Lean Manufacturing Application in Textile Industry

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Abstract

The main objective of this research is to raise a proposal for the application of Lean Manufacturing tools for the reduction of waste in the textile industry. This paper presents of seeking the theoretical foundation of the philosophy of Lean Manufacturing, followed by a diagnosis was developed in a textile company where the main problem of 31% of non-fulfillment of orders is established, reaching measurements of activities that add value and does not add value, getting to elaborate the current Value Stream Mapping of the situation this company. Finally, the prioritization of the tools with criteria of cost, time, feasibility of the implementation, achieving definition of the proposal of 5S's and Manufacturing Cells. The 5S's Lean Manufacturing Tool, will reduce waste or activities that do not add value to the product. This implies that the cycle time of the cutting process decreases from 4'04''' to 3'50'', stamping, of 4'24 " at 4'16'' and packing from 2'40'' to 2'36" to himself, the work environment will be improved, from 46% to 87%. By implementing the Manufacturing Cells in the manufacturing process, the cycle time will reduce from 8'28" /pajamas to 4'55"/pajamas, this implies that the production capacity of the process will increase from 1.080 pajamas for month to 1.964 monthly pajamas, exceeding the customer demand with 23% which will reduce the order failure from 31% to 0%. This will allow the company to fully comply with the 1,589 monthly pajamas demanded by the customer.

Keywords
Lean Manufacturing, Textile industry, Manufacturing Cells, Takt Time, Lead Time, Efficiency, Productivity

1. Introduction
At the present time worldwide, Lean Manufacturing (LM) has revolutionized the way of producing by eliminating those activities that do not add value to the final product (Bhamu and Sangwan, 2014), also called waste (Khalili et al., 2017). Over the years, numerous improvement techniques have been developed, such as Total Quality Management (TQM), Business Process Reengineering (BPR), the competitive advantages of the Porter diamond model and the emergence of the Philosophy of LM with which seeks to raise the parameters of productivity, quality, aiming at industrial excellence (Shah and Hussain, 2017).

Being the reason for study of this work entitled HME Application Proposal, this system is based on the reduction of waste, through the use of tools such as; 5S's, error-proof (Poka Yoke), Manufacturing Cells (CM), Total Productive Maintenance (TPM), Identification through cards or labels (Kanban) (Villena, 2016).

The application of the LM, generates a great impact from the industrial, financial and commercial point of view. It is based on a production based on demand, quality, reduction of delivery times and above all greater customer satisfaction, and avoids activities that do not add value, this generates a reduction impact on production costs (PC), therefore, the profits will be greater (Gurumurthy and Kodali, 2011).

There is consensus that lean techniques can eliminate waste and reduce risk to manufacturing and services sectors including construction (Howell and Ballard, 1998), aerospace (Hines et al., 2004), services (Bortolotti and Romano, 2012; Suárez et al., 2012) and public administration (Radnor and Walley, 2008; Vlachos, 2015)

A survey carried out to manufacturing companies that have adopted the principles of this methodology highlights important benefits in the areas of operation, administration and management, with improvements of up to 90% reduction of time in the work cycle and increases of 80% in the final quality of the product, also allows to gain market share to the competition, which produces slower times, higher costs or lower quality (Arota and Pacheco, 2017; Green, 2010; Otoya and Sampayo, 2017).

In Ecuador, the use of this system is not common, therefore, it has been necessary to turn around the traditional way of operating companies and optimize production processes, as well as eliminate the waste generated in it, using the Lean Manufacturing Tools (LMT), which includes the concepts of activities that add value (AAV) and activities that do not add (ANV), and other aspects within the process.

2. Materials and methods
Taking into account the analyze of the LM philosophy and its various approaches; the procedure used to make the proposal to improve the process is detailed. This procedure consists of 4 phases.

2.1 Analysis and Diagnosis
To have a global vision about the LM system and develop its methodology, the first step was to carry out a pertinent scientific and technical investigation about its philosophy, tools, applications, objectives, benefits; which provided necessary information to start the investigative work.

The work consisted of looking for the theoretical foundation of the LM philosophy, followed by a diagnosis and measurements, until the map of the current situation of the company was drawn up. Finally, the prioritization of the tools was done with criteria of cost, time, feasibility, feasibility for the implementation proposal.

- **Selection of the line or product to study**

One of the five lines will be chosen, which takes the largest amount of production for this, the Pareto diagram will be used to organize, and focus the efforts for the Lean Manufacturing Tools (LMT) search applicable to the waste that affects the selected line.

Within the most representative production line selected in this step, the product with the highest production volume or star product will be chosen.

- **Order fulfillment analysis**

This analysis includes data such as orders received, back orders specifically from pajamas, with which the level of compliance with the orders received by the customer will be established.

- **Study of the standard time of the product**

Once the star product is chosen, the time study is carried out, with the objective of establishing Standard Time (ST), Cycle Time (CT) and calculation of the production rate (Takt time). To then analyze and determine problems in each process.

- **Development of current Value Stream Mapping**

The current Value Stream Mapping (VSM) will be designed for the star product selected in the previous step, which allows a panoramic view of the entire value chain. In order to identify ANV problems, identify the waste of LM. The scope of the investigation is the identification of activities and measurement of times.

2.2 Improvement Proposal

- **Lean Manufacturing Indicators**

Once the current VSM has been prepared, a starting point will be identified for the indicators, based on the data collected, that will best help us achieve the objectives set in the current diagnosis of problems within the comparison of CT and the rhythm of production (takt time), Lead Time, Efficiency, Production capacity, Labor Productivity.

- **Prioritization of lean manufacturing tools**

Having identified the LMT in the future Value Stream Mapping, we will prioritize the lean manufacturing tools with the help of the Brainstorming tool and the prioritization matrix where the main problem is related to the criteria cost, time, feasibility, feasibility, giving solution with LMT.

- **Proposal for lean manufacturing tools**

In order to achieve the improvements proposed by the philosophy of ME, by eliminating the problems prioritized in the previous step, the resulting tools of the prioritization matrix will be applied.

- **Development of the future Value Stream Mapping**

Obtained the representation of the current state of the product or family, thanks to the current VSM design and determined the indicators of LM, the next step will be the design of the future VSM that consists of the identification of LMT that solve the problems, which will be evidenced with the results or improvements obtained in each process.

3. Improvement Proposal

Based on the research carried out and the information collected by applying the described procedure that served to perform an analysis of the results of this improvement proposal, it is necessary to carry out the following calculations:

Selection of line or product to study

In this case the Pareto diagram, as shown in Figure 1, indicates that the pajama and casual line are the 20% that represents 80% of sales taking into account the 5 lines, but due to the complexity of the process and the short time for the completion of the project, this study focuses only on the pajama line.
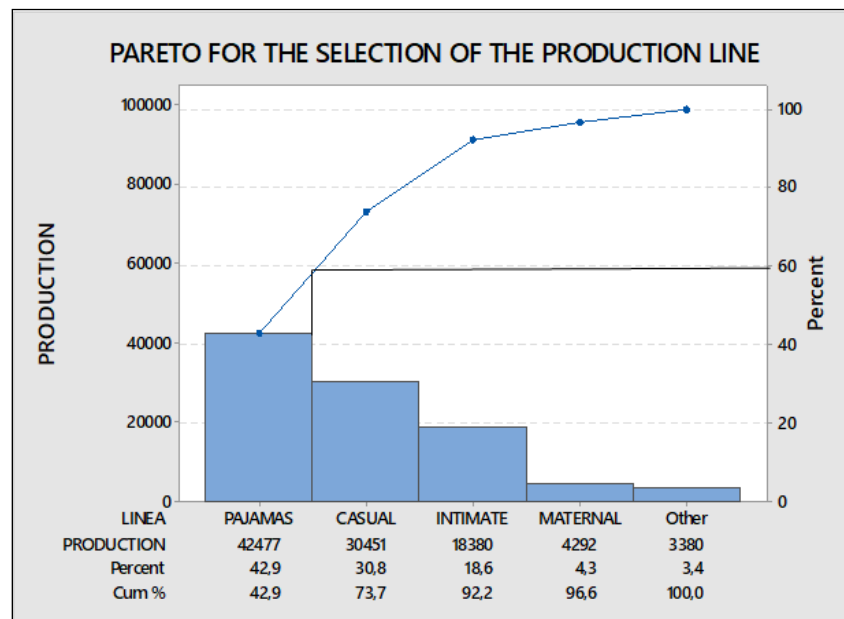

Figure 1. Application of Pareto for the selection of the line to study.

With reference to the above, the pajama line represents 40% of the production that generates 60% of sales.

Order fulfillment analysis
According to the data collected in the course of the analysis of the current situation, by interviewing the packing, stamping, and cutting workers, it was established that the pajamas line has a delivery level of 31%, as appreciate in the following calculation.

$$\% \text{ Delivered to Time} = \frac{\text{Orders Delivered to Time}}{\text{Orders Received}}$$

$$\% \text{ Delivered to Time} = \frac{66}{95}$$

$$\% \text{ Delivered to Time} = 69 \%$$

The level of compliance or delivered on time is 69% and non-compliance is 31%, reflecting a non-adequate percentage of non-compliance. This is how the present study focuses on the analysis of each of the processes in order to determine the causes that cause waste (overproduction, waiting, unnecessary transport, reprocessing, incense movements, inventories, defective products), which attack the delivery times of orders.

Study of the standard time of the product
From the standard time, the cycle times of each process were obtained, as shown in Table 1.

Table 1. Cycle time of each process

Cutting	Dressmaking	Screen printing	Packing
4'07''	8'28''	4'24''	2'40''

Development of the current Value Stream Mapping
At the end of the current VSM design, the main waste existing in the Value Stream Mapping that affects the pajama line is identified. The purpose is to reduce this waste, and in case it can be eliminated by applying the LM tools.
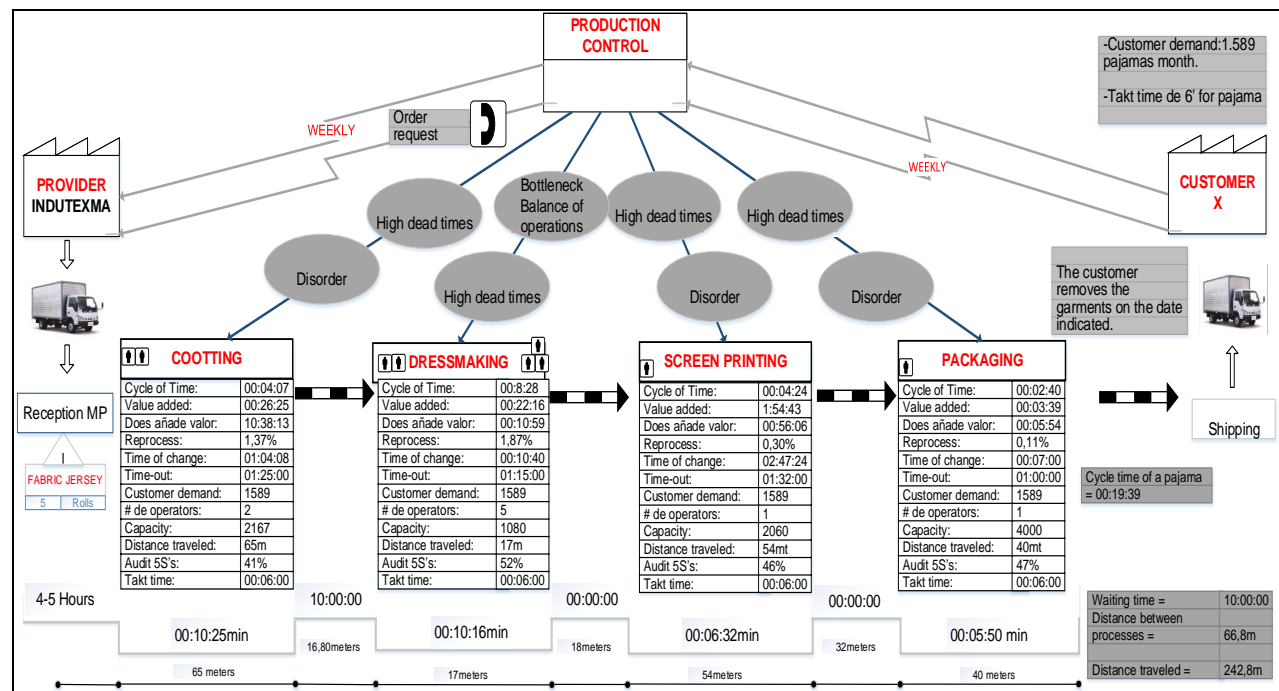

Figure 2. Current Value Stream Mapping

With reference to the above, we proceed to describe the types of waste identified in the current VSM.

Cutting process

Unnecessary movements: In the cutting process the time of change or preparation time is 1h 4 '08' ', which is high because in this process there are unnecessary or silent movements, these activities are: Search for orders that are lost with a time of 3'30 ", look for tools that are lost with a time of 2'40 " and delays by disorder with a time of 2 ', adding a time of unnecessary movements of 8'10, this time multiplies according to the number of times that happens in this case at least three times a day therefore has a time of 24'30 ", this type of seedlings is intended to eliminate when implementing the 5S's and the rest of time belong to ANV but that are necessary in the process.

Disorder: Through the 5S's audit, it is established that the cutting process has a compliance level of 41% which is considered low, the same one that seeks to improve the parameters of the 5S's tool.

Dressmaking process

Production flow: When making a comparison of the CT of 8'28 " and the time takt time of 6 ', it is considered waste because this process is not able to comply with the time required by the 6' customer each pajama for this purpose, the flow and distribution of operations within module 5 will be analyzed more closely, in order to seek to reduce and adjust up to the takt time. The production capacity of this process is 1.080 and the customer's demand is 1.589, which the company is not currently able to comply with because the capacity has a direct relationship with the CT.

Disorder: Through the 5S's audit, it is established that the manufacturing process has a compliance level of 52% which is considered low, which will be aimed at improving the parameters of the 5S's tool.

Screen printing process

Disorder: Through the 5S's audit, it is established that the stamping process has a compliance level of 46% which is considered low, the same one that seeks to improve the parameters of 5S's.

Transportation: The distance traveled is 47m due to the fact that the process is located on the fourth floor and the operators go down to the manufacturing process to move the garments for printing, and they go to the second floor to deliver the stamped garments for their packaging. For this, the packaging process will be relocated.

Unnecessary movements: The time of change or preparation is 2h 47'24" to not have implemented the philosophy 5S's lost time of 17'35" in looking for negatives, 10'28 " in looking for frames and tools, these are valuable times that are lost when performing ANV to the product and only increase the CT, the remaining times are ANV but that are necessary, to eliminate or reduce these activities the implementation of the 5S's is proposed.

Packaging process

Disorder: Through the 5S's audit, it is established that the packaging process has a compliance level of 47% which is considered low, the same that seeks to improve the parameters of the 5S's tool.

Transportation: The distance traveled is 40m which is generated by the location on the second floor and operators go up to the process of making and stamping in order to find clothes that remain in reprocess. For this, the packaging process will be relocated.

Unnecessary movements: The preparation time is 7 'which is because of unnecessary movements as in this case is the search for garments in the previous processes having a time of 5'27'', for which it is intended to eliminate the relocation of the process and application of the 5S's.

Indicators Lean manufacturing

Lead Time

Lead Time is the time that elapses from the start of a request for the supply of raw materials and supplies to suppliers or the factory of a certain product until the finished product is delivered to the customer. Lead time is composed of three factors (Lorente et al., 2018).

Lead Time = LT Supply + LT Production + LT Transportation * 100
Lead Time = 300 min + 319 min + 0 min
Lead Time = 619 min

The Lead Time of the textile company in study is of 619 min where the Lead Time of Supply, Lead Time of Production and Lead Time of Transportation, are considered to elaborate the pajamas.

Calculation of the time the client demands (takt time)
The takt time represents the consumption rate required by the market or the client, in other words, it indicates the pace or pace at which it must be produced in order to be in synchrony with the customer's demand, we start from the following equation.

$$\textbf{Takt time} = \frac{\text{Production time available in the pajama line}}{\text{Costumer Demand}}$$

$$\textbf{Production time available} = \left(1\frac{turn}{day}\right)*\left(10\frac{hour}{turn}\right)*\left(60\frac{min}{hour}\right)*\left(60\frac{seg}{min}\right)$$

$$\textbf{Production time available} = \left(10\frac{hour}{day}\right)*\left(3600\frac{seg}{hour}\right)=\left(36000\frac{seg}{day}\right)$$

$$\textbf{Production time available} = \left(36000\frac{seg}{day}\right)-\left(8280\frac{seg}{day}\right)$$

$$\textbf{Production time available} = \left(27720\frac{seg}{day}\right)$$

$$\textbf{Takt time} = \frac{27720\,s}{day}\,/\,\frac{79\,pajamas}{day}$$

$$\textbf{Takt time} = \frac{351\,s}{pajamas}$$

Takt time = 5'85''/pajama ≈ 6' pajama

Therefore, the current CT of each process must be the same or approach the takt time as much as possible, at which time a comparison is made with each CT versus the takt time, in order to have a clear idea of how the process flow to process.

Efficiency calculation
It is the ability to achieve the objectives, with the least amount of resources possible, this implies "doing things correctly", without having to spend time on unnecessary activities, for which the following data is used (Lorente et al., 2018). The Table 2 details the times of the current situation of the process of making pajamas.

Table 2. Summary of time that add value and do not add value.

General Result of the time that add value and do not add value						
Activity		**Current**				**Minutes**
		Quantity	Time	Distance	Add value	2:47:03	167,03
Process	Detail	#	minutes	meters	Do not add value	1:15:13	111,13
●	Operation	63	2:47:03	0	**Total**	4:38:16	278,16
■	Inspection	5	0:07:36	0			
➡	Transport	15	0:27:41	136			
D	Delay	7	1:15:55	35			
▲	Ware housing	1	0:00:00	5			
Total		91	4:38:16	176			

$$\textbf{Efficiency} = \frac{\text{Time Value Added}}{\text{(Time Value Added +Time Non Value Added)}}*100$$

$$\textbf{Efficiency} = \frac{167.03}{(167.03+111.13)}*100$$

Efficiency = 60%

It means that the process of making pajamas is at 60% efficiency. There is a 40% waste in the resource time, evidencing a serious problem due to the existence of molts or ANV to the product.

Labor productivity
It refers to the efficient use of resources (inputs), when producing goods or services (products). Productivity in terms of employees is synonymous with returns (Lorente et al., 2018).

Next, labor productivity (Labor) is calculated taking into account the result of the current production capacity of 1,080 pajamas per month.

$$\textbf{Labor Productivity} = \frac{\text{Total units producid}}{(\text{Total man hours worked})(\text{No Workers})} * 100$$

$$\textbf{Efficiency} = \frac{1080 \text{ pajamas}}{151 \text{ hours} * 5 \text{ workers}} * 100$$

$$\textbf{Efficiency} = \frac{1,40 \text{ pajamas}}{\text{hours} / \text{workers}}$$

Process flow in the pajama line of the pajama module
The takt time is 6 'and the current cycle time in each process are compared in order to determine the one with the highest CT, with mention to this the processes of; Cutting, stamping and packing shows that the CTs are lower than the takt time expected by the client, except for the manufacturing process since the cycle time is longer, then the existing problem must be analyzed and determined, which is vitally important. said CT must adjust to the takt time, being one of the conditions established by the management of ME. Figure 3 presents the relationship of the time takt time with the CT of each process.
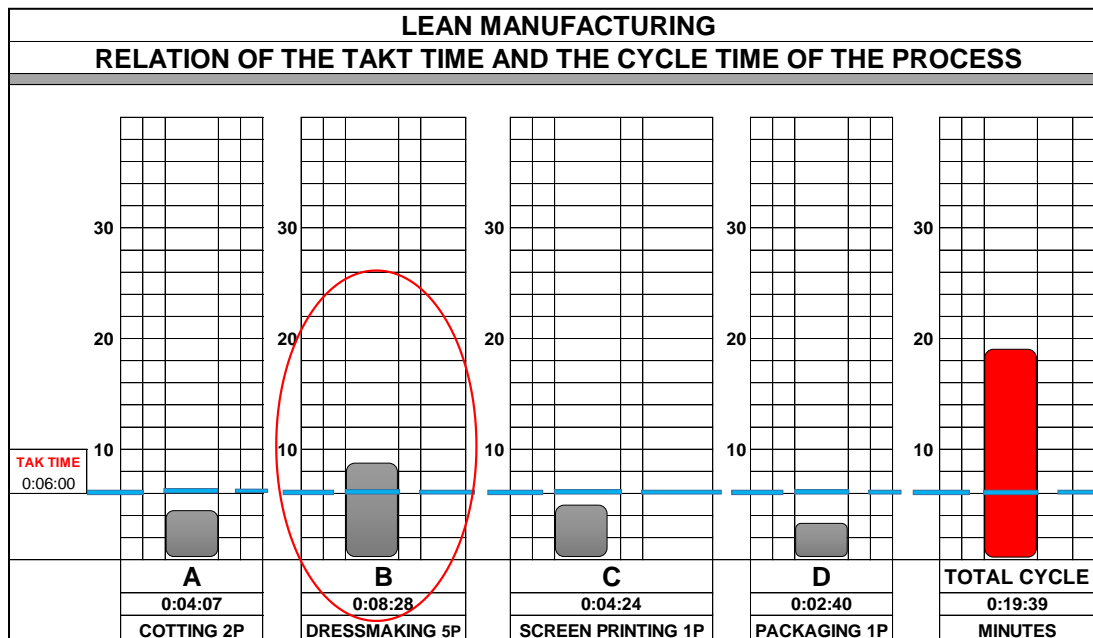
Figure 3. Ratio of Takt Time vs Cycle Time of each process.

Current production capacity (modular system)
The calculation of the current production capacity, labor cost, general productivity, was carried out in a period of one month under ideal conditions. It should be noted that this capacity is determined by establishing the manufacturing process as a bottleneck due to its high CT and its low production capacity compared to others with greater capacity.

This method analyzes the path followed by the raw material by the different stations in this case machines, each one shows the capacity taking into account the human resource, time, and the existing reprocesses for each machine. The Figure 4 shows the current production capacity taking into account the set of operations that each operator must perform. Next, an analysis of the limiting capacity is carried out.
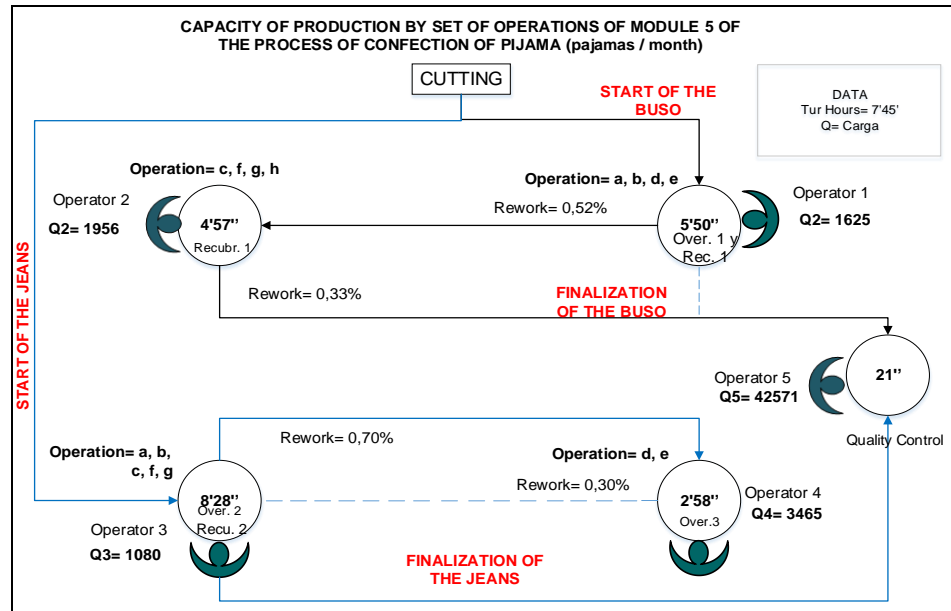

Figure 4. Production capacity by set of operations.

Analyzing the load or volume of productivity, the capacity with the highest CT is chosen, in this case the operator 3 with a cycle time of 8'28"with a capacity of 1.080, which will be called as production limitation, that is to say at the end of the One-month period can only produce 1.080 sets or pajamas. The current production capacity in module 5 is 1080 pajamas per month as it was considered the time of 1'15 " that represents the dead time per day, which is why they work only 7'45 " day.

5S's audit
Through the "5S's" audit, the current situation of the tool was determined, based on these results the improvement to each of the requirements is started, thus pursuing the optimal level of 100% of the application of the tool in each one of the processes.

The summary of the audit of the "5Ss", allocating 41% for the cutting process, 52% for making, 46% for printing, and 47% for packaging, these values accurately define the weaknesses that each process has, in terms of the application of the "5Ss" tool.

4. Result and Discussion
Based on the data obtained in the analysis of the current situation of the company with the aim of seeking the reduction or elimination of the percentage of 31% of non-fulfillment of orders in the star product the pajamas, a brainstorm is held against the problem, causes and the possible solutions or tools of LM which can be seen in Table 3.

Table 3. Brainstorming matrix applied to the problem of order delivery delays.

Brainstorming			
Problem	**Causes**	**Possibles solutions**	**Process**
Orders delivered 31%	There are not times in the process of cutting, stamping, packaging	Study of time	Cutting, Screen printing Packing
	Cycle of Time> takt time	Manufacturing Cell	Dressmaking
	Disorder and movement	5S's	Cutting, Screen printing Packing

	Mechanic stop	Autonomous Maintenance	Cutting Packing
	Unlike operations	5S´s	Packaging

After the brainstorming application, we proceed to prioritize the tools for their subsequent proposal

4.1 Prioritization of Lean Manufacturing tools

In Table 4 presents the final prioritization matrix, which is the result of the comparison of the tools with each one of the criteria (implementation cost, implementation time, Feasibility, Viability). According to the results, the tool that will be proposed in this study will be carried out in the following order. Study of times in the process of stamping, cutting, packing, 5S's in cutting, stamping, packaging and CM in the manufacturing process.

Table 4. Array of prioritization of tools to propose.

Lean tools	Final Prioritization Matrix				Summary	Prioritization Order
	Criterion 1	Criterion 2	Criterion 3	Criterion 4		
	Cost	Time	Feasibility	Viability		
Study of time	28%	28%	29%	31%	29%	1ro
5S's	28%	23%	27%	24%	26%	3ro
Autonomous maintenance	15%	23%	15%	15%	17%	4to
Manufacturing Cell	28%	26%	29%	29%	28%	2do
Total					100%	

4.2 Proposed Manufacturing Cell

It should be noted that this proposal will only be applied in the manufacturing process because this is the bottleneck, which is limiting for the fulfillment of the customer's demand.

4.2.1 Balance of operations in module 5

The balance is made to reduce the operating times in each operator in such a way that a sketch of the CM is made with a continuous flow for both the upper garment and the lower garment that makes up the pajamas.

Figure 5 indicates the distribution of the operations to each worker, which are grouped in such a way that a single value is obtained in operation times of the 5 machines assigned in the cell.
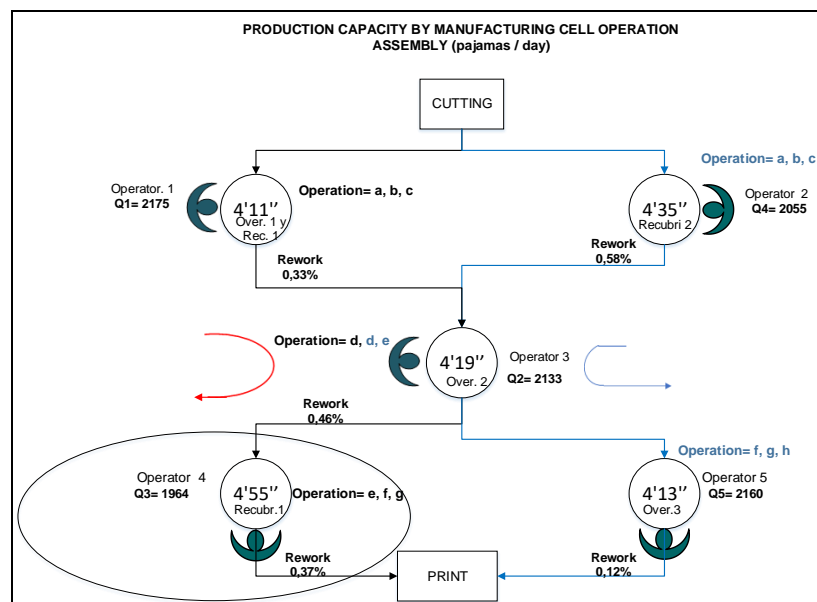

Figure 5. Capacity and distribution of operations in the MC

Analyzing the load or volume of productivity, the capacity with the longest cycle time is chosen, in this case the operator 4 with a cycle time of 4'55 "with a capacity of 1,964, which will be referred to as production limitation, that is to say, finishing the period of one month can only produce 1.964 sets or pajamas.

4.3 Proposal for the "5S's" tool
It is necessary to work first on this tool, it should be emphasized that to justify the proposal an audit of "5S's" was carried out, which helps to determine the starting point and propose the following results that will be achieved when complying with the specifications or requirements that the tool required in each of the processes, see table 5.

Table 5. Values pursued with the implementation.

Audit summary 5S's		
Process	**Total score**	**Percentage**
Cutting	123	88%
Dressmaking	125	89%
Screen printing	117	84%
Packaging	112	87%

Table 6 shows the improvements that will be obtained when implementing the "5S's" tool. Improvement when implementing the tool proposal.

Table 6. Improvement when implementing the tool proposal 5S's.

Proposal for improvement when implementing 5s's		
Process	**Improvement**	
Cutting	**Proposal**	**Improvement**
Preparation of time	1h 04'08''	39'38''
Cycle of time	4'07'	3'50''
Production of capacity	2183	2654
Screen printing		
Preparation of time	2h 47'24''	2h 27'50''
Cycle of time	4'24''	4'16''
Production of capacity	2060	2201
Packaging		
Preparation of time	7'	3'18''
Cycle of time	2'40''	2'36''
Production of capacity	4.000	4.068

It is vital to detail that the capacities that will be obtained when implementing will not be the real one because the company will operate with the capacity of the bottleneck (Dressmaking).

Comparative analysis after making the diagnosis to the company, it is necessary to carry out a comparative analysis that indicates the percentage of improvement in case of implementation as shown in table 7.

Table 7.Indicators before and after implementation.

Comparative table of results before and after the implementation of "5S's and MC"					▼ Decreases
					⬆ Increase
Indicator	**Current**	**Results**			**Units**
		Proposal		**Improvement**	
Cycle time	8'28''	4'55''	▼	3'7''	Minutes
Production capacity	1.080	1.964	⬆	884	Units/month
Real production capacity	1.080	1.589	⬆	509	Units/month
Efficiency	60%	72%	⬆	12%	Add value
Lead Time	619'	615'	▼	4'	Minutes/pajamas
Labor productivity	1,40	2,10	⬆	0,7	Pajamas/hour/worker
Production cost	5.843,10	6.794,64	⬆	951,54	$/month

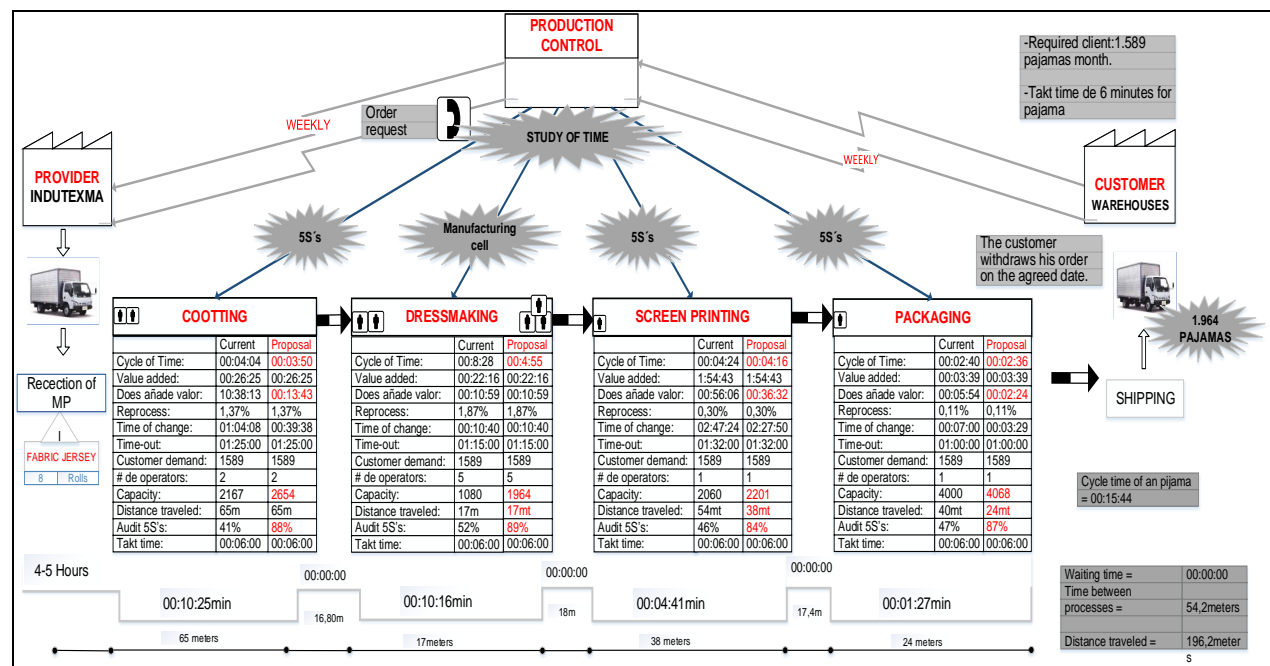| Cost of unit production	5,41	4,28	↓	$1,01	$/unit
P.V. U	13,12	9,75	↓	3,20	$/unit

Development of the future value Stream Mapping
In this way, the tools of 5S's and MC point to the improvement in capacity and therefore a better satisfaction of the client for which the VSM was made, which is presented in the Figure 6, where the indicators are presented that will be improved in the process of elaboration of pajamas.

Cutting process
Disorder: By applying the 5S's in the cutting process, the compliance level will be improved from 41% to 88%.

Unnecessary movements: In the cutting process there is a preparation time of 1h 4'08", which is proposed to reduce to 39'38", by eliminating ANV as, looking for orders with a time of 3'30'', find tools that are lost with a time of 2'40''and delays by disorder with a time of 2', adding a time of unnecessary movements of 8'10", this time is multiplied according to the number of times that happens in this case at least three times a day, so you have a time of 24'30", this will be achieved with the application of the first phase to organize the 5S's tool.

Figure 6. Design of the future VSM of the pajama making process.

Dressmaking process
Disorder: By applying the 5S's in the manufacturing process, the compliance level will be improved from 52% to 89%.

Production flow: Through the times granted by the dressmaker it is established that the pajamas module 5 has the operations distributed as follows: Operator 1 with an operating time of 5'50", operator 2 with 4'57", operator 3 with 8'28", operator 4 with 2'58" and operator 5 with 21", which by means of a balance of operations is distributed in such a way that operator 1 executes the operations in 4'11", operator 2 in 4"35", operator 3 in 4'19", operator 4 in 4'55", and operator 5 in 4'13''.

The CT will be reduced from 8'28 "to 4'55" in such a way that it is less than the time takt time of 6 ', so that it is able to comply with the time required by the 6' client each pajama, for this, the flow and distribution of the operations within the module 5 were analyzed in depth, looking for a distribution of the operational load ordered and balanced to each operator.

Screen printing
Transportation: The total traveled distance is 54m which was reduced to 38m, this reduction is achieved by reducing the activity transferring garments to packing from 32m to 16m, by changing the location of the packing process from floor 2 to floor 3, and this represents a decrease from 3'27" to 1'30".

Unnecessary movements: The time of change or preparation is 2h 47'24 " which was reduced to 2h 27'50 " when applying the first phase to organize the 5S tools which focused on reducing the ANV as : look for negatives 17'35 " which was reduced to 6'05 ", look for frames and tools 10'28 " to 4'15 ", in total it was reduced 28'15 " in activities that do not add value to the product having a positive impact on the cycle time since it was reduced from 4'24 " to 4'16 ", the remaining time is of ANV but which are necessary.

Packaging process
Disorder: By applying the 5S's in the manufacturing process, the compliance level will be improved from 47% to 87%.

Transportation: The distance traveled is 40m is reduced to 24m which is achieved by the relocation to the second floor, this also represents a reduction in time of the activity looking for garments in reprocess from 5 'to 1'45' ', this activity is considered as ANV to the product.

5. Conclusions
The Lean Manufacturing system helps deliveries to be quick, at the lowest price and the amount required by improving the work environment, eliminating the seven classic wastes present in any industry.

When performing the initial diagnosis, it was determined that there is a 31% non-fulfillment of orders, this caused by processes without standard times, efficiency of 60% and with a CT 8'28 " greater takt time of 6 ', which is considered as bottleneck or critical process.

When implementing the MC in the manufacturing process, the CT will reduce from 8'28 " / pajamas to 4'55 " / pajamas, this implies that the production capacity of the process will increase from 1,080 pajamas per month to 1,964 pajamas per month, exceeding al to the customer's demand with 23% which will reduce the non-fulfillment of order from 31% to 0% this will allow the company to fully meet the customer's demand.

When applying the first phase, organizing the 5S's in the cutting process will eliminate the activity to look for orders and look for tools, reducing 24'30 " which reduces preparation time from 1h4'08 " to 39'38 " , on the other hand, the CT will decrease from 4'07 " to 3'50 ", in print the activity will be reduced to look for negatives from 17'35 " to 6'05"and the activity of looking for 10 " paintings 28 " to 4'15 " which will decrease the preparation time from 2h 47'24 " to 2h 27'50 " and the CT from 4'24 " to 4'16 ".

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