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The influence of organizational culture and leadership styles in companies undergoing lean manufacturing implementation

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Abstract

Aims(s): This paper aims at identifying the association between leadership styles and organizational culture (OC) characteristics that best support companies undergoing lean manufacturing (LM) practices implementation

Methodology: Data from a survey carried out with 225 leaders from companies of different sizes and sectors, at different stages of lean implementation was used

Results: We state that OC profiles are associated with leadership behaviors and the implementation level of LM practices, indicating that the expected effect of the relationship between leaders' styles and OC profile on the LM implementation may not be as suggested in the existing literature

Practical Implications: Previous studies on LM emphasize the importance of the underlying OC already in the company, viewed as a key element for its long-term sustainability

Keywords: Organizational culture, Leadership styles, Lean manufacturing.

1. Introduction

A question that arises from the literatura is how specific OC characteristics are associated with different styles of leadership for determining the firm's success in implementing Lean Manufacturing (LM). Existing literature suggests that, in order to implement a change process such as LM successfully, firms should have transformational leaders at the top (SURESH et al., 2012). Such leaders should emphasize on behaviors that eventually lead to the desired culture and outcomes, which may be pursued by transactional leaders in middle management ranks (EMILIANI, 1998). A common belief is that leaders in companies undergoing LM implementation should be cooperative, delegators, and excellent motivators of personnel (ANGELIS et al., 2011; PAMFILIE et al., 2012). However, detailed descriptions of the desirable attributes and styles of leadership along the evolutionary process of LM implementation are not yet available in the literature. Such gap is reported by Liker (2004), Mann (2009), Rother (2009), Dibia (2012), Liker and Convis (2011), Marodin and Saurin (2013), and Dombrowski and Mielke (2014), among others.

Additionally, research on OC that may impair or favor leaders towards a leaner firm is also lacking in the literature and usually approach OC as an antecedent of LM practices (BORTOLOTTI et al., 2015). Previous studies providing a more comprehensive analysis of the phenomenon (e.g., SPEAR; BOWEN, 1999; LIKER, 2004; ROTHER, 2009) generally focused on the Toyota case history, without leveraging well-established OC models. Mann (2010) highlights that the establishment of a lean culture requires an almost completely different approach in day-to-day management, compared to anything with which leaders in conventional batch-and-queue environments are familiar or comfortable. The creation of a supportive organizational culture is an essential platform for the implementation of LM (ACHANGA et al., 2006; BHASIN, 2012). Essentially, lean needs to be seen as a mind-set that governs how one looks at the business or processes (Bhasin and Burcher, 2006). High-performing companies are those with a culture of sustainable and proactive improvement (Taleghani, 2010; Angelis et al., 2011). Thereby, previous research indicates that the manner in which a change process such as LM implementation is introduced, embraced and tackled is defined by an organization's culture (SIM; ROGERS, 2009, SINGH et al., 2010). However, it is worth noticing that LM as practiced by Toyota may not be easily emulated by other organizations due to the prevailing culture. Thus, we argue that identifying OC characteristics

and leadership styles that best support LM implementation could shed light on difficulties that companies report when implementing lean.

Thereby, to answer this question, this paper aims at identifying the association between leadership styles and OC characteristics that best support companies undergoing lean implementation. Our research provides arguments to understand how the association between both aspects occurs in firms that are widely adopting LM. We are not aware of any other study comparable to ours regarding its objectives. This rest of this paper is structured as follows. Section 2 gives an overview of the literature on LM implementation, leadership styles and OC characteristics. Section 3 describes the research method, with results presented in section 4. Section 5 closes the paper presenting conclusions and future research opportunities.

2. Background

2.1. LM practices

Table 1 lists LM practices most frequently studied in the specialized literature. Fifteen papers were selected, and fourteen LM practices were identified. From these, two practices ('standardized work' and 'problem solving methods') are the most frequently cited. The application of 'standardized work' serves three purposes: (i) create basic stability in production processes by mitigating process variability (DOOLEN; HACKER, 2005; STENTOFT; VAGN, 2013), (ii) balance workload among employees (SHAH; WARD, 2007; BORTOLOTTI et al., 2015), and (iii) promote quality-checking and establish key daily routines (FURLAN et al., 2011; BHAMU; SINGH SANGWAN, 2014). Associations between 'problem solving methods' and LM are more recent and appear in smaller number in the literature (NETLAND et al., 2015; MARODIN et al., 2015). The practice relates to the capacity of solving problems in a structured way, regardless of the kind and criticality of problem (SPEAR, 2009).

Table 1 - Incidence of LM practices in the literature

LM practices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	Level of Agreement
1- Pull system	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	80%
2- Takt-time	✓	✓		✓		✓		✓				✓		✓	✓	53%
3- Continuous flow	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	80%
4- Material supply	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓	✓	80%
5- Zero deffects	✓	✓			✓	✓	✓	✓	✓	✓				✓	✓	67%
6- Quality assurance	✓	✓	✓	✓				✓	✓	✓				✓	✓	60%
7- Product/process quality planning	✓		✓	✓	✓			✓	✓	✓		✓		✓	✓	67%
8- Standardized work	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	87%
9- Production leveling	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	80%
10- Maintenance system	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	80%
11- Workplace organization	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	73%
12- Self-managed teams	✓					✓	✓			✓	✓		✓	✓	✓	53%
13- Cross-functional teams		✓		✓	✓					✓	✓			✓		40%
14- Problem solving methods	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	87%

Sources: (1) Shah and Ward, 2003; (2) Doolen and Hacker, 2005; (3) Treville and Antonakis, 2006; (4) Shah and Ward, 2007; (5) Furlan et al., 2011; (6) Stone, 2012; (7) Moyano-Fuentes and Sacristán-Díaz, 2012; (8) Marodin and Saurin, 2013; (9) Stentoft and Vagn, 2013; (10) Netland and Ferdows, 2014; (11) Bhamu and Singh Sangwan, 2014; (12) Jasti and Kodali, 2015; (13) Bortolotti et al., 2015; (14) Netland et al., 2015; (15) Marodin et al., 2015.

2.2. *Leadership styles*

We now present the basics of leadership styles. Situational leadership (SL) theory suggests the existence of four basic leadership styles; they vary according to the relationship intensity between leaders and followers, and to leaders' behavior when confronted with a task (HERSEY; BLANCHARD, 1969). Leaders that are highly focused on tasks and present low relationship intensity with followers are said to be telling or directing (S1). Such style is usually recommended to teams in which followers cannot do the job or are unwilling to try. In those cases, the leader should assume a highly directive role, telling followers what to do. The second style (S2, selling/coaching), in which leaders concern both with task completion and relationship with followers, is suitable for situations in which followers can do the job partially or entirely, and are motivated about it. In the participating/supporting style (S3), leaders are less focused on the task, but remain concerned with the intensity of the relationship with followers. Style S3 is prescribed to teams in which followers are highly

competent regarding the task, but unwilling or insecure to perform it. Style S4 (delegating/observing) is characterized by low leadership focus on both task and relationship, being indicated to teams of high performing and motivated followers, presenting high levels of readiness (BLANCHARD et al., 1985; HERSEY et al., 2001; THOMPSON; VECCHIO, 2009; BLANCHARD, 2010). Further studies have expanded the discussion on effective leadership styles. Sethuraman and Suresh (2014) complemented the SL theory by investigating the influence of leaders' personality types on leadership behaviors through the application of the Myers Briggs Type Indicator. Thompson and Glaso (2015) tried to quantify followers' needs and their relationship with leader's styles. However, despite evidence from previous studies, leadership is yet a highly studied theme and much still needs to be investigated (SHARMA; KIRKMAN, 2015), specifically in companies undergoing a lean implementation (BORTOLOTTI et al., 2015).

2.2. OC and LM

OC is the belief system that members of an organization share, including ways of working, traditions, stories, and acceptable methods to achieve goals (Hofstede, 2001; House et al., 2004; Schein, 2004). Whilst lean is concerned with reducing waste at all levels, it is also about changing such OC (Bhasin and Burcher, 2006). A lean culture is dedicated to developing human talent throughout the organization to participate in continuously improving the enterprise. Thus, success is defined not just by performance or financial metrics but by an engaged workforce producing thousands of process improvements and continually striving for higher targets of quality (ZARBO, 2012). An inherent problem is that firms are usually under pressure to deliver benefits within the first year of the LM implementation (Bhasin, 2012). However, as highlighted by Liker (2004), Emiliani (2008) and Kull et al. (2014), LM requires a long-term commitment and to consider it as a short-term solution to an acute management crisis would be misguided. Thus, most of failures in implementing LM are attributed to the construction of a proper OC, which tends to take a longer time than the short-term expectations (Dahlgaard and Dahlgaard-Park, 2006; Paro and Gerolamo, 2017).

Literature evidence has verified the relationship between LM and OC under different approaches. For instance, Angelis et al. (2011) used the ASSET questionnaire developed by Cartwright and Cooper (2002) to measure the development of a commitment culture throughout the lean implementation. Kull et al. (2014) examined the moderating effect of OC

on the relationship between LM and operating performance through the application of the GLOBE National Culture Value Dimensions (HOUSE et al., 2004). Bortolotti et al. (2015) used the same dimensions of OC to investigate their relationship with the adoption of soft LM practices. Padkil and Leonard (2015) proposed the utilization of the Quinn and Spreitzer's (1991) Competing Values Framework to investigate how OC influences on lean implementation. This framework is the most frequently used in conceptual and empirical studies of organizational behavior and performance (GREGORY et al., 2009), and is comprised of four quadrants according to two major dimensions: effectiveness and focus (see Figure 1). Group culture is characterized by its family-type structures and internal environment. In the model, it is represented by high flexibility and an internal focus, including a focus on the employee (CAMERON; QUINN, 2005). Developmental culture is the most responsive of the four quadrants to external competition. In the model, it is represented by high flexibility and an external focus, presenting a high emphasis on individuals, risk, and preparing for the future. Hierarchical culture is characterized by low flexibility and internal focus. There is intense specialization and uniformity, resulting in little flexibility concerning rules, which allows outputs to be consistent. Finally, Rational culture is characterized by low flexibility and external focus. It is focused on a hostile external environment rather than the internal environment, including suppliers, customers, and regulators, and its primary aim is to improve its competitive position. Despite the propositions performed by Angelis et al. (2011) with respect to the relationship of these four OC dimensions and LM implementation, the authors did not validate them empirically, which has motivated our study.

3. Research method

There are three stages to the research method proposed here: (i) questionnaire development and data collection, (ii) clustering of data, and (iii) data analysis. These stages are detailed in the sections to follow.

3.1. Questionnaire development and data collection

We used the following criteria to select companies and respondents. First, we targeted at companies that were (i) implementing lean, and (ii) geographically located in the south of Brazil, in order to control the effect of environmental factors, such as availability of skilled

labor. Questionnaires were sent by e-mail to 759 former students of executive education courses on lean offered by a large Brazilian University since 2008. The final sample was comprised of 225 valid responses (representing a response rate of 29.64%). The sample presents a balanced amount of companies for each contextual variable. Most respondents were from large companies (72%); the majority of companies belonged to the automotive supply chain (41%). Most respondents had up to 2 years of leadership experience (61%), and more than 30 years of age (52%). Further, most respondents were male (68%), and directly led teams comprised of more than 5 followers (52%). Finally, regarding job position, there was a predominance of Group Leaders (33%) within the sample.

Figure 1 - Competing values framework
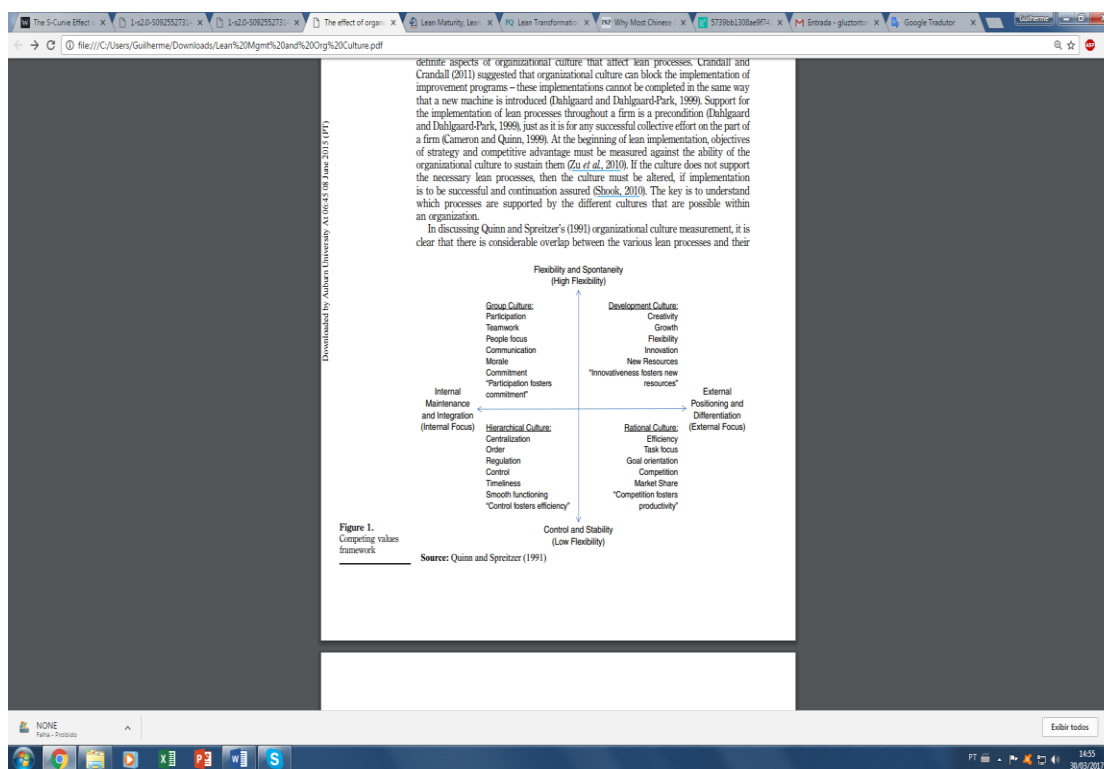
Source: Adapted from Cameron and Quinn (2005)

The questionnaire had three parts. The first part aimed at identifying the predominant OC dimension. To achieve that, we adapted the Quinn and Spreitzer's (1991) Competing Values Framework (later improved by Cameron and Quinn, 2005) to diagnose the perceived OC dimension that prevails in the firm. Further, it examines the values and beliefs that inform employees' perceptions and opinions about their working environment (DEMIR et al., 2011). Thus, we used the Organizational Culture Assessment Instrument (OCAI), which is a 6-item ipsative measure, whose items are related to dominant characteristics, organizational leader,

organizational "glue", organizational climate, criteria of success and management style. This instrument has been previously applied by Paro and Gerolamo (2017), who have investigated the effect of OC on lean programs.

The second part intended to assess the leadership style of respondents. For that, we adapted the LEAD (Leadership Effectiveness & Adaptability Description) questionnaire – originally developed by Blanchard and Hersey (1969), and improved by Blanchard (2010) – to be used in an organizational environment undergoing lean implementation. The questionnaire, comprised of 12 questions related to leadership behaviors, is aimed at identifying primary (adopted most frequently) and secondary (adopted as backup) leadership styles, as well as leaders' flexibility to adapt to different styles.

Finally, the third part of the questionnaire aimed at measuring the degree of adoption of fourteen LM practices most frequently listed in the literature (Table 1). Each question was answered using a 5-point scale ranging from 1 (not used) to 5 (fully adopted). We tested all responses related to the 14 LM practices for reliability, determining their Cronbach's alpha values. Responses displayed high reliability, with an overall alpha value of 0.887.

3.2. Clustering of data

In this step we perform two clustering of observations using questions on (i) implementation level of LM practices, and (ii) leadership styles as clustering variables. Clustering tools are used to analyze relationships within a database in search of a summarized representation of data, grouping observations in a small number of clusters (EVERITT, 1980; GORDON, 1999). In both clusterings performed on the same sample of observations, we first applied a hierarchical method to identify the proper number (say k) of clusters – we used Ward's method for that – and then the k-means clustering method, to rearrange observations into k clusters. See Rencher (2002) for more details.

When clustering using the implementation level of LM practices as clustering variables, two clusters were identified. An ANOVA (Analysis of Variance) was performed to verify differences in means of clustering variables calculated using data from each cluster. For all 14 clustering variables we found significant differences in means (p-values < 0.000 in all cases). The 112 observations assigned to cluster 1 presented a high average adoption level of LM practices, and the cluster was labeled HLM (high level of lean manufacturing

implementation); the 113 observations assigned to cluster 2 presented a low average adoption level of LM practices, and the cluster was labeled LLM (low level of lean manufacturing implementation).

The same observations were clustered using the four leadership styles (denoted by Si, i=1,…,4) as clustering variables. The number of clusters was set to 4, following the number of styles, and the k-means method for nominal data was used to assign observations to clusters. The primary leadership style of observations in a cluster corresponded to the one with highest occurrence frequency. We obtained four clusters with different primary preference styles, indicating that all four leadership behaviors were represented in the studied sample. Cluster sizes were as follows: S1: n = 45; S2: n = 64; S3: n = 46; S4: n = 70). The chi-square test for frequencies confirmed the existence of statistical difference in the occurrence frequency of styles in each cluster, with p-values < 0.00 in all cases.

3.3. Data analysis

Since we are using the predominant OC dimension perceived by respondents, these variables were considered as categorical, allowing the application of the chi-square test with contingency tables and adjusted residuals. We considered significant associations with adjusted residual values larger than |1.64|.

4. Results and discussion

With regards to the analysis of observations' frequency for each OC dimension according to leadership styles, Table 2 shows the results of the contingency table with chi-square test values. In firms where the Group culture prevails, the leadership style S3 appears to be associated with the LM implementation levels. This finding indicates that in contexts where organizations share values and reinforce aspects such as participation, collaboration, teamwork, employee involvement, and corporate commitment to workers are found, leaders who prefer adopting the participating/supporting behaviors are more frequently observed; entailing a wider implementation of LM practices. Surprisingly, in firms with the same cultural characteristics, but LM practices are still beginning to be implemented (LLM), leaders tend to neglect both relationship and task behaviors, favoring style S4. These results are consistent with previous literature evidence, which indicates that the establishment of a

Group culture occurs when there is high goal congruence and a need for achieving higher levels of participation and morale (House et al., 2004; Cameron and Quinn, 2005; Padkil and Leonard, 2015). Additionally, the implementation of LM relies heavily on teams' efforts based on consensus building for decision making and employee commitment (LIKER, 2004; MANN, 2009; LIKER; ROTHER, 2011). Therefore, it is reasonable to expect that relation-oriented leaders, such as S3 style, tend to promote the lean change more effectively in organization whose cultural characteristics excel in reinforcing participation of employees, suppliers, and customers to improve firm' performance. In turn, a delegator-kind leader within this OC may struggle to implement LM practices and conduct his team to a more advanced stage of the lean change.

Table 2 - Chi-square test results across dimensions of OC, leadership styles and levels of LM implementation

Dimensions of OC	Leadership style	LLM		HLM		Total frequency
		Frequency	Adjusted residual	Frequency	Adjusted residual	
Group	S1	4	-0.01	3	0.01	7
	S2	8	-0.02	6	0.02	14
	S3	4	-1.96**	8	1.96**	12
	S4	11	1.91*	3	-1.91*	14
	Total frequency	27		20		
Development	S1	3	1.99**	8	-1.99**	11
	S2	10	0.45	7	-0.45	17
	S3	7	-0.03	6	0.03	13
	S4	12	1.27	6	-1.27	18
	Total frequency	32		27		
Rational	S1	5	-0.58	10	0.58	15
	S2	4	-2.11**	16	2.11**	20
	S3	9	1.48	7	-1.48	16
	S4	14	1.14	15	-1.14	29
	Total frequency	32		48		
Hierarchical	S1	6	-0.54	6	0.54	12
	S2	10	1.83*	3	-1.83*	13
	S3	2	-0.79	3	0.79	5
	S4	4	-0.83	5	0.83	9
	Total frequency	22		17		

*significant at 10% (residual adjusted>$^{|1.64||1.64|}$), **significant at 5% (residual adjusted>$^{|1.96||1.96|}$) and ***significant at 1% (residual adjusted>$^{|2.58||2.58|}$)

Results for environments whose predominant OC dimension is the Development culture show that the frequency of directing behaviors (S1) of leaders is significantly higher when the

firm is widely implementing LM practices. This OC is more likely to support high-risk organizations and presents little centralization, which requires a higher level of employees' training, development and empowerment. In other words, it is a dynamic and creative place to work where individuals innovate (INGO;d SKITMORE, 2006; DEMIR et al., 2011). Contrary to commonsense belief, our findings suggest that, in this kind of OC, firms with higher levels of LM implementation are more likely to present task-oriented leaders, telling followers when and what to do. In fact, according to studies by Spear and Bowen (1999), Spear (2004), Spear (2009), and Liker and Convis (2011), successful LM implementations usually describe rigid specifications as the core that makes flexibility and creativity for continuous improvement possible. Therefore, our results corroborate to a better comprehension of such LM system paradox.

5. Conclusion

Our approach identifies the preferred leadership styles that may contribute to the adoption of lean practices considering specific OC perceived characteristics. For that, we analyze our sample of respondents grouping them in clusters according to leadership styles and implementation level of LM practices. Analysis of OC perceived characteristics is carried out across clusters, in a nouvelle analytical approach. Using our proposition, researchers may identify the combination of OC characteristics and leadership style with the highest likelihood of contributing to the implementation of LM practices within each cluster of companies. We also provide a deeper understanding on how leaders' behaviors and OC characteristics can support the adoption of LM practices, allowing companies undergoing lean implementation to better manage their change processes.

We presented empirical evidences on how leadership styles and OC profiles are associated with the implementation levels of LM practices. For instance, with respect to firms where the Group culture prevails we have demonstrated that leaders performing their duties in environments in which lean practices are well implemented adopt the leadership style S3. Further, the influence of a Development culture is significant only for leaders who are more likely to present style S1 when performing their duties in environments in which lean practices are more widely adopted. Overall, evidences presented here suggest that the studied

leadership styles and OC characteristics are significantly associated with the implementation level of LM practices. Analyzing those results, organizations undergoing lean implementation may be able to understand their cultural environment and, hence, stimulate proper leadership behaviors to enhance such implementation accordingly.

It was not possible to identify in the survey sample of respondents those who would qualify as authentic leaders. According to Avolio et al. (2004), authentic leaders are individuals who are deeply aware of how they think and behave, and are perceived by others as being aware of their own and others' values/moral perspective, knowledge, and strengths. The identification of such leaders was beyond the scope of this study, being viewed as a promising future research topic.

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