

# Lean Construction Systems & Tools In Improving Operational Performance

Ng Jing Peng

Bachelor of Civil Engineering  
The University of Birmingham  
Birmingham, United Kingdom  
2001



Submitted to  
The Graduate School of Business  
Faculty of Business and Accountancy  
University of Malaya

In partial fulfilment of the requirements for the Degree of  
Master of Business Administration

Oct 2010

## **Abstract**

Construction contractors are continually searching for ways of eliminating waste and increasing profit with the continuous decline in profit margins and increased competition in construction projects. Although numerous approaches have been developed to improve efficiency and effectiveness of construction processes, lean construction techniques offer the promise to minimize, if not completely eliminate, non value-adding work.

Lean Construction is a philosophy based on the concepts of Lean Manufacturing. It is about managing and improving the construction process by eliminating waste and increasing profit to deliver what the customer needs.

Although construction organization have integrate some form of Lean System in day to day operation at macro level however knowledge is not fully conceptualize with Lean Construction still in the early stage of development.

This research was carry out to study the lean manufacturing principles and tools so that Lean Construction Systems and Tools are develop for better implementation in the near future in the local construction industry to improve operational performance in term of Time, Cost and Quality.

## **Acknowledgements**

I would like to express my profound gratitude to my thesis supervisor, Prof. Madya Dr. Abdul Razak Ibrahim, for being an excellent mentor, flexible advisor and a supportive teacher.

I would like to express my appreciation to my friends who closely followed my progress and demonstrated interest and support for my work. Not to forget, my colleagues who had covered me on my job during critical times allowing my thesis fulfillment.

Last but not least, my parents, for their love and inspiration.

## **TABLE OF CONTENTS**

	Abstracts	i
	Acknowledgements	ii
	Table of Contents	iii
	List of Tables	v
	List of Figures	v
<b>1.0</b>	<b>Introduction</b>	
1.1	Introduction	1
1.2	Purpose of Study	3
1.3	Significance of Study	4
1.4	Research Problem	6
1.5	Research Objectives	7
1.6	Outline of Study	8
<b>2.0</b>	<b>Literature Review</b>	
2.1	Introduction	9
2.2	A brief History of Waste Reduction Thinking	10
2.2.1	Pre-20 <sup>th</sup> Century	10
2.2.2	20 <sup>th</sup> Century	11
2.2.3	Ford starts the ball rolling	13
2.2.4	Toyota develops TPS	17
2.3	Types of Wastes	19
2.4	Lean Construction	23
2.5	Lean Construction Systems & Tools	31
2.5.1	Planning System (Last Planner System)	33
2.5.1.1	Master Schedule	34
2.5.1.2	Reverse Phase Scheduling	34
2.5.1.3	Six-Week Lookahead	35
2.5.1.4	Weekly Work Plan	36
2.5.1.5	Percent Plan Complete	36
2.5.2	Increased Visualization	37
2.5.3	Daily Huddle Meetings	37
2.5.4	First Run Studies	38
2.5.5	The 5s Process	39
2.5.6	Fail Safe for Quality & Safety	40
2.5.7	Design System (Design for Buildability / Detailed Engineering)	40

2.5.8	Procurement & Logistic System (Just-In-Time, JIT)	41
2.5.9	Enterprise Resource Planning System (ERP)	42
<b>3.0</b>	<b>Research Methodology</b>	
3.1	Introduction	43
3.2	Research Questions	44
3.3	Research Hypotheses	45
3.4	Research Design	46
3.5	Research Model	48
3.6	Sampling Design	49
3.7	Data Collection Procedure	52
3.8	Data Analysis Technique	54
<b>4.0</b>	<b>Research Results</b>	
4.1	Questionnaire Part 1	55
4.2	Questionnaire Part 2	62
4.3	Questionnaire Part 3	67
<b>5.0</b>	<b>Conclusion &amp; Recommendation</b>	
5.1	Conclusion Based on Findings	71
5.2	Evaluation on Research Objectives	72
5.3	Evaluation on Research Hypotheses	73
5.4	Recommendations Based on Findings	74
5.5	Recommendations for Further Research	75
<b>6.0</b>	<b>Reference</b>	<b>77</b>
<b>7.0</b>	<b>Appendix (Questionnaire)</b>	<b>79</b>

## List of Tables

Table 5:	Question 1 Descriptive Statistic	55
Table 6:	Question 2 Descriptive Statistic	56
Table 7:	Question 3 Descriptive Statistic Summary	57
Table 8:	Question 4 Descriptive Statistic Summary	62
Table 9:	Knowledge & Improvement Mean Response Summary	71
Table 10:	Correlation between Knowledge & Improvement Mean Response Summary	71

## List of Figures

Figure 1:	Research Design Flow Chart	47
Figure 2:	Research Model	48
Figure 3:	Contractor Registration by Grade 1Q 2010	49
Figure 4:	Contractor Registration by Grade & State 1Q 2010	50
Figure 5:	Question 1 Response Summary	55
Figure 6:	Question 2 Response Summary	56
Figure 7:	Question 3 Response Summary	57
Figure 8:	Question 4 Response Summary	62
Figure 9:	Question 5 Respondent Age Group	67
Figure 10:	Question 7 Respondent Education Level	67
Figure 11:	Question 8 Respondent Years of Experience	68
Figure 12:	Question 9 Respondent Job Position	68
Figure 13:	Question 10 Respondent Department	68
Figure 14:	Question 11 Respondent Company Size	69
Figure 15:	Question 12 Respondent Company Trade	69