Benefits of Value Stream Mapping as A Lean Tool Implementation Manufacturing Industries : A Review

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Abstract

Lean manufacturing can be considered as a business strategy and it has been proved to be an effective management philosophy for improving businesses in a competitive market by eliminating non-value added waste and improving in process operations. Value stream mapping (VSM) can be an extremely powerful tool, combining material processing steps with information flow as well as other important related data. This paper illustrates the review of VSM techniques and its benefits in machining industry. The purpose of this paper is to highlight the effective utilization of the VSM tools for process and productivity improvements by different authors.

Keywords: Lean Manufacturing, Value Stream Mapping, Review, Tools And Techniques.

I. INTRODUCTION

Lean manufacturing is the productivity and Quality improvement technique that many manufacturing companies in India have been implement in order to remain in the market in an increasing competitive global market.[1] The lean have number of tools for the quality improvement. Out of these tools the value stream mapping is an extraordinary device.[2] In Lean philosophy, "value" is the addition that attracts the end customer. It means improving what the customers is ready to pay for, what gives "value" to him. The whole process of value creation and value addition should be observed and optimized from the end costumer's point of view. So once " value" is defined it can be added for better satisfaction of the customer. That are currently required to bring the product to the finished product from the raw material and ultimately to the customers. [3]

II. VALUE STREAM MAPPING

Value stream mapping is a visual representation of all the sub manufacturing activities, including the flow of material and information as well as lot size, which occurs along the value stream selected for a product or family (Tapping, 2002). The value stream mapping process will likely expose that a significant amount of non-value-added activities which ultimately plays the role of loss are present in current processes. These activities consume financial and human resources and adds significant amount of lead-time without adding value. However, some of these activities are really necessary in the process due to inbuilt limitation of the company; therefore the idea is to minimize their impact. [9].

It helps you more than just the single-process level, i.e. welding, assembly, soldering, painting, tool changing etc. in production. You see the flow. It helps you see more than non-value added activity. Mapping helps you see the sources of non-value added activities in your value stream. It provides a common language for talking about manufacturing processes. It makes decision about the flow appropriate, so you can be able discuss them. Otherwise, many detail and discussion on your shop happen by default. Its patch together lean concept and techniques as well as tools [10]. Figure 1 below shows the value stream symbols used to describe each process of manufacturing or assembly

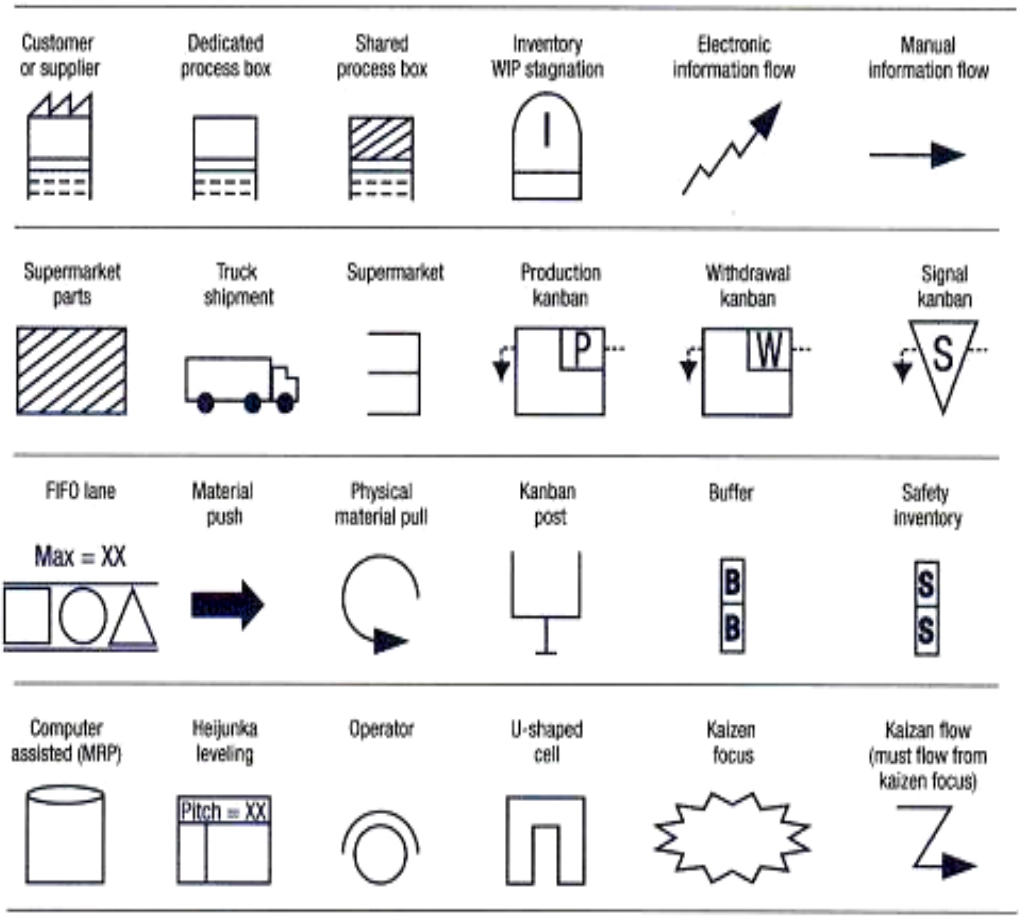

Fig. 1: VSM Typical Symbols [10]

III. LITERATURE REVIEW

A. Bhim Singh, S.K. Garg, S.K. Sharma, Chandandeep Grewal, 2010. [4]

In this paper the author made an attempt to identify areas of wastes and these can be reduced or eliminated using lean techniques from the Components of diesel traction fleet, Indian railways. Lean implementation is carried out in a production industry with the help of VSM technique and many benefits are reported such as reduction in WIP inventory by 89.47 %, finished goods inventory by 17.85 %, product lead time by 83.14 %, processing time by 12.62 %, manpower required by 30 %and output per operator is increased by 42.86 %.

B. S. Vinodh, K.R Arvind, M. Somnaathan, 2010. [5]

This paper represents the application of Value Stream Mapping as one of the Lean tools to eliminate waste, and improved operational procedures and productivity in case of stiffer cam shaft assembly in India. VSM reduces ideal time has been decreased from 19660 to 19449, Total cycle time has been reduced from 539 to 525, Reduction of work-in-progress inventory, improvement on time delivery 70% to 85%, Reduction 4% in defects has been achived and Increase 1.7% in uptime has been realized.

C. Benjamin Haefnera, Alexandra Kraemera, Torsten Staussa, Gisela Lanzaa, 2014. [6]

In this Paper an innovative approach called Quality Value Stream Mapping (QVSM) is presented. Based on the design elements of VSM, it provides a suitable tool for the visualization, analysis and design of quality assurance measures within process chains in manufacturing. The implementation of the developed approach is exemplarily shown for a complex value chain of a manufacturer in the electronic industry. Number of parameters studies was, Preparation, Quality Value Stream Mapping Analysis, Quality Value Stream Design, Implementation. In this Studied both the rate of defects and the quality-related costs were reduced. The developed method of Quality Value Stream Mapping is capable of systematically visualizing, analysing and optimizing multistage manufacturing processes from a quality assurance viewpoint

D. Danijela Gracanin, Borut Buchmeister, Bojan Lalic, 2014. [7]

Basic aim of this paper, study introduces the framework for value stream optimization by combining value stream costing and cost-time profile. Number of parameters studies was, Cost Rate, Material Cost, Duration (min), and Predecessors. The aim of this paper was to emphasize importance of relationship between money and time and provide framework for value stream optimization. Previous analysis of cost-time profiles with different parameter values for same value stream shows that every measure gives different results and savings (time or money).

E. Paramdeep Singh, Harpuneet Singhusing, 2011. [1]

This paper presents the value stream mapping in tractor industry case study. The current manufacturing system has been compared with the proposed pull (kanban) system which shows the benefits of the proposed lean manufacturing system over existing traditional manufacturing system. The future state value mapping of the crank case shown reduction in total lead time by 50%. Also number of operators involved in processing of crank case has been reducing from 22 to 18.

F. Tony Manos, 2006. [9]

This paper aimed in current state map is indicate the material flow and information flow with waste, value added and non-value added. The future state map by changing the processing sequences, redesigning the layout and pulling the production from downstream (the customer), we reduce the lead times, lower the WIP inventory, increase value added ratios and solve the bottleneck problem

IV. VALUE STREAM MAPPING METHODOLOGY

The process analysis is carried out by acquiring the list of information from various enquiries with experts in shop floor level, labourers and by directly participating in measuring time for various processes. The various steps in the VSM methodology are as follows.

- Collection of Data
- Current State Mapping
- Application of VSM Tools
- Creating Future State Map

A. Collection of Data -

1) *Customer Demand:*
   - What is the product family?
   - How many products are required and when?
   - How many variety parts are made?
   - How many products are dispatched at a time?
   - What sort of packing is required?
   - Other information like number of delivery points, delivery windows etc.

2) *Information Flow:*
   - What kind of forecast information is given by the customer?
   - Which department does this information go to in the firm?
   - How long does it stay there before being processed?
   - How do they pass it to as it moves towards suppliers?
   - What sort of forecast information given by suppliers?
   - What order quantities do supplier specify?

3) *Physical Flow:*
   - How many products are wanted and when?
   - How many different parts are required?
   - How many products are to be dispatched at a time?
   - How often do dispatches occur?
   - What sort packing is making?
   - How long does it take to dispatch?
   - Other information like more number of suppliers for a given part number?

B. Current State Mapping:

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.

C. Application of VSM Tools involves:

Table - 1
Vsm Tools [12]

Tools	*Parameters*
Process activity mapping	*Identify lead time & productivity opportunities*
Demand amplification mapping	*Volume with respect to Time*
Quality filter mapping	*Product defects, Scrap defects & Service defects*
Production variety Funnel	*No .of products variant- manufacturing process path*
Value adding time profile	*Value adding & Non-Value adding costs- Time*

D. Creating Future State Map:

The improvement in the existing flow using various lean tools which will ultimately help in reducing inventory, lead time, changeover time and improving productivity comes to this phase of work.

V. CONCLUSION

After referring number of paper it is not inconsistent to conclude that Value Stream Mapping works to be an effective tool in order to improve and gather the information at each and every stations about station cycle time, uptime or utilization of resources, setup time, WIP inventory, manpower requirement and the information flow from raw materials to finished goods. VSM works in any of the sector such as hospitability, manufacturing, service industry, automobile, machining and casting industry, Transportation etc.

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