

**CAUSES AND EFFECTS OF DELAY IN THE  
CONSTRUCTION PROJECT**

**NURSHAPIKA ADILA BINTI ADNAN**

**B. ENG(HONS.) CIVIL ENGINEERING**

**UNIVERSITI MALAYSIA PAHANG**

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Date : 20 JUNE 2018

CAUSES AND EFFECTS OF DELAY IN THE CONSTRUCTION PROJECT

NURSHAPIKA ADILA BINTI ADNAN

Thesis submitted in fulfillment of the requirements  
for the award of the  
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources  
UNIVERSITI MALAYSIA PAHANG

JUNE 2018

## **ACKNOWLEDGEMENTS**

Praise to the Almighty Allah the God of the Universe who gave me strength to complete this thesis. This piece of work would not become possible without His bless.

I would like to express my heartfelt gratitude to my supervisor, En Zahrizan bin Zakaria for his kind assistance, wise counsel, professional comments and suggestions throughout this final year project.

Greatest thanks to all respondents in the survey conducted, who participated in this questionnaire survey and patient enough to spent their precious time in replying the questionnaires, and my colleagues in the faculty who assist me during the data distribution. Your kind and generous help will always be in my mind.

Deepest thanks to my family especially to my beloved mothers, Mrs. Salmah binti Ismail and to my siblings for their constant support and prayers throughout the process of producing this project report. I would like to take this opportunity to express my appreciation to my friends. My special thanks to Muhammad Al Amin, Nur Fatihah, Nur Rabiatal Adawiyah and Nor Ain for their valuable advice, support and assistance throughout the period of my project.

Finally, I would also like to acknowledge each and every person who has contributed their effect in this study by whether means directly or indirectly. Without the contribution of all those mentioned above, this work would not have been possible, thank you to all of you.

.

## ABSTRAK

Penyiapan projek pembinaan yang mengikut masa adalah kriteria penting dalam menentukan kejayaan sesebuah projek. Kegagalan untuk menyiapkan projek mengikut masa akan mengakibatkan kelewatan dalam projek pembinaan. Keperluan untuk mengawal punca-punca kelewatan semasa proses pembinaan timbul apabila jumpal projek-projek yang mengalami kelewatan telah meningkat dari semasa ke semasa. Oleh itu, ianya penting untuk mengenalpasti punca-punca masalah ini pada permulaan projek pembinaan. Objektif kajian ini adalah untuk mengenal pasti sebab-sebab penangguhan dalam industri Pembinaan, untuk mengenal pasti kesan pengangguhan dalam industri pembinaan dan akhir sekali, kajian ini akan menilai cara-cara terbaik untuk memperbaiki masalah pengangguhan dalam industri pembinaan. Kajian ini menganbil pendekatan dan percubaan untuk menganalisis kesan ppengangguhan. Kajian menggunakan boring kaji selidik telah dijalankan untuk mengenalpasti sebab-sebab dan kesan terhadap kelewatan dalam projek pembinaan daripada perspektif pelanggan, perunding dan syarikat pembinaan. Kajian ini telah mengenal pasti sebab-sebab utama berlakunya pengangguhan dalam projek pembinaan daripada tiga puluh empat sebab-sebab, tujuh kesan yang menyumbang kepada kelewatan dalam pembinaan dan cara-cara untuk mengurangkan kelwatan dalam projek pembinaan. Perspektif pelanggan, perunding, kontraktor, bahan, peralatan dan masalah luaran yang berkaitan telah dianalisis dan didasarkan berdasarkan *Relative Important Index* (RII). Berdasarkan keputusan RII, sepuluh kedudukan tertinggi sebab-sebab berlakunya kelewatan dalam projek telah dihasilkan. Masalah berkaitan pelanggan merupakan penyumbang utama kepada penyebab berlakunya kelewatan dalam projek pembinaan melalui penglibatan atau campur tangan dari pelanggan semasa projek pembinaan sedang berlangsung. Tujuh kesan pengangguhan projek ialah melebihi kos yang ditetapkan, kelewatan masa, kekerangan kualiti kerja, disenarai hitam oleh pihak berkuasa, hilang minat oleh pemegang saham, gaji tidak dibayar oleh majikan, dan perlu menyusun semula jadual kerja. Projek melebihi kos dan masa yang ditetapkan merupakan kesan utama ke atas sesuatu projek apabila berlakunya kelewatan dalam projek pembinaan.



## **ABSTRACT**

A timely completion of the construction project is a major criterion of the project success. Failure to complete the project on time will ultimately result in delay. The need to control the causes of delays during the construction process comes out when the number of delay project has been increase from time to time. Hence, it is essential to identify the causes of this problem from the early stage of the construction project. The objectives of this study are to identify the causes of delay in the construction industry, to identify the effects of delay in the construction industry and finally to assess the best method to improve the problem of delay in the construction industry. This study takes an integrated approach and attempts to analyse the impact of delay. A questionnaire survey was conducted to identify the causes and effect of delay from client, consultant and Construction Company. This study identified the most important causes of delay from a list of thirty four causes, seven effect that contribute to construction project delay and recommendation the method to improve project delay. The perspective of client, consultant, contractor, material, equipment and external related problem has been analysed and ranked based on Relative Important Index (RII). Based on the RII result, the highest top ten ranking on causes of delay have been produced. Client related has the highest contribution to causes of project delay in project by client inference during the construction project. The seven effect of delay were cost overrun, time overrun, interior quality of works, blacklisted by relevant authorities, loss of interest by stakeholders, non-payment by employer and rescheduling of works. 'Cost overrun' and 'time overrun' has been the main effect to the project causes by project delay.

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## **LIST OF ABBREVIATIONS**

GDP	Gross domestic product
KPKT	Ministry of housing and local development
CIDB	Construction industrial development board
RII	Relative importance index
SCG	Special condition of contract
GCC	General conditions of contract
EOT	Extension of time

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The construction sector has been playing a significant role in the aggregate economy of our country in term of its contribution to revenue generation, capital formation and employment creation which ultimately support the gross domestic product (GDP) and the socio-economic development of Malaysia. Considering the substantial role of the construction sector in the economic development of Malaysia, it is necessary for Malaysia government to give attention and focus on construction sector for qualifying the title of development nation(Khan et al., 2014). However, many projects in Malaysia has experienced extensive project delays and exceed the time frame of the project.

Delay in the construction project is a common problem in Malaysian construction industry. There are many unpredictable factors resulting from various sources affecting construction projects (Nyoni et al., 2017).

Although there is no consensus on the factors affecting construction delay, it is generally understood that construction delay is the most critical problem causing failure to deliver the project in time, within stimulated budget constraint, and expected quality (KPKT, 2010).

All parties involved in the construction industry focus on the time, cost and quality of a project. It is important to keep the project on track to prevent the project from the delay. This research is carried out to study the causes and effects of the delay in the construction project in Malaysia.



## 1.2 Background of Problem

Delays in construction projects are problems faces in the entire world (Bangash, 2016). Project delay in the construction project can be identified as time overrun which is overrun beyond the time frame of the project in the contract. In the same line of argument, Awari et al (2016), defined that delay as the time overrun and cost overrun either beyond completion date specified in a contract or beyond the date that the parties agree upon for delivery of a project. Mohamad (2010) agitates that delay is an act or event that tends the time to complete or perform an act under the contract. There are many unpredictable factors that resulting in the project to delay.

Factor that causes delays on construction projects is a universal problem and often occur. By identifying possible delays, there is a better chance to manage and control possible causes through the life cycle of a project (Afshari et al., 2011). The success of a project is determined by cost, time and quality once the project is completed (Lessing et al., 2017).

In the year 2008, the construction sector grew 2.1% from the total of Gross Domestic Product (GDP), emanated mainly from the civil engineering sub-sector (BNM, 2009). GDP by the state showed that the state economic structure was varied and unique.

Delay becomes a problem that associates in the construction project. The need to control the factors of delays during construction process comes out when the number of delays project has been increased from time to time. When a project delay can no longer be absorbed by the client, it will lead to the project being abandoned. According to numbers released by Ministry of Housing and Local Government, about 115 abandoned housing projects are recorded since 1990 until June 2008 (Ministry of Housing and Local Government, 2009).

Regarding project delay, Malaysia government has acknowledged the construction delays and cost overruns problems as a big headache, especially with government-related funded projects. Minister of Public Work Department, Datuk Shaziman Abu Mansor, cited about RM200 million has been providing for the

construction industry to revive most of the abandoned government projects under economic Stimulus Package (Utusan Malaysia, May 2009). This showed that the Government always takes a cognizance of the important role of the construction to stimulate domestic economic activities and in enhancing economic growth in view of this linkage to construction-related industries.

### 1.3 **Problem Statement**

The delays in construction projects have become one of the most common problems in the industry that can cause a multitude of negative effects on the projects and its stakeholders. When project delays are unexpected, they are hardly manageable and have rather negative impacts on the project activities and outcomes. An expected delay will extend the overall duration of project activities and entails an increase in project cost. It produces time-associated cost effects that will increase the resource consumption and will require extra time upon reaching project success (Warudkar, 2016).

Delay in progress payment, slow decision making, poor communication between the consultant, inadequate information, conflicts between consultant parties and the mistake during construction are among the reason that can delay the construction project. This problem will lead to either extended or accelerate and therefore, incur an additional cost of the project.

In addition, the increasing of the oil price world, give the impact to the construction project. The cost of the construction also will increase because the price to buy material and to pay the labour salary will increase too. If the situation is left and nitrated, it will lead to the more serious problem in the future upcoming construction project in Malaysia. Furthermore, if this problem continuer, those were working in the construction industry will be facing numerous procedure and regulation before been awarded a construction project.

#### 1.4 **Objective**

The main objective of this research are:

- i. To identify the causes of delay in the construction industry.
- ii. To determine the effects of delay in the construction industry.
- iii. To assess the best method to improve the problem of delay in the construction industry.

#### 1.5 **Scope of Study**

This research will be focused on the following matter:

- i. This research will identify the cause of delay in the construction industry and will determine the effects of delay in the construction industry.
- ii. Based on the causes and effects of delay in the construction industry, this research will assess the best method to improve the problem related to delay in the construction industry.
- iii. The group of respondents for this research involved are the client, consultant and contractor companies that registered with Construction Industrial Development Board (CIDB).

#### 1.6 **Methodology**

In achieving these objectives, a research methodology is required. Following are the step of this research.

- i. The first step in this case study is to study the type of delay in the construction industry.
- ii. After that, this research will identify the causes of delay in the construction industry.
- iii. Then, this research will determine the effects of delay in the construction industry.

- iv. Assess the best method to improve the problem of delay in the construction industry.
- v. Data collection using the quantitative method. There are 4 sections in a questionnaire distributed to the parties involved in the construction industry.
  - Section 1: Demographic particular
  - Section 2: Cause of delay
  - Section 3: Effect of delay
  - Section 4: Method to improve
- vi. Data analysis using Relative Importance Index (RII) method.
  - This method was determined to establishing the relative importance of the various factor that contributes to cause, effect and method to improve in the construction industry.

### **1.7 Significant of Study**

The importance of this study is to detect the cause of delay in the construction project and to determine the effects of delay in the construction industry. Based on the cause of delay and the effect of delay in the construction project, this research will suggest the method of minimizing project delays in the construction project.

### **1.8 Expected Outcome**

Delay in the construction project is one of the foremost concerns of the construction industry. From this research, it is expected to give various information regarding the causes of delay, effects and method to mitigate delays in construction projects will be obtained. It is hoped that these findings will guide efforts to improve the performance of the construction industry and will be useful to the parties involved.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter covers the issues of the Malaysian construction industry, the factor that cause the delay in the construction industry, the effects of delay in the construction industry and also will discuss the method of minimizing project delays.

#### **2.2 The Malaysian Construction Industry**

The construction industry is an economic investment and its relationship with economic development is well posited. Many studies have highlighted the significant contribution of the construction industry to national economic development (Myers, 2013). Malaysia is actively working towards achieving a high-income status by 2020. This involves the intensive transformation of the economic structure. The government has outlined an economic roadmap to transform the country in order to be recognized as a developed nation. Since independence, the Malaysian economy has observed plans with five-year strategic thrusts. The strategic trusts are in line with the goal to become a high-income nation by 2020. Looking towards the 2020 target, the challenge is to sustain the impetus of robust growth. Specifically, this requires average growth of 6.0 % in GDP per annum during the Tenth Plan Period. To achieve this target, the economic sectors are to play significant roles. The construction sector is active and features prominently in terms of policy formulation and implementations (A.L Olanrewaju et al., 2015).

The construction industry is a growing industry in Malaysia. Fundamentally, construction activities are derived from the local economic activities in Malaysia. Construction of non-residential and residential buildings contributed between 40 to 55

percent of the total construction market between 2006 and 2009. The market revenues for building construction reached approximately \$7.21 billion in 2008 and \$6.67 billion in 2009, and it will potentially hit the \$9.00 billion mark by 2015 (Leong, 2010).

The construction industry is a major player in the economy, generating both employment and wealth (Sweis et al., 2008). However, many projects experience extensive delays and thereby exceed initial time and cost estimates (Durdyev et al., 2017).

### 2.3 Definition of Delay

In a construction project, delays can be such a problem and very serious issues for the parties involved such as client, consultants, and contractors. There are many negative effects that can occur as the result of the project delay. The construction industry is highly fragmented and is renowned for poor performance and productivity in comparison with other sectors (Durdyev et al., 2012). Often delays result in projects finishing late and running over budget. Construction delays and their effects are mainly to blame for the low performance in construction, as they are a common problem worldwide (Durdyev et al., 2017) [9]. This issue is a major problem in the construction industry not only in Malaysia but the phenomenon is a global problem for the construction industry worldwide (Noor et al., 2010).

Ministry of Housing and Local Government (KPKT) is the agencies who manage and monitor the residential construction in Malaysia. KPKT (KPKT, 2010) defines the project delay is the project who are experiencing delays in construction period where different gaps between the actual in progress sites work compared to the work scheduled which is between 10% to 30%. Delays in construction projects are problems faced in the entire world (Bangash, 2016).

Linguistically, delay refers to a period of time when something has to wait because of a problem that makes it slow or late. It also means a situation in which something does not happen when it should (OALD, 2010).

Delayed projects have negative repercussions on the final contract result because most of the construction contracts are associated with many expensive elements such as financial funding, equipment, and materials. Any delay in the project will be undoubtedly detrimental to both the owner and contractor alike (Rashed, 2008).

## **2.4 Type of Delay**

There is two type of delay in the construction project, non-excusable delays and excusable delays (Saleh Al Hadi Tumi, 2009). The terms of excusable and non-excusable come from the perspective of the contractor. A delay that is compensable is compensable to the contractor but non-excusable to the employer. On the other part, a delay deemed as non-excusable is compensable to the employer because it results in levying of liquidated damages.

### **2.4.1 Excusable Delays**

Excusable delays are divided into two: compensable and non-compensable delays. Compensable delays are caused by the owner or the owner's agents. While non-compensable delays 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 (Wa'el Alaghbari et al., 2008).

Excusable delays are caused by conditions that are reasonably unforeseen and not within the contractor's own control. Example of this kind of delay include:

- i. Labour strikes
- ii. Fires, floods, earthquakes and natural disasters
- iii. Change initiated by the owner
- iv. Errors and omissions in the plans, design document and specifications
- v. Differing site conditions or concealed conditions
- vi. Lack of action by governmental or oversight bodies
- vii. Intervention by outside agencies

#### **2.4.1.1 Non-Compensable Excusable Delays**

Fugar et al., (2010) stated in their recent research that non-compensable delays are delays that are produced by a third party. Such causes are acts of God, extraordinary weather, even political decisions by the government in its autonomous capacity.

Non-compensable excusable delays entitle a contractor to an extension of time only. Typically, this type of delay is caused by something beyond the control of either the contractor or the owner. For example, acts of God, unusual weather, and labour disputes will entitle a contractor to additional time to complete the work and is usually the contractor's only remedy. Contractors may agree to make a compensable delay a non-compensable one by waiving their right to delay damages in exchange for an extension of time, and generally, such waivers are valid (Admin, Non-excusable, Concurrent, and Non-compensable Excusable Delays, 2010).

#### **2.4.1.2 Non-Excusable Delays**

A non-excusable delay is a delay caused by the contractor or its suppliers, through no fault by the owner. The contractor is generally not entitled to relief and must either make up the lost time through acceleration or compensate the owner. Therefore, non-excusable delays usually result in no additional money and no additional time is granted to the contractor.

Non-excusable delay results from the contractor or his supplier. In this case, the contractor generally is not entitled to request an extension of the contract period or a compensation for the delay. The contractor may be compensated for the delay to accelerate the pace of work, and the owner is entitled to impose on the contractor demurrage, which will be deducted from his dues, which described in the contract. Liquidated damages are generally expressed as a daily rate that is based on a forecast of costs the owner is likely to incur in the event of late completion by the contractor (Fugar et al., 2010).



Majid et al. (2008) explained: “Understanding the underlined factors that contribute to causes of non-excusable delays would help in identifying the issues encountered by contractors during the construction process”. Generally, it is identified major contributing factors are materials, equipment, and labour that hampers the contractors to perform. Ruff et al. (2008) describe that flexible project management strategies i.e. turnkey and partnering arrangements and flexible contracting such as cost plus fee prove to be helpful in accommodating such changes. Turnkey and design built project structures are reported to be the best performers overall. Projects were reported to be more successful when mechanisms to promote partnering and team building introduced.

#### **2.4.1.3 Concurrent Delays**

According to Braimah (2008), the terms of “independent delays”, “serial delays” and “concurrent delays” are used to describe delays based on the interrelation of the above delay types with respect to their duration and time of occurrence. Independent delays are delays that occur in isolation or without other consecutive or simultaneous delays while serial delays occur in sequence consecutively and not overlapping with each other on a particular network path.

Concurrent delays referred as identification of two or more independent causes of delay happening at the same time period. The same time period where concurrency is evaluated sometime does not happen at the exact period of time. The duration of concurrency of the delays can be dependent on situations and circumstances. Concurrent delays are also described as multiple delay factors happening at one point of time so only one activity which is also the longest can be considered the rest will merge and become concurrent(Mohamed, 2015).

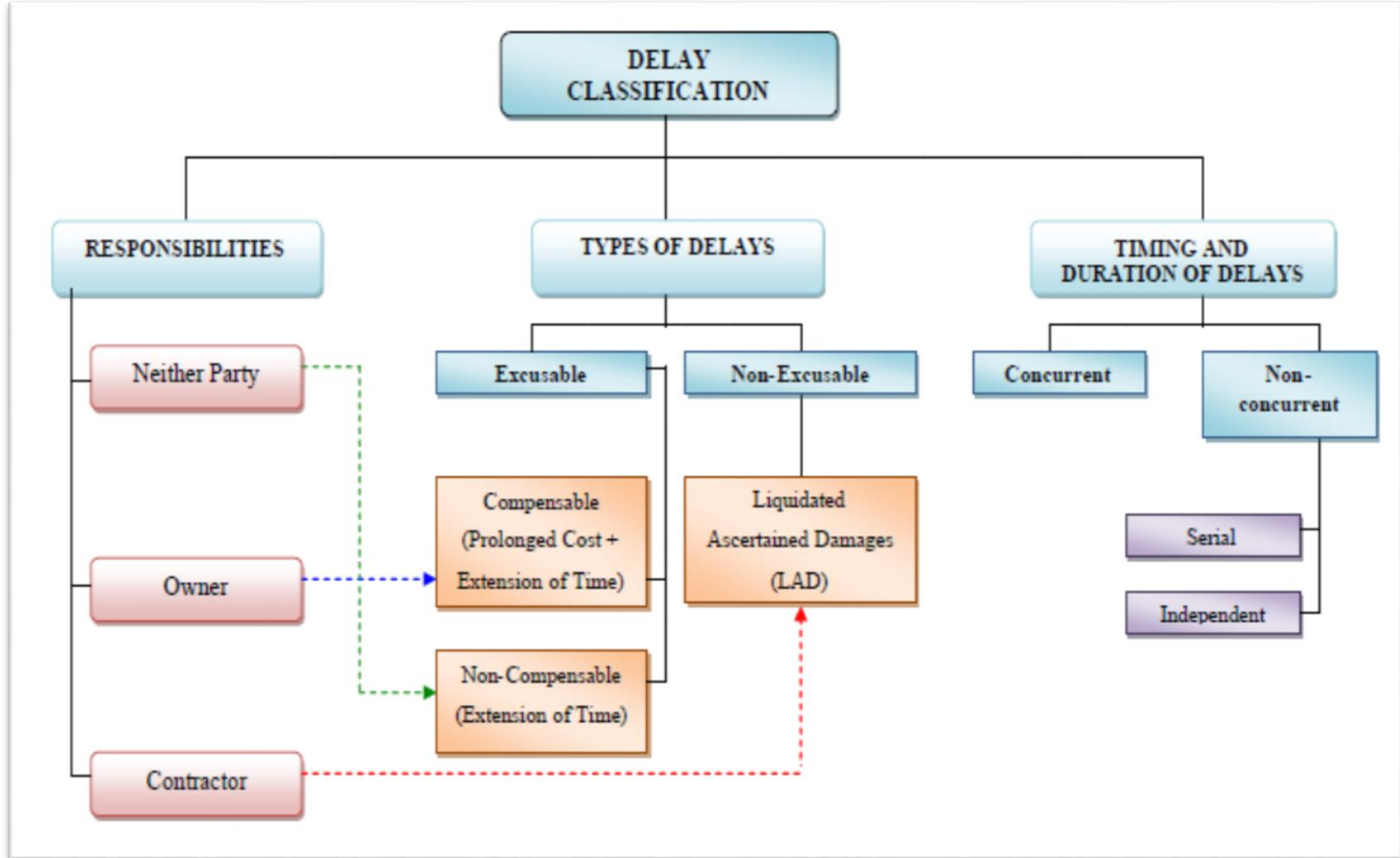


Figure 2.1 Classification of Construction Project Delays (Bramah N, 2008)

## 2.5 Factor that Causes of Delay

Factor that causes delays on construction projects is a universal problem and often occur. By identifying possible delays, there is a better chance to manage and control possible causes through the life cycle of a project (Afshari et al., 2011).

Doloi H et al., (2012) did research on Indian construction projects. A questionnaire and personal interview have formed the basis of their research. Factor analysis and regression modelling were used to examine the significance of their factors. From factor analysis most critical factor of construction delays are lack of communication, the insufficient site management and site coordination ranked third.

Keeping construction project within estimated costs and schedules requires sound strategies, good practices, and careful judgment. However, to the dislike of owners, contractors, and consultants, many projects experience extensive delays and thereby exceed initial time and cost estimates (A. Enshassi et al., 2009). According to T. Pourrostan et al., (2010), construction delay is a major problem facing the Iranian construction industry. They identified causes and effects of delay in construction projects. The most causes of delay were the delay in progress payment by client, change orders by client, financial difficulties by contractors, late in reviewing and approving design documents by client, problems with subcontractors, ineffective planning and scheduling of project by contractor, mistake and discrepancies in design documents, and bad weather.

Construction activity in Zimbabwe draws mostly on unskilled labour (Chigara et al., 2014). Nyoni et al., (2016), found that lack of experienced labour is also a common problem in the construction sector in Zimbabwe. Lack of highly skilled and trained workers in the construction industry in Zimbabwe could be attributed to high capital flight experienced in the country owing to economic hardships. This has seen more workers crossing borders in search of greener pastures.

Bangash (2016) analysed the causes of delays in construction projects in Pakistan and found that effective communication between parties and management skills are

critical items in contractor related factors. Anees et al., (2016) studied delay factors in the Indian building construction and concluded that the most important factors were the delay in payments, shortage of equipment and ineffective planning and scheduling [23]. Zewdu (2016) examined construction projects delays and their antidotes for the Ethiopian construction sector and revealed low-level application of techniques and software packages for project planning and time control.

Tumi et al., (2009), studied delays in construction projects in Benghazi city in Libya, this study said the problem of delay will not be solved unless measures have been taken. Administrative strict order to reduce this phenomenon through proper planning and oversight of good design activities and construction. One of the most important reasons that emerged from the study with regard to the reason for the delay in construction projects in Libya are: lack of effective communication; design errors; shortage of supply some materials; slow decision-making; financial issues; cash-flow problems during construction and increase in quantities (Tumi et al., 2009).

Fugar et al., (2010), investigate the causes of delay of building construction projects in Ghana to determine the most important according to the key project participants. All major stakeholders agreed that the top ten most important factors causing delay in Ghana are: delay in honouring payment certificates, underestimation of complexity of project, difficulty in accessing bank credit, poor supervision, underestimation of time for completion of projects by contractors, shortage of materials, poor professional management, fluctuation of price/ rising cost of materials, and poor site management.

Sweis G et al., (2008), studied the causes of delay in residential projects in Jordan and concluded that financial difficulties faced by the contractor and too many change orders by the owner are the leading causes if construction delay.

Abd El-Razak et al., (2008) in a similar study in Egypt found that the most important causes of delay are financing by contractor during construction, delay in contractor's payment by owner, design changes by owner or his agent during construction, partial payment during constructions and non-utilization of professional

construction management. The contractor and owner found to have opposing views, mostly blaming one another for delays, while the consultant was seen as having an intermediate view. The study showed there must be a collective work between the three parties to reduce the rate of delay in projects, and showed that the delay depends on the type and size of the project (Abd El-Razak et al., 2018).

Based on the questionnaire conduct by Hamidreza Afshari et al., (2011), they have ranked the top 20 causes of construction delays. The finding from the research show that the causes of construction delay were: not selecting competent construction subcontractors, poor management of the project changes, lack of mechanism for recording, analysing, and transferring project lessons learned, delay in forwarding material and equipment to the site, delay in awarding subcontractor's contracts, delay in detail design by project engineer subcontractor, delay in supplying shortage of the equipment, poor management of project site, poor management of project contract, issues in recruiting, attaining, and promoting expert and experienced project team, lack of effective communication with project stakeholders, delay in obtaining technical information from subcontractors, conflicts among performing organization, client, and consultant, slow decision making by project manager, detail design errors by project engineer subcontractor, delay in basic design by performing organization, lack of applying contractual tools, delay in basic design by project engineer subcontractor and conflicts in work schedule of the subcontractors.

Ibironke et al., (2013) study cause that leads to non-excusable delays in completing projects in Nigeria. Through work of survey to find out the reasons for the delay, its effects and ways to reduce them from the standpoint of consultants and contractors have been collecting and analysing information by weighted mean. Some of the most important factors that cause non-excusable delays are the insufficient number of equipment, change orders, poor design/delays in design, incompetent project team and improper planning and scheduling (Ibironke et al., 2013).

There is numerous factors that encourage delay on construction projects, however in the study conducted by Alsendi, (2015) state that the factors causing delay are ranked according to the mean index score. The factors include lack of funds to finance the project

to completion, changes in drawings, lack of effective communication among the parties involved, lack of adequate information from consultants, slow decision making and contractor's insolvency, variations. Also, there are project management problems, faults, and differences in contract documentation, equipment availability and failure, mistakes during construction, bad weather, and fluctuations in prices of building materials, incorrect overall organizational structure linking to the project and labour strike (Alsendi, 2015).

## **2.6 Effects of Delay in the Construction Industry**

Since Malaysia is adverting towards industrialization, the role of the construction industry is greatly enhanced. When the project is delayed, the client or user will have an impact not only the building cannot be used, but they had to postpone their early planning in addition to bear the cost overruns that will increase (Noor et al., 2010).

Delay in construction projects is considered one of the most of most common problem causing a multitude negative effect on the project and its participating parties (Awari et al., 2016). In the same line of argument, Divya et al., (2015) agitate that construction delay is considered to be one of the most recurring problems in the construction industry and it has an adverse effect on project success in terms of cost, time, interior quality of works and safety.

When the construction project delayed, it will give the serious effect to the client and stakeholders. Cost overrun is one of the effects of project delayed. Cost overruns refer to the excess of the actual cost that was planned or budgeted for the project from the conception phase to the construction and finishing phase. It can be referred to sometimes as cost escalation, cost increase or budget overrun (Singh, 2009).

When construction projects are delayed, the specific and overall cost of the project will certainly increase. This is due to the fact that prices of materials in the market fluctuate over time. Thus the amount that was budgeted for materials may increase when the delay occurs. Addition, exchange rates will affect the prices of materials purchased from other countries, increase in the price of labour. Moreover, if the delay is as a result

of changes in the design and rescheduling of works, the cost of the project will increase because the new design will be more expensive than the initial. And finally, the change of government policies over time will also lead to the cost increase of the projects particularly due to increase in tax rates(Mohamed, 2015).

Time overrun is one of the most common issues in the construction industry. It can be defined as the failure to complete a project within the estimated time (Ahmed et al., 2012). When the issue of time overrun occurs, the project completion time will be further extended beyond that which was estimated. The tendency is that it will lead to dissatisfaction by the owner or the clients or loss of interest by stakeholder. Sometime the contractor may lose the project as he will be seen as incompetent (Mohamed, 2015).

A study was carried out in Malaysia by (Aftab et al, 2011) on time overrun construction projects. They found out that a total of 30 construction projects were facing time overruns. Table 2.1 shows some example of project carried out in Malaysia that faced time overrun.

**Table 2.1 Examples of the project carried out in Malaysia that faced time overrun**

No.	Name of Project	Project Cost (Million RM)	Project Duration (Days)	Time Overrun (Days)	% Time Overrun
State of PERAK					
1	Construction of MRSM Kroh	33.6	504	335	66.47
2	Construction of MRSM Kuala Kangsar, Perak	40.3	545	4	0.73
3	Enlarge/ Upgrade of IKM Lumut, Perak	11.2	700	35	5
4	Construction of KKTm Lenggong, Perak	113.3	791	21	2.65
5	Fixing of Slipway Wind System, MIMET	1.3	265	68	25.66

Pourrostan et al., (2011) stated effects of delays are the consequences that occur when the reason of delay is unknown; they usually have the large impact on the completion of a project.

Sunjka et al., (2013) identified and defined the effects of delay and tabulated them as follows:

- i. Time overrun: When they are exceeded in the stipulated time necessary to complete the project
- ii. Budget overrun: When the end of the project at a cost higher than the stipulated budget
- iii. Poor quality: Poor workmanship or bad materials lead to the emergence of low quality
- iv. Bad Public Relations: When the delay occurs a bad reputation resulting for each party such as owner, consultant, and contractor.
- v. Total abandonment: If delay issues are not resolved timeously, delays in project execution could lead to total abandonment.

Kikwasi (2012) identified 14 effects of delays in Tanzania and ranked them as follows; time and cost overrun, negative social impact, waste of resource, arbitration, disputes, lead client to return the loans, poor quality, delay in making a profit for the owner, bankruptcy, litigation, create stress on contractors, total abandonment and acceleration losses (Kikwasi,2012).

When change order in the construction project, an extra cost would appear, such extra cost would be referred as a cost addition to fee, and it should always be acknowledged by all parties, further to that, all parties have to decide whether whom shall cover the additional fees, and would handle the price of delays, In other terms, the change in orders is equally in law to the original contract, and nowadays, only few construction projects proceeded without any sudden change in orders from either part or by being indispensable due to some unanticipated circumstance (Adnan et al., 2008).



## 2.7 Method to Minimizing Delay in the Construction Project

Through research done by Dinakar (2011), the analysis of the delay in the construction project, the last part of the survey was on measures to be taken on how to avoid delays in construction projects and the results show that the 5 highest ranking are conduct meeting to monitor progress more often, the latest technology should be used, using modern construction equipment that works well, use appropriate construction methods and have a strategic and effective planning such as have contingency allowance for emergency uses.

Another method that can be used to reduce project delay is to make sure that the project has a proper planning and scheduling. One key aspect of planning is attention to detail. Using a knowledgeable designer can help mitigate communication problems and cover details that might otherwise go ignored. Furthermore, in the planning stage, it is important to build in extra time for the project in order to deal with any delays that might arise, many of which are listed below. Although some project delays might be unavoidable, a carefully planned project will adhere much better to a timeline (Admin, 2016).

Good communication is absolutely key to the successful delivery of any project. It is almost impossible to exaggerate the importance of communication within an organization, and in particular within a project team, but all too often the issue is not given enough focus on attention. It is something that is assumed will just ‘happen’ during a project. In any project it is essential that the project team know what is expected of them; what they have to do, when they have to do it, and what budget and time constraints and quality specification they are working towards. A project team is generally quite a diverse group of people. Diversity within a project team can be cultural, geographical, organizational, functional, and age-related and so on. Project teams are usually thrust together to deliver a bespoke and unique benefit to an organization. Effective communication within such diverse groups is a challenge at the best of times. It is essential that all members of the team have regular and complete access to all information about the project; objectives, deliverables, plan, constraints, changes, risks, and progress (Barry, 2015).

When it comes to the construction industry, the workflow factor is important because it will impact the bottom line for better or worse. You need the sort of tools and strategies that will help you to optimize construction site workflow so that you can focus on what you do best without having to be concerned with issues relating to materials logistics. The right third-party solution will ensure that your materials are delivered on schedule, are stored in a secure location off-site until you need them and are safely delivered to your site when you require them. Whether you're working on a hotel project south of the border or a recreational centre across town, workflow matters. When it comes to getting projects done on time, you want equipment and materials delivered to the construction site on time. You can improve workflow at your construction site, therefore, by ensuring that products you need are available as needed. This will save you precious time and allow you to dedicate your energy to complete the construction project on time. Signing up with the right third party will ensure that there are no delays attributable to late deliveries. (Grossi, 2016).

All other things being equal, an increase in the productivity of labour would lead to a decline in the demand for that labour. This is because an increase in productivity means that the same amount of output can now be produced by a smaller number of workers. Productivity can be defined as the amount of a good that can be produced by one person in a given amount of time. When productivity goes up, each worker can make more units of a good in a day than any other time period. This means that an increase in labour productivity leads to decrease in the demand for labour and can minimize the project delay (Pohnpei, 2013).

## 2.8 Conclusion

The factor causes of project delay have been identified in the research are collected and group into six categories. The set of factors studied by different authors are collected and presented in Table 2.2.

**Table 2.2 Factor Studied by Different Authors**

No.	Author and Year	Major causes of the project delay
1	Dohoi H et al., (2012)	1. Lack of communication
		2. Insufficient site management
		3. Site coordination
2	T. Pourrostam et al., (2010)	1. Delay in progress payment by client
		2. Change orders by clients
		3. Financial difficulties by contractors
		4. Late in reviewing and approving design document by client
		5. Problems with subcontractors
		6. Ineffective planning and scheduling of project by contractor
		7. Mistake and discrepancies in design documents
		8. Bad weather
3	Chigara et al., (2014)	1. Unskilled labour
4	Nyoni et al., (2016)	1 Lack of experienced labour
5	Anees et al., (2016)	1. Delay in payment
		2. Shortage of equipment
		3. Ineffective planning and scheduling
6	Zewdu (2016)	1. Low application of technique and software package for project planning and time control
7	Tumi et al., (2009)	1. Lack of effective communication
		2. Design error
		3. Shortage of supply some materials
		4. Slow decision making
		5. Financial issues
		6. Cash flow problem during construction
		7. Increase in quantities

No.	Author and Year	Major causes of the project delay
8	Fugar et al., (2010)	<ol style="list-style-type: none"> <li>1. Delay in honoring payment certificates</li> <li>2. Underestimation of complexity of project</li> <li>3. Difficulty in accessing bank credit</li> <li>4. Poor supervision</li> <li>5. Underestimation of time for completion of project by contractors</li> <li>6. Shortage of materials</li> <li>7. Poor professional management</li> <li>8. Fluctuation of price/ rising cost of materials</li> <li>9. Poor site management</li> </ol>
9	Sweis G et al., (2008)	<ol style="list-style-type: none"> <li>1. Financial difficulties faced by the contractor</li> <li>2. Too many change orders by the owner</li> </ol>
10	Abd El-Razak et al., (2008)	<ol style="list-style-type: none"> <li>1. Financial problem by the contractor during construction</li> <li>2. Delay in contractor's payment by owner</li> <li>4. Non-utilization of professional construction management</li> </ol>
11	Hamidreza Afshari et al., (2011)	<ol style="list-style-type: none"> <li>1. Not selecting competent construction subcontractors</li> <li>2. Poor management of the project changes</li> <li>3. Delay in forwarding material and equipment to the site</li> <li>4. Delay in awarding subcontractor's contracts</li> <li>5. Delay in supplying shortage of the equipment</li> <li>6. Poor management of project site</li> <li>7. Lack of effective communication with the project stakeholders</li> <li>8. Sloe decision making by project manager</li> <li>9. Lack of applying contractual tools</li> </ol>
12	Ibironke et al., (2013)	<ol style="list-style-type: none"> <li>1. Insufficient number of equipment</li> <li>2. Change order</li> <li>3. Poor design/ delay in design</li> <li>4. Incompetent project team</li> <li>5. Improper planning and scheduling</li> </ol>
13	Alsendi, (2015)	<ol style="list-style-type: none"> <li>1. Lack of funds to complete the project</li> <li>2. Change in drawings</li> <li>3. Lack of effective communication among the parties involved</li> <li>4. Lack of adequate information from consultants</li> <li>5. Slow decision making</li> <li>6. Mistake during construction</li> <li>7. Bad weather</li> <li>8. Fluctuation in price of building materials</li> </ol>

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

To make this research success, the most important step in this research is data collection. This chapter explains the procedure of getting the data starting from research strategy, research method until the step of doing the data analysis. To achieve the objective, the research must follow accordance with the planned methodology.

#### **3.2 Research Methodology**

This research starts with finding the problem that already happens in the construction industry. The objective of this research can produce from this industrial problem. Then, the methodology will come out and achieve the objectives, the data for this research will be collected through the literature review and survey questionnaires.

#### **3.3 Instrument for Data Collection**

In order to achieve the objectives of this research, the survey questionnaires need to be carried out because the data will be collected from this survey. The questions asked are related to cause of the delay, an effect of delay and method to improve the problem of delay in the construction industry. The survey method is very efficient and economical to carry out because of all direct information from the company can be used. Even though it requires a long time period, but the information credibly owned is very effective.

### 3.4 Development of Questionnaire

The question was designed related to the research objectives, especially on the cause of the delay, an effect of delay and method to improve the problem of delay in the construction industry. Before designing the questionnaire, there is a very important point to be considered. The point needs to be short and easy to understand. The questionnaires were sent to the parties involved in the construction industry in Malaysia such as client, construction Company, architect, and others. The questionnaires were created based on the information gathered from the literature review.

There are four main sections in this questionnaire. The first section will ask about the respondents personal and organization background. Subsequently, in section B, the respondents were asked for the cause of delay in the construction industry. Section C is about the effect of delays and the last section, section D is about methods that can be used to minimize the delays in construction project.

**Table 3.1 Likert scale for answer questionnaire method**

Category	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Rating	1	2	3	4	5

The questionnaire is based on Likert Scale of five ordinal measures from one (1) to five (5) according to level contributing.

### 3.5 Data Analysis

The data analysis that is used in this research is Relative Important Index (RII). It is the appropriate method for determining the ranking of the different factors from different group of respondents. This method was determined to establishing the relative importance of the various factor that contributes to causing, effects and method to improve delays in the construction industry.

$$RII = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

Where,  $n_5$  = number of respondents who answer 5

$n_4$  = number of respondents who answer 4

$n_3$  = number of respondents who answer 3

$n_2$  = number of respondents who answer 2

$n_1$  = number of respondents who answer 1

$N$  = total number of respondents

The value of RII ranges from 0 to 1 and the factors which scored the highest value of RII are the most important factors.

**Table 3.2 Cause of delays – Client related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Client Related Problem</b>	1. Delay in progress payment								
	2.Slow decision making								
	3.Client interference the construction project								
	4.Change orders during construction								
		<b>TOTAL</b>						<b>100%</b>	

**Table 3.3 Cause of delays – Consultant related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Consultant Related Problem</b>	1.Late in approving designs								
	2.Poor communication between consultants								
	3.Incomplete document								
	4.Conflicts between parties								
	5.Delay in performing inspection and testing								
		<b>TOTAL</b>						<b>100%</b>	



**Table 3.4 Cause of delays – Contractor related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Contractor Related Problem</b>	1.Improper planning								
	2.Mistake during construction								
	3.Poor site management								
	4.Delay in subcontractor works								
	5.Financial problem								
		<b>TOTAL</b>						<b>100%</b>	

**Table 3.5 Cause of delays – Material related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Material Related Problem</b>	1.Shortage of construction materials in market								
	2.Delay in delivery of materials								
	3.Late purchasing of materials								
	4.Changing of materials used during construction								
	5.Low quality of materials								
	6.Increase of construction materials price in market								
		<b>TOTAL</b>						<b>100%</b>	

**Table 3.6 Cause of delays – Labour and equipment related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Labor and Equipment Related Problem</b>	1.Shortage of labour								
	2.Low productivity level of labour								
	3.Equipment breakdown								
	4.hortage of equipment								
	5.Low productivity and efficiency of equipment								
	6.Lack of high technology machinery equipment								
		<b>TOTAL</b>					<b>0.00</b>	<b>100%</b>	

**Table 3.7 Cause of delays –External related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>External Problem</b>	1.Unfavorable weather								
	2.Poor site condition								
	3.Problem with neighborhood/ public								
	4.Change in government regulation and laws								
	5.Politic issues								
	6.Effects of social and cultural factor								
	7.Accident during construction								
	8.Delay in obtaining permits from municipality								
		<b>TOTAL</b>					<b>0.00</b>	<b>100%</b>	

**Table 3.8 Effect of delays in the construction industry**

Effect of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
	1	2	3	4	5			
1. Cost overrun								
2. Time overrun								
3. Interior quality of works								
4. Blacklisted by relevant authorities								
5. Loss of interest by stakeholder								
6. Non-payment by employer								
7. Rescheduling of works								
	<b>TOTAL</b>						<b>100%</b>	

**Table 3.9 Method to improve delays in the construction industry**

Method to improve delay	Rate					Relative Important Index (RII)	Percentage	Rank
	1	2	3	4	5			
1.Clear information and communication								
2.Good team work among all parties								
3.Proper project planning and scheduling								
4.Increase productivity level of labors								
5.Appropriate construction methods								
6.Complete and proper design in time								
7.Conduct site meeting frequently								
8.Use proper and modern equipment								
9.Accurate preliminary cost estimate								
10.Contingeny allowance for emergency use								
11.Easure material deliver to site on time								
<b>TOTAL</b>							<b>100%</b>	

### 3.6 Research Framework

Figure 3.1 shows the research step starting from problem statement until the research finish. As such, this framework provided the proper steps to find out in how to establish the research study.

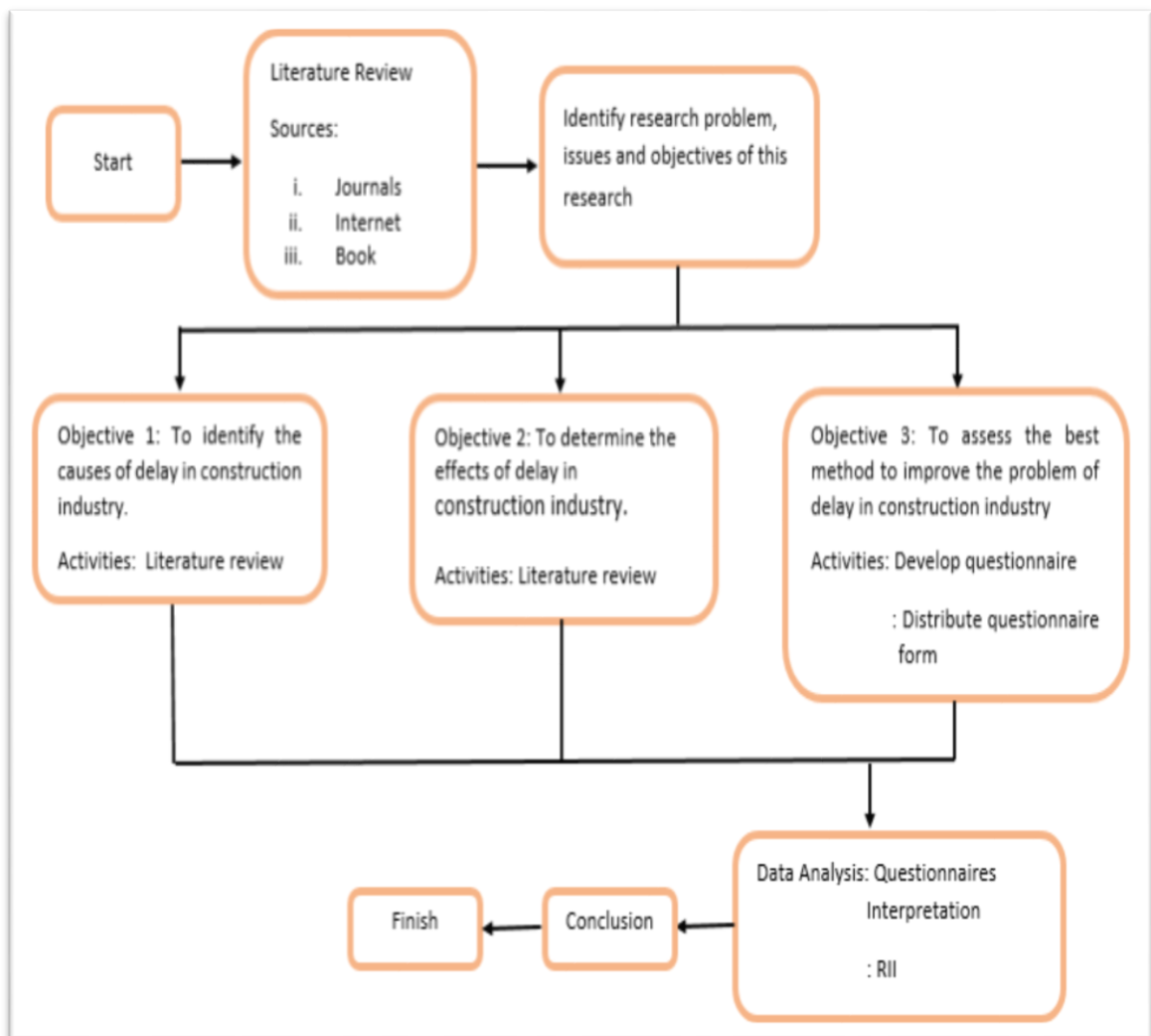


Figure 3.1 Research Methodology Framework

## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

#### **4.1 Introduction**

This chapter will discuss and analyse the result of a questionnaire survey. All the data are collected from despondences that involved in construction industry. The structured data are summarized by calculating percentage and ranks by using Relative Importance Indices (RII). This chapter will discuss the outcome of the survey.

#### **4.2 Data Analysis for Questionnaire Survey**

As described in chapter 3, the questionnaire has four section.

- i. Section A: General information of the respondent
- ii. Section B: Causes of delays in construction project
- iii. Section C: Effect of delays in construction project
- iv. Section D: Method to improve delays in construction project

Figure 4.1 shows that out of 80 questionnaires, the survey was distributed to the group of clients, consultants, contractors in Malaysia. 48 responded were fully returned the questionnaire. The percentage of questionnaires returned was 60 percent and only 40 percent did not return the questionnaire.

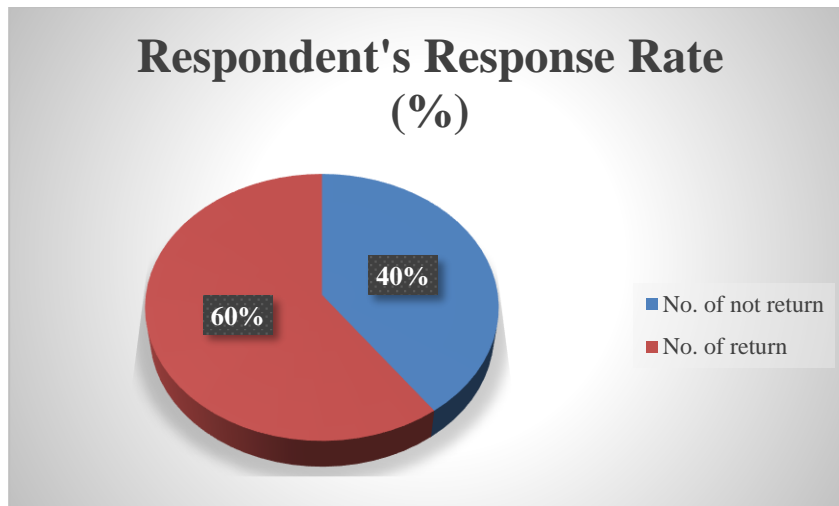


Figure 4.1 Respondent's response rate

### 4.3 Section A: General Information of the Respondent

The first section of this studied questionnaire is about the general information about the respondents. This section will be asked about the age, type of company, profession and years of experience.

#### 4.3.1 Respondent's Age

The pie chart in figure 4.2 shows the respondent's age for the survey conducted. The chart is divided into 4 parts. There are two groups that sharing the largest percent of respondent's age that take part in this survey, which is 33 percent of 26 to 35 years old and 36 to 45 years old. The second largest is 27 percent consists of 18 to 25 years old respondent's. The remaining 7 percent take part by 46 years and above respondents.

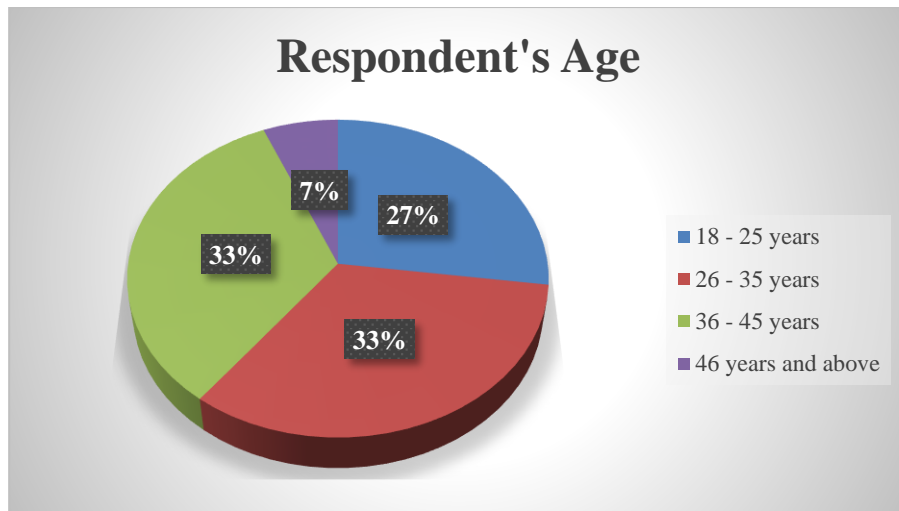


Figure 4.2 Respondent's age

#### 4.3.2 Respondent's Type of Company

Figure 4.3 gives information about the type of respondent's company that responded to the survey. It can be seen that 56 percent the number of the respondent has come from Construction Company. Respondents from Consultant Company is the second largest percent with 36 percent. Another 8 percent of respondent in this survey was coming from client category.



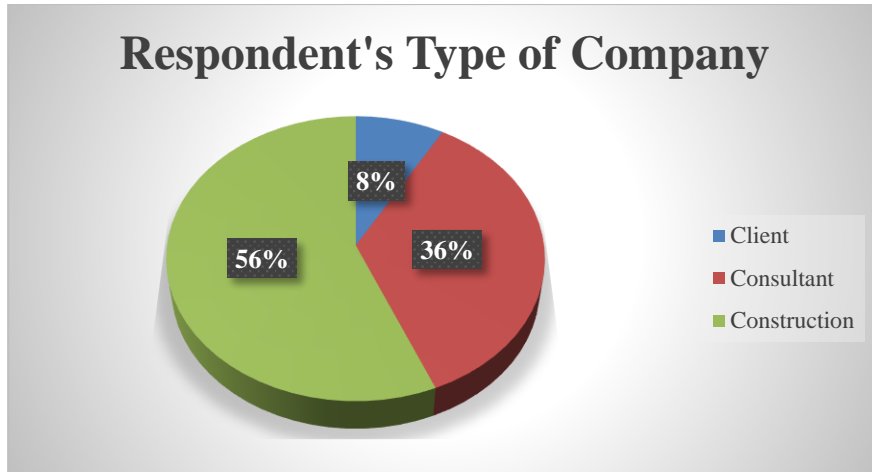


Figure 4.3 Respondent's Type of Company

### 4.3.3 Respondent's Profession

Figure 4.2 represents the distribution of the respondents by the type of positions. The highest percentage of respondents are consist of 29.2 percent engineers, 25 percent quantity surveyor, 12.5 percent planner and remaining 33.3 percent are formed types of 'others'; 14.6 percent site supervisor, 6.3 percent project manager, 4.2 percent technician, 4.2 percent of site clerk, 2.1 percent charge man and the last 2.1 percent project executive. Thus, the respondents are the eligible person to giving this research's data.

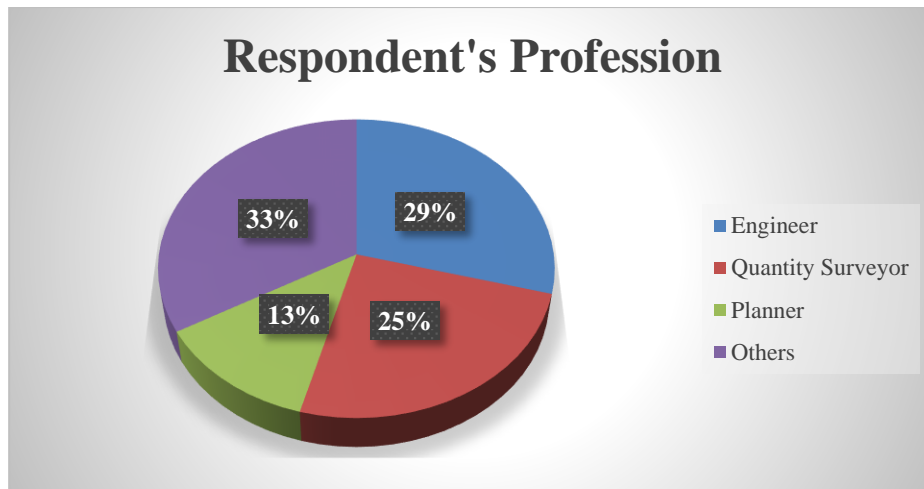


Figure 4.4 Respondent's types of profession

#### 4.3.4 Respondent's Years of Experience

Regarding figure 4.5, number of years involved in construction industry shows that 33 percent of respondents have less than 5 years, 42 percent of those have between 6 to 10 years and 21 percent, 21 percent of those have between 11 to 20 years and 4 percent of those have 21 years and more experience in construction. The experience possesses by the respondents may help in providing a better understanding of this matter and in a better position in giving much precise answer required to the questionnaires form.

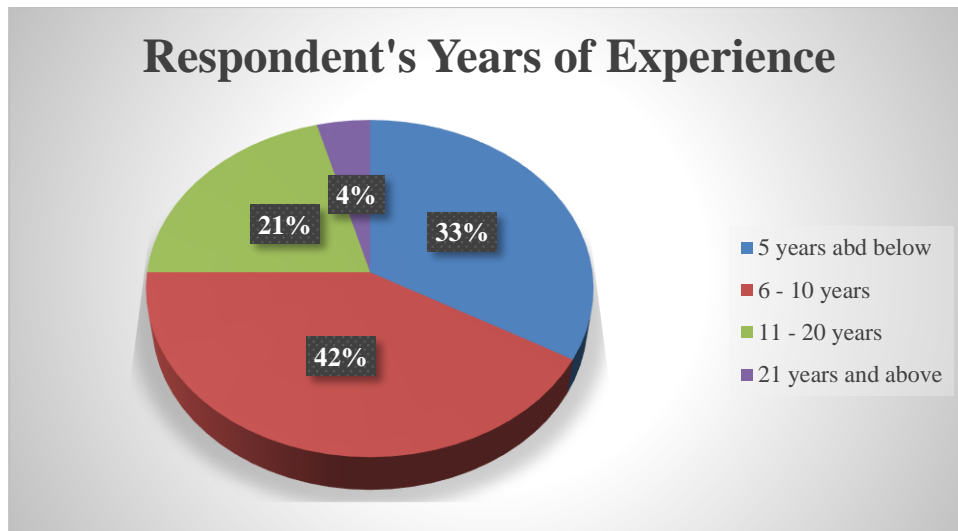


Figure 4.5 Respondent's Years of experience

#### 4.4 Section B: Causes of Delays in the Construction Project

The objective of this section is to study the causes of delays in the construction project in Malaysia. A total thirty-four causes that contribute to construction project delays have been identified from the literature review. The thirty-four cases were categorized into six major group; client related problem, consultant related problem, contractor related problem, material related problem, labour, and equipment related problem and external problem. These causes will be ranked within their group of causes based on relative importance index as mention in chapter 3.

##### 4.4.1 Causes of Client Related Problem

Table 4.1 represents the results of survey analysis on the causes of client's related delays. From the survey conducted, '*client interference in the construction project*' is the factor that always happens in construction projects in Malaysia with the highest RII of 0.89. Client interference has been viewed as a hindrance to project success. Although optimum client involvement across all the project phases is crucial for project success, contractors regarded the pre-construction phase to be a priority phase for client involvement, followed by the post-construction phase. They however considered the construction phase to be the least important for client involvement, as the contractor is responsible for project execution and this could be so as to avoid client interference which

could hindrance project success (Odeh et al., 2012). It followed by ‘change order during construction period’ with 0.83 of RII and 0.78 of RII of ‘slow decision making by the client’. Zawawi et al, (2010), defined a change orders as work that is added to or deleted from the original scope of work of a contract, which alters the original contract amount or completion date. Regardless of its causes, change order often resulted in disputes and dissatisfactions among the parties involved, project delay and difficult to manage due to additional costs. The impacts affect all players in construction projects. The last factor that causes delay to the project in causes of ‘delay in progress payment’ with 0.77 of RII. Client delay in paying construction contractors has impacted negatively on the effectiveness of the contractor and as such affect project delivery schedule. Failure to pay contractors for work executed might lead to the contracting firm being insolvent (RICS, 2016).

**Table 4.1 Result of client related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Client Related Problem</b>	Client interference the construction project	1	4	1	9	33	0.89	27.22	<b>1</b>
	Slow decision making	1	3	7	25	12	0.78	23.85	<b>3</b>
	Delay in progress payment	2	4	5	24	13	0.77	23.55	<b>4</b>
	Change orders during construction	1	4	4	18	21	0.83	25.38	<b>2</b>
		<b>TOTAL</b>					<b>3.27</b>	<b>100%</b>	

#### 4.4.2 Causes of Consultant Related Problem

There are 5 causes of consultant related problem lead to project delays that being ranked by 48 respondents in Malaysia as shown in Table 4.2. Among the causes in this group, '*late in approving designs*' by the consultant is the frequent delay factor in Malaysia. According to B.P. Sunjka et al, (2013) projects are required to be completed on schedule, within budget and according to specification. If consultants do not approve the design early enough, activities of the project may require alterations when such design is not being approved by the consultant (Sunjka et al., 2013). An '*incomplete drawing*' brings the second highest factor causes of delay at the rank 2. Complete construction plans consist of multiple sheets including architectural, mechanical engineering, electrical engineering, civil engineering, structural engineering, and possibly other disciplines. The more complex the project, the more sheets of drawings there will be. When the plans are not complete, it increases risk for the lender. This problem is especially common when a complex project like an apartment building has been drafted by a home builder or an architect who does not have extensive experience in larger projects. If the incomplete drawings are allowed to go to construction, they will lead to change orders when the contractor gets on site and starts pointing out the missing pieces to the owner, your borrower. (Gardei, 2018). '*Delay in performing inspection and testing*' are ranked as the third factor causes of consultant related problem. The fourth rank in consultant related problem goes to '*poor communication between consultants*' with 19.05 percent. Communication is a fundamental part of a construction project. Like any fundamental piece, it must be done in an effective way to ensure the success of the project. Given its importance, understanding the relationship between the different actors involved in a project, analysing the problems that arise between them and investigating the best options to ensure its correct functioning is very important for any actor involved in construction projects (Gómez-ferrer, 2017). Apart from that, the percentage of '*conflict between parties*' were the lowest with 18.94 percent (Rank 5).

**Table 4.2 Result of consultant related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Consultant Related Problem</b>	Late in approving designs	2	5	4	13	24	0.82	21.84	<b>1</b>
	Poor communication between consultants	2	9	6	22	9	0.71	19.05	<b>4</b>
	Incomplete document	2	6	5	21	14	0.76	20.39	<b>2</b>
	Conflicts between parties	2	10	9	14	13	0.70	18.94	<b>5</b>
	Delay in performing inspection and testing	2	9	6	16	15	0.74	19.72	<b>3</b>
		<b>TOTAL</b>					<b>3.74</b>	<b>100%</b>	

#### 4.4.3 Causes of Contractor Related Problem

There are five delay causes related to contractor were identified and ranked from the viewpoint of respondents in Malaysia Table 4.3 shows the result of survey analysis on the causes of the contractors related delays. According to Table 4.3, *'financial problem'* was ranked as the most frequent factor of project delays in Malaysian construction industry. The contractor that has poor cash flow management will lead to serious consequences that may lead the project delay. Ayodele et al, (2011) opined that financial problem of the contractor will result in the loss of continuity of construction activities and consequent breakdown in the command structure and communications (Ayodele et al., 2011). This is followed by *'improper planning'* and *'mistake during construction'* period. Planning and scheduling of activities play an important role in time management of a project. It is normally done before the construction begin. For example; the project should entail sourcing and be procuring/ordering of relevant materials.

Otherwise, construction delays are likely to befall, along with the corresponding impact on cost (M M Rahman et al., 2017). When it comes to the actual construction works on the project, failure to undertake planning in construction well results into tasks getting neglected or unsatisfactorily done because one is in a hurry to move on to the next task, and as a result, the structure may not achieve the desired structural strength properties. With planning comes deliverables and poor planning results in delayed project completion, cost overruns and poor quality work among other things. It is therefore important that the team in charge of the project accurately and appropriately plans prior to execution of activities to ensure smooth flow of works, the value of money and timely completion (Bonface, 2015). ‘*Delay in subcontractor works*’ which is at the ranked 4 with 19.84 percent. The last ranked with 19.31 result of contractor related problem was ‘*poor site management*’.

**Table 4.3 Result of contractor related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Contractor Related Problem</b>	Improper planning	1	8	3	13	23	0.80	20.26	<b>2</b>
	Mistake during construction	0	5	3	28	12	0.79	20.05	<b>3</b>
	Poor site management	0	8	9	14	17	0.77	19.31	<b>5</b>
	Delay in subcontractor works	1	4	6	23	14	0.78	19.84	<b>4</b>
	Financial problem	1	3	7	17	20	0.82	20.57	<b>1</b>
		<b>TOTAL</b>					<b>3.97</b>	<b>100%</b>	

#### 4.4.4 Causes of Material Related Problem

In the Table 4.4, shows the results on causes of material related delays problem. The ranking was led by '*late purchasing of materials*'. The labour was ready to work, but there no material and it will cause a delay of work on construction site. Late in purchasing of materials may cause a delay in the projects and may interrupt the work schedule (Donyavi et al., 2009). Followed by '*changing of materials used during construction*'. Ranked 3 consist of two factors with the same percent which were '*delay in delivery of materials*' to the site and '*increase of construction materials price in market*'. '*Shortage of construction materials in market*' and '*low quality of materials*' has been ranked as the ranked 4 and ranked 5 for the material related problem. Poor estimation of material quality causes either shortage of supply or oversupply. Shortage of supply disputes construction progress on site, as reordering can causes prolonged delay and additional costs, especially is the material needs to be imported from overseas. On the other hand, oversupply incurs additional costs or losses to contractor (M M Rahman et al., 2017). The quality of materials can delay their usage on site if the materials do not meet the standard or contain defects. The defect can be due to improper handling during packaging, shipment or delivery. (M M Rahman et al., 2017).



**Table 4.4 Result of material related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Material Related Problem</b>	Shortage of construction materials in the market	1	8	5	11	23	0.80	16.41	<b>4</b>
	Delay in the delivery of materials	1	3	3	27	14	0.81	16.67	<b>3</b>
	Late purchasing of materials	0	2	4	21	21	0.85	17.61	<b>1</b>
	Changing of materials used during construction	0	3	7	22	16	0.82	16.75	<b>2</b>
	Low quality of materials	1	6	7	20	14	0.77	15.81	<b>5</b>
	An increase of construction materials price in the market	1	3	3	27	14	0.81	16.67	<b>3</b>
		<b>TOTAL</b>					<b>4.85</b>	<b>100%</b>	

#### 4.4.5 Causes of Equipment Related Problem

Table 4.5 highlights the responses of survey for equipment related to delays problem. The highest rank was ‘*shortage of labour*’. M. Johnston (2014) said that the construction market in Hong Kong continues at a steady pace, but there’s still the question of manpower and what happens when projects are delayed due to labour shortages. Last

year the Development Bureau put forth a Technical Circular that declared a mandatory Special Condition of Contract (SCC) to delete part of a provision in various sets of the General Conditions of Contract (GCC), which “disentitles a Contractor to an extension of time if the cause of the delay is a shortage of labour”. Contractors find it a great challenge to engage an adequate and competent workforce in completing works projects in a timely manner especially under the current provision in the General Conditions of Contract (GCC), which expressly disentitles the contractors to an extension of time (EOT) if the cause of the delay is labour shortage (Johnston, 2014). This is followed by *‘low productivity level of labour’* and *‘equipment breakdown’*. *‘Lack of high technology machinery equipment’* and *‘low productivity and efficiency of equipment’*. These results are in general agreement with the work done by Theodore (2009) have been ranked as ranked 4 and ranked 5. The lowest rank, rank 6 was the shortage of equipment. Where it was identified that equipment breakdown is the major cause of delays in construction projects that are related to the equipment that is being used on sites. Further, the study of Wei (2010) identified that the major cause of delays that are equipment related was Lack of high-technology mechanical equipment. However, Hasseb et al (2011) identified the use of improper equipment as the major cause of delays on construction projects. Other causes identified by the scholarly studies above were the use of outdated equipment and Shortage of equipment as some of the major causes of delays.

**Table 4.5 Result of equipment related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>Labour and Equipment Related Problem</b>	1.Shortage of labour	2	3	2	14	27	0.85	18.64	<b>1</b>
	2.Low productivity level of labour	1	7	3	23	14	0.78	17.10	<b>2</b>
	3.Equipment breakdown	1	5	4	26	12	0.77	16.89	<b>3</b>
	4.Shortage of equipment	1	8	7	22	10	0.72	15.79	<b>5</b>
	5.Low productivity and efficiency of equipment	1	9	4	24	10	0.73	16.01	<b>4</b>
	6.Lack of high technology machinery equipment	3	9	6	17	13	0.71	15.57	<b>6</b>
		<b>TOTAL</b>					<b>4.56</b>	<b>100%</b>	

**4.4.6 Causes of External Problem**

There are eight factors of external related delayed delays that contribute to construction project delays have been ranked by the respondents as shown in Table 4.6. *‘Accident during construction’* was ranked as the most frequent cause of delays related to external problem. . The accident is unforeseen events, which cause damages or injuries unintentionally and unexpectedly. In the construction sector, accidents are unavoidable

and have higher risk compare to other occupations. Some accident may affect the goal and schedule of the project and accident at the site will involve additional costs to the employers (Singh, 2010). ‘*Delay in obtaining permits form municipality*’ and ‘*poor site condition*’ were at rank 2 and ranked 3. Helen said in his articles that Talk with most contractors about building permits and the topic will soon shift to a nightmare story or two about the problems experienced in obtaining city building permits. You will hear about how they had to make several trips to speak with different plan reviewers and waited weeks for a final plan review. And, while most municipal permitting centres have good intentions, the truth is, the building permit process is confusing to thousands of contractors across the country. These things can cause delays in obtaining building permits and starting construction in a timely manner (Callier, 2017). Followed by ‘*unfavourable weather*’ and ‘*problem with neighborhood/ public*’. Weather conditions can affects many aspects of the construction project from site work to workers comfort. For example Dry weather can cause the water in concrete and masonry to evaporate too fast. This rapid evaporation produces concrete with a lower compressive strength and a finished concrete that tends to curl upward and to spall (L.Crissinger, 2015).

**Table 4.6 Result of external related problem**

	Cause of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
		1	2	3	4	5			
<b>External Related Problem</b>	1.Unfavorable weather	3	7	2	16	20	0.77	19.89	<b>4</b>
	2.Poor site condition	0	8	2	24	14	0.78	20.16	<b>3</b>
	3.Problem with neighbourhood/ public	6	12	6	9	15	0.67	17.31	<b>5</b>
	4.Accident during construction	1	2	3	14	27	0.85	21.96	<b>1</b>
	5.Delay in obtaining permits from the municipality	1	5	6	18	18	0.80	20.67	<b>2</b>
		<b>TOTAL</b>					<b>3.87</b>	<b>100%</b>	

#### **4.4.7 Top Ten Ranking on Causes of Delay**

The previous section is the brief description of the result of this survey. The result and analysis are based on the group causes respectively. This section will be an analysis of delay causes based on the top ten from the overall causes. Table 4.7 and Table 4.12 were highlighted the ranking of RII for the cause of delays. Top 10 causes of delays have been listed.

From Table 4.7 shows the ranking of top ten causes of delay in the construction project based on its RII. The client-related problem has been agreed by the respondent to be the highest rank causes project delay. The result reveals that client in the construction project in Malaysia often interference during the construction project can lead to project delays. Respondent of this survey agreed that late in purchasing of material and shortage of labour are another main factor that contributes to project delays.

The fourth rank with RII of 0.85 is an accident during the construction phase. It followed by change order by the client during the construction stage will bring severe effect to the construction project and have causes schedule and expenditure increase from the side of contractors. This problem is due to the heavy workload of the persons, especially who handle the project from the side of the client. If client action is slow, it can retard the construction team's works.

Based on the respondents answer from the survey, causes related to consultant and contractor were ranked six and seven. Late in approving design by the contractor and financial problem of the contractor have become a problem to finish the construction project within the expected time in the contract document. It is followed by the change of materials use during the construction stage and also delay in delivery of material on site. The last top ten ranking causes of delays came from contractor group which is improper planning for the construction project. To achieve the objectives and goals of the project, the contractor needs to have a detailed planning about every work related to the project to minimize the project from the delay.

**Table 4.7 Ranking causes of delays**

<b>Causes</b>	<b>Group</b>	<b>RII</b>	<b>Rank</b>
1. Client interference during the construction project	Client	0.89	1
2. Late in purchasing of material	Material	0.85	2
3. Shortage of labour	Labour and Equipment	0.85	3
4. Accident during the construction	External Problem	0.85	4
5. Change order during construction	Client	0.83	5
6. Late in approving design	Consultant	0.82	6
7. Financial problem	Contractor	0.82	7
8. Change of material during construction	Material	0.82	8
9. Delay in delivery of material	Material	0.81	9
10. Improper planning	Contractor	0.80	10

#### 4.5 Section C: Effect of Delays in the Construction Industry

The previous section had been explained about the causes of delay in the construction project in Malaysia. For this section will be analysing the severity effect on the delay causes based on the overall seven causes.

Table 4.8 highlighted the ranking of severity effect for the causes of delays by overall. In Table 4.8, the respondent from the survey agreed that '*cost overrun*' is rank as the main effect to the project causes by project delay. The second highest rank effect of delay with RII of 0.84 is time overrun. Time overrun refers to the late completion of the time specified in the construction project. The main causes of this include financial problems, late payments by client and change order during the construction project. In most construction projects, best possible performance is unachievable with poor productivity resulting in time overrun and consequently cost escalation of the projects.

The occurrence of delay is concurrent with other delays and all of them can impact the project completion date (Salinkhe, et al., 2014). Then, it followed by ‘*loss of interest by stakeholder*’ and ‘*non-payment by the employer*’. At the rank fifth, respondents agree that when the project delay, the company will be ‘*blacklisted by the relevant stakeholder*’. ‘*Rescheduling of work*’ and ‘*interior quality of works*’ were ranked at the rank sixth and seventh.

**Table 4.8 Ranking effect of delays**

Effect of Delay	Rate					Relative Important Index (RII)	Percentage	Rank
	1	2	3	4	5			
1. Cost overrun	0	1	5	20	22	0.86	13.36	1
2. Time overrun	0	4	1	24	19	0.84	16.15	2
3. Interior quality of works	0	3	4	24	1	0.50	9.52	7
4. Blacklisted by relevant authorities	1	4	11	20	12	0.76	14.56	5
5. Loss of interest by stakeholder	2	4	8	16	18	0.78	15.04	3
6. Non-payment by employer	1	6	6	20	15	0.77	14.88	4
7. Rescheduling of works	0	4	2	7	25	0.70	16.55	6
<b>TOTAL</b>						<b>5.21</b>	<b>100%</b>	

#### 4.6 Section D: Method to Improve Project Delay

Project delays have been a topic of concern in the construction industry. Delays can be minimized when their causes are identified. Knowing the causes of any particular delay in a construction project would help to avoid the effects. The objective of this section is to study the method to improve the project from delay and minimize the effect that might be raised during the project phases.

In Table 4.9 shows the ranking of the eleventh method to minimizing construction delay from the viewpoint of respondents in this survey. The method was ranked based on

the RII as mention in Chapter 3. The most common reason for construction disputes us a breach in communication and information. The respondents are agreed that the highest rank in method to improve delay is giving '*clear information and communication*' to the project team. The second rank is '*proper project planning and scheduling*'. It doesn't matter how big or small the project, the proper project planning, and scheduling is key to success.

The respondents are agreed that '*ensure material deliver to the site on time*', '*increase productivity level of labours*', '*good teamwork among all parties*' are the top three until five effective methods to mitigate delay in the construction project. Additionally, '*appropriate construction methods*' and '*complete the proper design in time*' also method that can be used to improve the construction project from the delay. Another remaining method to improve agreed by the respondents are '*accurate preliminary cost estimate*', '*use proper and modern equipment*', prepare the '*contingency allowance for emergency use*' and the last rank is '*conduct site meeting frequently*'.



**Table 4.9 Ranking method to improve delay**

Method to Improve	Rate					Relative Important Index (RII)	Percentage	Rank
	1	2	3	4	5			
1.Clear information and communication	0	0	2	12	34	0.93	10.29	1
2.Good teamwork among all parties	0	0	4	26	18	0.86	9.46	5
3.Proper project planning and scheduling	0	0	3	18	27	0.90	9.92	2
4.Increase productivity level of labours	0	0	6	21	21	0.86	9.51	4
5.Appropriate construction methods	0	2	9	23	14	0.80	8.87	6
6.Complete the proper design in time	1	2	7	24	14	0.80	8.82	7
7.Conduct site meeting frequently	1	9	7	17	14	0.74	8.18	11
8.Use proper and modern equipment	0	7	8	18	15	0.77	8.50	9
9.Accurate preliminary cost estimate	3	6	3	18	18	0.78	8.54	8
10.Contingency allowance for emergency use	1	4	10	25	8	0.75	8.22	10
11.Ensure material deliver to site on time	0	0	5	20	23	0.88	9.65	3
<b>TOTAL</b>						<b>9.07</b>	<b>100%</b>	

## **CHAPTER 5**

### **CONCLUSION**

#### **5.1 Introduction**

This chapter consists of the conclusion and the recommendation for future work of the research. The aim of this study is to assess the best method to minimizing delay in the construction industry. As established at the beginning of this study, the objective of this study was to identify the causes of delay in the construction industry, to determine the effects of delay in the construction industry and the last objective is to assess the best method to minimizing delay in the construction industry.

#### **5.2 Conclusion of the Findings**

The followings are the conclusion derived from the literature study and questionnaire survey conducted.

##### **5.2.1 Objective 1: To study the causes of delay in the construction industry**

The first objective has been achieved through literature review. From the literature review, about thirty-four causes of delay in local construction market have been identified. The delay causes were grouped into six; client related problem, consultant related problem, contractor related problem, material related problem, equipment related problem and external problem. All these causes of delay are shown in chapter 2.

For the first objective, the result from the survey showed that the top ten causes of delays are: ‘client interference during the construction project’, ‘late in purchasing of materials’, ‘shortage of labour’, ‘accident during the construction project’, ‘change order by client during the construction project’, ‘late in approving design by consultant’,

‘financial problem by the contractor’, ‘change of material during construction project’, ‘delay in delivery of materials on the site’, and ‘improper construction planning by the contractor’.

### **5.2.2 Objective 2: To study the effects of delay in the construction industry**

The second objective of this research is to identify the effects of delay in the construction industry. The overall of seven effects of delay has been identified based on the literature review in Chapter 2. There are three highest effects that occur from the project delays. From the survey, the respondents agree that cost overrun and time overrun will give the highest effect to the project. Followed by the loss of interest by the stakeholders. Cost overrun will increase the cost of the labour, working force, material, and equipment. When the project delay, the contractor has to pay more to complete the project and these effects will also lead to time overrun since the project cannot complete at the time specified in the contract document.

### **5.2.3 Objective 3: Method to minimizing delay in the construction project**

The last objective of this research was achieved through the questionnaire survey. A total of eleven methods of minimizing project delays were identified. From the eleven methods to minimize project delays, the most five effective methods answered by the respondents in the survey are by giving a clear information and having a good communication among the parties involved in the construction project. Next is, proper project planning and scheduling. By having proper project planning and scheduling, every party involved will have an idea about their involvement during the construction stage. Materials are among the influential factors that can cause project delay. To finish the project within the time frame, it is important to make sure the materials are delivered to the construction site on time specified to prevent project delays.

### 5.3 Recommendations

Following are the recommendation to minimize delays, derived based on the analysis result of the significant causes.

- i. Client-related delays have contributes the highest part for causes of delays in the construction project. To prevent the project delays, the client has to know which stage that need of their involvement and contribution, and which stage is need less of client involvement. Client interference during the construction stage will affect the project planning.
- ii. Material related problem is one of the most significant causes in of delay. The result of the study indicated that late in purchasing of material is one of the major sources of project delays. Therefore, before the construction start, the contractor needs to have a detailed planning and scheduling especially about materials used for the project. Late purchasing of material will lead to late delivery of material on site. When there is no material available on the construction site, it will affect the time schedule of the construction project and lead to the project delays.
- iii. Contractor performance is an important factor for the project success. Therefore, contractor selection stage must receive more serious consideration. It is essential to choose a contractor with a strong financial background. Apart from that, the selected contractor must have sufficient experience, technical capability, and sufficient manpower to execute the works.
- iv. The consultants play a very important role because as they are in charge of the design process in conjunction with the owner of the project. Design related issues such as changes in drawings, incomplete and faulty specifications have a very damaging effect on project completion times and invariably lead to cost escalations as well. These are issues that can be controlled with proper design process management and timely decision making.

## REFERENCES

- Khan, R. A., Liew, M. S., & Ghazali, Z. Bin. (2014). Malaysian Construction Sector and Malaysia Vision 2020: Developed Nation Status. *Procedia - Social and Behavioral Sciences*, 109, 507–513. <https://doi.org/10.1016/j.sbspro.2013.12.498>
- Nyoni et al.,(2017). Towards Factors Affecting Delays in Construction Projects: A Case of Zimbabwe. *Dynamic Research Journals' Journal of Economics and Finance*. 2. 12-28
- KPKT, Kementerian Perumahan dan Kerajaan Tempatan. 2010: Putrajaya.
- Z.K. Bangash(2016). Analyzing delays in construction projects for Peshawar: Contractor perception, *Journal of Emerging Trends in*
- S.G. Awari, M. Jamgade and U. Patil, Identifying the causes of delay in construction industry in Mumbai region, *International Journal of Modern Trends in Engineering and Research*, 2(7), 2016, 541-543.
- M.R.B. Mohamad, The factors and effects of delays in government construction projects: case study in Kuantan, University of Malaysia
- Afshari, Hamidreza, Shahrzad Khosravi, Abbas Ghorbanali, Mahdi Borzabadi, and Mahbod Valipour. 2011. “Identification of Causes of Non-Excusable Delays of Construction Projects.” *Management* 3:42–46. <https://doi.org/10.4236/jssm.2012.52019>
- BNM (2009). Bank Negara Malaysia Annual Report 2008. <http://www.bnm.gov.my/view.php?dbIndex=0&websiteid=1&id=694>. As retrieved on 26.05.2009
- Ministry of Housing and Local Government (2009). *Statistic Report of Ministry of Housing and Local Government 2008*. Kuala Lumpur.
- Utusan Malaysia (May, 2009). Kementerian kurang senang projek lewat. [http://www.utusan.com.my/utusan/info.asp?y=2009&dt=0519&pub=Utusan\\_Malaysia&sec=Dalam\\_Negeri.htm](http://www.utusan.com.my/utusan/info.asp?y=2009&dt=0519&pub=Utusan_Malaysia&sec=Dalam_Negeri.htm). As retrieved on 26.05.2009
- Warudkar, Abhijit. 2016. “Analysis on Causes of Delay in Construction Industry in Pune City.” *International Journal of Innovative Research in Science*,

- Leong, M. (2010) *The Construction Market in Malaysia*. Frost & Sullivan
- KPKT (2010). *Kementerian Perumahan dan Kerajaan Tempatan*. Putrajaya
- Saleh Al Hadi Tumi, A. O. a. A. H. K. P. (2009). CAUSES OF DELAY IN CONSTRUCTION INDUSTRY IN LIBYA. *The International Conference on Administration and Business*. Faculty of Administration and Business, University of Bucharest, Romania.
- Wa'el Alaghbari, M. R. A. K., Azizah Salim and Ernawati (2007). "The significant factors causing delay of building construction projects in Malaysia." *Engineering, Construction and Architectural Management* 14(2): 192-207.
- Sweis, G., Sweis, R., Hammad, A. and Shboul, A. (2008). Delays in construction projects: The case of Jordan. *International Journal of Project Management*, 26(6), 665-674. doi: 10.1016/j.ijproman.2007.09.009
- Durdyev, S. and Ismail, S. (2012). Pareto analysis of on-site productivity constraints and improvement techniques in construction industry, *Scientific Research and Essays*, 7(7), 824-833. doi: 10.5897/SRE12.005
- Afshari, A., Khosravi, S., Ghorbanali, A., Borzabadi, M. and Valipour, M. (2011). Identification of causes of non-excusable delays of construction projects. *Proceedings of the International Conference on E-business, Management and Economics*.
- Durdyev, S. and Ismail, S. (2012). Pareto analysis of on-site productivity constraints and improvement techniques in construction industry, *Scientific Research and Essays*, 7(7), 824-833. doi: 10.5897/SRE12.005
- Durdyev, S., Omarov, M. and Ismail, S. (2017). Causes of delay in residential construction projects in Cambodia, *Cogent Engineering*, 4(1): 1-8. doi: 10.1080/23311916.2017.1291117
- Noor, S.N.A.B.M. & Hasbullah, M.A. Bin, 2010. *Faktor-Faktor Kelewatan Penyiapan Projek oleh Kontraktor Kelas A di Kuching, Sarawak*. Universiti Teknologi Mara.
- Dinakar, A., 2014. Delay Analysis in Construction Project. *International Journal of Emerging Technology and Advance Technology*, 4(5), pp.784–788. Available at: [www.ijetae.com](http://www.ijetae.com)

- Doloi H., Sawhney A., Iyer K.C. and Rentala S.(2012) “Analysing factors affecting delays in Indian construction projects”, *International journal of /project Management*, Volume 30, Issue 4, Pages 479-489
- Myers, D. (2013). *Construction Economics: A new approach* (3rd ed.). New York: Routledge.
- A.L. Olanrewaju and A.-R. Abdul-Aziz, *Building Maintenance Processes and Practices*, DOI 10.1007/978-981-287-263-0\_2
- A. Enshari et al., (2009). Delay and cost overruns in the construction projects in the Gaza Stri. *Journal of Financial Management of Property and Construction* vol. 14, 126-151. (2009)
- T. Pourroostam et al., (2010). Causes and effects of delay in Iranian construction projects. *International Conference on Construction Project Management*, Chengdi, China. Available at Novemner 16-18, (2010)
- Z.K. Bangash, Analyzing delays in construction projects for Peshawar: Contractor perception, *Journal of Emerging Trends in Applied Engineering*, 1(1), 2016, 13-18.
- T. Chigara and T. Moyo, Factor affecting labour productivity on building projects in Zimbabwe, *International Journal of Architecture, Engineering and Construction*, 3(1), 2014, 57-65.4
- T. Nyoni and W.G. Bonga, An Empirical Investigation of Factors Affecting Construction Sector Labour Productivity in Zimbabwe, *International Journal of Business and Management Invention*, 5(8), 2016, 68-79.
- S.G. Awari, M. Jamgade and U. Patil, Identifying the causes of delay in construction industry in Mumbai region, *International Journal of Modern Trends in Engineering and Research*, 2(7), 2016, 541-543
- R. Divya and S. Ramya, Cause, Effects and Minimization of Delays in Construction Projects, *Proc. Conf. on the Research in Communication, Computation, Electrical Science and Structures (NCRACCESS-2015)*, 2015, 47-53
- M.K. Anees and S. Sabarinathan, Ranking of delay factors in the Indian Building Construction, *International Journal On Engineering Technology and Sciences*, III (VI), 2016, 39-50.

- Z.T. Zewdu, Construction Projects Delay and Their Antidotes: The Case of Ethiopian Construction Sector, *International Journal of Business and Economics Research*, 5(4), 2016, 113-122.
- Tumi, S.H., Omran, A. and Pakir, A.H.K., “Causes of Delay in Construction Industry in Libya”, *The International Conference on Economics and Administration*, Faculty of Administration and Business, University of Bucharest, Romania ICEA – FAA Bucharest, 14-15th November 2009.
- Fugar, F D K and Agyakwah-Baah, A B “Delays in building construction projects in Ghana”, *Australasian Journal of Construction Economics and Building*, 10 (1/2) (2010) 103-116.
- Sweis, G., Sweis, R., Abu Hammad, A. and Shboul, A. “Delays in construction projects: The case of Jordan”, *International Journal of Project Management* 26 (6) (2008) 665-74.
- Abd El-Razek, M.E., Bassioni, H.A. and Mobarak, A.M. “Causes of delays in building construction projects in Egypt”, *Journal of Construction Engineering and Management*, 134 (11) (2008) 831-841.
- Afshari, H., Khosravi, S., Ghorbanali, A., Borzabadi, M., & Valipour, M. (2011). Identification of Causes of Non-excusable Delays of Construction Projects. *Management*, 3, 42–46. <https://doi.org/10.4236/jssm.2012.52019>
- Fugar, F.D. and Agyakwah-Baah, A.B. (2010). Delays in building construction projects in Ghana. *Australasian Journal of Construction Economics and Building*.
- Sambasivan, M. and Soon, Y.W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management*
- Alsendi, M. A. Y. (2015). Studying The Effect of Decision Making on Delayed Construction Projects, 24(8), 2143–2148.
- Rashed, K., (March 9, 2008). Contractual aspects of construction projects. Available: <http://www.alqabas.com.kw/node/346199>. Article in ALqabas newspaper, Kuwait
- Pourrostan, T et al., (2011). Significant Factors Causing and Effects of Delay in Iranian Construction Projects. *Australian Journal of Basic and Applied Sciences*.



- Sunjka et al., (2013). Significant causes and effects of project delays in the Niger delta region, Nigeria: SAIIE25 Proceedings: Stellenbosch, South Africa
- Ibironke, O. T et al., (2013). Analyses of non-excusable delay factors influencing contractors. Performance in Lagos States, Nigeria, Journal of Construction in Developing Countries, 18(1), 53-72
- Kikwasi, G.J. (2012). Causes and Effects of Delays and Disruption in Construction Projects in Tanzania. Australasian Journal of Construction Economics and Building: Conference Series, 1(2), 52-59
- Ram Singh, 2009. Delays and Cost Overruns in Infrastructure Projects: An Enquiry into Extents, Causes and Remedies.
- Mohamed, M. B. I. (2015). a Study of Project Delay in Sudan.
- Ahmed, S., Azher, S., Castillo, M. and Kappagantula, P. (2002) Construction delays in Florida; an empirical study, Florida, 2002. [http://www.cm.fiu.edu/publication/Delays .pdf](http://www.cm.fiu.edu/publication/Delays.pdf)
- Braimah N. (2008). An investigation into the use of Construction Delay and Distruption Analysis Methodologies. University of Wolverhampton. PhD. Thesis.
- Majid MZA, M. C. (2008). Factors of non-excusable delays that influence contractors performance . Journal of management in engineering vol- 14, 42-49.
- Ruff C M, D. D. (2008). Owner contractor relationship on contaminated site remdiation projects . Journal of construction engineering and management ASCE Vol 122, 348-353.
- Mohamed, M. B. I. (2015). a Study of Project Delay in Sudan.
- Barry, D. (2015, May 19). Why good communication is central to project delivery. Retrieved from Engineers Journal: <http://www.engineersjournal.ie/2015/05/19/prince2-projectmanagement/>
- Admin. (2016, Jan 29). 7 Ways to Avoid Project Delays with a Contractor. Retrieved from Angies list: <https://www.angieslist.com/articles/7-ways-avoid-project-delays-contractor.htm>
- Barry, D. (2015, May 19). Why good communication is central to project delivery. Retrieved from Engineers Journal: <http://www.engineersjournal.ie/2015/05/19/prince2-projectmanagement/>

- Grossi, M. (2016, October 10). How To Improve Workflow At A Construction Site. Retrieved from 3PLL Links: <https://3pllinks.com/how-to-improve-workflow-at-a-construction-site/>
- pohnpei397. "Why would an increase in the productivity of labor lead to an increase or a decrease in the demand for labor?" eNotes, 11 June 2013, <https://www.enotes.com/homework-help/why-would-an-increase-productivity-labor-lead-an-439498>. Accessed 26 May 2018
- Sunjka et al., (2013). Significant Causes And Effects Of Project Delays In The Niger Delta Region
- Ayodele et al., (2011). Abandonment of construction projects in Nigeria: Causes and Effects. Journal of Emerging trends in Economics and Management Sciences, 2(2), 142 – 145
- Donyavi et al., 2009. The Impact of Effective Material Management on Construction Site Performance for Small and Medium Sized Construction 68 Enterprises. Nottingham, Association of Researchers in Construction Management , pp. 11-20
- Singh, R. (2010). "Delays and cost overruns in infrastructure project: Extent, causes and remedies". Economics and Political Weekly, XLV(21), 43-54
- Salunkhe, A. A. et al., (2014). EFFECT OF CONSTRUCTION DELAYS ON PROJECT TIME OVERRUN:. IJRET: International Journal of Research in Engineering and Technology, 543
- Gardei, C. (2018, Jan 12). 4 Construction Drawing Mistakes That Will Come Back to Haunt You. Retrieved from GLE associates: <http://www.gleassociates.com/4-construction-drawing-mistakes-will-come-back-haunt/>
- Gómez-ferrer, A. P. (2017). Communication problems between actors in construction projects, 87.
- Callier, H. (2017, May 1). Five Reasons Why Obtaining Building Permits Can Give Contractors The Blues. Retrieved from Sub Contractors USA: <http://subcusa.com/five-reasons-obtaining-building-permits-can-give-contractors-blues/>

L.Crissinger, J. (2015, February). Design and Construction vs Weather. Retrieved from rci online: <http://rci-online.org/wp-content/uploads/2015-02-crissinger.pdf>

Johnston, M. (2014, Apr 01). When Projects Are Delayed Due To Labour Shortages. Retrieved from Construction Post.Com: <http://www.construction-post.com/happens-projects-delayed-due-labour-shortages/>



## 2. SECTION B : CAUSE OF DELAYS IN CONSTRUCTION PROJECT

Client Related Problem	Rate				
	1	2	3	4	5
Delay in paying progress payment					
Slow decision making					
Contract modification					
Change orders during construction					

Consultant Related Problem	Rate				
	1	2	3	4	5
Late in approving designs/ drawings					
Poor communication between consultants					
Inadequate experience					
Incomplete document					
Conflicts between parties					
Delay in performing inspection and testing					

Contractor Related Problem	Rate				
	1	2	3	4	5
Improper planning					
Mistake during construction					
Poor site management					
Delay in subcontractor works					
Inadequate construction method use					
Financial problem					

Material Related Problem	Rate				
	1	2	3	4	5
Shortage of construction materials in market					
Delay in delivery of materials					
Late purchasing of materials					
Changing of materials used during construction					
Low quality of materials					
Increase of construction materials price in market					

Labour and Equipment Related Problem	Rate				
	1	2	3	4	5
Shortage of labour					
Low productivity level of labour					
Equipment breakdown					
Shortage of equipment					
Low productivity and efficiency of equipment					
Lack of high technology machinery equipment					

External Problem	Rate				
	1	2	3	4	5
Unfavourable weather					
Poor site condition					
Problem with neighbourhood/ public					
Change in government regulation and laws					
Politic issues					
Effects of social and cultural factor					
Accident during construction					
Delay in obtaining permits from municipality					

### 3. SECTION C : EFFECT OF DELAYS IN CONSTRUCTION PROJECT

Effect of Delay	Rate				
	1	2	3	4	5
Cost overrun					
Time overrun					
Interior quality of works					
Blacklisted by relevant authorities					
Loss of interest by stakeholder					
Non-payment by employer					
Rescheduling of works					

#### 4. SECTION D : METHOD TO IMPROVE DELAYS IN CONSTRUCTION PROJECT

Method to Improve	Rate				
	1	2	3	4	5
Clear information and communication					
Good team work among all parties					
Proper project planning and scheduling					
Increase productivity level of labours					
Appropriate construction methods					
Complete and proper design in time					
Conduct site meeting frequently					
Use proper and modern equipment					
Accurate preliminary cost estimate					
Contingency allowance for emergency use					
Ensure material deliver to site on time					





