

IMPROVING THE EFFICIENCY OF A 3PL USING LEAN PRINCIPLES

**Dissertation submitted to College of Management & Economic Studies for the partial
fulfillment of the degree of**

MBA (LOGISTICS AND SUPPLY CHAIN MANAGEMENT)

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CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation report on “SUPPLIER SELECTION AND SCORING (EVALUATION) IN AUTOMOBILE INDUSTRY” completed and submitted to University of Petroleum and Energy Studies, Dehradun by (student name) in partial fulfillment of the provisions and requirements for the award of degree of MASTER OF BUSINESS ADMINISTRATION (LOGISTICS AND SUPPLY CHAIN MANAGEMENT), 2009-2011 is a bonafide work carried by the scholar under my supervision and guidance.

To the best of my knowledge and belief the work has been based on investigation made, data collected and analyzed by the scholar, and this work has not been submitted anywhere else for any other university or institution for the award of any degree/diploma.

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Dated.....

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Executive summary:

The current scenario in the global Logistics market is rapidly changing. The need for fast, efficient and trustworthy logistics providers are in demand. But the efficiency and the work accuracy of the logistics service providers are less in no. The demand has to be met.

The 3PL industry in this path is moving ahead with lots of innovations and also with a lot of success stories behind them. Although 3PL services are provided in India since a decade or more, the efficiency of the domestic players compared to the MNCs are very less. The service, the costs and overall experience are not quite satisfactory. But, since few years this has changed to something better and efficient.

Firms using standard principles, operating manuals with extra edge to customize according to the customer requirements have become a bit of common in the industry. The firms have been experimenting on various moves and have got a lot of positive results.

This research study is based on the 3PL industry, their efficiency, shortcomings, and problems they are facing, expectations of the customers, the benefits of the outsourcing, use internationally adopted popular lean principles in the process to overcome the issues and to study how lean practice is going to change the scenario.

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Chapter 1: Introduction.

India is the 2nd largest attractive market for logistics in the world. Lean manufacturing originally started at “Toyota” motors in Japan. The various principles like: Kaizen, Poka-yoke, SMED, Genchi- Genbutsu, Process focus, JIT, Cultural change, highly used in manufacturing industry.

In-terms of operations and improvements, the service industries in general are long way behind the manufacturing industries.

Lean practices in service industry are what something new thing going on in the current market. There has been a presumption that lean can only be used in the manufacturing industry until few years back. There has been a lots of innovation and introduction of lean in service industry and are being successful too. Lean has entered banking sector, insurance, tourism, hospitality and many more.

But, the use of lean in 3PL was not in practice until some of the MNCs tried to do that too. There has been a positive results for this and it has continued to do so.

This research paper concentrates on what all can be a problem in a 3PL managing a tyre warehouse and what can be the solution for using it in 3PL.

Chapter 2: Research methodology:

Business problem:

- Customer satisfaction.
- On- time delivery of the product/ service.
- Operational processes.

Research problem:

- The areas where all the lean principles can be adopted.

Research gap:

- Unavailability of secondary data.
- Comparative study is not possible.

Research objective:

- To study the operational process of 3PL firm.
- To find the areas where lean can be practiced.

Research methodology:

- Type of research design: Exploratory.
- Type of data: Primary data and Secondary data.
- Methods of data collection: interviews, observations, trade journals, research papers.
- Scope of the study: limited to 3PL organizations.
- Limitations: lack of data, may not be implemented in a short span of time.

Review of literature:

Authors:	Context:	Inferences:
Julia Hanna	Bringing lean principles to service industries	Basic implementation of lean at various levels of an organization
Lonnie Wilson	How to implement lean manufacturing	Understanding of lean concepts
Karl. B Manrodt and Kate Vitasek	Lean practices in Supply chain	Use of lean practices in supply chain
2105 Third party logistics study	Facts and figures	Understanding the 3PL markets.

3 PL:

Definition:

“A person who solely receives, holds, or otherwise transports a consumer product in the ordinary course of business but who does not take title to the product.” **Council of Supply Chain Management Professionals.**

Third Party Logistics is the activity of outsourcing activities related to Logistics and Distribution. The 3PL industry includes Logistics Solution Providers (LSPs) and the shippers whose business processes they support. – **Logistics Focus**

Third Party Logistics (3PL) is the function by which the owner of goods (The Client Company) outsources various elements of the supply chain to one 3PL company that can perform the management function of the clients inbound freight, customs, warehousing, order fulfilment, distribution, and outbound freight to the clients customers. – **Maxwell**

From the above definitions we can note that, a 3PL is firm or a company which provides logistics services to the shippers which may or may not be inclusive of handling inbound freight, warehousing, packing, outbound freight, customs, order fulfillment and distribution at a cost, and operated as per the requirements of the shipper where the title of ownership of the goods are not transferred to the logistical service provider.

History of 3PL:

The beginning of 3PL was roughly around in 1970s and 1980s, when companies outsourced more and more logistics services to the 3rd parties so as to cut the costs and concentrate more on their core competencies.

According to CSCMP glossary, The term “3PL” was 1st used in the early 1970s to identify intermodal marketing companies (IMCs) in transportation contracts. Up to that point, contracts for transportation had featured only two parties, the shipper and the carrier. When IMCs entered the picture as intermediaries that accepted shipments from the shippers and tendered them to the rail carriers they became the third party to the contract, the 3PL.

Over the period 3PLs have grown themselves from just providing transportation and warehousing services to provide tailor made logistics services to the customers like, handling the entire logistics operations starting from, planning till execution of the order fulfillment of the customers of the shippers including specialized services like, picking, packing and kitting of the products.

In 1996, the term 3PL was registered by **Accenture** as a trademark and defined as, “*A supply chain integrator that assembles and manages resources, capabilities and technology of its own organization with those of complimentary service providers to deliver a comprehensive supply chain solution.*”

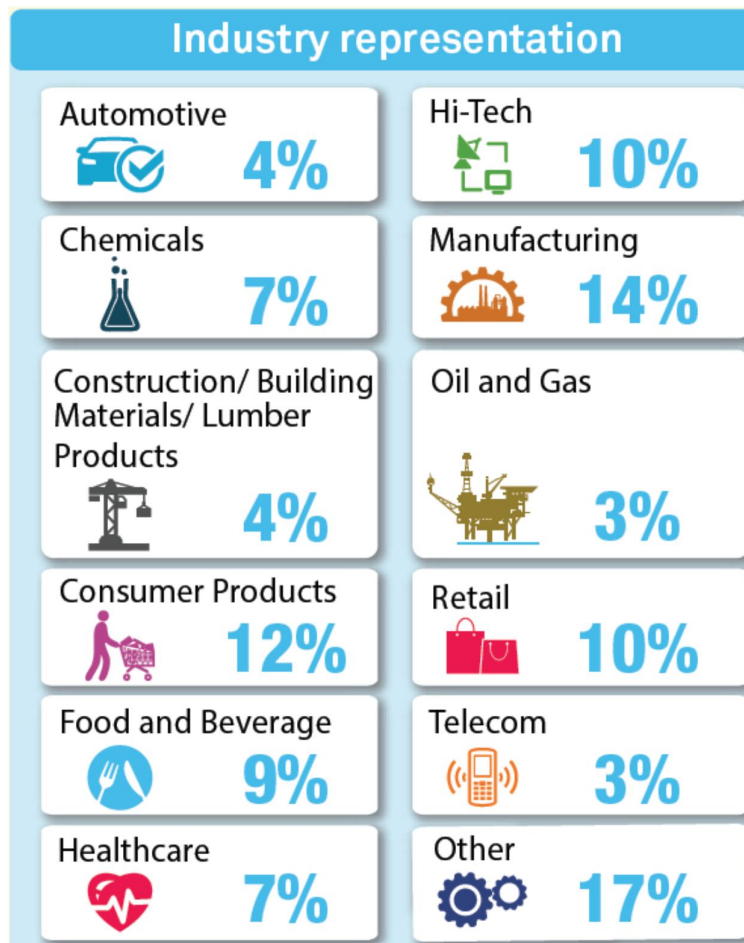
During 1990s, 3PL services were not mere handling the non-core operations of the shippers but also to provide the complete Supply Chain solutions by planning and executing the logistics services.

During 2000s, the technology came in handy and most of the 3PL service providers started using both standard and tailor made software’s solutions to make the logistics operation smoother and efficient.

Current scenario of 3PL:

The current scenario of the 3PL industry is more promising than the past. The performance of the 3PL firms has become better with the technologies and new innovation on various logistics activities. The support and the focus by the government and the companies have made all change. The willingness of bigger concerns and SMEs to outsource the logistics activities have made it possible for more 3PL firms to emerge at an increasing pace. Although all the firms who provide 3PL services are not the best, but the competition and growing need to fulfil the customer satisfaction has made the competing 3PLs to innovate more, reduce cost, serve in varied levels and perform better at various levels.

The outsourcing has also become a major decision and more and more companies are heading up towards it. Looking into the facts, the major outsourcer to 3PLs is manufacturing followed by consumer products and hi-tech and retails. Following is an industry representation of the users globally :



Source: 2015 Annual Third Party Logistics Study.

Financial aspects of 3PL:

When it comes to the financial aspect of a 3PL, the first thing is the expenditure which has been made and on what?

- The total logistics expenditure is at 7% of the sales revenue.
- The major expenditure is made on the transportation spend at 51% followed by the warehousing expenses at 36%.

Types of 3PL:

3PL can be differentiated based on the types of services they provide. Some of them are as follows:

- **Transportation based 3PL services:**

These firms provide services of transportation and beyond transportation to offer a comprehensive set of logistics activities. In here, the leveraged 3PLs use the assets of other firms and non-leveraged firms use assets belonging solely to the parent firms.

Examples: FedEx Logistics, UPS Logistics.

- **Warehouse/ Distribution based 3PL services:**

They start from warehousing and offer other activities too like, picking, packing, distribution; inbound and outbound freight management.

Examples: DSC Logistics, Caterpillar Logistics.

- **Forwarder based 3PL services:**

These 3PLs act as middlemen; they act as the freight forwarders. They offer a wide range of logistics services based as a leveraged logistics provider with non-asset owners.

Example: Kuehne& Nagle, C. H. Robinson.

- **Shipper/ Management based 3PL services:**

The firms which offer a wide range of management of logistics operation from beginning to the end of the process. They are the provider of technology in various logistics aspects to eliminate the heavy processes and make a smoother process like in, freight payment, accounting, carrier relations and also the information on freight data and matrix reports for better visibility and control on future logistics outcomes.

Example: AFS Logistics, GlobalTranz.

- **Financial based 3PL services:**

They provide services in the areas like, freight payment and auditing, cost accounting and control, tools for monitoring, booking, tracking, tracing and managing inventory.

Example: Cass Information systems, GE Information Services.

- **Information based 3PL services:**

They provide services based on the information. They are internet based companies which serves as the B2B service provider.

Example: Transplace, Nistevo.

Levels of outsourcing in a 3rd Party Logistics Services:

When a shipper decides to outsource the logistics services to a 3PL, they decide to outsource the logistics operations at some level. Those levels can be:

- **Transactional outsourcing:**

These types of outsourcing are limited to certain transactions only. There will not be any long term contracts, bonding or setting up of any infrastructure for the shippers on a long term basis. Once the transaction is done, the contract is over.

- **Tactical outsourcing:**

These are negotiated long term contracts. Here there will be creation of infrastructure, exchange of information on a regular basis. There will be an integrated IT system to facilitate the free flow of information and create supply chain visibility.

- **Strategic outsourcing:**

Based on certain long term contracts with successful outcomes, 3PL companies become the partners in supply chain management and they establish transactional transparency.

What does a shipper want from 3PL to be successful in the logistics operation and what a 3PL believes to have those tools to be successful.

What tools a 3PL needs to be successful (top 6 from user vs top 6 from provider)

Shippers

1. Transportation management (execution)
2. EDI
3. Transportation management (planning)
4. Warehouse/DC management
5. Visibility (order, shipment, inventory, etc.)
6. Web portals for booking, order tracking, inventory, etc.

Provider

1. EDI
2. Transportation management (execution)
3. Customer order management
4. Transportation management (planning)
5. Visibility (order, shipment, inventory, etc.)
6. Web portals for booking, order tracking, inventory, etc.

Source: 2105 Annual Third Party Logistics Study.

The Growth rate of 3PL markets:

The current revenue increase shows the eventual growth of the 3PL markets but also the down growth of certain markets. As the need for 3PL service providers increase the scope for the market increases at the same level given the market focus and the support from the economy and outsourcers are positive. The fact shows that Asia-Pacific region has a higher growth percentage compared to other markets. Keeping aside the socio-economic factors, Asia-Pacific region had a huge growth during the period of 2011-12 and is still in a positive growth stage as the growing markets of Asia and Pacific are at a positive pace in getting more of a manufacturing and outsourcing hub for various industry, especially for electronics and automobile markets. The growth in this region has a positive and a higher growth rate year by year, 10.9% CAGR.

Region	2012 Global 3PL Revenues (US\$Billions)	2013 Global 3PL Revenues (US\$Billions)	Percent Change 2012 to 2013	Percent Change 2011 to 2012 ^a	Percent Change 2010 to 2011 ^b	CAGR 2006-2013
North America	\$ 171.2	\$ 176.2	+ 2.9%	+ 6.7%	+ 7.2%	+ 4.0%
Europe	158.0	158.1	+0.01%	- 2.6%	- 2.8%	- 0.6%
Asia-Pacific	242.7	255.6	+ 5.3%	+ 23.6%	+ 21.2%	+ 10.9%
South America	43.6	44.9	+ 3.0%	+ 12.4%	+ 43.6%	+ 10.4%
Other Regions	69.6	69.0	- 0.01%	+ 6.4%	+ 54.0%	
Total	\$ 685.1	\$ 703.8	+ 2.7%	+ 9.9%	+ 13.7%	

Source: 2105 Annual Third Party Logistics Study.

Apart from the higher growth rates, there has been a positive change in various deliverables from the 3PLs. the logistics fixed assets has gotten decreased which shows more utilization of the available resources at the market. Although with the slower growth rate of outsourcing, the deliverables like, order fill rate and order accuracy has a positive increase with 60% to 66% and 61% to 66% respectively.

Results		2013 Study	2014 Study	2015 Study
Logistics Cost Reduction		15%	11%	9%
Inventory Cost Reduction		8%	6%	5%
Logistics Fixed Asset Reduction		26%	23%	15%
Order Fill Rate	Changed From	58%	66%	60%
	Changed To	65%	68%	66%
Order Accuracy	Changed From	67%	68%	61%
	Changed To	72%	69%	66%

Benefits of 3PL services:

Beyond the ability to save on freight costs, there are a number of other benefits realized by transportation management services to include:

1. **Better Decision Making through Data:** Data plays an important role in making any decisions. With better data you can make better decisions. So, most of the 3PLs have better data on the market than any other companies. By having better data one can drive down the costs
2. **Process Enforcement:** When a 3PL offers varied services through technology, a client company can build in the custom business logic to make sure users of the services are provided with a best experience.
3. **Domain Expertise and Consultation for Continuous Improvement:** When a company hires a 3PL who is an expert at the service you require, they not only provide you with the knowledge they have gained but also how to encounter the problems you face on a daily basis. It behooves the 3PL to make sure you are informed on all best practices and the benefit and also ROI can be realized eventually.
4. **Warehouse Efficiencies:** To get a better efficiency in the warehouse, there should also be a better transportation management. If a 3PL has a better management of the transportation, then the management in a warehouse will be more efficient, as the 3PL get transportation in less delay of time and with a hassle free operation in hand.
5. **Customer Satisfaction:** With a better management of all the logistics operations, the level of customer satisfaction would increase eventually.
6. **New Delivery Capabilities:** By eliminating the weeds in the process, the capability to meet the deadlines increases, so as the delivery capabilities.

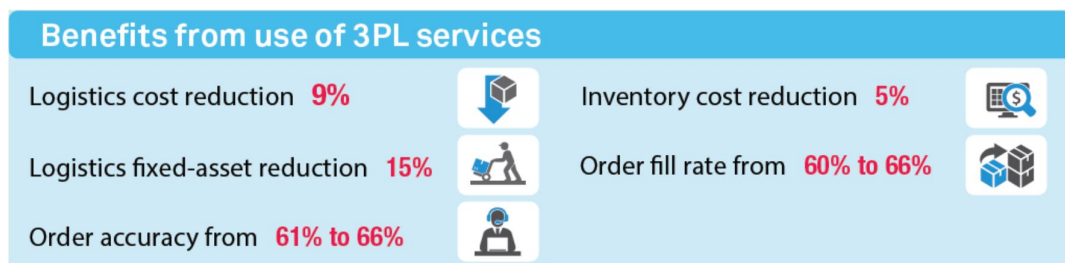
7. **Inventory Reductions:** As mentioned earlier, with the better transportation management, the reduction in inventory can be achieved with the practices like, JIT. The more data the firm has the more efficiently they can manage the inventory.

8. **Ability to Focus on Core business or allow managers the opportunity to focus on other projects:** The less of interference in the non-core activities, makes it possible to be more strategic and more innovative on the core business operation. And with the right partner, the productivity of the company will also increase in terms of both volumes and cash.

9. **Optimum utilization of resources:** When the cost reduction is one of the objectives of outsourcing, then the 3PLs will utilize the resources at the most optimum level.

10. **Better Analysis for driving down more costs through technology:** Once the utilization of the resources become more optimum with better technologies, the cost on weed out activities will come down and that's how outsourcing can become more efficient and do more in business with less cost.

Other than the above said advantages, below infographic representation of a survey represents the benefits of a 3PL services:



Source: 2105 Annual Third Party Logistics Study.

Lean:

Lean is a comprehensive set of tools and techniques, when combined, will allow the user to reduce and eliminate the wastes in and around the process.

According to Wikipedia, “lean is the set of tools that assists in the identification and steady elimination of wastes (MUDA), the improvement of quality, and production time and cost reduction. The Japanese terms from ‘Toyota’ are quite strongly represented in ‘Lean’. To solve the problem of waste, lean manufacturing has several tools at its disposal. These include, continues process improvement (Kaizen), the 5 Whys and the mistake proofing (Poka-Yoke), in this way it can be seen as taking a very similar approach to other improvement methodologies.

Often Lean and Toyota Production System (TPS) are used as synonyms. But TPS has been considered as the starter of lean system. The major objective of TPS was to reduce as much of waste as possible and improve the efficiency and the deliverables. The lean or leanness does not necessarily mean reduction of cost but also the time, reduction of wastages in the process and also to implement better process through better technologies to work efficiently in a longer run. This also had a key principle of continuous improvement so as to weed out the wastages and be near perfect day after day.

The lean principles:

The lean principles are those which are used as tools to eliminate the waste. Following are some of them:

- **Kaizen:** Continuous Improvement
- **Poka-Yoke:** Mistake proofing
- **Genchi Genbutsu:** Space Utilization
- **JIT:** Just In Time
- **Jidoka:** Use of men and machine
- **5 Whys:** Error Proofing.

The techniques of lean can be used to eliminate one or more wastes. All of them are being interconnected and sometimes can be used interchangeably.

7 Wastes:

To understand what are these tools meant for and how to use it, we must first understand the popular 7 wastes as defined by TPS. The popular and defined 7 wastes or MUDA are being:

1. Over production
2. Delay
3. Transportation
4. Motion
5. Inventory
6. Space
7. Errors

The seven wastes can be defined individually. Although they are considered as wastes can occur in various forms. In generic manner the following wastes can be explained individually and how it occurred in Toyota Production System.

1. Over Production:

Toyota has been producing more vehicles than required due to Bullwhip effect, which incurred them a lot of costs and time. The problem of over production was due to untimely and misinterpretation of information of sales data. As sales fluctuated during the various period of time, the production increased.

To sort out this problem of over production and to cut costs on warehousing and transportation the organization came up with the technique called; 'Buy One Sell One' policy. This made the dealers to crate the proper order data and eventually the result was accurate production.

2. Delay:

Delay was again one of the major issues. The delays were majorly due to the process which was distant n nature. The process was unlike continuous one but instead many delays even due to transportation and warehousing activities. This delay costs the profits of the company. It adds to the lead time too which in turn delays the supply chain activities.

Genchi Genbutsu is the technique which was used in TPS to eliminate this waste. Genchi Genbutsu is a technique of closely observing the process and eliminating the time delays. Kaizen has been used on a regular basis for the continuous improvement of the process.

3. Transportation:

Underutilization of the truck space, high carrier rates, and excessive back hauls, unable to trace the fast moving inventory, use of extra trucks for month end sales push were some of the issues in the process of transportation of the materials.

To overcome this problem, Toyota used the system approach. The JIT was one of the tools used. Just In Time inventory, this technique helped in eliminating excessive usage of the trucks and helped in use of optimum usage of the trucks. JIT approach reduced cost and helped Toyota to be more agile and cost reduction.

4. Motion:

Unnecessary movement of goods and manpower was also a major issue. This unnecessary movement also added more time to the process and this increased the lead time and underutilization of the resources.

Implementing the small batch process and the JIT were the tools which were implemented to overcome this issue. More over the man power were used in continuous improvement, Kaizen. This implementation of Kaizen was most successful and this helped Toyota to improve the process at the regular intervals and reduce the errors at most. Innovation was another major result of Kaizen.

5. Inventory:

Inventory storage for a longer period does not going to yield any interest to the manufacturing organizations due to various reasons. Toyota faced a major problem of inventory by wrong dispatch of goods to the wrong DCs, higher inventory than required, early deliveries had space issues too.

JIT was again a tool used in the elimination of the unnecessary inventory. '*Make one Sell*' one was one of the policies which Toyota developed to overcome this issue. This reduced higher inventory storage and lack of warehouse storage problem.

6. Space:

Unutilized space in a plant or a warehouse. This incurred a lot of cost to the company and also made it difficult for the company to store excessive goods received.

Genchi Genbutsu was again a successful tool to help in the reduction of the space problem. Kaizen was carried out regularly to improve the space/ storage problem.

7. Errors:

Errors in the process were a huge problem for the company to work with. This increased the cost and rework made it consume more time on the work which has already been done.

Errors were stopped at the spot and rectified. Poka-Yoke was one of the tools used. This helped the company reduce the cost and time in process. This also resulted in the better efficiencies in the process.

Most of the tools in TPS are today used in various industrial levels, not just in manufacturing. Kaizen is the most used technique which makes the continuous improvement in the process on regular basis. The lean is not just for manufacturing but also for other areas of business too. The TPS was interchangeable used as lean in most of the countries. But the point being, the tools and techniques, if used in a proper time for the proper process, the reduction and also the elimination of wastages can be possible.

Lean in 3PL:

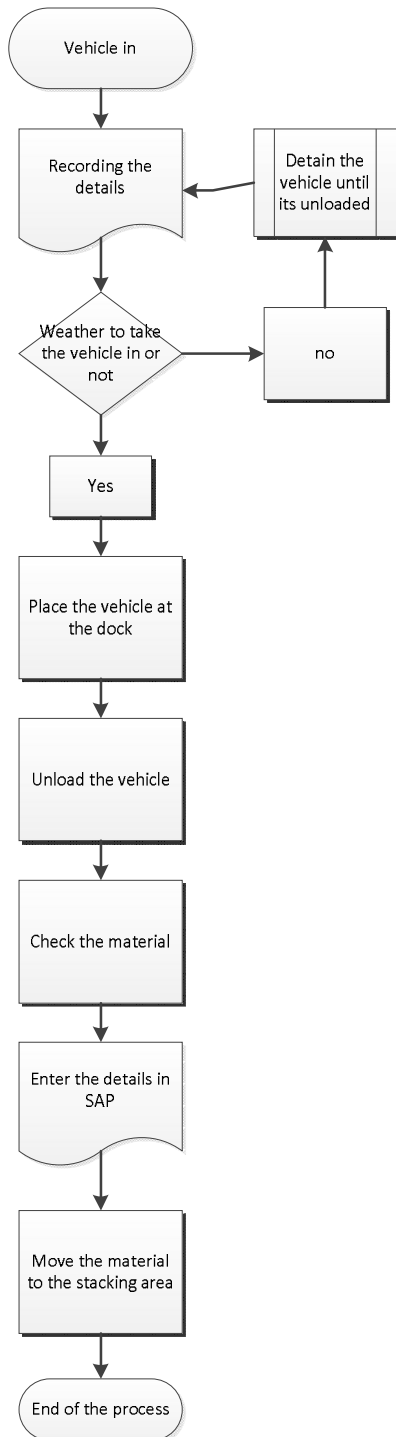
In the previous chapters, Lean and 3PL were explained. The use of Lean principles in the manufacturing industries has been a common practice, but the use of lean principles in service sector is a crucial task. As the measurable units of services cannot be defined all the time. But the opportunities and the necessity to reduce cost doesn't stops one to be innovative. Presently the service industry has also started to implement the Lean Principles in their processes. On this same note, this paper tries to explore the opportunities in 3PL industry to use Lean and make the process leaner to reduce cost and improve the efficiency of a process.

In this paper, I have taken an example of a 3PL handling the warehouse operations of a Tyre company. The research in this tyre company has some of the observations which have made a possibility to use some of the lean tools to optimize the operations.

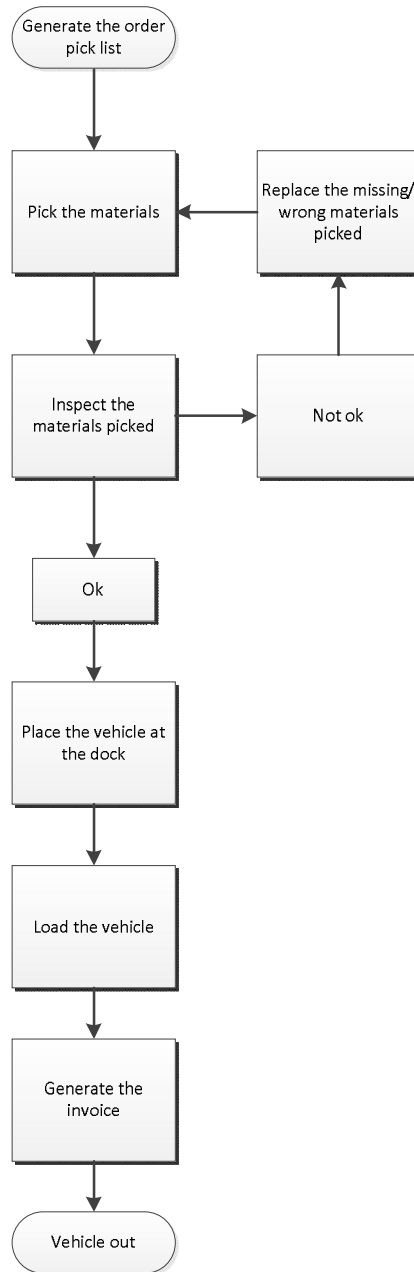
To see where we can implement the lean tools, we have to first understand the operations here.

Apollo tyres have outsourced its operation of managing one of its Regional Distribution Center (RDC) to a 3PL. The 3PL manages most of the operations of that RDC except for planning. The routine operation includes the following:

In bound:



Out bound:



The inbound processes are:

1. Vehicle In:

The process starts from vehicle carrying the materials reports at the warehouse.

2. Recording the details:

The details of the vehicle reported have to be recorded at the security desk manually in a journal. Then it has to be informed to the operation personnel.

3. Decision of unloading the vehicle:

Looking upon the materials the vehicle has carried, according to its need, the decision is made to either to unload the vehicle or to detain it.

4. Placing the vehicle to unload:

Once the decision is made to unload the vehicle, then its placed at the dock for unloading.

5. Unload the vehicle:

Unloading starts from assigning a group of labour to unload the vehicle. It usually takes, 30 minutes to 1 hour to unload a 32' multi axel container truck to get unloaded with a group of 6 labours. The unloaded materials are stacked at the marshal area according to its group.

6. Material checking:

Once the material gets unloaded, the inspection is carried out to look for any shortages or excess or any damage. If any of these are noticed, then its informed immediately and are recorded accordingly.

7. Enter in SAP:

The details of the materials unloaded are recorded in SAP. A remark has to be made if there is any shortage or the excess of any goods in the SAP.

8. Stack the materials:

The materials unloaded in the marshal area have to be moved to the designated area of the respected materials.

The outbound the processes are:

1. Generate the pick list:

The pick list has to be generated for the order that has been placed by the Distribution Office (DO). Generate the order for the material ordered as per the availability of the material.

2. Pick the materials:

Pick the materials from their respective bins and place it in the marshal area for inspection.

3. Inspect the materials:

Inspect the materials picked for the accuracy and to avoid the wrong dispatches to the DO before loading them to the truck. If there is any wrong picking of the materials, then replace them immediately before loading the materials to the truck.

4. Place the vehicle at the dock:

Place the assigned vehicle for respective DO as planned.

5. Load the vehicle:

Assign a group of 6 labours to load the vehicles. It takes 30 minutes to 1 hour to load a 32' container truck depending upon the type of materials picked.

6. Generate the invoice:

Once the loading is over and there is no materials left to load, or if any materials are left out due to non-availability of space in the vehicle, then make corrections in the pick list and the n generated the invoice according to the materials loaded on the truck.

Most of the process involves manual work rather than the automated work. It is time consuming and the use of labour will be extensive.

As the process involves manual work in most of the process, its time consuming too.

The problems:

Although the above processes seem systematic and methodological, there are issues in the process most of the time. These problems sometimes seem small and unimportant but sometimes they cause a lot of cost incurring and time consuming.

Following are the problems that are caused in **Inbound process**:

- Wrong vehicle in for the unloading.
- Use of excess labour in unloading of a truck.
- Stacking the materials in unsystematic way in the marshal area.
- Not counting or checking in the materials after unloading.
- Short of materials.
- Excess of materials.
- Improper or no recording of the documentation.
- Wrong entry of the documentation.
- Wrong stacking of the materials after unloading.
- Not stacking of the materials after unloading.
- Stacking of the materials in wrong bin.
- Mixing of the materials while stacking with other SKU.

The Solution:

For the problems that have occurred, the solutions can be found out by using lean principles.

- For the wrong vehicle unloading, the principle of systematic approach should be applied. In this assigning a token for every vehicle reported to the warehouse should be made. By this, there won't be any confusions and the one who doesn't have the token will not get unloaded.
- Excess labour problem can be resolved by assigning a batch of labours to a vehicle and assigning them the work for the day like, unloading of the truck and then stacking of the unloaded materials immediately.
- The use of **KANBAN** cards are the best solutions for these kinds of problems. Regular maintenance of this kind of methods will help in making the system more robust and can make the stock count easier during stock audits.
- Strict process implementation of material counting after unloading the materials should be done. Use of technology like bar coding can be used here.
- Short and excess of materials is not an issue for the receiver of the goods but if it is not recorded in the database, then it will cause a problem in future. So, proper and systematic maintenance of records and database should be done properly.
- Documentation is although a must in many organizations and this is included in the process too but, in some cases if details are not entered in SAP, the materials in the warehouse would show higher count than in books, so correct entry should be made and rechecking it should be practiced.
- Materials should be stacked at the defined bins only. If not then it would lead to wrong picking of materials during picking of materials for loading. Labours and the supervisors should be instructed and trained in the manner what the SOP says. Wrong stacking, mixing of SKUs should be avoided. The process should be followed from the start, so that to avoid any mistakes in the later stages of the process.

The issues in the outbound process:

- Wrong picking of the materials.
- Not picking the materials, skipping of the materials.
- Picking of excess materials.
- Loading to the wrong truck.
- Not checking the materials picked.
- Not documenting the materials loaded.

The solutions for these problems can be as follows:

- Having a proper checklist and systemized process for picking of the materials. Using a standard checklist format. Making sure of right materials during the picking. Proper training should be given to the supervisor and the labour. Material knowledge should be provided to all the staff, especially to the floor staff.
- Counting of the materials should be done before loading and after picking the materials and kept in the marshal area. Here technology like bar coding can be used to save much of time and labour. Same can be used to see if there are any excess and short of materials while picking to avoid the variations.
- Checking of the materials should be a must task so as to avoid the wrong dispatch of the materials and variations of the goods.
- Documentation of the materials sent should be done only after the loading of the truck. The reason being, if the documentation is done before the loading, there might be a chance of not all the materials gets loaded. So, to avoid the problem of short or excess, it should be done after loading.

Other than the issues in Inward and outbound, there will be issues in the floor management also. Those can also be tackled using some of the lean principles.

- JIT is a tool that should be used in the elimination of the unnecessary inventory. This will reduce the higher inventory storage and lack of warehouse storage problem.

- Implementing the small batch process and the JIT are the tools which can be implemented to overcome the issue of spaces. More over the man power should be used in continuous improvement, Kaizen. This implementation of Kaizen will be most successful to improve the process at the regular intervals and reduce the errors at most. Innovation is also a major result of Kaizen.

- Genchi Genbutsu is again a successful tool to help in the reduction of the space problem. Kaizen can be carried out regularly to improve the space/ storage problem.

- Errors should be stopped at the spot and rectified. Poka-Yoke is one of the tools that can be used. This will help the company to reduce the cost and time in process. This also can result in the better efficiencies in the process.

Changes after lean:

Activity	Time before lean	Time after lean
Unloading	60 mins.	45 mins.
Checking of the materials	10 mins	7 mins
Moving materials to bin	30 mins	25 mins
Stacking	45 mins	45 mins
Coding	10 mins	10 mins
Total time	155 mins	132 mins

The above study was done for unloading a truck of 32' which contained 150 truck tyres and 200 car tyres.

Conclusion:

The lean is a very versatile principle. This can be used at many levels in varied fields to change the various process flows in an organization. Although the lean is practiced mostly in manufacturing sector, it can be applied in service sector too to optimize the efficiency of the company.

The applicability of this might be a time consuming but the results will be immediate. During this research, the lean were principles were actually used and were found to be working, and the results were positive in nature.

Other than the above mentioned principles, organizations can also use, BPR as a tool, six sigma and various other tools to increase the efficiency.

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