

# ***THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT***

## **Value Stream Mapping : A Lean Tool**

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### **Abstract:**

*Value Stream Mapping involves process flows, communication flows and material flows from the point of raw material to the delivery of product to customer. Value stream mapping is a method used to identify the activities that add value compared to non value added in a process which creates opportunity for improvement and has a significant impact on production system. This paper presents how value stream mapping can be used in manufacturing firms for improvement of overall production process.*

**Key words:** Value Stream Mapping, current state value stream, future state value stream

### **1. Introduction**

Value Stream Mapping (VSM) is a tool which is used for analyzing the material flow, information flow necessary in delivering a product to the customer. The advantage of using this method allows anybody to “see” both process flow and communications flow within the process or value stream (Nash and Poling, 2008). Due to the ability of collecting, analyzing and presenting information in a small period of time, this method has gained popularity in continuous improvement. The important objective of Value Stream Mapping method is to identify opportunities for improvement in a future period of time.

VSM is defined as a powerful tool that not only highlights process inefficiencies, transactional and communication mismatches but also guides about the improvement (Rother and Shook, 1999). Since VSM is an analytical method, and it is based on the level of details available, VSM can address only to a process, or to the production lines, or to entire factory.

### **2. Value Stream Mapping**

Henry Ford made the following statement: “Before everything else, getting ready is the secret of success”. Therefore when value stream method is to be used, some preparations are required to collect more information related to the company situation.

The starting point for improvement process will be knowing the current situation and places that has to be improved. To draw Value Stream Map it is very important to use observational skills and document how the company looks & not to neglect or hide the exact situation.

Based on the lean manufacturing principles value stream mapping is done, which are listed below:

- To specify value from customer’s perspective.
- To identify the value stream.
- To eliminate the muda(wastes).
- To make the work flow.
- Work should be pulled rather than push.
- Strive to perfection level.

- VSM Includes Five Basic Steps

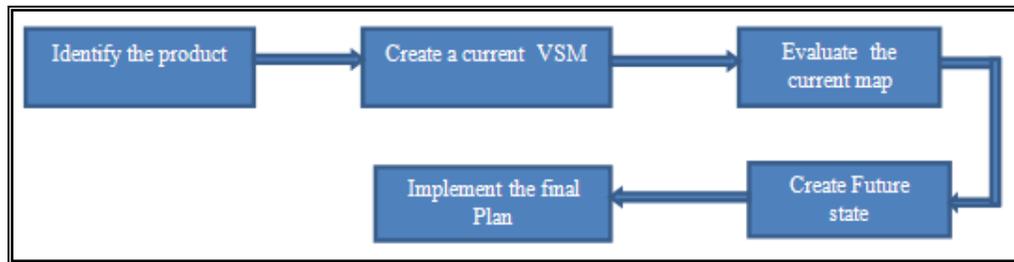


Figure 1: Steps involved in creation of VSM

The points which are to be considered before using VSM method are:

- It should include both value added & nonvalue added activities of the process.
- Pencil and paper has to be used to draw VSM.
- After mapping the current state the next step is to analyse the current state, to identify the improvement areas and to make the action plans for improvement.
- It is required to work with cross functional team to draw the VSM.
- The Current State will be the reference point of the existing process from which improvements are measured.
- Value Stream Maps is drawn to record both Current State Map and the Future State Map .
- Future State Map signifies how it looks after making the improvements.

Value stream map is mainly divided into three sections :

- **Material flow**  
The team must identify the start and end points of the product, process description, material movements, operators details for drawing value stream.
- **Information or communication flow**  
Communication throughout the process must be proper and simple such that it can be understood by employees,suppliers, customers and management.Communication signifies informational flow between all the materials involved into the process and more then that into the entire company.
- **Time line**  
The time line represents the time needed for product to move through production process.The top line indicates the lead time and the bottom line indicates total cycle time.

### 3. Current State Map

Rother and Shook (1999) has discussed that, mapping helps to see the sources of waste in the value stream. Value Stream Mapping is a pictorial tool that incorporates material flow and information flow into a crucial path chart to understand the importance of Value added and Non-value added activities.For drawing current state map the particular product process has to be observed, real time data is to be captured and it should be represented in pictures.

#### 3.1. Procedure involved in drawing Value Stream Map

When team starts to draw the current state map it should follow some procedure so that the team will capture all required data as shown in figure 2. Team should start to draw from customer icon followed by supplier and production control icons.

- Customer requirements based on per month or per day is entered.
- Outbound shipping icon followed by inbound shipping icon and truck delivery frequency is to be drawn.
- Process and data boxes are added from left to right.
- Information arrows are added.
- Collect all data and add in data boxes.
- Operator symbols and numbers are added.
- Add how much inventory is carried at each process.
- Identify and add whether push, pull and FIFO is been carried out in production process.
- Add available time,Cycle and Lead Times.
- Calculate Total Cycle Time and Lead Time.
- Calculate velocity ratio.

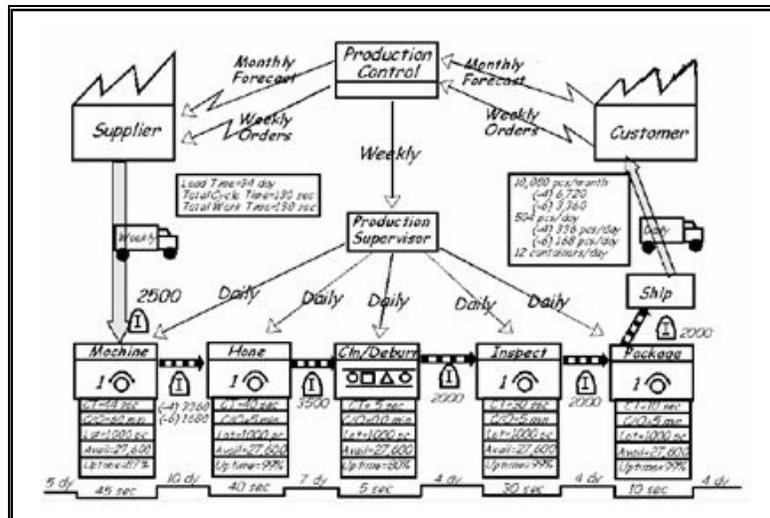


Figure 2: Current state map

Customer is the most important in any production process. He will be the one who is going to buy the products and based on his demand the company plans for production of the product. The product must be delivered on time without comprising with quality. For this reason companies use daily demand to calculate the rate at which the product must be produced and it is known as Takt time.

Takt Time is calculated as shown below:

$$\text{Takt time} = \frac{\text{Net available time}}{\text{Customer demand}} \quad (1)$$

The net available time is the total time during a particular period of time without considering any breaks, meetings and down time. By using forecast method customer demand is determined. Takt Time is usually calculated on shift wise or on daily basis which gives opportunity to identify where the improvements can be done in production process.

Data box is used in current state as shown in figure 3 to enter all the data collected at each step in the process flow.

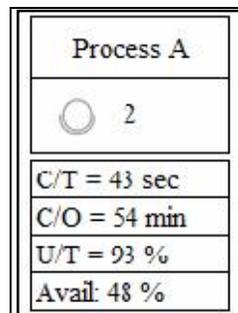


Figure 3: Process data box

Data box contains number of operators, change over time, cycle time, uptime, available time of equipment. Based on the company structure and complexity of process, the Value Stream Map can be simple or complex. A broader map can have parallel flows and subtasks, but same principles are applied for mapping. Information is must about the suppliers, customers, production flow and process. Thus customer demand, order quantity and deliver time must be known. Also, the supplier information is important like who is the supplier, how much we order, time taken by the supplier to deliver the materials and whether supplier is maintaining the quality required by us. In value stream customer and supplier may be external or internal depending the process flow. In production process the information which has to be known are working time, number of breaks in a day, number of stops in process, down time. Based on this information the process can be monitored to produce output as per Takt time.

#### 4. Future State Map

After drawing the current state map, it is the time for team members to evaluate and list all the improvement actions required to draw the Future state. The Future State Map can be designed to monitor the positive changes that are required for the future which shown in figure 4.

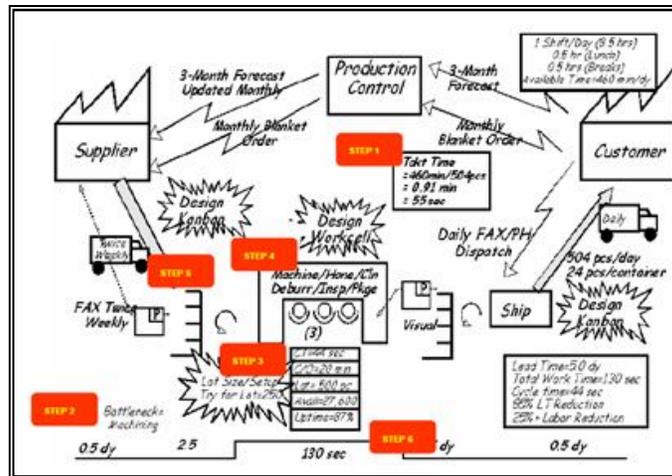


Figure 4: Future state

The future state map includes necessary actions to be carried out for continuous improvement of the project. The symbols used in Future state for identify the improvement areas are shown in figure 5.

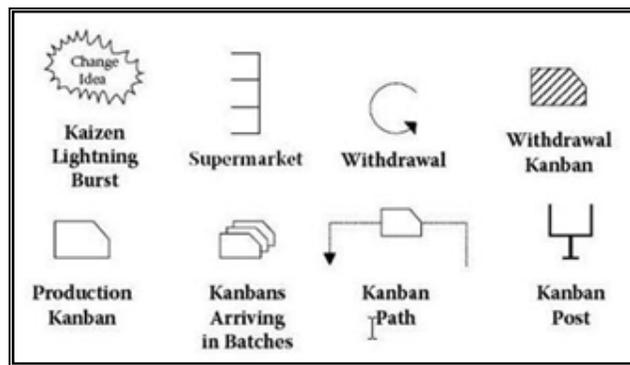


Figure 5: Symbols used in Future state

Major symbols used in Future state map are Kaizen burst and Pull icon. Kaizen burst is used to highlight where the improvement can be done in the process. Pull system is used to produce what was consumed. After designing the Future State Map it has to be presented to everybody who are involved in the process flow so that it helps in adding some more changes required for improvements in the map.

**5. Implementation**

After developing Future State, in most situations it does not remain same as drawn. The map can have some changes due to new problems or identification of new improvement areas. Future State Map will be the first point for improvements. Irrespective of the methodology used by each company to create her own design and improvement program, the first step is to develop an action plan that includes all process improvement activities. The main focus of action plan should be towards improving the entire process by eliminating the waste. Standardized approach has to be followed by the project team for the successful implementation of the action plan. Lean implementation provides a number of tools and concepts required to make change a reality, and it implements change at the same speed as mapping the process. To eliminate errors and defects, each company has her own quality systems for identifying and reducing the problems. These systems can be focused for a product, a process or for entire flow. The product can be checked by placing a person at each step of the production line by implementing action plan. The causes leading to the problems has to be find out rather than finding the defects and isolate them. Employees should be encouraged to actively participate in creation and implementing VSM, best way is to gain their trust by appreciating their input and ideas are valuable.

**6. Conclusion**

Value Stream Mapping is a most important tool for lean manufacturing and allows firms to understand and continuously improve towards lean thinking. It bridges process, tools, people, and even reporting necessities to achieve lean goals. It gives clear and brief communication between shop floor teams and management about lean outlooks, along with actual information and material flow. The effectiveness of Value Stream Mapping is exposed when the team walks across the production process, communicate with workers and observes how the product is transformed from the raw material to the finished product. Value Stream Mapping drawn must be in a such way that it easy to understand by the operators, management, suppliers and the customer which helps in identifying the real problems from the current process flow and create a vision of how the process should look like by making

improvements. For obtaining good improvements along with Value Stream Mapping method other methods like Kaizen, 5 S, Total Productive Maintenance, Setup reduction and others are necessarily used.

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