

A REVIEW ON APPLICATION OF VALUE STREAM MAPPING TOOL IN SMALL SCALE INDUSTRY FOR WASTE REDUCTION

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Abstract—This paper presents the practical application of Value Stream Mapping (VSM) tool in order to reduce waste in small scale industry. A value stream is an assortment of all actions (value added as well as non-value added) that are required to bring a product through the essential flows, starting with raw material and ending with the customer. In today's highly competitive business environment, companies require improvement in Production Lead Times, costs and customer service levels to survive; hence they cannot afford to operate with waste in their processes. That is why it is necessary to have practical tools that will support the redesigning process for manufacturing systems.

Keywords—Value stream mapping, lean manufacturing, waste, material flow, process flow, lead time.

I. INTRODUCTION

Manufacturing processes are the basis on which businesses create their wealth through value addition. Some processes in manufacturing are essential but do not add value while others are neither essential nor they do add value. Most organizations are not quite aware of the non-value-adding processes in their plants. Value Stream Mapping (VSM) is a set of methods to visually display the flow of materials and information through the production process.^[1] The objective is to identify and improve value-addition as well as eliminating or minimizing non-value adding activities. VSM has been used as step in the implementation of Lean programs resulting in success. ^[2]

Value Stream Mapping is a lean manufacturing tool which enables a company to identify and eliminate waste, thereby streamlining work processes, cutting lead times, reducing costs and increasing quality and hence productivity. The main aim of VSM is to identify, demonstrate and decrease waste in the process, highlighting the opportunities for improvement that will most significantly impact the overall production system.

1.1 VALUE

Value is defined as the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. In other words "Value" can simply be defined as something a customer is willing to pay to receive. If a customer is not willing to pay for it, then there is no value.

1.2 VALUE ADDING AND NON-VALUE ADDING ACTIVITIES

There are two elements in every process, one that add value and the other that add no value, both take time and cost us money but only one earns us money. In the Lean Management philosophy, all activities in an organization are grouped into two categories:

- (I). Value added (VA) activities, and
- (II). Non-value added (NVA) activities.

1.2.1 Value added activities

VA activities are those that bring additional value to products or services. Examples include entering orders, ordering materials, laying foundations, creating codes, assembling parts and shipping of goods to customers. Customers are willing to pay for these improvements that can change the form, fit or function of a product or service.

1.2.2 Non-value added activities

On the other hand, NVA activities are tasks that do not increase market form or function. Examples are filing, copying, recording, waiting, counting, checking, inspecting, testing, reviewing and obtaining approvals. These activities should be eliminated, simplified or reduced.

A company can improve the value of its products and services by tackling wastes from an end-to-end business process, and not just that, it can also achieve significant cost reduction, strengthen cash flow and emerge from the downturn with a stronger and more competitive profile.

1.3 Wastes in lean manufacturing

Any activity that doesn't add to the market form or function of the product (things for which the customer is willing to pay) is a non-value added activity, or the "wastes" that lean seeks to eliminate. Lean manufacturing focuses on eight specific major wastes:

- a. Transportation

- b. Inventory
- c. Motion
- d. Waiting
- e. Over production
- f. Over processing
- g. Defects

II. BACKGROUND

Lean Thinking, a concept that is based on the Toyota Production System, extends continuous improvement efforts to reduce the costs of serving customer/s beyond the physical boundaries of a manufacturing facility, by including the suppliers, distributors and production system that support the manufacturing function.^[3] These improvements and cost reductions are achieved by eliminating the muda (wastes) associated with all activities performed to deliver an order to a customer. Wastes are defined as “all activities that consume resources (add costs to the product) but contribute zero value to the customer.”

In recent years, value stream mapping (VSM) has emerged as the preferred initial methodology to implement Lean Thinking, both inside factories and at the supply chain level.^[4] Rother and Shook used their knowledge of Toyota practices to create a simple way for managers to see the flow of value and presented the VSM method in the Lean Enterprise Institute (LEI) workbook “Learning to See”.^[5] As Lean manufacturing aims to achieve a steady flow of small batches of components or products moving through the company based on the systematic elimination of waste and systematic problem solving, the organization of the shop floor and the allocation of resources to tasks can have a significant impact on job lead time.

Lixia Chen has proposed application of value stream mapping based lean production system for Chinese enterprise to help them deploy lean production systematically which could make them to have an overall look at total efficiency.^[6] This study was focusing on the identification and elimination of root causes of wastes, rearrange overall value stream better and to increase the competitive ability of Chinese enterprises. The result of application of VSM was showing reduction in cycle time from 1.46 hrs to 21.9 minutes, reduction in set up time from 3.2 hrs to 0.3 hrs, reduction in WIP from 67 days to 16 days and Lead Time from 67 days to 16 days.

III. RESEARCH METHODOLOGY

The methodology for implementation of value stream mapping is essentially having five steps. These all steps are to be performed in a sequential way. The sequence is as follows-

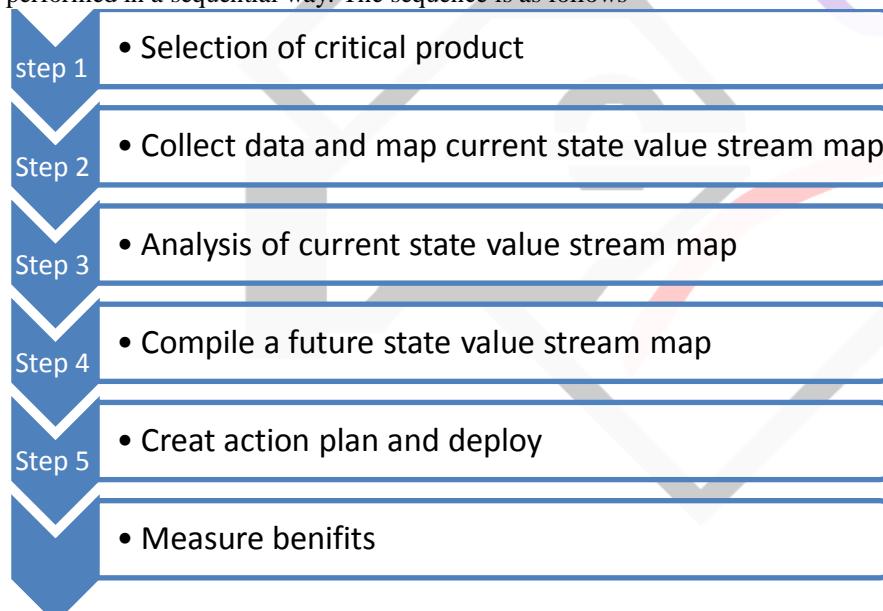


Figure: VSM Methodology

3.1 The value stream map description

3.1.1. Value stream mapping symbols

Value stream mapping uses a set of unique symbols to visualize a process, which is presented in figure no.2

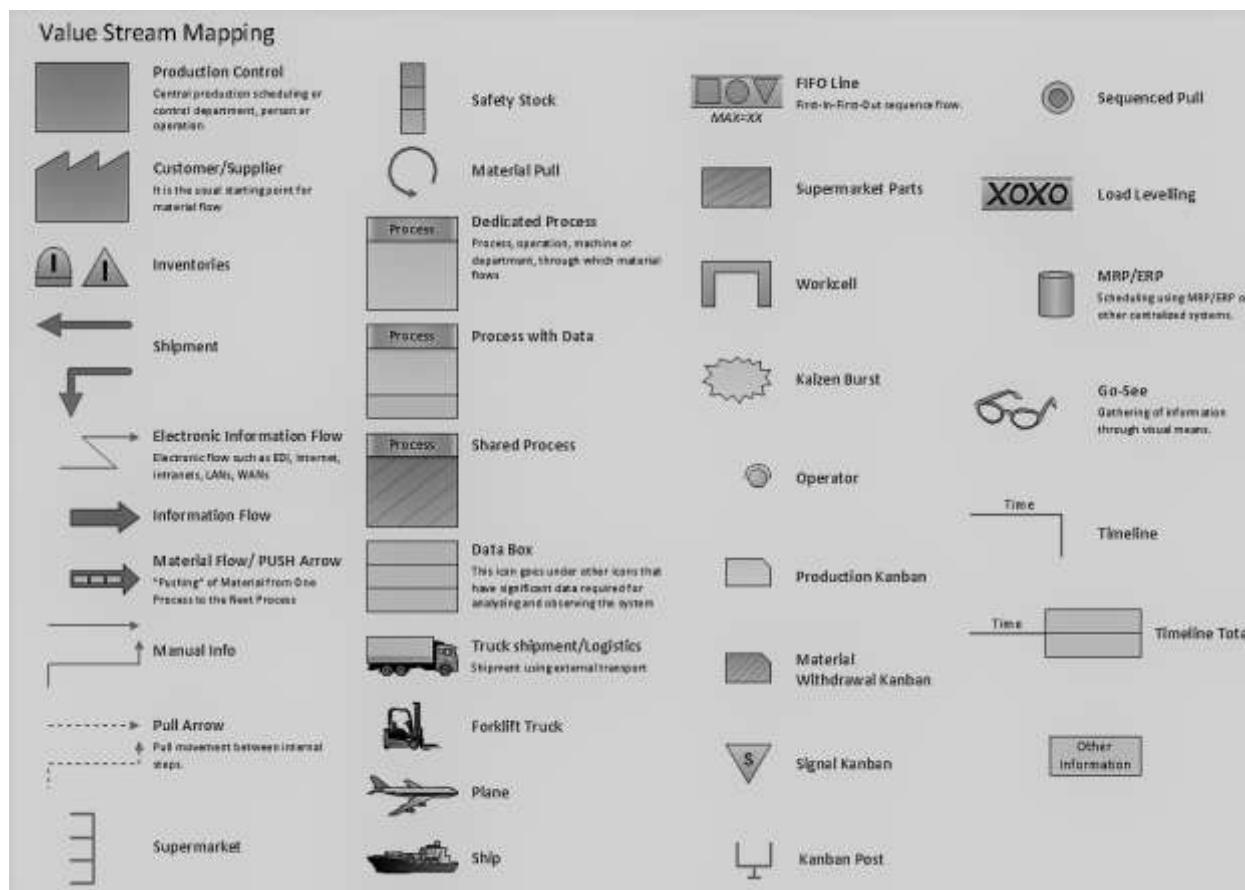


Fig.no.2 -VSM symbols [20]

3.1.2. Value stream mapping components

A Value Stream Map is divided into three sections:

1. Process or material flow,
 2. Communication or informational flow and
 3. Timeline
- which are presented in fig.no.3.

1. Material flow

For a better defining of the company value stream, the team who is responsible with the map drawing needs to identify some key elements from the production flow: the starting and ending points of the flow, description of each process step, the movement of the products, and the placement of the operators.

2. Communication flow

Communication represents any kind of informational flow between all the parts involved into the process and more than that into the entire company. Because communication is crucial, by using a proper and simple way to communicate with employees, customers, suppliers and anyone else involved, the company will avoid created by excessive or ineffective communications throughout the process. Also, communications must have place at all levels of the organization, starting from operators heading to superiors and vice versa.

3. Time line

The time diagram shows the disproportion between the time needed for product to pass through production and cycle time. The top line measures the process lead time (meaning the total elapsed time from the moment raw material are received to the time the finished good are sent to the customer) and the bottom line represents total cycle time (total amount of work from each process steps).

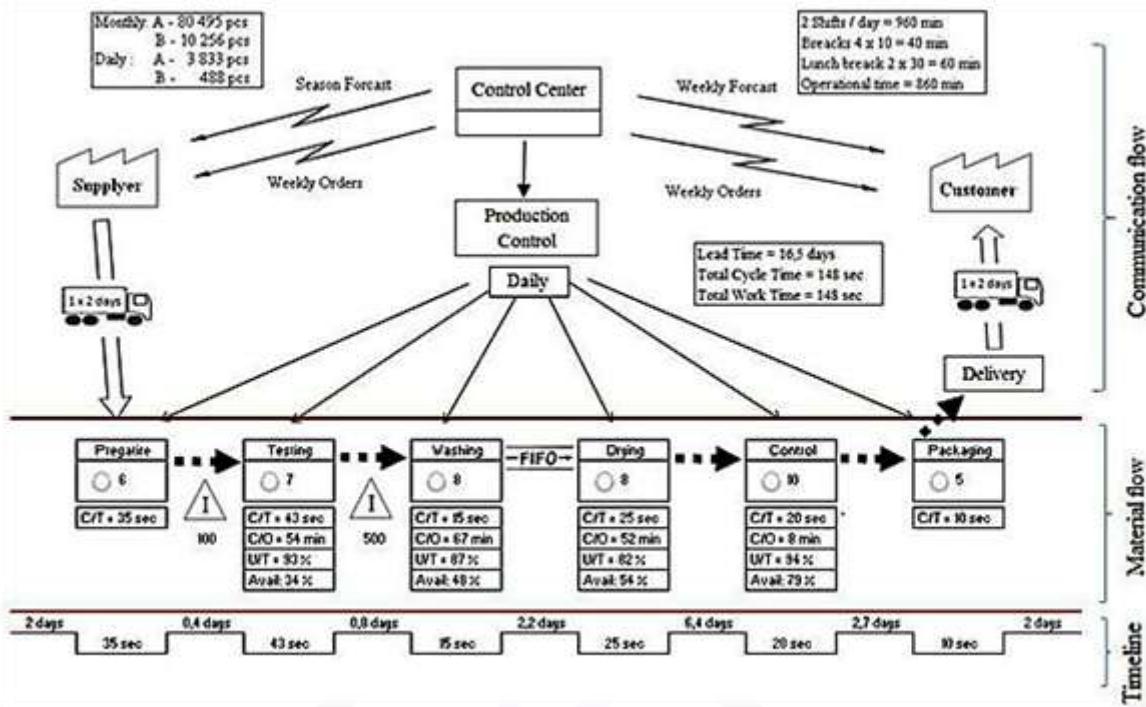


Fig.no.3.-The Structure of Value Stream Map [5]

IV. CONCLUSION

Value Stream Mapping is a simple, yet very effective, method to gain a holistic overview of the status of the value streams in an organization. Value stream mapping is a method for clearly showing the material and information flow in diagram form. The mapping creates a language and tool for organization to actually pick apart a specific process, see the waste, develop a lean vision, and apply it to that particular process. VSM does not just contribute to reducing lead times by reducing and avoiding waste, it also contributes to increasing effectiveness and efficiency by improving work methods and the organization of work, thereby raising productivity.

IV. FUTURE SCOPE

We would apply this value stream mapping tool in a small scale industry in order to reduce the waste. With the help of VSM tool we would draw current state map and future state map to show the information and material flow in the industry. This will help to visualize the present level of waste occurring in the industry and the future possibilities to reduce or eliminating them. In order to continuously reduce or eliminate waste, management of companies need to apply different Lean tools and techniques accordingly while giving adequate training to their employees.

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