

# Identification of Retention Time & Information Delays Applying Value Stream Mapping Technique in Apparel Manufacturing Organization

Azim Mohammad<sup>1</sup>, Shibbir Ahmad<sup>2\*</sup>, Mohammad Iqbal<sup>3</sup>

<sup>1</sup>Advance Engineering Management (AEM), Bangladesh University of Engineering Technology (BUET).

<sup>2</sup>Dhaka University of Engineering and Technology (DUET), Gazipur-1700, Bangladesh.

<sup>3</sup>Shah Jalal University of Science and Technology (SUST), Sylhet-3100, Bangladesh.

\*Corresponding Author e-mail: [ahmedfarabi82@gmail.com](mailto:ahmedfarabi82@gmail.com)

## Abstract

Waste is a significant problem in a manufacturing organization. Waste is anything that does not add value to the process. Waste elimination is one of the most effective ways to increase profitability in manufacturing and distribution businesses. In order to eliminate waste, it is important to understand exactly what waste is and where it exists in the factory or warehouse. While products differ in each factory, the typical wastes found in manufacturing environments are quite similar. Among some wastes, waste of waiting time (retention time) is more significant in Ready Made Garments (RMG) industry. If waiting time is increased, production lead time will also be increased which would lead to delayed delivery, increased production cost, interrupted production schedule and so on. The goals of this project were to identify retention time and its associated causes and consequences applying Value Stream Mapping (VSM) technique and thereby to suggest any improvement strategy. In that context, a case study has been conducted in Masco Knitwear Limited, Tongi, Bangladesh. This project outlines the value added time, non-value added time and unavoidable non-value added time at different sections of the studied company.

## 1.1 INTRODUCTION

Ready Made Garments (RMG) Industry plays a vital role in our country's economic growth. In Bangladesh, the Ready Made Garment (RMG) Industry has emerged as a major economic sector and has had its impact on the financial service sector, communication, transportation and on other related Industries. Now in Bangladesh, 2 million garment workers are working in the RMG units, of whom 80 percent are women. RMG roughly covers 76 per cent of the total export of the country and is the highest earning industry in the economy. Two million workers in 4,000 factories, which is about one-fourth of the number of employees engaged in the manufacturing sector, constitute the real backbone of the country's economy [1]. In Today's competitive world, the very important driver for success is *time*; the company that delivers goods with a shorter lead time is the market winner. Financial growth of any company depends upon productivity improvement and waste minimization. The waste minimization is real challenge for a company, whatever the resources are available at its disposal. While products differ in each factory, the typical wastes found in manufacturing environments are quite similar. After years of work to eliminate waste, Taiichi Ono, a former executive at Toyota, identified seven categories of waste. These wastes are [2]: Waste from overproduction, waste from waiting time, waste from transportation, waste related to useless and excess inventories, waste in production process, waste for useless motion, and waste from scrap and defects.

In the highly competitive business environment, the success of an organization highly depends production lead time, quality of product, production cost and overall productivity level. Among these factors, this research focuses on the production lead time, which are strongly associated with value added and non-value added time. To reduce lead time, it is necessary to reduce unnecessary non value added time, which is stated as retention time in this project. The root causes of retention time usually are [3]: Under skill work load, Lack of proper training, Lack of advance technology, unbalanced work load, unplanned maintenance, long

process set-up times, quality problems, unlevelled scheduling, Ineffective layout, under-utilization of resources and idle equipment. However, the great challenge is to identify the actual retention time and its associated root causes and consequences.

In this connection, the project has been conducted with a set of specific objectives, which are:

- a. Identification of retention time (i.e. non-value-add) & information delays applying VSM.
- b. Assessments of the impact of retention time to production lead time.
- c. Draw future plan to improve lead time & remove information delay.

## **1.2. SIGNIFICANCE OF THE PROJECT:**

In concern organization will able to-

- Visualize all kinds of Waiting Time & information Delays at a glance.
- Understand current stage of value stream map and concern about lead time.
- Revise & will draw the future stage of value stream map.
- Will develop implementation strategy based on Future stage map.

## **1.3 BRIEF COMPANY PROFILE:**

MASCO GROUP of Industries Limited is a total commitment to its products and customers has helped it grow from a knit fabric manufacturer to a composite and garment manufacturer. MASCO GROUP of Industries Limited is a pioneer in introducing European technology in knit fabric manufacturing in this country. It started its journey at December 09 1999. Now it's having one knitting factory, one dyeing factory and two garment manufacturing units with capacity about (15 million doz. of T-Shirt, Polo Shirts, Shorts of all designs per year, they are in a position to serve the ultimate users to their satisfaction. They may not be so big if the capacities are considered but their commitment to quality and adaptability to the ever-changing customer demand is our strength. [3]. Specialties: T-Shirt, Polo Shirt, Shorts

## **1.4. METHODOLOGIES:**

For this project, I have applied relatively new lean manufacturing technique named Value Stream Mapping (VSM). Value Stream Mapping is a method of visually maps a product's production path (materials and information) from "door to door". Value Stream Mapping can serve as a starting point to help management, engineers, production associates, schedulers, suppliers, and customers recognize waste related to materials and information flow that affects lead time, space and cost. I consider that this technique can also be very effective for identification of value added and non-value added time, while tracking the material and information in various processes. Therefore, the research includes two major steps:

1. Idea generation about the VSM application for the Knitwear industries.
2. Identify product family for project work.
3. Data collection with the help of VSM log sheet.
4. Analysis of data in connection with project objectives.
5. Draw the current stage of VSM
6. Revised & Draw the future Stage of VSM.

### **1.4.1. Idea generation about the VSM application for the Knitwear industries.**

Value stream mapping is a combination of three word "Value", "Stream", "Map"

**Value:** Creating or making something of value that a customer is willing to pay for.

Based on value all task are divided two types:

1. Value added activities
2. Non-value added activities

Value added activities: According to garments perspective where any pieces of fabric changes its shape in a process then we can say that is value adding process or activities. If fabrics don't change its shape it will be non-value adding activities or process.

Value adding activities are two types:

1. Necessary value adding activities
2. Un-avoidable non value adding activities.
3. Non-value added activities.

**Stream:** Sequential flow of activities needed to create work unit and deliver to customer.

**Map:** In geometrics or geospatial science and technology. Mapping usually refers to map-making and often used instead of cartography. Mapping term is also sometimes used for geospatial data collection.

As a whole definition “Value Stream Mapping (VSM) is a lean technique used to analyze the flow of materials and information currently required to bring a product or service to a consumer. Value Stream Mapping works on the principle that "Value is added only when our action or operation contributes to transform the materials into the product that the customer is willing to pay for." The critical phrase in this definition is, "the customer is willing to pay for." [4]

### 1.4.2. Create a list of products and group them in families or identify product family:

Our studied companies offer varied products and services. For example T-shirt, polo, cargo etc. It is relatively easy to group products into families by constructing a simple table, like the one given in below. The goal is not only to identify all product families, but also to identify what process steps each product utilizes. This will be a living, breathing table, so a project team should be prepared to make further revisions as it dives deeper into its analyses. According to product family analysis I have found that Henz Basic style has 30% production shear in this factory. It should be wise decision to select this style for our further analysis. In fig-1 shows the result.

Categorizing Product Family													
Factory		Masco Knitware Ltd.				Enter a cycle time per unit inside the cells under each manufacturing stage			Product family is group of different type of product sharing same route (Manufacturing stages) or machineries				
Champion		Md.Abdul.Halim											
Working Minutes per month per		12480											
Route	Product Type	Average of Month Quantity (average of 4 mon)	Workers Required	Cycle Time	Minutes Required	Ratio	Spreading	Manual Cutting	Fusing	Sewing	Finishing	Packing	
	Long Pant	19604			0	4%	x	x		x	x	x	
	Hoody Jkt	20598	0	0	0	5%	x	x	x	x	x	x	
	Tank Top	72871	0	0	0	16%	x	x		x	x	x	
	Henz Basic	133636	206	19.278	2576235	30%	x	x		x	x	x	
	L.Slv.T-Shirt	39531	0	0	0	9%	x	x		x	x	x	
	Shorts	141031	0	0	0	31%	x	x		x	x	x	
	Polo	24137	0	0	0	5%	x	x	x	x	x	x	
	<b>Total</b>	451408			2576235	100%							

Fig-1: Product family identification data log sheet.

### 1.4.3. Data collection with the help of VSM log sheet.

After selecting target product for Value stream mapping we use a SIPOC diagram [5] (suppliers, inputs, process, and output, customers) to document the process steps. Begin with the customers and work forward. Once the walk-through is completed, there should be enough initial data to understand the value stream, and begin creating a current-state value stream map with a more detailed depiction of the value stream. We have collected data from three sections cutting, sewing and finishing. Initially I have analyzed

data section wise and finally draw a current stage map based on three section data. All of three section Data collection log sheet given in appendix A.

#### 1.4.4. Analysis of data in connection with project objectives:

Simple analytical technique is used for data sorting and analysis. Microsoft Excel program is used for some calculations and pre-designed value stream map is used to build the scenario of the value-added and non-value-added time at different sections.

In fig-2 shows cutting section current stage total working time is 535 minute, total retention or waiting time is 207 minute , Total value added activities is 61% and Non value added activities is 39%.

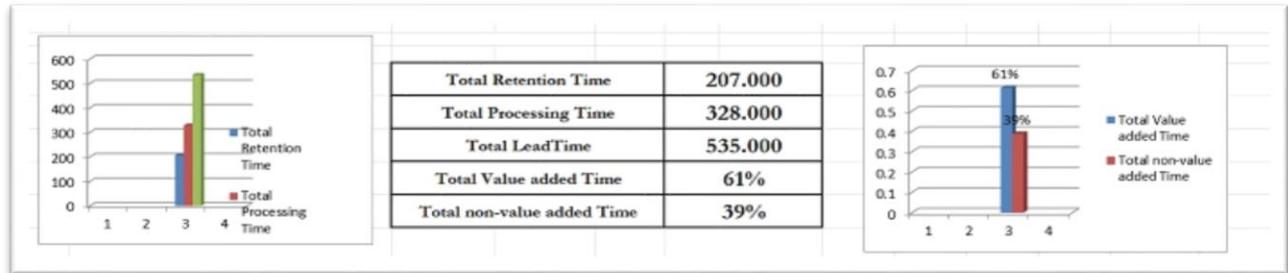


Fig-2: Current stage map for cutting section

In fig-3 shows sewing section current stage total working time is 281.105 minute, total retention or waiting time is 273.60 minute. Total processing time 7.505 minute. Total value added activities is 3% and Non value added activities is 97%.

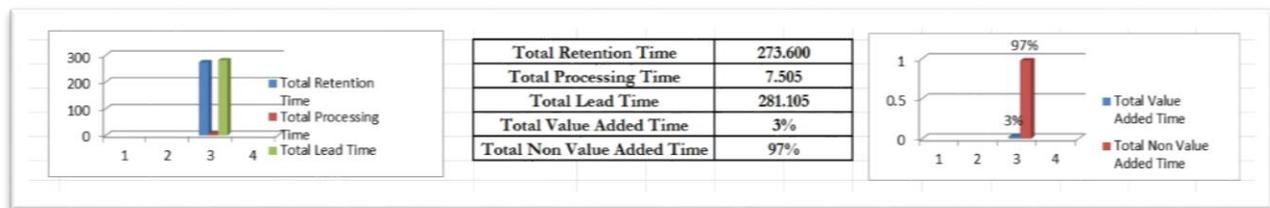


Fig-3: Current stage map for sewing section

In fig-4 depict finishing section current stage total working time is 467.225 minute, total retention or waiting time is 459 minute and total processing time is 8.225 minute. Total value added activities is 61% and Non value added activities is 39%

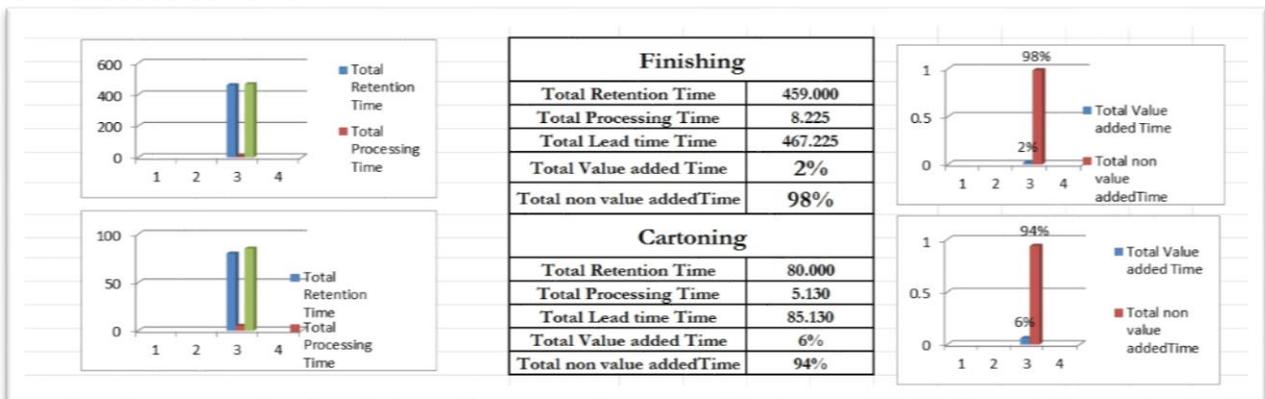


Fig-4: Current stage map for finishing section

As a product needs to move through all three sections, the total value-added and no-value-added time in these sections are calculated to identify their respective contribution to the total process. The overall scenario is depicted in Fig-5. From the figure, it is found that the value added, non-value added and value added time percentages in cutting, sewing and finishing totally respectively 75% and 25%. The overall scenario of the studied areas is finally portrayed in a value stream map (Fig-6.), which portrays the existing material and information flows along with value added and non-value-added time at different sections.

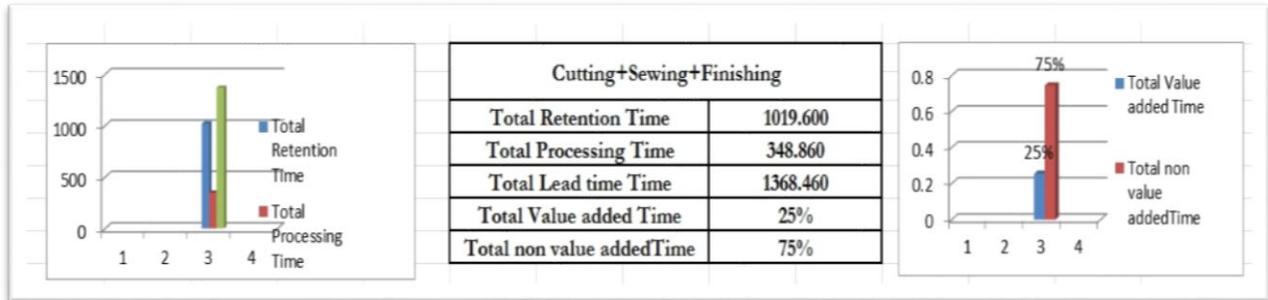


Fig-5: Overall three section current stag map

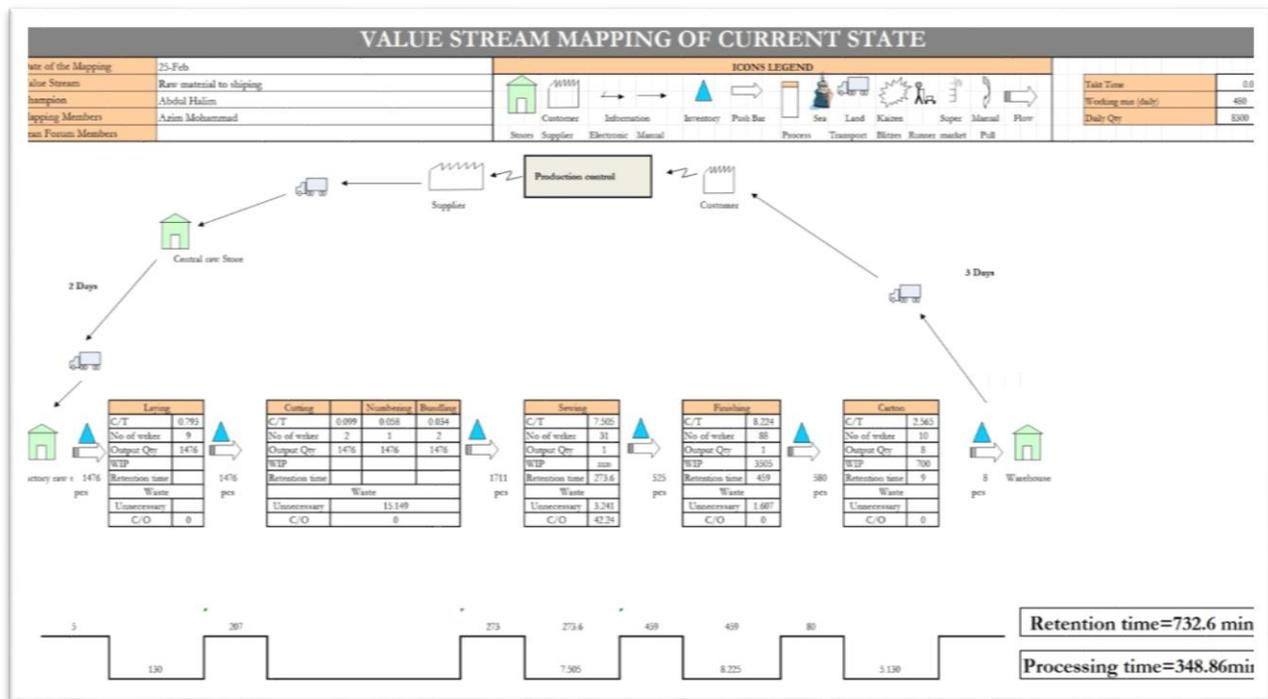


Fig-6: Current stage value stream mapping

#### 1.4.4. Revised & Draw the future Stage of VSM.

The company can implement quick change over method to those areas, where changeover is unavoidable [6]. In our identified areas of no-value adding tasks, if the company apply quick changeover method, it can significantly reduce the non-value-added time. Currently, changeover time is very high. This can be reduced to 30 minutes.

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. By applying 5s in the store, cutting, sewing, finishing section, the organization can organize the workplace. It is found that the hand tape, sticker, gum, poly, stapler and some hand tools are not placed in a particular location. This causes a problem to the uses to find them at right time. Significant amount of time is wasted just for this. By applying 5s tool, non-value added time can be reduced notably.

The study reveals that machine malfunctions and machine breakdowns are frequently caused problem in the studied organization. Because of the improper maintenance plan and practice, the organization is incurring remarkable amount of non-value-added time, which can be reduced to a tolerable level with the application of Total Productive Maintenance (TPM) technique [1]. For an example, by applying preventive maintenance in the sewing section, the organization could reduce 35.09 min of waiting time in a day.

Work-in process (WIP) is found a notable problem in the organization that adds significant amount of non-value added time. Minimizing WIP with the application of JIT philosophy, the organization could save waiting time for materials in the workstations.

Some recommended tools for future stage implementation strategy [7]

1. Quick change over (SMED)
2. 5S or work place organization method.
3. Total preventive method.
4. Multi-skill worker development for higher time utilization.
5. Implement total quality management system
6. Use Kanban system for cutting & sewing section

By applying the proposed tools and techniques, the organization could reduce its non-value-added time, thereby its production lead time. In fig-7 showed value added time has increased up to 60% and retention time become 40% and finally lead time also decreased. An overall future stage value stream mapping depicted in fig-8.

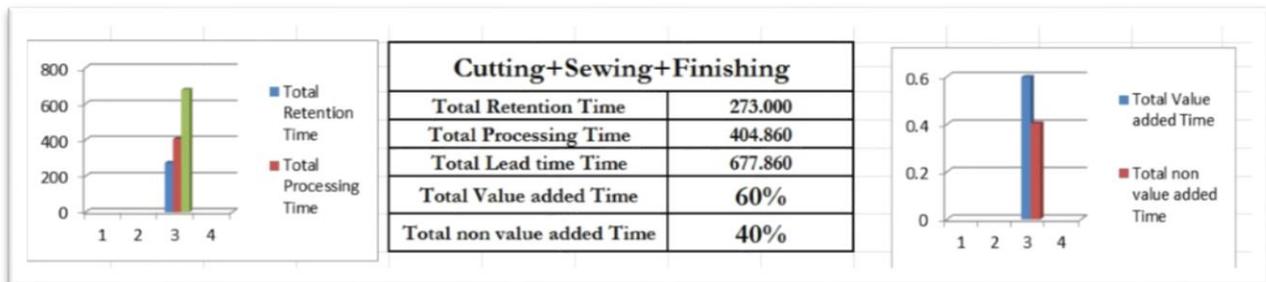


Fig-7: Proposed future stage map for all three section.



**References:**

1. [www.acronymfinder.com/Bangladesh-Garment-Manufacturers](http://www.acronymfinder.com/Bangladesh-Garment-Manufacturers).
2. Liker, Jeffery K., „The Toyota Way – 14 Management Principles from the World’s Greatest Manufacturer“, Page 27, McGraw Hill, 2004
3. [www.linkedin.com/company/masco-group-bangladesh](http://www.linkedin.com/company/masco-group-bangladesh).
4. Learning to See (2009), Rother, Mike and Shook, John, Lean Enterprise Institute.
5. [http://www.valuebasedmanagement.net/method5s\\_value\\_stream\\_mapping.html](http://www.valuebasedmanagement.net/method5s_value_stream_mapping.html).
6. Shingo Shigeo, (1996), Quick Changeover for operators: The SMED system, Productivity press.
7. New lean toolbox : Towards fast flexible flow (2004), Bicheno, John, Piccie Books.