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Research Paper

The impact of the concepts of lean manufacturing on the strategies of the supply chain

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Abstract

In a highly competitive environment, cost reduction and optimization of the supply chain are more than ever a strategic issue for companies. In this sense, lean manufacturing is a lever that allows the company to continuously reduce the time required for the transformation of raw materials into finished products, eliminating waste and with the aim to meet the growing and diverse needs of these customers.
In this paper, it based on the latest studies in this field in order to highlight the relationship between supply chain and lean manufacturing at reducing costs, eliminating waste and non-value added. Then it highlights the impact of lean manufacturing on the reactivity of the supply chain through inventory reduction, cycle time and flow acceleration. Finally, it presents the role and expectations of the supplier in the context of the merger Lean Manufacturing and Supply Chain.
This research has enabled to understand the impact of lean manufacturing concepts on supply chain strategies.

Keywords: *Acceleration of the Flow; Cycle Time; Lean Manufacturing; Stock Reduction; Supply Chain.*

1. Introduction

Recently, whatever the field of activity, the continuous improvement of performance is a vital imperative to ensure the sustainability and the strength of the company in a highly competitive environment. The interest of lean manufacturing, both in academia and business, recorded a continuous increase in recent decades. Part of this interest is justified by the significant results that lean generates in relation to reducing costs and improving quality standards in the organization.
However, as already demonstrated in several studies, the results generated by the implementation of lean manufacturing alone are not sufficient to ensure a competitive advantage. The supply chain (SC) should be aligned with the implementation of lean manufacturing in both directions (upstream and downstream), leading to lean Supply Chain.
In this work, we relied on the latest studies in this field to highlight the relationship between supply chain management and lean manufacturing in terms of reducing costs, eliminating waste and improving value. Then we emphasize the impact of lean manufacturing on the responsiveness of the supply chain through inventory reduction, cycle time and flow acceleration.
Finally, we present the role and expectations of the supplier in the context of fusion Lean and Supply Chain (LSC).

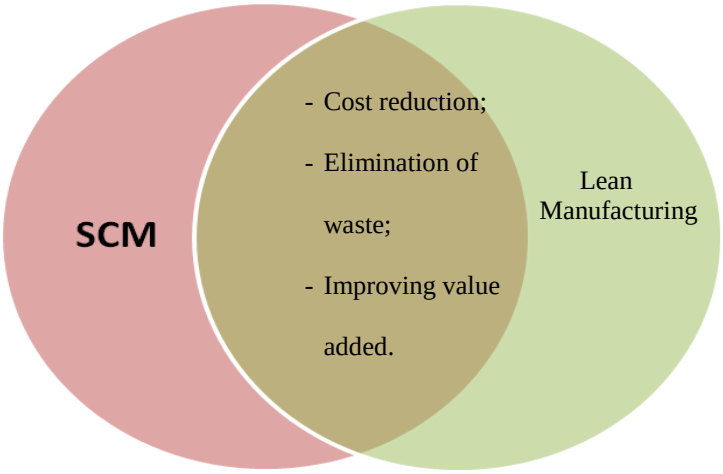


Fig. 1: The Relationship between Supply Chain Management and Lean Manufacturing

2. Definitions and principles

During the past decade, Lean was developed as the dominant model of development production processes not only in industry but also in the health sectors, administration and general services [1]. It was invented in the seventies by Toyota Motors. The concept applies to the original in production industries but Americans have extended to all of the support functions of the company and now all of the entire supply chain.
According to Taiichi ohno a lean production system, is a system that obeys the principles TPS, that seeks to eliminate waste tirelessly (Muda), variabilityies and rigidities in the entire production system and to develop the principle of the right in the first time, in order to continuously reduce costs.

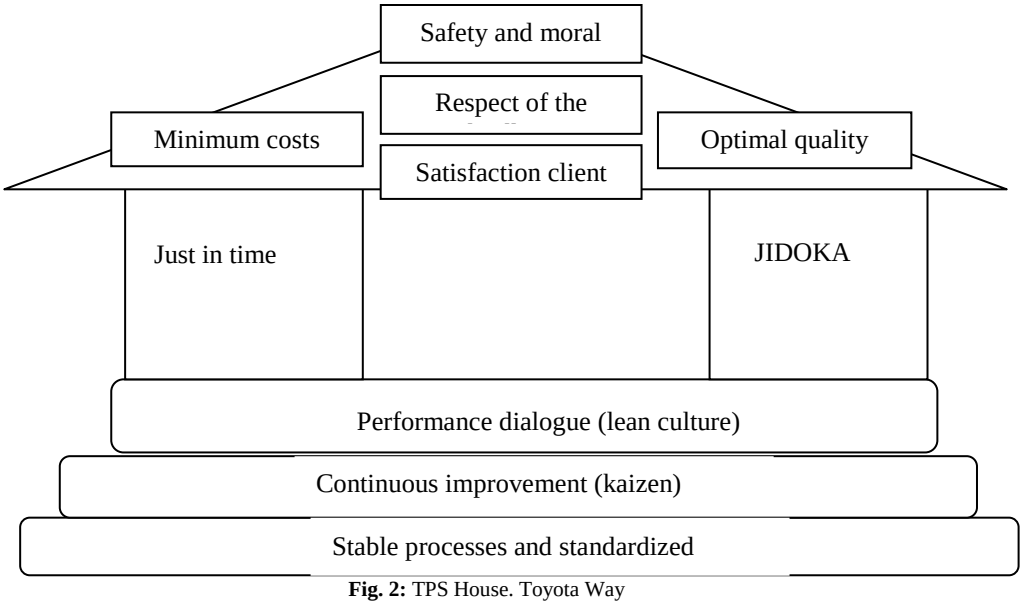


Fig. 2: TPS House. Toyota Way

The system of Lean production has for objective to satisfy his customer and to reach there it rests on two principles (pillars) and foundations “fig. 2”. The house of the Toyota Production System “fig. 2” is a symbolic Representation of a temple built with the main tools which uses the system of production Toyota, Imagined by Fujio cho in 1973. To produce more values, with fewer resources by developing culture of the elimination of the wastes, in an environment favorable to the quality of the work, to the safety of the staff, and to the respect for the discipline. Just in time and JIDOKA are both pillars of the system of lean production. On the other hand the standardization, the continuous improvement and the dialogue of performance are the foundations of the system lean production.
Just in time allows optimizing the use of the resources, to manufacture and to transport the necessary product, when it is necessary, in necessary quantity and with the shortest lead time. The four steps to set up Just in time are: stabilize and smooth the production, Put the on-line machines, Produce in the takt, and Set up of the pull flow.
JIDOKA is a production process that stops when a problem appears, the goal is to improve product quality, improve productivity and reliability of the equipment.

The mechanism of functioning of a stable and standardized process is insured by means of a standard. A standard is a visual reference document which defines and organizes the way of working to guarantee the quality, the safety and the productivity; it is developed in common with the people who make the codified task and is respected by all the collaborators.
The performance of dialogue assures that the anomalies or the ideas of improvement are taken into account, and lead to actions through goals reviews and the corrective action plans.
The continuous improvement (Kaizen) allows to improve non-stop the way of working by looking for the innovation. The continuous improvement asks to handle the cause's sources and not just to apply a temporary solution.

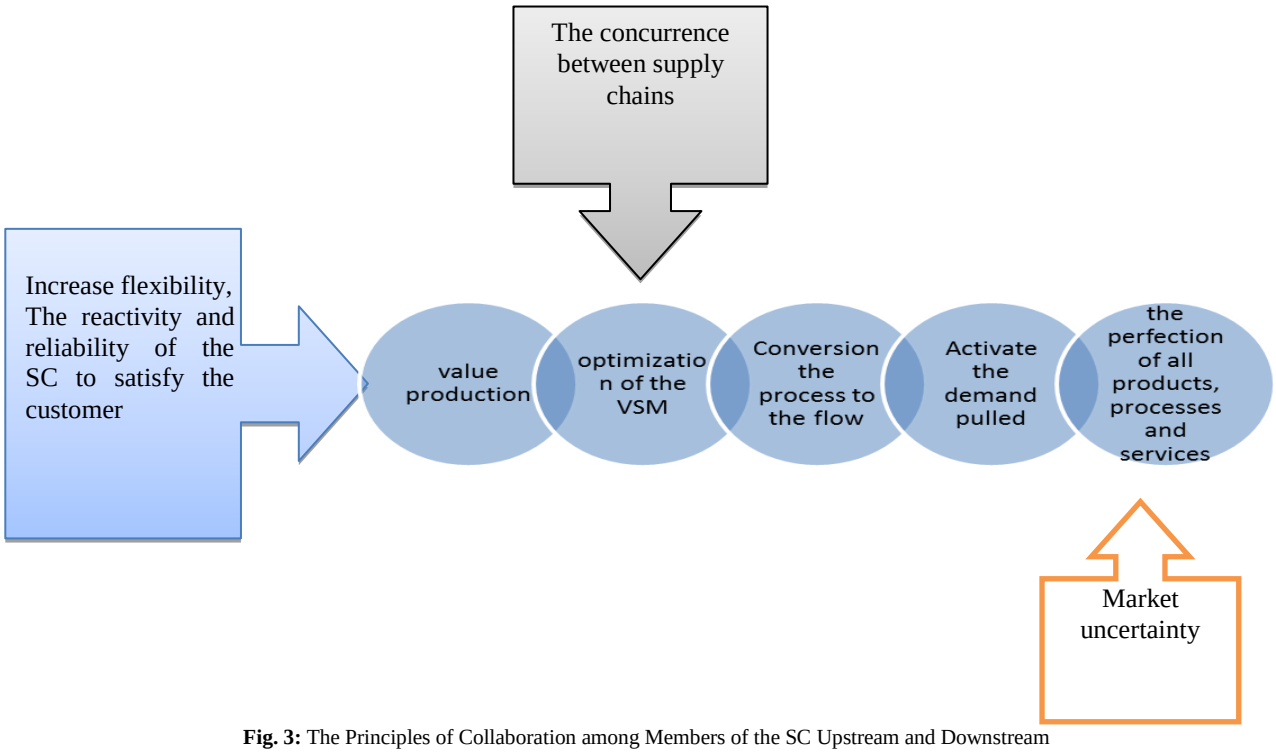


Fig. 3: The Principles of Collaboration among Members of the SC Upstream and Downstream

According to [2], lean philosophy has five fundamental principles that guide the elimination of waste and the simplification of all the process of manufacturing and support:

- Value production, the value is determined from the customer's perspective (lower costs, better delivery performance, higher quality) a unique solution for the requirement products / services, or a combination of these requirements. The value proposition is expressed as the product or service required at a specified price and deadline, the production of this specification is the value creation.

According to the authors it is a mistake to see lean as a strategy to reduce costs, the fundamental priority is to find the best ways and practices to provide an added value to the customer.

- Optimization of the VSM: this step of the Value Stream Mapping for the manufacturing value added marked the true beginning of the lean supply chain, because it moves beyond the walls of the manufacturing company to include the supplier and the customer.
- The producer should focus primarily on the partners in the supply chain which create alliances to added value rather than those who offer price concessions only.
- The conversion process to the flow: the flow principle is the basis for the management of lean operations. Once that wastes are eliminated, the goal is to transform all steps of manufacture of products (as well as the interior of the external organization) in a continuous flow, in order to eliminate the significant number of outstanding amounts, limits movement, as well as capitalized costs related to these outstanding amounts.
- Activate the demand pulled: the ability to design, plan, produce and deliver to the demand pulled from the customer allows you to get a stream of work more stable and efficient. This type of production develops in the first semi-finished products, thus allowing to accelerate the response to the client (lead time) with this production started.
- The perfection of all products, processes and service: when the first four principles are in place, the companies are willing to implement the perfection of all processes with more of new ways to create customer values, Simplification of processes and creation of the transparency for that supply chain partners may participate in an interactive way to the improvement of the value.

The implementation of the lean philosophy is an ongoing and long-term and its implementation may not reach its destination if the commitment is short-term, objective incorrect, poor planning, lack of involvement of employees, methods of training and transfer of knowledge are inadequate.
The objective of the SC has changed over the past two decades, particularly with the evolution of competition in the organizations, which has changed from the competition between companies to the competition between supply chains. It is necessary that each link of the chain gets different skills to enhance flexibility, since the market for the consumption becomes even more [3].
Hence the need for collaboration between the members of the SC, in both upstream and downstream exceeding the integration functions of physical flows and information.
Currently, it is necessary that the operations along the SC are carried out at lower cost, with a level of quality which is aligned on the expectations of consumers, with the possibility of modification, if necessary, be fast and have the high level of reliability to meet the requirements of the consumer [4].
It also seems that these definitions were not recounted the integration of lean in the Supply chain i.e. the lean supply chain.
Finally, the choice of Lean Manufacturing as a principal strategy of operations allows obtaining the place of leadership at the level of costs, and more, having an effective and flexible supply chain.

3. Relationship lean manufacturing and supply Chain (lean supply Chain)

The lean manufacturing appeared at Toyota at the level of production systems, but is it applicable in the supply chain?
The lean manufacturing found its originality in the Toyota Production System. Adaptable to all economic sectors, the lean is currently at the heart of the SCM, through the application of a set of tools and methodology which are aimed at the elimination streaming of all the waste.
According to [5], the main advantages are the reduction of costs, the increase of productivity and the shortening of lead time.
There are, however, the authors who emphasize a mutual relationship between the lean manufacturing and supply chain management. On the one hand [6] noted that the successful implementation of lean is directly linked to the SCM. In effect, the practical implementation of Lean Manufacturing along the SC appears as an important alternative to increase the competitiveness not only in unique society, but in the supply chain. On the other hand some authors [7] emphasize that the successful implementation of the SCM depends on the integrated set of socio-technical practices aimed at the elimination of waste throughout the supply chain.
Moreover, [8] stressed that the successful implementation of the SCM system depends on the actions of development provided by the lean manufacturing to the levels of the specific capabilities:

- Development of organizational flexibility;
- Development of a solid relationship with the suppliers;
- A full coordination in the supply chain;
- Improve the quality of information, in order to reduce the uncertainty and the levels of stocks;
- Outsource the activities which are not distinctive competencies for the company;
- Implement at the demand pulled from the system of production, for the reduction of stocks and costs.

As well, what are the mechanisms that ensure a management more effective of the ecosystem in the supply chain by adapting lean supply chain management?
According to [2] Lean Supply Chain Management is based on the principles of lean manufacturing, but it has concentrated on the more effective management of the supply chain of the ecosystems. To succeed and lead the entire ecosystem of the supply chain they must continually adapt and adopt the six following six mechanisms:

- Mechanism 1: e-information, it affects the operations of storage, accumulation, monitoring, surveillance and exploitation on the internet. The main engine of the SCM is the information, while the fast information can be collected, analyzed and disseminated through the network of the channels in the supply chain.

These transactions between partners of the chain can be divided into five domains:

1) The information customers, the first challenge of lean SCM: understand and respond effectively to the needs of the customer.
2) The logistics e-information, the demand of information linked to the logistical data to determine the optimum use of the resources of the transport, storage and maximize the value of customer satisfaction.
3) The alignment of the network resources e-information: cost-effectiveness ratio. The SCM requires timely information regarding the assignment of positioning and the planning of products and services as they exist in the network at a given time.
4) The product and the process e-information: web based tool to run the synchronization of content of product design, liaison between the design teams of the various members of the SC, data management products, of direct flows of customer configuration and the collaboration software design.
5) The information e-procurement: the information on the relationships of collaboration and projects, as well as the information on the capabilities of suppliers. Both are focused on a single objective is to reduce the risks of the supply chain.

- Mechanism 2: The synchronization of the supply chain, a supply chain synchronized will include the following key elements: a strategy of unified business, common measures for the excellence of the product and the performance, and the selection of enabling technologies. Therefore, the synchronization of the offer/demand for information minimizes the work in progress and the stocks of finished products in the chain, dampens the products which are pulled through the pipeline distribution, reduces the overall cost, and corresponds to the requirements of customers with products available.
- Mechanism 3: The Collaboration in the supply chain, perhaps the most critical element of the lean SCM, the willingness of the members of the chain to engage and to continually improve the relations of collaboration. Many companies have realized that the short-term benefits caused by the optimization of logistics and information technology are unable to produce competitive breakthroughs, which can be obtained when the channel partners are trying to build long-term relations of collaboration.
- Mechanism 4: the optimization, the supply chain must be able to use the management of processes and technological tools to continuously optimize the production resources. The optimization requires the continuation and the merger of three levels of improvement. The first is the principle of lean which focuses on the elimination of waste and a perfect engineering process at the level of the company. It aims to reduce costs, while at the same time providing new sources of value for the customer. The second is the continuation of the optimization of the relations between the partners. This initiative is much more difficult to accomplish. The nodes in the chain must collaborate together closely, synchronize and integrate processes. The objective is to achieve the chain whose processes favor the cost savings, efficiency and productivity that make the ecosystem of the full supply chain more competitive. Finally, the optimization of the LSCM requires the standardization and rationalization of all processes of the SC, this effort aims to eliminate waste caused by the lots and the queues in the separate operations. In general, this principle helps partners to remove the same barriers in the SC and the integration of the design, planning, production and logistics; it also ensures the synchronization of efforts of customer satisfaction on the points the more efficient of the SC.
- Mechanism 5: the operational excellence, it is the foundation for an effective lean SCM which lies in the ability of entire networks of the supply chain to reach excellent superlative levels of the operational collaboration. The standard of excellence SCM requires that the partners of the SC shall coordinate the technology and processes in order to provide the highest level of customer satisfaction and service, while at the same time to manage multiple levels of external relations. Establishing at the same time a framework and content of such a robust level of the channel synchronization which requires a deep commitment, confidence, the willingness and the capacity to acquire and develop new skills.
- Mechanism 6: the connectivity and the networking are the fundamentals of the lean SC; which implies the creation of a certain connection between the technical infrastructure, the IT systems and people. The integration effort focuses on the activation of the creative thinking within and between the companies. It attempts to align the challenges, the opportunities offered by information technologies, the cultures and the capabilities of the modern organization. The second fundamental technology of dimension is the networking of connecting of different computers and their databases together in a peer-to-peer network; designed to solve the problems of different operating systems, also enable people to communicate directly to the inside of the company and on the SC.

However there are some authors who underline that the Lean approaches cannot have a universal application throughout the SC, in the perspective of power and influence, the strategic and commercial point of view. The difficulty to achieve results win-win when there is a dominant actor in the SC, the authors call for a more equitable approach to the sharing of the value and the reduction of waste [1].

4. The practices of lean supply chain management

The environmental and strategic context in which the SC is inserted has no impact on the LSCM practices? What are the practices LSCM? What are the ways to measure the performance of the LSCM?

The cartography of the literature has allowed identifying the key practices of the Lean SCM and the ways to measure the performance of the LSCM. This is done by using the key processes of the SCM proposed by [9], five main SCM processes which have a direct integration with the lean have been identified. After that, the practices and the performance measures have been organized in the "table 1". The practices have been identified by the codes relating to key processes in order to facilitate the organization of the proposed framework in "Fig. 2."

In a study which has proposed a performance measurement system SCM, [10] assert that it is necessary to take account of the environmental and strategic context in which the SC is inserted.

The techniques of lean manufacturing vary from a company to another or from a country to another, however, most, otherwise the entire accent on the minimization and the elimination of the waste and possible non-added values. It is in particular about the reduction of the cycle time, acceleration of flows; pull the system of production, use of the small lots, and reduction of lead time and use of programs of continuous improvement (kaizen).

What impacts of LSCM practices on the reactivity SC?

The authors assert that reduce the time of the change can reduce the delay and the stocks, which leads to reduce the lead time, the total costs and to increase the productivity, flexibility, adapt to the evolution of the market and the product mix.

Table 1: LSCM- Practices and Performance [4]

Key processes	Practices LSCM	Code of Practice	Measure Performance
Demand Management	-EDI (Electronic Data Interchange)	DM1	Service Level
	-Productive capacity synchronized in the chain	DM1	Shift in demand forecasting Load Factor Capacity Chain
Management of Customer Service	-Value Identification	MCS1	Evaluation of the Relationship (client)
	-Consumer Responsiveness	MCS2	Fidelity Index
Supply	-Limited number of suppliers	SUP1	Evaluation of the Relationship (supplier)
	-Suppliers near	SUP2	Delay in Delivery Index Defective Product Index
	-Transparency in costs	SUP3	Deliveries Index with incorrect Amount
	-Resourcing	SUP4	Average Price
Product Development	-Integrated development of products and services	PD1	Product Launch Time
	-Integrated innovation	PD2	Number of Products Launched
Production Flow Management	-VSM (value stream map)	PFM1	Stop Time Line
	- Kaizen	PFM2	Tackt Time
	- Kanban delivery	PFM3	Inventory Turnover Cost of Transportation
	- Milk Run	PFM4	Return to Index
	- Just Sequence	PFM5	Emergency Deliveries Index

The lean SCM also aims to reduce the variation in working time by setting in place procedures for standard work.
Thus the essence of lean manufacturing is the compression of time and space. The results of the compression of time and space are the increase of productivity, the optimization of consumption, the cost reduction, the improvement of the quality and the customer satisfaction [5].
Lean manufacturing duct toward the operational efficiency: the increased efficiency of the flow of materials and information, improvement of the links with suppliers, the simplification of the planning, with the emphasis on customer orientation.
The Lean manufacturing will have a profound effect on human society as the autonomy and the versatility of the posts cited by Womack [1].
The organization of the LSCM practices “Table 1” has helped to establish a framework which aims to align the operational strategy LSCM thanks to the verification of the requirements of the customers, the actions of competing channels aligned with the six competing priorities conceptualized by [11]. The practices have been classified according to the impact generated on each competitive priority. Some practices have an impact on more than a priority competitive. Therefore, the codes are repeated in some competing priorities “fig.4”.

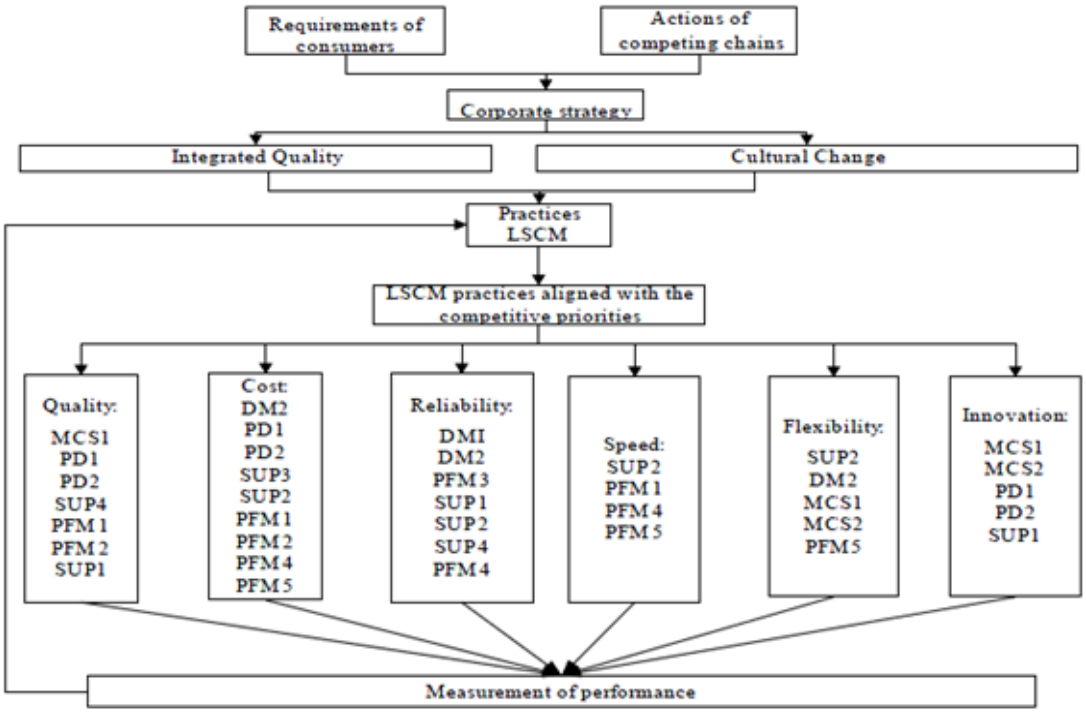


Fig. 4: Framework of LSCM [4]

5. The role and the expectations of suppliers in the context of the integration LSCM

The lean become a complete system of management which the effective implementation involves cultural changes within the organizations and new approaches in the production, customer service, and the link with the supplier. The reduction of the variability supplier is often carried by means of partnerships and other forms of cooperation supplier-producer [12].

The suppliers have five variables: the performance of production, the pulled production, the continuous flow, the high rotation of stocks, the short lead time. For [13] in addition to the integration of operational processes upstream of the SC it must be a deployment of lean practices upstream and downstream of the supply chain; Thus it is necessary to operate with a reduced number of suppliers, thereby creating greater collaboration practices lean applied not only by the company of convergence, but also by its suppliers [14].

The “Table2” shows the characteristics of supply of lean supply chain:

Table 2: The Supply Characteristics of Lean Supply Chain. [15]

characteristic	Traditional Supply chain	Lean supply chain
suppliers	several	reduced
Interactions	conflicting	Collaborative
Center of relationship	transactional	Long term
Criteria of main selection	cost	Performance
Duration of the contract	Short term	Long term
Future price	increase	Decrease
Lead Time	Length	short
order quantities	Large lots	small Lots
Quality	Extended inspection	The quality at the source
Stock (supplier and Customer)	wide	Minimal
Information flow	one direction	Two directions
Flexibility	low	High
Role of product development	small	Wide (Collaborative)
trust	Limited	Extended

6. Manufacturing case in lean industrial processes thermo mechanical

6.1. Presentation of the problematic

This analysis is built around a longitudinal study carried out in a leader of thermo mechanical processes Extrusion). It focuses on the deployment of lean manufacturing concepts in order to develop the strategies supply chain.
This company recorded significant losses in its production units that require developing a drastic strategy of cost reduction.
In the context of deploying the concepts lean in order to satisfy its customers, one among the production units must increase its productivity and responsiveness while reducing its manufacturing costs. To do this, we must mainly improve our equipment availability, reduce and master our changing time series and therefore improve our Overall Equipment Effectiveness OEE (TRS) and rate of respect schedule.

Table 3: Table of Key Indicators for Monitoring

Key indicators	Before	Objective
Overall Equipment Effectiveness	33%	79%
Average of the change time series	55,9 h	35h
rate of respect schedule	37%	85%
Average of stocks compared with the stock mini	31%	50%
Energy Consumption	0,81 KW/kg	0,75 KW/Kg

6.2. Progress of the project

The project was conducted according to the schedule below in six phases "Table 4":

Table 4: Planning Deployment of Lean Project

M 08 Preparation	M 09 Diagnosis	M 10 Vision	M 11 Planning	M 12/ 01-02-03 Implementation	>M04 Sustainability
Constitution of the team, communicate, gather the data	Operational System Infrastructure and Management State of mind and behavior	Operational System Infrastructure and Management State of mind and behavior	Develop plans of implementation by identified levers	Implementation of levers	Ensure the sustainability of change and improvement

Diagnostic Phase: we worked on three major objectives, first to have a factual transparency on the tool of production and its performance by identifying the main dysfunctions and constitute an integrated view of the perimeter to transform (production system, infrastructure management and state of mind and behavior).
Then identify the potential and the main levers, by a definition of factual way the achievable goals and to outline the main levers that achieve the objectives.
Finally align the management and the operational team on a factual basis.
For the tools of diagnosis, we used the value stream mapping (VSM), analysis of the implantation, graph in cascade OEE (TRS) and cost analysis for the operational system. For the diagnosis of the state of mind and behavior as well as the infrastructure of management we used the investigation social field.
Phase vision / planning: is based on the diagnosis made in the diagnosis phase through the three dimensions (operational system, infrastructure and management and state of mind and behavior). Two workshops of vision (the first with the operational operators of the production unit and the second with the steering committee) for the design of an improved VSM with the planning of a macro-planning which the levers to implement in order to achieve this vision, by prioritizing the different suggestions of the participants.
Phase Implementation: The implementation phase consists in the implementation of Lean tools recommended to combat waste and to introduce the operational improvement.
The main projects of the implementation phase are:

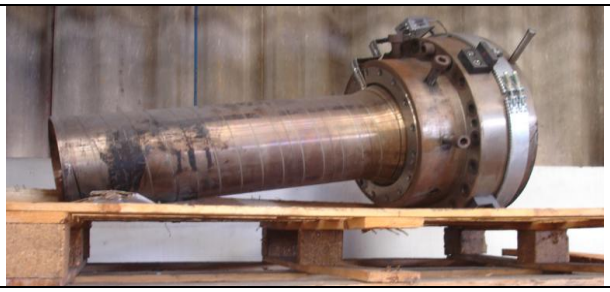
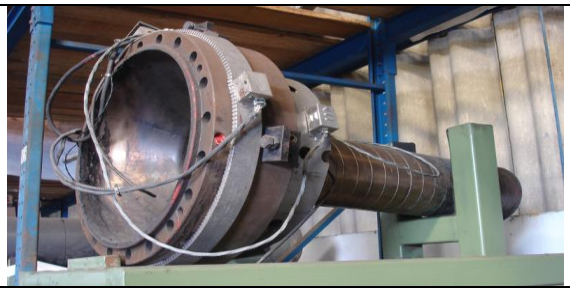
- Performance management project which is to put in place performance management through the establishment of indicators for monitoring the performance as well as the animation of the performance reviews for the handover of instructions and the resolution of problems.
- SMED project for a reduction in a systematic way the time of change of series with a quantified objective. With the project team we have analyzed the videos in the series change of different teams and we have put in place a plan of action to achieve the goals traces in the vision phase:

Table 5: Action Plan SMED Project

Action	Commentary
Reorganization and identification of the racking storage production tooling	For a maximum exploitation in more a more rapid access to the tooling designated
Organization, identification of crates of tooling	For a good management and preservation of the tooling, reduce the time of preparation and research.
Organization, identification and inventory of clamping screw	A good management, mastery of the change and reduce the time of change, sometimes 2 to 3 h of research of screws
Achievement standards of serial change in collaboration with the team leaders after analysis	-Control and training of the team to the spots of change -Standard in the form of Gantt diagram for a better management of tasks in order and in effective (the tasks in parallel and successive)
Manufacture the brackets of tooling, cages, table of change	-Protect the state of tooling and facilitate the handling. -Achievement of external tasks (change of the inserts with the table)
Audit of change	Ensure the follow-up, the proper conduct of the change and the proposal of improvements for the standards achieved
Use tools handling	Secure and facilitate handling

Table 6: Table Showing the Organization Before and After the Implementation of the SMED Project

Before	After
	
	
	
	

- Project spare parts: for a better management of spare parts, we realized a database for the management, monitoring and the identification in order to avoid breaks of stocks.
- Standard project, for the generalization of the best practices and the optimization of resources used, we have achieved standards of working in two forms, The first type concerns the standards of organization with the illustration and the second in the form of Gantt diagrams for a good mastery of the chronology of tasks and the allocation of resources, as well as training sessions for the production teams, also the fact sheets audit for the monitoring and improvement of these standards.
- 5S project, for an optimization continuously working conditions by ensuring the organization, the cleanliness and safety.
- Planning project, in the face of the volatility of markets the planning of activities of the company has become an extremely difficult exercise. An upgrade and integration of the PIC/PDP in order to improve the visibility.

Phase Sustainability: for the sustainability the transformation, we have set up a permanent audit carried out by a rolling schedule of the project committee in order to ensure the sustainability and the improvement of the existing.

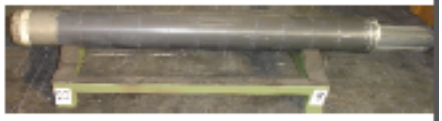
Numéro	Emplacement	Désignation	Qté	Outils de serrage	illustration
1	Calsse N° 1 ID 200 J 5	Poinçon interne	1	Clé BTR N° 17 avec douille / visseuse pneumatique	
2		Poinçon externe	1		
3	Rayonnage K5	Filière	1	Clé BTR N° 19 avec douille	
4	Calsse N° 1 ID 200 J 5	Buse matière couche externe	1	Clé BTR N° 6	
5		Buse matière couche interne (1)	1	Clé plate N° 13 + clé entrefer	
6		Buse matière couche interne (2)	1		
7		Pièce de serrage de buse matière couche interne (2)	1	Clé de serrage entrefer	
8		Clé de serrage	1		
12		Support de maintien et fixation (conduite eau, air et vide) avec(8)	1	Clé BTR N° 6 et N°2	
9	Support mandrin rayonnage K5	Porte mandrin	1	Clé BTR N° 8	
10		Mandrin	1	Clé BTR N° 8	
11	Calsse N° 1 ID 200	Punch (relié avec (10))	1	Clé BTR N° 6 et N°2	

Fig. 5: Standard of Tools Organization

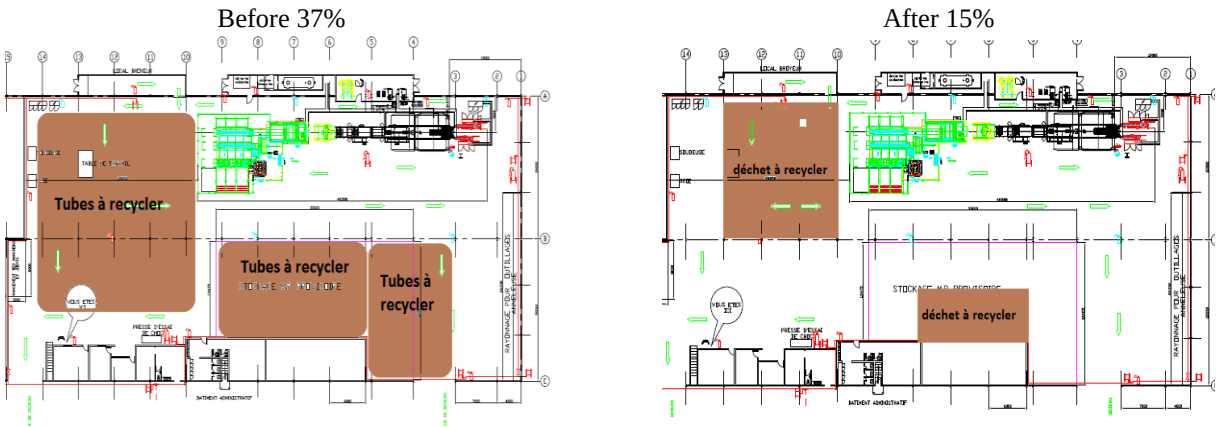


Fig. 6: Figure Shows the Space Gained (22 %) after the Implementation of the 5S to the Inside of the Production Unit

6.3. Calculated impacts

Table 6: The Calculated Impact of the Concepts of Lean Manufacturing on the Strategies SC

		Before					After											
Months		M08	M09	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
OEE [%]		34	31	28	32	38	52	53	52	66	65	67	83	78	65	70	75	78
Average OEE before and after [%]		33%					67%											
respect schedule [%]		38	35	25	36	49	44	62	63	78	80	103	96	85	77	86	89	79
Average of respect schedule [%]		37%					79%											
Average of the change time series [h]		71	42	55	62,5	49	47	39	37,5	38	34	32	37	36	38	32	29	34
Number of change series		4	4	3	3	4	3	3	3	3	4	3	2	3	3	2	2	3
Status of the stock relative to the stock mini [%]	REF 1	12	25	14	26	22	55	37	22	88	34	24	12	4	89	72	11	8
	REF 2	13	8	22	10	54	52	22	65	34	57	21	3	87	44	21	0	75
	REF 3	18	34	38	26	57	47	20	59	49	38	17	6	76	31	0	46	23
	REF 4	31	18	26	11	43	11	73	33	54	12	87	23	11	0	75	13	5
	REF 5	11	11	0	48	0	54	7	77	31	70	95	41	15	65	36	0	67
	REF 6	17	2	32	2	34	37	65	37	19	53	32	11	76	41	26	0	69
	REF 7	0	50	15	54	27	21	78	54	23	49	23	13	8	74	41	12	8
	REF 8	73	76	55	27	17	62	41	35	24	14	66	43	39	15	0	65	52
	REF 9	66	83	65	55	46	43	25	19	134	87	64	48	23	8	65	54	39
Average of the stock relative to the stock mini [%]				Panne									RM				RM	
		27	34	30	29	33	42	41	45	51	46	48	22	38	41	37	22	38
Average of the average of the stock relative to the stock mini before and after [%]		31%					39%											

To ensure the development of supply chain strategies, the company must implement a flexibility at the level of its organization and especially of its production system, in order to cope with these new challenges. This is the purpose of this project which was launched from the months 08 and currently in phase of sustainability. This project has implemented all the projects mentioned above to ensure the optimization of productivity and the improvement of the responsiveness.

In “table 6”, we see the positive impact of the Overall Equipment Effectiveness OEE (TRS), which has recorded a net increase in the average value of 33% to 67 %. This positive impact is assured by the good results provided by all projects in place at all levels and at all mutual intersections.

For example the “fig. 7”, illustrates an impact among others which affects the regular adjustment of the PDP (each week) in the planning project, which gives in his turn a better visibility to the SMED project, in order to anticipate in the external actions for the reduction of the time and the number of series change, The latter enters the gearing with the

other projects as the standards, 5S and the management of spare parts to improve the availability and reduce the NOEE (NTRS) and so on. In the diagnosis phase, we found that changes series are nearly 35% of NTRS, which passed to 19% in phase implementation thereafter.
This mechanism is piloted by a good performance management and the resolution of the problems. The increase of the OEE (TRS) in his turn causes the improvement of rate of respect schedule by an average of 37% to 79 %.
In the end this increase of the OEE and the rate of respect schedule offer an improvement of the productivity and the reactivity which is reflected by an optimal level of the level of the stock compared to the stock mini. This level provides a commercial advantage particular to this activity sector.
A characteristics which affects this activity sector and which made the difference between the suppliers, is that the customer requires the availability of the full range, i.e. the smallest up to the largest (in order to put in the operation of transport and storage, the references the smaller in the larger who follow them and so on; the principle of the telescope) to ensure optimization at the level of logistical costs.
Finally, the table of the impact calculated of the project shows the strong relationship which exists between the organization in lean manufacturing and the supply chain strategies of the company.

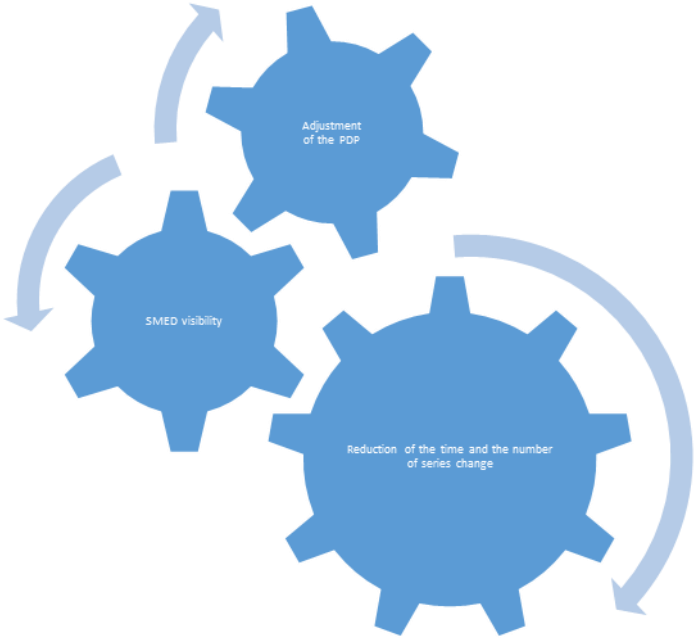


Fig. 7: Mechanism of Reduction of the NOEE

7. Conclusion

In this work, we have tried to show that the lean is in the heart of the development of supply chain strategies by the elimination in continuous of all the waste and the activities to non-added values to the customer, by the use of a set of tools and methods which aim the operational performance. We have concluded that the company of today has a great interest to extend the lean practices throughout the supply chain seen the relationship that exists between these last two, for the research of the other competitive advantages.
Then, to succeed and improve the entire ecosystem of the supply chain companies must continually adapt and adopt the mechanisms granted by lean manufacturing.
Finally the LSCM has evolved into complete system of supply, whose effective implementation involves cultural changes within the organizations and new approaches to the management of links with the suppliers.
This work is part of the current trend of lean supply chain which aims to provide elements of a response to design and implement the essential mechanisms of the LSC which puts the emphasis on the concepts of lean manufacturing.
The modeling of lean manufacturing concepts in a supply chain would help us better to understand the interrelationship of the lean with the SCM.

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