

FEATURES, ROLES AND PROCESSES OF PERFORMANCE MEASUREMENT IN LEAN CONSTRUCTION

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1 BACKGROUND AND IDENTIFICATION OF PROBLEM

Since the spread of Toyota production principles, researches have been trying to justify the change in production paradigm (from mass production to lean production). This occurs due of the apparent decrease of productivity in the early stages of lean implementation, from the point of view of traditional measurement systems, which are based on financial accounting (Åhlström 1998).

This has been increasing the interest of academics and professionals to the use of performance indicators in lean production (Chavez et al. 2013; Fullerton & Wempe 2009). The main change in production paradigm shifted by Toyota principles was the focus on value creation for the customers, fact which led the companies to change their strategies based on cost-leadership to strategies based on differentiation/customization. This changes leads a revolution in the field of Performance Measurement (Neely 1999).

However, in spite of advances in other industries on PMS, in the construction sector, as well as LC, it is slow (Deng et al. 2012), demanding more studies in this research matter (Nudurupati et al. 2007; Deng et al. 2012; Korde et al. 2005).

It is necessary to come up with more comprehensive and applicable measurement systems (Yang et al. 2010; Kueng et al. 2001). Is also necessary to create conditions to enable the correct use of PMS already deployed in the companies (Taticchi et al. 2010). In the lean construction context, studies suggest that this question remains open (Li et al. 2015; España et al. 2012; Alarcón et al. 2014).

2 RESEARCH AIM AND METHODOLOGY

- **Research Aim:** this paper aims to analyse the performance measurement process in the lean construction context focused on the main characteristics, roles, processes to do it
- **Methodology:** multiple case study (Yin 2010) of three building companies through 6 interviews with top managers and documental analysis to support interviews claims. Was explored the main features, roles and process according to Cândido et al. (2016) (Table 2).

Table 2: Example of audit criteria protocol

Processes	Criteria
Information management	Does the model present a procedure or provide guidelines to management and information interpretation, connecting them to the decision-making process through the operation of information transference mechanisms (discussion, debates, publications, selective diffusion of information, others, or using ICTs)? 0 – It does not provide any guideline. 1 – It provides guidelines to assure information reaches the interested ones and is available to make decisions. 2 – It provides guidelines to assure the integrity and consistency of measurement results, as well as the way they should be used (which information transference mechanisms are supposed to be used?).

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3 RESEARCH FINDINGS

Table 2: Companies’ self-assessment and audit for features, roles and processes

Features, Roles and Processes to Performance Measurement	Alpha Company			Beta Company			S Company		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
A. Features	100%	85%	75%	93%	73%	75%	90%	60%	75%
a. Performance measures	100%	100%	100%	100%	80%	100%	100%	60%	100%
b. Supporting infrastructure	100%	70%	50%	87%	67%	50%	80%	60%	50%
B. Roles	100%	86%	70%	93%	69%	60%	76%	68%	60%
a. Measure Performance	100%	100%	50%	100%	87%	50%	80%	80%	50%
b. Strategy Management	100%	80%	100%	93%	73%	100%	80%	80%	100%
c. Communication	100%	80%	50%	87%	73%	50%	100%	80%	100%
d. Influence Behavior	100%	80%	100%	87%	53%	50%	60%	40%	0%
e. Learning and Improvement	100%	90%	50%	100%	60%	50%	60%	60%	50%
C. Processes	98%	90%	40%	92%	73%	70%	84%	60%	50%
g. Selection and design measures	100%	100%	50%	100%	93%	100%	100%	80%	100%
h. Data collection and manipulation	100%	90%	0%	100%	80%	100%	100%	80%	50%
i. Information management	100%	80%	50%	80%	60%	50%	100%	80%	50%
j. Performance evaluation and rewards	90%	90%	50%	93%	80%	50%	60%	40%	0%
k. System review	100%	90%	50%	87%	53%	0%	60%	20%	50%

Legend: (1) importance degree; (2) use degree; (3) audit scored

- Analysis of the Companies’ PMS characteristics: the other performance indicators are traditional and widely spread as PPC, PCR, Cost Variance, ROI, among others. But in general they are focused on cost control and financial outcomes.
- Analysis of the Companies’ PMS roles: it allows the respect for people, motivation and self-determination. However, it was the worst role of Companies PMS analysed. Without this role, the focus on indicator (means to check the performance) becomes greater than the value generation (the goal) (Sink & Tuttle 1993). This is also true in Lean Construction context.
- Process Analysis: the indicators do not derived from LC concepts; need of formalization of indicator handbooks; was identified the uses of visual devices to spread information and the sharing information of performance with suppliers; unstructured process of performance evaluation and rewards, although there is an award for each work phase based on the financial performance of each finished stage; the PMS are statics, i. e., there is no a structured process of PMS review

4 CONCLUSION

Despite of the limitations of a case study, it is possible that the PMS (performance measurement system) is too fragile to promote Lean. It is worth noticing that the design and selection of measures were not derived from Lean Construction principles. LC companies should adopt a broader scope that focuses not only on traditional financial performance but also on process improvement and value creation. Thus, management should evolve to embrace different performance criteria and related indicators.

