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LEAN CONSTRUCTION: KNOWLEDGE AND BARRIERS IN
IMPLEMENTING INTO MALAYSIA CONSTRUCTION INDUSTRY

VICTOR LIM AIK JIN

A project report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
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NOVEMBER 2008

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To my beloved family, Hueh San, and friends
Thanks for your never ending love and support

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ABSTRACT

Construction industry is a very fragmented industry and reluctant to accept changes to its current practice because of the belief that construction industry is completely different in nature resulting in producing high wastage and low productivity. Hence, improvement methods or philosophy had been developed out to overcome the above mention problem such as lean construction. Lean Construction is a philosophy based on the concepts of lean production which is termed on 1990 by Womack. Thus, this research was carried out to identify the level of knowledge of local practitioners' and compare the potential barriers in implementation of lean construction in Industrialised Building System (IBS) and Conventional type of construction. With the help of Statistical Package for Social Sciences Software (SPSS 15.0) and Microsoft Excel, data collected from questionnaire surveys were analysed. In general, local practitioners' knowledge on lean construction was high, the only problem was most of them (respondents) do not understand the technical term of lean construction yet, applying its principles in their work site. Three potential barriers identified which most of the respondent agreed that it occurred very frequently on site which is (1) Ineffective management practices (Traditional), (2) Just-in-time (JIT) delivery of materials on site (IBS) and (3) "Cut and Paste" from previous project (Traditional and IBS). Statistical test using Wilcoxon Signed-Rank Test shows significant difference between the potential barriers in Traditional and IBS type of construction.

ABSTRAK

Industri pembinaan merupakan satu industri yang sangat fragmen dan keberatan untuk menerima perubahan-perubahan kerana mempercayai industri pembinaan adalah keseluruhan berbeza, di mana penghasilan pembaziran adalah ditahap yang tinggi dengan produktiviti yang rendah. Oleh itu, kaedah-kaedah atau falsafah peningkatan telah dikajikan untuk mengatasi masalah-masalah tersebut seperti *lean construction*. *Lean Construction* adalah satu falsafah yang berdasarkan konsep *lean production* yang dinamakan pada 1990 oleh Womack. Justeru, penyelidikan ini dilaksanakan untuk mengenalpasti tahap pengetahuan pengamal-pengamal tempatan dan potensi halangan dalam pelaksanaan *lean construction* di dalam pembinaan jenis '*Industrialised Building System*' (IBS) dan tradisional. Dengan bantuan perisian *Statistical Package for Social Sciences Software* (SPSS 15.0) dan *Microsoft Excel*, data yang telah dikumpul daripada kajian soal selidik dianalisis. Secara umumnya, pengetahuan pengamal-pengamal tempatan terhadap *lean construction* adalah di tahap yang tinggi. Walaubagaimanapun, masalah umumnya adalah kebanyakan daripada mereka (responden) tidak memahami istilah teknikal tetapi masih menggunakan prinsip-prinsip *lean construction* dalam tempat kerja mereka. Tiga potensi halangan yang sering sangat berlaku telah dikenalpasti oleh kebanyakan responden di tapak pembinaan iaitu (1) *Ineffective management practice (Traditional)*, (2) *Just-in-time (JIT) delivery of materials on site (IBS)* dan (3) *"Cut and Paste" from previous project (Traditional and IBS)*. Ujian statistik menggunakan *Wilcoxon Signed Rank Test* menunjukkan perbezaan signifikan antara halangan-halangan yang berpotensi diantara jenis pembinaan Traditional dan IBS.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiv
	LIST OF CHARTS	xv
	LIST OF APPENDICES	xvi
1	INTRODUCTION	
	1.0 Introduction	1
	1.1 Problem Statements	2
	1.2 Aim	4
	1.3 Objectives	4
	1.4 Scope of Research	5
	1.5 Brief Methodology	5
	1.6 Report Outline	7

2

LITERATURE REVIEW

2.1	Introduction	8
2.2	History of Lean Production / Manufacturing	9
	2.2.1 Just-In-Time (JIT)	13
2.3	Definition	13
2.4	Concept of Lean Production	15
	2.4.1 The Seven Forms of <i>Muda</i>	17
	2.4.1.1 Defects	18
	2.4.1.2 Overproduction	18
	2.4.1.3 Conveyance	18
	2.4.1.4 Waiting	19
	2.4.1.5 Inventory	19
	2.4.1.6 Motion	19
	2.4.1.7 Overprocessing	19
	2.4.2 Lean Production Principles	21
	2.4.2.1 Reduce the Share of Non-Adding Value Activities	21
	2.4.2.2 Increase Output Through Systematic Consideration of Customer Requirement	22
	2.4.2.3 Reduce Variability	22
	2.4.2.4 Reduce the Cycle Time	23
	2.4.2.5 Simplify by Minimizing the Number of Steps, Parts and Linkages	25
	2.4.2.6 Increase Output Flexibility	26
	2.4.2.7 Increase Process Transparency	26
	2.4.2.8 Focus Control on the Complete Process	27
	2.4.2.9 Build Continuous Improvement into the Process	28
	2.4.2.10 Balance Flow Improvement with Conversion Improvement	29
	2.4.2.11 Benchmark	30
2.5	Concept of Lean Construction	31
2.6	Principles of Lean Construction	32

2.6.1	Specify Value	32
2.6.2	Identify and Map the Value Stream	33
2.6.3	Flows	34
2.6.4	Pull	36
2.6.5	Perfection / Continuous Improvement	36
2.6.6	Transparency	37
2.6.7	Process Variability	38
2.7	Case Studies of Implementation of Lean Construction in United Kingdom	38
2.7.1	Case 1 - Mordernisation of Community Housing, The Wyre Forest District	40
2.7.1.1	How the CLIP Process Work	40
2.7.1.2	Benefits from CLIP's Initiative	42
2.7.2	Case 2 - Street Lighting Maintenance Contract 2002-2007 – Hampshire	45
2.7.2.1	How the CLIP Process Work	45
2.7.2.2	Benefits from CLIP's Initiative	46
2.7.3	Case 3 - Implementing Process Improvements at a Window and Door Manufacturer	47
2.7.3.1	How the CLIP Process Work	48
2.7.3.2	Benefits from This Initiative	50
2.8	Summary of Chapter 2	52

3 RESEARCH METHODOLOGY

3.1	Introduction	53
3.2	Stage 1 : Literature Review	53
3.3	Stage 2 : Collection of Data	54
3.3.1	Survey Questionnaire	54
3.4	Data Analysis	55
3.4.1	Average Index Analysis (A.I)	55
3.4.2	One-Sample <i>t</i> -Test	57
3.4.3	Chi-Square Test	57

	3.4.4	Reliability Analysis	58
	3.4.5	Cronbach's Alpha	58
	3.4.6	Wilcoxon Signed-Rank Test	58
	3.5	Summary of Chapter 3	59
4		DATA ANALYSIS	
	4.1	Introduction	60
	4.2	Questionnaires Delivered	61
	4.3	Demographic of Respondents	62
	4.3.1	Response Received	62
	4.3.2	Respondents' Position	63
	4.3.3	Respondent's Qualification	64
	4.3.4	Respondent's Working Experience	65
	4.3.5	Respondent's Location	66
	4.4	Level of Knowledge on Lean Construction	67
	4.5	Potential Barriers	70
	4.5.1	Management Stage Barriers	70
	4.5.1.1	Traditional	71
	4.5.1.2	IBS	72
	4.5.2	Construction Stage Barriers	73
	4.5.2.1	Traditional	73
	4.5.2.2	IBS	74
	4.5.3	Design Stage Barriers	75
	4.5.3.1	Traditional	75
	4.5.3.2	IBS	76
	4.6	Summary of Chapter 4	77
5		RESULTS AND DISCUSSION	
	5.1	Introduction	78
	5.2	Level of Knowledge on Lean Construction	79
	5.2.1	One Sample <i>t</i> -Test	81

5.2.2	Realistic of Data (Chi-Square Test)	81
5.2.3	Reliability Statistics (Reliability Test)	84
5.2.4	Ranked Principles	84
5.2.5	Level of Knowledge on Lean Construction	85
5.3	Potential Barriers	88
5.3.1	Traditional Type of Construction	88
5.3.1.1	One Sample <i>t</i> -Test	88
5.3.1.2	Realistic of Data (Chi-Square Test)	88
5.3.1.3	Reliability Statistics (Reliability Test)	91
5.3.1.4	Ranked Principles	91
5.3.2	IBS Type of Construction	92
5.3.2.1	One Sample <i>t</i> -Test	93
5.3.2.2	Realistic of Data (Chi-Square Test)	93
5.3.2.3	Reliability Statistics (Reliability Test)	96
5.3.2.4	Ranked Principles	96
5.3.3	Potential Barriers in Implementing Lean Construction in Malaysian Construction Industry	97
5.3.4	Comparison between IBS and Traditional	100
5.3.4.1	Wilcoxon Signed-Rank Test	100
5.4	Summary of Chapter 5	101

6 CONCLUSION AND RECOMMENDATIONS

6.1	Introduction	102
6.2	Aim and Objectives Revisit	102
6.3	Evaluation on Objectives and Aim of the Study	103
6.3.1	Objective No. 1	103
6.3.2	Objective No. 2	104
6.3.3	Objective No. 3	104
6.4	Limitation of Studies	105
6.4.1	Time Limitation	105
6.4.2	Cost Limitation	106
6.4.3	Area of Coverage Limitation	106

6.5 Recommendations	106
6.5.1 Recommendations Based on Findings	107
6.5.2 Recommendations for Further Research Studies	108
REFERENCES	109
APPENDICES	115

LIST OF TABLES

TABLES	TITLE	PAGE
Table 2.1	Definitions of lean production	14
Table 2.2	Summary of the case studies	50
Table 3.1	Level agreement of Average Index Analysis (A.I) by Abdul Ghani (2006)	56
Table 3.2	Level agreement of Average Index Analysis (A.I) by Madon (2005)	56
Table 4.1	Questionnaires delivered	61
Table 4.2	Responded questionnaires	62
Table 4.3	Respondents' position	63
Table 4.4	Respondents' qualification	64
Table 4.5	Respondent's working experience	65
Table 4.6	Respondent's location	66
Table 4.7	Principles of lean construction	67
Table 4.8	Result of principles of lean construction ranked by respondents	68
Table 4.9	Management barriers stage result (Traditional)	71
Table 4.10	Management stage barriers result (IBS)	72
Table 4.11	Construction barriers stage result (Traditional)	73
Table 4.12	Construction stage barriers result (IBS)	74
Table 4.13	Design stage barriers result (Traditional)	75
Table 4.14	Design stage barriers result (IBS)	76
Table 5.1	Short form used to key in the SPSS	80

Table 5.2	One sample <i>t</i> -test result for lean construction knowledge	82
Table 5.3	Chi square result for lean construction knowledge	83
Table 5.4	Reliability test result for lean construction knowledge	84
Table 5.5	Ranked principles	85
Table 5.6	Level of lean construction knowledge	86
Table 5.7	One sample <i>t</i> -test result for potential barriers (Traditional)	89
Table 5.8	Chi square result for potential barriers (Traditional)	90
Table 5.9	Reliability test result for potential barriers (Traditional)	91
Table 5.10	Ranked potential barriers (Traditional)	92
Table 5.11	One sample <i>t</i> -test result for potential barriers (IBS)	94
Table 5.12	Chi square result for potential barriers (IBS)	95
Table 5.13	Reliability test result for potential barriers (IBS)	96
Table 5.14	Ranked potential barriers (IBS)	97
Table 5.15	Summary of potential barriers	98
Table 5.16	Comparison between IBS and Traditional result	100

LIST OF FIGURES

FIGURES	TITLE	PAGE
Figure 1.1	Flow chart of research methodology	6
Figure 2.1	Time line marking the critical phases in the lean production evolution	12
Figure 2.2	Production as a flow process: simplistic illustration	15
Figure 2.3	Performance improvement in conventional, quality and new production philosophy approaches	17
Figure 2.4	Overproduction, waiting and transporting	20
Figure 2.5	Processing and inventory	20
Figure 2.6	Movement and defects	20
Figure 2.7	Cycle time can be progressively compressed through elimination of non value-adding activities and variability reduction	24
Figure 2.8	A programme of works for the CLIP project was displayed	44
Figure 2.9	Column replacement total work time analysis	47
Figure 5.1	Sequence of SPSS test	79

LIST OF CHARTS

CHARTS	TITLE	PAGE
Chart 4.1	Questionnaires delivered	61
Chart 4.2	Response received	62
Chart 4.3	Respondents' position	63
Chart 4.4	Respondents' qualification	64
Chart 4.5	Respondent's working experience	65
Chart 4.6	Respondent's location	66
Chart 4.7	Result of principles of lean construction ranked by respondents	69
Chart 4.8	Management barriers stage result (Traditional)	71
Chart 4.9	Management stage barriers result (IBS)	72
Chart 4.10	Construction barriers stage result (Traditional)	73
Chart 4.11	Construction stage barriers result (IBS)	74
Chart 4.12	Design stage barriers result (Traditional)	75
Chart 4.13	Design stage barriers result (IBS)	76
Chart 5.1	Level of agreement by respondents' for knowledge	87
Chart 5.2	Level of agreement by respondents' for potential barriers	99

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Questionnaire Survey (Traditional)	115
B	Questionnaire Survey (IBS)	120
C	Confirmation Letter from Faculty	125

CHAPTER 1

INTRODUCTION

1.0 Introduction

Construction and manufacturing differ significantly in the physical features of the end product. In manufacturing, finished goods generally can be moved as a whole to retailers or end customers. Construction, on the other hand, deals with larger units that cannot be transported.

Construction industry is very unique and complex due to the involvement of many parties and consumption of varieties of resources. According to Ballard & Howell (1998), construction covers a spectrum ranging from slow, certain, and simple project to quick, uncertain and complex project.

Meanwhile, Koskela (1992) stated that construction is unique in the sense of it is one-of kind nature of projects, site production and temporary multi-organization. However, failure of establishing a good management system in construction project will lead to many problems that would cause cost of project increases, late completion of project and low quality which finally reduce the profit

of the contractor. In order to overcome these problems, lean thinking or lean construction has been introduced in this construction sector.

According to Howell (1999), lean construction is one of the new philosophies that have been implemented by Toyota in their manufacturing process which is now applied to the construction industry in order to smoothen the construction project and increase the contractor's profit by eliminating waste. This is supported by Ballard and Howell (1998) who also stated the same facts that lean thinking in construction concerns waste reduction.

Lean construction project is very different compared to traditional construction project management where the Lean approach aims to maximize performance for the customer at the project level, set well-defined objectives clearly for the delivery process, design concurrent product and process and apply production control throughout the life of the project (Howell, 1999).

Generally, the lean approach breaks the construction project into smaller parts of activities which will be defined clearly with the start and end date for completion of each activity with an appointed person to keep on monitoring all the activities to be completed according to the schedule.

1.1 Problem Statement

Lean thinking or the Toyota Production System (TPS) had been developed between 1948 and 1975 by the founder of Toyota, Sakichi Toyoda, his son Kiichiro Toyoda, and the engineer Taiichi Ohno (Wikipedia, 2008). Although it was developed way back in the seventies for the manufacturing industry, the

United Kingdom and America construction industry is picking up this method in the early nineties (Howell, 1999).

According to Murman *et al.*, (2002), lean production or manufacturing concept comprises a variety of production systems that share certain principles, including waste minimization, responsiveness to change, just-in-time, effective relationships within the value stream, continuous improvement, and quality from the beginning. Lean concepts have been brought to the construction industries of Australia, Brazil, Denmark, Ecuador, Finland, Peru, Singapore, USA and Venezuela (Ballard and Howell, 2003).

According to Ibrahim and Ong (2003), construction is known as a very reluctant industry to accept changes to its current practice because of the belief that construction industry is completely different in nature. However, with the problems that industry inherits such as lack of focus to customers, lack of quality, adversarial relationship among team members, inefficient project communication and project delay force the industry to reconsider its current practice.

The author found out that Ong (2002) had done his research related to this topic. His scope covers the readiness of companies' in implementing lean production in local construction industry and methods on improving the construction based on lean production principles. Hence, the author will further his research into level of local construction practitioners' knowledge on lean construction in the industry and potential barriers in implementation of lean construction.

Due to lack of information on our local construction industry related to this topic, the author had done some preliminaries interview with some of the professionals in the industry and found out that the level of application of lean construction is very minimal because it is still new to the industry and the knowledge on lean concept among practitioners is still minimal.

The author had identified preliminaries barriers in implementing lean construction from the preliminaries interview. Quoting from one of the respondent, the major barrier in implementing lean construction is that “*there is no solid proof of what lean construction can contribute any benefits to the project*” and “*besok, lusa*” attitude or ‘see first’ attitude from the local practitioners. Thus, the author had initiated to investigate the knowledge and potential barriers of lean construction in implementing in Malaysia construction industry.

1.2 Aim

The aim that initiated this research is to investigate the application of lean construction into Malaysia construction industry.

1.3 Objectives

1. To study the concept of lean construction and how it is being implied in the local construction industry
2. To identify the level of knowledge on lean concept among professionals involved in Industrialised Building System (IBS) and Conventional type of construction
3. To identify and compare the potential barriers in implementation of lean construction in IBS and Conventional type of construction

1.4 Scope of Research

The scope of this research is focus on reviewing the local construction industry in implementing lean construction. Emphasis is given to identify the level of knowledge and potential barriers of construction parties in implementing lean construction.

The limitation of this research is this research is only conducted in Malaysia, the trustworthy of the respondent in responding the questionnaire, and the local construction industry information in lean construction. There are no case studies or actual documentation of lean construction being implemented in the local construction industry which will provide a better and concrete result. Therefore, the author had approach a UK based company practicing lean construction in referring to its passed completed project which the information given by them is not complete will be discussed in the later chapter.

1.5 Brief Methodology

In carrying out this research, right methodology is required to enable the compilation of data and information from various sources. Three stages are involved which are literature review, collection of data and lastly conclusion and recommendation (Refer to Figure 1.1).

Firstly, is to collect of information and data such as books, journals, and internet related to the term 'lean'. Then, questionnaires are to be send to selected companies to be responded and return back to the author. Interview will also be conducted with some professional in the local industry. Data analysis will be

conducted by using qualitative methods through the collected reading materials and secondary data generated from the questionnaire. Lastly, recommendations are proposed to boost up the usage of lean construction in the local construction context.

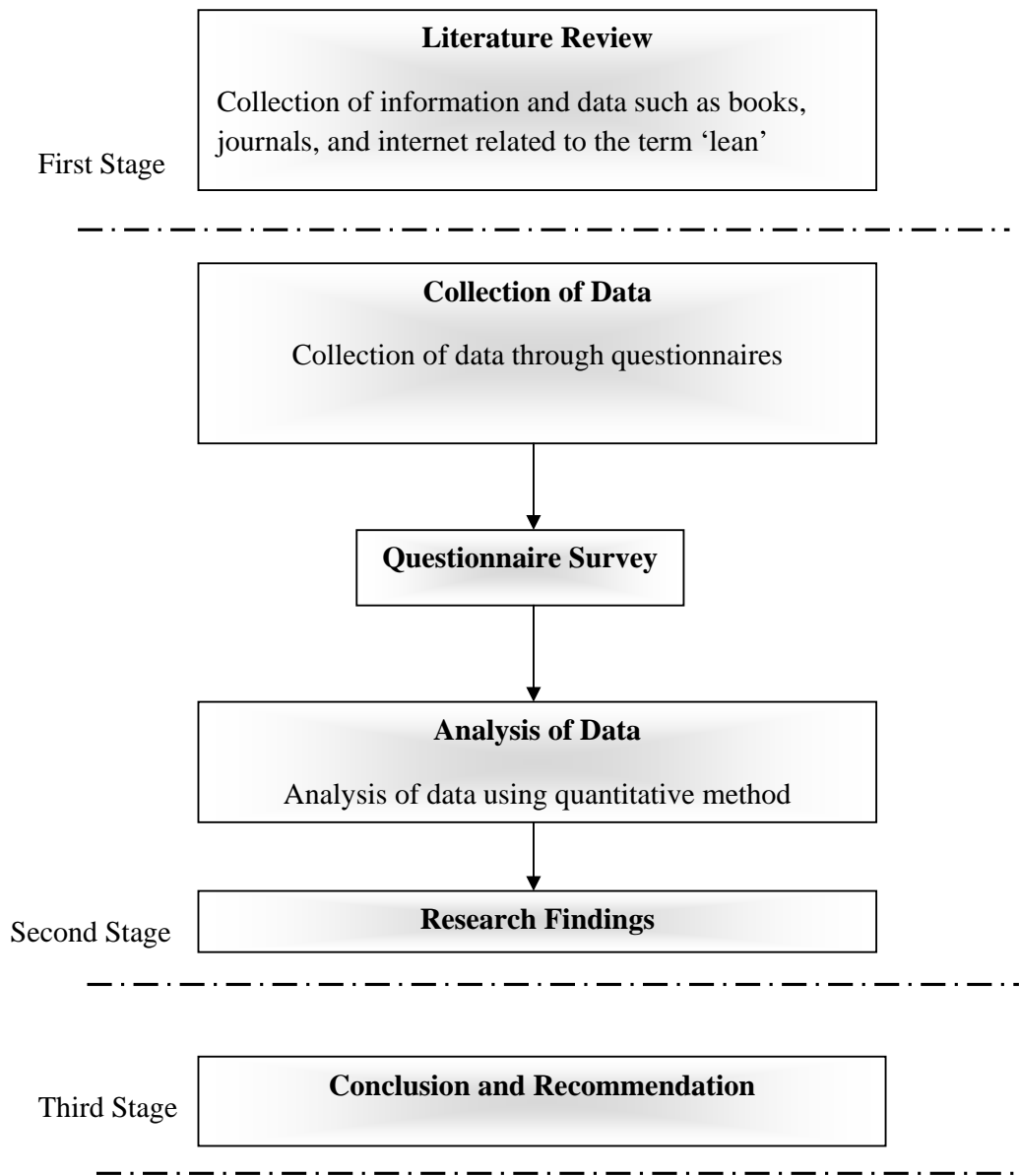


Figure 1.1: Flow chart of research methodology

1.6 Report Outline

This research was divided into six (6) chapters. The first chapter (Chapter 1) explained the problem statement, aim and objectives, scope of study and brief methodology that will be used throughout the study.

The second chapter (Chapter 2) elaborates on the history on lean production, concept of lean production, concept of lean construction and three case studies were introduced in this chapter.

Chapter three (3) elaborates on the methodology used throughout the study together with the structure and description of the questionnaire survey. The questionnaire will collect data on demographic background of all respondents as well as their feedback on the system developed.

The fourth chapter (Chapter 4) elaborates on the data collected by survey questionnaires by using Microsoft Excel which shows the respondents' demographic.

The fifth chapter (Chapter 5) continues on the result and discussion whereby SPSS software were used to determine the reliability of the data gathered earlier with the intention that no bias or errors free data.

The final chapter (Chapter 6) concludes the overall research and suggests recommendation for future research.