



Faculty of Manufacturing Engineering

**DEVELOPMENT OF LEAN CONSTRUCTION
FRAMEWORK FOR 'RUMAH KOMUNITI' PROJECT**

Md Assri Bin Hashim

Master of Manufacturing Engineering (Industrial Engineering)

2018

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA

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SESI PENGAJIAN: 2017/2018

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MD ASSRI BIN HASHIM

**A thesis submitted in fulfillment of the requirements for the degree of Master of
Manufacturing Engineering (Industrial Engineering)**

Faculty of Manufacturing Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2018

DECLARATION

I declare that this thesis entitled “Development of Lean Construction Framework for ‘Rumah Komuniti’ Project’ is the result of my own research except as cited in the references. The thesis has not been accepted for any master degree and is not concurrently submitted in candidature of any other master degree.

Signature :

Name : Md Assri Bin Hashim

Date :

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Manufacturing Engineering (Industrial Engineering)

Signature :

Supervisor Name : Mr Nik Mohd Farid Bin Che Zainal Abidin

Date :

DEDICATION

ALHAMDULILLAH,

thank you for my beloved

Dad (Hj Hashim bin Samion) & Mom (Saadiah Binti Hashim)

my wife Herryanni Binti Abdullah

my daughters and sons

you give me endless support

Allah bless our family.

Aminn.

ABSTRACT

Engaging in lean construction efforts could prove to be highly rewarding for Jabatan Pendidikan Kolej Komuniti (JPKK) and Kolej Komuniti Bandar Penawar. However, lean construction is risky and can be disastrous if not properly managed. Lean production efforts in some other firm construction have not been successful due to the many barriers to its successful implementation. To enable lean construction efforts and to increase the chances of success in eliminating waste, a thorough study of the lean practice or lean conformance is essential. Structured questionnaire were carried out to assess their perception of lean conformance based on their experience to build 'Rumah Komuniti'. The lean conformance influenced by sub principles Culture/people, Continuous improvement, customer focus, eliminate waste and Standardization. The obtained information from the data was analysed using descriptive analysis with mean respectively 3.9917, 3.8438, 4.0750, 3.9764 and 4.0542. The proposed Lean Construction Framework in this study is generic and can be applied to any type of work.

ABSTRAK

Penglibatan dalam usaha pembinaan secara 'Lean' menjadi sangat bermanfaat kepada Jabatan Pendidikan Kolej Komuniti (JPKK) dan Kolej Komuniti Bandar Penawar khususnya. Pembinaan secara 'Lean' mempunyai cabaran dan boleh membawa bencana jika tidak diuruskan dengan baik. Usaha Pembinaan secara 'Lean' dalam beberapa aktiviti pembinaan tidak berjaya kerana banyak halangan kepada kejayaan pelaksanaannya. Untuk membolehkan usaha Pembinaan secara 'Lean' dan untuk meningkatkan peluang kejayaan dalam mengurangkan sisa pembinaan, penyiasatan secara menyeluruh terhadap halangan adalah penting. Kajian menyeluruh terhadap amalan 'lean' atau pematuhan 'lean' adalah penting. Soal selidik berstruktur telah dijalankan untuk menilai persepsi mereka tentang kesesuaian amalan berdasarkan pengalaman mereka semasa membina 'Rumah Komuniti'. Amalan 'lean' yang dinilai dalam kajian ini ialah budaya kerja, peningkatan latihan berterusan, fokus pelanggan, optimum bahan sisa binaan. Maklumat yang diperolehi daripada data dianalisis menggunakan analisis deskriptif dengan min masing-masing 3.9917, 3.8438, 4.0750, 3.9764 dan 4.0542. Rangka Kerja Pembinaan Lean juga dicadangkan dalam kajian ini adalah berbentuk generik dan boleh digunakan untuk semua jenis kerja pembinaan.

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LIST OF ABBREVIATION

GDP	Gross Domestic Product
CIDB	Construction Industrial Development Board
TQM	Total Quality Management
TPS	Toyota Production System
JIT	Just in Time
MRP	Material Resource Planning
WIP	Work in Progress
PDCA	Plan Do Check Action
JIPM	Japan Institute of Plant Maintenance
JPKK	Jabatan Pendidikan Kolej Komuniti
OEE	Overall Equipment Effectiveness
LPS	Last Planner System
BPR	Business Process Re-engineering
CE	Concurrent Engineering
PCs	Product Circles
WBS	Work Breakdown Structure
CPM	Critical Path Method
SPSS	Statistical Package for Sciences Social

CHAPTER 1

INTRODUCTION

1.1 Introduction

The construction industry has a significant consequence to the economy (Kamar et.al. 2009) and it might assist as a barometer for indicating the country's economic condition (Tahmasebi, 2012). The Malaysian construction business plays an important role in making investment to the country and development of social and economic infrastructures and buildings. Since the 1990's, the influence of the construction division to the Gross Domestic Product (GDP) also fluctuated although at a more stable rate varying from a high of 4.8 per cent in 1997 to an estimated low of 2.7 per cent in 2005 (CIDB, 2010). This illustrates that the demand for construction is highly sensitive to the developments in other divisions of the economy. The latest data presented that the construction division growth at 5.3% in 2007 and contributed 2.5% total GDP of Malaysia (CIDB, 2010). Concurrently, this industry also provides job opportunities for nearly 1.03 million people which represented 8% of total workforce (Malik, 2006).

Execution of the construction process especially in the case of realization of the construction project in the city center, with limited space, is a complex undertaking. Each building requires a technical facility, including a storage area which is one of the

key elements of the construction process. Traditional methods of management associated with the same plan implemented throughout the construction period typically operate inefficiently (Nowotarski and Paslawski, 2015) because they do not involve the introduction of improvements in the process. Recent study shows, that introduction of Lean Management has a great potential in construction industry taking into account waste analysis (Aziz and Hafiz, 2013).

1.2 Background of the Study

The building industry is often described as an industry with many problems and a lack of efficiency. The solution to all of these problems is said to be in using the concept of lean construction. The word “lean” was defined by Howell (2001) as “Give customers what they want, deliver it instantly with no waste”. The lean construction experience developed by Toyota is, for many people, regarded as the only path for the building industry. Lean construction concepts have recently received attention as a modern way to improve construction performance and labour productivity (Abdel-Razek et al., 2007). Lean production is currently a buzzword in many manufacturing industries (Fellows et al., 2002), and some in the construction sector have tried to adapt it.

The proponents of lean construction argue that it has the potential of tapping into new and existing production theories dedicated to minimising wasteful activities. It has the goal of better meeting the customers' needs while minimising waste and using fewer resources (Dunlop and Smith, 2004). The term "lean" was coined by a research team working on international auto production and it reflects the waste reduction nature of the

Toyota production system and contrasts it with the craft and mass forms of production (Womack et al., 1991). Several researchers have voiced their concerns about the continued decline in performance of the construction industry and the increasing challenges (Orr, 1995; Abdulhadi, 1997). To deal with this unfortunate situation, some construction companies have adopted Total Quality Management (TQM). Others have tried rightsizing, restructuring and other concepts in order to reverse the trend. However, the payoff of these approaches is small compared to the investment (Hansen, 1997). Lean construction is one of the latest management concepts. It advocates for minimising waste in the construction process, a change the construction industry needs.

To reduce the risks associated with waste minimisation, it is imperative that building firms realise, understand, and manage the various barriers to their success. The main objectives of this research are: prioritising influential (strong) barriers to successful lean construction, determining the difficulty associated with overcoming each barrier, and developing a graphical aid that enables decision makers to concentrate on the barriers that are both influential and easy to overcome.

1.3 Problem Statements

Lean thinking or Toyota Production System (TPS) had been developed between 1948 and 1975 created by the founder of Toyota, Sakichi Toyoda, his son Kiichiro Toyoda, and the engineer Taiichi Ohno. Although, it produced way back on the seventies meant 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.

Naturally, construction is not an environmental friendly activity. Many researches proved that construction is a major contributor to environmental pollution. Moreover, according to the complexity of construction projects and disability of the project managers to establish day-by-day program a significant amount of waste would be emerged, which is called Non-value-adding activities and can cause delays and impose financial burden to the project.

Construction of 'Rumah Komuniti' have challenges that require low-cost financing, should be completed in less than 1 month, and other things that have been set JPKK. Notwithstanding there are numerous studies and researches have been undertaken towards construction time, cost and waste reduction but only few notion are available in order to compare constructability. Due to justification for the cure of Kolej

Komuniti Bandar Penawar perform construction work in accordance with the priorities as lean construction.

1.4 Objectives of Study

The aim of this study is:

- i. To identify the important factors barrier effect on the Construction of ‘Rumah Komuniti’.
- ii. To evaluate a study by applying Lean Construction Management on ‘Rumah Komuniti’.
- iii. To develop Lean Construction Frame Work for ‘Rumah Komuniti’.

1.5 Scope of Study

In order to achieve the objectives of this study, the research was only focused on the ‘Rumah Komuniti’ Construction at Kolej Komuniti Bandar Penawar and ‘Rumah Komuniti’ construction at Jerteh Besut Terengganu. Data were collected from questionnaire survey while discovering the project schedule time and cost of two case studies. The respondents of the questionnaire survey and interview were from construction such as technical student, lecturer, technician, contractor and engineers who have experience in ‘Rumah Komuniti’ construction methods. The case studies were one ‘Rumah Komuniti’ Construction at Kolej Komuniti Bandar Penawar and ‘Rumah Komuniti’ construction at Jerteh Besut.

1.6 Significant of Study

As the time, cost and quality are the most important and their direct effect on economic implications (Dissanayaka and Kumaranwammy, 1999) therefore, the significance of this study is summarized as follows:

- i. To obviate the concern and possible ambiguity on existence of benefits in using Lean Construction Management rather than conventional management.
- ii. The investigated factors for constructability performance will assist decision makers to select better construction system and develop a better project planning based on it.
- iii. Time and cost saved over incorporation of Lean Construction Management of conventional method can be measured leading to provocation of those who involved in construction industry to pay more consideration toward green building system.
- iv. This research was expected to realize the vision of Community College Bandar Penawar, Jabatan Pendidikan Kolej Komuniti and the government of Malaysia to promote use of Lean Construction Management.

1.7 Research Framework Concept

This conceptual framework is based on some of the previous researcher's findings to be provided as a guide and reference. In addition, this conceptual framework serves to clarify the actual concept of the study to be conducted by the researcher. This will make it easier for researchers to plan their work more systematic and organized.

Furthermore, conceptual framework is usually presented in the form of diagrams or mind maps to understand the idea of the study conducted. The concept of framework shown in Figure 1.1, the construction of ‘Rumah Komuniti’ and the factors that influence the success of lean construction.

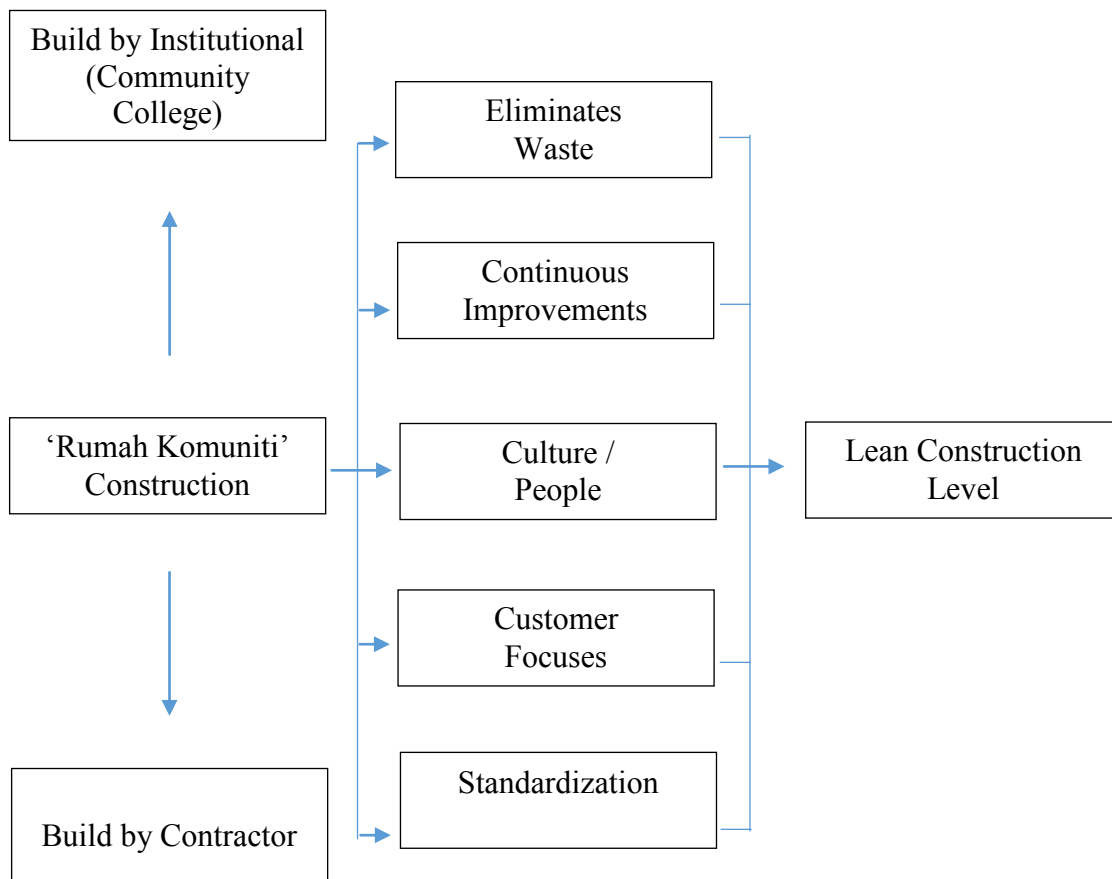


Figure 1.1: Framework concept of ‘Rumah Komuniti’ construction