

## Inbound Logistics: A Case Study

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### Abstract

*The competition among companies and corporations forces them continually seek for improvements to achieve and keep place in the market. In the dynamism of current time, in which big brands are unstable and the cycle of life of their products are gradually shorter, adapt the production means is becoming a matter of survival, once the products among competitors are getting more and more similar, in technology and price as well. The differential consists, therefore, in production costs, storage, distribution and transport, what it is called inbound and outbound logistics. The companies, which are able to optimize their service and produce through lean manufacturer, has the possibility of putting in the market, in fact short time, new models. To make the costs more competitive, it was used in this study the Value Flow Mapping in a factory located in Manaus Industrial Pole, which has the main clients two wheels that automakers produce in Brazil. This factory works with national and international logistic, through waterway and road transport, to import raw material and inputs for its end product. The article about dissertates concepts which base the tool of Value Flow Mapping, advantages, improvements, besides difficulties for its implantation and necessary steps for its use. The main goal of this study is to sustain the process of continuing improvement, focused on Lean Production. The methodology used was the case study. The result it will reached the productive process leaner and, therefore, more competitive for global market*

**Key words:** Value Mapping Flow, Lean Production and Inbound Logistic



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### INTRODUCTION

The consumer markets are in constantly mutation and their needs change faster and faster each day. In this sense, organizations require a higher approach with their internal processes to have a response to this demand in the same rhythm it is prompted. That way the lean philosophy is applied in manufacture.

On the other hand, a very fragmented look leads to mistakes when making decisions. To understand all the phenomenon it is necessary to see the processes from their origin to their final destination. After the matters of availability and stock management are exposed, the importance of knowing the whole will be analyzed, i.e. the evaluation of all the supply chain as a single system.

According to SOUZA (2002), logistics science was originated in the 18th century. In the reign of Louis XIV there was the rank of Marsha l-General of Lógis-, responsible for supplying and war material transport in the battles. However, GALLO (1998, says that the first general to use that term was general Von Clausen of Frederick of Prussia, and the technique was developed after by the American intelligence (CIA), with Harvard professors, to World War II.

In Brazil, the logistics appeared in the early 80's, shortly after the explosion of Information Technology and internet usage. Some entities have emerged, among them the ASLOG (Brazilian Association of Logistics). According to this Association, the logistics concept is defined as "the process of planning, implementing and controlling efficiently, the correct cost, the flow, and storage of raw materials, stock during production and finished products, from the point of origin to the final consumer, in order to meet customer requirements." FILHO (2001 p. 26).

Initially the term logistics reported only to physical distribution of materials CHING (2001) and, along the time, this concept evolved and now it is understood as the integration among several areas. Later,

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logistics started to be identified as a differentiating element and provider of competitiveness that comes from the preoccupation with the interfaces among many organizational functions COYLE, BARDI & LANGLEY (1996). From this environment of changes, in the beginning of 80's decade the Supply Chain arises, integrated by a list of organizations whose main goal is the final consumer satisfaction.

In the last years, Mike ROTHER and John SHOOK, (learning to See .1999) have been trying to find ways to assist companies to have a sight over the flow as a whole, with the goal of deploying a lean production system, instead of an isolated system of improvements. On the other hand, Mike ROTHER after a long search to articulate the concepts and lean techniques, which were analyzed isolated, figured out the mapping method while studying the practices of Toyota lean implementation.

The starting point of the lean thinking is the value. It is necessary to start with a consistent attempt to define precisely the value in terms of specific products with specific capacity, offered at prices defined through dialogue with specific clients WOMACK (2006).

## **METHODOLOGY**

The work is a study case in a factory located in the Industrial Pole of Manaus, built in the early eighties and has as main customers two of the biggest two wheels automakers produced in Brazil. The factory works with national and international logistics through the waterway and roadway, for raw materials import and supplies for its final product. Nationally, the factory imports inputs from Porto Alegre (RS), Salvador (SC), São Paulo (SP), Belo Horizonte (BH) and Belem (PA). Internationally, because of the uniformity of products on a global scale, the inputs are imported from Japan, where the company's headquarters is located.

## **INBOUND AND OUTBOUND LOGISTICS**

Before continuing the theme, it is important to understand how the supply chain works and their conceptual referential described in Figure 2, below:

### **LOGISTICS INBOUND**

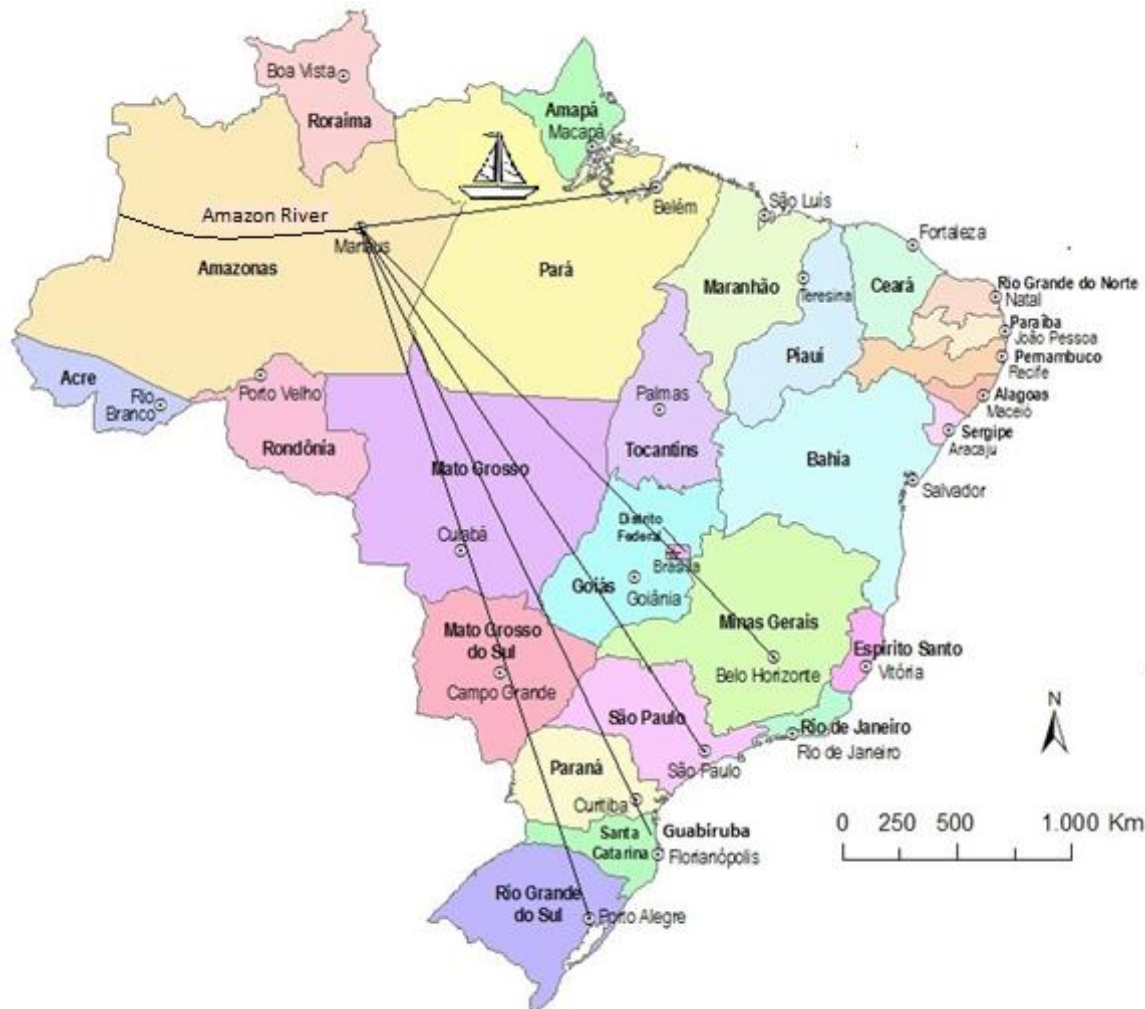
Inbound logistics is part of business logistics which corresponds to the set of operations that are associated with the flow of materials and information, from the source of raw materials to the entrance at the factory.

In purchasing the commodity buyer is responsible for issuing the purchase order, which will be sent to the supplier, according to the annual planning of the final customer. Among the requested materials are: raw materials, purchased parts, machinery, supplies and all other goods and services used in the production system.

The buying process is divided into three parts: purchase requisition, request for quotation and purchase order.

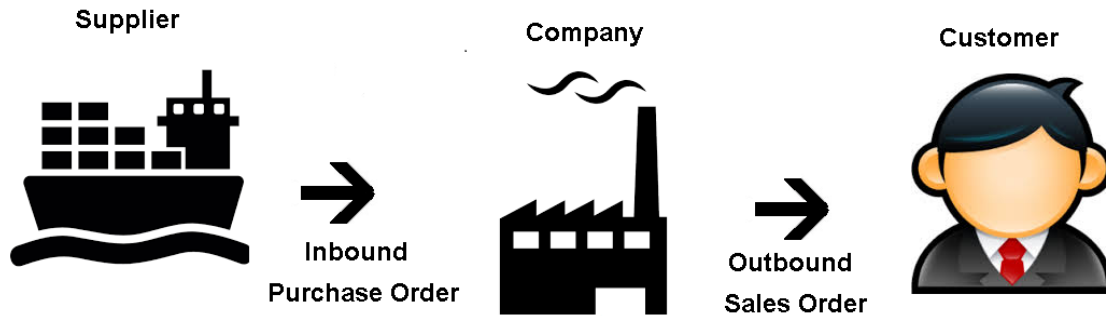
1. Purchase Requisition: authorizes the Purchasing Department to acquire the product and services. The request includes an identification of requested object, quantity, date or requested delivery schedule, how the purchase must be charged, where the product or service must be delivered and the confirmation of the responsible for the approval of the purchase.
2. Quote request: it is prepared by the Purchasing Department and sent to suppliers that are able to meet the requirements of cost and quality defined by the company.
3. Include: material specifications, purchase amount, date and delivery schedule wanted, where the product or service purchased must be delivered, and the date that the supplier choice will be completed. Quotation requests generally ask each supplier as followed: unit price and total price, information on whether the supplier will pay the freight cost, discounts for immediate payment, and other terms of payment, date or delivery schedule, and any special conditions of the supplier.

Figure 1 - Route loads within Brazil



4. Purchase order: it is the most important instrument of purchase. It is the basis of the authority of suppliers to produce the goods or services, and represents the obligation of buyers to pay for the items. When a purchase order is issued in the absence of request for quotation, there is a legal commitment when the supplier recognizes acceptance of the purchase order. Purchase order forms include: the purchase order number, shipping and billing, unit price and total price, discounts for payment in cash and any special terms of purchase.
5. After the order issue, which is the last step in purchasing process, the supplier and the owner or carrier, are contacted to align the import process, since the company does not use freight services agency. So this is a direct service, in which the cost is lower, because there is no commissioning by the service.

Figure 2 - Inbound and Outbound Logistics



The waterway route used is via Panama international fluvial infrastructure, with an average transit time, from the supplier to the entrance in the factory, of 40 days. The road route is made via Belém (PA), where it is used waterway service to Manaus, see Figure 3. The average transit time until the entrance of the factory is 12 days.

The factory owns three deposits: for small components, for fuel pump parts, and for chemical products. As soon as the cargo arrives at the factory, the fiscal sector registers the entry of materials in the system, and the same are referred to the deposit.

Figure 3 - Cargo Transport in the Amazon River-Belem to Manaus





## VALUE CHAIN AS A GOAL OF LEAN MANUFACTURING

To achieve lean manufacturing it was defined a set of activities as targets for increasing capacity of dealing with changes and the minimization of waste in production, establishing a true innovative management organization. These organizations have as principles: have (and maintain) the right items in the right places, at the right time and in the correct amount; create and nurture effective relationships within the value chain; work in order to have continuous improvement in pursuit of optimal quality since the first unit delivered.

1. WOMACK and JONES (2004) analyzed several implementations of improvement influenced by the Toyota Production System (TPS), ending up in the identification of their essential causes, as principles of Lean Thinking. The five principles are the following ones:
2. Specify value for each product- consists in the noticeable features to the client, in terms of what each product or service provides. These characteristics make the difference at the time of the client's decision to acquire them. The higher the value perceived by the customer, the greater the satisfaction. Therefore, loyalty will grow even more. Examples of perceived value: price, quality, delivery, provided service, specific differentiating features.
3. Identify value chain for each product-Defines a process or a set of stages that each product or service has to pass to be completed. To analyze the existing value in the chain, it is necessary to identify existing waste so that they can be eliminated. This will be made step by step throughout the process. It is possible to verify unnecessary time, inappropriate activities, inefficient working methods, undefined or misfit quality standards.
4. Make the value flow happen with no interruption – It may refer to the flow of people, materials, information or capital. This flow goes along the entire value chain and the goal is to be continuous, i.e. without any bottlenecks that imply the stopover or reduced activity at certain points in the chain. For the answer to customer requests be the smallest as possible, bottlenecks detected should be reduced or eliminated, increasing the responsiveness capacity, the costs that would be reduced, making the Organization more competitive.
5. Let the client pull product value-With this principle, it is intended to refer that the production of a product or service must be started only when the customer orders, considering the features which the client establishes. Here, it is applied the concept of *just-in-time* producing or serving at the moment in right amounts, which allows the reduction of excessive production and consequently a reduction of excessive stocks, as well as the use of unnecessary labor.
6. Chasing perfection (product in measure, delivery time zero, no provisioning)-this principle has implied the importance of quality and the absence of work repetition. You must invest in training employees, distribute quality instructions to the main tasks, set standards and criteria of adjusted quality and ensure a good monitoring of all stages of the process.

This way it is possible to have a good productivity, reduced costs, better response times and a good image in front of the client, getting their loyalty. Identify and map with precision the complete value of the product flow is fundamental task to detect waste in each process and implement actions to eliminate them, creating a new value flow optimized writes ROTHER and SHOOK (1998).

To WOMACK and JONES (2004) the value chain is a set of all the specific actions necessary to make a product go through three critical stages of any business:

1. Troubleshooting: it goes from conception to product launch, through detailed project and engineering process;
2. Information management: from receiving the request to delivery, following a detailed schedule;
3. Physical transformation: it goes from raw material to finished product in the hands of the client.

In the phase of identification it is important to separate each one of the processes into three types: First those which effectively aggregate values, then those who do not aggregate values but are important for the maintenance of processes and quality, and finally those that do not add value and should be eliminated.

## VALUE STREAM MAPPING

Shingo begins the first chapter of the book *the Toyota Production System* with the phrase: before studying the Toyota Production System, it is necessary to understand the function of production as a whole ". With this sentence Shingo (1996) points out that to interfere in a process it is necessary to dominate each part of it.

Thus, in addition to the material flow, which is the movement of materials within the plant, it must be taken into consideration with the same importance, the flow of information, which is the responsible for notifying each process what to manufacture or do next.

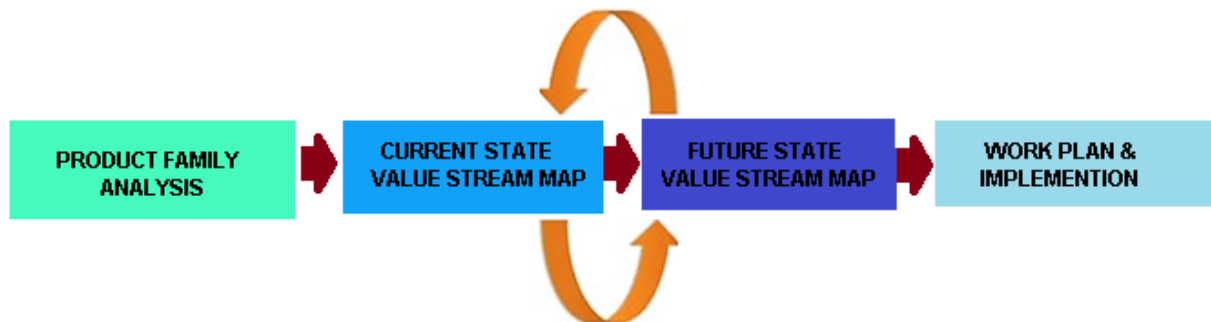
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1. Troubleshooting: it goes from conception to product launch, through detailed project and engineering process;
2. Information management: it goes from request to delivery, according to detailed and pre-established schedule;
3. Physical transformation: it goes from raw material to final product in the hands of the client.
4. Identification stage was important to separate each one of the processes through the following consideration: First those which effectively aggregate values, then those which do not aggregate values, but are important for maintenance of processes and quality, and finally those that do not add value and should be eliminated.

## STEPS IN THE FVM AT

The FVM can be divided into 5 (five) stages, four of them are shown in Figure 4 - the Division of initial stage of FVM at in 3 (four) steps.

Figure 4 - Initial stage of the VSM at. Source: Rother & Shook, 1999



First stage. Product family: Rother & Shook (1999) defined it as a group of products that go through similar steps of processing and use common equipment in their previous processes. The choice of the family of products for mapping process should be brought up from the consumer side.

Second stage. Design of current and future States: initially the flow is mapped as it is occurring today, collecting data from the factory ground. These data are necessary for developing the future State, which will be a map with proposed improvements in order to reduce waste. It is possible to notice the existence of arrows linking the current and future States, showing the dependency between them. It means that while current state is made it is showed up ideas for the creation of a future State, and developing this, information will be identified on the current state that before was not seen.

Third stage. Implementation plan: Describes how it is planned to get to the future State. After you have put it into practice, another map of the future State must be drawn, i.e. it should occur a continuous improvement in the value stream level.

### **Difficulties for deploying mapping**

It is possible to show several barriers that make it difficult the implementation of FVM. The following are some of them (XAVIER & SAMPSON, 2013):

1. Cluttered mapping: An organization's value flow should not be mapped all at once.
2. The mapping cannot be delegated: it is a responsibility of top management, with its direct involvement.
3. The FVM is different from traditional maps processes (PM): the PMs usually focus on individual processes, while the FVM focuses on the flow of materials and information related to product families.
4. Levels of stock (raw materials, in transit or finished product): it must be observed in their value flow.
5. Monitor the execution of the FVM daily; barriers, which may appear after a change, must be removed.

### **Benefits by applying the mapping**

To SHINGO (1996), combining the progress of the implementation of the QCT system (quick-change of tool), a series of results begin to emerge, such as:

1. Reduction of set-up and lead-time;
2. Productive capacity increase;
3. Production without stock;
4. Production flexibility increase;
5. Preference for new work system by operators; Simplification of operations;
6. Standardization of activities;
7. Elimination of errors in the implementation of the set-ups;
8. Reduction of unproductive tasks; Reduction of investment in new machinery.

### **OUTBOUND LOGISTICS**

Once the goods are produced, they need to get to the final consumer. How this is done, it should be cost efficient and satisfy the growing expectations in respect to the service performed and availability of the offered product. For simple storage solutions, shared structures can be made for example, which will lead to a reduction of costs for the client. Here are some examples of services that may be performed on out-bound logistics:

1. Line-hauls: transfer of materials and products between a customer's two locations, such as from a local warehouse and a regional distribution center.
2. Delivery: delivery services for both residential and commercial addresses.
3. Installation: install consumer goods or spare parts at home or in work environments.
4. Picking and packing: collection of applications and packaging services. Get item by item at the warehouse to match them and answer the request of each client. Use of the most advanced and innovative software to achieve the best service levels possible, i.e. 25 (twenty-five) deliveries per day; 5 (five) trucks being 1 spare, deliveries are made from Monday to Friday from 07:00 to 01:50, and on Saturdays when there is need.

### **RESULTS AND COMMENTS**

Inbound logistics kept the supply through the maintenance of flow, and not through the generation of stocks.

Movement, storage and transport, even if highly minimized, will always exist and the challenge is to manage this environment the leanest way as possible.

Receiving, contrary to what it may seem at first, is not only an order of arrival for entrance of trucks; it is an integral part of the production planning and control. This operation as in the whole logistics chain must be installed similar to *takt time* and the mix of client production to maintain the uninterrupted flow,

keeping the material in movement. At the time the material remain stationary, it become stock. When making the receiving worksheet, rules must be written down in a clear and rigid way as follows:

1. The sequence of movement of trucks in the yard of the factory must obey the sequence and rhythm of demand of the production planning and control;
2. The ideal sequence is the one that follows a fixed program of loading volume and maintains therefore a fixed quantity of receiving trucks equitably distributed within the workday similar to the production process, which is, following the same rhythm and work shift.

## CONCLUSION

The company has achieved significant results in the application of techniques and tools of lean manufacturing. However, even more significant results were achieved when this management philosophy was expanded, including the lean environment in the environment internal logistics activities, inbound and outbound.

There is not only one way to implement a logistics project, whether it is Inbound or Outbound, it is needed to study sets of logistics formats that interact among them, making the timing of the operation more organic as possible, i.e. without impoundments of steal material generating stock and always focused on a shorter Lead Time.

What JIT, which aimed to maintain the flow of material, supplied with the delivery of the materials needed, when needed, in the exact amount needed. However, because of the distance between the suppliers, the factory works with a minimum stock and these are kept ready to use.

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