The way lean starts
− a different approach to introduce lean culture and changing process with people’s involvement

RF Mascarenhas\textsuperscript{a,b}, C Pimentel\textsuperscript{b}, MJ Rosa\textsuperscript{c}

\textsuperscript{a}RM consulting, Avenida Dr. Lourenço Peixinho, 3800-192 Aveiro, Portugal
\textsuperscript{b} GOVCOPP, DEGEIT, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal and UNIDEMI, Faculty of Science and Technology (FCT), Universidade NOVA de Lisboa, 2829-516, Caparica, Portugal
\textsuperscript{c} CIPES, DEGEIT, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro

Abstract

Traditionally, the lean manufacturing path starts with people’s involvement in the application of some lean common tools, such as the Value Stream Mapping (VSM), 5S or visual management. But is this the only way to start a lean journey? And does it always work? In this paper we will resort to a case study to present the argument that both questions can have a ‘no’ answer. When people’s involvement through the application of the VSM, 5S and visual management does not lead to the expected results and, consequently, the changing process is too slow or does not happen at all, a different approach must be followed.

An organisation’s culture, conditioned by its surrounding environment, is a major asset but it can also be an obstacle to change and progress. If an organisation faces a hostile environment and there is a total reluctance to change from its own employees, the first step to introduce a lean approach must be the search for employees’ involvement, even if these do not include the application of the usual lean tools. In the case study presented in this paper, employees’ involvement was achieved through an improvement action in the company’s production planning and control process. Considering that one of the purposes in an industrial environment is to achieve a levelled production, the company successfully introduced lean manufacturing by developing an effective production planning and control mechanism and levelling the orders, after the failure of the usual lean implementation path. The strategy followed led to a waste reduction of 2.5%, while the number of units produced correctly first time increased from 95.14% to 97.66%. Furthermore, order levelling proved to be a solution to promote people’s involvement, mainly due to the internal dissemination and sharing of the results obtained.

© 2019 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

Peer-review under responsibility of the scientific committee of the Flexible Automation and Intelligent Manufacturing 2019 (FAIM 2019)
1 Introduction

Lean manufacturing is an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability [1]. To achieve this objective, an appropriate deployment of lean concepts should be implemented in any organisation [2]. Figure 1 shows some of the typical tools associated with lean manufacturing.

Over the last seventy years, the path to start a lean journey in an organization has been typically systematized in the same sequence: people involvement, Value Stream Mapping (VSM), 5S and visual management. It is an efficient path and the results obtained from its implementation in different organisational settings confirm it.

![Fig. 1 Lean tools house](image)

Lean is not synonymous of laboratory work but rather of a real working environment, where there is a wide range of influences. Its emergence, as well as the appearance of other operational management methodologies, was "driven by necessity, because in post war Japan consumers were eager for many automobiles with differentiation between them more than many all-alike automobiles as was typical of the United States assemblers who used the Ford Motor Company production model" [4].

There is awareness of the potential gains associated with the use of proven methodologies and tools. Nevertheless, there is also a lot of subjectivity and some disorganization around their implementation and use. Subjectivity is a reality that does not help to make the path of implementation pragmatic; indeed, there are several possible paths. In [5] a systematic literature review is presented of different available lean implementation approaches in the manufacturing industry.

Human involvement is one of the leading requisites for a lean implementation, but wrong mindsets, poor understanding of the basic knowledge and the lack of a proper implementation of the strategies can always lead to failure and misapplication in a lean implementation [5]. From a strategic point of view, however, other approaches can be used (particularly regarding the tools they offer), without contradicting the core objective of lean – to provide added value to customers. In other words, any concept that provides customer added-value can be in line with a lean strategy, even if lean production tools on the shop-floor, such as kanban, production levelling, or takt time production, are not typically used at the beginning of a lean journey. And in fact, there is a range of complimentary approaches, such as kaizen, and some quality tools, that can and have been used in conjunction with lean [6].

Production levelling or Heijunka is a customer-driven technique, which consists of defining a sequence of a mix of items to be produced in a short period of time (for example, one day) during a given planning horizon (for example, a month). The goal is to repeat this pattern until the (month) requests are resolved. This is an added value technique because it allows the combination of different products; ensures a continuous production flow; prevents production in large batches; minimizes work in progress; levels the resources effort (employees and machinery); eliminates peak

*Keywords: Lean manufacturing; Lean implementation frameworks; People involvement; Heijunka*
production; reduces customer lead time (increasing customer satisfaction); eliminates bottleneck resources; and eliminates waiting times.

In many cases, it is not easy to deal with the constant changes that accompany fluctuation in the volume and variety of products a company needs to deliver. Levelled production keeps the production volume constant for a certain period, reducing confusion on the shop floor, while helping to make problems visible [9]. When this concept is applied together with other improvement tools, the production becomes more fluid and improvement actions can be implemented more easily [9].

One of the strategies used for production levelling is batch/mix production, where different products are produced in combination, resulting in reduced stocks of finished products, shorter delivery times and an easy adaptation of production to changes in the mix of products requested by customers. There was a care taken by those who programmed to combine measures. This good practice was refined to reduce the paint stock and reduce the reference change time, as well as the set of references in each sector, taking into account the adjacent sectors.

Independently of the approach followed, some critical factors for the successful implementation of lean manufacturing include management commitment and involvement, training and education, organisational culture and organisational structure, and employee’s participation and empowerment [7, 8]. Additionally, the nature of the process and the existence of a motivated change agent are also crucial factors for lean adoption [8].

The history of mankind has taught us that if we can imagine it, we can do it [9], and that not always the obvious solution or the one selected by the majority is the best to solve a given individual or organisational problem. In fact, this paper resorts to a specific company to put forward the argument that under certain conditions other paths, rather than the usual employees’ involvement/VSM/5S/visual management one, offer better ways to really embrace a whole organisation in an effective lean journey. It is a matter of not giving up at the first drawbacks and really work hard to find the solution that better fits the organisation’s culture and its people.

In the remaining of this paper, the company object of study will be presented, including its main production process. Then the work conducted in the company to implement a lean manufacturing approach is described, being highlighted the main challenges, drawbacks and learned lessons along the journey. Finally, the results obtained from the lean manufacturing approach implemented are presented, as well as the major conclusions derived from the work.

2 The case study company and its production process

The company concerned is more than 170 years old and is one of the oldest in the packaging and paper sector in Portugal, producing paper bags. The paper factory is located in the north of Portugal, approximately 50km from Aveiro and 25km from Oporto, and it was founded in 1848. In the same factory there are two productive units: one of paper and another of packaging. In this article we will stick to the packaging unit.

At a macro level, and to produce large series of bags, the production process is composed of three sectors: tubes, bottoms and packaging. In the first sector, there is an assembly, gluing and cutting operation that gives rise to the height of the bag. In the second one, the bottom of the bags, and in some cases also the tops, are closed. In the third and last sector, a quality control is undertaken, and every package is checked before the pallet’s preparation and filming. The production of small series does not fit in this description, since it entails other details and/or specific operations such as, for example, the use of wings or of sewn bottoms.

The tubes sector has seven production lines (each line is composed of a machine), each one working in two shifts with two sub-teams of two people each. In the bottoms sector, there are five machines, of which two are specific for some operations and measures. There is a team of three people per machine and this sector also works in two shifts. In the packaging sector all operations are manual. Two teams of four people work in this process in two shifts. During peak production times, an extra team is built to deal with the extra work in this sector.
The existing technology is not brand-new, mainly because the process has remained almost the same over time and no new machinery was felt to be needed. As such, some machines have more than fifty years of continuous use.

The company’s employees also have a long-term relationship with it. The average age of employees is over fifty years old, with thirty years or more of work in the company, which translates into a significant reluctance to change the way of working. The knowledge of the process is supported by the number of years of 'experience', but no one in the company controls it fully.

3 Lean implementation in the case study company

The consultancy work developed for this company was initiated because of a specific need the company felt, related to its layout improvement. Thus, the following question emerged: how much can be gained with a new layout? This first question originated two other ones: is it really necessary to change the layout at this stage? Is this the priority? This, in turn, led to a third round of interrogations: is there any other improvements that can be done before implementing a new layout and that can bring a return to the business, while also facilitating the new layout implementation? In order to ensure an increase in the company’s profitability, the team (internal team and consultancy team together) involved with the new layout project was asked to answer these questions.

With the support of the administration, a project has then been started to introduce lean manufacturing into the organization. At the first meeting, the administration stated that it felt the layout as a problem both for the situation it had and for the entry into force of a customer’s requirement. On the ground, after an initial diagnosis, it was found that the layout was bad but that was not the main problem and that the change had a high operational and financial impact (it entailed a deep maintenance intervention in the equipment). In this way and with the data collected and analysed the project was changed. It is worth to mention here, that in the case of this specific company the administration was effectively involved in the project and “as close as possible to the ‘true place’” [10], the genba. The project was initiated with its purpose being communicated to all the employees, with a few of them being selected to be directly involved in its operationalisation.

Before the project started, a preliminary analysis of the company’s current situation was undertaken, which allowed gathering information to build a VSM for the bags production macro-process, while also helping to answer the questions initially raised: a new layout was not indeed a top priority. The analysis revealed that there was a lot of waste throughout the production process, together with a tremendous reluctance on employees’ side to change their practices and normal ways of working. In addition, the change of the layout was too expensive and time consuming (including the need to stop the production for at least four weeks). Consequently, the objective of implementing a layout change has been replaced by the goal of increasing the process’s productivity and, consequently, the company’s profitability.

To achieve this new goal, the proposed path for the lean manufacturing implementation was the typical one: starting with the involvement of all people, selecting a process to be deeply analysed through VSM and, subsequently implementing an action plan to improve the process, which would include the application of 5S and visual management. This path would presumably allow showing the company’s employees what were the benefits for both the company and themselves of a lean manufacturing approach.

A roadmap for lean implementation was then presented, which included the steps that are usually recommended in the literature and applied in companies [11]:

1. Characterization of the initial situation - current state;
2. Definition of objectives and metrics (KPI) for results’ evaluation - future state;
3. Constitution of teams, definition of their roles and tasks, as well as of the goals to be achieved by every team member;
4. Internal communication of the project and its goals;
The purpose of the project was initially communicated to all employees and presented again each time the implementation team, composed by company employees and consultants, went to a new workplace or that someone raised questions about it. The implementation team was nevertheless received with coldness and hostility by the employees, since from their perspective it was interfering with their comfort zone and usual way of working. Hardly anyone provided the consultancy team with the right information or was available to cooperate with honesty. The first difficulty of such a project was then identified: to build a team of employees motivated to be involved and effectively take part in the project.

Despite these difficulties, an implementation team composed of company employees and consultants was constituted and started to build a VSM for one of the bags’ production process sectors: tubes, bottoms and packaging. A second difficulty was then identified: this team was harassed and pressured by the other employees. Even though, the VSM designed allowed to build an action plan to optimize the flow of a line/machine.

Furthermore, and along with the VSM work, the 5S started to be implemented in a pilot area, after training has been given to the employees involved and the intervention prepared, including the design of an audit plan. The first three "S" were then run, and employees perceived their implementation as "a party day"; however, the last 2 "S" were not supported by employees, mainly due to personal disputes between those working on the same machine team. Since the 5S pilot implementation has failed, mainly due to personal issues between the employees, it was not possible to present to the rest of the production’s employees the advantages of such an approach and, worst, the wrong message about the benefits of this tool was what actually passed to them.

A month after this initial failure, a new 5S pilot was implemented in another production line, with the goal of reducing the time in the organization and its surrounding area of the existent machine (a basis for the future implementation of SMED – Single Minute Exchange of Dies). This time, a line team was involved and the 5S program was completed, while a new team was also created to work in the line. Overall, this team did a great job and was making progresses regarding the line productivity (20% reduction in setup average time). However, the changes they have made in their way of working had implications in all other employees’ modus operandis, which needed to be changed accordingly. As such, their colleagues started to boycott the work done, which led to a failure regarding the project’s initial purpose and to its abandonment by the team. After this stage, the overall project was stopped to be re-analysed. Already a year of work was consumed without significant progress. During this analysis, it was verified that:

- employees were too afraid to leave their comfort zone;
- this fear was in part due to the ongoing stress caused by the way the production was managed and by a poor production planning, which was ensured by only one production manager;
- employees did not feel responsible for their own work and actions and felt unimputable even for intentional 'errors'.

Within this scenario, two possible paths emerged for future action: admit failure and give up or try a different approach. The option was for the second scenario and as a result of further discussions, around the project’s purpose – the intention to introduce lean manufacturing in the company –, it was decided that a different approach should be taken. The aforementioned analysis of the ongoing project allowed verifying that there was one particular aspect of the production process that was dependent on just one person: the overall production management. As such, if this...
person could be motivated for the project and really felt involved in it, there was a chance that the project could eventually have success. The idea emerged then of putting the effort in trying to reduce or eliminate the waste associated with the way the production management was done, which caused an enormous amount of stress to its manager, while also trying to design an efficient and effective production planning and control system.

To follow this path, it was necessary to give basic training in production management and computer tools (Excel®) to the production manager and to get some of his time to be dedicated to the project. For three months a team constituted by one of this paper’s authors (as a consultant) and the production manager, built and optimised a planning model, based on information provided by the production manager, which in the end was able to allow him to daily plan and monitor the company’s production process.

Additionally, during these three months data was collected and recorded on the available time, time consumed, stop time and number of pieces produced, by production machine. The number of viable parts to be produced in the lost time was also registered, and an improvement percentage per machine was calculated (reduction of the time of inactivity). The model built is depicted in Table 1. The data collected, together with the weekly production plan, began to be presented in a shared information frame, present on the factory floor. In addition to having a weekly basis plan, the workers started receiving the weekly and monthly results. Both are posted in the production information frame

For six months, weekly, the production manager drafted the production plan and registered the daily units produced correctly at the first time, not correctly produced at the first time, reworked correctly, rejected, as well as the value in euros associated with those losses. This work allowed him to build an increasingly refined production plan, able to incorporate customers’ orders and the company’s response, in terms of produced bags (that is total parts produced which is the sum of parts produced correctly at the first time and parts not correctly produced at the first time).

After the first six months, the production manager began delivering a weekly plan to each production team, together with a two hours break to analyse it; after its analysis, a signature of the team leader was requested in order to validate and approve the plan. He started by explaining the new model (and new way of working) to all employees, and during the first twelve weeks no liability or penalty attached to non-compliance with the approved and validated weekly production plan was implemented. After this period, the team became liable for non-compliance with the plan in case it had not informed the production manager about its (un)feasibility during the review period (i.e. if they signed up saying that they had all the information and considerations to comply with the plan without really analysing and validating it).

Only after nine months of monthly reports per machine, (additional clarification: the results of the previous week were posted weekly and the monthly results by sector were posted at the end of the month). Also at the end of the month the results were posted / disseminated by machine), it was possible to identify teams able to achieve the intended results. These teams were then publicly recognised and congratulated for their work (information on their achievement was placed in the information board on the shop floor). And it was only after this that employees actually realized what had to be done and what resulted from the work of the production manager. The machine monthly reports were then updated with new targets and the actions involved in their achievements restarted. An overview of the monthly global records along 2018 is presented in Table 2.
Discussion

The average deviation from the average monthly production was over 35% when the production planning project started. At the end of the nine months, it was 17.7%, i.e., a stabilization improvement of more than 50% was achieved. It took nine months to level production according to customer requests and to have the capacity to respond between stages of the process, considering on a weekly basis waste throughout the process and mitigating losses. With the leveling among sub-processes, everyone was receiving production orders of equal value without considering losses or wastage. This led to the subsequent subprocess being left with a sub-production record, and a new batch of the same reference needed to be produced. To prevent this, what was done was to estimate the waste and the deviation that was achieved by reference between sub-processes, and this estimate began to be considered in the production order of each sub-process. At the end of the project, it was possible to trace all the parts and find differences of less than 4 pieces in every 2,000. Delayed time to delivery has been reduced by more than 60%. Errors in the final stage (counting and packaging) decreased by 40% and the work in progress (WIP) was reduced by 20%.

Furthermore, the results obtained in terms of productivity and quality also made employees keener to take care and be responsible for their machines and their work, because they wanted to be congratulated for it; or, in other words, they did not want to be the 'worst of the line'. In addition, the weekly production plans began to be carefully analysed and the possible problems within them anticipated and reported to the production manager.

An internal continuous improvement team was then created to support the 5S implementation, with the goal of going back to the initial VSM action plan and of supporting the people in the genba who wanted to improve their jobs or machines/lines.

At the end of a year of work, it was possible to reduce the waste by 2.5% or 794,350 units, as can be seen in Table 3. Also, the level of units produced correctly at the first time increased from 95.14% to 97.66% (Table 3).

Table 1. Production planning and control template

<table>
<thead>
<tr>
<th>Week</th>
<th>2019.02.04</th>
<th>2019.02.05</th>
<th>2019.02.06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts produced correctly at first time</td>
<td>95.14%</td>
<td>97.66%</td>
<td>97.66%</td>
</tr>
</tbody>
</table>

Table 3. Productivity and quality indicators by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Parts produced correctly at first time (units)</th>
<th>Parts not correctly produced at the first time (units)</th>
<th>Total parts produced (units)</th>
<th>Waste (%)</th>
<th>Parts produced correctly at first time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>28,729,120</td>
<td>1,468,072</td>
<td>30,197,192</td>
<td>4,86%</td>
<td>95,14%</td>
</tr>
<tr>
<td>2018</td>
<td>28,164,723</td>
<td>673,722</td>
<td>28,838,445</td>
<td>2,34%</td>
<td>97,66%</td>
</tr>
</tbody>
</table>
Table 1. Production planning and control template

Table 2. Monthly global records and evaluation

<table>
<thead>
<tr>
<th>Month</th>
<th>Time spent on change in minutes</th>
<th>Number of changes and stops</th>
<th>Requested parts</th>
<th>Produced Parts</th>
<th>Final Parts</th>
<th>Quantity Rejected</th>
<th>Parts Rejected</th>
<th>Parts Recovered</th>
<th>% waste</th>
<th>overproduce ion [parts]</th>
<th>overproduction [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>30.510</td>
<td>315</td>
<td>2.078.550</td>
<td>2.170.499</td>
<td>2.123.831</td>
<td>45.169</td>
<td>15.819</td>
<td>69.988</td>
<td>15.320</td>
<td>32.67%</td>
<td>106.181</td>
</tr>
<tr>
<td>February</td>
<td>34.935</td>
<td>277</td>
<td>3.195.000</td>
<td>3.375.153</td>
<td>3.302.185</td>
<td>70.398</td>
<td>29.392</td>
<td>99.788</td>
<td>27.432</td>
<td>12.91%</td>
<td>180.153</td>
</tr>
<tr>
<td>March</td>
<td>35.831</td>
<td>310</td>
<td>2.813.541</td>
<td>2.964.680</td>
<td>2.924.247</td>
<td>66.910</td>
<td>23.956</td>
<td>92.826</td>
<td>22.393</td>
<td>3.90%</td>
<td>181.039</td>
</tr>
<tr>
<td>April</td>
<td>36.075</td>
<td>303</td>
<td>2.620.505</td>
<td>2.667.985</td>
<td>2.733.081</td>
<td>59.665</td>
<td>19.051</td>
<td>78.756</td>
<td>17.842</td>
<td>4.08%</td>
<td>160.450</td>
</tr>
<tr>
<td>June</td>
<td>35.265</td>
<td>284</td>
<td>2.773.140</td>
<td>2.902.429</td>
<td>2.832.394</td>
<td>67.493</td>
<td>24.547</td>
<td>92.040</td>
<td>22.025</td>
<td>3.33%</td>
<td>169.269</td>
</tr>
<tr>
<td>July</td>
<td>32.200</td>
<td>257</td>
<td>2.012.547</td>
<td>2.771.395</td>
<td>2.707.415</td>
<td>61.216</td>
<td>22.027</td>
<td>84.240</td>
<td>20.492</td>
<td>3.52%</td>
<td>134.409</td>
</tr>
<tr>
<td>August</td>
<td>31.750</td>
<td>212</td>
<td>1.818.070</td>
<td>1.706.122</td>
<td>1.685.141</td>
<td>56.858</td>
<td>14.040</td>
<td>50.027</td>
<td>9.246</td>
<td>3.75%</td>
<td>87.944</td>
</tr>
<tr>
<td>September</td>
<td>32.425</td>
<td>225</td>
<td>2.076.630</td>
<td>2.822.284</td>
<td>2.709.560</td>
<td>59.645</td>
<td>22.607</td>
<td>82.202</td>
<td>22.472</td>
<td>2.96%</td>
<td>144.389</td>
</tr>
<tr>
<td>November</td>
<td>28.920</td>
<td>246</td>
<td>3.016.892</td>
<td>3.162.904</td>
<td>3.102.298</td>
<td>59.518</td>
<td>21.042</td>
<td>80.582</td>
<td>19.884</td>
<td>2.98%</td>
<td>146.052</td>
</tr>
<tr>
<td>December</td>
<td>25.165</td>
<td>193</td>
<td>1.715.625</td>
<td>1.800.900</td>
<td>1.761.069</td>
<td>58.581</td>
<td>14.248</td>
<td>52.820</td>
<td>18.598</td>
<td>3.03%</td>
<td>83.873</td>
</tr>
</tbody>
</table>

Table 3. Productivity and quality indicators by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Parts produced correctly at the first time (units)</th>
<th>Parts not correctly produced at the first time (units)</th>
<th>Total parts produced (units)</th>
<th>Waste (%)</th>
<th>Parts produced correctly at first time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>28.729.120</td>
<td>1.468.072</td>
<td>30.197.192</td>
<td>4.86%</td>
<td>95.14%</td>
</tr>
<tr>
<td>2018</td>
<td>28.164.723</td>
<td>673.722</td>
<td>28.838.445</td>
<td>2.34%</td>
<td>97.66%</td>
</tr>
</tbody>
</table>

4 Discussion

The average deviation from the average monthly production was over 35% when the production planning project started. At the end of the nine months it was 17.7%, i.e. a stabilization improvement of more than 50% was achieved.

It took nine months to level production according to customer requests and to have the capacity to respond between stages of the process, considering on a weekly basis waste throughout the process and mitigating losses. With the levelling among sub-processes everyone was receiving production orders of equal value without considering losses or wastage. This led to the subsequent subprocess being left with a sub production record and a new batch of the same reference needed to be produced. To prevent this, what was done was to estimate the waste and the deviation that was achieved by reference between sub-processes and this estimate began to be considered in the production order of each sub-process. At the end of the project, it was possible to trace all the parts and find differences of less than 4 pieces in every 2,000. Delayed time to delivery has been reduced by more than 60%. Errors in the final stage (counting and packaging) decreased by 40% and the work in progress (WIP) was reduced by 20%.

Furthermore, the results obtained in terms of productivity and quality, also made employees keener to take care and be responsible for their machines and their work, because they wanted to be congratulated for it; or, in other words, they did not want to be the 'worst of the line'. In addition, the weekly production plans began to be carefully analysed and the possible problems within them anticipated and reported to the production manager.

An internal continuous improvement team was then created to support the 5S implementation, with the goal of going back to the initial VSM action plan and of supporting the people in the genba who wanted to improve their jobs or machines/lines.

At the end of a year of work, it was possible to reduce the waste by 2.5% or 794,350 units, as can be seen in Table 3. Also, the level of units produced correctly at the first time increased from 95.14% to 97.66% (Table 3).
5 Conclusions

One of the main challenges and difficulties of the project developed in this company had to do with its employees’ (non)involvement in it and their (no)willingness to change their way of working. Indeed, employees have shown a very significant degree of resistance to change, fuelled by the fact that the environment where they had been working for almost all their life did not put enough pressure on the need for change. Thus, the challenge was to find a way to show them how they could work differently and through that achieve better results.

More important than the improvements obtained in the indicators of productivity and quality, was the fact that the project in the end was able to promote employees’ involvement, leading them to really want to do their jobs in a better way, while also realizing the impact of their work in the company’s overall objectives. At present, employees are requesting training in the 5S, supporting change interventions and wanting to know the results of the audits. Some of them are even proposing, on an autonomous basis, possible improvement actions at their workstations and in other parts of the company, in simple processes and operations such as how production records are made, or the stopping time accounted for (example: at the end of the line do a first screening of products produced correctly first time or not).

The company is now moving towards a philosophy of work where employees have gained greater self-confidence and self-control and are encouraged and supported to improve their workstations. Now the time and space exist to turn this company in a lean mentality organization. It is nevertheless an ongoing work, where most probably only small steps will be able to lead to significant improvements.

The case study reported in this paper confirms the argument that there is not a unique or best path to start a lean manufacturing journey, and that the traditional one is not always a feasible solution. It all depends on the specific company where lean is going to be implemented, namely on its culture and employees. Above all, employee’s motivation and involvement in a lean manufacturing journey is indeed paramount for its success; as such, the company needs to find the best path, including methodologies, principles or tools, to achieve it.

References