THE FRAMEWORK OF DIRECT AND INDIRECT EFFECT OF PROJECT RISK RESPONSE-RELATED MEASURES ON PROJECT PERFORMANCE IN MANAGING CONSTRUCTION DELAY

PRIYADATCHINI A/P KARUNAKARAN

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Specially dedicated to

my beloved family, seniors, professors, lecturers and

all my beloved friends who had encouraged, guide and inspired me throughout my journey of education.

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ABSTRACT

Project performance can be enhanced via proper risk management, particularly with the development of risk response measures. Though delay issues have been explored in many studies, to date, no study has attempted to measure how delay factors and risk measures are associated with the project performance. Therefore, the aim of this study is to establish the framework of the direct and indirect effect of project risk response-related measures (RM) on project performance (PP) in managing project-related delay factors (DF) in Malaysian construction companies. A total of 332 questionnaire responses were collected from Grade 7 contractors via posts, online survey, email, and by hand. The data was examined using Statistical Package of Social Sciences and Structural Equation Modelling. The result of the study showed that all RMs have significant effect on time and cost performance, except for corrective-related measures and their effect on time performance. Both the DF and RM have a significant effect on PP. Also, the mediating effect was found to be significant on PP. This research provides guidelines for construction practitioners and decision makers on identifying critical delay issues and ways to deal with it with effective risk response measures in order to enhance the project performance. This research also benefits the researchers to have a clear view of the theoretical parts and comprehensive analyses in dealing with delays in the construction industry. This research highly recommends the researchers to further explore on risk behaviour from a different point of views to understand a firm's intention in mitigating risk.

ABSTRAK

Prestasi projek dapat ditingkatkan dengan pengurusan risiko yang berkesan terutamanya dengan pembangunan langkah pengurusan risiko. Walaupun isu kelewatan telah diterokai dalam pelbagai kajian, sehingga kini, tiada kajian dapat menyimpulkan sejauh mana faktor kelewatan dan pengurusan risiko boleh mempengaruhi prestasi projek. Oleh itu, matlamat kajian ini adalah untuk mengkaji kesan langsung dan tidak langsung langkah pengurusan risiko (RM) terhadap prestasi projek (PP) dalam menangani faktor kelewatan projek (DF) untuk syarikat pembinaan Malaysia. Sejumlah 332 soal selidik telah dikumpul melalui pos, tinjauan dalam talian, e-mel dan secara bersemuka dari kontraktor Gred 7. Data dianalisis menggunakan (SPSS) dan Pemodelan Persamaan Berstruktur (SEM). Hasil kajian menunjukkan bahawa RM memberikan kesan yang signifikan terhadap prestasi masa dan kos kecuali untuk langkah pemulihan dan kesannya terhadap prestasi masa. DF dan RM memberikan kesan yang signifikan terhadap PP. Kesan pengantara turut didapati signifikan ke atas PP. Kajian ini memberikan garis panduan untuk pengamal pembinaan dan pembuat keputusan untuk mengenal pasti isu kelewatan yang paling kritikal dan cara untuk menanganinya dengan langkah pengurusan risiko yang berkesan untuk meningkatkan prestasi projek industri pembinaan Malaysia. Kajian ini turut memberi manfaat kepada penyelidik dengan memberikan pandangan yang jelas mengenai teori dan analisis komprehensif dalam menangani kelewatan dalam industri pembinaan. Kajian ini turut memberikan saranan kepada para penyelidik untuk melaksanakan kajian lanjut mengenai tingkah laku risiko daripada sudut pandangan yang berbeza untuk memahami niat syarikat dalam mengurangkan risiko.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

%	-	Percentage
α	-	Cronbach alpha
f^2	-	Effect size
AG	-	Auditor-general
AVE	-	Average variance extracted
BNM	-	Bank Negara Malaysia
CB	-	Covariance-based
CdF	-	Coordination-related factors
CF	-	Cost-related factors
CFA	-	Confirmatory factor analysis
CIDB	-	Construction Industry Development Board
CIMP	-	Construction Industry Master Plan
CITP	-	Construction Industry Transformation Program
CM	-	Corrective-related measures
CPM	-	Critical Path Method
CR	-	Composite reliability
CREAM	-	Construction Research Institute of Malaysia
CSFs	-	Critical success factors
D^2	-	Mahalanobis distance
DF	-	Project-related delay factors
DVs	-	Dependent Variables
DSM	-	Department of Statistics Malaysia
e.g.	-	*Exempli gratia* or for example
EF	-	Environmental-related factors
ETP	-	Economic Transformation Program
G1-7	-	Grade 1-7

GDP	-	Gross Domestic Product
GFCF	-	Gross Fixed Capital Formation
GNI	-	Gross National Income
GST	-	Goods and services tax
Ho	-	Null Hypothesis
HTMT	-	Heterotrait-monotrait
IBS	-	Industrialised Building System
IVs	-	Independent Variables
KKR	-	Ministry of Works
KPKT	-	Ministry of Housing and Local Government
MARA	-	People's Trust Council
MVs	-	Mediator Variables
MYR	-	Malaysian Ringgit
OM	-	Organizational-related measures
P-value	-	Significance value
PdM	-	Predictive-related Measures
PERT	-	Project Evaluation and Review Techniques
PLS	-	Partial Least Square
PMBOK	-	Project Management Body of Knowledge
PP	-	Project Performance
PvM	-	Preventive-related measures
RF	-	Resources-related Factors
RII	-	Relative Importance Index
RM	-	Project Risk response-related measures
RO	-	Research objectives
RQ	-	Research questions
SD	-	Standard deviation
SE	-	Standard error
SEM	-	Structural equation modelling
SME	-	Small and medium enterprise
SST		Sales and service tax
SPSS	-	Statistical Package for Social Sciences
TCE	-	Transaction Cost Economics

TF	-	Time-related factors
TN 50	-	Transformational National 2050
UK	-	United Kingdom
USD	-	United States Dollar
VIF	-	Variance inflation factor
WBS	-	Work breakdown structure

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Prefatory remarks

This chapter provides a brief explanation of this research study. It presents the background of this study on construction industry, the motivation of the study, research problem, research questions, research objectives, research scope and limitations, significance of the study, and overall structure of the research as shown in Figure 1.1.

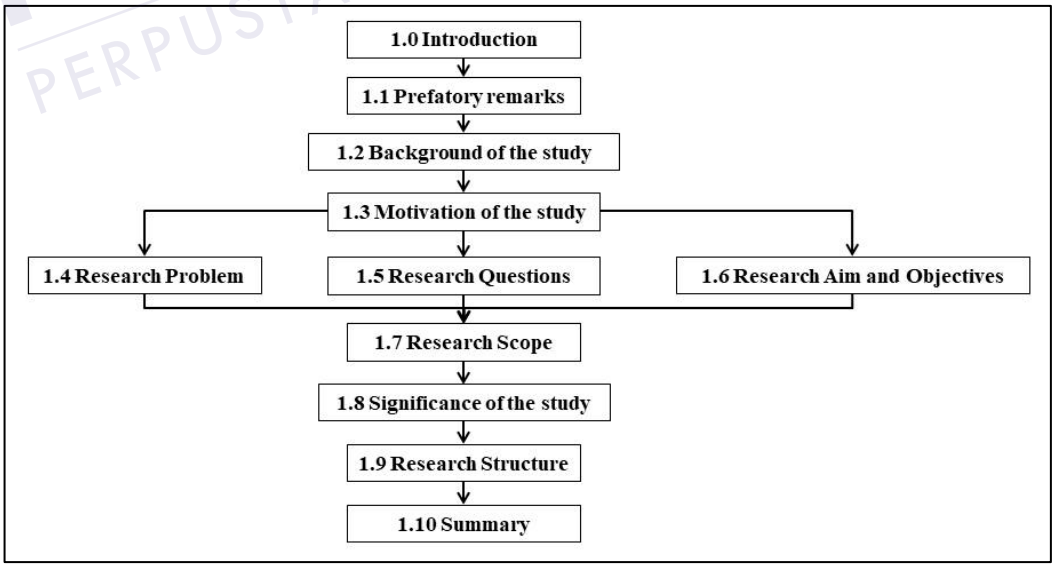

Figure 1.1: The organization and flow of chapter one

1.2 Background of this research

The economic transformation of every region globally is dependent on the performance or output of the construction sector (Sekar, 2017). The economic expansions for the key regions in the world, measured in terms of gross domestic product (GDP) value, are as given in Table 1.1

Table 1.1: World's GDP growth rate (The World Bank, 2019a)

No.	Geography/Region	GDP growth rate in % (as of year 2018)
1	East Asia and Pacific	3.6
2	Europe and Central Asia	1.7
3	Latin America and Caribbean	0.5
4	Middle East and North Africa	0.6
5	North America	2.0
6	South Asia	5.5
7	Sub Saharan Africa	-0.3

Based on Table 1.1, East Asia and Pacific, which includes Malaysia, holds the second highest GDP growth rate as high as 3.6 % in the world. Clearly, for Asia, that includes Malaysia, the construction sector plays an important role as one of the top growth-initiating factors for a nation's economy (Department of Statistics Malaysia (DSM), 2017), despite of multiple external challenges such as falling oil prices, introduction of taxes, weaker currency, rising inflation, fiscal deficit and so on (Sekar *et al.*, 2018). The impact of these challenges on economic activities in Malaysia, that includes the output of construction industry, can seen on the GDP annual growth of Malaysia is plotted as in Figure 1.2.

Based on Figure 1.2, during the period of 2010 to 2016, Malaysia's GDP growth rate has registered an average annual growth rate of 5.46 % despite of its tragic experience on financial crisis and economic downturn in year 2009. Based on Central Bank of Malaysia (BNM) (2014), the annual report for the year 2014 indicated there were signs of weakening consumer demand caused by the combination of monetary tightening and high levels of Malaysia's household debt. This eventually leads to a steep decline in the economy growth for Malaysia from the end of year 2014 to 2016 (BNM, 2016). Despite the challenging economic environment, Malaysia could able to rebound with a strong growth rate by 5.9 % in the year 2017 before it moderated back to 4.8 % in the year 2018.

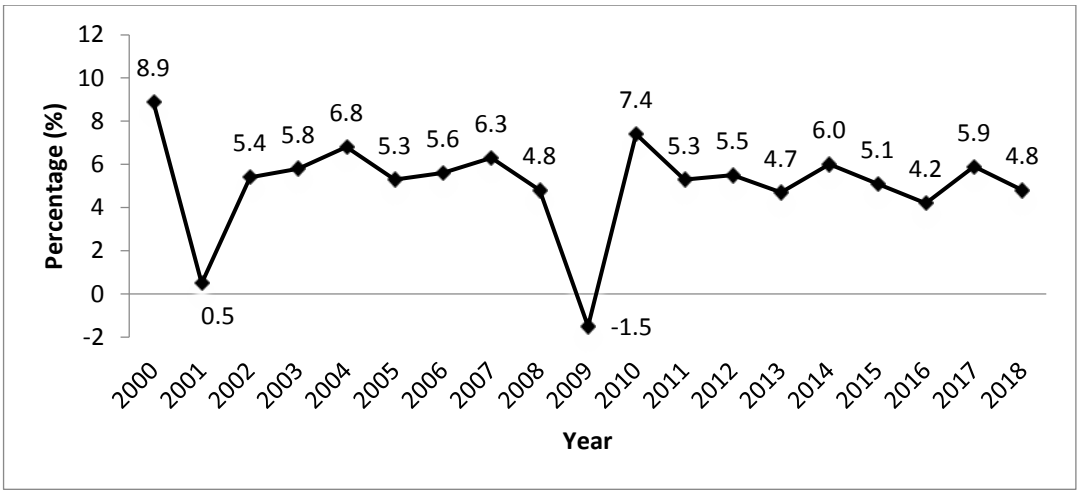

Figure 1.1: GDP of Malaysian economy growth (The World Bank, 2019b)

Being a developing country with the aim to achieve developed nation status by year 2050 via Transformation National 2050 (TN 50), the Malaysian government has invested heavily in conventional projects such as residential, non-residential, infrastructure, and social amenities. The Government also has initiated several mega projects to improve and increase the country's infrastructure facilities (Construction Industry Development Board (CIDB), 2017). The large volume of construction work with an estimated development allocation of Malaysia Ringgit (MYR) 260.0 billion (United States Dollar [USD] 60.6 billion) has commenced in 2016 under the 11th Malaysia Plan (from 2016 to 2020), which is an ongoing phase in gearing Malaysia to achieve the 2050 National Transformation (DSM, 2017).

The performance of a construction sector is basically evaluated based on the construction output and its annual growth rate. As for the growth rate of the Malaysian construction sector, it was reported construction industry contributed an average annual growth rate of 7.9 % to the nation's GDP during the years 2010 to 2016, following a moderated average growth to 6.7 % during the succeeding four years (DSM, 2019). Clearly, the sector has registered a commendable growth amidst impact from declining oil prices, implementation of goods and services tax (GST) and Sales and Service Tax (SST), increase of construction material's prices, shortage of labours, the Government's fiscal policies and compounded effect (Sekar, Viswanathan & Sambasivan, 2018).

The Malaysian government has taken several initiatives by developing and implementing the industry Master Plans through CIDB to improve and strengthen the

performance of the industry. This includes Construction Industry Master Plan (CIMP 2006 - 2015) and Construction Industry Transformation Program (CITP 2016 - 2020). The objective of industry Master Plans is to facilitate construction project managers with numerous strategic thrusts to achieve the National Economic Transformation Program (ETP) of Malaysia (CIDB, 2015). Following are the key strategic thrusts of CIMP and CITP outlined in Table 1.2.

Table 1.2: Strategic thrusts of CIMP and CITP (CIDB, 2015; CITP, 2019)

CIMP (2006 - 2015)	CITP (2016 - 2020)
• To integrate the construction industry value chain to enhance productivity and efficiency • To strengthen the construction industry image • To strive for the highest standard of quality, occupational safety and health and environment practices • To develop human resource capabilities and capacities in the construction industry • To innovate through research and development and adopt new construction method • To leverage on information and 269 communication technology in the construction industry • To obtain benefit from globalisation including the export of construction products and services	• Quality, safety and professionalism - Related to everyday practices to reduce cost and improve time performance; creating high quality products; and efficient safety & health environment • Environmental sustainability - Related to high compliance to the environmental sustainability ratings and practices • Productivity - Related to efficient adoption of new technologies and modern practices; high skilled and highly paid workforce • Internationalisation and competitiveness - Related to quickness of practitioners to compete in the construction world with highly skilled and professional workforce.

Despite the great extent of initiatives made by government to support construction project performance, construction projects in Malaysia are seen easily generating unwarranted, uncertain event or condition called risk (Cheung, Suen & Cheung, 2004). Based on the historical valuations of the construction output in Malaysia as shown in Figure 1.3, it shows a fluctuating growth rate between extremities that swinging from as high as 35 % in 2012 to as lows as -6.3 % in 2020. This prompts us to investigate the risks impose to the performance of a project to understand how it decelerates the multiplier effects to the nation's economy (Abdullah *et al*., 2009).

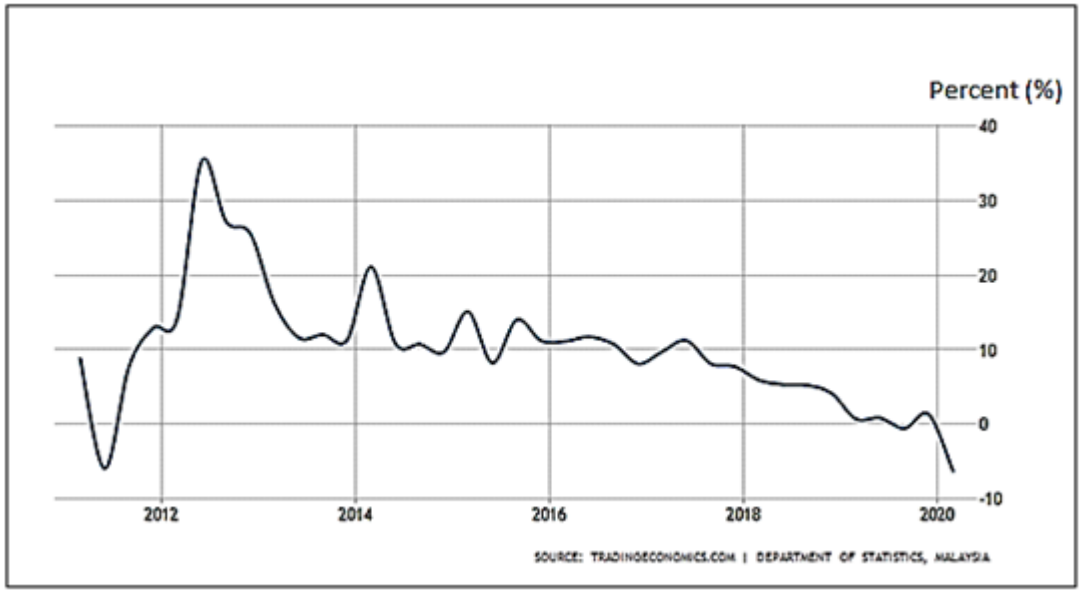

Figure 1.3: Malaysia construction output (Trading Economics, 2020)

For decades, delays in construction work have become part and parcel of the construction industry's ongoing challenges, locally and globally. The delay in work is described as the slowing down of work or time lag without any stoppage of work (Bartholomew, 1988). The main reasons of why delay issues are remaining not mitigated are because minor delay factors are frequently overlooked, and in a prolonged period, its cumulative effect has severe impact on project time and cost performance (Ibrahim, 2017). The delay issue appears to be challenging due to the industry's one-off endeavours with organizational, technological and nature complexity (Baccarini, 1996; Wood & Ashton, 2010; Zailani *et al*., 2016). Sambasivan & Soon (2007) found delays can cause time overrun, cost overrun, disputes, arbitration, litigation and total abandonment.

1.3 Motivation of this research

According to Abdul-Aziz & Abdelnaser (2011) and also Ministry of Housing and Local Government (KPKT) (2020), any projects in Malaysia that face delay between 10 % to 30 % when compared to its actual progress is categorized under "delayed project", whereas any projects that face delay more than 30 % or if the construction

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