VALUE STREAM MAPPING IN GARMENT MANUFACTURING - A CRITICAL REVIEW

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ABSTRACT

Value stream mapping is a technology used to increase production in any industry, Companies who want to attain a competitive structure should analyze the existing situation and should have a structure that can respond quickly to fast-changing customer demands. One of the tools used to achieve this goal is value stream mapping method. Value stream mapping is a powerful tool that can show material and information flow on a single page with symbols. Future state map is drawn by asking a series of critical key question to improve the current state. The aim of this study, to describe the use of Value Stream Mapping in Apparel Industry. First of all, the current state of company has been prepared to describe the current position and problem areas. At the future state map, the total process of production time is reduced.

Keyword: Lean Manufacturing, Manufacturing improvement, Value Added, Value Stream Mapping, waste reduction

1.INTRODUCTION

Value stream mapping is a tool used in any industry to gain production and is useful to decrease production time. VSM is applicable to any industry, like garment industry, service-related industries, healthcare, software development, product development, etc. It was first developed by Toyota and it was widely used in all industry. It is used to analyze current state of company and future state of any process. It is used to reduce waste in production. It is used to combine material processing steps with information flow, along with related data. Value stream thinking entails seeing the combination of processes required to bring the product to the customer. In its absence, departments might optimize measures in their zone without considering the impact on other areas or on the business. Value stream mapping have the immense importance when it comes to on time delivery leading to customer satisfaction. Normally, textile or garment units work with department specific approach. This means that every department does its jobs and wants to achieve targets irrelevant of the problems which the subsequent departments face. Suppose cutting department does cutting of all fabrics allotted to it as per plan and passes the cut bundles to sewing department but sewing department has not achieved its target of the previous job assigned to it. Now the problem arises, sewing department must have faced various problems due to which it did not achieve target but cutting department simply pushes off the cut panels to this department without thinking. This problem will be calculated in value stream mapping. Lean in principle is, identification of non-value adding steps and eliminating them in all possibility. In the process it strives for value addition by reducing defects and wastes. There are 8 types of wastes that are in garment industry. VSM is a powerful Lean tool, combines material flow and information flow on a map. By this technique, a product's production path from customer to supplier is followed, and a visual

representation of every process in material and information flow is carefully drawn. Then by answering a set of key questions, a future stare map of how value should flow is drawn. Doing this over and over is the simplest way to learn how to see value and especially the sources of waste

Benefits of Value Stream Mapping

- Value stream mapping can be applied to mass production in apparel industries.
- Value stream mapping helps to identify waste and streamline the production process.
- Value stream mapping can be applied to both the product and customer delivery flows.
- It is a process of production planning.
- It is used to delivery product in time without any delay.

2. LITERATURE SURVEY

Jim Lee (1) explains the Lean concepts have been implemented to the rope manufacturing process. The goal of these changes was to decrease the overall time required for the company to get the customer's order. Lean concepts were first applied to the information flow system.

Vikas Kumar (2) in their research investigates these issues as part of the overall lean philosophy and in correlation with some of its main tools. Five hypotheses and three complementary research questions were formulated and tested using a combination of descriptive statistics and Pearson correlation.

Subrata Talapatra and Jannatul Shefa (3) describes the Value stream mapping is an effective Lean tool that helps in the visualization of process under study to address the wastes and areas of improvements to pave the way of attainment of continuous flow from upstream to downstream of production resulting in reduced inventory, production cost and increased efficiency.

John Dzissah (4) in their research work studied the manufacturing process of XYZ Company for the family product of soft lead pigs. The research was conducted successfully, and current and future state map developed. It served as a significant tool in identifying wastes, documenting details of the operation, and proposing recommendation for potential improvement. It is hoped that XYZ Company implements the recommendations and the results obtained henceforth is successful as planned and expected.

S. N. Teli (5) describes the VSM have been proven to be a greatly useful tool to eliminate some waste in a cycle and find there are more waste for us to eliminate in next cycle, during which lean becomes a habit or culture. The technique of lean tool can be applied to every situation in a company by finding out what customer wants and eliminating waste. The idea is to create culture in which people at various levels of an organization are continuously improving their production every day & in every way.

Mariusz Salwin (6) states the implementation of value stream mapping in the lean manufacturing area was aimed at reducing the waste and increase the quality and efficiency of the production process. The first stage was collecting and analyzing data on the processes taking place in the enterprise and their interactions.

Shubham Ghushe (7) The lead time and Process time can be reduced and the efficiency of this process can be increased with the help of value stream mapping. Waste activities such as waiting, redoing and batching are generally not modeled by other tools, however in value stream mapping those wastes can be easily identified.

Avinash Nath Tiwari (8) VSM has been categorized yearly focusing on their aim and finding after implementation of VSM. we can say that VSM also works for the integration of man, machine and material along with methods. VSM should not be end with one improvement; it should be continued with continuous improvements.

Mr. Rahul. R.Joshi (9) By applying the Value Stream mapping tool in a die manufacturing industry, a current state map is developed. A future state value stream map is created by eliminating nonvalue added activities Value Stream mapping helps the in attaining higher usage levels by the proficiency of shop floor practices aimed at increased human and machine productivity and thus improving the process.

Fernando Forcellini (10) There are opportunities to develop technologies to assist in the measurement of data to obtain current state maps. Other engineering areas are well developed in the use of standards, equipment, and traceability of measurement procedures, but industrial engineering requires some attention to collecting data about production.

Xavier Brioso (11) A workflow can be enhanced by identifying all the activities that add and do not add value to the construction system through the VSM.) There was no difficulty in adapting the concepts and elements used in the VSM; however, it would be helpful to add other concepts/elements typical of the construction.

Mitsuhiro Fukuzawa (12) Using VSM as a lean tool to improve the workplace such as production unit, lean states have long been achieved in specific units and activities. This had the effect of reducing the number of people who

got lost on their lean journey.

K.Venkataraman (13) Lean manufacturing system implemented in this manufacturing cell to eliminate the 8 non-value adding wastes like over production, waiting, unnecessary transport movement, defects and unused employee creativity from the manufacturing system and also to create product mix flexibility in the manufacturing cell.
Akshay Agrawal (14) In current map, a variety of wastes were recognized. This method helps in reducing the lead time & project cost, improving quality & workflow of the project and is expected to help the practitioners in their future research.
Kaushik Chaudhari (15) The map of the future state is drawn based on the map of the current state for every activity and the improved activities are highlighted with the symbol of solution applied to achieve those improvements. Also, the flow of information or material, if improved, is shown in the future map.
Pradip Gunaki (16) The rearranged process flow diagram in its future state with process steps and information, simplified and made less expensive and enhance in productivity by optimizing the process optimization.
Peng Wu (17) The results suggest that understanding value and waste in a diverse value stream environment and ensuring the suitability and usability of traditional lean techniques within the different flow settings are central to the VSM development.
Michał Banka (18) The directions of further work will include the implementation of new tools that will allow the improvement of the production process in the analyzed enterprise. Particular emphasis will be placed on issues related to environmental protection and rational management of the company's resources.
Seyed MojibZahraee (19) The results show that our approach can make substantial improvements in production lead time, value-added time and Takt time. The results obtained from this study have been presented to the management of heater industry for further consideration and implementation. The result of this study can help the manager.
O Joochim and S Jungthawan (20) It can be said that VSM is a valuable planning tool and can be utilized to develop and implement lean improvement of packaging manufacturing processes.
M. Mostafizur Rahman Sobuj (21) This case study deals with various types of waste exists in sewing section more specifically time waste. The information as well as data has been gathered through the questionnaire, observation, and interview. The data and information were collected through the observation of the production floor and some past record from the industrial engineering and planning department of the selected industry.

3.MATERIAL AND METHOD

The research is conducted in apparel industry. Company's manufacturing units comprise cutting, sewing, washing, quality control and finishing departments. All products manufactured are processed through finishing, preliminary quality control, ironing and final quality control processes, which include sewing of such accessories as buttons, rivets, snappers and eyelets. The company has a monthly production capacity of 500.000 pieces. The company practices below techniques.

3.1 Lean tools

In this research work different types of Lean Tools, such as: Pareto analysis, Cause-effect analyses, Five S (5S) and 5 Why analysis; are used to find existing situation and to identify various types of wastes exists in the selected industry which does not add any value to the overall production process. These tools are described below,

3.2 Pareto analysis:

In nineteenth-century Italy, the Italian economist Vilfredo Pareto observed that about 80 percent of the country's wealth was controlled by about 20 percent of the population. This observation lead to what is now known as the Pareto Principle; it is also known as the "80-20" rule. In general, the Pareto principle, applied to quality, suggests that the majority of the quality losses are mal-distributed in such a way that a "vital few" quality defects or problems always constitute a high percent of the overall quality losses. The intent of a Pareto analysis is to separate the vital few from the trivial many. Thus, the Pareto analysis can assist to identify the most important effects and causes to stratify the valuable data which can be used to prioritize the product-process improvement efforts.

3.3 Cause & Effect Analysis:

A cause is a fundamental condition or stimulus of some sort that ultimately creates a result or effect. Most analysis are worked in both directions, from cause to effect or effect to cause in order to discover and document causes, effects, and cause-effect linkage. Cause-effect analyses are usually summarized in a Cause effect (CE)

Diagram. The CE diagram was developed by Ishikawa for the purpose of representing the relationship between an effect and the potential or possible causes influencing it. The CE diagram, sometimes referred to as a "fish-bone" diagram, is an organized or structured picture with lines and twigs (resembling fish bones) used to stratify and group causes. The effect is typically contained in a box on the right side, while the causes appear on the left side.

Five S (5S) or Work place Organization:

5S is a method to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. This tool is a systematic method for organizing and standardizing the workplace. It's one of the simplest Lean tools to implement, provides immediate return on investment, crosses all industry boundaries, and is applicable to every function with an organization [5]. The 5S pillars are, (1) Sort (2) Set in Order (Straighten) (3) Shine (4) Standardize (Systemize) (5) Sustain.

3.4 VSM-Value Stream Mapping

VSM was used for the elimination of the wastes in the enterprise. It is based on four phases. The main steps in VSM are shown in figure [1.1].

Figure 1.1

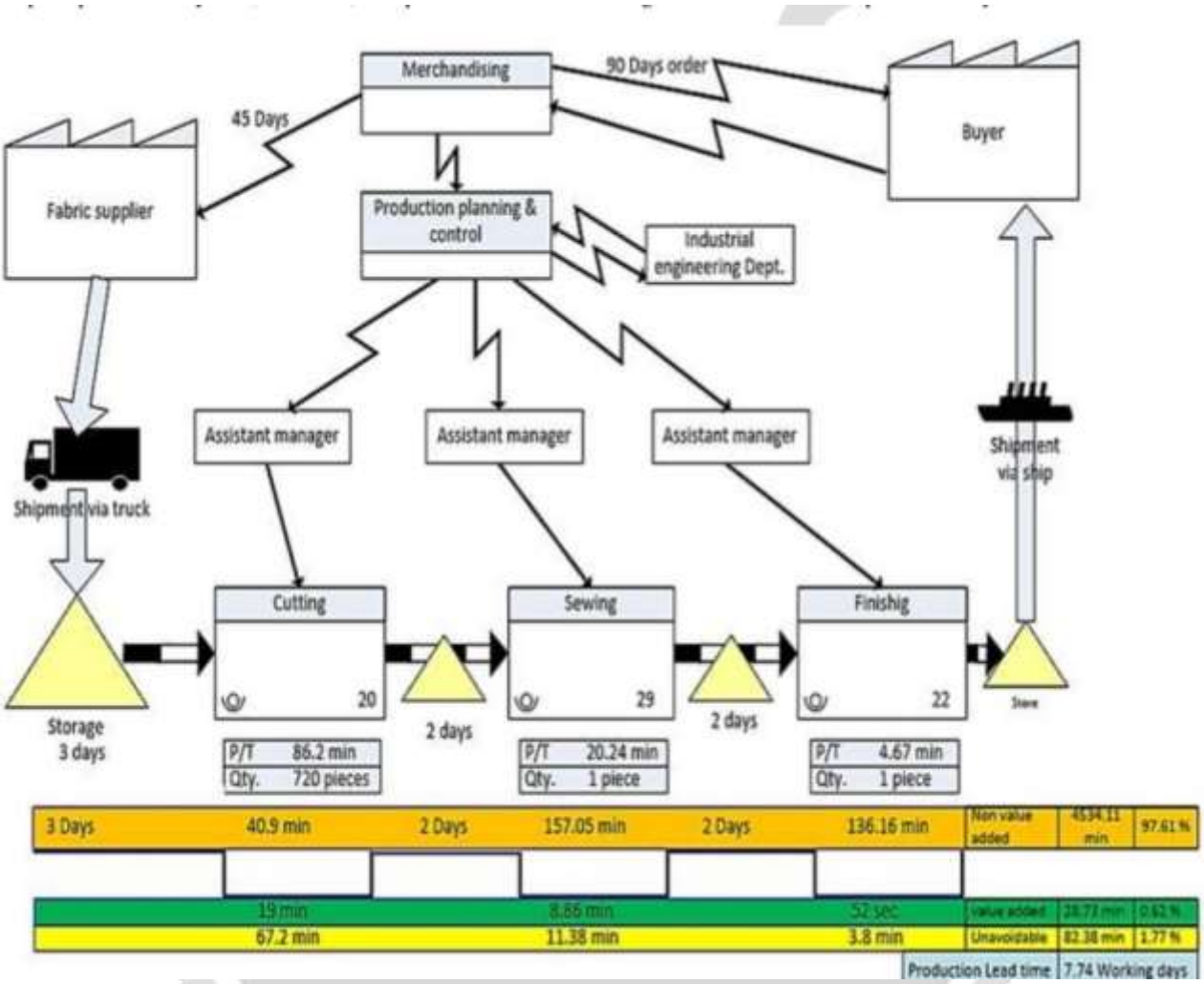
The steps of VSM application as shown, the first step is selection of the most important product family. The next step is to draw current state map. In the current state map the main problem areas, value-added and non-value-added operations were identified. And while drawing the current state map, for the future state a vision should be improved.

The next step is to draw future state map. Rother and Shook (1999) developed a guide for developing a future state to analyze current state. The brief steps are: Calculation of time, using continuous flow wherever possible, using of supermarkets to control the production, create an initial pull and process improvements for continuous improvements, and the production schedule should be as closely as possible to the demand. The last step is to make business plan for application and after application evaluation of results (lead time reduction, inventory reduction, productivity, etc.).

4 RESULT AND DISCUSSION

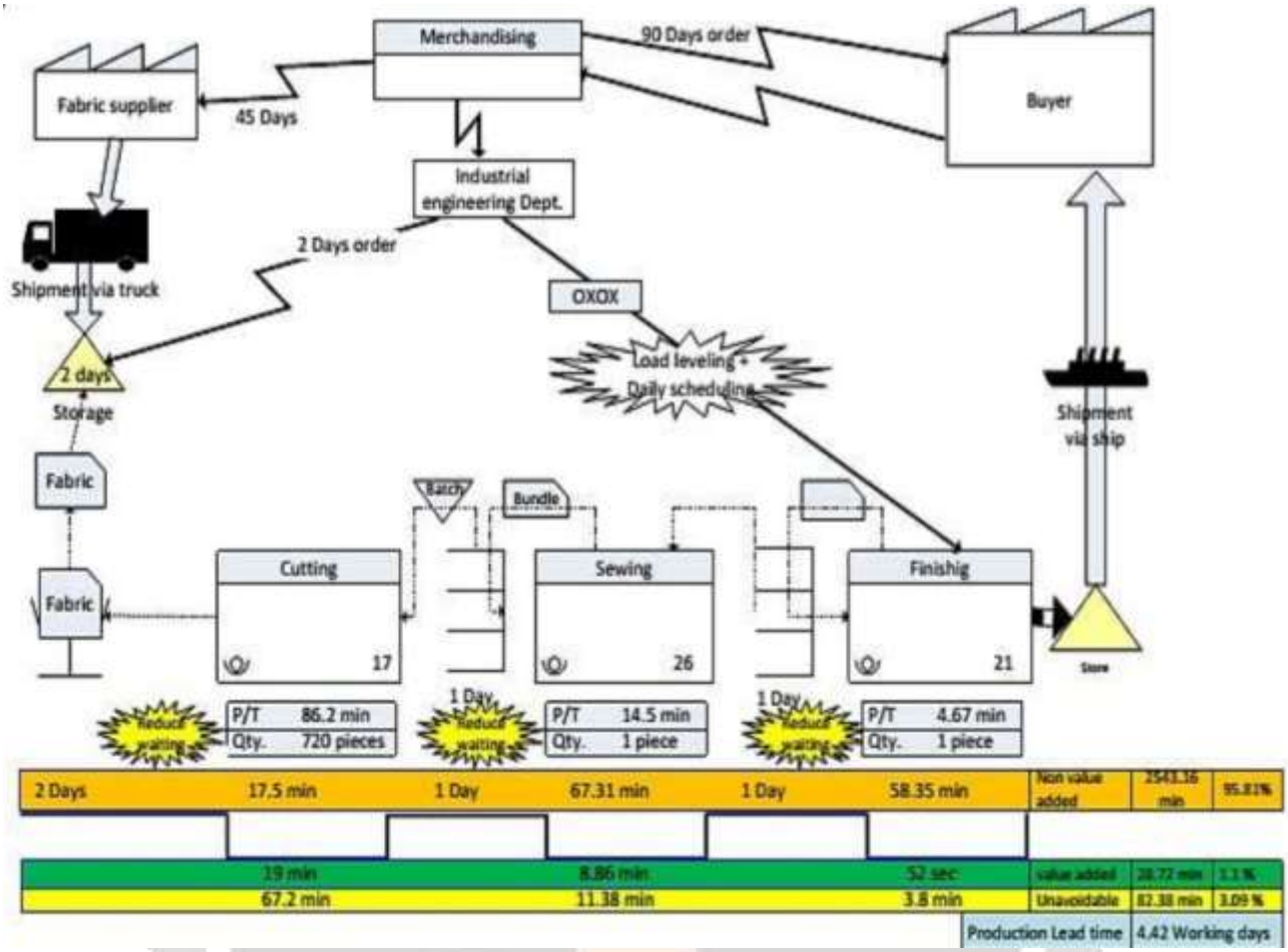
4. 1 Current Value state map:

The current state VSM shows the process flow from the start to the end of the manufacturing line for cutting, sewing, and finishing sections. Diagram shows the current state map of the flow. The current state mapping shows that, this company is currently using a pure push production system; therefore, it requires mass effort to change from this traditional production system.



4.2 Future state value stream mapping:

After improving various waste, removing bottleneck from the sewing process and improving current layout future state map is drawn. The future state VSM is shown in . The improvement activities are shown in the VSM by the Kaizen burst icon. Kanban pull system are also proposed to replace the traditional push system.



Comparison of current state map and future state map:

Factor	Current state map	Future state map
Inventory	7 days	4 days
Waiting Time	283.58 minutes	115.26 minutes
Transportation	34.91 minutes	17.64 minutes
Non value added time	7.56 days	4.24 days
Total lead time	7.74 days	4.42 days
Super market	None	2
Production information	Production planning and control	Industrial engineering department
Manpower	71	64

5 CONCLUSIONS

This paper proposes the Lean Manufacturing tools implementation in a garment industry for the reduction of process time Lean is based on waste management philosophy, the aim behind the above lean tools implementation is purely on waste reduction bias for the existence of the textile industry. In this we had seen that there are 8 type of waste in lean manufacturing technology.From this we can understand ,value stream mapping is used to reduce the waste in

any industry and it also helps to increase the production in any industries like apparel sector ,healthy care ,software development ,etc. It is used to achieve process of any industry from beginning to end and calculate the time of production of the product, so that it helps to rectify the problem and helps to increase the production rate.

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