A review Paper on Value Stream Mapping in Industrial Application

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***Abstract*: The VSM has its roots in lean manufacturing. Lean Manufacturing is a set of principles used to enable the manufacture of goods fewer resources. The term lean production was first used by John Krafcik of the MIT International Motor vehicle program to describe a manufacturing system that operates with minimal excess assets. The term lean means ability to do more and more with less and less. Today many people associate lean production or lean manufacturing, as it more commonly called, with the Toyota Production System (TPS). TPS is considered by many people to be the first manufacture system that fully integrated the various factors of lean manufacturing.**

I] Introduction

Value Stream Mapping (VSM) is a lean manufacturing technique used to analyze and improve value-addition. It emanates from developments on the Toyota Production System (TPS) but with wide application outside the automotive industry. VSM helps to identify and eliminate waste in the service and production sectors. A process is a series of activity steps that move inventory from one step to the next to transform it into the intended output. The output could be a physical item or a service. A process can be any type or size and cover any period of time. Each step in a process also consists of processes within the step. VSM is used to investigate processes to identify improvement opportunities lying in their wastefulness and lack of fluidity. Value is from the customer's perspective, the customer being the person who uses the output. Value-adding actions and resources are those which create value for the customer.

II] Work carried out on Value Stream Mapping

Hugh L. McManus and Richard L. Millard explored the concept of Value Stream Analysis and Mapping (VSA/M) as applied to Product Development (PD) efforts. Value Stream Analysis and Mapping is a method of business process improvement. The application of VSA/M began in the manufacturing community. PD efforts provide a different setting for the use of VSA/M. Site visits were made to nine major U.S. aerospace organizations [1].

Johan Tingström et al. suggested that VSM should not be implemented as a transformation, but as an evolutionary strategy in the organization. The group acting within the process is the one responsible for improving its processes. Since a number of years back many companies strive to get more efficient in the way they do things. This could be in many different aspects, e.g. to optimize a physical flow in the production or an information flow in an organization. For this Value Stream Mapping, henceforth called VSM can be used [2].

For Quality filter mapping it is difficult in actual practice to predict or analyze the defects at each foundry processes as the final inspection gives the clear picture of internal defects. But it is possible to reduce the chances of defects at the generic origin sources i.e. at melting, molding, pouring, finishing and by controlling the melting parameters like pouring time, temperature etc. In this study bottleneck product is identified. The key sources for internal scraps are identified and these are analyzed and improvement is carried out in these areas. After that future state quality filter map with findings are presented. Future state map revealed that about 700 castings per million are saved from defects. It is however to be noted that there is a significant cost to carry out any required changes but the increased throughput against Takt time will pay back for investment [3]

RumbidzayiMuvunzi et al. explained that the value stream mapping process was used to reduce waste in a manufacturing set up in located in Southern Africa economic region. The methods of data collection and how the samples were to be selected were designed and selected. The product family selected for the research work was the micro-concrete roof tile production (MCR). A Current State Map (CSM) of the product family was created. Data for drawing the CSM was collected primarily through site visits and field work, interviews and observations with the assistance of machine operators and supervisors. In addition, some documents and literature that gave information of the current situation and action that were implemented at the organization were reviewed to capture secondary data for use in the study. The problems with the CSM were identified by highlighted the low-hanging-fruits and problematic bottlenecks. Possible improvements were proposed and a Future State Map (FSM), which has more efficient processes and optimum space and labour utilization, was created using Microsoft Visio Software. Wasteful processes and practices were rectified which included, waste in the form of waiting time, processing, defects arising during, molding, transporting, stacking and curing of the tiles and over consumption of raw materials [4].

Romero D. and Chávez Z suggested that the success of the manufacturing industry is largely determined by its ability to rapidly respond to market changes and to immediately adjust to customer needs. This has resulted in an increasing demand for deployment of systems that can cope with agility and efficiency to these demands. Companies must respond with product designs or completely new products, modifying production processes while seeking lower times and more flexibility in their production systems [5].

Abu Md. Saifuddoha et al. suggested that to identify and address various wastes or non-value added activities in the supply chain of a cement industry using a value stream mapping (VSM). Critical observations and interviewing techniques were used with open-ended questions to understand the processes involved in the value chain of the cement industry. There is an overproduction, excess inventory and information delays in the whole supply chain. Waste or non-value added activities removal from the cement-processing sector is one key to improving the productivity of the sector [6].

S. Santhosh Kumar and M. Pradeep Kumar suggested that Cycle time should be considered a viable option when an organization is trying to improve efficiency, productivity, and cost base and customer responsiveness. Tools of lean manufacturing and line balancing are used to reduce the cycle time in an automobile assembly plant, which contains many non-value added activities and work. Assembly line Balancing is the process of assigning operations to workstations along an assembly line, in such a way that the assignment is optimal in some sense [7].

Schönemann, M.a et al. suggested that the linkage of product and process design by proposing a value stream based modeling approach for manufacturing information. Software tools for the exchange of domain specific expert knowledge are vital for successful collaborative product development. Such software could utilize the presented modeling concept for product–process integration by providing valuable information for both product designers and manufacturing engineers [8].

Mahmoud Al-Odeh et al. suggested that VSM can identify continued opportunities to enhance value, eliminate waste, and improve flow. It is known that VSM can identify continued opportunities to enhance value, eliminate waste, and improve flow. In this work, four steps were followed while implementing VSM: identifying the product, creating a current state value stream map, creating a future state value stream map, and creating an action plan. Takt time, process cycle time, and process cycle efficiency (PCE) were computed for prior and post states for comparison. Although PCE did not improve, takt time, cycle time, budget, and number of required employees were significantly reduced [9].

Palak P. Sheth1 et al. suggested that Value Stream mapping aim is identified waste in terms of non-value added activities. Current State Map is prepared to give details about the existing position and identify various problem areas. Future State Map is made to show the implementation action plan. Value Stream Mapping 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 [10].

Rehab M. et al. suggested that increasing volatility, global competitiveness and sales crisis as all force the manufactures to the journey of world class manufacturing performance via adopting "Lean System" to enable economic success in difficult times. Among the journey to lean, one of the hardest steps is measuring the properties of lean policies implementation especially in this highly dynamic market. This paper presents a dynamic model to evaluate the degree of leanness in manufacturing firms. The model is based on system dynamic approach and presents a "leanness score" for the manufacturing system. In addition, it examines the dynamics associated with the application of "one-piece flow" concept via "Takt Time". Results show that working on adjusting the system's cycle times to follow Takt Time will improve the overall performance [11].

III] Research Methodology

To start improving productivity by identifying waste and then removing it by implementing lean principle in the industry there is no other tool better than VSM. The Value Stream Mapping method (VSM) is a visualization tool oriented to the Toyota version of Lean Manufacturing (Toyota Production System). It helps to understand and streamline work processes using the tools and techniques of Lean Manufacturing. The goal of VSM is to identify, demonstrate and decrease waste in the process.

A manufacturing system operates with timing of step-by step activities. The various steps in implementation of VSM are shown in Figure.6, and are discussed in the following sections. Figure below shows the VSM methodology that was used. It starts with gathering relevant literature on the subject. The product family was then identified. The current state map was drawn for the product. Data for drawing the current state map was gathered through site visits, motion studies, observation, interviews and document review. The current map was then used to identify problems and possible improvements [12].

Before applying VSM methodology, study of whole plant is required with plant manager, supervisors, operators and conducting interviews with these people will help to identify the critical shop floor where we can create the opportunity to improve the productivity. The company has Four main divisions namely Design, Foundry, Machining (CAM/CNC) & Assembly. After the discussion with company employees it came to know that foundry shop floor is having so many problems related to cycle time, improper handling of equipments by operators, and wastages of material. Hence the further decision is made to select foundry as critical shop floor and applied methodology as shown in figure 1.1

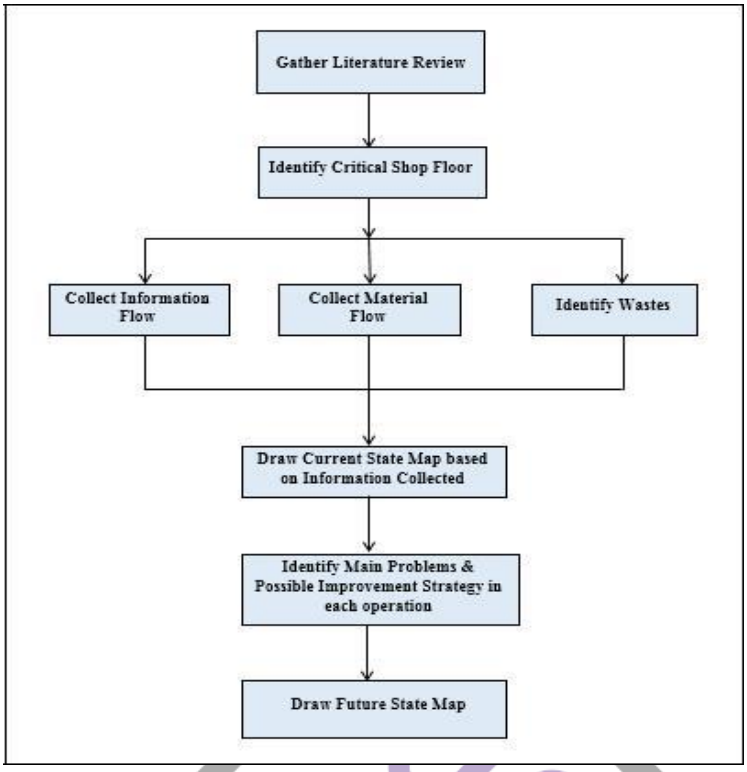

Figure No.III-1

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