

IMPACTS ON PSYCHOSOCIAL FACTORS OF LEADERS IN LEAN PRODUCTION SYSTEMS

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ABSTRACT

The aspects that came from Henry Ford's innovation caused some problems, since many parts were produced in large scale for a single car model. The result was huge amounts of unused stock and a high level of waste. In this context, the Toyota Production System or, as it is known, the Lean System (commonly called Lean Production System) emerged in Japan. Although this model proved to be very promising in terms of productivity and optimization of resources, it was identified - also - the need to devote more attention to the well-being of workers, since the Lean Production System (LP) also impacted the Psychosocial Factors (called by the International Labor Organization as aspects of working conditions, organizational structure, and culture, among others). Aim: to verify whether there is an impact on Psychosocial Risks (PR) in professionals who hold leadership positions within the context of companies that have implemented LP. As a research strategy, a questionnaire was developed and applied to evaluate the organizational conditions perceived by these professionals. As a result, it was possible to identify that there is no influence of LP on psychosocial risks. It was concluded that, when identifying evidence of LP impact on well-being in the work environment, these impacts were perceived positively by the respondents.

Keywords: Lean System; Lean Production; Psychosocial Risks.

1. INTRODUCTION

In 1948, Ohno and Toyoda began to develop the Toyota Production System or TPS (Soares, 2013), later known as Lean Manufacturing, which had two fundamental principles: the elimination of waste and manufacturing with quality (Maximiano, 2005). If on the one hand the Lean system can mean an efficient alternative to reap good results in the production process, on the other hand, it can cause and increase the levels of stress among workers (Conti et al., 2006). Although stress does not represent harm to health – along with anxiety, mood swings, and isolation – it is a symptomatic indicator of physical and emotional damage. Stress can, in this sense, be linked to a biological agent, an environmental condition, a stimulus, or an event (Iol, 2016).

In 1984 the ILO called the work environment factors that can cause stress Psychosocial Factors (PF), bringing attention to the dynamic interaction between the work environment and human factors (Iol, 2016).

Although LP has proven to be a powerful approach for improving productive operational performance, it has been observed that many companies adhering to LP have not been able to achieve a high level of performance (Bortolotti et al., 2015).

Authors Pereira et al. (2014) mention studies citing that the main sources of stress among managers in the modern world are associated with organizational restructuring processes arising from globalization (Isma, 2008).

When considering that workers are permeated by several psychosocial factors, when they occupy a leadership position, increasing their degree of responsibility in the organization, this context can be much more complex. In this sense, it is relevant to verify the psychosocial risks in professionals who exercise a leadership role within the lean production system.

Therefore, the present study intends, by means of a survey, through a customized questionnaire, to identify whether there is an impact on psychosocial risks in professionals who exercise a leadership role within the context of LP.

2. THEORETICAL BACKGROUND

Lean production system

Some concepts of the Toyota Production System (TPS) were already known to industrial engineers and practiced at Ford during the 1920s. With the help of Taiichi Ohno and Shigeo Shingo, Toyota introduced and continually refined a production system whose goal was to reduce or eliminate non-value added tasks: those for which the customer was not willing to pay.

The Toyota System adopted three main ideas for waste elimination, namely: Workforce rationalization, Just in Time, and Flexible production. By applying these concepts, Toyota managed to reduce production time considerably; activities such as changing the molds on the presses were accomplished in just 3 minutes in Japanese factories, while in Western companies this process took a whole day (Maximiano, 2005).

Table 1. Actions to eliminate waste

Workforce rationalization	Just In Time	Flexible production
Group workers into teams with a leader for each team;	Minimize manufacturing time and inventories;	Manufacture only what is in demand from customers;
Lead and coordinate the group and replace any absences rapidly;	Produce only what is needed at the right time with the right product;	Manufacture in small batches;
Perform maintenance by its own workers who are responsible for the quality control of its equipment.	Develop partnerships with few suppliers to strengthen the supply chain.	Make changes in the molds of the presses, through its own workers.

Liker (2004), in his analysis of Toyota, identified that the lean concept operates on two principles: continuous improvement and respect for people. However, Nordin (2012) ponders that the second principle was not positively understood by senior leaders at Toyota. Continuous improvement (kaizen), in turn, required not only skill, but also a mindset focused on systematically eliminating waste and raising the value of processes. In this sense, the lean concept evolved to the level of knowledge management.

Conti et al. (2006) in a study on the impacts of LP on stress in the workplace highlighted the elements that contribute to stress reduction, as follows:

Table 2. LP elements that contribute to stress reduction

Elements of Lean Production	Description	Reference
Set-up reduction	Reducing the time to change from one item to another. It reduces delivery time and reduces inventory.	Shingo (1981, p. 63); Schonberger (1982, p. 20); Krajewski and Ritzman (2003, p. 439, 451); and Suzaki (1987, p. 33, 167)
Inventory and waste reduction	Waste is any activity that does not add value to the customer. Excess inventory is a major waste and a primary target for reduction.	Shingo (1981, p. 112); Schonberger (1982, p. 18); Krajewski and Ritzman (2003, 439); and Suzuki (1987, p. 7)
Kanban	A shop floor control system with visual signals from usage to supply work centers, indicating the need for more parts. This “pulls” the needed spare parts based on actual usage or demand.	Shingo (1981, p. 272); Schonberger (1982, p. 85); Krajewski and Ritzman (2003, pp. 437, 444); and Suzaki (1987, p. 146)
Partnership with suppliers	Lean companies form cooperative relationships with suppliers, sharing design and cost improvement responsibilities and emphasizing on-time delivery of high-quality parts.	Shingo (1981, p. 219); Schonberger (1982, p. 157); Krajewski and Ritzman (2003, p. 441); and Suzaki (1987, p. 196)
Continuous improvement program	A continuous program of improving the quality, cost, and schedule of processes and products through the cooperative efforts of workers and engineers. It is often called “kaizen”.	Shingo (1981, p. 7); Schonberger (1982, p. 181); Krajewski and Ritzman (2003, p. 443); and Suzaki (1987, p. 69)
Mixed model of Production	Assembles different products and product variations on the same line. Balances shop floor workloads when combined with tiered production schedules. Reduces delivery time and inventories.	Shingo (1981, pp. 191, 204); Schonberger (1982, 93); Krajewski and Ritzman (2003, 440); and Suzaki (1987, p. 124)
Total Quality Management	Integrated program to improve process and product quality through techniques such as statistical process control (SPC), “quality at source” (workers inspect and stop the line if defects occur), and quality control before supplier delivery.	Shingo (1981, p. 34); Schonberger (1982, p. 49); Krajewski and Ritzman (2003, pp. 114, 438); and Suzaki (1987, p. 101)
Fail-safe systems (poka-yoke) or design for assembly (DFA)	Foolproof techniques seek to eliminate judgment and discretion in the execution of production tasks to produce highly reliable products. DFA is a computer rule-based design system to reduce parts in a product, improve quality, and reduce costs.	Shingo (1981, p. 25); Schonberger (1998, p. 3); and Suzaki (1987, p. 135)
Total Preventive Maintenance (TPM)	Highly organized program of periodic machine maintenance and preventive replacement of components such as bearings, to minimize the frequency and duration of machine breakdowns. Routine secondary maintenance during working hours is done by the workers.	Shingo (1981, p. 188); Schonberger (1982, p. 136); Krajewski and Ritzman (2003, p. 442); and Suzaki (1987, p. 113)
Standard Operating Procedures (SOPs)	Detailed descriptions of production tasks are documented to aid organizational learning, training, and ISO 9000 compliance. Helps maintain the cumulative effect of continuous improvement.	Shingo (1981, p. 219); Krajewski and Ritzman (2003, p. 441); and Suzaki (1987, p. 135)

A study conducted by Barker (1998) with managers found that most of them resist LP implementation due to lack of skills or knowledge on this system. For employees, resistance is linked to lack of commitment or inadequate training.

3. PSYCHOSOCIAL FACTORS

The term “psychosocial factors” at work encompass a set of worker’s perceptions and experiences in their work environment. It also encompasses economic and social influences that impact the worker. There are stud-

ies that explain the nature and interaction between these factors, including the relationship with hierarchies, family or private life circumstances, and cultural elements, such as nutrition, transportation facilities, and interactions with authorities.

The target of Lean was a certain development of the production process, both in terms of quality and productivity control, and in terms of efficiency and effectiveness. The competitiveness strategy causes a relative change in production and labor relations as it transforms the work collective. In this context, workers become each other's inspectors, committed to the company's strategy by acting in an atmosphere of consultation and consensus.

Stenger et al. (2014) expose that the constant technical and technological changes, automation of productive activities, in addition to the leaning in hierarchical levels, aiming at more effective internal flow of information, were factors that contributed to the perception of anxiogenic environments.

For Camelo and Angerami (2008), overload or low workload, lack of control over working activities, and high levels of pressure are psychosocial risks related to work (included in this category), which can lead to stress. In this sense, the authors argue that control over the workday could not only reduce conflict at home and at work, but also reduce the dangers of excessive stress.

The study proposed by Koukoulaki (2014) points out that aspects such as decision-making authority, skill development, autonomy, and job satisfaction, if absent or

low, can be a risk factor and generator of effects such as upper limb musculoskeletal disorders, fatigue, tension, and stress.

In this sense, according to Levi (2005), the continuous work-related stress is an important determinant of depressive disorders, besides other impacts on the worker's health, generating consequences such as increased blood pressure and probably contributing to morbidity from heart diseases, triggering of diabetes, exhaustion, weight loss, physical exhaustion, and the onset of other diseases such as stroke and kidney problems due to hypertension.

Leadership in the context of lean production and psychosocial factors

One of the impacts of adopting the LP methodology is on the way people work. While most people will find their work more stimulating as the LP culture is absorbed and production increases, some tasks may become more stressful. This is because one of the essential goals of this production system is to bring responsibility to the bottom of the organizational pyramid. This responsibility means freedom to control one's own work; an advantage, however, that increases the fear of making mistakes that lead to losses, and certainly a disadvantage in our mentality of job insecurity and moderate stimuli for decision-making processes at this level (Moreira, 2011). In a recent study, Seidel and Saurin (2020) define lean leadership as a social process carried out by leaders with personal attributes aligned with lean principles to sustain continuous improvement, and they must be supported by a manage-

Table 3. Relationship between Psychosocial Factors and Lean Production

Psychosocial factors in each production model	Taylorism (context: Fordism)	Lean production
Parts/Tools and supplies to work with	Homogeneous. Repetition of gestures and tasks. Search for the smallest movement.	Variables of parts and products.
End product of the work	Standardized.	Variation according to demand.
Autonomy at work	Relative low/medium procedural autonomy in events such as accidents.	Production cell autonomy/ Process autonomy/ Risk management by the team.
Work control	Through intermediary hierarchy (management).	By production cell or team.
Alternation of tasks	No turnover.	Mobile polyvalent groups.
Team work	No, competitiveness established by standard worker.	Yes, problem solving groups; multidisciplinary groups;
Time management of tasks (production rhythm)	Cadence imposed by management.	Just-in-time work.
Job stability	By productivity in the task.	Through individualized productivity evaluations.
Communication at work	No, associated with Fordism.	Yes, by establishing interpersonal competition in the production cell.

ment system compatible with the internal and external context of the company.

An extensive study conducted by Koukoulaki (2014) supports the relevance of the theme proposed by this article; in it, correlations are presented between the possible impacts -positive or negative- of LP on workers' PR. The research grouped the search terms into three indicators: lean production, work characteristics, and risk factors and health effects, as shown in the following table:

As a result of studies of this nature, theoretical perspectives on the effects of lean production have evolved over the years. When lean production was first introduced, it was presented as an efficient production system with positive effects for workers, increasing their autonomy and empowerment.

Judging by the exposure seen by some authors, we could deduce that in part LP is a contributing factor to the aggravation of psychosocial risks. Koukoulaki (2014) highlights research indicating that negative effects observed in workers would be strongly associated with some lean practices, since they intensify work pace. However, lean production cannot be said to be - in itself - harmful. Waste reduction practices are considered the core of Lean production, and without them, a production system can hardly identify itself as Lean. The author also mentions that not all Lean characteristics are harmful, but the main ones can affect negatively if no support – such as social support to the worker – is applied. As highlighted by Conti et al. (2006), it is possible to conclude that LP

does not directly represent the impact factor on well-being, but is associated with how it is implemented and how its management is conducted by the leadership.

4. RESEARCH METHOD

Outlining the research steps

As a strategy for data collection, we used Survey software, which allows obtaining information about characteristics, actions, or opinions of a certain group of people through a research instrument, usually a questionnaire (Freitas et al., 2000). The choice was due to the fact that it is the most appropriate for answering questions such as “what is happening” or “is it possible to happen”. Considering the fundamentals proposed by Gil (2002), the research was divided into five stages: (1) Design; (2) Data collection instrument and Pre-test; (3) Data collection and verification; (4) Data analysis and interpretation; and (5) Presentation of results.

In the Conception stage (1), we sought to specify the research objective, thus allowing us to delimit the subject to be studied and to establish the best research strategy. In this stage a literature review was carried out, selecting articles whose keywords were related to the terms LP and PF.

In the step data collection instrument and pre-test (2), the questionnaire was prepared for information collec-

Table 4. Search Terms for Literature Review

	Indicators	
Lean Production System	Job Characteristics	Risk factors and health effects
Waste Reduction	Control	Stress
Toyota system	Work	Fatigue
Just in Time	Overload	Risk
Just in Time	Work Load	Psychosocial risk factors
Flexibility	Work Load	Psychosocial
Organizational change	Empowerment	Well-being
Total Quality Management	Involvement	Stress
	Team	Musculoskeletal Disorders
	Team autonomy	Musculoskeletal Disorders
	Self-managed teams	Upper Limb Disorders
Total Quality Management	Autonomy	Ergonomics
	Job satisfaction	Ergonomics
	Time pressure	Health and safety
	Work rhythm	Working conditions

tion, which would be directed to professionals who work in leadership positions. In the data collection and verification stage (3), the platform for inserting the instrument (questionnaire) and applying it to collect information from the target population was defined. In step (4), data analysis was performed. In the step (5), the presentation and interpretation of the research results was carried out, describing the conclusion obtained on the proposed theme.

Questionnaire Development

The questionnaire was divided into three sections that comprise:

- **Company characterization:** this section has nine questions about the economic sector in which the company operates, its size in relation to the number of workers and billing, benefits offered, and issues related to human resources behavior, such as turnover and absenteeism. The questions in this section were prepared by the author.
- **Psychosocial aspects:** this section has 30 questions addressing the respondent's perception of psychosocial factors inherent to the work environment. The questions addressed aspects related to work organization, hierarchy and interpersonal relationships, support from superiors, control, expectations, work demands, leadership, communication, organizational culture, quantity and quality of work, opportunities, insecurity, compensation, autonomy, learning, and career. The questions formulated for the questionnaire were designed after reviewing the literature on occupational psychosocial factors. The anchor levels of the response alternatives used in this section were "Very rarely or never", "Rarely", "Sometimes", "Often", and "Frequently or always". In some questions, the anchors "Completely", "Somewhat", "Almost never", and "Absolutely not" were used. In the final questions, the anchors used were "Strongly agree", "Agree", "Disagree", and "Strongly Disagree". These differentiations occurred in order to keep the alternatives of the original questionnaire models preserved. The scores given for each anchor level was 1 point.

Table 6 presents the previous works from which the questions in this section of the questionnaire were selected.

Respondent profile: This section has 19 questions that dealt with personal aspects and habits of the respondent.

The questions used in this section were developed by the author. Quantitative questions were also conducted in this section.

Data Collection and Analysis

Data collection was carried out through the application of the questionnaire sent by e-mail. The "SurveyMonkey" platform was chosen to insert the questions, develop the layout, and collect the answers. After developing the questionnaire and creating the link to access it, it was sent to approximately 15,000 addresses. In addition, the link was shared via social networks (such as LinkedIn and Facebook) and multi-platform messaging (including WhatsApp and Line). Thus, it was not possible to specify the number of possible respondents.

In all, 138 people answered the questionnaires. The survey was conducted from July 29 to October 21, 2019, and had an average response time of 10 minutes and 54 seconds.

From an initial analysis, it was noticed that not everyone had completed the questionnaire; therefore, certain "filters" were established in order to obtain the sample to be analyzed. The first filter was to verify if the questions were answered in their entirety. Of this total, it was verified that forty-seven respondents had not answered all the questions (N=47). According to some reports informally obtained by the researcher, although the theme was relevant, the length of the questionnaire (with 74 questions) impacted on a completion rate of 62%.

Considering the focus on professionals in leadership positions, we disregarded the data from respondents outside this criterion (N=18). Thus, a final sample of 73 respondents was obtained. Next, this sample was divided between companies with LP and companies without LP, aiming at comparative analyses. To this end, an initial questioning was made as to whether the company in which the respondent worked has the LP implemented or not. Thus, the total population obtained was divided into two samples: one formed by companies which had the LP (N=47) and the other by companies which did not (N=27). The following flow chart describes the steps for obtaining the samples that were used to perform the analysis.

For the data analysis, the statistical computational "tool" was used. For the response alternatives of each question in the questionnaire, a score was adopted, considering 1 for the worst situation and 5 for the best situation. For questions that had four alternative answers, 4 was considered the best situation.

Table 6. Questionnaires used and their approaches

ID	QUESTIONNAIRE	ORIG	REFERENCE	APPROACH
A	General Nordic Questionnaire - QPS NORDIC	Denmark	Dallner A, Elo A- -L, Gambrele F, Hottinen V, Knardahl S, Linstrom K, Skogstad A, Orhede E. 1997	The questionnaire includes the assessment of three categories: task, organization, and personal issues. They deal with questions regarding work demands, expectations and role played, control, predictability, dominance, leadership, social support, intimidation and harassment, organizational culture, communication, interpersonal relationships, commitment, work centrality, and private life.
B	Factores Psicosociales – Identificación de Situa- ciones de Riesgo	Spain	Matilde Lahera Martín E Juan José Góngora Yerro 2006	The INSL methodology is adequate to identify situations that may put the worker's health at risk, carrying out a survey of the general state of the company from the psychosocial point of view.
C	Vragenlijst Beleving en Beoordeling Van de Arbeid VBBA – Questionnaire on The Experience and Evaluation of Work – QEEW	Netherlands	Van Veldhoven And Mei- jman 1994	QEEW is a work experience and assessment questionnaire to measure stress and workload. It analyzes, among other issues, pace and amount of work, mental load, emotional load, physical effort, learning opportunities, independence, relationships with superiors and colleagues, communication, participation, insecurity, compensation, career possibilities, organizational issues and conditions, and pleasure.
D	Grille D'Identification de Risques Psychosociaux Au Travail	Canada	Institut National De Santé Publique Du Québec – Inspq 2009	The instrument is composed of questions about work organization, absenteeism, and occupational health policies and policies to deal with psychological violence and harassment in the workplace, in addition to information about other sources of psychosocial risk, such as social support, communication, workload, etc.
E	Job Diagnostic Survey – JDS	United States	J. Richard Hackman & Greg R. Oldham 1974	The Job Diagnostic Survey is a tool designed to assess the five characteristic dimensions of work: skill variety, work identity, work meaning, autonomy, and feedback.
F	Health and Safety Execu- tive Indicator Tool / HSE	United Kingdom	Health And Safety Execu- tive – HSE 2008	It is a 35-item questionnaire that assesses risks of work-related stress from six primary stressors noted in the Management Standards approach to addressing stress in the workplace. The axes analyzed include: demands, control, support from superiors, peer support, relationships, role/function, and changes.

Table 7. Instrument adapted by the author from other questionnaires

QUESTIONS	ID
For your function, is it necessary to work at a fast pace? () Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	A
Do you usually work overtime, or work beyond the normal work day, even when not at work? () Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	A
Does your job require quick decisions? () Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	A

Have you ever been exposed to any kind of threat at work?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are errors in your work associated with risk of economic losses?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Do you have clear, planned, and defined goals and objectives for the development of your work?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Do you know exactly what is expected of you at work?	B
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Could the activities you perform be done differently?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Do you often receive conflicting requests from two or more people?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Does your job involve tasks that are in conflict with your personal values?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are you satisfied with the quality of the work you do?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are you satisfied with the amount of work you do?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are you satisfied with your problem-solving skills at work?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are you satisfied with your interpersonal relationships in the work environment?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Do you receive feedback on the quality of work you do?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
If necessary to the work, do you receive support from your immediate superior?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
In your opinion, does your immediate superior treat workers fairly and impartially?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Is the relationship between you and your immediate superior a source of stress for you?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Are the workers on your team encouraged to propose improvements in the workplace?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Is there efficient and effective communication in your department?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	
Do the demands of your job interfere with your family life?	A
() Very rarely or never () Rarely () Sometimes () Many times () Frequently or always	

If necessary, can you take breaks from your work for a short period of time? () Absolutely not () Almost never () A little () Completely	C/F
Can you decide the time allotted for a specific activity? () Absolutely not () Almost never () A little () Completely	C/F
My promotion prospects are low. () Strongly Disagree () Disagree () Agree () Strongly Agree	D
My job security is weak. () Strongly Disagree () Disagree () Agree () Strongly Agree	D
With all my efforts and achievements, I receive the respect and esteem that I deserve in my work. () Strongly Disagree () Disagree () Agree () Strongly Agree	D
With all my efforts and achievements, my salary is satisfactory. () Strongly Disagree () Disagree () Agree () Strongly Agree	D
I often think about quitting this job. () Strongly Disagree () Disagree () Agree () Strongly Agree	E
Mark the option below that best describes the organizational climate in your work team: () Competitive () Stimulating and supportive () Distrustful and suspicious () Relaxed and comfortable () Rigid and rule-based.	A

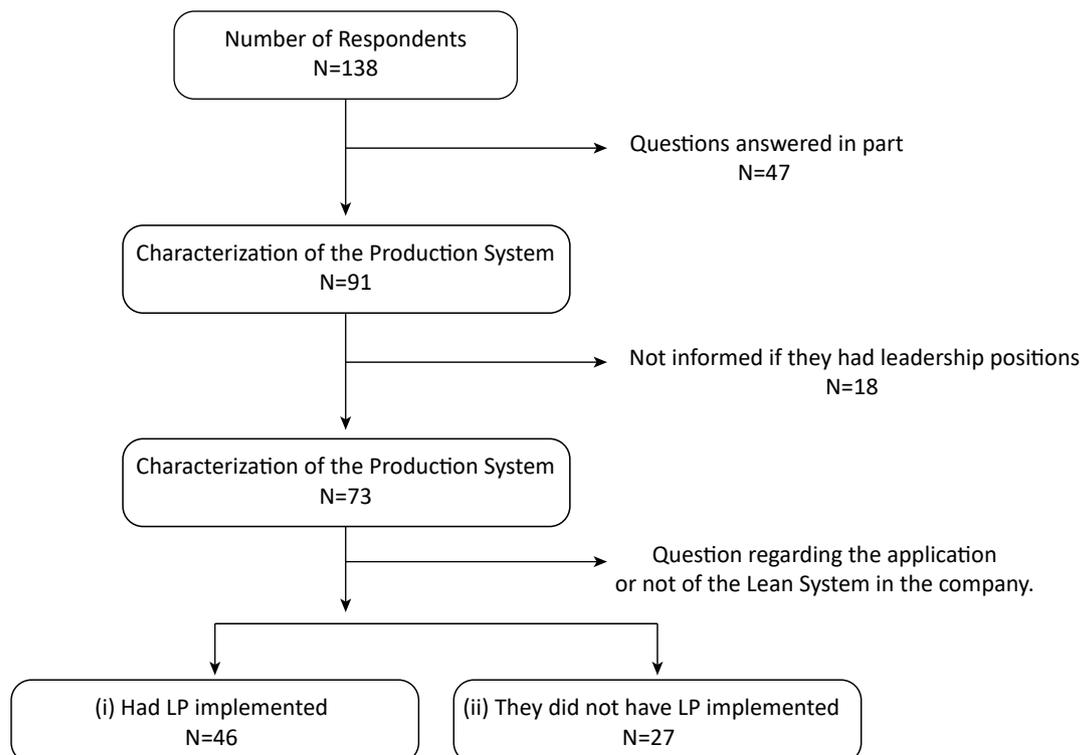


Figure 1. Flowchart to obtain the sample to be analyzed

After these steps, the sample means of all the questions were calculated. Comparisons were made between the averages of the two samples of each question, in this case treated as companies that had adopted LP and those without LP. Thus, by analyzing the averages of the two samples of each question, it was already possible to identify the sample that had the most favorable or positive result.

Afterwards, the “t-test” was performed for each question, considering the two samples and their algebraically distinct means. The t-tests are hypothesis tests aiming to compare the means. This was necessary because we wanted to compare the performance of the answers for each question and, therefore, state whether or not the difference between the averages of the two samples was statistically significant.

For the data analysis of the samples and averages, a 95% confidence level was adopted (α 0.05), considering the hypothesis test equal to 0 (zero), that is, that the samples had similar behavior.

After performing the analyses, the t-stat values obtained in the hypothesis tests of the questions were tabulated so that a judgment of the results could be made. Only after performing this analysis, was it possible to say whether the samples had similar performance or significant difference, and thus validate or not LP as an influencing factor in PR.

5. RESULTS

Characterization of the sample: companies

Table 8 shows that more than 50% of the respondents' companies that adopt LP had revenues exceeding two hundred million reais in 2018. Analyzing the total population of respondents, it was possible to identify that approximately 80% of the companies that adopted LP had positive billing results compared to 66% of the companies that do not use LP. In general, companies that apply LP tend to be larger and have higher revenues. On the other hand, in relation to the benefits offered by the company, the “Career Plan” criterion, companies without LP showed a performance 5% higher than companies with LP. Conversely, in the criteria “Educational Incentives,”

“Pension Plan”, and “Profit Sharing”, companies with LP showed a 25% better performance than companies without LP.

Table 8. Respondents' company profiles

QUESTIONS	Had Lean	Did not have Lean
Approximate number of workers		
Up to 49	4%	22%
From 50 to 99	4%	11%
From 100 to 199	2%	7%
From 200 to 499	15%	11%
From 500 to 999	13%	7%
Over 1000	61%	41%
Approximate annual turnover of your company		
Up to 1 million	4%	19%
Up to 5 million	2%	7%
Up to 50 million	17%	33%
Up to 100 million	9%	11%
Up to 200 million	15%	7%
Over 200 million	52%	22%
Approximate percentage (%) of growth in company revenues in the last year		
Result was negative	9%	4%
No growth	11%	30%
Up to 1% growth	7%	11%
Up to 3% growth	26%	19%
Up to 5% growth	17%	7%
Up to 10% growth	7%	11%
More than 10%	24%	19%
The company offers benefits to its employees:		
Educational Incentive, Complementary Pension, Fitness Center, others	87%	63%
Career Plan	57%	63%
Profit Sharing Policy	63%	37%

Table 9 shows the results concerning personnel turnover and absenteeism, denoting a significant distinction between samples in the first aspect. When analyzing the results concerning turnover, it can be seen that the group of companies with LP showed better results, which may be related to the benefits offered by the companies.

Table 9. Comparison of turnover and absenteeism indicators

LEGEND:

¹ Sample average score ranging from 1 to 5 according to the following response scale:
 (5) Less than 1% | (4) Less than 5% | (3) Less than 10% | (2) Less than 15% | (1) More than 15%

Question	Mean ¹ Standard Deviation		Stat t	Is there a statistical difference?
	Uses LP	Does not use LP		
What is the approximate annual turnover rate of the company?	3.57 ±1.025	2.93 ±1.466	2.188	Yes
What is the approximate annual absenteeism rate of the company?	3.61 ±0.906	3.19 ±1.272	1.656	No

Characterization of the sample: respondents

Table 10 presents a summary of the respondents' characterization. The most visible difference refers to the level of knowledge in LP, which, as expected, is higher in companies with LP. Another interesting finding is that 81.48% of the leaders of companies without LP admitted having some level of knowledge about the system, which indicates a potential for applying LP in these companies.

Table 10. Comparison of indicators about the respondents' profile

QUESTIONS	Uses LP	Does not use LP
Which alternative below best identifies your knowledge of Lean Systems?		
Advanced	34.78%	18.52%
Intermediate	39.13%	25.93%
Basic	21.74%	18.52%
Beginner	4.35%	18.52%
None	0.00%	18.52%
What is your education level?		
Post-graduation	84.78%	77.78%
Higher education complete	13.04%	7.41%
Higher education incomplete	2.17%	14.81%

What is the education level of the professionals you lead?		
Post-graduation	4.35%	0.00%
Higher education complete	43.48%	55.56%
Higher education incomplete	21.74%	22.22%
High School complete	23.91%	18.52%
High School incomplete	2.17%	0.00%
Elementary school complete	4.35%	0.00%
Elementary School Incomplete	0.00%	3.70%

Perceptions regarding psychosocial factors

Table 11 presents the results regarding the perceptions of psychosocial factors related to organizational culture and work organization. There was no significant difference between the two groups of companies. Nevertheless, considering absolute values, the companies that do not use LP presented better results in seven of the ten questions.

In a study conducted by Conti (2006) with 1,670 workers from 16 factories, the results indicated that workers in factories with LP had heavier workloads, with great difficulty in slacking off or changing work characteristics. It is important to clarify that that study, however, did not indicate the degree of lean implementation or the effects of specific LP practices.

Table 11. Perceptions regarding work organization and organizational culture

LEGEND:

³ Sample mean score ranging from 1 to 5 according to the following response scale:
 (5) Very rarely or never | (4) Rarely | (3) Sometimes | (2) Often | (1) Frequently or always

Questions	Mean ³ Standard Deviation		Is there a statistical difference?
	Uses LP	Does not use LP	
Does your job require you to work at a fast pace?	2.39 ±0.856	2.48 ±0.975	No
Are you used to working overtime, or working beyond the normal day, even outside of work?	2.74 ±1.144	2.96 ±1.126	No
Does your job require quick decisions?	2.15 ±0.759	2.19 ±0.879	No

Have you ever been exposed to any kind of threat at work?	3.74 ±1.144	3.44 ±1.553	No
Are mistakes in your work associated with the risk of economic loss?	2.43 ±0.935	2.52 ±1.122	No
Do you often receive assignments without adequate resources to complete them?	2.74 ±0.953	2.52 ±1.156	No
Do you often receive conflicting requests from two or more people?	2.91 ±0.939	3.26 ±1.196	No
Does your work involve tasks that conflict with your personal values?	3.85 ±1.135	3.70 ±1.235	No
Is the relationship between you and your immediate superior a source of stress for you?	3.48 ±1.090	3.67 ±0.961	No
Do the demands of your job interfere with your family life?	3.09 ±1.050	3.41 ±1.083	No

Table 12 shows the results about psychosocial factors associated with personal satisfaction and interpersonal relationships. In only one of the twelve questions was there a difference between the two groups of companies. However, the companies with LP showed a higher average in eleven of the twelve questions. About this factor, Marochi (2002) notes that teamwork in LP allows workers to have a greater vision of the activities they perform and, therefore, of their participation in the productive process. Based on this, the author concludes that in LP the communication process is expanded.

Table 12. Perceptions on Job Satisfaction and Interpersonal Relationship

LEGEND:

⁴Sample average score ranging from 1 to 5 according to the following response scale:

(5) Frequently or always | (4) Often | (3) Sometimes | (2) Rarely | (1) Very rarely or never

Questions	Mean ⁴ Standard Deviation		Is there a statistical difference?
	Uses LP	Does not use LP	
Do you have clear, planned, and defined goals and objectives for developing your work?	3.80 ±0.859	3.19 ±1.178	Yes
Do you know exactly what is expected of you at work?	3.96 ±0.842	3.52 ±1.189	No

Could the activities you perform be done differently?	2.65 ±0.795	2.59 ±0.747	No
Are you satisfied with the quality of the work you do?	3.72 ±0.911	3.78 ±0.506	No
Are you satisfied with the amount of work you do?	3.39 ±0.977	3.26 ±0.764	No
Are you satisfied with your ability to solve problems on the job?	3.76 ±0.822	3.67 ±0.961	No
Are you satisfied with your interpersonal relationships in the work environment?	3.91 ±0.839	3.74 ±0.903	No
Do you receive feedback on the quality of your work?	3.13 ±0.909	3.04 ±1.255	No
If necessary to the work, do you receive support from your immediate superior?	3.54 ±1.069	3.37 ±1.334	No
In your opinion, does your immediate superior treat workers fairly and impartially?	3.72 ±1.089	3.52 ±0.935	No
Are the workers in your team encouraged to propose improvements in the workplace?	3.85 ±0.816	3.63 ±0.839	No
Is there efficient and effective communication in your department?	3.57 ±0.807	3.48 ±1.014	No

In **Table 13**, which deals with the autonomy of leadership in process control, there was no significant difference between the two groups of companies.

Regarding autonomy at work, Martinez et al. (2004) recommend actions that increase the autonomy and control exercised by workers over their activities (without generating overload) as a strategy to positively impact the psychosocial aspects at work.

Table 13. Perceptions about Autonomy

LEGEND:

⁵Sample average score ranging from 1 to 4 according to the following response scale:

(4) Completely | (3) A little | (2) Almost never (1) Absolutely not

Questions	Mean ⁵ Standard Deviation		Is there a statistical difference?
	Uses LP	Does not use LP	
If necessary, can you take breaks from your work for a short period of time?	3.33 ±0.701	3.19 ±0.786	No

Can you decide the time allotted for a specific activity?	3.35 ±0.706	3.26 ±0.859	No
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Table 14 presents the perceptions regarding the efforts and achievements made by the leaders. There was no statistically significant difference between the two groups of companies. For Scherer and Ribeiro (2013), the implementation of an LP system should be continuously monitored, promoting recognition to employees for the goals achieved. Araújo and Rentes (2006) point out that changes, even if they are for the better, are difficult for most people; in this sense, when facing change processes, especially those in LP Systems implementations, the authors highlight the importance of reward and recognition systems, as they strengthen mutual trust and respect among people.

Table 14. Recognition

LEGEND:

⁶Sample average score ranging from 1 to 4 according to the following response scale:

(4) Strongly Agree | (3) Agree | (2) Disagree | (1) Strongly Disagree

Question	Mean ⁶ Standard Deviation		Is there a statistical difference?
	Uses LP	Does not use LP	
With all my efforts and achievements, I receive the respect and esteem I deserve in my work.	2.91 ±0.725	2.96 ±0.587	No
With all my efforts and achievements, my salary is satisfactory.	2.61 ±0.906	2.74 ±0.813	No

In **Table 15**, three questions were addressed regarding the leaders' expectations about career and the comparison showed that only one question had a significant difference. This result may be associated with the implementation process of LP, which envisions long-term results and - associated with this perspective - seeks to create an environment of development, professional training, and, consequently, stability.

Table 15. Professional Expectation

LEGEND:

⁷Sample average score ranging from 1 to 4 according to the following response scale:

(4) Strongly Disagree | (3) Disagree | (2) Agree | (1) Strongly Agree

Question	Mean ⁷ Standard Deviation		Is there a statistical difference?
	Uses LP	Does not use LP	
My promotion prospects are low.	2.39 ±0.714	2.30 ±0.775	No
My job security is poor.	2.93 ±0.854	2.52 ±0.802	Yes
I often think about quitting this job.	2.83 ±0.902	2.78 ±0.934	No

6. CONCLUSIONS

The research conducted allowed us to know and reflect upon the psychosocial risks that leaders may be exposed to, comparing companies that use and do not use LP.

Judging by the results obtained, more than 90% of the questions showed no statistically significant difference between the two groups of companies, i.e., it is not possible to state that LP is a factor that causes some kind of impact on PRRP. The results obtained largely showed that there were similar performance behavior between the companies.

Thus, it is not only the level of implementation of LP that correlates with PRRP, but possibly also the contextual characteristics of each application. According to the literature reviewed, the main mechanism underlying the health effects of LP is work intensification, and in some cases this will be unavoidable. It may be that this does not manifest itself so strongly in leaders, because they do not perform operational and repetitive activities most of the time.

The limitations of this study include: (i) the small number of respondents; (ii) there was no assessment of the level of development of the leaders' competencies, which would allow verifying whether they were more adherent to the style of Lean leaders or traditional leaders; and (iii) it did not consider the degree of maturity of the administration in the team management, the method used for the LP implementation, and the regional economic context. These factors could explain the absence of significant differences between the groups of companies.

As for the possibility of future studies, the following can be highlighted: (i) the expansion of the application of the survey to a larger number of respondents; (ii) the application of the survey in conjunction with a tool to assess the level of development of lean competencies by leaders.

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Received: October 25, 2020

Approved: November 16, 2021

DOI: 10.20985/1980-5160.2021.v16n3.1683

How to cite: Forte, I.K. (2021) Impacts on psychosocial factors of leaders in lean production systems. Revista S&G 16, 3. <https://revistasg.emnuvens.com.br/sg/article/view/1683>