Comparative study between the Toyota Production System and international standards SAE J4000/1: a case study in a lean industry

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Abstract

Study of lean maturity in an engineer to order company using the requirements of SAE International J4000/1 and concepts from Toyota and Lean Production Systems.

Key words:

Lean Manufacturing Maturity, Lean Production, SAE International J4000/1

Introduction

Lean Manufacturing combines the advantages of craft and mass production, avoiding the high costs of the first and the rigidity of the latter. So there are teams of multi-skilled workers employed at all organizational levels and more flexible and automated machines, in order to produce huge volumes of wide range of products, quickly attending market demands.

The scientific research aims to analyze lean maturity by using the requirements of SAE International J4000 and J4001² along with the concepts of the Toyota Production System and Lean Production. This research has also the goal to study the lean implementation in such a way to evaluate the differences and opportunities by means of a case study applied to a company, user of the Lean Manufacturing System.

Results and Discussion

The methodology used was a case study in an international company, according to the requirements stated at the Implementation of Lean Operation User Manual contained in the SAE J4001. It is composed of 52 closed questions, called components, distributed along six elements (4 to 9). All answers are also pre-established in four gradual levels of best lean practice, from 0 to 3, as showed in Chart 1.

Chart 1. Results of the structured interview.

		Component													Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	
E l e m e n t	4. Management/Trust	3	3	3	3	1	1	3	3	2	2	2	2	2	30
	5. People	3	1	1	1	2	2	1	1	2	2	2	2		20
	6. Information	3	2	3	2										10
	7. Supplier/Organization/Customer	1	1	2	1										5
	8. Product	1	1	0	1	1	1								5
	9. Process/Flow	1	0	2	3	1	1	1	1	1	1	1	2	1	16

Chart 2. Results of the degree of adherence of the elements and lean global degree (total).

4. Management/Trust	5. People	6. Information
$g_4 = \frac{\sum L_4}{3 \times 13} = \frac{30}{39} = 0,769$	$g_5 = \frac{\sum L_5}{3 \times 12} = \frac{20}{36} = 0,555$	$g_6 = \frac{\sum L_6}{3 \times 4} = \frac{10}{12} = 0,833$
7. Supplier/Organization/Customer	8. Product	9. Process/Flow
$g_7 = \frac{\sum L_7}{3 \times 4} = \frac{5}{12} = 0,417$	$g_8 = \frac{\sum L_8}{3 \times 6} = \frac{5}{18} = 0,278$	$g_9 = \frac{\sum L_9}{3 \times 13} = \frac{16}{39} = 0,410$
TOTAL		
$g = \frac{g_4 + g_5 + g_6 + g_7 + g_8 + g_9}{L_4 + L_5 + L_6 + L_7 + L_8 + L_9} = \frac{3,262}{6} = 0,544$		

In addition, Lucato, Maestrelli and Vieira Jr.¹ defined the degree of adherence of the elements (g_n) mentioned above and lean degree (g) whose respective equations were used in Chart 2. Lastly, Chart 3 figures how the organization is far or close to reaching the best practice, namely, grade 1, which means 100% of lean operation.

Chart 3. Radar chart with degree of adherence of the elements.

Conclusions

The case study showed how to rank a company, in a scale of 0 to 100%, regarding its level of leanness. The lean level of the analyzed industry was calculated in 54%. There are elements in which it presented better performance than the average grade. However there are others with results lower than 50%, like the elements 7 to 9. This is evidence that in this particular case, it should start by improving the development of these weak points.

The method applied is yet not widespread throughout the academic and corporate area. Therefore it is not possible to compare this factory with others, since there is no data base or published information regarding the lean maturity of organizations of the same sector.

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¹ Lucato, W.C.; Maestrelli, N.C; Vieira Jr., M. Determinação do grau de enxugamento de uma empresa: uma proposta conceitual. Revista Ciência & Tecnologia. v.12, n.24, p.25-38, jan, **2006**.

² Society for Automotive Engineers. SAE J4000 – Identification and measurement of best practice in implementation of lean operation. **1999**.