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LEAN SIX SIGMA – MULTIPLE CASE STUDY

LEAN SIX SIGMA – ESTUDOS DE CASOS MÚLTIPLOS

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Resumo

Lean Six Sigma é uma gestão focada na qualidade e desempenho produtivo em sistemas operacionais. Este artigo discute os fundamentos desta metodologia através de duas diferentes concepções de gestão, Lean Manufacturing e Six Sigma. Primeiro, o artigo explica o DMAIC (definir, medir, analisar, melhorar e controlar) e suas respectivas fases, após a filosofia Lean com o sipoc e técnicas de mapeamento de fluxo de valor. O artigo pretende mostrar a integração destes dois conceitos e seus resultados. A metodologia consistiu em uma teoria baseada em uma pesquisa bibliográfica de pesquisa exploratória que consistiu de três estudos de caso em empresas de diferenças localizadas em Sorocaba, São Paulo. Neste artigo estuda a aplicação de Lean Seis Sigma e seus resultados.

Palavras-chave: lean six sigma; qualidade; gerenciamento de produção

Abstract

Lean Six Sigma is a management focused on quality and productive performance in operating systems. This article discusses the foundations of this methodology through of two different conceptions of management, Lean Manufacturing and Six Sigma. First of the article explain the DMAIC (define measure, analyze, improve and control) and their respective phases, after the Lean philosophy with the sipoc and value stream mapping techniques. The article aims to show integration of these two conception and their results. The methodology consisted in a theory was based on a literature search an exploratory research which consisted of three case studies in differences companies located in Sorocaba, São Paulo. In this article studies the applying of Lean Six Sigma and its results.

Keywords: lean six sigma; quality; production management

1. Introduction

Lean manufacturing is a business initiative to reduce waste in manufacturing products. The basic idea is to reduce the cost systematically, throughout the production process. Their goal is to satisfy the customer with the exact product, quality, quantity, and price in the shortest time. Lean manufacturing is more than a cost reduction program or a problem solving approach. The main idea is that an efficient production can be achieved by a comprehensive approach to minimize wastes. That means eliminating excess production and inventory, redundant movement of material, waiting and delays, over processing, excess worker motion, and the need for rework and corrections. Part of Lean manufacturing is reviewing operations, processes or products that add cost rather than value. Each step of the manufacturing process is monitored to determine if it adds value to the product. If it does not add value, the process could be delegated to a subcontractor or outsourcing company in order to focus the staff on value-added operations of its core business. Is also a premise of Lean projects to analyze in details the interfaces between the processes looking for the mentioned waste.

Six Sigma is methodology that was born in 1980 in Motorola, using the DMAIC method (Define, Measure, Analyze, Improve and Control), based on the basic thinking that the customer satisfaction is the priority. The root of Six Sigma is to treat the deviations in the processes, aiming to achieve the minor possible variance. Many expressive results are reported using the Six Sigma methodology, as an example from GE Company, appointed by the CEO, Jack Welch, in 1999 as 1,5 billion US dollars as gain. The purpose is to research the perspective of quality in productive operations and observe the results achieved through the implementation of Lean Six Sigma methodology in two companies (1 and 2) in distinct problems with different approaches. The research strategy adopted was a multiple Case studies, with secret companies' names, therefore denominated Cases: 1 and 2, the company 1 belongs to the branch of pulp and paper in a city near to Sorocaba-SP, the company 2 belongs to the metal mechanic sector of the city of Sorocaba-SP, Brazil. These are multinationals that primarily serve the automotive sector. The choice of this approach is in accordance with the propositions of Yin (1994), because one wishes to "investigate a current phenomenon within its real context, when the boundaries between phenomenon and context are not clearly defined and using various sources of evidence". Field research, having been carried out through multiple case studies, used a qualitative method of descriptive research. According to Lazzarini (1997), the so-called qualitative methods are characterized by a greater focus on the understanding of the facts than in their measurement. The research aims to describe characteristics of a particular population or phenomenon, or to establish differences between variables, using the

method of multiple case studies. The problematic to be studied in the article is: The use of Lean methodology and Six Sigma bring a competitive advantage to the company? The article is structured as follows: introduction, theoretical reference of Lean and Six Sigma, description of the methodology, studies of chaos, final considerations and references.

2. Theoretical Framework - Lean Six Sigma

2.1 Six Sigma

The Six Sigma developed by Motorola in 1980 as a strategy to increase profits and improve the effectiveness and efficiency of operations, Anbari and Hook (2006). The Six Sigma brings important advance to the operating system as it directs the entire organization to the same end: meet customer requirements, align processes and analytical rigor and running second Bhargava et. al. (2010). Its fundamental principle is the client and the objective of achieving better results in a continuous improvement cycle. Therefore, its definition ranges from errors processes to customer satisfaction processes and outcomes and their focus is to improve operations. The methodology act through of DMAIC (Define, Measure, Analyze, Improve and Control), Frame 1. (BHARGAVA 2010). This method divides the process of improvement in some phases that favors the recognition errors and their causes to eliminating them. As tools of DMAIC, are commonly used sipoc, boxplot, capability studies, statistical process control, measurement system analysis, cause and effect diagram, cause and effect analysis, data collection, hypothesis testing, regression, and brainstorming (Arumugam et al 2012). In DMAIC phases are import to use these tools to analyze and achieve better results and are described below in Frame 1, DMAIC phases, and include in its description of its steps the sequence and the tools:

Frame 1 - Phases of DMAIC

Phase	Description
Define	In this phase we clarify the process or product that needs improvement. Define the most suitable team members to work with the improvement. Define the customers of the process which are the internal or external customers, their needs and requirements, and create a map of the process that should be improved.
Measure	Identify the key factors that have the most influence on the process, and decide upon how to measure them and in this phase we can collect fresh data to clarify the sources of process variation
Analyze	Analyse the factors that need improvements and we can reduce the factors of process variation.
Improve	Design and implement the most effective solution. Cost-benefit analyses should be used to identify the best solution and hypothesis test to assure the improvement.
Control	Verify if the implementation was successful and ensure that the improvement sustains over time. So we can use control tools such as control plan.

Source: Mousa (2013)

The DMAIC manages and leads projects supported by leaders and by actions previously defined and supported in the statistical relationships and controls that generate safe and visible results for system improvement.

2.2 Lean Manufacturing

Lean manufacturing comes from the Toyota production system in the 80's. According to Chen (2008), this methodology consists of two central points: remove activities that do not add value and add value in production as much as possible. The focus is eliminate "anything other than the minimum amount of equipment, materials, parts, space and time which are absolutely essential to add value to the product" Dumitrescu and Dumitrache (2014, p.138). Lean emphasizes waste reduction to reduce costs. So the importance is support productivity sequence, quality and product development dynamics and effectively without remains. The Lean improves the flow of the holistic management process, and thus, removes waste and unnecessary activities Boopathi and Kumar (2015). At the same time of 2nd world war, Toyota realized that investing in people is more important than investing in bigger size machinery and continues employee training throughout the

organization. This motivates all employees and they are more open to the improvement process and everyone started giving their input to the company.

In this way, short production runs started by Toyota became a benefit rather than a burden, as it was able to respond much more rapidly to changes in demand by quickly switching production from one model to another. Toyota didn't depend on the economies of scale production like American companies. It rather developed a culture, organization and operating system that relentlessly pursued the elimination of waste, variability and inflexibility. To achieve this, it focused its operating system on responding to demand and nothing else. This in turn means it has to be flexible; when there are changes in demand, the operating system is a stable workforce that is required to be much more skilled and much more flexible than those in most mass production systems. Over time, all these elements were consolidated into a new approach to operations that formed the basis of lean or Toyota Production System (Boapati, 2015).

Lean Manufacturing can be described as a multi-faceted production approach comprising a variety of industrial practices, directed towards identifying value adding processes from the purview of customer and to enable flow of these processes at the pull of the customer through the organization (Shah & Ward, 2007; Womack, Jones & Roos, 1990). It evolved from the conceptualization of Toyota Production System (TPS) by Taichii Ohno's initiatives at Toyota Motor Company (Ohno, 1988). The central thrust of lean manufacturing is to create a streamlined flow of processes to create the finished products at the required pace of customers with little or no waste. Shah and Ward (2007) performed a comprehensive, multi-step approach based study to identify the dimensional structure of lean manufacturing and developed reliable scales to signify them. They quantified the conceptual definition and measurement of lean manufacturing in ten factors, as mentioned below:

- ***Supplier feedback****:* Critics and performances of products and services received from customers to be periodically communicated back to suppliers, for effective transfer of information.

- ***Just-In-Time (JIT) delivery by suppliers:*** Only required quantity of products to be delivered by suppliers at the specified time when customers require them.

- ***Supplier development:*** Suppliers to be developed along with the manufacturer, to avoid inconsistency or mismatch in competence levels.

- ***Customer involvement:*** Customers are the prime drivers of a business, their needs and expectations should be given high priority.

- ***Pull production:*** An initiation of need from the successor through kanban should enable the flow of production from the predecessor, signified as JIT production.

- ***Continuous flow:*** A streamlined flow of products without large halts should be established across the factory.

- ***Setup time reduction:*** Time required to adapt resources for variations in products should be maintained as least as possible.

- ***Total productive/preventive maintenance:*** Failure of machines and equipment should be avoided by effective periodical maintenance procedures. In case of failure low rectification time is to be maintained.

- ***Statistical process control:*** Quality of products is of prime importance, no defect should get percolated from a process to a subsequent one.

- ***Employee involvement:*** With adequate motivation and entitlement, employees are to be empowered for an overall contribution towards the firm.

The Lean philosophy have successful initiatives, does the value chain flowing connection provides agile management, able to adapt quickly to any changes in industry Subramanian (2014) and Todorut et. al. (2012). For accomplish advances in philosophy, there are techniques such as value stream map, the VSM and supplier – input – process – output – consumers, the SIPOC. Using to track down flaws in the process provides a reliable in analysis of the value chain.

The application of SIPOC and VSM identifying the waste of different kinds and evolving action plan for elimination of such wasteful. Delineate the process in detail, and find out whether the steps add value or not. In the first step in a lean transition is to identify and analyze the value-added processes business and do not add value. If an action does not add value, it should be modified or eliminated from the process. The Value Stream Mapping (VSM) (Basu, 2009) provide a reliable qualitative analysis tool for. The benefits of VSM ans SIPOC are many, including the provision of a common language when considering manufacturing processes, a dynamic and quick view and developing the idea of the mapping process itself becoming a continuous tool, (BASU, 2009; MOUSA, 2013). Consider the advancement of processes and adaptation to changes as the main concept for organization. Therefore, Lean manufacturing integrates sectors and their activities in a single segment management. Through the VSM and SIPOC can realize eradication activities, suppresses costs, allows adjustments in processes and operations and bring customer value generating profitability and making the company competitive.

2.3 Lean Six Sigma

Lean Six Sigma is the latest generation of business improvement methodology. It is based on two previous philosophies (Lean Manufacturing and Six Sigma) and adopts effective aspects of these respective approaches, according to Mousa (2013). This technique “uses tools from both toolboxes, in order to get the better of the two methodologies, increasing speed while also

increasing accuracy". The Lean Six Sigma presents several benefits, highlights some of them in frame below:

Frame 2: Lean Six Sigma Benefits

Lean Six Sigma Benefits
Ensuring services/products conform to what the customer needs ("voice of the customer")
Removing non-value adding steps (waste) in critical business processes.
Reducing cost of poor quality.
Reducing cost of poor quality.
Reducing cost of poor quality. Delivering the correct product/service at the right time in the right place."

Source: Antony (2005)

Lean Manufaturing and Six Sigma are aligned for the purpose of satisfy the customer and improve processes, but each serves different areas of quality, while the first concerns itself with removing activities that do not add value, another strives to maximize the productive performance . According to Anthony and Kumar (2012), the scope of Lean is to create a setting to improve the flow and eliminating waste, "approaching ensure smooth and uninterrupted product flow through the organization to produce only what is required by the customer". The Six Sigma scopes is identify and quantify the problems related to process variation, Anthony and Kumar (2012), "focuses on "critical to quality" processes or operations. Six Sigma relies on the selection of appropriate projects which are strategically relevant to both the organization and the customer". The advantage of the integration is "the beneficial combination in providing focus on flow, value streams and waste reduction, as well as focus on variation reduction through structured problem solving and application of statistical tools and techniques." (Jenica, 2014). The Lean philosophy reinforces the structure and provides strategic direction for improvement. Guides the overall dynamics of the system and reports the current state of operations. The Six Sigma project identifies and focuses on improvement CHEN (2008). Leads the system to the desired future state. This description can be seen in Frame 3.

Frame 3: Lean Six Sigma interconnections

Lean Manufacturing	Six Sigma
Wide - comprises the whole, improves capacity, focuses on continuity and value chain - single process of improvement of flows.	Complex and focused - understands the details, appreciate and improve the situation by the tools - focuses on control capability to meet customer

Source: adapted Jenica et. Al. (2014).

The Lean Six Sigma ensures the organization achieve the proposals established and brings so not only with gains in profitability, but customer loyalty and continuity of increasingly effective processes.

2.4 Comparisons between Lean Manufacturing, The Theory of Constraints

According Pacheco (2014), (Theory of Constraints - TOC) and Six Sigma. analyzed the evolution and fundamental differences between TQM, TPM, TOC, Lean and Six Sigma, contrasting these approaches with the model of production from Ford. It was verified that: i) Lean has a paradigm of production based on output pulled in relation to pushed; (ii) it is possible to develop integrating Lean and management philosophies of quality; (iii) the combination of TOC with other approaches indicates superior results in relation to other models. TOC is an effective management philosophy that results in positive outcomes such as increased gain, reduced levels of inventory and operational expenditure, thereby improving organizational performance; (ii) contrary to the idea that the gain orientation directly improves the organizational performance concluded that the relationship between TOC and organizational performance is completely mediated by the results of TOC.

That is, the implementation of TOC does not directly in the financial and market performance of the firm as proposed by Dettmer (2001). The conclusion is that the implementation of TOC improves results, which in turn have a positive impact on organizational performance. Thus, the impact of implementation of TOC is felt first in the level, indicating which metrics are reported to the success of TOC could focus on the operational and organizational results. Convergences and divergences between Theory of Constraints and Lean The study by Dettmer (2001) indicated the following points of similarity between the two approaches:

Have the common goal of increasing profits, the value is defined by the customer, the quality factor is essential in both, they advocate production in smaller batches, aim for the continuous flow and increase of capacity, seek to minimize inventory, and the participation of the labor force fulfills relevant to the success of the unfolding of the and tools. TOC accepts variability and demand instability and operations using strategic lungs (physical, time, ability), while the Lean aims to constantly reduce the variabilities. In general, Dettmer (2001) considers that there is substantial overlap between the lean mentality paradigm and TOC, where TOC provides a framework to guide the Lean efforts avoiding the pitfalls of applying them where they are unnecessary. The divergences and contradictions would be: (i) in the STP it seems clear content of the transformation or change, above all from the elements of its structure, such as: subsystems of

basic prerequisites (standard operation, quick change of tools, layout), subsystem of zero-fault (5S and TPM), zero-defect subsystem (machine capacity, autonomy, poka-yoke). While in TOC, this discussion does not exist formalized. This is because TOC discusses the means and not the content, through the process of thinking, to formulate transformation strategies

3. Methodology

The search strategy taken was the multiple case studies. The choice of this approach is in accordance with the Yin propositions (1994), because it aims "to investigate a current phenomenon inside of its real context, when the distinctions between phenomenon and context is not clearly defined and using many sources of evidence". The Field research, conducted through case studies, used a qualitative method of descriptive study (or explorative), adopting the matching strategy between multiple cases studies. Yin (1994), the qualitative methods are characterized by a strong focus on comprehension of facts instead of its measurement. It was considered a pair of studies for each mentioned patterns. It was sent a semi-structured questionnaire to the managers. The interviews were recorded, after feedback from the managers and evaluated with the researcher and transcribed to a magnetic device with participatory observation, where the main issues and points addressed to structure the work are attached to this article. The document examination was also the subject of the study. In each case study, a member of strategic level (directors) and tactical (managers) was interviewed, aiming an analysis of the answers of the questions to a better understanding of the vision of each interviewee. It is worth mentioning that these interviewees have at least 10 years of experience in companies. A data analysis was used to collect all the data. Content analysis, in addition to performing interpretation after data collection, is developed through more or less refined techniques. Thus, content analysis has been shown to be one of the most used data analysis techniques in the field of administration in Brazil, especially in qualitative research (DELLAGNELO; SILVA, 2005). A semi-structured questionnaire was sent to the employees (three managers and three Lean / SixSigma engineers) in each of the two companies surveyed, the companies are classified as large companies having more than 2000 employees each. The interviews were recorded after the interviewed opinion, evaluated with the researcher and transcribed to magnetic medium, and analyzed the main issues and issues addressed for the structuring of the work. The documentary exam was also the subject of the research. It is worth mentioning that these interviewees have at least ten years of experience in the same company.

4. Case studies

The case studies surveyed case number 1 and 2, refer to diverse industries of Sorocaba, city state São Paulo. The purpose of the studies is to check the application of Lean Six Sigma in different settings demonstrating its results in resolution of problems involving the variability of manufacturing processes.

4.1. Case number 1

The case number 1 it is about a low profitability in production system caused by inefficiency on the machine. The manufacturing process has four different operations to manufacture a component. One of operations stations has a high time of set up and it is unsatisfactory compared to other machines of the same function. The consequence of this is stopping the ideal flow from operations in the process (leadtime). The relevance of the project is centered on two factors: cost and time factors that have a direct impact on profits of industry. The cost of the process, in low profitability situation, was estimated at around R$ 2,000,000.00 reais/year and the total operating time of 539400 min/year. If the machine was optimized, reducing its time by approximately 15%, while the total time of the procedure would decrease around 8%. The production would require 496240 min/year and the cost would decrease to R$ 1,800,000.00 reais/year resulting in approximately R$ 200,000.00 saving in the year. The purpose of the Lean Six Sigma methodology was optimization the machine and consequently the production flow. The aim is savings resources and improve the leadtime in the process.

Through VSM and SIPOC (Lean) obtained the identification of the production flow and their interrelations in each transaction observing time and costs. This tool supports data analysis and identify the problem' machine. The offshoot of DMAIC (Six Sigma) and its statistical tools, adjust the machine to an ideal standard. In the DMAIC were described processes and reasoning, the focused is the machine, it was in trouble. Therefore, the start of the construction methodology begins at DMAIC, within D, the DEFINE. In DEFINE, arose important information, which consists in comparing average of chrono time analysis of machines to define which had low profitability. The results confirmed the problem analysis. This evaluation provided by SIPOC and VSM along the data showed the cause. The second phase consists of the MEASURE, two targets were set: one of trouble machine and another of process, respectively the first one, have a specific goal: reducing the time to 50 seconds to 43 seconds, optimizing the time of process in the machine in 15 %. The overall goal is reduce the time from 98 to 91 seconds, in the role process, optimizing in 8%. Also during this period, it was determined the overall indicator: profitability, to monitor and check the

result. The third phase, ANALYZE sought the removal of the variables that influence the machine. Through statistical tools such as Pareto chart and the Box plot was obtained the time dispersions, which could be observed by the belt. Brainstorming raised possible causes for dispersion, which is causing the low profitability: 1. Over-on-metal, 2. Finishing and roughing time, 3. Advancement of the X-axis and 4. Dressing time. The mapping of SIPOC and of cause and effect diagram a have driven a discussion for a potential solution to the problem was priority: reducing machine time. In the final phase, the IMPROVE rated the Brainstorming and its assumptions. The analysis initials shows options 1 and 2, however the first and second option is a problem of suppliers. As soon, machine-roughing time was discussed as a good possible to correct the machine. The project to change the machine parameters as previously discussed in other phases. After the planned adjustment of the machine, there was a new stratification and new boxplot. The result after the adjustment of the machine exceeded the targets. The target specific achieved a 32% optimization, which reduced the time from 51 to 32 seconds operation. Consequently, the overall goal came to 15%, reducing from 98 to 82 seconds. Therefore, the result increased the reduction in spending more than expected. Finally, the C (CONTROL) verified quality in the process. The new machine parameters were satisfactory, this leading the maintenance to new parameters. In order not go back the problem, the document of the machine have an adjustment, as well as monthly reports to monitor machine performance and process.

4.2. Case number 2

In Case 2 the goal is to reduce the consumption of tools and machine optimization in the production line of an auto parts supplier company. As a starting point, tool costs (R $ 3.38 per linear meter) were raised and a low performance of CBN grinding wheels and high machining times were observed. As it is a grinding wheel with a cost of approximately R $ 2,300.00 each, hence the importance of treating not only the reduction of tool consumption but also the reduction of machining times. The grinding wheels are used to machine various types of gear groups each with their respective costs per linear meter. In the current situation, the average monthly cost of reworking this material is R$ 109,081.48 / month, with an annual cost of R $ 1,308,979.47. The Ishikawa`s tool (6M) was also used, in order to identify the causes of the problem. The main causes were: (a) system "pushed" the supplier sends everything that has covered; (B) lack of programming for items with closed requisition; (C) high hardness of the parts and low service life of the covers. Afterwards, the Theoretical Analysis Model (MTA) was used with the 5Why tool and the Improvement Prioritization Matrix with the GUT technique to map the actions more clearly until reaching the reduction objective.

The MTA, with 5 Why, is an approach in the form of an array of questions that guides the group in getting answers to particular problems or action plans. It is a systematic to better understand a certain situation, exploring its different aspects. The priorities set out in 100% and 70% relate to the priority level of each topic, established by the team of improvements and focusing on solving the problem established, and in the penultimate column the proposed solutions to the problems. Next, the prioritization matrix was performed, whose objective is to reduce and order, in a rational way, the number of items to be implanted, to be later ordered in the matrix. It is a matrix specially constructed to order a list of items, a tool for decision making, since it establishes a prioritization, which may or may not be based on criteria with defined weights. The weights were defined in conjunction with the factory floor (machine users) and Factory Improvement Project team. The GUT technique was used with the matrix and the procedure used was to list all the problems (or risks) related to what was treated in the situation to be explored.

Then we assign a note (1 to 5) for each problem, in three aspects: Severity, Urgency and Trend (hence the name GUT). Gravity is the size of the impact of that problem in case it happens. Urgency is related to the time that this problem should take to happen, the greater the urgency the less time available to solve this problem. Trend is the potential of the problem, ie, "If I do not solve this problem now, will it get worse little by little or will it get worse?" Summing up the values of each of these aspects (Severity, Urgency and Trend), we have a priority. The problems with the highest priority are those that you must treat first, precisely because they are the ones with the highest Severity, Urgency and Tendency. The others you can leave for later, or even ignore if necessary. So after several brainstorms, the matrix was completed. For each Kapp machine, they produce various groups of materials (gears, grinding wheels and planetary). In 2014, beginning of the project to reduce the consumption of tools and machining times, below figure1 brings the monitoring of the situation of 2014. The cost of the month of January spent with tools was R $ 153,426.00. The monthly cost per linear meter of the groupings was calculated (R$ 153,426.00 / 53469 linear meter) at R$ 2.83 per linear meter. According to the frame below.

Frame 4: Matriz GUT

	Improvement Priorization matrix					
Project: Kapp machines optimization						
Variable processes	Topic		U	T	Priorization	MTA priorization
	Systhematic implementation for teeth grinding experience		5	5	125	
	Monitoring after implementation		5	5	125	
	After experience / Implement correction formulary		5	5	125	
	Life time controlling of grinding wheels		3	3	27	
	Execute inventory checking via SAP system define systhematic for demand calculation		5	3	75	
	Implement sensors against crashing and train operators		5	5	125	
	Surface coating development		3	3	27	
	Negotiate purchase price of tooling due to the productivity gain for the supplier		3	3	27	
	New development cost reduction		3	1	15	
	Monitoring of cycle time after improvements		5	3	75	
	Identify products with possibility to share the same development		5	5	125	
G	The waste could be	**U**	Action should be taken		**T**	In case of not act
	5 high importance		5 Imediately			5 highly worst
	3 +/- importance		3 Can wait			3 stable
	1 low importance		1 No priority			1 improve

Source: Authors (2017)

5. Final considerations

The Lean and Six Sigma programs have emerged in different scenarios and epochs, and although they use different methodologies, both aim as the main result of a process to increase productivity and quality. In the case of the Lean, the initial strategy of conducting isolated kaizens in areas, sectors or processes generated specific results awoke the companies to the necessary organizational culture change that should accompany the introduction of these programs. In the case of Six Sigma, the need for a staff structure capable of applying statistical tools (so-called Green Belts, Black Belts and Master Black Belts), with partial or full dedication to improvement projects, combined with relatively long generation time Of expressive results, it ended up cooling the rhythm

of the actions and, consequently, the achievement of the planned results. Lean Six Sigma covers everything from operational and tactical aspects of quality to customer satisfaction. The contribution of this methodology is to reduce costs, times and activities in the pursuit of productivity, as well as being concerned with adding value to the process and bringing the customer a new perception of the product. Lean Six Sigma is the theory and practice of the cases studied. It can be seen that by means of the aforementioned techniques, in these cases there is a significant improvement in operating times, reliability / quality and a cost reduction without loss of capacity, in particular in these cases there was an increase in production capacity. The Lean and Six Sigma philosophies worked simultaneously bring significant results. The integration of tools and methods of these two management practices show harmony and efficiency in process improvement. Therefore, strategically aligning holistic and timely views on the same focus presents progress in operational times, reduction of losses and costs involved directly and indirectly in production. The Lean Six Sigma methodology proved to be satisfactory and effective. The limitations observed in the article are related to the information collected in the interviews with the persons mentioned, due to the confidentiality of the companies. As a suggestion for future research, one must broaden the research to all areas in which Lean and Six Sigma are implemented and the benefits to employees with this new methodology are felt. The two cases studied are connected by the fact of using the Lean and Six Sigma methodology in similar companies and getting success comparing to the planned targets. All of them were developed by Six Sigma Professionals, seeking for cost reductions and waste eliminating in the factories.

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