

Lean Accounting: Economic-financial Performance of Companies with Lean Manufacturing

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Abstract— This article presents a study of multiple cases with four leading publicly traded companies on Bovespa (Brazilian Stock Exchange), before and after the implementation of lean manufacturing, evaluating economic and financial performance through primary and secondary data. Net income was the indicator that showed the greatest positive variation after lean manufacturing, although it increased indebtedness (over 200%) and storage (over 140%), indicating difficulties in conditioning suppliers to the production cycle. Lean manufacturing was not accompanied by accounting practices appropriate to the new productive environment, suggesting a rethinking of the management system, under the lean accounting approach, based on the value stream flow. The results are consistent with the view that lean thinking is a holistic business strategy and demonstrates the weakness in the spread of lean accounting in the corporate environment, which is necessary in order to optimize the overall results of a lean company. It is concluded that there is still a long way for lean Brazilian companies to develop a new organizational model and become lean enterprises focused on the flow of the value chain.

Keywords — Lean accounting, Lean manufacturing, Bovespa, Value stream.

I. INTRODUCTION

Companies have adopted differentiated procedures in response to changes in an increasingly competitive market, and this new environment has driven changes in organizational structures, manufacturing technologies and accounting practices. From this perspective, in the last decades, many organizations in different industries have transformed their production system and introduced a strategy of lean manufacturing. More recently,

organizations are beginning to realize that not only the production processes but also the cost and accounting management system need to be consistent with the lean manufacturing strategy and even lean enterprise [1].

It is worth noting that, according to Womack & Jones [2], a lean company refers to the one that adopted the philosophy of lean manufacturing in its productive sector. In contrast, an organization characterized as lean enterprise requires much more than the implementation of the lean manufacturing approach, and it is necessary to create a new organizational model defined by the understanding of the flow of value in order to consider the expansion of lean philosophy for all the sectors and processes of the organization.

However, making it difficult for the organization to achieve the status of lean enterprise, many managers encourage timely optimization instead of flow, ignoring the importance of lead time whose reduction is one of the principles of lean philosophy. Cost of flow is a powerful way to help bring lead times much closer to value aggregation times when differences between flow and product cost systems almost disappear.

Baines & Langfield-Smith [3] shows how to add operational costs to value-stream maps for all resource-sharing products, highlighting how to translate inventories in time to see the cost based on the flow. The actual value of the cost of the flow serves to help managers prioritize lean improvements by being able to see the financial consequences in terms of increased sales, less money invested in inventories, reduced operating expenses and postponed investments.

In this new environment dominated by lean thinking, the role of the accountant should be modified to encourage behaviors and practices of lean accounting [3]. Jusko [4] understands that lean accounting is not simply

to apply principles of the lean philosophy to the accounting function; it is about using accounting methods and practices that can support lean thinking and show clearly and simply how lean changes affect operational and financial performance and add value to the customer.

According to the literature, the needs of companies based on the lean enterprise precepts are not fully met by the classic model of the controlling area [5]. Exceeding the accounting, financial and legal sphere, controlling in lean organizations presents a broader and more complex role, with participatory bias, linking to the operational aspects of the sectors. In this way, it is based on the management of the flow of value, identifying and eliminating waste; stimulating optimizations based on managerial information of an objective and significant nature for all individuals aligned with the company's processes; and developing a logical and consistent management accounting system [6].

Given the above, it is of great value to study the magnitude of the results coming from the adoption of the lean philosophy by the Brazilian productive sector, allowing also to reflect if the companies researched adjusted their accounting controls to support the implementation and maintenance of the production system organized according to the principles of lean manufacturing.

Therefore, this study aims to evaluate the financial economic results measured in large Brazilian companies that are leaders in their segment, after the effective adoption of procedures for implementing lean manufacturing.

II. LITERATURE REVIEW

LEAN MANUFACTURING

Lean Manufacturing's approach was pioneered by Toyota through the Toyota Production System (TPS), which was based on Just In Time (JIT) and Jidoka. In 1998, a working group led by James Womack of the Massachusetts Institute of Technology (MIT) presented the five guiding principles of lean thinking, with a view to implementing this thinking in the productive system [7].

As a first guideline, lean thinking is part of the attribution of value for each product, in particular. In this sense, one must identify what the customer wants and, from the understanding of what is value from the perspective of the consumer, then the real cost of the product is defined, so as not to waste time on what the customer does not want [7].

The second principle refers to the identification of the rationalized and simplified flow of value in the production medium. Defining the best purchase, receipt, movement of inputs and transformation process, from the

request to the actual delivery to the customer, becomes essential for the identification of the flow of value. It is possible to identify potential wastes and activities that do not add value to the finished product [7].

The third principle, then, starts from the creation of the flow of value without interruptions, that is, the continuous flow of the processes is effected, so that each item is passed continuously from one process to the next, without stoppage or generation of stock. In this respect, it is necessary to abandon the idea that batch and departmental production is the most efficient [7].

Based on the creation of the continuous flow, there is (i) a reduction in the need to configure machines in the change from one product to another; (ii) a decrease in processing time, through the array of cells; (iii) and the maintenance of the productive operations close to each other, resulting in a reduction in costs and improvement of quality, as well as a reduction in the delivery time of the product [7, 8].

The fourth principle, one of the most emblematic in the field of lean thinking, refers to the production pulled by the customer, avoiding the extra production and, consequently, the generation of unnecessary stocks. Thus, from the continuous flow of the process, it is understood the need to manufacture only when the customer requests (manufacturing pulled by the customer), without pushing undesirable stock and implementing JIT concepts, in order to develop the suppliers for input supplies according to the request for the start of production [2; 7].

Finally, following a logical trigger, the last principle is based on the constant pursuit of perfection. Therefore, once the value is identified from the perspective of the customer as well as the flow of value, it is necessary that the organization seeks to improve processes and activities, reducing costs, improving product quality, eliminating waste, pursuing zero defects, streamlining value flows and increasing the value of products to customers.

This principle also encompasses the measurement and control system that provides information and delegates authority for each employee to act, when necessary, autonomously in activities that add value and eliminate waste in the process, reflecting the involvement of factory floor workers with ideas and initiatives for the continuous improvement of processes [7].

LEAN ACCOUNTING

Lean accounting can be understood as a set of managerial accounting tools adapted and structured with specific decision models to supply the decision-making process of companies that are adopting or adopting the principles and values of lean manufacturing.

Lean accounting is consistent with the principles of lean thinking, as it does not encourage overproduction, as costs are directly attributed to the flow of value according to resource consumption. Also, it does not motivate the formation of unnecessary stocks of raw materials, in-process components and finished products. In addition to the philosophy of lean thinking, it registers and encourages the reduction of lead time and the elimination of waste [9, 10].

Thus, reflecting specifically on the general principles of lean accounting, we can identify a system of measurement and evaluation of economic events captured according to lean thinking, aiming to reach certain performance, quality and productivity standards through conceptual paradigms composed by a series of managerial practices. Thus, we can include costing according to the flow of value, techniques of monitoring inventory levels, modification of financial statements and inclusion of non-financial statements [10].

One of the characteristics of lean results statements is that they separate the costs that are defined by the volume of costs that are only variable in the medium term or fixed. This is extremely important to make decisions about the elasticity of demand and how to deal with it. Standard cost systems, on the other hand, assume that all manufacturing costs are totally variable. As a result of this implicit assumption, by predicting the impact of additional sales, the impact of profits is underestimated and, predicting the impact of lost sales, the reduction in profits is underestimated [11].

In a lean financial statement, the difference between the variable margin and the gross margin is clear. In addition, the specific accounting transactions of the Generally Accepted Accounting Principles (GAAP) for the valuation of inventories are separated from the actual elements of costs, giving a direct clarification to the decision making. It is valid, then, to evaluate how to reach the stages for the implantation and advance of lean accounting. As the stages of development of lean thinking advance, processes begin to get under control, inventories decrease, and efficiency increases. So, traditional controls, geared towards mass production, are progressively being replaced [6].

There are three stages of implementation of lean accounting. Stage 1 is called Pilot Lean and Production Cells, referring to the introduction of the first cells, intensive training of lean principles, identification of the value stream and early customer-driven production initiatives, as well as the beginning of elimination of unnecessary processes.

Lean Manufacturing Widespread, stage 2, refers to the stage at which lean thinking is disseminated strongly;

applies visual controls throughout the production; beginning of certification of all suppliers covered by the method; and controlled reduction of inventories, both for inputs and finished products. Cost analysis contributes to the identification of value flows, so costs are allocated according to the characteristics of the production cells and the characteristics of the products, with an integration between the direct operational and the financial costs.

In stage 3, called Lean Thinking Applied or Lean Enterprise, lean thinking expands outside the company, seeking real partners for the process. At this stage the company is fully organized by value stream and there is extensive cooperation between customers, suppliers and partners and continuous improvement becomes part of the routine. Target costing is used to understand the value to the customer and directs the continuous improvement of products and processes. Value stream mapping and costing expand, involving suppliers, customers, and third parties. With purchases and inventories under control, many purchasing and inventory records are eliminated, as well as rationalized or outsourced accounting routines, going backwards or backflushing accounting cost [5, 9].

Thus, the adequacy of managerial accounting for lean transformation requires reporting and decision-making to support production and other processes based on lean thinking.

According to Maskell & Baggaley [5], making use of a cost flow by value, in which costs are allocated directly to the flows, a new information system is needed when the company migrates from mass production to lean manufacturing. These costs include labor and raw material; support for production, operation, maintenance and installations; and all other costs of the flow of value.

III. METHODOLOGY

The present study is descriptive exploratory, starting with a bibliographic review, followed by the collection of primary and secondary data. In order to understand and interpret more profoundly the facts and phenomena related to the adoption of lean manufacturing by the Brazilian productive sector and the adequacy of accounting control to support the implementation and maintenance of the lean manufacturing system, a multiple case study, comprising four large companies governed by the Brazilian Securities and Exchange Commission (CVM) and the Brazilian Stock Exchange (Bovespa), which implemented lean manufacturing, was developed.

Firstly, as a secondary source of research, the Lean Institute Brazil was contacted to have certification of which Brazilian companies adopted lean philosophy with a high degree of development and investment in its structure. Confirmation of 18 companies was obtained;

however, this work was focused on the organizations considered leaders in their segments, with revenues in excess of R\$ 1 billion/year, shares opened on the Bovespa and governed by CVM regulations and which implemented lean manufacturing in similar times. In this way, four organizations from different sectors were selected, in order to enrich the analysis:

Company 1 – transport equipment sector.

Company 2 – housewares sector.

Company 3 – processed foods sector.

Company 4 – chemicals sector.

This work considered the period of time between 2005 and 2015, making 11 years of analysis of the indices and accounting variations of the data. The analysis was divided into three time intervals according to the similarity of the time of implantation of lean manufacturing by the companies:

- (I) period prior to the implementation of lean manufacturing – between 2005 and 2008;
- (II) lean manufacturing period – between 2009 to 2012;
- (III) post-implantation period of lean manufacturing – from 2013 to 2015.

The survey was further developed in CVM and Bovespa data. The data collected were based on the evaluation of profitability, based on net sales; contribution margins (gross profit); net profits; inventory turnover; and level of indebtedness.

Complementarily, in order to obtain primary data, according to the accessibility factor, companies 2 and 4 were chosen to apply a face-to-face questionnaire. The research instrument was answered by professionals directly involved in the implementation of the lean philosophy, such as Product Development Director and Controller.

The questionnaire developed was based on the North American model instituted by the Lean Enterprise Institute, founded by James Womack in 1997. Aiming to

characterize how lean concepts were adopted in the production and accounting/financial controls of the two companies, the questionnaire base had the following characteristics:

Part I: socio-demographic issues, aiming at the better characterization of the company, as well as evaluation of the approximate time that the organization remained in the implementation of this methodology.

Part II: closed questions, based on multiple alternatives with scale of evaluation, about the degree of intention that the company had to implement the techniques, practices, reports and actions.

Part III: Closed questions, based on multiple alternatives with scale of evaluation, on how companies have effectively implemented lean manufacturing practices.

Part IV: open questions of textual responses in order to capture some problems that companies have faced, and potentially still face, to reach the central purpose of the lean proposal, specifically within Brazil's tax and social economy and legislation.

The data were analyzed and tabulated using Microsoft Excel, using mean and dispersion measures.

IV. RESULTS AND DISCUSSION

Table 1 presents a summary of the indices and values obtained from the data collected at the CVM and Bovespa, according to the company surveyed.

It can be seen that in Company 3 and Company 4 there was an increase in the contribution margin and net profits from the implementation of lean manufacturing, and the latter parameter also increased in Company 2, although less significantly.

In all the companies there was a significant increase in the stock levels in the period after lean manufacturing, contrary to the precepts of lean thinking. An analysis by company will be presented below.

Table 1: Results of companies that adopted the Lean manufacturing, considering different indices and the period between 2005 and 2015

Year	COMPANY 1					COMPANY 2					COMPANY 3					COMPANY 4				
	FL	MC	LL	NE	NED	FL	MC	LL	NE	NED	FL	MC	LL	NE	NED	FL	MC	LL	NE	NED
2005	9.1	24%	5%	3.8	2.6	4.9	19%	3%	0.8	0.1	5.1	28%	7%	0.6	1.7	17.0	16%	4%	1.5	4.3
2006	8.2	22%	6%	4.6	1.8	5.0	23%	7%	0.8	0.1	5.2	26%	2%	0.7	1.8	16.5	13%	1%	1.7	4.6
2007	9.9	16%	5%	4.9	3.0	5.5	28%	10%	0.8	0.1	6.6	28%	5%	0.8	2.2	22.4	14%	2%	2.2	7.4
2008	11.7	20%	8%	6.8	4.2	5.9	31%	13%	1.1	0.1	11.4	24%	0%	1.6	5.3	23.0	12%	-11%	2.9	11.2
2009	10.8	19%	6%	4.2	3.5	6.6	20%	7%	0.6	0.1	15.9	23%	1%	3.1	8.8	19.4	13%	5%	1.9	9.0
2010	9.3	19%	8%	3.6	2.3	7.3	25%	10%	0.9	0.1	22.6	25%	4%	2.1	7.1	25.5	16%	7%	3.0	10.2
2011	9.8	22%	5%	4.2	3.1	7.4	24%	5%	0.8	0.1	25.7	26%	5%	2.7	8.0	32.5	11%	-2%	3.6	15.1
2012	12.1	24%	10%	4.4	4.2	8.4	22%	10%	0.9	0.1	28.5	23%	3%	3.0	9.4	35.5	9%	-2%	4.1	17.5
2013	13.6	23%	12%	5.3	5.1	9.3	23%	11%	1.1	0.1	27.7	25%	4%	3.1	10.0	40.9	13%	1%	5.0	18.5
2014	14.9	20%	9%	6.3	6.6	9.6	22%	11%	1.1	0.2	29.0	29%	8%	2.9	11.5	46.0	13%	2%	5.3	20.3
2015	20.3	18%	5%	9.0	13.8	9.3	17%	4%	1.1	0.2	32.2	31%	10%	4.0	15.2	47.2	22%	6%	5.5	27.2

Source: CVM (2016); BM&FBOVESPA (2016)

Indices in order of presentation:

FL - Net Sales - in billions of Brazilian Real

MC - Contribution Margin – in %

LL - Net Profits – in %

NE - Inventory Levels - in billions of Brazilian Real

NED - Levels of Indebtedness - in billions of Brazilian Real

COMPANY 1

With offices and factories in various parts of the world, this leading company in its segment in Brazil is listed on the Dow Jones Sustainability Index (DJSI) and BM&FBovespa Corporate Sustainability Index (ISE) portfolios, composed of organizations that have the highest standards of governance and sustainable management.

The performance of Company 1, before, during and after-deployment lean manufacturing was evaluated. Net revenue remained stable, once between 2005 and 2008 the average was already 22% in relation to net revenues. Between 2009 and 2012, at the peak of lean deployments, gross profit reached an average of 19% of gross revenues. However, in the economic environment, after 2013, gross profit rose to 22% of net revenue, reaching lean indexes similar to those pre lean manufacturing.

After lean manufacturing, the average operating profit on net revenue was 6% and, from the period of 2009-2012, a good average of operating profitability was established, advancing to a level of 10% on the operating profit due to the automation and de-bureaucratization of productive and administrative processes, with restructuring including employees.

In lean manufacturing years, inventories remained at a good level compared to previous periods - average inventory during implementation 2008/2012 was R\$ 4,200 million versus an average of R\$ 4,900 million previously. In fact, factory supply also changed so that, prior to lean, all inputs to be used in the assembly were disposed alongside the product under construction; currently, the components are delivered and used every shift.

However, the economic situation led, after 2011, to a level of R\$ 6,000 million, on average, so that growth in the stock level, from 2005 to 2015, increased by 232%, surpassing the growth in the level of net sales (variation of 122% in the same period). This positive variation in stocks is not in line with the principles of adoption of the lean manufacturing processes initially proposed.

The level of borrowing, in turn, increased considerably; before implementation, was R\$ 3,500 million a year, but after 2011, the funding level reached R\$ 6,000 million.

It is thus perceived that structural investments require high efforts and financing that improve logistic performance (speed and quality), but also require compatible financial performance for the maintenance of new practices.

COMPANY 2

It is a multinational company and the largest manufacturer of domestic utilities in the world, present in practically all countries. In Brazil, the company has 3 factories, 2 administrative offices, 4 technology centers, 23 laboratories and 3 distribution centers.

Net sales remained stable, once between 2005 and 2008 the average was already 26% in relation to net revenues. Between 2009 and 2012, gross profit went to an average of 23% of gross revenues, however, given the economic situation after 2013, gross profit rose to 21% of net revenue, showing a lower performance than before of lean manufacturing.

Considering the years before the introduction of lean manufacturing, the average operating profit on net revenue was between 8 and 9%; in the post-deployment years, operating profit remained at an average of 9%.

In the production lean years, stocks remained at average levels similar to previous periods, that is, average inventory during the 2009/2012 implementation - R\$ 811 million versus an average of R\$ 849 million previously. However, after 2011, the stock reached a level of R\$ 1,150 million, on average, representing a growth of 144%, between 2005 and 2015, being higher than the index of inflation of the period (approximately 90%). Therefore, a reduction of inventories was not observed as proposed in lean manufacturing.

Finally, with regard to the level of indebtedness, in this case the effects of loans and financing remained at stable levels.

Therefore, there was no substantial influence of lean philosophy on the company's financial results. However, analyzing the practices for the transition to lean manufacturing, there was a preponderant interference in logistics and production control.

COMPANY 3

It is one of the largest food companies on the planet and is a global leader in the export of animal protein to produce food that reaches more than 150 countries on five

continents. It has around 105 thousand employees in 35 industrial units in Brazil; 16 overseas factories and 40 distribution centers.

It was observed that, during the lean manufacturing implementation period, due to the complexity and size of the company, there was a decrease in the average gross margin, reducing from 26 to 24%. The consistency in the use of the organization in cells allowed an optimization in anti-waste practices and the company's margins increased from 24% in the implementation period to 29% in subsequent years, in order to give leverage in return for the organization.

During the implementation of lean manufacturing, Company 3 undertook a vast restructuring in its production sites, as well as remanufactured its administrative structure and controls to a cellular base according to the logistics of its factories, creating subdivisions according to the product. These changes impacted on its EBITDA (earnings before interest, taxes, depreciation and amortization), which jumped from an average of 3% in the pre-implantation and during the implantation periods to an average of 7% in the post-implantation period.

The process of corporate restructuring and factory alignment focused on lean manufacturing began in mid 2008/2009 through the association of two of the largest processed food companies in the world. Thus, after the merger, the company launched a process of restructuring and reorganization of its plants in Latin America, applying lean manufacturing processes and processing readjustment in serial cells with the approach of suppliers.

In reference to inventories, the association of processed food companies between 2008 and 2009 meant that inventory levels obviously migrated from a balance of less than R\$ 1 billion to R\$ 3 billion after 2009. Differently to economic-accounting results that made a positive leap with the implementation of lean manufacturing, stocks jumped to R\$ 4 billion in mid-2015.

Another factor that demonstrates the increase in the level of inventories refers to the comparison with indices inflationary; inflation between 2012 and 2015 was 25%, while the level of inventory increase was 50% for the same period.

A major effort in restructuring the post-merger company was observed through the level of indebtedness, so much was invested in the reorganization of production units around South America, contributing to the high indebtedness ratio that increased from R\$ 1,2 billion in 2005 to R\$ 12 billion in 2015.

Analyzing the case of Company 3, it can be observed that lean manufacturing, together with the restructuring of

the factories with a focus on high waste control and cell production, gave positive results in the economic performance that reflects positively today. However, too much indebtedness and a need to improve on the basis of decreasing turnover are left as a remnant.

COMPANY 4

Created in the early 2000s, it is the largest producer of thermoplastic resins in America, the world leader in the production of biopolymers and the largest producer of polypropylene in the United States. It has 40 industrial units, 29 in Brazil, 5 in the United States, 2 in Germany and 4 in Mexico.

It was noted that the contribution margin rose from 12% to 16%. The use of lean manufacturing in its factories helped consolidate international demand and leveraged sales with rapid and effective deliveries from the cellular organization the company adopted.

As this industry shares a history of successive acquisitions, from its foundation to mid-2010, its main challenge has become the adequacy of its administrative and commercial structure. Thus, the cellular structuring for adapting to lean manufacturing was reflected in all the fixed structures of the factories, contributing to the improvement in operational profit, which increased from 1 to 3% in the post-implantation period.

Again, it was observed that the main challenge in implementing lean manufacturing is consistent reduction in inventories. Thus, the industry in question had, in 2002, R\$ 1,567 billion in inventories; in contrast, in 2015, it presented R\$ 5,517, meaning a variation of 252%, which surpassed the sales (variation of 177%) in the same period. Other evidence of a significant effort in the restructuring of the post merger company was the level of indebtedness, contributing to the increase of R\$ 3.2 billion in 2005 to R\$ 25.3 billion in 2015.

Thus, Company 4 presented a positive influence on its lean manufacturing post-roll results, albeit without significant variation.

LEAN MANUFACTURING: IMPLICATION IN THE ACCOUNTING SYSTEM

According to the data collected, a similarity was observed in the response of the questionnaires by Company 2 and Company 4, pointing out that, although they are of different segments, the path taken to implement lean manufacturing, as well as the difficulties encountered, were very close.

The primary data collected corroborate the information of the CVM and Bovespa and suggest why it has not been generally verified a very significant influence of the lean philosophy on the economic financial results of the companies. Regarding planning for the implementation of lean manufacturing, the

organizations under study presented 80-90% of the conditions necessary for the implantation of lean thinking, including the training of employees according to the new production practices.

Also, the companies adopted internal controls in the pursuit of measures that indicated the positive effects on the customers gain, reduction of wastes and performance of the supplies of the suppliers. The companies still had difficulties in maintaining the low levels of inventories due to the set-up of machines and excessive regulation, demanding high security stocks.

The suppliers had an impact on the performance of lean production, so that the difficulties in conditioning the production cycle were observed. The Company 4, for example, highlighted the balance between customer orders and the supply time, explaining the stock level of 252%, between 2005 and 2015.

Regarding the financial gain, a Company 2 obtained a gain of 15% in profitability, but had a difficult to point out the overall gain of the chain. Company 4, on the other hand, is not a numerical example that allows analysis of some kind, stating that the controls for this election are still under supervision.

Both companies did not demonstrate certainty as to the accounting method that reflected the flow of value. In fact, the answers show the maintenance of the traditional methodology in the internal controls for the calculation of costs in accounting, representing a bottleneck in the accounting controls of a company with lean manufacturing.

The results obtained corroborate the study by Collatto et al. [12], which indicated that industrial firms that have adopted lean manufacturing continue to use traditional costing methods since they understand that the sophistication of accounting methods will not lead to more assertive management information.

Fullerton et al. [13] evaluated 244 industrial goods firms in the United States and found that the extent of lean manufacturing implementation is associated with the appropriate use of accounting practices. The authors concluded that lean accounting positively influences the use of value flow costing, which, in turn, positively influences the use of visual performance measures.

Other works in the literature also claim that traditional cost accounting systems are inadequate when referring to the principles of lean manufacturing, and it is necessary to rethink the management and accounting system under the lean accounting approach based on the flow of value [5, 6].

V. CONCLUSION

The studied companies can be seen as a milestone in the implementation of lean manufacturing in Brazil and the trajectory covered by each of them, explored in the present study, can serve as a basis for directing better practices for applying lean thinking in the productive and corporate environment.

In companies 3 and 4, there was a slight increase in the contribution margin, in the post-implantation period of the lean philosophy. In addition, the exploration of lean practices has led to a more significant increase in net income in almost all the companies surveyed, although an increase in the level of indebtedness of more than 200% between 2005 and 2015 has also been observed. Implantation of the production cells of the value chain and the training of the employees demand a lot of investments, collaborating to the increase of the indebtedness in the long term.

In all companies, one point worth mentioning is a significant increase in inventories (above 140%) between 2005 and 2015, which is totally against the principles of lean manufacturing. This fact demonstrates the impact that suppliers can have on the performance of lean manufacturing, so that difficulties were observed in conditioning the suppliers to the production cycle, which caused a constant search of partners with certifications and efficiency in the time of supply of the supplies.

An inadequate integration between the control system and the lean manufacturing was verified, generating a costing method and mismatched evaluations in the leading companies studied. Thus, investments in the implementation of lean manufacturing should be not only well planned, but well coordinated and managed through accounting controls appropriate to lean philosophy.

In this sense, a bottleneck observed mainly in companies 2 and 4, since the industries did not demonstrate certainty as to the appropriate accounting method that reflected the flow of value and the effective gains in the productive cycle.

Although the flow of value in the cells allowed production to continue uninterrupted, reducing costs, companies did not reach the objective of systematic reduction of inventories due to supply chain failures and failures to integrate accounting controls in costing, as indicated by the primary data collected.

Therefore, the results obtained confirm that the full adoption of lean thinking, through lean enterprise, is a process that starts on the factory floor and evolves to the administrative areas of organizations, including the entire chain of value. In this way, it can be concluded that the companies studied can be characterized only as lean companies, being far from exercising the precepts of lean management of the business.

It was verified the importance of the spread of practices and actions related to lean accounting in the corporate environment, in order to meet a production system based on lean manufacturing. At this point, it is perceived that an adequate analysis of the financial-managerial statements derived from the adhesion to lean manufacturing by the company is of paramount importance for the maintenance of investments, route correction and any other type of decision making that effectively optimizes the results of a lean company.

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