Timeline

After Drawing of Current State Map find out the seven waste between all the process and draw a ranking chart and other way to find that which lean tool applied to improve the process like 5S, Kanban, Kaizen, Line balancing etc. to reduce the total lead time

and increasing the productivity and indicate that as Kaizen Blitz. Kaizen means “continuous improvement” and Blitz means “lightning fast”.

3. Future State Map

Step 1: Calculate Takt Time

Starting to draw the future state map know takt time.

$$\text{Takt Time} = \frac{\text{Net Available Time}}{\text{Customer Demand}}$$

The net available time is the total operational time during a specific period of time, meaning the total amount of time. [15]

Step 2: Develop Continuous flow whenever possible

Step 3: Use supermarket to control inventory with Kanban cards

A Kanban stands for a signal from the supermarket to a previous process step to build a defined quantity

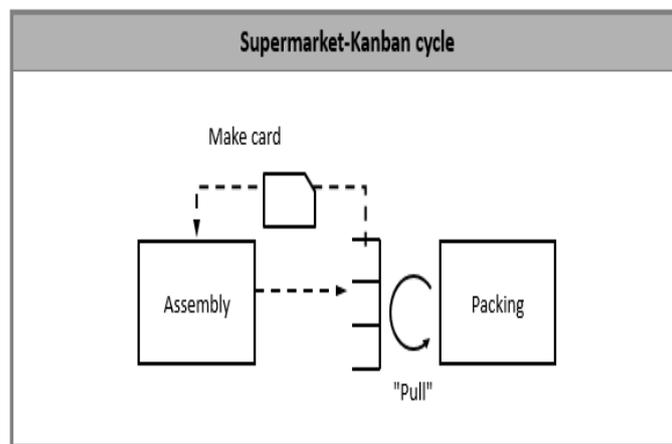


Fig. 3- Supermarket pull process

Another way to reducing the inventory apply FIFO Rack between the process but give the schedule for only one process.

Step 4: Try to send the customer schedule to one production process called as Pacemaker process.

Step 5: Distribute the production of different products evenly over time at the pacemaker process.

Step 6: Level the production Volume

Step 7: Develop the ability to make “every part every day” (then every shift, then every hour or pallet or pitch) in processes upstream of the pacemaker process.

Based on processes apply the steps and draw a future state map and it describes the proposed/future position of shop floor of any organization in order to bring some improvement.

IV. Summary:

Each of the literature review provides good techniques that can be applied in my work. Reading the literature reviews helped to clarify my understating of Value Stream Mapping. I now have good knowledge of the various lean tools and how to select which ones to use when. I have also gained confidence in developing current state and future state maps. This review gives the motivation for my research project at automotive industry.

V. ACKNOWLEDGMENT

I would like to acknowledge and extend my sincere gratitude to **Prof. Vivek A. Deshpande** for their constant assistance and much needed motivation to publish a paper.

REFERENCES

- [1] Hande ALACA, Dr. Cemil Ceylan, “Value Chain Analysis using Value Stream Mapping: White good industry application” International Conference on Industrial Engineering and Operation Management, Malaysia, Jan 22-24, 2011.
- [2] Rauniyar, M., 2007, “Value Stream Mapping at XYZ Company”, Ph.D. dissertation, The University of Wisconsin-Stout Menomonie.
- [3] G. Sathiya Reddy, Harsha Lingareddy, K.Jagadeshwar, “Value Stream Mapping in Manufacturing Industry”, IJAET, Vol-IV, April-June 2013, pp 20-23.
- [4] R.M.Belokar, Vikas Kumar, Sandeep Singh Kharb, “ An application of Value Stream Mapping in Automotive Industry , IJITEE,July-2012,pp 152-157

- [5] G.Saranya, Mr.S.B. Nityanananth, "Improvement of crankshaft assembly supply chain using lean techniques" IJMER, Apr-2012, pp 403-406
- [6] William M. Goriwondo, Samson Mhlanga, Alphonse Marecha, "Use of the Value Stream Mapping Tool for waste Reduction in Manufacturing. Case study for bread manufacturing in Zimbabwe." International Conference on Industrial Engineering and Operations Management, Malaysia 2011.
- [7] Renu Yadav, Ashish Shastri, Mitlesh Rathore, "Increasing productivity by reducing manufacturing lead time through Value Stream Mapping", IJMIE, Vol-1, Issue-3, 2012.
- [8] B. Senthil Kumar, V.R. Sampath, Garment manufacturing through lean initiative-an empirical study on WIP fluctuation in T-shirt production unit. Eur. J. Sci. Res. 73(92), 235-244 2012
- [9] Yang-Hua Lian, Hendrik Van Landeghem, "An application of simulation and value stream mapping in lean manufacturing", European Simulation Symposium 2012
- [10] Nitin Pandhi, Sanjiv Verma, "Value Stream Mapping in Automotive Industry", IJCET, Vol-2, No.3, 2012
- [11] S. Vinodh, K.R. Arvind, M. Somanaathan, Application of value stream mapping in an Indian camshaft manufacturing organization. J. Manuf. Technol. Manag. 21(7), 888-900, 2010
- [12] W.M. Goriwondo, A.F. Van der Merwe, T.D.Maukra, "Enhancing lean manufacturing using the value stream mapping tool in pharmaceutical operations: A case study of a pharmaceutical manufacturing company in Zimbabwe.
- [13] Abbett D., Payne V., "Gulfstream value stream tour, presentation at 1999 lean summit
- [14] Application of Value Stream Mapping to reduce waste and improve productivity: A case study of Tile Manufacturing industry, IJAIEM, Vol 2, Issue 7, 2013.
- [15] Emil Suciu, Mihai Apreutesei, "Value Stream Mapping: A lean production methodology", Vol 11, No-1(13), 2011
- [16] M. Rother, J. Shook, Learning to See: Value Stream Mapping to Create Value and Eliminate Muda (Lean Enterprise Institute, Cambridge, 1999)

