

**A MATURITY MODEL FOR LEAN CONSTRUCTION:
THE CASE OF SRI LANKAN CONSTRUCTION
INDUSTRY**

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Doctor of Philosophy

Department of Building Economics
Faculty of Architecture

University of Moratuwa
Sri Lanka

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Thesis submitted in partial fulfilment of the requirements for the degree
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DECLARATION

I declare that this is my own work, and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date: 07.03.2025

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The above candidate has carried out research for the PhD thesis under my supervision.

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Signature of the Supervisor:

Date: 07.03.2025

DEDICATION

I dedicate this thesis with all my heart to my beloved wife, parents, parents-in-law, my sister, all my family members, friends and everyone whose continuous support and unconditional love have been my constant source of strength and inspiration.

ACKNOWLEDGEMENT

Completing this thesis has been challenging and rewarding, marking an extraordinary journey over the past few years. This achievement would not have been possible without the unwavering support, guidance, and encouragement of many individuals, to whom I am deeply grateful.

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ABSTRACT

The construction sector plays a vital role in the world economy and is essential for global development. Inefficiencies in the construction industry have hindered productivity, and lean construction provides a structured solution to enhance performance. However, a key concern in lean construction implementation is the lack of a reliable method to measure lean construction progress and maturity. Despite the growing interest among organisations in adopting lean construction practices, they hesitate due to the unavailability of a proper method to assess lean construction maturity. Theoretically, there is a notable lack of evidence of studies on lean construction maturity assessments. From a practical point, there is a lack of evidence of a lean construction maturity model in the context of Sri Lanka. Thus, there is a need to develop a reliable method for evaluating lean construction maturity. Therefore, this research is aimed at developing a lean construction maturity model. The study adopted the pragmatic research philosophy with an abductive approach. The choice of qualitative research was deemed appropriate, considering the context of the study.

Empirical data were gathered through the qualitative Delphi method in three rounds using semi-structured interviews. 25 lean construction experts were purposively selected to conduct 72 interviews. Data were analysed using deductive content analysis. Research findings revealed key components of the model. The model assessing components comprised eight model attributes, including Production Efficiency, Waste Elimination, Quality Management, People, Customer Focus, Lean Leadership, Transparency, and Lean Philosophy. These attributes are further explained through 28 model process areas, which provide a more descriptive account of the model attributes. 140 model indicators further detail the model process areas. These indicators serve as visible measures that assess lean construction maturity at the operational level. A detailed descriptive statement is formulated for each indicator to explain what is expected from model indicators. An assessment guide including six maturity scales is provided to evaluate the maturity level of each indicator. The model identified barriers at each maturity level and proposes strategies to overcome them. Model validation was conducted through four expert interviews. The final model assessment, a platform for assessing lean construction maturity and strategies on lean implementation. The study contributes to the theory by presenting a new lean construction maturity model designed for developing nations and a universally applicable conceptual lean construction maturity model. The study fills a critical gap in the construction industry by providing a model for assessing lean construction maturity in construction organisations.

Keywords: Attributes, Indicators, Lean Construction Maturity Model, Lean Construction, Maturity levels, Process areas, Sri Lanka

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LIST OF ABBREVIATIONS

Abbreviation	Description
BIM	Building Information Modelling
CIDA	Construction Industry Development Authority
CIFE	Centre for Integrated Facility Engineering
CMM	Construction Maturity Model
CPD	Continuing Professional Development
ERP	Enterprise Resource Planning
IT	Information Technology
IESL	Institute of Engineers Sri Lanka
LCI	Lean Construction Institute
LCMM	Lean Construction Maturity Model
LM	Lean Model
LPS	Lean Production System
MA	Model Attribute
MI	Model Indicators
MM	Maturity Model
MPA	Model Process Areas
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SLR	Systematic Literature Review
UK	United Kingdom

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