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Model for measuring the degree of leanness of a company that manufactures equipment for the hotel, catering and laundry sectors

Abstract Companies have adopted many operational strategies to increase their competitiveness, with lean manufacturing (LM) being the most successful. However, only a few companies determine or quantify the degree of leanness achieved. This study implements a leanness measurement system to determine the company's position at the beginning of a lean transformation project to efficiently monitor its impact throughout the course of the transformation.

Keywords: Lean manufacturing, degree of leanness, competitiveness factor, line back principle, leanness measurement model

1 Introduction

Faced with the constant need to adapt to the changes brought about by globalisation, industrial companies have been developing new products and/or services to satisfy the new needs of consumers at a global level—opting multi-location or delocalisation strategies for their production plants (Ferdows, 1997) and intensifying outsourcing policies for parts of their production (Brennan *et al.*, 2015). To efficiently adapt to this new scenario, companies must rethink their existing dynamics to look for new methods or mechanisms that will allow them to improve their capacity for adaptation and/or flexibility towards these new needs (Verma and Gustafsson, 2020).

Therefore, to maintain and/or increase their competitiveness, organisations must focus, among other things, on reducing production costs, decreasing wastage, increasing productivity and improving quality (Patel *et al.*, 2019; Suáres- and Castillo-, 2011; Suárez-Barraza *et al.*, 2011). To this end, industrial companies have adopted many strategies, methods and techniques with varying degrees of success. Among them, the most successful one has been the lean production system (LPS) or lean manufacturing (LM) (Krafcik, 1988).

One of the fundamental principles of this production philosophy is full customer orientation—both value chains and efforts have to be geared towards satisfying customer needs (Womack and Jones, 2003). In other words, this philosophy seeks to

systematically reduce all operations that do not add value (muda) (Arunagiri and Gnanavelbabu, 2014; Liker, 2008).

Notably, evaluation of the results of the lean transformation process has been of interest to researchers and practitioners alike, with various qualitative and quantitative evaluation methodologies proposed to track and measure the degree of leanness achieved (Narayanamurthy and Gurumurthy, 2016).

A competitive company has the ability to design, manufacture and market its products better than the competition, in a way that meets the expectations of its customers worldwide while also maintaining a high average profitability (Lucato *et al.*, 2012). According to Lucato *et al.* (2012), there are eight relevant competitive factors that should be considered when assessing and measuring the degree of competitiveness of companies—design, modularity, pricing, kaizen, lean, proximity, management and finance. Furthermore, a model that allows accurate measurement of a company's degree of competitiveness should be based on comparisons with a competitive standard (Lucato *et al.*, 2014). Drawing on this context, the SAE J4000 standard can be proposed as a valid model for measuring the degree of leanness or competitiveness of companies (Lucato *et al.*, 2012, 2014).

2 Objective

The aim of this study is to evaluate the degree of slenderness of a global leading company in the manufacture of equipment for the hotel, catering and laundry sectors. This company is part of a group of companies comprising 9 manufacturing plants, 35 sales offices and more than 2,200 employees worldwide. The plant in which this action research case study was conducted belongs to the parent company of this group. The primary purpose of measuring the degree of leanness is to estimate the starting position of the company in relation to the competitiveness factors described by Lucato *et al.* (2012) so as to assess the evolution of the company as lean transformation actions based on the line back principle (LBP) are implemented (Boppert *et al.*, 2007; Klug, 2018).

3 Methodology

SAE J400 is a tool used to identify and measure best practices in the implementation of lean operations in manufacturing organisations. In addition, the SAE J4001 procedure can also be used to assess the levels of conformance since it details each component of each element to be assessed. Each component can be assessed in terms of four degrees of leanness, ranging from L0, indicating that nothing is done, to L3, indicating the company is fully aware of it. In this work, a numerical system

was used for each evaluation grade, following the criteria proposed by Lucato *et al.* (2012)—L0: 0 points, L1: 1 point, L2: 2 points and L3: 3 points.

To conduct the first evaluation, which aims to establish the starting point of the company in relation to its degree of leanness, a survey directed at the management, middle management and technicians of the company was launched. This survey was prepared in a digital format, comprising the elements to be evaluated as well as the different components for each element, as proposed by SAE.

Finally, once the results were compiled with regard to the SAE indications and those proposed by Lucato *et al.* (2012), the starting point of the company's leanness was identified.

4 Results

The study sample comprised 19 respondents, from whom 14 responses were successfully received, representing 73.7% of the sample. Among these, 57.1% responses were from middle management, 28.6% from process technicians and 14.3% from directors. In relation to the businesses, the washing business and management were the ones that provided the highest number of responses with 28.6%, as shown in **Fig. 1**. This is indicative, as this is the business where lean transformation based on the Line back principle (PLB) was initiated.

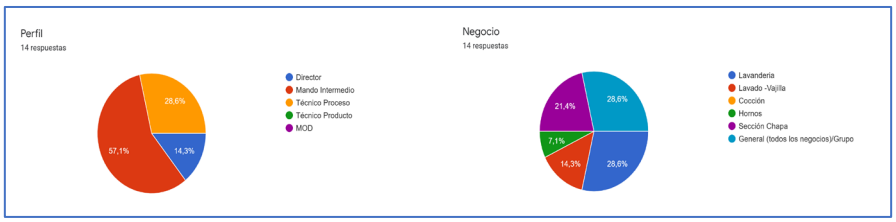

Fig. 1 *Distribution of responses by profile and by business*

The formula used for the evaluation of each of the elements in this study is based on the one proposed by Lucato *et al.* (2012) (Equation 1):

$$ge = \frac{\text{Points obtained as a result of the evaluation of the components of the elements}}{\text{Maximum possible points}}$$

Equation 1 Element value calculation

The elements evaluated and the related results obtained were as follows: 4 Management/Trust: 0.2198, 5 People: 0.3422, 6 Information: 0.2797, 7 Supplier/Organization/Customer: 0.2592, 8 Product: 0.3057 and 9 Process/Flow: 0.2739 (**Fig. 2**).

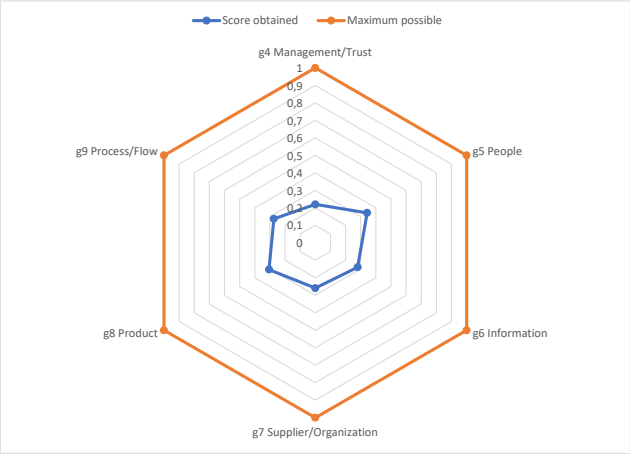

Fig. 2 *Positioning of the company for each evaluated element*

Subsequently, to calculate the degree of leanness (DOL) of the company, the following formulation was proposed (Lucato *et al.*, 2014) (Equation 2):

$$g = \frac{g4 + g5 + g6 + g7 + g8 + g9}{6}$$

Equation 2 Calculation of DOL

Therefore, the DOL value of the company is (**Fig. 3**):

$$g = \frac{0{,}2198 + 0{,}3422 + 0{,}2797 + 0{,}2592 + 0{,}3057 + 0{,}2739}{6}$$

$$g = 0{,}2801$$

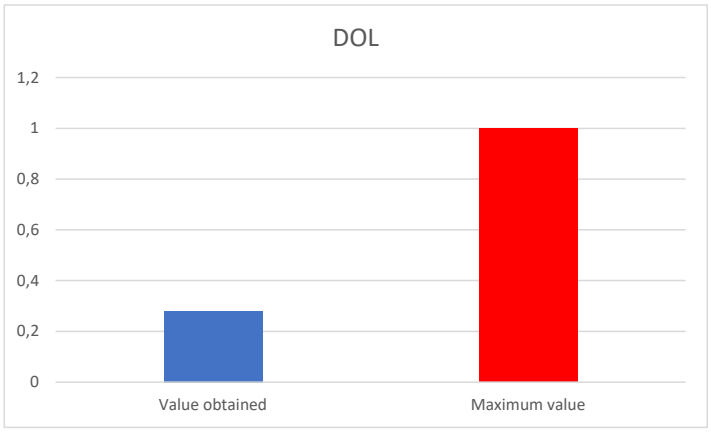

Fig. 3 *Company's DOL*

5 Conclusions

Compared to studies on lean implementation experiences and/or actions, only a few studies have been published on the evaluation of the success of lean transformation. As stated by Narayanamurthy and Gurumurthy (2016),, the evaluation of lean transformation is a concept that is still maturing based on the maturity of LM philosophy.

Although the number of research studies on LM is growing, the need for companies to comprehend the impact of LM on their businesses has led to an awareness of this impact among a few companies, which have in turn implemented evaluation systems that allow them to measure this impact.

In this study, a measurement system to calculate the DOL value of a company that manufactures equipment for the hotel, catering and laundry sectors has been defined and implemented. This system allows the company to compare itself with its competitors and measure the progress of the actions carried out throughout its lean transformation process.

Therefore, this study enabled the evaluation of the lean level of the company in a practical and objective manner with respect to the differential elements of competitiveness identified and defined in the SAE J4000 standard, thus showing the path towards achieving success in lean transformation. In addition, the DOL value obtained in this study may serve as an indicator when evaluating the success of LBP-based methodology used in lean transformation projects. **Finally, in the event of seeking or understanding the need to include or replace any of the elements or factors of competitiveness, this model supports the conduction of such an assessment while maintaining all other aspects of the evaluation.**

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