LEAN METRIC SYSTEM: PROPOSAL FOR A PERFORMANCE MEASUREMENT SYSTEM FOR CONSTRUCTION PROJECTS

Juliana Quinderé Carneiro[1], André Quinderé Carneiro [2], Vitor Arruda Machado [3], Luis Felipe Cândido[4] and José de Paula Barros Neto[5]

1 BACKGROUND AND IDENTIFICATION OF PROBLEM

The Performance Measurement is a critical issue to achieve the project success in any sector. In the construction management area, this was no different. There are several initiatives, at organizational and operational levels, that are well represented by benchmarking clubs around the world (Costa et al. 2004; Horta, Camanho, & Moreida da Costa 2010; Sector 2013).

Despite these initiatives, Cândido et al. (2016) highlight as the main difficulty the activities operationalization of measurement and control. Other authors point to problems to the operation level, such as overestimation for the supply of materials, undue payments of completed activities, reports preparation, among others (Luu et al. 2008).

In addition, the information flow is fragmented and erratic, making difficult the management actions that lead to project success. These problems are related to the principles of lean construction: transparency in construction (Koskela 1992), reduction of waste (Ohno 1997) and standardization of control processes (Nakagawa, 2006).

Then, to improve its performance measurement process some ways can be taken. Among them, the application of Information Technology (IT) for the constructions management is mentioned as an important success factor. Thus, a research question arises: how can Lean Metric improve the process of performance measuring in lean construction projects?

The LM is a management tool improved by IT developed for the application of construction projects, that uses concepts of hierarchical planning to monitor the constructions term and cost, based on information collected at the construction site.

2 RESEARCH AIM AND METHODOLOGY

- **Resarch Aim:** this paper aims to analyze the contributions of the LM to performance measurement process.
- **Methodology:** This study was carried out under Design Science (DS) methodological approach as presented in Figure 1.

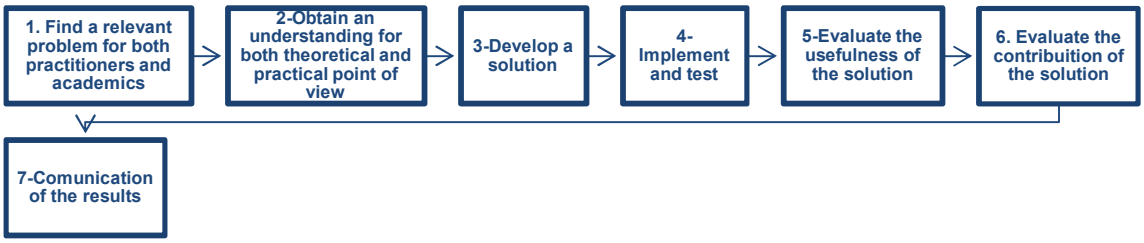

Figure 1: Research process.

[1] Civil Engineer at Aval Engineering, Brazil, juliana@avalengenharia.eng.br
[2] CEO, Aval Engineering, Brazil, andre@avalengenharia.eng.br
[3] CEO, Aval Engineering, Brazil, vitor@avalengenharia.eng.br
[4] Professor, Christus University Center (UNICHRISTUS), Brazil, luiscandido2015@gmail.com
[5] Professor, Federal University of Ceará (UFC), Brazil, jpbarros@ufc.br

3 RESEARCH FINDINGS

- Development of Lean Metric (LM): Standardization process of control
- Implement and Test Lean Metric (LM)

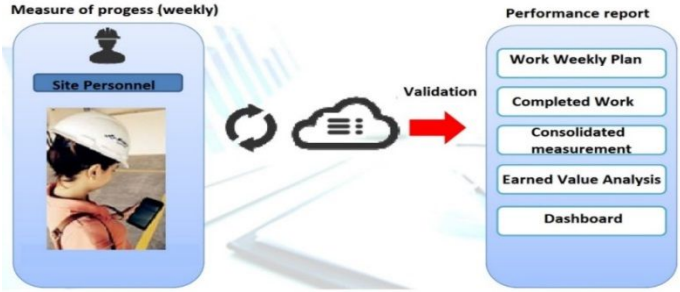

Figure 4: worksite data collection and key issues of performance report

- Improvements with Lean Metric
  - Data and indicators are generated in the same planning and budgeting WBS
  - Automatization of IRR;
  - Reduced from 44 working hours to 24 hours the time for data collection and compilation of all indicators
  - The schedule of purchase of the materials and contracting of services is linked to the physical goals of the construction work;
  - Human errors in the generation of indicators fell in 90%;
  - The number of steps that do not add value to the process has been reduced
- Lean Metric Contributions

Table 1: Lean Construction Concepts x Lean Metric

Principles	For Consultant company	For Customers
Transparency	The automatization of sharing information with customers reduced the doubts in the process of control	Generation of reliable information to improve the decision-making
Reduce the cycle time	Reduction of lead time from data collection to report	Real time performance indicators
Continous improvement	Simple performance and database of information provide continuous improvement of developed tool	The cycle of measurement enables the continous improvement of management actions for construction site along the project time
Standardization	Standardization of process f control Standardization of performance indicators	Standardization of projects performance indicators
Benchmarking	Database of Root cause for failure to complete work	A ranking with all indicators is carried out between different projects for different construction companies

4 CONCLUSION

The combination of participatory management, process transparency and the short cycle of control (reduction of control lot and information batch for decision-making) created conditions for continuous improvement for both ways, to performance measurement processes and the project performance.