

Effectiveness of Value Stream Mapping (VSM) as Lean Tool: A Review

¹Chetan Galage

¹Assistant Professor,

¹Yashwantrao Chavan School of Rural Development, MBA Shivaji University Kolhapur, India.

Abstract : Lean Philosophy is very important to eliminate the wastages from manufacturing and to improve productivity. Lean manufacturing is a philosophy which focuses primarily on the identification and elimination of waste from a product's production cycle. Many lean tools are used in various types of industries aiming at productivity improvement and cost reduction. Value Stream Mapping is one the lean tool which helps to find out flaws from current state and helps to improve it. This paper presents review of VSM and its effectiveness as a lean tool.

Index Terms- Lean Manufacturing, Value Stream mapping, Productivity, Wastages.

I. INTRODUCTION

Customers today demand products at a lower cost and at the highest quality. Manufacturing organization has to juggle around with resources because of this complex situation. They always seek optimum performance from each every resource in the organization. This also demands reduction in wastages at each and every stage of manufacturing. Many of the lean manufacturing tools and techniques (e.g., just-in-time (JIT), cellular manufacturing, total productive maintenance) were extensively employed. Basically lean manufacturing is a systematic approach for identifying and eliminating wastage activities through continuous improvement. The main goal here is to keep down on costs and stay ahead in the race[1]. To improve productivity, many manufacturing industries use lean principles to minimize wastage from their production cycles. Lean principles are implemented based on the feasibility and suitability of a specific tool or tools for different manufacturing scenarios using different lean tools. Value stream mapping is one such lean method that can be used to identify waste and increase efficiency in the manufacturing sector. Value stream is a collection of all activities necessary to pass a product through the main flows.

Value Stream Mapping is one of the lean tools that researcher as well as manufacturing organization have not explored and not used a lot. Value stream mapping is a very useful technique from the commodity development process to distinguish value-added and non-value - added activities. Value stream is a summary of all actions.

Some of VSM 's advantages are summarized below.

- It helps to identify residue sources in the process
- Helps discover bottlenecks
- It helps portray the process from the beginning of production to the end
- Helps boost productivity
- It ties lean principles and techniques together to avoid cherry picking

The overall goal of VSM is to define and take action to try to eradicate all forms of waste in the value stream. While researchers have developed a number of tools to optimize individual operations within a supply chain, the majority of these tools fail to link and visualize the nature of the material and information flow throughout the entire supply chain of the company.

Rahani and Ashraf[1] published on VSM 's effectiveness in finding secret wastes and increasing productivity. Significant amount of time spent on the production system is generally non-value added time according to them. They further showed that many of the Lean tools have an anticipated impact related to this waiting time reduction. In their work VSM applied to assess the expected impact of a manufacturing process change resulting in savings due to lower rejection rates.

Value Stream Mapping considers the output process of the products from start to finish. It represents with the help of a map every process involved in processing a product. This map is known as the current map of the state. After analyzing current state map solutions to problems are discovered and a future state map is then drawn to show how things should work best from a productivity perspective. For each of the SMEs' processes, lean methodology could be applied by conducting value stream mapping exercise to identify and eliminate the non-value - added activities involved in that process that is not intended for that particular service or process.

The mapping of value sources, according to Crowe and Arisha[2], is a very powerful method in mapping the present and future state of lean activities of organizations. When used effectively VSM is very effective in improving overall organizational productivity. It also offers a practical organizational perspective. Their system accounts for the company's current value and non-value activities and, by simulation, they have outlined the activities to be included in the creation of the future state map.

Manjunath et al[3] have shown that VSM is a powerful tool in lean manufacturing that helps businesses recognize and continuously develop their efforts to become lean enterprises. It connects people, processes, tools and even documents required in order to achieve lean objectives. It provides clear communication regarding lean outlooks between the shop floor teams and management. They compared the manufacturing firm's current state and future state map and observed that 38.2 percent reduction in lead time, 2.65 percent reduction in process time and 48.3 percent reduction in inventory. Khalid et al.[4] stated that many organizations have adopted Lean extensively, particularly in the manufacturing sector, in order to increase productivity and retain competitive markets. VSM is the most valuable tool in the lean implementation phase, as it helps to see the advantages of implementing lean concepts through VSM. Instead of the benefits offered, some issues have been highlighted in conventional VSM which, from a broader perspective, prevented its use. Hines and Rich[5] stated that VSM is a new typology and decision taking method for value stream mapping or supply chain mapping. VSM is based on identifying the waste in question. It allows an extension of the effective philosophy of internal waste reduction pioneered by top companies like Toyota.

Nishattusnim et al.[6] reported that most of the organization's main goal is to find the non-value added time and cut those as far as possible. By converting the push system to pull system they reduced WIP. Also, they tried to improve the process of reducing the change over time. Belokar et al.[7] reported that Lean production means continuous improvement and that we must continue to change the future state into the present state that will not end in our lifetime. VSM has proven to be a very useful tool to eliminate some waste in a cycle and find that in the next cycle, lean becomes a habit or culture, there is more waste for you to eliminate.

According to Verma and Sharma[8] value stream mapping is an important tool for lean manufacturing to minimize waste by segregating value added and non-value added activities in any phase. Their results clearly showed that mapping of time- and energy-efficient energy value streams in today's scenario is becoming very important. Rohani and Zahraee[9] reported that VSM was the most significant technique for lean manufacturing. They used VSM to boost a color industry's production line. To achieve this goal, using team formation, product selection, conceptual design, and timeframe formulation through takt time calculation, lean fundamental principles were implemented to construct VSM for the identification and elimination of waste. Based on the potential VSM, the final results showed that Output Lead-time (PLT) decreased from 8.5 days to 6 days by introducing certain lean thinking strategies, and the value-added time decreased from 68 minutes to 37 minutes.

Kumar et al.[10] reported that VSM helps to identify non-value - added process activities, thereby helping to increase usage levels through the skills of shop floor practices aimed at increasing human and machine productivity, so that process improvements are possible. They also stated that VSM also helps map current and future state maps for the process, is the powerful tool for lean manufacturing, and enables companies to recognize and continuously develop their lean achievement goals.

Value Stream Mapping Measures

Following are VSM time measure

- Takt Time
- Cycle Time
- Lead Time
- Value Added Time
- Non-Value Added Time
- Change over Time
- Uptime

II. CONCLUSIONS

Value Stream Mapping is very useful tool of lean practice. Value Stream Mapping is one of the lean tools that researcher as well as manufacturing organization have not explored and not used a lot. Value stream mapping is a very useful technique from the commodity development process to distinguish value-added and non-value - added activities. Value stream is a summary of all actions. It can help to visualize current state of any manufacturing organization and to take corrective actions on flaws in that. A detailed future state map can be drawn with modification which can help decision making.

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