

Implementation of Lean Management in the Company using Value Stream Mapping as a Tool

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Abstract- This research is based on a company doing trading business. After studying the company process, the objective was to improve the overall efficiency of the process by identifying the different forms of waste in the process and try to eliminate it through various lean tools. For this purpose, significant customers were taken into consideration by applying Pareto analysis on the one-year order frequency data. The overall time required for the operations was studied and analyzed. Further Value Stream Mapping was used on significant customers, and the time estimated for each process was then divided into Value-added and Non-value added activities. Non-value added activities were further identified as different types of waste associated with lean management. Accordingly, various suggestions were provided, such as improved MIS (Management Information System), E-Portal, etc. after studying the Value Stream. The study concluded by understanding a company's operations and trying to apply lean management in the best possible way to decrease the lead time and increase the overall efficiency of the company operations in terms of process time.

Keywords - Lean management, Value Stream Mapping, Waste, Value-added activities, Non- Value-added activities, Lean services, Lean tools

1. Introduction

1.1 Lean manufacturing

Lean manufacturing also referred to as lean production, is a method derived from Toyota's 1930 operating model "The Toyota Way" (Toyota Production System, TPS) which was used for manufacturing industries. The term "Lean" was first used by John Krafcik in 1988 and defined by James Womack and Daniel Jones in 1996. Lean manufacturing was made famous after James Womack, and Daniel Jones wrote the book "*The machine that changed the world*" It consisted of five fundamental principles; 'Precisely specify value by specific product, identify the value stream for each product, make value flow without interruptions, let customer pull value from the producer, and pursue perfection.' (Womack and Jones)

After reading the book various researchers have come up with different conclusions, some of which are- Womack and Jones explains how Toyota developed a production system that improves efficiency and increases their competitiveness using the Lean manufacturing principle Womack and Ross. Liker claims in his book that many organizations adopt Lean manufacturing principles to improve productivity. Womack and Ross reviewed the history of the development of Lean manufacturing, primarily at Toyota, but did not explicitly indicate how to achieve the methodology Moore, Standards and Davis. Other studies were completed recently by Standards and Davis, Liker, Womack and Jones. Key points of emphasis emerging from the book by Standards and Davis appear to be reducing process variability, reducing cycle time and above all, eliminating waste in the manufacturing process and supply chain. Liker focuses on management's responsibility on Lean, making decisions based on long term philosophy even at the expense of short term financial goals. He also notices that production levelling, employee involvement, standards, and problem solving are the main aspects of Lean methodology. Womack and Jones concur with Liker and Standards and Davis regarding emphasizing Lean thinking throughout the organization.

Lean is to identify and eliminate the process of waste to maximize customer satisfaction. The different forms of wastes identified are as follows -

Table 1 - Different Types of Waste

Waste	Description
Over Production	Producing products which customers do not require at that instance
Defects	Failure to conform to specifications or to customers' needs
Unnecessary Inventory	Excess stock which is not needed for production or by the customer
Over processing	Unnecessary activities or features that do not add value to the customer

Transportation	Unnecessary movement of material
Waiting	Failure to deliver products when needed downstream, employee
Motion	Unnecessary movement by employee

1.2 Lean in the service industry

In the early 1990s, Lean is successfully implemented in service industries such as public sectors and banking sectors, and even hospitals and airlines were adopting this methodology to improve efficiency within their organizations. It is a fact that some aspects of Lean manufacturing do not apply to all service industries; core Lean principles which apply to any industry, including service industries as: Value - customer focus; identifying the value stream; establishing flow or continuous flow; implementing a pull system, and striving for perfection. Organizations have transferred these principles to fit their environment and ensure compliance with other service standards

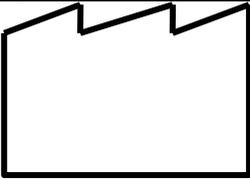
1.3 Value stream mapping

Value stream mapping and the map is a tool for management teams to explore a leaner supply chain. If the organization engaging in the activity exit the process with a deeper knowledge of the company's processes, it does not provide a plan but gives an idea on how to act on the knowledge acquired. The value stream map doesn't tell an organization how to eliminate waste in the processes, but it does tell organizations where opportunities lie to do so.

The VSM helps the organization to identify the Value-added and Non-Value added activities in the process. Value-added activities are defined as an activity that causes some tangible change to the product or Service towards its final configuration and is a set of proven techniques for driving continuous improvements. The customer is willing to pay for this activity. Non-Value added activities is defined as an activity that causes any form of waste such as delays, rework, defects, etc. towards the final configuration and the customer is not willing to pay for this activity. Further, these Non-Value added activities are divided into seven types of waste which are as follows -Transportation, Inventory, Motion, Waiting, Over Processing, Over Production, Defects.

Value Stream Mapping can be represented diagrammatically by various pre-defined VSM symbols. Some of the symbols used in the research paper are as follows -

Table 2 - VSM Icons

Symbol	Name	Symbol	Name			
	Customer/Supplier		External Shipment			
	Manual Flow		Electronic Flow			
	Kaizen Burst		Operator			
<table border="1" data-bbox="172 1843 461 1977"> <tr><td>Operator</td></tr> <tr><td>P/T</td></tr> <tr><td>L/T</td></tr> </table>	Operator	P/T	L/T	Data Table		Inventory
Operator						
P/T						
L/T						

2. OBJECTIVES

1. To identify the problem areas in the operations
2. To parse the processing time associated with various process and eliminate different types of waste using VSM as a tool
3. To suggest improvements for the effectiveness of the service company operations.

3. LITERATURE REVIEW

In the article 'THE FIVE PRINCIPLES OF LEAN' Doanh Do says that Lean is initially originated out of manufacturing practices and helped to transform the world of management. This encourages to practice continuous improvement in any organization. The five principles are given below with some of its characteristics which are as follows -

1. Define Value

- Value is defined as something customers are willing to pay for
- Latent needs of the customer
- Quantitative/ Qualitative methods are used to understand the needs of customer
- It also describes the way a customer wants the product/service to be delivered

2. Map Value Stream

- It is a process of identifying all the activities that contribute to the value of the customer
- It also identifies different types of wastes. Waste is categorized as -
 - Non-value added but necessary
 - Non-value added and not necessary
- It helps to reduce/eliminate unnecessary processes/steps
- By reducing and removing unnecessary procedures/steps, you ensure that customers are getting what they want while at the same time reducing the cost of producing that product or Service.

3. Create a flow

- Create a flow to ensure that remaining steps run smoothly without interruptions or delays.
- Some strategies used to ensure that value-adding activities flow smoothly include:
 - Breakdown steps
 - Reconfiguring the production steps
 - Levelling out the workload
 - Creating cross-functional, etc

4. Establish Pull

- Inventory is considered one of the major wastes in any production system.
- Pull system used to limit inventory and work in process (WIP) items and ensures that the required materials and information are available for a smooth flow of work.
- Pull systems are always created from the needs of the end-users, i.e. customers.

5. Pursue Perfection -

- It focuses on continuous improvement
- It strives towards perfection while delivering products/services
- It also helps to remain competitive, increase the value delivered, reduce the cost of doing business and increase profitability

David Arfmann, D. F. (2014). The Value of Lean in the Service Sector: A Critique of Theory & Practice. *International Journal of Business and Social Science*, 18-24. This paper explores the rationale and value of applying lean principles to service sector organizations. The objective of the paper had two goals. First, it challenges the foundations of lean Service and identifies several flaws in this production practice. Second, it aims to critically analyze the value of the customer pull concept in service systems. The review suggests that the benefits of lean service transformation are at least doubtful. The

study also indicates that lean service transformation is not able to address service operations challenges appropriately. The reason lies in its origins and specific characteristics. Existing research on lean services have failed to criticize lean principles when applied to the service sector. This review will partially fill this gap in the literature. The difference between types of waste in Manufacturing and Services sector are mentioned below given by David Arfmann, D. F. (2014)

Table 3 - Types of waste in Manufacturing and Services

Waste in manufacturing	Waste in services
Overproduction of goods not demanded by customers	Duplication like re-entering data, repeating details on forms and similar
Time on hand (waiting) for the next process step, machine, etc	Delay in terms of customers waiting for service delivery
Transportation of goods that is not necessary to create value	Lost opportunity to retain or win customers by ignoring them, unfriendliness, etc
Over Processing like unnecessary quality inspections within the process	Unclear communication with customers or internally leading to clarification circles
Stock on hand (inventory) that are simply waiting for further/future needs	Incorrect inventory being out of stock and hence not able to deliver
Movement of workers that is unnecessary as it does not add value to the product	Movement in terms of handling over orders, queuing customers several times
Making defective products that cannot be sold or have to be reworked	Error in the service transactions, including product damages in the product-service bundle.

In the article 'Top 25 Lean Tools' by Vorne tells about the different lean tools used in manufacturing as well as service sector. There are 25 various lean tools explained in brief, along with its usefulness and application in any organization.

Some of the tools that may be useful for this particular industry are listed below -

- ✓ 5S - Sort, Set in order, Shine, Standardize and Sustain
- ✓ Bottleneck analysis
- ✓ Continuous flow
- ✓ JIT
- ✓ KANBAN
- ✓ POKAYOKE
- ✓ KAIZEN (Continuous Improvement)
- ✓ Value streaming

Andrea Bonaccorsi, et.al, Service Value Stream Management (SVSM): Developing Lean Thinking in the Service Industry, Journal of Service Science and Management, 2011, 4, Page 428-439 This paper presents a comprehensive lean approach, based on Value Stream Management (VSM), which makes it possible to enhance the performance of a service, by spotting and tackling its criticalities. The paper also provides a detailed map of the process new icons were created, most of the lean approaches were adapted/modified and concepts such as Takt-Time and Pitch have been redefined in a more suitable way. To validate the approach, an enrolment process for application is taken into consideration.

4. RESEARCH METHODOLOGY

The study is a combination of primary and secondary data, where primary data being the company related data for analysis and secondary data collected from various sources such as research papers, news articles, reports and other online databases.

5. DISCUSSION AND ANALYSIS

5.1 Company operations

To apply lean in any organization, it is essential to understand their company operations. By studying the company operations, it will give you a brief idea about the processes carried out at the organization. For this purpose, the process was considered accordingly, and a flow chart was generated. The flow of the processes is as given below

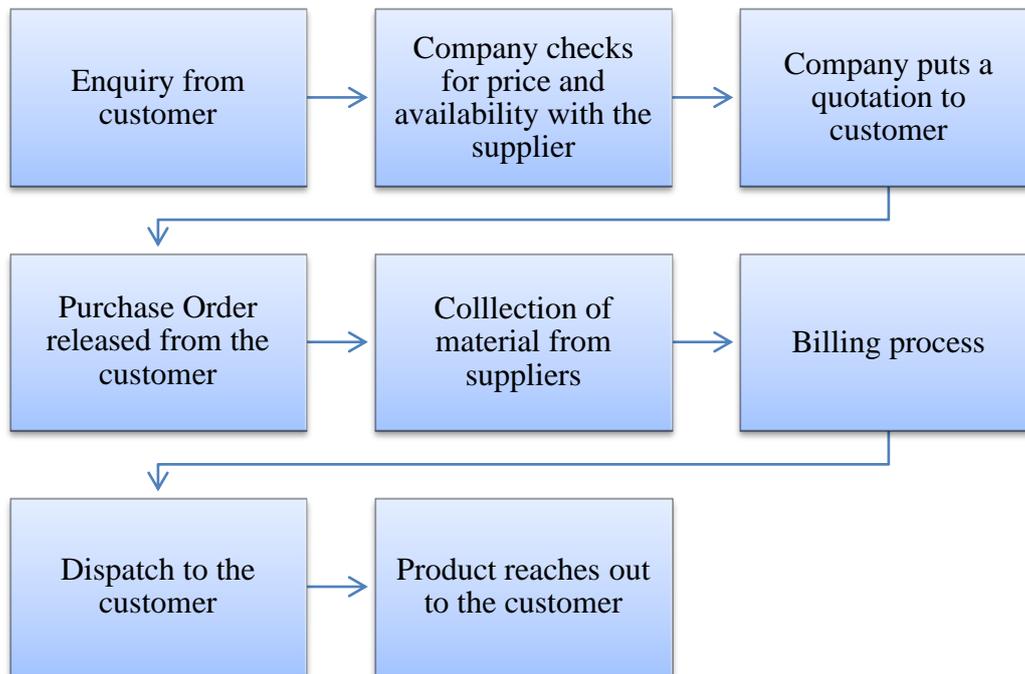


Chart 1- Process flow

5.2 Process time

After the study of the company operation, it was crucial to calculate the time required for the execution of each process to identify the different types of waste associated with each process. For this purpose four significant customers were selected as per order frequency data collected and process time data was collected for each activity and analysed to minimize it through various lean tools and techniques

Table - Process time

	Company A	Company B	Company C	Company D
<i>ENQUIRY from customer</i>	Start	Start	Start	Start
<i>Trading company checks for availability and price</i>	1-2 hrs	1-2 hrs	1-2 hrs	1-2 hrs
<i>Puts a quotation to the customer</i>	0.25 hrs	0.25 hrs	0.25 hrs	0.25 hrs
<i>PO released from Company</i>	3 hrs	3 hrs	3 hrs	3 hrs

Collection of material from vendor and bringing it to office*	1-2 hrs	1-2 hrs	1-2 hrs	1-2 hrs
Billing process	0.5 hr	0.5 hr	0.5 hr	0.5 hr
Dispatch it to company	1 hr	1 hr	1 hr	1 hr
Product reached at customer end*	2-3 hrs	2-3 hrs	2-3 hrs	2-3 hrs

Note -

*Collection of material from vendor and bringing it to office - Duration varies from vendor to vendor location.

* Product reached at customer end - Duration varies from client to client location.

After studying and analysing process and the time required for each process the cycle time is then separated out into Value added and Non-Value added activities. Further, Non-Value added activities are divided into seven types of waste which are as follows -

T-Transportation, **I** - Inventory, **M** -Motion, **W** - Waiting, **O Prc** - Over Processing, **O Prd** -Over Production, **D** - Defects

5.3 Fish Bone analysis - To understand the various types of operational wastes and the causes for that, potential stakeholders were interviewed from the management and process study was done. From the information that was collected through interviews and other data collections, a fish bone analysis was done

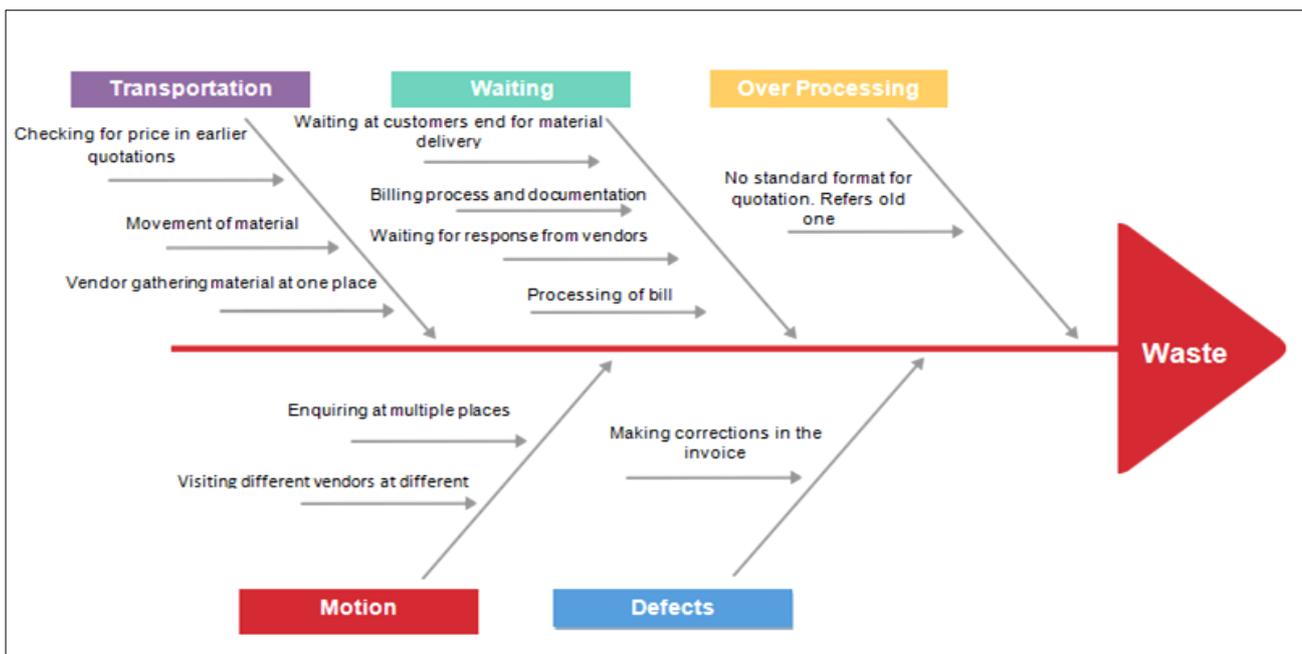


Figure 1- Fishbone diagram

This the below mentioned table is designed as per the requirements of VSM and the table would give us the proper proportions of waste which are Non-value added and are not at all necessary for the process and needs to be eliminated.

Table 5 - 7 Types of Waste

Operation Process										
Unit of measurement - Minutes										
Process Step	Cycle Time	Value Added	Non-Value Added	T	I	M	W	OPrd	OPrc	D
Enquiry from customer	-	-	-	-	-	-	-	-	-	-
Trading company checks for availability and price	120	20	100	10		30	60			
Submits quotation to the customer	15	5	10						10	
PO released when quotation submitted to customer	180	30	150	30		30	90			
Collection of material from vendor	120	60	60	10		30	20			
Billing process	30	15	15	5			5			5
Dispatch to the customer	60	30	30	10			20			
Product reaches the customer	150	90	60				60			
Totals	675	250	425	65	0	90	255	0	10	5
Proportions	100%	37%	63%	15%	0%	21%	60%	0%	2%	1%

From the above mentioned table, it is clear that in the following trading company the Non-value added proportion consists of 63% as compared to only 37% of Value added activities and major of the waste comes from waiting and motion.

For current state, VSM is diagrammatically represented using the above stated VSM icons which gives a clear picture where the process needs to be analyzed and studied. VSM consists of three parts viz. 1. Information flow 2. Product Flow 3. Process time chart.

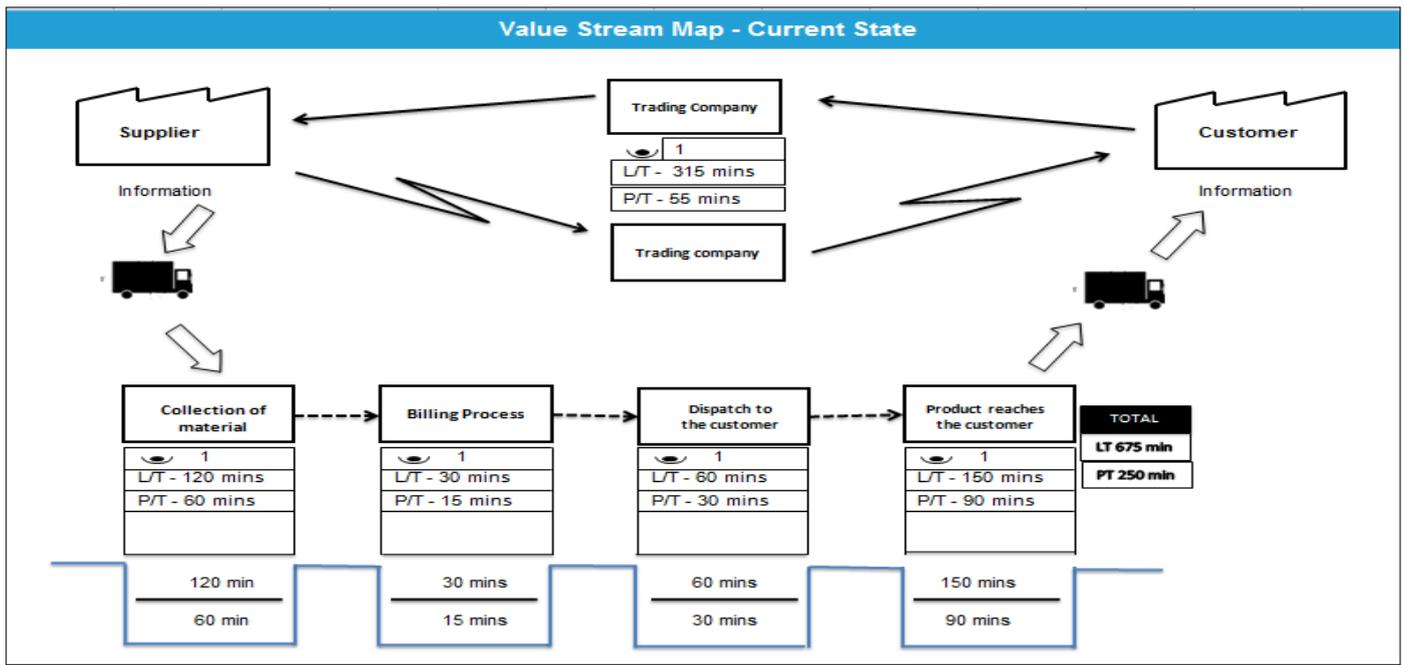


Figure 2 - VSM (Current state)

After studying the current state VSM, changes are made and future state VSM is made using necessary implementation of lean principles to make the process more effective and efficient in terms of process time

SUGGESTIONS

- ERP system must be implemented as there is no proper MIS (Management Information System) and the existing ERP consists of accounting module only. For this purpose, some ERP Solutions are suggested to the organization according to their needs & requirements and problem noticed during VSM. The advantages of the new ERP over existing ERP would be -
 - Summarized reports
 - Different modules (Accounting, Sales, Distribution, Inventory, Etc)
- An e-commerce platform for the company would help the company to save time on asking the vendors for cost and availability, and customers can also have the right product within no time. The ERP system can also be linked with the E-portal for bettering smoothening of the operations with less chances of errors in communication.
- Many of the time is lost for company in the PO (Purchase Order) generation by the customer. This creates a load on Company in some of the specific time period of a month. So it is suggested to Company to request their customers for Open PO (Purchase Order) on the basis of study on inventory management and may start with Open PO for high frequency parts on initial basis and later on increasing the number of parts in the list by studying the pattern in the future.
- Inventory
 - Since the parts currently being dealt in with high order frequency are small in size, office space can be used for storage purpose.
 - Upon an increase in the volume of products, storeroom can be considered for inventory keeping at the initial stage.
 - Further increase in order volume will lead to more substantial inventory, and then opting for warehouses will

be more feasible.

- o VMI for the parts at the location of the customer, especially for the ones in other states, will be cost-effective. But the catch is that the vendor should be reliable with the timely deliveries and maintaining proper inventory levels. Ability to change to more optimal vendor will be difficult. Vendor related data may be accessible by the third party. The above stated suggestions are represented in the below figure using VSM - Future state, where the suggestions are mentioned in a kaizen burst explosion shape.

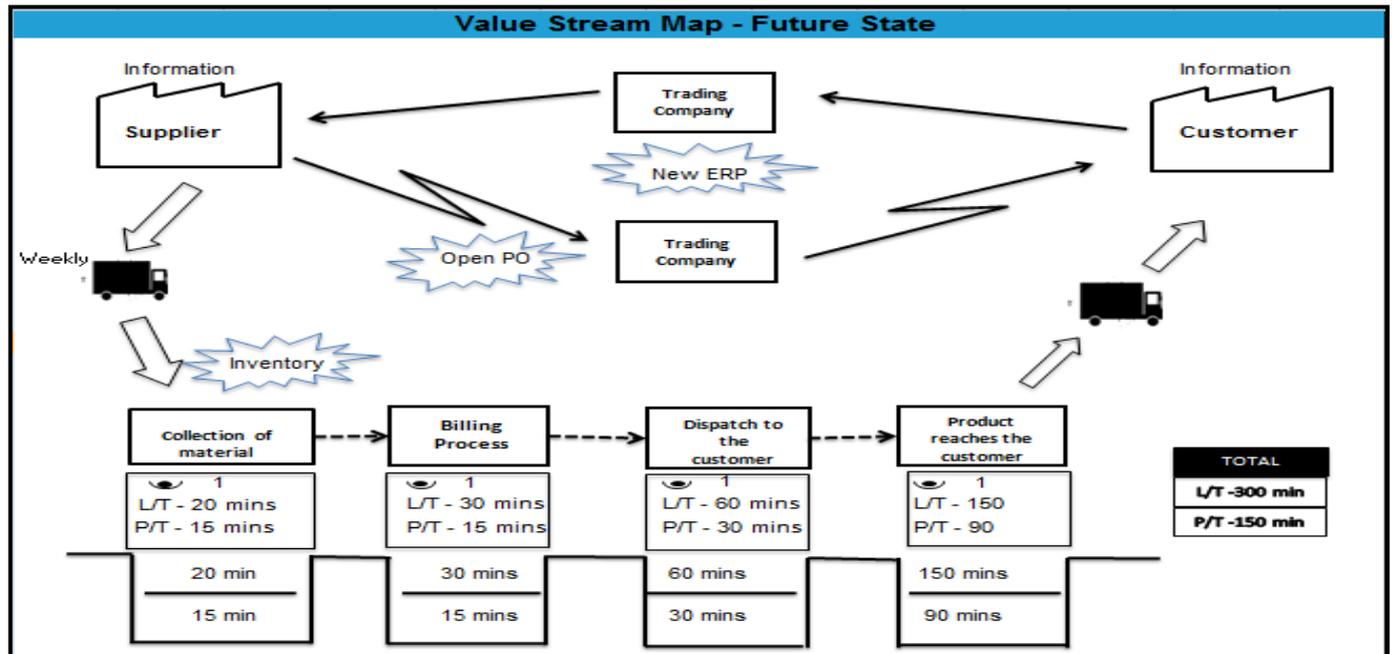


Figure 2. VSM (Future state)

CONCLUSION -

The objective was to improve the overall efficiency of the process by identifying the different forms of waste in the process and try to eliminate it through various lean tools. For this purpose, Value Stream Mapping was used as a tool to calculate the time required for each and every process and Non-value added activities were identified along with different types of waste associated with it. Different suggestions after studying the Value Stream was provided.

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BIOGRAPHIES



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