

RISK MANAGEMENT OF DESIGN AND BUILD PROJECT

NURUL KHALIDA BINTI AMAT BAKRI

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DEDICATION

For my beloved parents,
AMAT BAKRI BIN ABD RANI and
SITI FATIMAH BINTI ARIFFIN

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ABSTRACT

Design and build procurement method offer an alternative contracting route apart from traditional method. The significance advantage of design and build procurement method is it provides the client with single management point. With this contracting arrangement, client requires to appoint main contractor that shall responsible for both design and construction of project. Despite this advantage, design and build project can be very risky to both of owner and contractor. Therefore, this study has been conducted to carry out risk assessment on the design and build approach. This study commenced with the project identification of risks that are adopt for design and build approach. Next, risk analysis has been carried out to evaluate the impact of risk to project cost, duration and quality. The methodology used to carry out this study are by means of literature review study, interviews with industry experts and conducting questionnaire survey. The result from this study has enabled the risk to be classified into low, medium and high classification. Apart from that, this study also proposed risk mitigation strategies for the project that are categorised as high-risk item. Finally, it is hope that the findings from this study will be able to provide some insight for those who are implementing the design and build project.

ABSTRAK

Kaedah perolehan reka dan bina adalah pilihan alternatif selain daripada kaedah perolehan tradisional. Kelebihan kaedah peroleha reka dan bina ini adalah ia menyediakan pemilik projek dengan titik pengurusan yang tunggal. Dengan pengaturan kontrak ini, pelanggan perlu melantik kontraktor utama yang akan bertanggungjawab untuk mereka bentuk dan melaksanakan pembinaan projek. Walaupun bagaimanapun, projek reka dan bina ini boleh menjadi sangat berisiko kepada pemilik dan kontraktor. Oleh itu, kajian ini dilakukan bertujuan untuk melaksanakan penilaian risiko terhadap projek reka dan bina. Kajian ini bermula dengan mengenal pasti risiko-risiko yang berkaitan dengan pelaksanaan projek reka dan bina. Seterusnya, analisis risiko telah dijalankan untuk menilai kesan risiko terhadap kos, tempoh dan kualiti projek reka dan bina. Metodologi yang digunakan untuk menjalankan kajian ini adalah melalui kajian literatur, temu ramah dengan pakar industri serta kajian soal selidik. Kajian ini telah mengklasifikasikan risiko projek reka dan bina kepada rendah, sederhana dan tinggi. Selain itu, kajian ini juga mencadangkan strategi untuk menangani risiko yang telah dikenal pasti sebagai tinggi. Kesimpulannya, kajian ini bertujuan untuk memberi gambaran kepada mereka yang melaksanakan projek reka dan bina.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

National development is very much influenced by the construction industry. People and nation can be benefited from execution of construction project and raise the national progress and growth in terms of economy. Every construction project has different scope, size, location and standard make it very unique and different from one another.

Owner or client has to make decision on the technical choices such as size, location and standard for the project at the very beginning of implementation stage. Such characteristics can influence the type of project procurement method used and subsequently determining the success of the project. Cost overrun, time overrun, and bad quality of construction

workmanship is the risk of impacts that project owner has to bear if wrong project procurement method is chosen. Therefore, a careful procurement method analysis shall be made to establish the best method to engage contractors for the execution of project. This should have been made based on the client's priorities on the project cost, construction duration and quality of workmanship.

1.1.1 Design and Build Procurement Method

Over time, construction industry deals with increasingly complex and varying demands which need owners or clients to opt different procurement method in order to ensure smooth project execution. Adnan (2008) suggests that, 'the choice of procurement method will have an impact on the amount of pre-contract work, the employer's financial and human resource, outlay for the completion of the project as well as issues risk transfer and allocation of responsibilities under the contact'. These methods of procurement include Design-Bid-Build, Design and Build, Construction Management and Public-Private Partnership.

In recent years, design and build procurement method has gain its popularity due to its advantages in reference to project duration, project cost, quality and innovative solution for construction problem arisen (Oztas and Okmen, 2003). Design and build procurement method is a contracting arrangement where one organization take a sole responsibility for both design a construction of client's projects which normally undertakes lump sum fixed price (Adnan, 2008). Besides that, in Design and Build procurement method requires client to appoint main contractor that is responsible for design as well as project execution which makes it the simplest form of contractual arrangement as there is only one line of communication for the client compared to traditional procurement method.

1.1.2 Risk Management in Design and Build

Construction industry is very dynamic and complex as it requires big amount of capital and resources in order to be well delivered. Failure in establishing the right procurement strategy in regards to risk allocation can lead to unpleasant surprise which causing disputes among stakeholders. Risk or threat in construction project can be very hard to eliminate. However, once identified, it is easier to control and treat the risks.

Risk management is a scientific approach that dealing with risks faced by individual, team or whole organization with intention to reduce the impact of risks systematically. It is a process whereby identification, evaluation and prioritize of risk followed by appropriate handling of risk by means of coordination and implementation of economical application to reduce the negative impacts of risk to the project objectives such as cost, duration and quality. Risk management is an important tool for design and build project stakeholders in order to identify and analyse the possible risk that occur so that it does not impede the success of project.

Risk management requires project stakeholders to prioritize risks with greatest probability occurrence and greatest impact followed by risk with lower probability of occurrence and lower impact. In other words, attributes with high risk is handled first followed by medium risk and low risk. Ideal risk management concept imposes project stakeholder to spend minimally on resources but at the same time reduce the negative impact of risk as much as possible. With all being said, aggressive risk management approach does not necessarily mean abstain project with high level of risks but project stakeholders shall take up the challenge by going into the project with eyes open so that any risk adhere can be mitigated to ensure the success of the project as the main principle of risk management is to assure the operation continuity if the alarming risk is happening.

1.2 Problem Statement

Risk could be imminent for every construction project. This include design and build projects. Despite its advantages in regards of project duration, project cost, project quality and innovative solution, Design and Build projects can be very risky for both of owner and contractor which resulted in project fails to deliver main features of design and build procurement method such as shorter total project duration, stay in stipulated budget as well as exhibit good quality of construction workmanship.

Azizan and Ibrahim (2015) have classified design and build project is the riskiest project compared to other method of procurements. Both client and contractor are exposed to high degree of risks due to combination of design activities and construction process as well as on-site supervision. Ling and Poh (2007) claimed design and build delivery system shows no significant growth in Singapore as project owners feel that they need to bear more risk, design and build facilities are not delivered in high quality and maintenance issue is less considered. Changes in work scope and design, payment delay, owner financial problem, labour issue and governments regulation are one of common risk that associated with design and build projects (Saaidin et al, 2016). If these risks are not being tackled, project stakeholders should expect cost and time overrun as well as bad

quality of construction workmanship for the project. For these reasons, risk management had become important tools to tackle those risk through risk assessment in order to ensure success of design and build project delivery.

Risk management process consists of three main components. These components are; risk identification, risk analysis and risk mitigation. These processes are used in many industries to minimize losses from the occurred risks and transfer into opportunities which can increase contractor's profit. Therefore, this study aims to carry out risk assessment on design and build project

1.3 Aim and Objectives

The aim of this study is to carry out risk assessment on design and build project. The objectives of this study are outlined as follow:

- i) To identify the risk associated with design and build projects.
- ii) To carry out risk analysis in evaluating the impact of risk to project cost, duration and quality.
- iii) To suggest mitigation strategy for the high risk identified to each project objective; cost, duration and quality.

1.4 Scope and Limitation of Study

The scope of this study covered on design and build project in Malaysia. The risk assessment carried out by the author is based on the literature and only focus on three stages of risk management namely, risk identification, risk analysis and risk mitigation. The scope and limitation of study as listed below:

- i) Data collection through questionnaire surveys are collected from consultants, contractors, architect firms and developers within Peninsular Malaysia area;
- ii) The data collected only related to design and build project.

1.5 Significance of study

Design and Build projects can be very risky for both of owner and contractor which resulted in project fails to deliver main features of design and build procurement method such as shorter total project duration, stay in stipulated budget as well as exhibit good quality of construction workmanship. Therefore, this study is significant to identify the risk associated with design and build project. The risk associated with design and build project is identified through literature study and interview with industry expert. Twenty-four (24) risks are established and used for risk analysis through questionnaire survey.

Risk analysis is carried out by means of probability and impact assessment and further classified into LOW risk, MEDIUM risk and HIGH risk based on probability and impact risk rating matrix. Based on the risk analysis carried out, default and delay by subcontractors, contractor and owner financial capability, equipment breakdown, design team lack of competency and experience, design error, ambiguous scope definition, fluctuation in prices, delay in permit and licenses, late material delivery, continuous change in design and drawing, late progress payment, unpredicted weather condition and owner lack of quality control are classified as HIGH risk to the design and build project in regards to cost, duration and quality. Lastly,

mitigation strategy is established in respond to HIGH risk identified according to impact to project cost, duration and quality.

With all being said, from this study, design and build project stakeholder will be get some knowledge how to carry out risk assessment on design and build project.

1.6 Brief Research Methodology

This research outlines five (5) stages of research methodology as per Figure 1.1. These stages are; preliminary study and topic selection; risk identification; risk analysis; risk mitigation strategy and conclusion and recommendation. This study is carried out by means of literature review study, interview with industry expert and questionnaire survey.

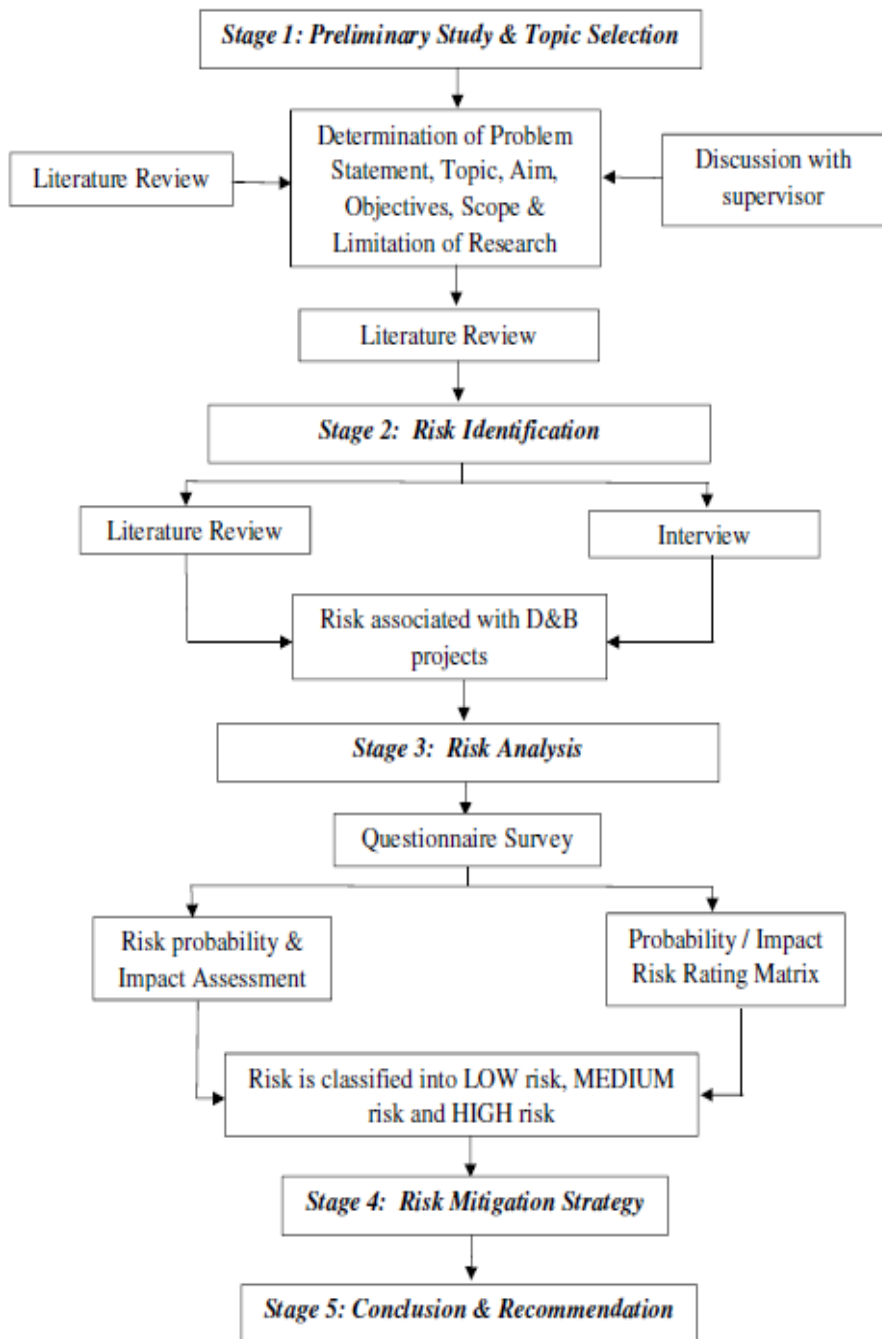


Figure 1.1 Research Methodology Flow Chart

1.7 Report Structure

This thesis consists of six (6) chapters. Chapter 1 outlines description of research background, problem statement, research aim and objectives, scope and limitation of research, and significance of study. Chapter 2 is a comprehensive literature review from various authors which covers information on design and build procurement method; features, advantages and disadvantages. Next, risk associated with design and build project is listed. Lastly, theory on risk management also is described in this chapter. Chapter 3 outlines the research methodology of this thesis. In this chapter the method used to achieve all objectives of research are discussed in detail. Study on literature review, interview and questionnaire survey the method used for this study. Chapter 4 describes the risk analysis carried out in evaluating the impact of risk to Design and Build project according to its cost, duration and quality. This is done by means of Risk Probability and Impact Assessment. Then, the risk associated with design and build are being further classified into low, medium and high risk for each project cost, duration and quality impact and illustrated in heat map. Chapter 5 discusses the result and findings of analysis carried out in chapter 4. From the results and findings, risk mitigation for design and build project is suggested. Chapter 6 outlines the conclusion for this study. Besides that, recommendation on contribution and potential direction for future works also being concluded in this last chapter

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