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Systematic literature review with bibliometric analysis on Lean Strategy and manufacturing in industry segments

Revisão sistemática da literatura com análise bibliométrica sobre estratégia e Manufatura Enxuta em segmentos da indústria

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Abstract: The production process of industries has been increasingly gaining an important role in building competitive benefits for companies. Considering the importance of production strategy aligned to operations as a priority for the achievement of positive results, a theoretical reflection through exploratory and bibliographic research seeks to analyze the Lean Manufacturing as a viable operations strategy; a second step aims to identify the Lean Production Strategy adopted by companies in the various segments. The problem lies in identifying and possibly stating that Lean Manufacturing approaches and it can be a viable model for the realization of strategy in the manufacturing process for organizations and sugar and ethanol plants from the sugarcane segment.

Keywords: Operations Strategy; Lean Production; Sugar and ethanol plant.

Resumo: *O processo produtivo das indústrias cada vez mais ganha importante participação na construção de benefícios competitivos às empresas. Considerando a importância da Estratégia de Produção alinhada às operações como prioridade para a conquista de resultados positivos, uma reflexão teórica por meio de pesquisa exploratória e bibliográfica busca analisar a Manufatura Enxuta como uma Estratégia viável às operações, e uma segunda etapa objetiva a identificação da Estratégia de Produção Enxuta adotada pelas empresas nos vários segmentos de atuação. A problemática está em identificar e, possivelmente, afirmar que a Manufatura Enxuta aborda e pode ser o modelo viável para a realização da Estratégia no processo de manufatura para as organizações e para as usinas de açúcar e etanol do segmento sucroenergético.*

Palavras-chave: *Estratégia de Operações; Produção Enxuta; Usina de açúcar e etanol.*

1 Introdução

The current global economic environment demand for organizations that have in their everyday dynamic culture of seeking continuous improvement, eliminate waste and develop skills and competencies in human capital (Gonçales et al., 2014). Votto & Fernandes (2014) reinforces this context when he mentions that companies exposed to adverse market conditions, have sought modern strategies production management to improve the production flow and minimize inconveniences inherent in their production systems.

Conducting research to identify the exploitation of scientific papers in the fields of industries related to the application of lean manufacturing strategy (LMS) is necessary to diagnose what gaps need attention and future developments. In this sense, the problem is in identifying which industry segments underexplored by LMS.

This study aims to identify segments in industries most worked by the LMS. A theoretical reflection through bibliographical research sample up quantitative data of scientific recognition. In other words, consider the lean manufacturing as a strategy to operations, and a second step identifies LMS adopted by companies in comparison to the sugar mill and ethanol sugarcane segment. In this sense, the problem is in identifying and possibly state that lean manufacturing can be a

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viable model for the realization of the strategy in the manufacturing process for this segment.

2 Theoretical framework

In this section are presented the main concepts and features of business strategy and strategy of lean production, by way of an initial literature review.

2.1 Business strategy

Strategy is a word of Greek origin, whose current meaning is derived from the French language designating a maneuver or military Fireworks (Houaiss, 2001; Macedo et al., 2012). It is the art of organizing and conducting a series of preventive military operations to coordinate the action of the armed forces in the theatre of operations until they are in contact with the enemy, or part of military science that deals with the coordination of armed forces (integrating the political, logistical and economic) in the conduct of a war or in the organization of the defense of a nation, a coalition (CNRTL, 2010; Macedo et al., 2012).

From this observation, it appears that there was a transposition of the original meaning to its use in the field of administration. The transposition of the strategy of the military field for the field of administration took place in the second half of the 20th century, in the United States. Organizations need to plan its operations to survive in a world full of dynamic transformations. Ansoff (1977) is appointed as one of the pioneers of the study of the strategy, to analyze the importance of markets and products for the organization.

For Skinner (1974), in his work, the classic about the manufacture with the company's strategy, reports that manufacturing management is ignored in the company's strategy, even though it is a function that represents active worthy and can be a tool to gain competitive advantage. The technical vision and were important for the machine. As for the concept of production Strategy is defined as a set of plans and policies of the company in order to gain advantage over competitors, including plans for the products and for the marketing of these products.

The strategy has undergone an extraordinary turbulence in the period of the industrial revolution circa 1880. The first industrial entrepreneurs have devoted most of their energies to the creation of modern production technology, setting around her organizational technology (Ansoff, 1993).

Porter (1986) introduces the types of strategies gathered from the core business of the Organization, noting his location, distinction, development, extension and recognition. And defines how competitive strategy, offensive or defensive actions to create a defensible position in an industry, to face successfully the competitive forces and thus obtain a greater return on investment. Slack (1993) also focuses on the strategic importance of production, when points out that competitiveness issues are within the field of production. They are: quality, speed, introduction of new products and flexibility.

The capitalist mode of production search new forms of organization of production and many companies in the sugar sector are also seeking, through the productive and organizational restructuring, action strategies to stand out to the different market situations that have been submitted.

In this sense, to Silva (2006), globalization brought to the enterprises a possibility of expansion of its consumer market, but at the same time forced them to compete with each other, resulting in a ceaseless search for lower costs, higher quality products and services. And boosted the development of productive processes more adapted to this reality. In search of competitive advantage, organizations have invested in productive processes that aim to better meet the expectations of its customers.

For Brito (2002) the origins of this method of production to the present day, new concepts were aggregated, such as intelligence networks and information technology, providing a better understanding of this management system, as well as, made it possible to understand the magnitude of the impacts caused in organizations from the adoption of the same. In this context, Amato (2009) argues that many organizations have been engaged in the implementation of transformation processes based on the philosophy of Lean Manufacturing (LM), on principles of systematization and adaptation of Japanese production techniques, with reference to the Toyota Production System (TPS).

Neely (1999), Veiga et al. (2008) provide that the development in industrial processes, formatting is based particularly on changes in production systems. The Japanese model based on the Toyota Production System, has revolutionized the way people conceive a company operations. Thus, the strategic importance of the LM model.

2.2 Lean Manufacturing Strategy (LMS)

Womack & Jones (1996), o LM is dry because it is a way to do more and more with less and less – less human effort, less equipment, less time, less movement and less space, eliminating waste and creating wealth through activities that only add value to the final product, giving customers exactly what they want.

As Liker (2005) the key to LMS whose origin is in the TPS and what makes it stand out is not any of its individual elements, but all the information

gathered as a system put into practice every day in a very systematic way-not alone. According to the author, the success derives from the balance of the role of people in an organizational culture that expects and values your continuous improvement, with a technical system focused on the stream of high added value. There are four sections representing the success of TPS: (i) Long-term philosophy. Get serious thinking long-term. Organizations to be successful must become learning companies, (ii) The right process will produce certain results. Process-oriented company. The flow is the key to obtaining the best quality at less cost with high security and disposal. In Toyota focusing on process is part of the DNA of the company, (iii) Add value to the organization by developing your people and partners. The vision is that build people and not just cars, (iv) The continuous solution of basic problems drives organizational learning. Identify the causes of the problems and prevent them from occurring.

In this way, the four sections are presented below by Figure 1, as synthesized by the 4 p's of LMS based on TPS, whose goal is to make work more satisfying by creating continuous flow production, enabling immediate feedback on efforts to transform waste into value.

The key of the TPS is not only on tools and techniques such as just in time, but on the commitment of a company with the permanent investment in your people and the promotion of a culture of continuous improvement (Liker, 2005).

Second Oprime et al. (2010), This practice then known was that provided by mass production, i.e. manufacturing in high volumes of standardized products to a market of large dimensions. So, for Toyota, the solution was to how to produce competitively a greater variety of models in small quantities. That way, the problem was to achieve efficiency and cost reduction is no longer based on economies of scale, but in other elements of manufacturing production.

According to Davenport (1994), the construction of the LMS serves as an "umbrella" to cover all the methodologies that are based on the reduction of waste in the environment, no matter how different they may be in the form and content of current and of their culture in the company. For Bhasin (2012) each company must find its own path to the LMS. Managers had difficulties with the techniques when attempting to implement isolated parts of a lean Strategy without understanding the whole. A reliable guide for implementation action is on the five principles of lean thinking, (i) determine precisely the value for specific product; (ii) identify the value chain for each product; (iii) make value flow without interruptions; (iv) leave the customer pull value from the producer; (v) seek perfection.

Therefore, adopting the LMS as a philosophy and adhering the Lean Tools, possibly good results can be achieved. As Womack & Jones (1996) eliminate waste and create wealth. The companies lost sight of the value and how to create value for the customer. Create waste. Need of lean thinking to help companies specify value correctly. Align all activities that create value for a specific product along a value chain and make value flow according to customer requirements, in search of perfection and of continuous improvement.

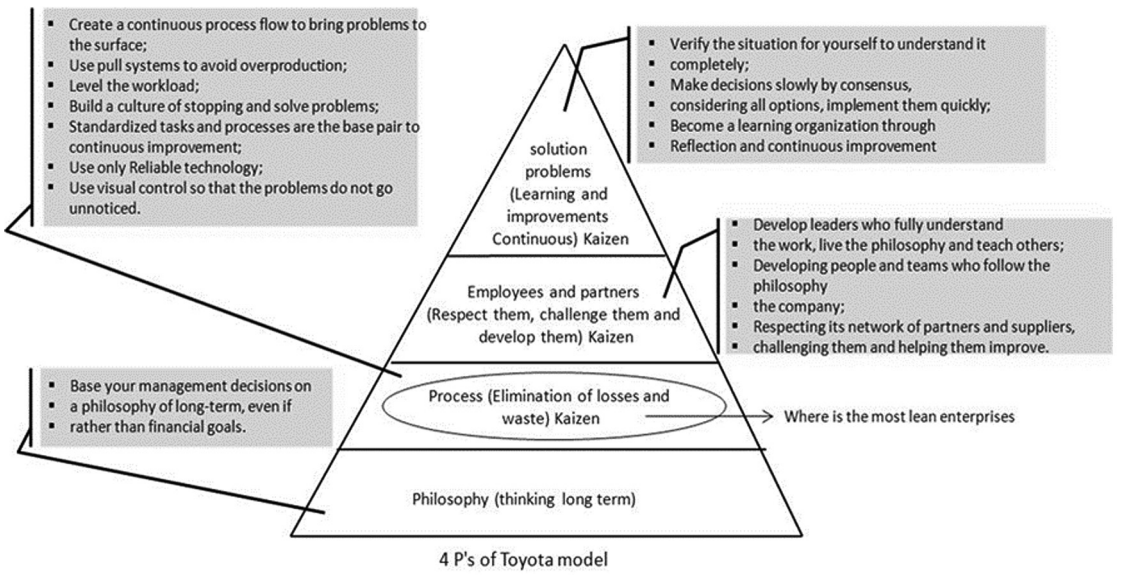

Figure 1. 4 p's of Toyota model. Source: Liker (2005).

Muda (Japanese word) that means waste, activities that do not create value, errors that require correction, producing items that nobody wants, accumulation of goods in stock. Processing steps that are actually not necessary. Movement of staff and goods transport from one place to another without purpose, a subsequent activity which is waiting because a previous activity was not performed in due time, in short: goods and services that do not meet customer needs. All teams from a company that follows the LMS can measure precisely the waiting time and continuously improve the own design methodology.

With the adoption of the LMS many companies have achieved superior performance across multiple dimensions that were considered, such as: low cost, high quality, speed and flexibility. Competitive priorities can reinforce each other (Porter, 1986).

The Industrial Management consulting firm epitomizes all that theoretical-conceptual Lean on following Figure 2.

However, where conflicting goals remain and which can be reduced or eliminated with the implementation of LMS? Are questions that must be made when fetching their use this strategic perspective.

In this sense, the knowledge generated by the authors referenced is that the implementation of LMSE is a process of continuous improvement, in which learning must be used to manage the change.

Hayes (1981), Veiga et al. (2008) put that Japanese success is due to the use of futuristic techniques, but the attention to the basic aspects of manufacture. All stages of the manufacturing process, from product development to distribution, are equally important. They work constantly improving the equipment design, inventory control system and the ability of workers through cooperation at all levels. In addition, each worker is trained to solve small problems that appear on a daily basis, conduct regular preventive maintenance, and to seek ways to eliminate potential interruptions continuously and to improve the effectiveness. The consistency and discipline in the manufacturing operations of the Japanese. Muitas empresas vêm utilizando as melhores práticas enxutas como base de suas estratégias de manufatura. The best practice approach involves the philosophy of *world class manufacturing* (WCM), *and of benchmarking*, and is based on the argument that the continuous improvement of best practices in all areas of organization leads to superior performance improving organizational learning and competitiveness (Voss, 1995; Veiga et al., 2008).

In this way, it can be considered that the practices, regarded as the best, cover the content of this paradigm of LMS. And benchmarking represents your process and learning.

2.3 Plant sugarcane

The plant, in a generic, is a company that produces sugar, hydrated and anhydrous ethanol fuel for vehicles, fertilizer from the vinasse, distilled alcoholic and energy production from sugarcane bagasse, among other derivatives (Piacente, 2005).

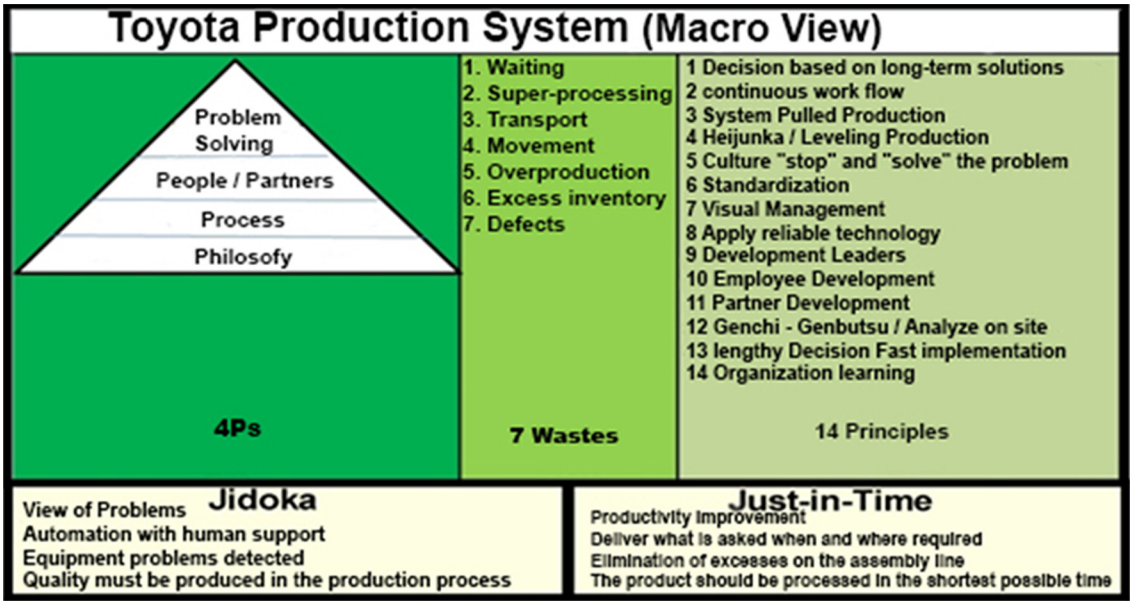

Figure 2. Overview of the principles and concepts of TPS. Source: Gestão Industrial (2013).

Currently, there are 342 active Plants installed in the national territory, and other 46 are inactive. Among them, the largest producers processing, on average, 7,690,200 tons of sugar cane per harvest (2013-2014) as shown in Table 1.

The industrial unit is known mainly by five divisions as shown in Table 2.

3 Methodology

The methodological approach of this research is characterized as exploratory, descriptive and documentary (Gil, 2008), When using the deductive method (Cruz & Ribeiro, 2003). As for the outline, the bibliographical research and survey sampling, using technological resources of search as a tool to run the search (Gil, 2008), in this case, the foundations of the CAPES – Coordination and Improvement of Higher. *Journals consulted have their articles available for consultation on-line*, Thus, the survey data.

To survey and analysis conducted in this study was done a systematic review of the literature (SRL) followed by Bibliometrics based on the following steps: i) Search term – selection of journals, ii) reading of titles, abstracts, keywords of articles returned; III) Reading of the methodology and results of the articles returned; IV) tab and data evaluation found; v) identification of the articles segment and vi) Suggestions for the implementation of future work in segments with little scientific exploration. The selection of journals on the basis of the CAPES portal started by means of the key words: strategy + lean + industry. The filters have been implemented and thus were selected journals, approaching its content to the topic under study. For filters, the refinement of key word via the searched terms and temporality. Defined databases, document type, only works in the area of engineering III and the classification Web-Qualis. These were the criteria for inclusion and exclusion of articles found, which resulted in a Bibliometric analysis presented by the definition of the 18 articles on strategy that paved the way to research.

The selection of 18 articles by publication date, by the Qualis-Capes (engineering III) of all periodicals. And finally, if you read all the titles, abstracts, keywords, goals, their research methodologies, relevant aspects, analysis of results and conclusions.

At the end of these steps of sorting and reading articles, so for the last phase: the tabulation and evaluation of its characteristics, the results are presented and discussed below.

Table 1. The five largest plants in milling capacity.

Ranking	Tons of cane per harvest (grinding)
1º	10,500,000
2º	7,638,000
3º	7,000,000
4º	6,813,000
5º	6,500,000

Source: Novacana (2015).

Table 2. To from an industrial unit.

#	Divisions
1	Reception/preparation/grinding
2	Juice treatment
3	Sugar factory
4	Ethanol distillery
5	Storage of products

Source: elaborated by the authors.

4 Results

The analysis and implementation of LM can be done through the strategic decisions in various areas. The Strategy process found in the existing literature shows consistent with the definition of LM as a basically emerging Strategy for many organizations, whose actions are outlined by the consistency of behavior afforded by continuous improvement and learning generated. The LM can be characterized as a set of best practices, but the analysis of the feasibility of adopting any technique cannot be neglected. However, it has been seen that the LM is a strategy that reduces waste and provides better results for the manufacturing processes.

For this first stage of the research the 18 surveyed work form the basis for identifying the Strategy theme with the lean manufacturing process, and this is confirmed when it scans the titles of the works of these authors. Chosen works that focused on the themes and LM Strategy in the years 1974/77/81/86/93/84/95/96/99 and 2001/02/06/08/10/9/12 in an attempt to obtain the evolution of this approach and see through of these authors, the LM may be the methodology becomes consistent with the strategy. They met in the word strategy in 53% of the publications and the words linked to LM in 42%, and if found in 100% of the work the two words correlated. In the Table 3 there researched authors in chronological order and the titles of his works.

In Table 4 we can observe the authors surveyed and the evolution of the strategic objectives and production.

Note that the focus of the goals with regard to the words efficiency, low cost, higher return and the recovery of manufacturing aspects are present in all periods, with greater attention to planning, competitiveness and quality arises from the works of Porter, Slack, Ansoff and waste reduction, the quest for superior performance, world-class organization, development of industrial processes, understand the

Table 3. Year of publication of the works of the authors.

Year	Author	Title
2012	BHASIN, S.	An appropriate Change Strategy for lean success
2012	MACEDO, F. M. F.; BOAVA, D. L. T.; ANTONIALLI, L. M.	The social phenomenology in research strategy
2010	OPRIME, P. C.; MONSANTO, R.; DONADONE, J. C.	Analysis of complexity and learning strategies in continuous improvement projects: case studies in Brazilian companies
2009	AMATO NETO, J.	Management of local production and innovation systems (clusters / APL)
2008	VEIGA, G. L.; LIMA, E. P.; COSTA, S. E. G.	A discussion on the strategic role of Lean Production Model.
2006	SILVA, V. C. O.	Analysis of implementation cases of Lean Production in Brazilian companies of agricultural machinery and implements
2002	BRITO, J.	Cooperation networks between companies
2001	HOUAISS, A.	Dictionary Houaiss Portuguese
1999	NEELY, A.	The performance measurement revolution: why now and what next?
1996	WOMACK, J. P.; JONES, D. T.	Lean Thinking: Banish Waste and Creat the Wealth in Your Corporation.
1995	VOSS, C. A.	Alternative paradigms for manufacturing strategy.
1994	DAVENPORT, T. H.	Process Reengineering
1993	ANSOFF, H. I.	Strategic administration
1993	SLACK, N.	Competitive Advantage Manufacturing: Achieving competitiveness in industrial operations.
1986	PORTER, M.	Competitive Advantage Manufacturing: Achieving competitiveness in industrial operations. Competitive strategy: techniques for analyzing industries and competition
1981	HAYES, R.	Why Japanese factories Work. Harvard Business Review
1977	ANSOFF, H. I.	Business strategy
1974	SKINNER, W.	Manufacturing-Missing link in corporate strategy: itaruard business review

Source: elaborated by the authors.

Table 4. The objectives of the authors.

Year	Author	Objective
2012	BHASIN, S.	Implementation of Lean
2012	MACEDO, F. M. F.; BOAVA, D. L. T.; ANTONIALLI, L. M.	Organization defense
2010	OPRIME, P. C.; MONSANTO, R.; DONADONE, J. C.	Competitively produce a wider range of models in small amounts
2009	AMATO NETO, J.	Implementation of transformation processes
2008	VEIGA, G. L.; LIMA, E. P.; COSTA, S. E. G.	Pursuit of superior performance enhancing competitiveness
2006	SILVA, V. C. O.	Lower costs
2002	BRITO, J.	Understanding the impacts on the organization
2001	HOUAISS, A.	Defense organization
1999	NEELY, A.	Development of industrial processes
1996	WOMACK, J. P.; JONES, D. T.	Be a viable and efficient company in automobile manufacturing
1995	VOSS, C. A.	Pursuit of superior performance enhancing competitiveness
1994	DAVENPORT, T. H.	Reduce waste
1993	ANSOFF, H. I.	Plan their operations to survive in a dynamic world full of changes
1993	SLACK, N.	Improve the quality and delivery time
1986	PORTER, M.	Successfully face the competitive forces and thus get a higher return on investment.
1981	HAYES, R.	Appreciation of all aspects of manufacturing
1977	ANSOFF, H. I.	Plan their operations to survive in a dynamic world full of changes
1974	SKINNER, W.	The expected result: efficiency, low cost and acceptable service.

Source: elaborated by the authors.

impacts on organizations and the implementation of lean as a viable Strategy organizations are added by later works.

It is observed that initially there was some concern with the LMS that was ignored by the administration. The value of production as competitive function leaving the restricted vision that was only focused on technique and importance of machine would be.

The concept that the LMS is a powerful competitive tool of development was incorporated and happened to have a broader vision that goes from product to distribution with equal weights and other functions were recognized and developed as an integral system to enhance competitiveness.

Therefore, in addition to the production function, the marketing function, Comptroller (finance), human resources, research and development and quality are strategically composed, was until the manufacturing policies and recognize the economic, technological and logistical factors.

Currently, it is considered the EPE, the location, and competitive forces. Adopted best practices and benchmarking, value cultural aspects and if is another vision about waste and about the networking concepts, technology, production and cost reduction as a competitive factor that can provide higher quality of products and services. In Table 5 we can observe the authors searched relevant aspects and the contribution of his works.

Table 5. Relevant aspects and contribution of the works of the authors.

Author	Appearance relevant	Contribution
BHASIN, S.	LM implementation covering the whole: the value chain, flow, pull production and perfection	Guide to Implementation
MACEDO, F. M. F.; BOAVA, D. L. T.; ANTONIALLI, L. M.	Strategy as a maneuver or military device	Political, logistical and economic
OPRIME, P. C.; MONSANTO, R.; DONADONE, J. C.	Efficiency and cost reduction	Achieving efficiency in other aspects of ME - Lean Manufacturing beyond the mass production
AMATO NETO, J.	Techniques LM - Lean Production	Development of processes through TL - Thinking Lean
VEIGA, G. L.; LIMA, E. P.; COSTA, S. E. G.	Lean practices is the basis for the manufacturing strategy	Best practice involves the philosophy of WCM (world class manufacturing) and benchmarking
SILVA, V. C. O.	Highest quality products and services	Development of production processes to better meet customer expectations
BRITO, J.	Search for a better understanding of the system	LP - lean production and new concepts of network and information technology
HOUAISS, A.	Strategy as a maneuver or military device	Political, logistical and economic
NEELY, A.	Formatting of industrial processes	Strategic importance of LP model - Lean Production
WOMACK, J. P.; JONES, D. T.	A philosophy: waste disposal, pull production, lean thinking	Dissemination of the base of the production process employed by Toyota
VOSS, C. A.	Lean practices is the basis for the manufacturing strategy	Best practice involves the philosophy of WCM (world class manufacturing) and benchmarking
DAVENPORT, T. H.	Cultural aspects	Join the Lean tools
ANSOFF, H. I.	Importance of markets and products to the organization.	The implementation of the military field strategy for the field of administration
SLACK, N.	Strategic Importance of Production	Search to competitiveness in production
PORTER, M.	It is considered location, distinction, development, extension and recognition	Types of competitive strategy, offensive or defensive actions
HAYES, R.	Training and capacity building - inventory control system, and the ability of workers	Product development to distribution, are equally important
ANSOFF, H. I.	Organizational technology	Creation of modern production technology
SKINNER, W.	Manufacturing management is ignored in the company's strategy	Manufacturing management is a function that represents a valuable asset and can be tool to obtain competitive advantage

Source: elaborated by the authors.

In order to achieve the second objective proposed, researched the scientific works developed in enterprises and their respective segments, and the first given to be computed was the total number of items available that you can see in Figure 3 below:

Using the key words: strategy + lean + industry met 20150 available articles, and those articles, peer-reviewed totaled 13222 units, and this was home-based work. Continuing the selections were added the topics, namely, the words searched to bring the contents of the articles to the topic to be developed as shown in Figure 4.

Found 240 articles with the topic Lean Production which represents a 23% share of the total of the selected terms. It may be noted that the second most significant contribution was the topic Strategy Planning (Business) with 20%, and a total of 205, followed by the topic Automobile Industry which contained 148 journals and the topic Human Resource Management 135 journals. For the Automotive Industry topics, Lean Manufacturing and Performance results 209 periodicals as stratified participation by Figure 4.

It was later made a tab with the goal of meeting the databases that were participating in the production of articles.

Figure 5 shows the amount of periodicals that are published in the bases.

It is observed that the higher occurrence of publications appears mainly in the periodical OneFile (Gale) with 450 publications and a 46% share, followed by the journal Scopus (Elsevier) with 386 publications and a slice of 40%, the base SciVerse Science Direct (Elsevier) has 138 publications and contains 14% of magazines.

Figure 6 shows the resource used, and the focus given to the document type applied in this research.

For the resource type used, note that was in unanimity worked articles, deleted-if this work every other resource types, all reviews, textual resources, proceedings of conferences and journal articles. Other data presented and that contributes to the selection of items is the publication date as shown in Figure 7.

Highlights that the temporal position considered only those years where there were publications and from 2003 until the present day, read year 2014, more precisely until may 2014. Therefore, we have 44% of the sample between 2009 and 2014. Other information parsed and represented in Figure 8, subsequently was the Qualis-Capes stratum of all periodicals.

It was noticed that more than half of the journals do not have engineering III classification and other areas such as: computer science, biological sciences I, administration, accounting, agriculture and tourism, interdisciplinary, medicine, psychology, biology II, among others. However, 10 journals in the area of engineering III have qualification (A1) and nine journals are (A2). It was realized that periodic 24 have classification B1 and B2 are 30, and 18 to B4 and that no journal for B3 and B5 or for other classes, that is, we have no qualifications in this work in

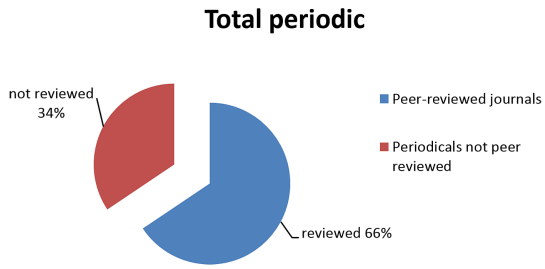

Figure 3. Numbers of articles published in the period.

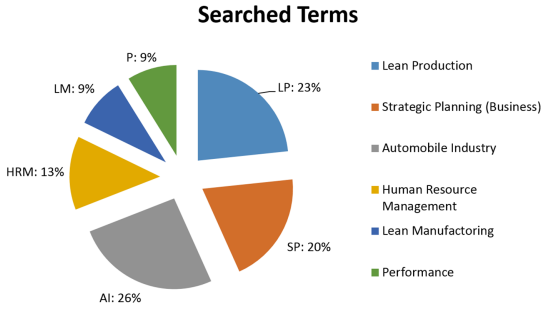

Figure 4. Amount of topics selected for the study area.

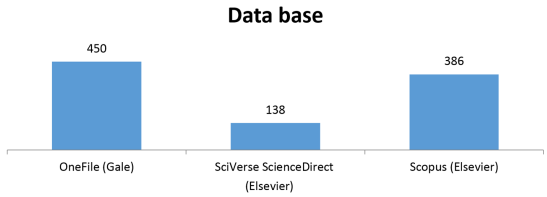

Figure 5. Number of articles per database.

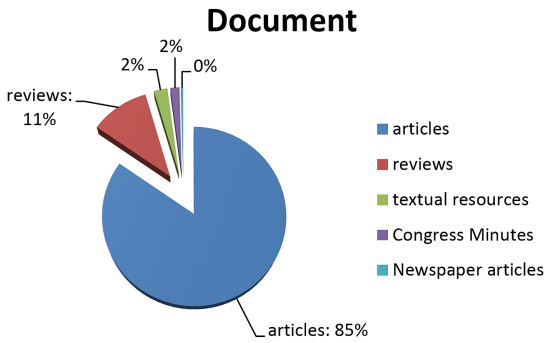

Figure 6. Resource used in research.

magazines C1, C2, C3, and so on. Then we analyzed the participation of journals on the subject and who are represented in Figure 9.

The International Journal of Operations Production Management has 41 & incidence, i.e. 23% of the publications were found. However, there is also high participation to the International Journal of Lean six sigma with the amount of 18 articles of the area and a slice of 20%, others: International Journal of Production Economics, The International Journal of Productivity and Performance Management, Journal of Manufacturing Technology Management and Management Decision, add up to 49 publications and a 54% share of the total that accumulate on average less than 13.5% incidence for each magazine. However, there is also high participation to the International Journal of Lean six sigma with the amount of 18 articles of the area and a slice of 20%, others: International Journal of Production Economics, The International Journal of Productivity and Performance Management, Journal of Manufacturing Technology Management and Management Decision, add up to 49 publications and a 54% share of the total that accumulate on average less than 13.5% incidence for each magazine. Was also made a tab in order to see the languages in which the international articles were written. Figure 10 shows what percentage of the total number of items and their respective language.

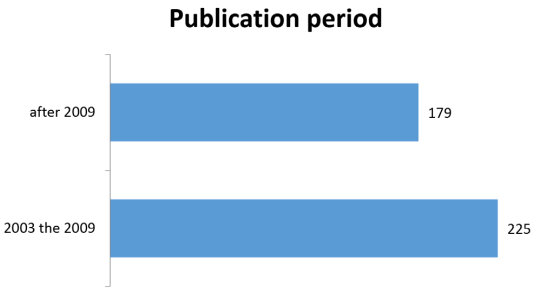

Figure 7. Date of publication of the articles.

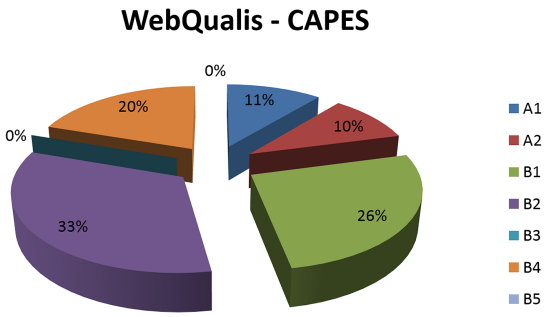

Figure 8. The Qualis-Capes.

It is observed that the amount of publications in English is surprisingly larger than the publications in other languages, especially the Portuguese, Spanish and German, for these do not participate with any publication on this work. Until here reached in articles 91 and sought to find the segment of industries worked within these selected articles, for this achievement was to read all their titles, abstracts, keywords, their research methodologies and conclusions are presented in Figure 11.

It is observed that the manufacturing industry has the highest participation with 26% totaling 16 items developed in this segment, the auto industry and has similar services, the first with 21% and 13 articles and, consequently, the second with 20% and 12 works, the food industry, construction, transport, small and medium-sized businesses, retailer, and industry and Commerce combined, they have 36 jobs and a share of 59% and the average between the latter not 33% and total 20 published works and there are no scientific articles for the sugar industry and ethanol in the sugar/energy segment.

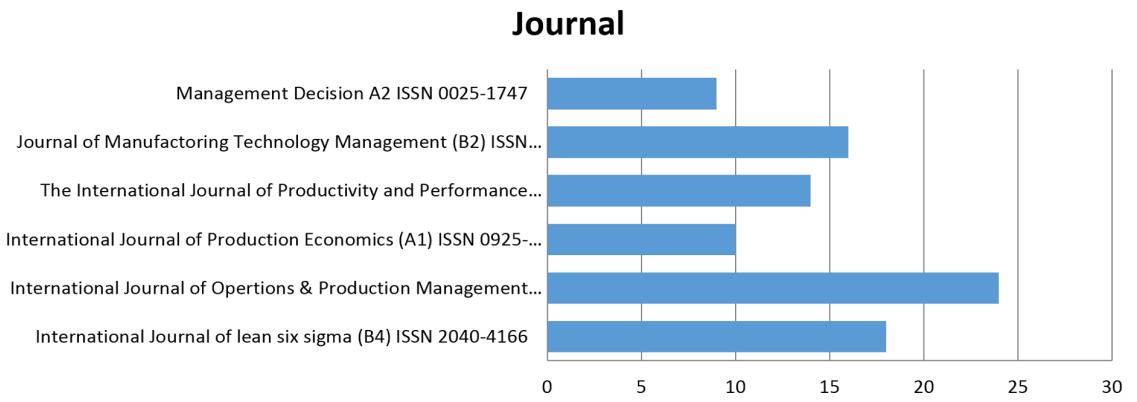

Figure 9. Publications by journal (Journal).

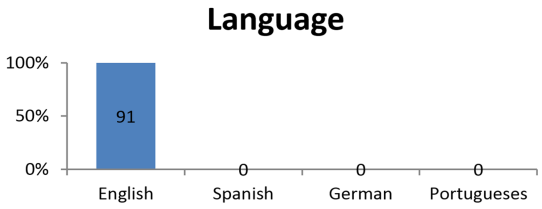

Figure 10. Number of articles published per language.

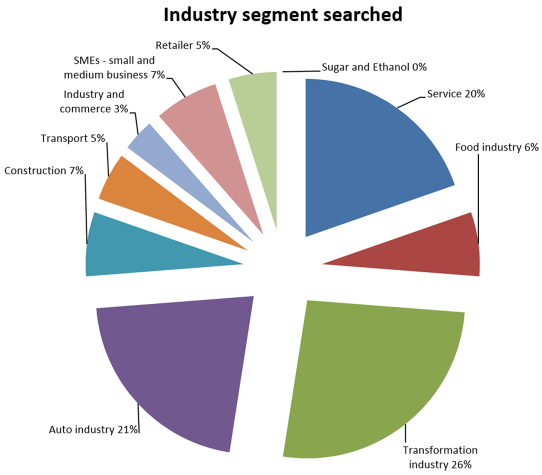

Figure 11. Segment of industries surveyed in periodicals.

5 Conclusion

The lean manufacturing can be considered as a viable strategy because it have short and long term planning. The literature itself reports that the LM's practices in the pursuit of improvement and development of production processes is not easy and can take long periods to reach maturity. These manufacturing processes are critical to facilitate and leverage the results set out in the strategy by the directors and shareholders. With LMS seeks to achieve superior performance, world-class, and continuous improvement.

The philosophy of world class manufacturing (WCM) and benchmarking, is associated with the LMS and, with continuous improvement of best practices in all areas of the organization, leads to superior performance in order to improve the competitiveness of enterprises.

With the LMS adoption many companies can achieve superior performance in several dimensions that were considered, such as: low cost, high quality, speed and flexibility. Competitive priorities can reinforce each other.

The second goal it has set itself the product was also achieved because information arose and drew up an analytical overview of the scientific literature on the subject in LMS available journals. The articles found through the established parameters, do not address the sugar industry and the sugarcane industry ethanol. So, here we have an opportunity to work and further research to be explored, so that they can contribute to the knowledge within the production process of this segment registered as the increased need for scientific production.

The results show that the LMS is on the rise internationally and is the methodology found in referenced journals. Scientific production around the subject is predominantly done by a single magazine or a single industry segment, showing an open space for those wishing to deepen and, in particular, sugar and ethanol segment, as this is presented as the greater opportunity of development work and scientific research.

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