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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.

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## **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.

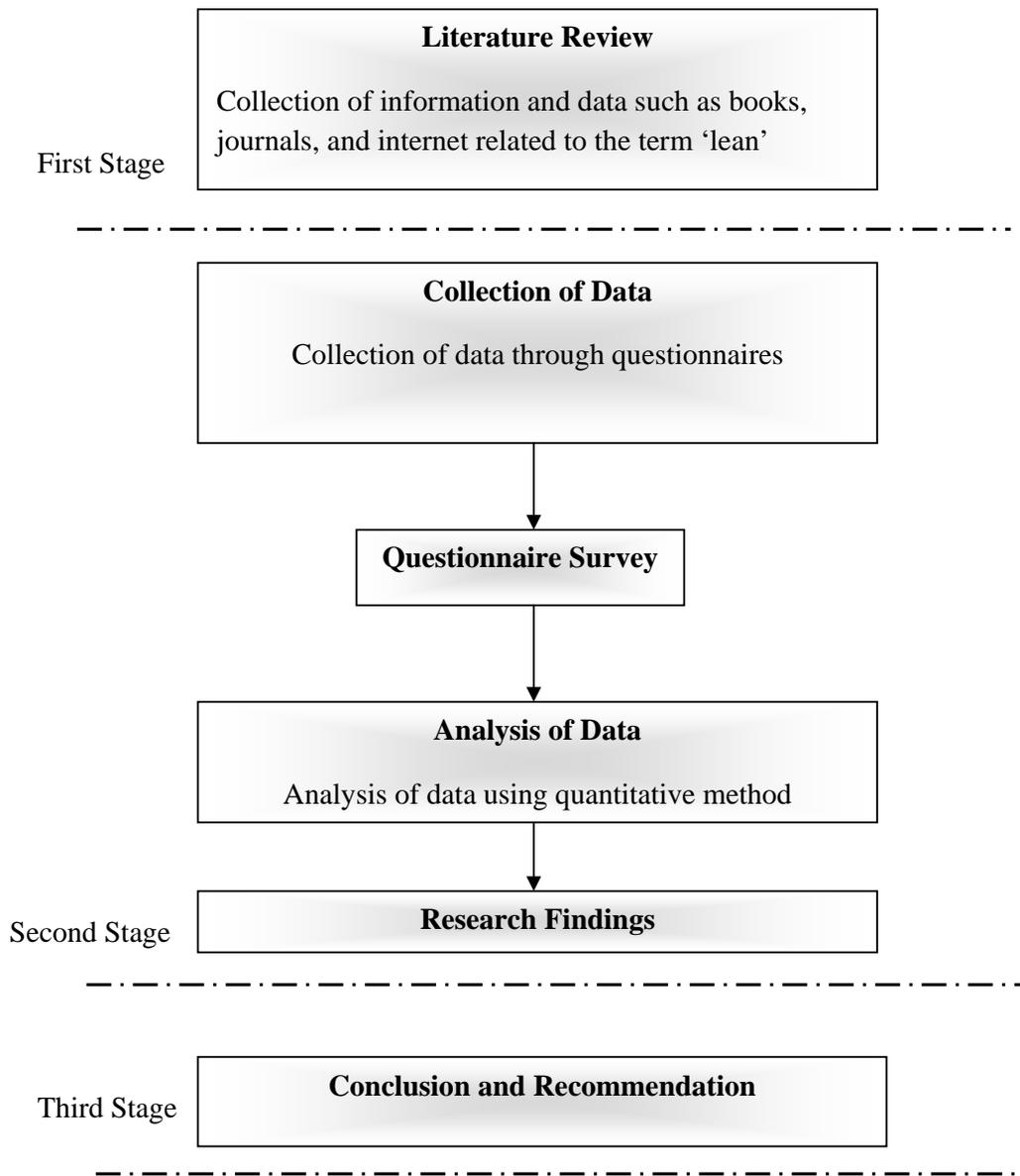


Figure 1.1: Flow chart of research methodology

## **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.