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LEAN CONSTRUCTION AND MATURITY MODELS: APPLYING FIVE METHODS Introduction

• Main purpose: select the suitable MM to assess LC growth in a small size Brazilian construction company.

Materials and methods

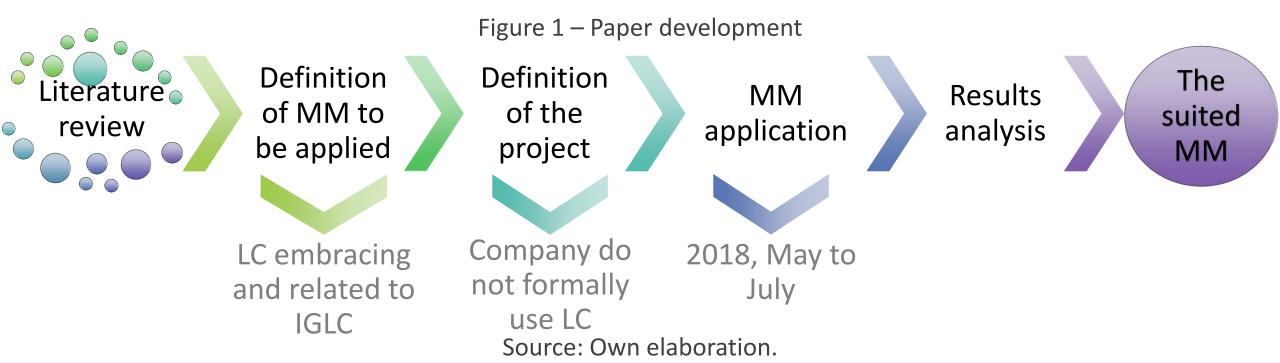
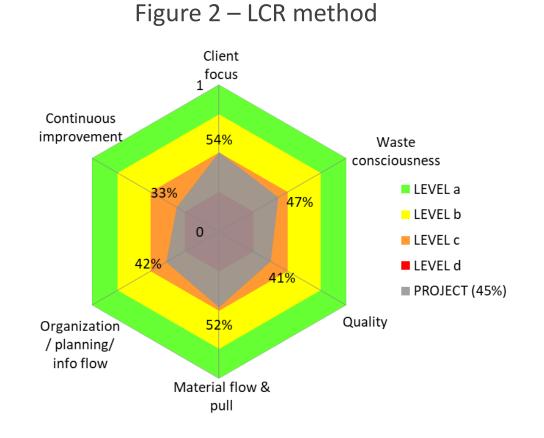




Table 1 – Sorted Maturity Models

MM NAME	AUTHOR	YEAR	COUNTRY
LCR - LEAN CONSTRUCTION-QUALITY RATING MODEL	Hofacker <i>et al.</i>	2008	Brazil and Germany
MDCE - LEAN CONSTRUCTION DIAGNOSTIC MODEL	Arantes	2010	Brazil
LCMM - LEAN CONSTRUCTION MATURITY MODEL	Nesensohn	2014	UK
MMDPLC - MATURITY MODEL FOR DEVELOPMENT OF LEAN CONSTRUCTION PRINCIPLES	Soto	2016	Chile
DOLC — DEGREE OF LEAN CONSTRUCTION	Carvalho and Scheer	2017	Brazil





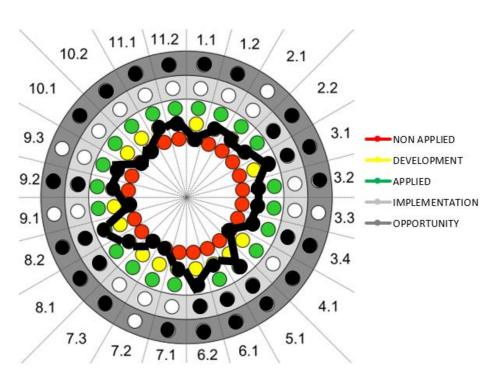
Answered by:

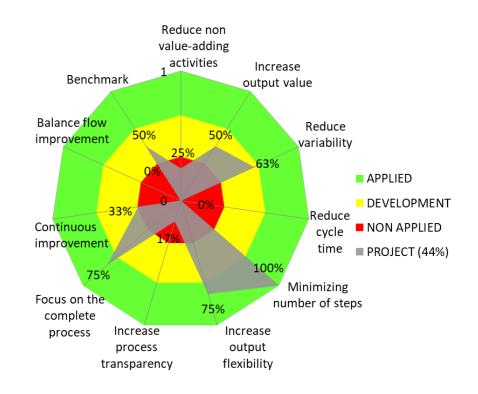
- Internal evaluator (engineer)



Figure 3 – MDCE original method

Figure 4 – MDCE adapted method





Answered by:

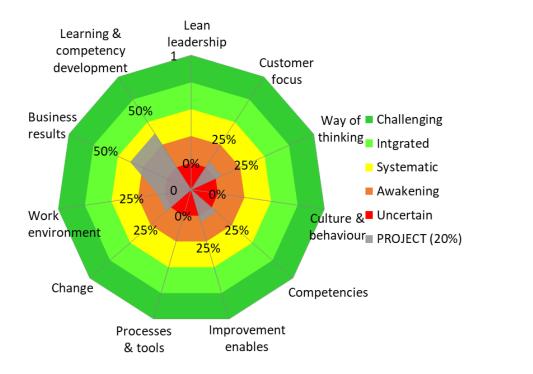
- Internal evaluator (engineer)

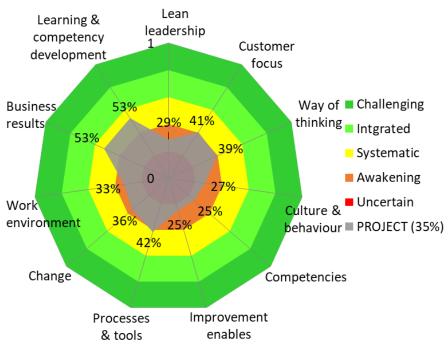
Source: Own elaboration.



Figure 5 – LCMM original method

Figure 6 – LCMM adapted method



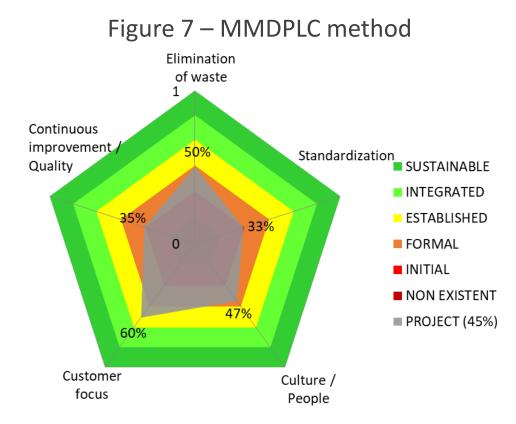


Answered by:

- External evaluator (researcher)

Source: Own elaboration.





Answered by:

- Internal evaluator (engineer)



Reduce non value-adding activities Increase 100% Benchmark output value 60% Balance flow Reduce 55% 51% improvement variability LEVEL A 60% LEVEL B 0% Reduce LEVEL C 59% 59% cycle LEVEL D Continuous time improv<mark>ement</mark> 55% PROJECT (56%) 53% 53% Minimizing 66% Focus on the number of steps complete process Increase Increase output process flexibility transparency Source: Own elaboration.

Figure 8 – DOLC method

Answered by:

- Designer (internal);
- Engineer (internal);
- Worker (internal);
- Director (internal);
- Client (external).



MDCE LCR LCMM MMDPLC DOLC CARVALHO and HOFAKER ET AL. (2008) **ARANTES (2010)** NESENSOHN (2014) SOTO (2016) **SCHEER** (2017) CATEGORY % CATEGORY CATEGORY CATEGORY % CATEGORY % % % 95% to 100% 95% to 100% aaa AAA 84% to 100% Sustainable 90% to 94% AA aa 89% to 94% Challenging 80% to 100% 85% to 89% Non applied Α 81% to 88% а 67% to 100% BBB principle 80% to 84% 75% to 79% BB 73% to 80% bbb Integrated 68% to 83% В 70% to 74% 44% Integrated 60% to 79% bb 64% to 72% CCC 65% to 69% 56% CC 60% to 64% Estabilished 51% to 67% b 55% to 63% С 55% to 59% 45% Development DDD 50% to 54% 34% to 66% Systematic 46% to 54% 40% to 59% CCC 45% principle DD 45% to 49% 20% / 35% 34% to 50% Formal 37% to 45% CC 28% to 36% С Awakening 20% to 39% Initial 17% to 33% ddd 19% to 27% D 0 to 44% 0 to 33% Applied principle 10% to 18% dd Uncertain 0 to 19% 0 to 16% Non existent 0 to 9% d

Figure 9 – Comparison between the ranking scale of the five models



- LCMM were the suited MM for this case study;
- This MM provide guidance to companies at any point in LC journey;
- Has hard ascending levels since use the lowest statement score to evaluate the related attribute;
- We propose use the range of attributes to evaluate the attribute;
- For future work: develop a decision-making process to adjust weights to company principles and apply LCMM in others construction firms.



THANK YOU!

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