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Ariadne Hoiara Zanin[1] | Elias Shohei Kamimura[2] | Anderson Rogério Faia Pinto[3]
José Luís Garcia Hermosilla[4] | Fabio Ferraz Junior[5]

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[1] Master in Production Engineering (UNIARA).
Araraquara - São Paulo, Brazil.
Email: ariadne.zanin@gmail.com

[2] Master in Production Engineering (UNIARA).
Araraquara - São Paulo, Brazil.
Email: eliasshohei@gmail.com

[3] PhD in Production Engineering (EESC-USP).
Professor at the University of Araraquara.
Araraquara - São Paulo, Brazil.
Email: anderson@life.com.br

[4] PhD in Mechanical Engineering (EESC-USP).
Professor at the University of Araraquara.
Araraquara - São Paulo, Brazil.
Email: jlghermosilla@hotmail.com

[5] PhD in Mechanical Engineering (EESC-USP).
Professor at the University of Araraquara.
Araraquara - Sao Paulo, Brazil.
Email: fabio.ferraz@sensoft.com.br

ABSTRACT

The demand for higher competition and waste elimination have prompted organizations to implement Lean Manufacturing (LM). However, this trend is quite more prominent in most big enterprises than in Micro- and Small-sized Enterprises (MSEs). It's before this gap that this paper aims to propose a set of guidelines for the LM implementation in MSEs in the clothing industry manufacturing located in the region of Barretos (SP). This objective is divided into two LM targets: i) identify the particularities and which LM principles are perceived or used in MSEs and; ii) identify the barriers, limitations and critical success factors for the implementation of LM in MSEs. The analyzes of multiple cases in 17 enterprises show that only 18% (3 enterprises) know, have resources, and use LM practices. This research fills a gap in the literature and proposes a guide that helps the LM implementation in MSEs. It is possible to conclude that LM provides many opportunities for research and waste reduction with productivity gains for MSEs in the textile industry in Brazil. A few suggestions for future research are broadening the study to different sectors and regions of Brazil; carrying out practical implementation by means of the proposed outlines; and formulating frameworks which are better adapted to the MSEs.

Keywords: Lean Manufacturing, Success Critical Factors, Micro- and Small-sized Enterprises.

INTRODUCTION

Over the last few decades many organizations around the world have applied Lean Production (LP) techniques and concepts. Nowadays, the pursuit for waste reduction has become a common goal for most organizations (MARTINS; CARTAXO, 2014). The continuous and systematic elimination of waste in production systems, in order to eliminate unnecessary costs, is the basis of the LP philosophy (WOMACK; JONES; ROOS, 1992; SHINGO, 1996). This philosophy is guided by principles that employ the application of a set of techniques and tools that make up LM (SHAH; WARD, 2003; LIKER, 2005; ACHANGA, 2006). Such principles, according to Womack, Jones and Roos (1992), constitute lean thinking and basically are: i) specifying value; ii) value stream; iii) continuous flow; iv) pull production and; v) perfection pursuit. It is evident that any process of transforming a product or service to meet demand involves activities that in many cases are necessary regardless of whether they add value or not (HINES; RICH, 1997; WOMACK; JONES, 2004). Therefore, the elimination or reduction of activities that do not add value, in order to provide flexibility and responsiveness to customer demands, is the objective of LM (WOMACK; JONES; ROOS, 1992; LIKER, 2005). In addition, it is important to point out that LM allows flexibility of deployment in different manufacturing environments (MARTINS; CARTAXO, 2014).

However, most large enterprises, compared to Micro and Small Enterprises (MSEs), have better conditions and resources for the LM implementation (BARROS; 2010). There is empirical evidence that large enterprises are more likely to implement LP practices than MSEs. The fact is that, despite their important role in the Brazilian economy, MSEs are faced with restrictions on human, material and financial resources that increase the degree of difficulty of the implementation process (PE ROSE et al., 2011). The main issue is that the participation of MSEs is gaining more and more importance in the Brazilian economy. In 1985, these enterprises accounted for 21% of the Gross Domestic Product (GDP), reaching 30% of GDP in 2017 (SEBRAE, 2017). In Brazil, there are more than 17 million small businesses, 7 million micro and small enterprises and 10.9 million individual

micro-entrepreneurs, which together represent 99% of all enterprises in the country (SEBRAE, 2017). MSEs employ 52% of the formal workforce and, as they represent 99% of the enterprises, they correspond to 27% of the Brazilian Gross Domestic Product (GDP) (SEBRAE, 2017).

Although MSEs represent 95% of enterprises and employ 42% of the sector's human resources, they have the worst productivity when compared to large enterprises (CNI, 2017). These enterprises are also inserted in a complex and intensely disputed environment, have specificities in the structure and management processes, with few employees and family administration, which hinders the specialization of relevant operational functions (DE AMORIM, 2019). Failures related to programs to improve productivity, reduce waste and increase competitiveness before market competition show that MSEs need LM practices (PINGYU; YU, 2010). In general, a recurrent point in LP implementation processes is the lack of a method with guidelines, scripts and standards that are better adjusted to the specificities of MSEs (BEDNAREK; LUNA, 2004; YANG; YU, 2010; ROSE et al. , 2011). The analysis of the literature shows that there is a demand for studies that identify the particularities and critical success factors of MSEs in the process of implementing the LM.

It is because of this gap that this paper aims to propose a set of guidelines for the LM implementation in MSEs of the clothing industry sector located in the region of Barretos (SP). The research is an exploratory-descriptive nature and is based on scripts and guidelines proposed in the literature with a focus on the adaptability of implementing LM concepts and techniques in the universe of MSEs. Therefore, this research divides the objective into two specific goals that direct the LM implementation: i) to identify the particularities and which LM principles are perceived or used in the MSEs and; ii) identify the barriers, limitations and critical success factors for the LM implementation in MSEs. The textile-clothing chain under study is composed of textile industries, and covers the production of yarn, flat fabrics and knits, and manufacture, which includes clothing and clothing items. A study by the SEADE foundation (2021) showed low rates of innovation in the textile and clothing sectors, especially in the new product indicator for the national market, that is, the textile and clothing industry in São Paulo has been decreasing its dynamism with loss of markets for the imported items. A research based on interviews with entrepreneurs and organizations representing the chain revealed

that MSEs have difficulty supplying wholesalers and large retailers (SEBRAE, 2021).

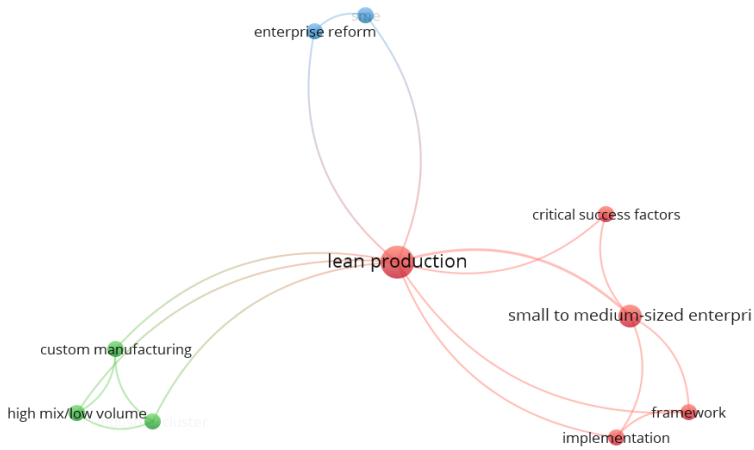
It is in this increasingly competitive environment that MSEs struggle to adapt to what is demanded by large retailers, whether participating in a portion of production or adapting their production to the identified trend. There is still a great lack of knowledge about standards and regulations in this scenario, since 85% of the interviewed enterprises reported that there is no specific technical standard for the company (SEBRAE, 2021). Associação Brasileira da Indústria Têxtil e de Confecção (ABIT- Brazilian Textile and Apparel Industry Association) points out that the textile industry accounts for 17.4% of formal enterprises and points out that an important regional center for the manufacture of uniforms is in the region of Barretos (SP). The possibility of training and development of this sector is, therefore, essential for the development of MSEs in Brazil. Considering the important role that MSEs play in strengthening the regional economy, whether in its economic or social scope, with income generation and worker settling in the region, this research pays special attention to management principles that can contribute to strengthening the studied business sector, and therefore promote the competitiveness and productivity of small organizations in the region. Therefore, this paper is structured as follows: section 2 shows the research methodology; section 3 brings a theoretical framework on LM application in MSEs; section 4 brings the exploratory research with analyzes of the LM application in MSEs; the paper ends with final considerations and suggestions for future research directed at the LM application in MSEs.

RESEARCH METHODOLOGY

This paper presents exploratory-descriptive research that uses technical procedures based on bibliographical analyzes and the study of multiple cases in MSEs (see Haegeman et. al. (2013), Linnenluecke, Marrone and Singh (2020) and Donthu et. al. (2021)). The empirical reality of the MSEs under study is confronted with the literary findings referring to the procedural aspects for the LM implementation. The proposed review was based on a traditional search using the collections Emerald, Science Direct, Periódico Gestão e Produção (Periodic Management and Production), annals of the Encontro Nacional de Engenharia de Produção (ENEGEP - National Meeting of Production Engineering), annals of the Simpósio de Engenharia de Produção (SIMPEP - Symposium

of Production Engineering) and the Biblioteca Digital Brasileira de Teses e Dissertações (BDTD - Digital Brazilian Library of Theses and Dissertations). The keywords used in the advanced searches were: Lean, Framework, Lean Manufacturing, Small and Medium-Sized Enterprises, Limitations and Critical Success Factors. In order that the results could necessarily contemplate the searched keywords, the Boolean expression "AND" was used. The searches began by parameterizing dates for the month of January 1999 and continued until December 2017, which resulted in a total of 48 findings (44 papers, 3 dissertations and 1 thesis). The refinement of the selection of productions, considering theme, objective, research focus, and keywords that include the implementation of LM in MSEs resulted in 11 papers, 2 dissertations and 1 thesis. The illustration of the keywords relation map of the selected texts is shown in Figure 1.

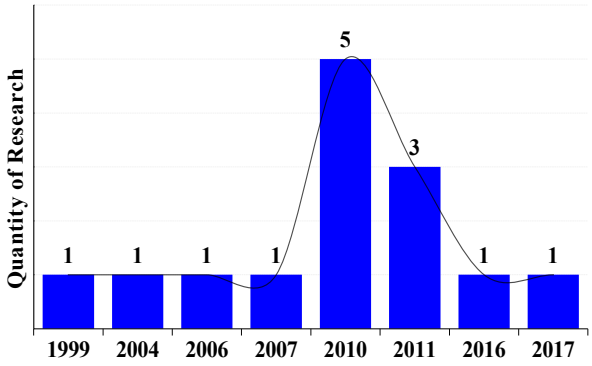
Figure 1 | Keywords relation map



Source: Research data

Figure 1, which was created by using the software VOSviewer version 1.6.16, illustrates the relationship and keywords intensity map of the selected publications. Figure 1 also shows that the research dealing with Lean Production and Small and Medium-Sized Enterprises are contemporary with the theme addressed in this paper and related to lines of research in Production Engineering. The temporal distribution corresponding to the findings is illustrated by Figure 2.

Figure 2 | Temporal distribution of research



Source: Research data

From the selection of publications, the research method was the study of multiple cases, in which a qualitative approach was used to compare the information and interpret how LM is implemented in MSEs. It is important to emphasize that the research protocol was built using the instrument proposed by Gambi (2011). However, there were necessary adaptations to meet the questions and objectives of the research, as well as to identify the principles perceived and used in MSEs. This instrument was divided into 3 parts: i) General information and characterization of the company; ii) LM (principles perceived and/or used in MSEs) and; iii) Identification of critical success factors, barriers and limitations. The selected enterprises, based on the research protocol, had the evidence of LM implementation monitored through the observation Check List proposed by Figueiredo (2017). The selection of enterprises was based on three criteria: i) size; ii) the segment and; iii) interest in participating the research. The research used the basis of SEBRAE SP, which promotes training for MSEs in the clothing industry sector in the region of Barretos (SP). From this base, which has 75 participants, 17 enterprises that showed interest in participating the research were selected and had the MSE framework.

LEAN MANUFACTURING IN MICRO AND SMALL ENTERPRISES

The literature review shows that there is a scarcity of research around the object of study that resulted in the selection of a limited number of papers referring to LM implementation in MPEs. The research by White, Person and Wilson (1999) was the first to present a study of the LM implementation in MSEs in the United States. Research has shown that large enterprises are more

likely to implement LM and that performance depends on the size of the manufacturer in relation to the MSE universe. Bednarek and Luna (2004) dealt with problems in the LM implementation in enterprises located in Mexico. The research developed and applied LM with a focus on the pursuit for better competitiveness of MSEs. The conclusions revealed 5 levels of perception of MSEs that use Lean. These levels are: i) concept misunderstanding; ii) use of various tools to reduce cost and/or improve productivity; iii) waste disposal; iv) reduction of delivery and production time and; v) process improvement to target customer and market. Shah and Ward (2007) present the definition and development of conceptual measures in order to identify 10 factors that constitute the LM functioning. Marodin and Saurin (2010) provided a case study in which they defined the guidelines for managing barriers in the LM implementation. The research listed 6 guidelines for the LM implementation: i) training at all levels; ii) definition of lean goals and objectives; iii) evaluation of the interaction between principles and barriers; iv) choice of a pilot value stream to show the result; v) participation of operators in improvements and; vi) a communication plan for all employees. The research Rose et al. (2011) classified the best LM practices for implementation in MSEs into three groups: i) those that are independent of size; ii) those that relate to the size of the company and may be more difficult and; iii) those that can be implemented in a segmented way. This research provided a deepening of perceptions regarding countermeasures, best practices and how best to deal with problems and the main barriers to LM implementation in MSEs.

In addition, there were also studies that proposed to identify countermeasures and guidance on what the critical factors for the LM successful implementation in MPEs are. Achanga et al. (2006) presented a literature review with a study of multiple cases in 10 enterprises and presented the critical success factors for LM implementation in MSEs in the United Kingdom. The research identified as critical success factors, leadership and management, financial capacity, skills and experience and organizational culture for LM implementation in MSEs. Pingyu and Yu (2010) identified barriers and countermeasures to LM implementation in 100 MSEs from the Whenzhou region of China. The research lists the following critical success factors for LM implementation in MSEs: i) managers attention and engagement; ii) a good communication platform; iii) organizational

learning and; iv) the establishment of an evaluation system. Subsequently, Bakas, Govaert and Van Landeghem (2011) carried out a study of multiple cases applied to 11 enterprises, 7 located in Belgium and 4 in Norway. The research identified the following challenges and critical success factors for LM implementation in MSEs: i) leadership and management engagement; ii) employee engagement and participation; iii) allocation of time for organization preparation; iv) motivation to continue and initiative; v) development of internal competences in the organization and; vi) creation and monitoring of the performance evaluation system. More recently, Belhadi, Touriki and Fezazi (2016) studied LM implementation in 4 MSEs in Morocco. The implementation took place in a three-phase way, with preparation, execution and generalization focused on the effective implementation structure of the LM. The research brought as critical success factors: i) management commitment and support; ii) staff training; iii) alignment of the global strategy; iv) long-term vision; v) appropriate methodology for implementation; vi) pilot area selection and; vii) initial planning. In general, the literature shows a convergence of critical success factors, the main ones being showed in Table 1.

Table 1 | Critical success factors

Critical Factors	References
Planning	Achanga et al. (2006), Yang e Yu (2010),Bakas, Govaert e Van Landeghem (2011) e Belhardi, Tauriki e Fezazi (2016).
Long term vision	
Leadership and team training	
Appropriate deployment methodology	

Source: Research Data

Faced with the barriers and critical success factors, many authors have proposed guidelines to improve the level of effectiveness of implementing the philosophy in organizations, one of the highlights being training at all levels, the definition of lean objectives and goals, the evaluation of the interaction between the principles of lean manufacturing and the barriers, the choice of a pilot value stream to show results, the participation of the operators in the improvement activities, and the plan of dissemination and communication for all the employees (MARODIN; SAURIN , 2010; SHAH; WARD, 2007; BELHADI; TOURIKI; FEZARI, 2016).

In view of the critical factors in Table 1, the literature also presents guidelines, scripts and recommendations for improving the level of effectiveness in LM implementation in MSEs. The literature review, in this context, revealed two lines of research on LM implementation in MSEs: one focused on the guidelines elaboration and the other on the proposition of implementation scripts. The first line is represented by the proposals of Marodin and Saurin (2010) and Figueiredo (2017). These authors provide the entire theoretical framework regarding the principles for the elaboration of general guidelines and instructions for LM. These frameworks do not bring closed or specific tools, but guide the organization on a proper implementation methodology better adapted to the specificities of each MSE. The comparison of the two proposed guidelines identified in the literature is shown in Figure 3.

Figure 3 | Comparison of proposed guidelines

Marodin e Saurin (2010)	Figueiredo (2017)
Training for, high, medium and low levels	Actions for the commitment of managers and employees
Definition of goals and objectives aligned with LM	Develop and maintain a long-term philosophy
Assessment of the interaction between principles and barriers	Focus on customer
Defining a pilot value stream	Develop leaders
Participation of operators in the application	Develop professional employees and teams
Communication plan for all employees	Challenge and respect network partners and suppliers
	Develop continuous improvement
	Use pull systems
	Focus on the perfection of products, processes and services
	Eliminate waste and reduce process variability

Source: Research Data

Therefore, the second line of research identified in the literature, which deals with the proposition of LM implementation scripts in MSEs, is represented by the works of Gambi (2011) and Belhadi, Touriki and Fezazi (2016). These authors recommend the execution of three phases for LM implementation, as can be seen in a comparative way, in Figure 4.

Figure 4 | Comparison of recommendations for LM implementation

Gambi (2011)	Belhardi, Touriki e Fezazi (2016)
Phase 1 – Planning and dissemination of the culture	**Phase 1 - Preparation**
Training in LM concepts and techniques	Establishment of the LM policy and objective
Definition of objectives and goals	Establishing a lean team
Definition of a lean team	Team training
Waste identification	Definition of the pilot process
Value stream mapping	Lean deployment master plan
Implementation of the 5S program	Definition of LM evaluation indicators
Improvement suggestion program	
Phase 2 - Improvement and standardization	**Phase 2 - Execution**
Development of standard operating procedures	Workforce training update
Preparing preventive maintenance plans	Model and analyze current situation
Elaboration of training plans and skills matrix	Identification of opportunities for improvement
Conducting Kaizen events	Implementation of the pilot project
Phase 3 - Monitoring and Control	**Phase 3 - Generalization**
Production programming and visual management	Results monitoring
Definition of performance indicators	Identification and standardization of LM practices
Sustainability initiatives	Lean perimeter extension

Source: Research Data

Evaluating the two lines of research, it is possible to conclude that both have issues involving benefits, barriers and critical success factors that influence LM implementation in MSEs. However, these references were based on models used by large enterprises and did not take into account the specific characteristics of MSEs. Among the main disregarded characteristics are the reduced teams, the high variety of products and the low volume produced by many MSEs. It is against this background that it will become important to deepen existing guidelines in the literature in conjunction with practical corroboration, so that a better assessment of adhesions and proposals for necessary LM adaptations to the MSE sector is possible.

EXPLORATORY RESEARCH

This section presents the proposed study whose objective is to suggest a set of guidelines for LM implementation in MSEs of the clothing industry sector located in the region of Barretos (SP). This research divides the objective into two specific goals that guide the LM implementation: i) identify the particularities and which LM principles are perceived or used in the MSEs and; ii) identify the barriers, limitations and critical success factors for the LM implementation in MSEs. The first stage of the empirical investigation took place through the data collection from the 17 MSEs under study, as shown in Table 2. Next, the map in Figure 5 shows the location and number of MSEs in the region of Barretos (SP).

Table 2 | General characteristics of the enterprises studied

Company Identification	Company County	Number of Employees	Monthly Production (Units)	Market Experience (Years)	Main Lines of Products
a	Morro Agudo	103	30.000	18	Shirts
b	Bebedouro	555	15.000	24	Uniforms
c	Pirangi	7	5.000	9	Swimwear and fitness
d	Guaraci	25	8.000	5	Swimwear
e	Barretos	22	2.500	3	Uniforms ans T-shirts
f	Barretos	17	2.000	5	Uniforms
g	Monte Azul Paulista	15	300	30	Leather Clothes
h	Barretos	12	500	12	Uniforms
i	Barretos	9	450	13	Uniforms
j	Morro Agudo	5	350	5	Uniforms
k	Bebedouro	4	100	6	Uniforms
l	Bebedouro	4	300	12	Feminine Clothes
m	Barretos	3	450	15	Saddlery
n	Ariranha	3	200	7	Uniforms
o	Bebedouro	1	150	3	Uniforms
p	Barretos	1	650	8	Shirts
q	Barretos	1	1.500	12	Underware

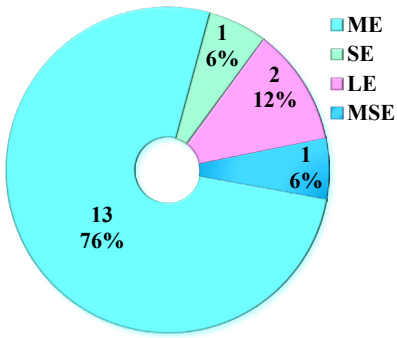
Source: Research Data

Figure 5 | Location of the studied enterprises

Source: Research Data

Figure 5 shows that the MSEs researched are concentrated in the mesoregions of Ribeirão Preto and São José do Rio Preto. Note that most MSEs are located in Barretos (41%), Bebedouro (24%) and Morro Agudo (12%). With regard to the number of employees, according to SEBRAE (2013), MSEs are classified as Microenterprise (ME), Small-Sized Enterprise (SE), Medium-Sized Enterprise (MSE) and Large Enterprise (LE). The total classification of these MSEs is illustrated in Figure 6.

Figure 6 | Enterprises categories



Source: Research Data

With regard to the LM principles perceived by the empirical universe of the research, there is an important result for the 17 MSEs. The research found that only 3 (18%) know and/or use the LM principles in their processes, that is, 82% of the participating MSEs have an insufficient level

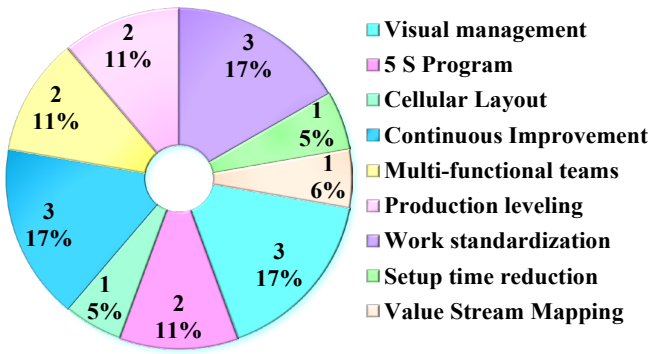
of knowledge about the subject. Therefore, MSEs that do not know and/or do not use LM in their processes were discarded, since they could not offer contributions to the objective of this research. Clearly, this result reinforces the issue pointed out by the literature regarding the lack of knowledge and LM implementation by MSEs. In this sense, the selected MSEs were only those which know and/or use LM in their processes, which were called (a), (b) and (c). Verification of barriers, limitations and critical success factors were obtained through visits, interviews and monitoring of each of the three selected MSEs. In addition, it was also possible to analyze the approaches used in each of the MSEs, whose results can be seen in Table 3 and Figure 7.

Table 3 | Known and/or used approaches in the analyzed enterprises

Known and/or Used Approaches	Enterprises (a)	(b)	(c)
Visual management	✔	✔	✔
5 S Program	✔		✔
Cellular *Layout*	✔		
Continuous improvement	✔	✔	✔
Multifunctional teams	✔		✔
Work standardization	✔	✔	✔
Production leveling	✔		✔
Reduction of setup time	✔		
Value stream mapping		✔	

Source: Research Data

Figure 7 | Known and/or used most applied approaches



Source: Research Data

Table 3 corroborated by Figure 7 shows that of the 9 known and/or used approaches, only 3 (33%) are present in the 3 MSE enterprises. These approaches are continuous improvement, visual management and work standardization, while the 5S program, production leveling and cross-functional teams are present only in company (a) and (c). With regard to the barriers and limitations faced, it is possible to verify the difference between the analyzed enterprises, as shown in Table 4.

Table 4 | Barriers and limitations faced by the analyzed enterprises

Barriers and Limitations Faced	Enterprises (a)	(b)	(c)
Centralized management	✔	✔	
Reactive team culture	✔		✔
Unknown suppliers			✔
Lack of staff training		✔	
Process flow is not continuous			✔
Lack of strategic planning	✔	✔	
Lack of continuous improvement culture			✔
Lack of ongoing problem solving			✔
Troubleshooting does not attack the cause			✔
Lack of workload leveling		✔	
Layout disorganized with production flow inadequado		✔	✔
Difficulties for continuous improvement actions	✔		✔
Low production volumes and wide variety			✔
Leadership and employee development	✔		

Source: Research Data

Table 4 shows that among the barriers and/or limitations of LM, at least 1 was found in the 3 MSEs. Therefore, of the 12 barriers and limitations listed, only 5 (42%) are present in at least two MSEs. Next, Table 6 lists the critical success factors observed in each of the three MSEs selected for the LM analysis.

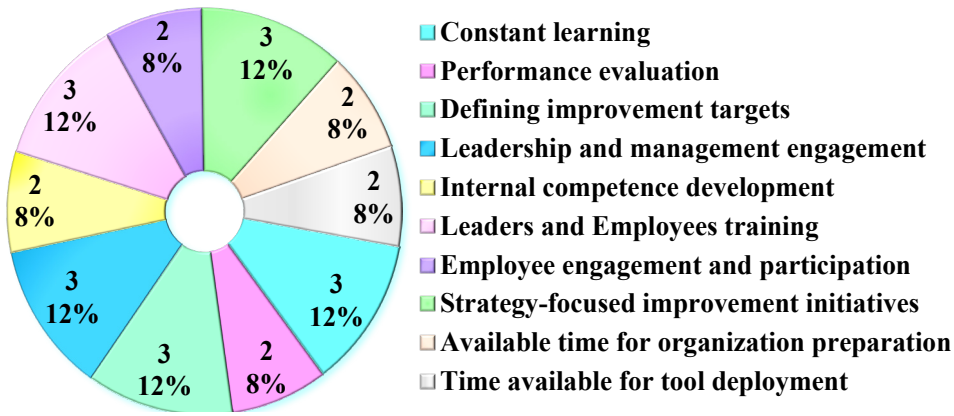
Table 5 | Critical success factors in the analyzed enterprises

Critical Success Factors	Enterprises		
	(a)	(b)	(c)
Constant Learning	✔	✔	✔
Performance evaluation	✔		✔
Definition of improvement goals	✔	✔	✔
Leadership and management engagement	✔	✔	✔
Internal skills development	✔		✔
Employee and leadership training	✔	✔	✔
Strategy-focused improvement initiatives	✔	✔	✔
Employee engagement and participation	✔		✔
Time available for organization preparation	✔		✔
Time available for tool deployment	✔		✔

Source: Research Data

Enterprises (a) and (b) have the same critical success factors as shown in Table 5. Figure 6 lists the factors by number of verifications in each company. Thus, the factors of improvement initiatives focused on strategy, definition of improvement goals, constant learning, employee and leadership training, and management engagement were identified in the 3 enterprises analyzed. The known and/or used approaches by MSEs are graphically showed in Figure 8.

Figure 8 | Known and/or used approaches



Source: Research Data

The analysis of the results obtained in the study shows that there is a set of LM approaches and tools that have not yet been implemented by MSE. These enterprises focus on the use of approaches and tools to improve manufacturing processes, improve productivity and reduce waste, whose results can be seen in the short term. Evidently, enterprises focus on some specific principles, but they do not apply continuous improvement in the development of teams and the LM philosophy. However, significant improvements in the lean philosophy and in the results can also be obtained with the implementation of other elements that make up the LM. There is a need for advances in relation to the development of employees who remain in the same teams for a long time in order to result in a stagnation in the LM process improvements. This fact was observed in company (a) which, despite having worked with LM approaches and tools for 12 years, does not promote tools and actions aimed at developing teams and creating long-term visions. Company (c), while promoting a long-term vision and the development of the team and partners, needs to eliminate waste and improve the flow.

Therefore, there is a need to develop a LM philosophy that includes principles of valuing the organization and developing employees and partners with a focus on long-term planning for each MSE. The possibility of investing in valuing, training and developing people with a focus on long-term culture and encouraging continuous improvement is essential for MSEs. Thus, from the data obtained on the perceived principles as well as the barriers, limitations and critical success factors, it was possible to carry out the analyzes of the MSEs. Therefore, comparative analyzes carried out concurrently with the knowledge and experience of the entrepreneurs showed the guidelines used in the implementation processes of the LM carried out by the MSEs. These analyzes showed that, due to the products, production processes, high variety and low volumes, not all LM tools can be implemented in MSEs. Therefore, it is not possible to implement LM using tools and/or closed scripts and/or pre-defined approaches, since some approaches do not suit the specificities of the MSEs. So, an adaptation of the guidelines suggested by Figueiredo (2017) was proposed, as shown in Figure 9.

Figure 9 | Proposed guidelines for the implementation of PE in MPE

Actions to obtain commitment	Train employees and managers in LM ↓ Define who will the multiplier be ↓ Define first action for employee engagement ↓ Define the schedule of other actions
Justification: everyone's knowledge and engagement is a critical factor for the success of LM	
Long term philosophy	Strategic planning with objectives and goals ↓ Mission, vision and values ↓ Plan medium and long-term actions ↓ Determine performance indicators ↓ Organize all processes ↓ Define tools for continuous improvement
Justification: it is necessary to elaborate a project with broad and lasting objectives	
Focus on customer	Identify customer needs ↓ Maintain a relationship with the customer ↓ Develop strategies geared to customer needs ↓ Implementation of the pilot project
Justification: need for continuous focus on the customer in order to meet expectations	
Develop leaders and teams	Define competencies for each manager ↓ Define ways to evaluate managers ↓ Participation of managers in the elaboration of strategies ↓ Determine performance indicators ↓ Communication for all levels ↓ Training of all leaders and teams
Justification: change in organizational culture needs to develop leaders and teams	
Develop a continuous flow	Value Stream Map (VSM) ↓ Determine best production layout ↓ Use of multifunctional operators ↓ Eliminate bottlenecks
Justification: people, materials, and information to avoid intermediate stock and overproduction	
Develop continuous improvement	Continuous troubleshooting ↓ Plan to predict problem prevention ↓ Standards for processes
Justification: For LM sustainability, a continuous improvement program is necessary	
Seek perfection in products, processes and services	Determine quality indicators ↓ Determine productivity indicators ↓ Culture of doing the right thing ↓ Use of information systems
Justification: Striving for perfection is necessary to gain competitive advantage	
Eliminate waste and process variability	Using VSM to add value ↓ Implement 5S program ↓ Machine maintenance planning ↓ Train people to reduce process variability
Justification: It is necessary to streamline the process and add value.	

Source: Research Data

Figure 9 shows that of the 10 guidelines proposed by Figueiredo (2017), two did not adapt to MSEs. The guidelines relating to developing and respecting the network of partners and suppliers as well as the use of pull systems are understood as restrictions due to the particularities of MSEs. There is a need to adapt the guidelines proposed in the literature that comprise the LM theoretical framework. In particular, there is the formulation of action plans that deal with issues related to the high variety of products, low production volume, small teams and poor relationships with suppliers. In addition, another aspect observed was the focus on some specific principles in a way that other approaches and tools were not implemented or worked on by MSEs. The consistence of stagnation in relation to the continuous improvement of processes and advances in the development of teams with a philosophy focused on long-term actions is a decisive factor for LM failure. The main suggestion to obtain improvements is the definition of actions, deadlines and tools for the implementation of all LM principles in MSEs. It is evident that MSEs are faced with restrictions in terms of human, material and financial resources that increase the difficulty of LM implementation process. However, internalizing a leadership philosophy, constant learning and strengthening relationships with suppliers and employees is an inherent factor in the successful LM implementation.

FINAL CONSIDERATIONS

In the pursuit for greater competitiveness and waste elimination, many organizations around the world have applied Lean Manufacturing (M) techniques and concepts. However, most large enterprises are more likely to implement LM than Micro and Small Enterprises (MSEs). The fact is that MSEs are faced with restrictions on human, material and financial resources that make the LM implementation process difficult. In addition, there is a scientific shortage of methods with guidelines, scripts and standards for implementing LM that are better adjusted to the specificities of MPEs. Because of this gap, this paper proposed a set of guidelines for the LM implementation in MSEs in the clothing industry sector located in the region of Barretos (SP). The research is of an exploratory-descriptive nature and is based on scripts and guidelines proposed in the literature, which focus on the adaptability of LM implementation in MSEs. Therefore, the objective is divided

into two goals of the LM: i) to identify the particularities and which principles of the LM are perceived or used in the MSEs and; ii) identify the barriers, limitations and critical success factors for the LM implementation in MSEs.

The analyzes of multiple cases in 17 MSEs identified that there is a significant lack of knowledge about the LM principles perceived or used by MSEs in the industry sector in the region of Barretos (SP). The research showed that only 3 (18%) MSEs know, have resources and use LM practices. However, the non-use of the LM due to lack of resources or lack of knowledge of the subject corresponds to 82% (14) of MSEs. The research also identified that the LM implementation can contribute to productivity gains and waste reduction that result in an improvement in the competitive performance of MSEs. However, LM cannot be seen as an immediate solution to the different problems that exist in MSEs. The use of LM principles and guidelines aimed at developing a culture of continuous improvement that creates a philosophy focused on the long term is essential for MSEs. The analyzes together with the perception of the entrepreneurs showed that the LM implementation should consider guidelines that include the characteristics of high variety of products, low production volumes and size of the MSE teams. These are the proposed guidelines for the LM implementation in the referred MSEs: i) focus on the customer; ii) continuous flow and continuous improvement; iii) maintain a long-term philosophy; iv) develop professional leaders and teams; v) perfection of products, processes and services; vi) commitment of managers and employees and; vii) eliminate waste and reduce process variability.

In general, this research fills a gap in the literature and brings practical contributions through a roadmap that helps LM implementation in order to develop competitiveness and provide benefits to MSEs. Based on the studies carried out, it was possible to satisfy the goals and objective of the research, identifying LM barriers and critical success factors in order to better adapt them to the MSEs. Therefore, it made it possible to research elements that corroborate the need to adapt LM implementation scripts and guidelines to the practical reality of MSEs. The importance of implementing the LM for MSEs is also highlighted in order to encourage such initiatives with the support of organizations such as SEBRAE-SP. It is shown that such evidence should be further explored

in order to provide greater consistency before being considered as closed proposals for MSEs.

It is possible to conclude that LM provides research opportunities to the scientific community and waste reduction with productivity gains for MSEs in the textile industry in Brazil. The main limitation of this research is that the elaborated guidelines were developed based on the study of multiple cases performed in only 3 MSEs. The other MSEs that make up the empirical universe of the research do not know or do not use the LM concepts. It is important to emphasize that the proposed guidelines have not been evaluated in practical LM implementations in MSEs. In addition, the research time factor has an impact on obtaining and evaluating results versus the critical success factors in the LM implementation. Examples are management leadership and engagement, and people training and development in order to create a long-term culture in MSEs. Based on the results and limitations presented, the following suggestions are proposed for future research: i) implement LM in other market sectors in which MSEs operate; ii) implement LM in MSEs of the same sector in other regions of Brazil; iii) elaborate a step by step program for the development of the LM culture in MSEs and; use the guidelines proposed in this research so that a practical analysis of the LM implementation in MSEs is possible. It is important to emphasize the potential gains that can be obtained by the research, both for MSEs and for the regional economy, since it directs efforts towards the systematization of procedures for the adoption of modern management principles by small enterprises.

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