PREDICAMENT IN CONSTRUCTION – AN OVERLOOK TO DELAYS, COST OVERRUNS AND RISKS

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ACKNOWLEDGEMENTS

First and foremost, I would like to express my grateful to Allah SWT because giving me great chances to be contributing in the engineering field.

I am grateful and would like to express my sincere gratitude to my supervisor Madam Wafty Abd Rahman for her great ideas, sharing expertise, and sincere and valuable guidance and encouragement extended to me. I appreciate her consistent support for me from the first day I applied this program. I am truly appreciate of her acceptance of my mistakes and her obligation to my career.

I take this opportunity to express gratitude to all of the Civil Engineering Department of Universiti Malaysia Pahang (UMP) members for their help and support. I also thank my parents for the unceasing encouragement, support and attention. I am also grateful to my partner who supported me through this venture.

Finally, I must express my very profound gratitude to my parents for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them.

ABSTRAK

Prestasi masa dan kos adalah kriteria asas bagi kejayaan dalam mana-mana projek. Masalah ini adalah fenomena global dalam industri pembinaan. Malaysia dianggap sebagai industri yang menghadapi prestasi buruk yang membawa kepada kegagalan dalam mencapai prestasi masa dan kos yang efektif. Akibatnya, kebanyakan projek menghadapi kelewatan masa dan kos yang berlebihan. Kajian ini menilai kelewatan dan kos lebihan projek pembinaan di Malaysia dan mengenal pasti cara yang berkaitan untuk meminimumkan kelewatan, kos berlebihan dan risiko yang terlibat dalam projek pembinaan. Penyumbang utama kepada prestasi buruk ini termasuk masalah reka bentuk, pengurusan bahan yang tidak teratur, keadaan cuaca, penghantaran bahan secara tidak langsung dan ketiadaan insentif untuk kontraktor untuk menamatkan lebih awal dari jadual. Tambahan pula, wawancara telah dijalankan keatas kakitangan yang berpengalaman yang terlibat dalam menguruskan projek. Kajian ini memberikan gambaran keseluruhan mengenai amalan semasa yang boleh digunakan sebagai langkah pencegahan untuk projek masa depan.

ABSTRACT

Time and cost performance are the basic criteria for the success of any project. These problems in the construction industry are a global phenomenon. Malaysia has been regarded as an industry facing poor performance leading to failure in achieving effective time and cost performance. As a consequence, most projects face huge amount of time or delays and cost overruns. This study assessed the delay and cost of overruns of construction projects in Malaysia and identified relevant ways to minimize deferred costs, delays and risks involved in construction projects. The major contributors to this poor performance include design problems or errors in resource, poor management of material, the weather condition, unpunctually material delivery and unavailability of incentives for contractor for finishing ahead of schedule. Furthermore, interviews were conducted with experienced personnel involved in managing construction projects in order to comprehend the situations encountered during the cycle life of the project. This study provide insight overviews of the current practice such that can be used as preventive measures for future projects.

TABLE OF CONTENT

DEC	CLARATION	
TIT	LE PAGE	
ACKNOWLEDGMENTS		ii
ABS	STRAK	iii
ABS	STRACT	iv
TAE	BLE OF CONTENT	V
LIS	T OF TABLES	viii
LIS	T OF FIGURES	X
CHA	APTER 1	1
1.1	INTRODUCTION	1
1.2	1.2 BACKGROUND STUDIES	
1.3	3 PROBLEM STATEMENT	
1.4	4 OBJECTIVE	
1.5	5 RESEARCH SCOPE	
1.6	.6 SIGNIFICANCE OF STUDY	
CHA	APTER 2	5
2.1	.1 INTRODUCTION	
2.2	PROJECT LIFE CYCLE	6
	2.2.1 Project Initiation	6
	2.2.2 Project Planning	6
	2.2.3 Project Execution	6

	2.2.4 Project Closure	6	
2.3	CHALLENGES IN A PROJECT		
2.4	DELAY		
	2.4.1 Definition of Delay	8	
	2.4.2 Type of Delays	10	
	2.4.3 Cause of Delays	11	
2.5	COST OVERRUNS	14	
	2.5.1 Definition of Cost Overrun	14	
	2.5.2 Cause of Cost Overruns	15	
2.6	RISK	18	
	2.6.1 Definition of Risk	18	
2.7	Ways for Minimizing Cost Overrun and Delays	21	
CHAPTER 3			
3.1	INTRODUCTION	22	
3.2	DATA COLLECTION	24	
3.3	DATA ANALYSIS	26	
3.4	DATA INTERPRETATION	29	
CHA	APTER 4	30	
4.1	INTRODUCTION	30	
4.2	DELAYS AND COST OVERRUNS OF CONSTRUCTION	31	
	4.2.1 Bus Stop SMA Sultan Zainal Abidin, Kuala Terengganu	31	
	4.2.2 Radial Drainage, Kuala Terengganu	32	
	4.2.3 Construction and Maintenance Building, Kuala Terenggan	ı 33	
	4.2.4 Pedestrian Walkaway, Kuala Terengganu	34	
	4.2.5 Masjid Al-Madaniah, Subang Jaya, Selangor	36	
	vi		

	4.2.6	Kuala Terengganu Bypass, Kuala Terengganu	37
	4.2.7	Hospital Rembau, Negeri Sembilan	38
	4.2.8	Paya Bunga Square (PB Square), Kuala Terengganu	39
	4.2.9	East Cost Expressway Project Phase 2 (LPT2)	41
	4.2.10	Kuantan Court Complex, Pahang	42
	4.2.11	Hospital Tampin, Negeri Sembilan	43
4.3	COMP	PARISON PROJECTS BETWEEN GRADE CONTRACTORS	44
	4.3.1	Duration of Project Delays According To Grade of Contractor	44
	4.3.2	Cost Overruns According Between Grades of Contractor	45
	4.3.3	Comparison between Causes Due To Delay and Cost Overruns	46
4.4	EFFEC	CTS OF COST OVERRUNS AND DELAY PROJECTS	52
CHAI	PTER 5		54
5.1	CONC	LUSION	54
5.2	RECO	MMENDATION	56

REFERENCES

LIST OF TABLES

Table 2. 1	Natural and Human Risk (Kashiwagi et al., 2015)	20
Table 3. 1	Summary of Grade (CIDB, 2016)	25
Table 3. 2	Name of projects and grades of contractor	
Table 3. 3	Clause on delay and extension of time (PWD, 2010)	27
Table 3. 4	Clause on Suspension of Works (PWD, 2010)	27
Table 3. 5	Clause on Amendment (PWD, 2010)	28
Table 3. 6	Clause on Superintendent Officer's (S.O) Instruction	28
Table 3.7	Clause on Restriction and Procedure on use of Imported Materials & Goo	ds
		29
Table 4. 1	Clauses, Reasons and Period of Delay	31
Table 4. 2	Clauses for Bus Stop at SMA Sultan Zainal Abidin, Kuala Terengganu	
	Project	32
Table 4. 3	Reason and Additional cost	32
Table 4. 4	Clause for Radial Drainage, Kuala Terengganu Project	33
Table 4. 5	Clauses, Reasons and Period of Delay	
Table 4. 6	Clauses for Construction and Maintenance of Building, Kuala Terengganu	
	Project	34
Table 4. 7	Reasons and Additional Cost	35
Table 4. 8	Clause for Pedestrian Walkaway, Kuala Terengganu Project	35
Table 4. 9	Clauses for Masjid Al-Madaniah, Subang Jaya, Selangor Project	36
Table 4. 10	Clause for Kuala Terengganu Bypass Project	37
Table 4. 11	Clause for Hospital Rembau Project	38
Table 4. 12	Reason and Penalty Cost	39
Table 4. 13	Clauses, Reasons and Period of Delay	39
Table 4. 14	Clauses for Paya Bunga Square, Kuala Terengganu Project	40
Table 4. 15	Clauses for East Coast Expressway (LPT2) Project 41	
Table 4. 16	Clause for Kuantan Court Complex, Pahang Project	

Table 4. 17	Clause for Hospital Tampin, Negeri Sembilan Project	43
Table 4. 18	Duration of Project Delays According To Grades of Contractor	44
Table 4. 19	Duration of Project Delays According To Grade of Contractor G7	45
Table 4. 20	Cost Overruns for Contractor Grade G3	45
Table 4. 21	Cost Overruns from Contractor Grade G7	46
Table 4. 22	Summary of Causes of Delays and Cost Overruns	47

LIST OF FIGURES

Figure 2. 1	Relationship among Cost Overruns, Delays and Risk Involved	8
Figure 3. 1	Methodology Chart	23
Figure 4. 1	No. of Projects versus Causes of Delays	49
Figure 4. 2	Percentages Causes of Delays	50

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Projects are made with a due date in order to complete on time. This is to reduce costs as being delayed costs of money. Currently, projects are getting harder to complete hence certain projects are left unfinished. This is getting worse by the years. Ali and Kamaruzzaman (2010) mentioned that the cost overruns are a risky and crucial problem. They also stated that the problems of cost overruns and project delays are becoming a trend in the worldwide and it occurs more in developing countries due to growing rapid pace. It becomes a problem when the inability of the project managers to cope up with the growing industry hence resulting in budgeting and planning problems. Eventually, this lead to delay in projects completions. Hence, it is important to determine the factors that contribute to the cost overruns, take action to prevent and reduce these issues in the future.

The construction industry plays an important role in achieving fully developed nation status. It is imperative to complete projects on time as this is a sign of how good the company performance is. In fact, a project is considered 'successful' if it is not delayed and does not incur an additional costs which can be burdening to the company. Normally, when the projects are delayed, they are either extended or accelerated and therefore, incur additional cost. Delivering a project on time requires mettle and commitments to the project since the construction process is subjected to many variables and unpredictable factors. To plan and manage a successful project, the three parameters, time, quality and costs, play the major roles. It is imperative to balance out the three components in order to reach an agreeable terms in cost, time and also quality of the project. The clients in the construction industry are primarily concerned with quality, time and cost. But majority of construction projects are procured on the basis of the constraints time and cost. Cost escalation and time overruns are typically associated with poor management practices. This study attempts to identify the cost overrun factors occur in the construction industries and investigate the impact of the cost overruns factors to the project delay.

1.2 BACKGROUND STUDIES

Construction project is not only the development work, but also conjointly enclosed all the planning, designing, management, executing or others work until the end of the construction phase. A construction project can be considered as successful if the project satisfies the all the requirements on original budget, on schedule, and agreed with the scope as that are set inside the project (Wu et al., 2014)

In foreign country, a very comprehensive analysis done by Wu et al,(2014) state that nine out of ten public construction projects in Chicago have overrun within the cost and schedule. Sambasivan & Soon, (2007) study report shows around 46% of the project, either had cost overruns or it did not meet the requirement or desires of client and users. In addition, researchers from Saudi Arabia, found that only 30% of construction projects were finished inside the completion date, and therefore time overrun was between 10% and 30%.

Recently, the construction industries of Malaysia are being developed quickly (Ali & Kamaruzzaman,2010). However, they are facing chronic issues, such as time and cost overruns, poor workers performance, poor productivity, over hooked in to from foreign countries and lack of resource (A. Memon, Abdul Rahman, & Asmi Abdul Aziz,(2012).

1.3 PROBLEM STATEMENT

Malaysia is facing a chronic problems including poor performance of time and cost. Besides that, construction waste, poor productivity and over dependent of foreign workers and all over these challenges that will be considered as critical issues. Meanwhile, in Malaysia it is reported that only 20.5% of the public projects 33.5% of the private sector projects were completed within the time. (Ammar Ali, 2018)

The critical issues facing by Malaysia is because of the dearth of concern by project manager within the construction issues. Less of studied on the impact of the cost overrun factors to the project delay and lack of updated information concerning costs factors contributed to the project delay in numerous stages. (Jia, 2015)

The construction trade is of terribly complicated and strategic nature. Therefore it is considered as a risky affair due to its peculiarity. Because of involvement of assorted stakeholders connected with the project, many internal and external factors increase the risks of the project.

Such problems if not managed efficiently will bring unanticipated and unexpected impact to the company as well as the construction industry. Therefore, project managers and site contractors need to pay serious attention to curb the problem.

Thus, this study is tried to highlight the factors of cost overruns within the industry, and investigate the impact of the factors of the project delay within the industry, therefore resulting an unfinished comes in certain projects. Hence, it will facilitate contractors and project managers to understand the importance of cost and time in an exceedingly project, alleviate financial and time related issues to ensure the flow of the project is smooth, therefore creating the project successful.

1.4 OBJECTIVE

The objectives of this study are:

- i. To identify the problems in the construction industry related to the time and cost in the construction industry.
- ii. To determine the risks associated with construction delays and cost overruns.
- iii. To identify the relevant ways of minimizing the delays, cost overruns and risks involved of construction projects.

1.5 RESEARCH SCOPE

This study is limited to the construction industry and is conducted in order to identify the cost overrun factors and to examine the relationship the causes of delays and cost overruns between various grades of contractor. To carry out this study, constructions companies in Malaysia are chosen to make this study.

1.6 SIGNIFICANCE OF STUDY

There has been not much research conducted to examine the relationship between cost overruns, delay and risk involved in construction. So, from this study, we can educate the people on the cost overruns definition, factors and how it impacts the project in terms of delays, costs increment due to delays.

The advantages of this research can anticipate the factors of costs overruns and how it affects the flow of the projects. It can be the guideline or reference to the parties that are involved in the construction industry like project managers, site managers or contractors. So the findings of this study will beneficial to the parties that are involved during conducting construction projects. With the results or information from this research, it can reduce the cost overruns and shorten the time of construction taken and minimize the risk occurred

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Cost overrun occurs in every construction project thus, it is assumed as a common phenomenon, and the magnitude of the delays, risks involved and cost overruns varies considerably from project to project. If a project is a small project, the cost overrun incurred is minimal thus it has a minimal impact to the construction project. But if a project is a large scale project, the cost overrun incurred will be high and thus have a high impact on the construction project The project manager must identify factors and assume or predict what would happens to the construction. He must also alleviate and try to curb the risks associated with what is going to happen to the project in order to help decrease and avoid delays, risk involved and cost increase in any construction project.

In order to comprehend the problem occur at site, an understanding on the overall project life cycle is presented followed by its characterization and challenges. The several definitions of cost overruns, delays and risks, the factors and impacts are presented in order to get a broad indication of the different aspects of the definition from different sources. Later, it will generally determine the risks associated with construction project delays and review the results of research in the last few years were presented. Lastly, identifying the relevant ways to minimizing or reducing this issue in construction industry in order to help contractors and construction managers curb the problem in today's age, were discussed.

2.2 PROJECT LIFE CYCLE

The life cycle is the predictable pattern of the project. In the project life cycle, consist of four stages, which are initiation, planning, execution and closure. Project life cycle can help deliverables the client's need and requirements (Project Management Institute, 2008). These also can outline the flow of work or project streamline the construction of phase.

2.2.1 Project Initiation

Project Initiation is first phase in the Project Management Life Cycle (PMLC), as it involves starting up a new project. The project can start by defining its objectives, scope, purpose and deliverables to be produce. In additional, project manager will also put together a project team, define early milestone, and earlier burger proposal (Project Management Institute, 2008).

2.2.2 Project Planning

Once defining the project and assembling the project team are established the project manager will ready, enter in depth of the project planning phase (Project Management Institute, 2008).

2.2.3 **Project Execution**

Once, the project planning is established the project team can begin executing the project against their assigned task (Project Management Institute, 2008).

2.2.4 Project Closure

The last stage involves in project closing. The project closure involves delivering the final product or services to the customers, handing over project documentation (Project Management Institute, 2008).

2.3 CHALLENGES IN A PROJECT

It is clearly that the development industry has unique characteristic that are not common in different industries. Within the construction industry, is composed of various types uncertainty and unpredictable factors when they are flip out and grow to be more complex, the extra resource, cost and time are needed. Any uncertainty can convey the effect to the productivity level and damages within the workplace.

Cost is a prime factor to measure the project fulfillment, especially for the construction projects in the developing country, because creation projects within the developing nation are perform under insufficient resources, continually confronted issues of shortage materials. Generally, a project is considered successful if the project is finished within a stated cost or budget, and also getting performed on time and meet the challenge objectives. Second most essential component that affects the project success is the time to complete the projects. If is continually related to the financial losses, because the lack of financial sources to complete the project, may extend the completion period.

Generally, most of the construction project experienced cost overrun and time overrun throughout their execution phase. Cost overrun will increase the amount money need use to construct a project over and above the original budgeted amount (Alinaitwe, Apolot, & Tindiwensi, 2013). This is going to delay the project status due to project manager and contractors need to find the funds for the following execution work. Time overrun is when the project cannot complete within the planned schedule and this may effect to the project entirety date, cost overruns, dispute, and litigation. These critical troubles are incapability to finish the construction projects on time, low quality work and cost overruns. Figure 2.1 Exhibits the relationship among cost overruns, delays and risk involved in a typical projects.



Figure 2.1 Relationship among Cost Overruns, Delays and Risk Involved

2.4 DELAY

2.4.1 Definition of Delay

The studies of time delays has been done by previous researches. A study was conducted in order to overcome a worldwide problem regarding the causes of time delays in construction. Delays are the one of the major problem in the construction project. Time overrun either beyond date specified in a contract are called construction delays. In other words, the delays exceed initial time and cost estimates (Owalabi et al., 2014).

Besides that, delays caused by the client such as late submission of drawings and specifications, continuous change of orders and incorrect site information generates claims from both the main contractors and sub-contractors which many times entail lengthy court battles with huge financial problems (Rao, Shekar, Jaiswal, Jain, & Saxena, 2016).

In term of stakeholders of construction project, delays also can be caused by contractors can generally be concluded to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall (Rao et al., 2016).

In Malaysia, Abdullah, Rahman and Azis (2010) have made a survey of on delay on Majlis Amanah Rakyat (MARA) one of the government agencies in Malaysia. MARA management procurement construction project phenomenal issues of delayed has been an argument for a long time. Eighteen causes have been identified. The respondents are person who work as consultants such as executive, resident engineers, and clerk of work and client, MARA itself consists of directors, project officers and engineers. The studies concluded that cash flow and financial difficulties faced by contractors, contractors' poor site management and ineffective planning and scheduling by contractors are the main cause of the delay

In addition, delay can be highlighted and defined as time overrun of extension of time to complete the project. Construction delay is something that cannot be avoided especially in the government agencies in Malaysia. The delay is a situation when the actual progress of a construction project is slower than the planned schedule or late completion of the projects (Hamzah, Khoiry, Arshad, Tawil, & Che Ani, 2011).

It is clear that many researchers have shown that delays occur in most construction projects, whether simple or complex. Construction delay could be defined as the time overrun either beyond the contract date or beyond the date that the parties agreed upon for delivery of a project (Sweis, Sweis, Abu Hammad, & Shboul, 2008).

Delays can be taken to be "incident" that effect an undertaking's advancement and delay project activities. Project that postponements might be caused by awful climate, inaccessibility of assets, outline or design delays and so on. As a rule, project defers result from activities that have both outer and interior circumstances and end results connections (Al-najjar, 2008).

2.4.2 Type of Delays

Delays can be categorized by many types. Firstly, delays that affect the duration or completion of project are critical delays. The delays do not affect duration or completions of project are noncritical delays.

Secondly, there are two types of delay non-excusable delays and excusable delays. A non-excusable delay is delay caused by the contractor or its suppliers by their own will, through no fault by the owner. The contractor generally not entitled to relief and must either make up the lost time through acceleration or compensate the owner by paying the owner money hence incurring additional cost. Therefore, non-excusable delays usually result in no additional money and no additional time being granted to the contractor (Tumi, Omran, & Pakir, 2009).

Thirdly, excusable delays are divided into two compensable and non-compensable delays. Compensable delays are caused by the owner's own words or the owner's inability to ready a drawing of the project on time. While non-compensable delays are caused by third parties or incidents beyond the control of both the owner and the contractor. These delays are commonly called "acts of God" because they are not the responsibility or fault of any particular party (Alaghbari, Razali A. Kadir, Salim, & Ernawati, 2007).

A compensable delay is a delay where the contractor is designated to prolong the time and to add the compensation. Excusable delays are able compensate. In non-compensable delays, the contractor is not able to claim for the compensation from the excusable delays (Owalabi et al., 2014).

2.4.3 Cause of Delays

A number of studies had been conducted by previous researches over a decade in order to solve delays in construction industries. Delays problem has been a serious issues for construction project begun. A construction and project management consultant (PMC) in Malaysia since 1962, had mentioned that projects in the last decade has not functioned perfectly in Malaysia. In Malaysia a study of delay factors and their impacts on construction projects completion in the Malaysian construction industry was carried out by Sambasivan & Soon (2007). Their result showed a list of 28 different causes. AmonGST these causes were; contractor improper planning, contractor poor site management, shortage of material, inadequate labor supply, equipment unavailability and failure, lack of communication amonGST project participants and mistakes during the construction projects are many and differ from country to country and from circumstances to circumstances.

Kaliba, Muya, & Mumba (2009) had identified factors affecting construction are heavy rains and floods have the most significant role in delays in construction projects compared to other factors such as customer failure.

In other researcher about environmental factor that shown the actual site conditions of a project are not usually determined until excavation is completed. It is sometimes possible that site conditions are overlooked. When the initial review of site is ongoing, conditions have changed due to change of weather conditions or sub-soil conditions. The unexpected conditions on sub surface sometimes require fundamental redesign or project with high expense and time taken is increasing. Changes of site conditions become a problem for machinery and supplies to move in and out of the site (A.S.Ali & S.N.Kamaruzzaman, 2010).

In Jordon, Odeh & Battaineh (2001) studied the causes of construction delays in traditional contracts in Jordon, using a questionnaire survey. The study illustrated that contractors felt labor productivity to be the most important delay factor. However, inadequate contractor experience was the most important delay factor to consultants. All parties generally agreed on the ranking of the individual delay factor. Agreed that inadequate

contractor experience, owner interference and financing or work were among the top five most important factors (Enshassi, Al-Najjar, & Kumaraswamy, 2009).

Besides that, in other country, Ogunlana et al.(2014) reported that were distinct problems that caused delays in the construction industry of Nigeria. Three factors were classified into three groups namely; firstly problems of shortages or inadequacies in industry infrastructure which are mostly supply of resources, secondly problems caused by clients and consultants and thirdly problems caused by contractor's incompetence or knowledge and experience deficiencies.

In the "Causes and Effects of delay in Iranian Construction Projects", the survey was conducted to identify the causes and a questionnaire with twenty-eight causes and six effects for delays are taken for this investigations. The ten major factors which affected the time take for construction by client, consultants and contractors are revealed. This stated that same factors in construction industry of Nigeria (Pourrostam & Ismail, 2012).

In addition, Kaliba et al.(2009) mentioned that contractors, consultants and clients should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. It is better if construction manager have experience and qualifications in project or construction management in order to anticipate the incoming problems and risks that might happen during the construction phase.

It is clear that many researchers have shown that the delays are evidently frequent problems in the construction industries of many developed and developing countries. The factors leading to time overruns (delays) in construction project in the Gaza Strip. Additional special contributors to delays here, the relative perceptions of contractors, consultant and owners, resulting in short term and long term delays due to unforeseen risks. The lack of materials in markets, and delays in materials delivery to the site also contribute to the cost increment of the project and delays the project's flow (Enshassi, Al-Najjar, & Kumaraswamy, 2009b).

The most important thing in construction projects that to control the cost for not exceeding the contractual cost. Financial difficulties faced by the contractor were considered to be the first and most frequent causes of delay in building projects in Jordon from the viewpoint of the contractor and second most important the owner and the consultant. Most Jordanian residential contractors are independent, small in size to underbidding rivals to win contracts. Besides that, the contractor has little access to credit facilities. The cause above will affect the cash flow problems later. Moreover, the contractor indirectly blames of the financial difficulties on the owner (Sweis et al., 2008).

Besides that, poor planning and scheduling of the project by the contractor and both the owner and the consultant is major delay cause of projects. The shortage of technical professions in the contractor's organization, insufficient coordination among the parties by the contractor and ineffective quality control by the contractor. These show that all party must participate and try to communicate and resolve any disputes in construction phase to make the project run smoothly without any mistake due to the changes of orders in construction industry (Sweis et al., 2008).

Furthermore, researchers have recognized that factors of influencing project timeline delays are delay in payments, long financial process, form of contract irregulars and ambiguities, economics problems, material procurement equipment unavailability, poor supervision, construction mistakes and poor coordination on site. Each factors has it their significant roles in time overruns in construction projects.

One that has contributed to delays in major construction projects is economic and political instability. Kashiwagi et al., (2015) stated that, in particular the 'foreign supply chain' is a negative impact on construction projects. First, excavation equipment must be imported from abroad, where 'restrictions' deteriorate in civil engineering. Second, economic instability leads to fluctuations in the local exchange rate. This is because unstable currencies compare with international currencies. Hence, the price of the plant will increase substantially from the predetermined price estimate. This is one reason or factor affecting the main delay and the negative impact on a construction.

2.5 COST OVERRUNS

2.5.1 Definition of Cost Overrun

A cost overruns, characterized as the expansion balanced deviation amonGST acknowledged and evaluated cost, may give some data about the nature of the choice to attempt the task being referred to. The finding that transitional cost invades tend to increment as the basic gauge vulnerability falls appears to be incongruent with arbitrary mistake and may be more in accordance with lacking endeavors to refresh costs or with vital distortion. (Oglend, n.d.).

Singh (2009), reported that proliferate on cases of delayed postponements and unreasonable cost overruns in foundation ventures. Case of successful on undertaking usage, similar to development of the Delhi Metro Rail are few and seem just far in the middle. In fact, the issue of time and cost overruns in India is across the board and extreme. However, not very many observational examinations exist regarding the matter. Indeed, even rarer are the investigations in view of finished ventures. Subsequently, the degrees and the causes behind postponements and cost invades have different issues identified with deferrals and costs overwhelms in publically supported infrastructure projects (Khattri, Agarwal, Gupta, & Pandey, 2016).

Throughout the world, cost overruns are a phenomenon, some of which are only complete in estimates that have been estimated (Kaleem, Abd Halid, & Sasitharan, 2016).

2.5.2 Cause of Cost Overruns

The important of construction projects, frequency of cost overruns and direct and indirect cost associated with such delays have inspired many researchers. According to Ubani, Okorocha, & Emeribe (2013) a few factors that impact cost overrun of development tasks, for example, lacking undertaking arranging, delay in development change in extent of the venture, arranging and usage, supple of crude materials and gear by contractual workers, asset requirement: control, reserves, related helpers, outside exchange not prepared and delay in basic leadership by government, disappointment of particular organizing bodies.

Shete & Kothawade, (2016) mentioned change orders one of the factors contributing to cost overruns. This may due to design, unexpected site conditions, increase in project scope, weather conditions, and other project changes. Besides that, factors of cost overruns change orders in India are the developed regression models may be used to estimate the extent of future cost overruns, time delay of any future project given its project characteristics and any available contract details.

Some cost increases had been stated as being unavoidable because of changes within the fitness provider's statutory necessities, building guidelines and a new liability for tax however, different increases might have been avoided. These increases were due to freeze layout, huge design adjustments, delay to the constructing works, a large variety of disputes and claims and the insolvency of principal works package contractors.

(A. H. Memon, Rahman, Asmi, & Azis, 2011) studied the causes of cost overruns are lack of management systems and lack of ability to prevent cost increment leads to need of effective cost management system and cost control system. To avoid this problem, the important steps are to identify and understand the causes and factors responsible for this with their information in hands, a contingency plan could be produced to alleviate and curb the upcoming risks.

In Ghana, the factors that cause overruns in construction of ground water projects and found that according to the contractors and consultants, monthly payments difficulties was the most important cost overrun factor, while owners ranked poor contractor management as the most important factor. Besides that, material procurement, poor technical performances, and escalation of material prices are also the factors that effects the cost overruns as mentioned form researcher (A. H. Memon et al., 2011).

The study shows that cost overruns increase in the construction of private residential projects and found out that cost increase was greater than the total cost. A major factor contributing to the cost overruns was the inadequacy of money and time allocated to the design phase. Moreover, the material related problems and again owner's financial constraints, inadequate planning, unpredictable weather conditions and fluctuations in the cost of building materials in Kuwait (A. H. Memon et al., 2011).

In Malaysia, the factor that affects the cost overruns is the contractor's poor management and supervision. Inadequate contractors experience shortage of site workers, incorrect planning and scheduling by contractor and frequent design changes with change in the scope of the project were more significant factors affecting construction cost. This leads to increment of cost of the project (A. H. Memon et al., 2011).

Peeters & Madauss (2008) stated that the biggest factor that contributes to overruns of budget is inaccurate estimation of original or initial cost of a project. It is because of technical problems on how to estimate project costs and also not enough project information in the early stage of project which results in the cost increment of the project.

In addition, in other studies stated that seven principal factors were the slowness and lack of constraint, incompetence, design, market and estimate, financial capability, government and workers. These was compared the causes of construction time and cost overruns in Asia and Africa (Le-Hoai, Lee, & Lee, 2008).

Besides that, corruption and bribery, political interests, poor site management, delay in site mobilization, rigid attitude by consultants, extra work without approvals and frequent changes during execution are the mostly happened to the cost performance in Pakistan (Nawaz, Shareef, & Ikram, 2013).

Meanwhile, Rosenfeld (2014) undertook a root analysis of construction-cost overruns and identified fifteen universal root causes such as premature tender documents, too many changes in owner's requirement and unrealistic tender prices were featured.

In Malaysia, housing project projects in the Klang Valley which were completed in 2000 to 2009 with a contract value of more than RM5 million are indicating that there is a most serious factor and contributes to surplus costs due to an inaccurate cost estimation problem. In addition, the most significant impact is the mistake of designing a project (A.S.Ali & S.N.Kamaruzzaman, 2010).

Although some similarities exists between different studies, it is noted that each study explores the constructions cost overruns issue according to the influential parameters and specific design changes factors in which the research is conducted. In other words, the cost overruns factor and their importance may be different between countries and economic environments.

2.6 **RISK**

2.6.1 Definition of Risk

The primary aim of this study is to identify the perception of the different parties regarding causes of delays, the allocation of responsibilities and the different types of delays. It was found that; the consultants play a very important role in design-related delays because they are in charge of the design process in conjunction with the owner of the project. Furthermore, delays in payments categories do not have the same negative impact on project completion times as other factors considered in this study such as code, design and construction related issues.

The challenge facing the construction industry is to manage the risk of cost overruns and deliver projects within budget. Risk is common concepts used in safety and applied ergonomics literature. Risk includes a component of how likely or what the probability of an event is and the seriousness of the consequence of what the severity is if something does occur (Jaffar, Abdul-Tharim, Mohd-Kamar, & Lop, 2011).

In other studies, the risk is also intuitively relative within and across work settings. Risk implies a probability for injury, and the odds of an injury are a function of the level of risk and worker exposure time. It is possible for workers at a site not to have injuries for a period of time (Jaffar et al., 2011).

Ehsan, Mirza, Alam, & Ishaque (2010) mentioned that risks can be either acceptable or unacceptable. An unacceptable risk is one which has a negative impact on the critical path of a project. Risks can either have short term or long term duration. In case of a short term risk, the impact is visible immediately, such as a requirement change in a deliverable. The impact of a long term risk is visible in the distant future such as a product released without adequate testing. In addition, risks can also be viewed as manageable and unmanageable. A manageable risk can be accommodated, example being a small change in project requirements. An unmanageable risk on the other hand, cannot be accommodated, such as turnover of critical team members (Ehsan et al., 2010).

Risk is the effect of positive or negative deviations from what is expected and is also "the effect of uncertainty on objective". Analyzing, evaluating and treating is a regular way of effective risk management. Ling and Hoi (2006) noted that some techniques may be used by managers for risk reduction or eliminating them after identifying such risks. In addition, there are unique risks such as political, social and cultural risks and general risks of regulatory, design, nature and management risks.

There are two main categories of risk, natural risks and human risks. Natural risks are associated with site conditions or location projects with general risks. Table 2.1 summarized the type of risk and their causes.

Type of Risk	Risk	Causes
	Weather condition	Heavy rain, flood
	Geological issues	Earthquakes, eruption
	Political risk	War, civil disorder, corruption, change in
		law, delay in approval, expropriation
Natural Risk	Economic risk	Material supply/Labor supply/Equipment
		availability, inflation, fiscal policies,
		exchange rate
	Financial risk	Interest rate, credit ratings, capital supply,
		cash flow, rentals
	Legal risk	Contract clauses, regulations and codes,
		risk allocation
Human Risk	Managerial risk	Life expectancy, infant mortality
	Technical risk	Design failure, equipment and system
		failure, estimation, collision and accidents
	Social risk	Criminal acts, civil torts and substance
		abuse
	Cultural risk	Religion, culture

Table 2. 1Natural and Human Risk (Kashiwagi et al., 2015)

This unique risk is related to politics, location, religion and culture due to the different locations. This risk applies to countries of diverse cultures and religions and more discussed in detail on future risks.

2.7 Ways for Minimizing Cost Overrun and Delays

Peeters & Madauss, (2008) found out some approach to avoid cost overruns. In any development project, there must be contain certain amount of risk. Therefore, a risk management function needed to be performed by project manager to determine and reduce the risk of the particular project. The aim of risk management is to minimize any risk that might result failure to meet the project requirement.

To get the effective cost planning relates the design of facilities to their cost, need the full account of quality, risks, likely scope changes, utility and appearance, the cost of a project is planned to be within the economic limit of expenditure that noted by (Dominic & Smith, 2014)

The major portion of construction companies in Pakistan deal with project risks on basis of their experience, judgment and intuition. The majority of risk are subjective and are related to contracts or construction processes. These risks are better dealt on the basis of previous experience. Besides that, risk management techniques require valid data to be available which is difficult to implement and the client seldom in using the risk analysis because they expect that project management can manage and minimize the risks.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In the beginning of this study, literature reviews involved in gathering and reviewing the factors of delays and cost overruns in construction projects. This study involved in collecting and gathering data which are collected from eleven different projects and grades of contractor. The interviewed was carried out with experienced personnel involved in managing construction projects in order to comprehend the situations encountered during the cycle life of the project. Figure 3.1 summarized the approach in completing this study.


Figure 3. 1 Methodology Chart

3.2 DATA COLLECTION

This study involved in collecting and gathering data which is, the data collected from eleven different types of construction projects with different grades of contractor. The data was carried out by interviewing with experienced personnel involved in managing construction projects in order to comprehend the situations encountered during the cycle life of the project.

The interviews were conducted with the consultants, contractors with over 5-10 years of experience in the construction industry and private clients or owners. The area of concerned are implied the high position, lengthy years or work experience and educational background provided reviewer with enough knowledge of the construction industry with issues relating delays, cost overruns and risk involved of construction project. These interviews are to get opinions from clients, consultant and contractors of construction companies in regards to the factor and also the effects of construction project delays and cost overruns.

Classification of contractor grade is used to indicate the range of cost that are involved in the awarded projects. Table 3.1 shows the grade of contractor, category and the limit of tender or value or works according to the Contractor Registration Requirements and Procedures Handbook from CIDB Malaysia.

Grade	Limit of Tender / Value of Work
G1	Not exceeding RM200,000
G2	Not exceeding RM500,000
G3	Not exceeding RM1,000,000
G4	Not exceeding RM3,000,000
G5	Not exceeding RM5,000,000
G6	Not exceeding RM10,000,000
G7	No limit

Table 3. 1Summary of Grade (CIDB, 2016)

Thus, findings from the data for all eleven different of projects were combined and reviewing in order of duration of project delays and cost overruns according between grades of contractor. All these gathered information data were interpreted to compare the cause due to the delays and cost overruns in terms of all aspects. Sample of different projects and classification of contractor were collected and summarize in Table 3.2.

Grade of Contractor	Name of Projects	
G1	School Bus Stop	
	Radial Drainage Building	
G3	Construction and Maintenance Building	
	Pedestrian Walkaway	
G6	Masjid Al-Madaniah	
	Kuala Terengganu Bypass	
	Hospital Rembau	
G7	Paya Bunga Square	
07	East Coast Expressway (LPT2)	
	Kuantan Court Complex	
	Hospital Tampin	

Table 3. 2Name of projects and grades of contractor

3.3 DATA ANALYSIS

Data analysis is the process to record and evaluate all the result that get from the primary data collection. Besides that, the data analysis made up of the comparison of factors and impact on construction with time and cost overruns on grades of contractor.

By analyzing the data, the relationship between delay factor and cost overruns to a construction in Malaysia can be established. Condition of contract (JKR203A) by the Public Works Department (PWD) is used as reference for analyzing this study. Clause on delay and extension time (Clause 43) is tabulated in Table 3.3. Table 3.4 (Clause 50) summarized clause of suspension of works while Table 3.5 provided clause of amendment (Clause 70). Another clause for analyzing delay factor is Clause 5 – Superintendent Officer's Instruction (Table 3.6). Clause 80 (Table 3.7) on Restriction and Procedure on the use of Imported Materials and Goods play a major role in contributing to delay and cost overruns.

Table 3. 3Clause on delay and extension of time (PWD, 2010)

Cla	use 43- Delay and Extension of Time
a	Force majeure as provided under clause 58
b	Inclement weather
С	Suspension of works under clause 50
d	Direction given by the S.O. consequential upon disputes
e	S.O.'s instructions issued under clause 5
f	Contractor not having received in due time instructions in regard to
	the nomination of subcontractors and supplier provide in the contract
g	Delay in giving possession of the Site as provided under clause 38.4
h	Delay on the part of tradesman or others engaged by the Government
i	Contractor inability for reason beyond his control
j	Delay on the part of the Sub-contractor and Nominated Supplier

Table 3. 4Clause on Suspension of Works (PWD, 2010)

Clau	Clause 50 – Suspension of Works		
a.	The S.O instruct the Contractor to suspend part or all of the works at any time		
b.	Contractor shall suspend part or all of the works and protect, store and secure the		
	works against any deterioration loss or damage		
c.	During suspension period, the obligations under contract still running as usual and		
	maintain insurances and performance bond		
d.	The S.O may instruct the Contractor to resume the works at any time, contractor		
	shall resume works and examine the loss of works during suspension of time.		

Table 3. 5Clause on Amendment (PWD, 2010)

Clause 70 - Amendment

Stated that no modification, amendment of the provision of contract shall be effective unless made by mutual consent and made in writing by way supplementary agreement specifically referring the contract. The provision in respect of such amendment, variation or modification shall be supplement and be read as integral part of the contract and full force and effect to all parties involved.

Table 3. 6Clause on Superintendent Officer's (S.O) Instruction

Clause	5 – S.O's Instruction
a.	the Variation as referred to Clause 24
b.	any discrepancy in or between the Contractor Documents as referred to in
	Clause 8.2(b)
c.	the removal from the Site of any materials or goods brought thereon by the
	Contractor and the substitutions of any other materials or goods
d.	the removal and/or re-execution of any works executed by the Contractor
e.	the dismissal from the Works of any person mentioned in Clause 23.6 hereof
	employed thereupon
f.	the opening up for inspection of any work covered up
g.	the amending and making good of any defects whatsoever under Clause 48
h.	any matter which is necessary and incidental to the carrying out and completion
	of the Works under this Contract and
i.	Any matter in respect of which the S.O is expressly empowered by this
	Contract to issue instructions.

 Table 3.7
 Clause on Restriction and Procedure on use of Imported Materials & Goods

Clause	e 80 – Restriction and Procedure on use of Imported Materials and Goods
	The contractor shall own cost entirely substitute any materials including making
80.3	any necessary sub-sequential changes or adjustments to the design of works to
	accommodate.

Amendment respectively be entitled to an extension pursuant to the reasons for the delay beyond its control in accordance with the relevant provisions of this clause. From this analysis, it is possible to know the factors that often occur in a construction against delay and cost overruns through the data provided in chapter 4.

3.4 DATA INTERPRETATION

On interpretation data, it involves a conclusion on the analysis that has been done at the stage before this. Additionally, suggestions can be simply proposed to improve this study.

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

Cost overruns can be characterized as when the task goals are not accomplished inside assessed spending plan and delay can be defined as time overrun of extension of time to complete the project. Overrun costs can also be characterized as unattainable tasks in the planned expenditure plan. The deferred cost is the proportion of the agreement to increase the total cost of the contract agreement at the initial stage of project construction. So from this research or study that be related the risk affected to a construction when occur this predicament. However, proper selection of contractor for a construction or project of the good previous experience would contribute to make the completion of construction on time and cost effective.

4.2 DELAYS AND COST OVERRUNS OF CONSTRUCTION

Eleven projects were chosen to demonstrate the causes delay and cost overruns. The projects were categorized by summary of grades by CIDB and Public Works Department (PWD203A) are used to categorize the causes of delays and cost overruns.

4.2.1 Bus Stop at SMA Sultan Zainal Abidin, Kuala Terengganu

The contract was awarded to contractor Grade G1 to build and construct a bus stop in front of SMA Sultan Zainal Abidin, at Kuala Terengganu. The scheduled date of completion was June 24, 2017 but was extended to September 10, 2017. The delay recorded was 11 weeks due to Clause 43. Table 4.1 summarized the reasons of delays together with their extension of time.

Table 4. 1	Clauses	, Reasons	and Per	iod of	f Del	lay
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Clause	Reasons	Period of Delay
43(c)	Instructor's Instruction	7 weeks
	Problem in site (utility)	1 weeks
43(d)	Ramadan Month (half day worker)	2 weeks
	Eid al-Fitr	1 weeks

Explanation on Clause 43 of JKR203A were tabulated in Table 4.2.

Table 4. 2Clauses for Bus Stop at SMA Sultan Zainal Abidin, Kuala Terengganu
Project

Clause 43	Explanation	
- Delay & Extension of Time		
	Instruction from the S.O. The contractor shall make good	
12(a)	any deterioration or defect in or loss of the works which	
43(0)	has occurred during the suspension and take all necessary	
	actions to mitigate the expenses incurred.	
	Consequential upon disputes with neighboring owners	
(2(1))	provided the same is not due to any act, negligence or	
45(d)	default of the contractor or any sub-contractor,	
	nominated or otherwise.	

4.2.2 Radial Drainage, Kuala Terengganu

This contract purpose was to build a radial drainage for a building and awarded to contractor Grade G1. The original contract price was RM133, 680.00 and the final contract price was RM141, 700.00. Cost overruns was recorded at RM18, 232 and was due to Clause 5. Table 4.3 summarized the reasons of cost overruns together with their reasons.

Table 4. 3Reason and Additional cost

No.	Description	Cost (RM)
1.	Work on supplying and laying premix (bituminous	
	Macadam) as thick as 50mm, after compressing and	
	watering 'Tack Coat' with 0.435 liters per meter over	17,200.00
	road surface and crusher run as directed by	
	Superintendent	
	Subtotal	17,200.00
	GST 6%	1,032.00
	Total	18,232.00

Explanation on Clause 43 of JKR203A were tabulated in Table 4.4

Clause 5 - S.O's Instruction	Explanation		
	The S O may from time to time issue further drawings details		
	and/or written instructions (all of which are hereafter		
5(d)	collectively referred to as S.O instruction in regard to :		
	• The removal and/or re-execution of any works		
	executed by the contractor.		

Table 4. 4Clause for Radial Drainage, Kuala Terengganu Project

4.2.3 Construction and Maintenance of Building, Kuala Terengganu

This contract was awarded to contractor Grade G3 to carry out the construction and maintenance of buildings in Kuala Terengganu. The scheduled date of completion was January 12, 2015 but was extended to Mac 2, 2015. The delays recorded was 7 weeks due to Clause 43. Table 4.5 summarized the reasons of delays together with their reasons.

Clause	Reasons	Period of Delay
43(b)	Constant rainfall makes maintenance work difficult	2 weeks
43(j)	Delay of supply suppliers as approved by the scope of work changes	5 weeks

Table 4. 5Clauses, Reasons and Period of Delay

Explanation on Clause 43 of JKR203A were tabulated in Table 4.6.

Table 4. 6Clauses for Construction and Maintenance of Building,

Clause 43 - Delay and Extension of Time	Explanations
43(b)	An exceptionally inclement weather
43(j)	Delay on the part of the Nominated Subcontractor and/or Nominated Suppliers to perform their works, due to reasons as stated above in sub-clauses.

Kuala Terengganu Project

4.2.4 Pedestrian Walkaway, Kuala Terengganu

. The contract was the Physical Black spot Project 2017 (Pedestrian Walkaway). This contract awarded to contractor G3. The original contract price was RM377, 254, 000 and the final contract price was RM380, 700, 000. Cost overruns was recorded RM2, 746 was due to Clause 5. Table 4.7 summarized to reasons of cost overruns together with their reasons.

No.	Description	Cost (RM)
1.	Supply and install 1830mm x 1200mm sized signage as directed	830.00
	by the Superintending Officer	
2.	Supply and install 600mm x 600mm sized signage as directed by	350.00
	the Superintending Officer	
3.	Painting on yellow plots	500.00
4.	Painting the pedestrian crossing line (Zebra Yellow Crossing)	300.00
5.	Works of removing existing yellow lines using paint (Black	360.65
	Color)	
6.	Works cutting existing signboards and closing existing holes	150.00
	using concrete	
7.	Work on supplying and installing signage (No Parking)	100.00
	Subtotal	2,590.56
	GST 6%	155.44
	Total	2,746.00

Table 4. 7Reasons and Additional Cost

Explanation on Clause 5 of JKR203A were tabulated in Table 4.8.

Table 4.8	Clause for Pedestrian	Walkaway, Kuala	Terengganu Project
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Clause 5 - S.O's Instruction	Explanation
	The S.O may from time to time issue further drawings, details and/or written instructions (all of which are hereafter
5(d)	 collectively referred to as S.O instruction in regard to : The removal and/or re-execution of any works executed by the contractor.

4.2.5 Masjid Al-Madaniah, Subang Jaya, Selangor

The contract was construction of Masjid Al – Madaniah, Subang Jaya received approval to build in September 2015 and was awarded to contractor G6. The work at site started in May 2017 and expected to be completed in November 2019. The construction experienced delay for three month due to approval for the local authority. Change of government also contributed to delay in the construction progress. Extension of time was awarded according to Clause 45 (Table 4.9). The project is expected to be completed by year 2020. Explanation on Clause 45 of Condition of Contract were tabulated in Table 4.9.

Clause 45 - Delay and Extension of Time	Explanation
45(f)	Delay in receipt of any required permission or approval of any statutory body or local authority which the Contractor has taken all practicable steps to avoid or reduce.
45.2	Contractor has incurred or is likely to incur direct loss and/or expense beyond that reasonably contemplated and for which the contractor would not be reimbursed by a payment made under any provision in this contract.

Table 4. 9Clauses for Masjid Al-Madaniah, Subang Jaya, Selangor Project

4.2.6 Kuala Terengganu Bypass, Kuala Terengganu

For this construction project were handled by contractor Grade G7 and no limitation for the value of works. The project was worth RM321 million and of that value, RM167 million was the contract cost while the cost of land acquisition was RM154 million. The road started from Simpang Tok Molor, Jalan Tok Adis (T12) to Kampung Durian Burung at Jalan Persekutuan FT03 Kota Bharu - Kuala Terengganu. The project was expected to be completed by January 2019.

With this construction it will benefit 70,000 residents, especially residents in the Bandar Baru Bukit Besar development area. In terms of time savings, normally for the route from Kuala Ibai to Durian Burung during peak times, it takes 30 minutes to travel. After the completion of the Kuala Terengganu Bypass route, travel time can be reduced to 10 minutes. The Kuala Terengganu Bypass solution was delayed by refusing settlers. The project has encountered a number of obstacles, including the replacement of the borrower in the plot where the shortcut will be built. Construction of the bypass will persist, the project will only be completed by July 2020, compared with the original deadline in January 2019. The delay was awarded according to Clause 43(g). Explanation on Clause 43 of JKR203A were tabulated in Table 4.10.

Clause 43 - Delay and Extension of Time	Explanation
	Delay give possession of the Site as provided under clause 38.4 of any delay in giving possession of the
43(g)	site from the "Date of Possession," as stated in the Letter of Acceptance or delay in giving any section or part of the site provided.

Table 4. 10Clause for Kuala Terengganu Bypass Project

4.2.7 Hospital Rembau, Negeri Sembilan

The contract was to build a Hospital Rembau and awarded to contractor grade G7. The government was forced to incur an additional cost of RM8 million following the delay in the construction of Rembau Hospital. The original cost of RM96 million, was now rising to RM104 million and should be completed in September 2017.

The hospital's construction project covers an area of 19.4 hectares. The construction work has made 85 percent progress. Construction of the hospital has a design problem at initial stage that caused the project to delay. Eventually, the construction was completed in June 2018 and began operations in September 2018. Explanation on Clause 80 of JKR203A were tabulated in Table 4.11

Clause 80	
- Restriction and Procedure on use	Explanation
of Imported Materials and Goods	
80.3	The contractor shall own cost entirely substitute
	any materials including making any necessary
	sub-sequential changes or adjustments to the
	design of works to accommodate.

Table 4. 11Clause for Hospital Rembau Project

Based on the problems in the construction of this hospital project, it will have an adverse impact on the contractors who run the project because the contractor is likely to be blacklisted and penalized. Therefore, contractor achievement and client confidence in a project will be less. This project as categorized as delay over the construction period which is increased due to problems that occur and result in cost overruns and that it has not agreed on the agreed contract at the contractor selection stage.

4.2.8 Paya Bunga Square (PB Square), Kuala Terengganu

This contract was awarded to contractor Grade G7 to build a shopping complex and government office called as Paya Bunga Square. Delay and cost overruns occurred during the construction period. The original contract price was RM141, 867, 000 and the final contract price was RM150, 867, 000. The scheduled date of completion was July 21, 2013 but was extended to May 8, 2014. The delay recorded was 36 weeks due to Clause 43. The main delays were due to stop work order and supply of precast of the glass fiber reinforced concrete (GRC). Table 4.12 and 4.13 summarized the reasons of delays together with their reasons.

Table 4. 12Reason and Penalty Cost

No.	Description	Penalty Cost (RM)
1.	Fines on Contractors	17,500 x 291 days
	Total	5,092,500.00

Clauses	Reasons	Period of Delay
43(b)	Constant rainfall makes maintenance work difficult	4 weeks
	Instructor's Instruction	7 weeks
43(c) Ramadan Month (half day worker)		2 weeks
	Eid al-Fitr	1 weeks
43(d)	Problem in site (utility)	4 weeks
43(f)	Problem with sub-contractor and/or suppliers	5 weeks
43(j)	Delay of supply suppliers as approved by the scope	7 weeks
	of work changes	

Table 4. 13Clauses, Reasons and Period of Delay

Explanation on Clause 43 of JKR203A were tabulated in Table 4.14.

Clause 43	Explanation	
- Delay and Extension of Time	Explanation	
43(b)	An exceptionally inclement weather	
43(c)	Instruction from the S.O. The contractor shall make good any deterioration or defect in or loss of the works which has occurred during the suspension and take all necessary actions to mitigate the expenses incurred.	
43(d)	Consequential upon disputes with neighboring owners provided the same is not due to any act, negligence or default of the contractor or any sub- contractor, nominated or otherwise.	
45(f)	Delay in receipt of any required permission or approval of any statutory body or local authority which the Contractor has taken all practicable steps to avoid or reduce.	
43(j)	Delay on the part of the Nominated Subcontractor and/or Nominated Suppliers to perform their works, due to reasons as stated above in sub- clauses.	

Table 4. 14Clauses for Paya Bunga Square, Kuala Terengganu Project

4.2.9 East Cost Expressway Project Phase 2 (LPT2)

The East Coast Highway 2 connects Jabor, Kemaman to Kampung Gemuruh, Kuala Lumpur is 184 km was supposed to kick start in 2006 and completed in 2009 and awarded to contractor Grade G7. This project were postponed and delayed and recommenced in 2011. Finally, the project completed in September 2014.

This project was delayed because of the amendments in design and structure. The additional allocation was for the purchase of land and rising prices for raw materials. Besides that, the project which was supposed to have been completed in 2009 was also delayed because the additional allocation had to come from the 11th Malaysia Plan (11MP) while the initial project was funded under 10MP.

Additional cost involved was RM800 million in order to changes on the road alignment and for the purpose of entering the new highway design, to build toll plazas and the Rest and Recreation area. Clauses involved are Clause 45.1(g) and Clause 50.2(c) (Table 4.15).

Clauses	Explanation
Clause 45.1(g) - Delay and Extension of Time	Purchase of land which include in this clause that by reason of delay in giving possession of the site as provided.
Clause 50.2(c) – Interim Payments	The value of any goods or unfixed materials delivered to or adjacent to the Site for use or to be incorporated into the works.

Table 4. 15Clauses for East Coast Expressway (LPT2) Project

4.2.10 Kuantan Court Complex, Pahang

The new court complex in Bandar Indera Mahkota, Kuantan was originally priced at RM157.3 million. This contract was awarded to contractor G7. The new court was to replace the old complex in Jalan Masjid, Kuantan dan came under the purview of the Prime Minister's Department Division of Legal Affair.

The construction of the complex was delayed for 560 days. The project started on July 8, 2009 with a contract period of 78 weeks but was only completed on July 17, 2012 adding to the total project period to 158 weeks.

Besides that, the defects found during the Defect Liability Period (DLP) has not been fixed yet and added that maintenance work is scheduled during DLP. The Public Works Department (PWD) needed to monitor construction projects so they would run more smoothly. Clause involved for the extension of time is 45.1(e) (Table 4.17).

Clause 45 - Delay and Extension of Time	Explanation
45.1(e)	This issues provided that such instructions are not issued due to any default or breach of contract by the Contractor or any sub-contractor.

The construction of the Complex was delayed and also the cost has increased by RM19.56 million because of the poor planning issue in design phase and scope of works. Inappropriate design and practical construction, while construction work is not in compliance with contract specifications or drawings.

4.2.11 Hospital Tampin, Negeri Sembilan

This project was awarded to contractor G7 to build Hospital Tampin that worth RM138.39 million in Negeri Sembilan and failed to complete the project within three years since the construction started in 2009. It was postponed for 150 days even after the initial grant of 344 days. Design and build methods, contractor was fully responsible for design and project supervision including design, construction, completion, equipping, commissioning and maintenance of the Tampin Hospital

It is established that one of the two agencies operating at the hospital was "not available" and that the hospital suffered some "faulty design" case. Besides that, failure of contractor in technical assessment has affected the timely project completion. Liquidated and Ascertained Damages (LAD) amounting to RM3.84 million has been imposed on the contractor for the delays.

This hospital has experienced a number of defects such as cracks in the walls, dirty water and a non-functioning operating theater. Ministry of Works must report to the relevant authorities if they find that construction projects to be low quality, and the forensic audit should be conducted by experts on the wall cracking of Tampin Hospital.

Table 4. 17	Clause for	[•] Hospital	Tampin,	Negeri	Sembilan	Project
			. .	<u> </u>		

Clause 80				
- Restriction and Procedure Use of	Explanation			
Imported Materials and Good				
	The contractor shall own cost entirely substitute			
80.3	any materials including making any necessary sub-			
60.5	sequential changes or adjustments to the design of			
	works to accommodate.			

Its revealed inefficiencies in the project implementation and improper contract administration for the new hospital. The main causes of the delay for this project was the quality and some improper design cases due to lack of supervision or disability of consultants. Besides that, among the disabilities were wall fractures at 1,182 points around the hospital complex, unsuitable water tank designs that resulted in the presence of coliform bacteria in water samples from the A & B Block water tank. Because of these, the contractor was slapped with Clauses 80.3 (Table 4.17).

4.3 COMPARISON PROJECTS BETWEEN GRADE CONTRACTORS

4.3.1 Duration of Project Delays According To Grade of Contractor

Table 4.18 summarized the extension of time for Grade G1, G3 & G6. The delays range from 7 week, 11 week and 53 weeks, respectively.

Grade of		Contract	Actual	Delays
Contractor	Name of Contract	Deadline	Completion	(weeks)
G1	Bus Stop SMA Sultan Zainal Abidin, Kuala Terengganu	June 2017	Sept 2017	11 weeks
G3	Construction and Maintenance Building	Jan 2015	Mac 2015	7 weeks
G6	Masjid Al-Madaniah, Subang Jaya, Selangor	Nov 2018	Jan 2020	53 weeks

 Table 4. 18
 Duration of Project Delays According To Grades of Contractor

Name of Contract	Contract	Actual	Delays
Name of Contract	Deadline	Completion	(weeks)
Kuala Terengganu Bypass	Jan 2019	July 2019	24 weeks
Hospital Rembau	Sept 2017	June 2018	40 weeks
Paya Bunga Square	July 2013	May 2014	36 weeks
East Coast Expressway (LPT2)	Dec 2011	Sept 2014	180 weeks
Kuantan Court Complex	July 2009	July 2012	92 weeks
Hospital Tampin	Mac 2013	Mac 2014	48 weeks

 Table 4. 19
 Duration of Project Delays According To Grade of Contractor G7

Six projects for Grade G7 recorded delays ranging from 24 weeks to 180 weeks due to variety of causes. Each contract has different value and scope of work which explained the different of time extension given. Table 4.20 summarized the extension of time for Grade G7.

4.3.2 Cost Overruns According Between Grades of Contractor

Nama of Cantuast	Contractual	Actual Costs	Additional	Percentage	
Name of Contract	Costs (RM)	(RM)	Cost (RM)	(%)	
Radial Drainage,	133 680 00	141 700.00	18 232.00	13.64	
Kuala Terengganu	155, 000.00	141, 700.00	10, 252.00	15.04	
Pedestrian					
Walkaway, Kuala	377, 254.00	380, 700.00	2, 746.00	0.73	
Terengganu					

Table 4. 20Cost Overruns for Contractor Grade G3

The cost of the Radial Drainage project increased by 13.64% due to design change. However, small increase (0.73%) recorded in the Pedestrian Walkaway project. This small percentage was due to discrepancy in drawings. Summary of these two project under Grade G3 was presented in Table 4.21.

Name of Contract	Contractual	Actual Costs	Additional	Percentage
	Costs (RM)	(RM)	Cost (RM)	(%)
Hospital Rembau	96.0 M	104.0 M	8.0 M	8.00
Paya Bunga Square	141.9 M	150.9 B	9.0 M	6.34
East Coast				
Expressway	2.0 B	2.09 B	800 M	40.00
(LPT2)				
Kuantan Court	157 3 M	176.8 M	19.6 M	12 43
Complex	137.3 14	170.0 11	17.0 101	12.15
Hospital Tampin	138.4 M	142. 2 M	3.8 M	2.77
 ታእ <i>ለ</i> ነ1ነ				

Table 4. 21Cost Overruns from Contractor Grade G7

*M – million

B - billion

Table 4.22 summarized the project's cost under Grade G7. The highest percentage of additional cost for this Grade G7 are 40.00% which belongs to the East Coast Expressway (LPT2) with additional cost are RM800 million. The additional cost was due to the land acquisition process. The lowest percentage of cost 2.77% was recorded by the Hospital Tampin project.

4.3.3 Comparison between Causes Due To Delay and Cost Overruns

The data from the projects selected in Table 3.3 in Chapter 3 were used to identify the reasons for the period of delays, the total cost overruns and the clauses involved in the project construction standards set by the PWD according to the contractor grade and value of works. Table 4.22 summarized the causes of delays and cost overruns for the related projects from this study.

Figure 4.1 summarize the cause of delays from the sampling data collected while Figure 4.2 exhibit the percentage of delay causes. From the findings, the main reasons for delays is due to design problem at construction stage. Grade G7 recorded the highest number of delays. Design problems caused rework in construction projects while rework is the prevalence cause of delay and disruption due to the loss of productivity.

Design problem are factors that limit the range of potential design solutions that can be adopted. In the early stage of a project only some of these constraints may be known, while others become apparent as the design progresses. Design problem may be inherent in the type of building required, or the site, or they may be imposed by the client or a third party. It is often argued that design constraints are actually helpful in the development of a design, as they limit the number of feasible options and point towards an obvious solution.

Grade of Contractor	Projects		Causes of Delays		Causes of Cost Overruns
Gl	Bus Stop SMA Sultan Zainal Abidin Ladang, Kuala Terengganu	•	Instructor's instruction Problems in site (utility)		
01	Building Radial Drainage, Kuala Terengganu			•	Removal and re- execution of any works by the contractors
G3	Construction and Maintenance Building, Kuala Terengganu	•	Inclement Weather (environment) Delay in supply by suppliers Scope works changes		
	Pedestrian Walkaway, Kuala Terengganu			•	Supply and installation of construction items
G6	Masjid Al-Madaniah, Subang Jaya	•	Permission or approval from local authority		
G7	Kuala Terengganu Bypass	•	Refusing settler and encountered number of obstacles		

Table 4. 22Summary of Causes of Delays and Cost Overruns

	Hospital Rembau,	•	Design problems	•	Payment leading to
	Negeri Sembilan				deferral work
		•	Inclement weather	•	Fines the
			(environment)		contractor
		•	Instructor's		
	Paya Bunga Square,		instruction		
	Kuala Terengganu	•	Delay to sub-		
			contractors and		
			supplier to do		
			works		
	East Coast Expressway (LPT2)	•	Amendments of	•	Purchase of land to
			design and structure		connecting the
		•	Allocation from		highway
			government	•	Rising prices for
					raw materials
		•	Poor planning		
	Kuantan Court	•	Not compliance		
	Complex Pahang		with the contract		
	complex, I analig		specifications of		
			drawings		
	Hospital Tampin, Negeri	•	Design faulty	•	Fines the
	Sembilan				contractor



Figure 4.1 No. of Projects versus Causes of Delays



Figure 4. 2 Percentages Causes of Delays

The next main causes of delay are inclement weather and instructor's instruction. The inclement weather is the commonly phenomena in Malaysia. The impact of this cause affected the timeline or schedule of construction projects, as this provision is stated in the Clause 43 (b) (the extension of time in inclement of weather) in the Condition of Contract JKR203A.

Where there is a delay to a construction project which impacts on the completion date, and that delay was not caused by the contractor, it may constitute a relevant event (or compensation event), for which the contractor may be entitled to an extension of time and in some cases loss and expense.

Some contracts list exceptionally adverse weather conditions as one such event. Even if it is not specifically mentioned however, it may still qualify as a neutral matter that adversely affects the completion date.

Where there is a delay to a construction project which impacts on the completion date, and that delay was not caused by the contractor, it may constitute a relevant event (or compensation event), for which the contractor may be entitled to an extension of time and in some cases loss and expense.

Rising cost of raw materials recorded as the common cause of cost overruns. This is due increase in crude oil prices, energy cost, local taxes and charges, cost of fuel and power supply, cost of transportation and the high cost of labor. In order to mitigate the cost overruns, the progress of projects should be continuously monitored and appropriate adjustments to be made and recorded accordingly.

The second main causes of cost overruns in term of payment. The slow or delayed payment to contractors for construction project completed works are common complaint of contractor about the project's client. This cause appeared to occur in government funded projects because of a typically slow payment procedure. The public sector around the world is more bureaucratic because the level of power and decision-making is centralized. The difficult for contractors to access the project objective because of the failure payment on time to contractors. The late payment does not only consume contractor's time and money, but it more importantly it can affect the trust relationship between contractors and the owner. In addition, an increase in the cost of projects as contractors increase their overhead cost to cover up that risks occur to their company.

51

4.4 EFFECTS OF COST OVERRUNS AND DELAY PROJECTS

Combined environmental factors and behaviors can lead to construction disputes. Projects are usually long term transactions with high uncertainty and complexity, and it is impossible to complete all the details and predict each contingency at the outset. As a result, circumstances often arise that are not clearly addressed by the contract. The basic factor that drives the development of construction disputes is uncertainty, contractual issues, and behavior.

Moreover, disruption and delays in construction project create the following consequences; negative social impact, misunderstanding causing dispute, time overrun, resources wasting in relation to equipment as well as labor, and work going beyond budget. Most construction contract deals with delays in construction projects and disruption through making provisions inside a contract that a contractor ought to make submission of claims for time extension and cost recovery after proper notification that events met are expected to or are resulting in delays to completion.

Besides that, the next main effects of delays and cost overruns are arbitration. In order of client and contract relationship factors escalate disputes to be settled by arbitration process. A competent third-party can settle the disputes in good way without going to the court.

In addition, delays and cost overruns also effected the stakeholders in construction projects. Its can effects the client, labor, contract, contract relationship-related, and external factors escalate disputes to be settled by the litigation process. The parties involved in the projects use litigation to settle disputes.

The most critical adverse effect of delays in construction projects is abandonment that could be temporary or in worse condition for permanent duration. The major causes of client related, consultant related, contractor related and external related may lead to project abandonment that will lead to delays in construction projects. Cost overruns have obvious effects for the key stakeholders in particular and the building construction in general. To the client, cost overruns implies added costs high over and above those initially agreed upon at the pre contract phase, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental or lease costs. To the professionals, cost overruns imply inability to deliver value for money and could well tarnish their reputations leading to loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non-completion and defamation that could jeopardize his/her chances of winning future contracts, if at fault. To the industry as a whole, cost overruns could bring about project abandonment and a drop in building activities, bad reputation and inability to secure project finance or secure projects at higher costs due to added risks.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION

A construction project is commonly acknowledged as successful when the aim of the project is achieved in terms of predetermined objectives that are mainly completed the project on time, within budget and specified quality in accordance with the specifications and to stakeholders' satisfaction. One of the most important problems that may arise in the construction project is delays and the magnitude of these delays varies considerably from project to project.

From the analysis data in Chapter 4, the main causes are the design problems during construction phase. The data recorded that this type of causes is the highest percentage among the others causes in term of number of projects. Grade G7 recorded the highest number of delays in term of this design problems. In spite of the fact that it is far-fetched that an undertaking can be delivered without any variation during the construction stage, a long process for preparing or processing the design changes arranges negative impacts on the duration of time and cost of a construction projects.

However, change is a necessary fact of a project. A design change is a form of change that will deviate the way the work was planned, budgeted or scheduled. Almost all building projects undergo various degrees of design changes through the project lifecycle. Changes in construction projects are inevitable in most construction projects to correct or modify original design or scope of work (Alnuaimi, Taha, Al Mohsin, & Al-Harthi, 2010).

Besides that, change in a project's design could be a piece of a construction project nature due to its intrinsic multifaceted nature and vulnerability. Design change makes delay as its needs be audited and affirmed by clients. In any case, this factor was found to cause cost invade in various developed nations. Lack of clearly defined project objectives and scope was mainly the cause of frequent change orders in construction projects in these countries.

The main causes of delays are inclement weather. These are affected materials supply in two ways: while importing materials from overseas via sea freight, and during delivery to the project site. Shipment via sea freight depends on the weather condition of source country of the materials, as it influences the loading. Moreover, it is not safe for ships to sail in the sea during bad weather.

As a result, delays are common during monsoon season. On the other hand, Malaysia is a tropical country with rain throughout the whole year, and the rain comes with little notice. Rain can prevent the supply of some materials to construction sites. For example, readymixed concrete suppliers do not produce concrete during the spells of rains, because the water ingress cannot be controlled. If heavy rain starts when concrete carrying vehicles reach the site, the concrete cannot be placed, because the concrete will have excessive water content, and hence be too workable or too weak (once hardened), or the concrete may even be washed away. As fresh concrete is perishable, there is no turning back once the cement in the concrete has been mixed with water. Such negative impact on schedule from undesired events like rainy weather seems to be common in tropical or semi tropical countries, like in Malaysia.

Furthermore, material cost change is possible in countries with unstable economic conditions. A change the material cost will change the whole project cost estimation. There are a couple of solutions for this matter: cutting cost of smaller projects to obtain the budget for the bigger and more important ones and collect all the needed material before

implementation. Further, it is sometimes more advantageous for the owner to start its own factory for producing the needed material and machinery.

In overall, the findings of this research about the predicament in construction, shows the causes and effects to a delays and cost overruns for different type of contract and grade of contractor. Therefore, the first and second objective that is to identify problems and risk effected the associated projects of delays and cost overruns had achieved.

5.2 **RECOMMENDATION**

From the findings of this research, the following recommendations are provided to ensure that delays and cost overruns on future projects are avoided or minimized. A comprehensive and systematic site investigation should be carried out at the design phase for avoidance of variations (additions or omissions) that may occur during the construction phase. All aspects of the change should be considered before construction begins to prevent improper changes and delays.

In this research, design problems are the main causes. So, all design discrepancies and errors as well as omission in design work must be completed with clearly defined scope of work before construction starts. Once the construction starts, surely the design cannot be change and if changes of design occurs, more consumption of time and cost will be needed and effect up the timeline of the projects.

Besides that, keeping construction projects within estimated costs and schedules requires sound strategies, good practices, and careful judgment. There are, however, steps that can be taken to minimize their causes and effects of time and cost overrun, the major one is using efficient project management tools and practices. Project management tools that can complete control over the planning of projects right from the start. In addition, it also can allow the effectively assign and schedule resources. By doing this, it is critical in paving the way to project success.

In term of prescriptions for the client, when selecting a contractor, the customer must make and ensure that the contractor is not selected because of the low offer but must be selected according to sufficient experience, technical capability, financial capability and sufficient workforce to carry out a construction project. Besides that, clients should not interfere frequently during the execution and keep making major changes to the requirements. This can cause inordinate delays in the project, clients should have the finances in time to pay the contractors after completion of a work. Therefore, clients should work closely with the financing bodies and institutions to release the payment on schedule, and clients must make quick decisions to solve any problem that arise during the execution.

Furthermore, for prescriptions for the consultant, when completely select the right contractor for a construction project, the consultant must include items such as duration of contract, mechanism to solve disputes, mechanism to assess the causes of delay, if there are any and risk management plans, consultant should monitor the work progress frequently by making inspection at appropriate times.

Besides that, contractor should not take over all the works at construction project because not have sufficient expertise and contractor should have-able site managers for the smooth and clearly planned execution or work. In addition, contractors must plan their work properly and provide the entire schedule to the clients for management of the project still follow the right schedule and without any cost overruns to a construction projects.

As the objectives of this study is to identify the relevant ways of minimizing the cost delays, cost overruns and risks involved of construction projects are provided which can be minimizing and ensure to avoid delay and hence, to avoid cost overruns due to delay.

57

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