



**THE EFFECTS OF NON-EXCUSABLE DELAY IN CONSTRUCTION PROJECT**

**NOR SHAHIRA BINTI SHAARI**

**Thesis submitted in fulfilment of the requirements  
for the award of the degree of  
B. Eng. (Hons.) Civil Engineering**

**Faculty of Civil Engineering  
UNIVERSITI MALAYSIA PAHANG**

**JUNE 2014**

## ABSTRACT

The construction industry is wide, unpredictable and requires high capital outlays. Delay is phenomenon that always happened in construction sector and it is becoming trend that very synonym in construction industry. Usually non-excusable delay is caused by various unpredictable causes faced by contractor or its suppliers. Thus, the study of effects non-excusable delays are crucial in minimizing the projects that delays seem to occur during project delivery. The purposes of this study are to determine the causes of non-excusable delays and to determine the effects of non-excusable delays towards contractor. 60 questionnaires were distributed during data collection process and 46 responses were received. The study involved construction companies selected around Kuantan, Pahang. The scope of this research will focuses on contractors since non-excusable delays are due to the contractors fault. Analysis of the data collections were done through SPSS software and Microsoft Excel. Out of 15 causes of non-excusable delays, only five causes were considered important since their relative indexes are more than 0.5. The causes of non-excusable delays include financial problem faced by the contractor, delay in supplying shortage of the materials and equipments, not selecting competent subcontractor for construction project, poor management of project site and poor management of project changes. Meanwhile, out of 20 effects only 10 were considered crucial since their relative index are above than 0.5. These effects include cost overrun due to inflation and fluctuation, extension of time on the project, rescheduling and rearrangement of works, disputes between parties involved, arbitration among the parties involved, poor quality of work due to hurry, total abandonment of the project, declination of reputation, litigation to the contractor and late payment to contractors. Thus, identifying causes and effects of non-excusable delays will reduce non-excusable delays in construction projects for the sake in the future projects.

## ABSTRAK

Industri pembinaan luas, tidak dapat diduga dan memerlukan perbelanjaan modal yang tinggi. Fenomena kelewatan sering berlaku di sektor pembinaan dan ia menjadi 'trend' yang amat sinonim dalam industri pembinaan. Kelewatan yang tidak dibenarkan biasanya disebabkan oleh sebab-sebab tidak dapat diduga pelbagai dihadapi oleh kontraktor atau pembekal-pembekalnya. Maka, kajian kesan kelewatan tidak dibenarkan adalah penting dalam mengurangkan projek pembinaan yang mengalami kelewatan semasa penyerahan projek. Tujuan kajian ini akan menentukan sebab-sebab kelewatan yang tidak dibenarkan dan menentukan kesan-kesan kelewatan yang tidak dibenarkan terhadap kontraktor. 60 soal selidik telah diagihkan semasa proses pengumpulan data dan 46 jawapan telah diterima. Kajian ini melibatkan syarikat pembinaan sekitar Kuantan, Pahang. Skop penyelidikan ini akan menumpukan pada kontraktor memandangkan kelewatan tidak dibenarkan adalah berpunca daripada kontraktor. Analisis data dibuat melalui perisian SPSS dan Microsoft Excel. Daripada 15 sebab-sebab kelewatan tidak dibenarkan, hanya lima sebab-sebab utama dianggap penting memandangkan indeks relatif mereka ialah lebih daripada 0.5. Antara sebab-sebab kelewatan yang tidak dibenarkan adalah masalah kewangan dihadapi oleh kontraktor, melambatkan dalam membekalkan kekurangan bahan dan peralatan, subkontraktor yang tidak cekap, pengurusan tapak projek yang lemah dan pengurusan perubahan projek yang lemah. Sementara itu, daripada 20 kesan hanya 10 dianggap penting sejak indeks relatif mereka di atas daripada 0.5. Antara kesan-kesannya adalah lebihan kos disebabkan inflasi dan pergolakan, pelanjutan masa projek, penjadualan semula dan penyusunan semula kerja, pertikaian di antara pihak terlibat, timbangtara antara parti terlibat, kurang kuaiti kerja disebabkan kegopohan, pembuangan projek sepenuhnya, penurunan reputasi, litigasi kepada kontraktor dan bayaran lewat kepada kontraktor. Maka, mengenal pasti sebab-sebab dan kesan-kesan kelewatan yang tidak dibenarkan akan mengurangkan kelewatan projek pembinaan untuk kepentingan projek yang akan datang.

## TABLE OF CONTENT

		<b>Page</b>
<b>SUPERVISOR'S DECLARATION</b>		ii
<b>STUDENT'S DECLARATION</b>		iii
<b>DEDICATION</b>		iv
<b>ACKNOWLEDGEMENT</b>		v
<b>ABSTRACT</b>		vi
<b>ABSTRAK</b>		vii
<b>TABLE OF CONTENT</b>		viii
<b>LIST OF TABLES</b>		xiii
<b>LIST OF FIGURES</b>		xiv
<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	
1.1	Introduction	1
1.2	Background of Study	2
1.3	Problem Statement	3
1.4	Research Objectives	4
1.5	Scope of Study	4
1.6	Significance of Study	5
<b>CHAPTER 2</b>	<b>LITERATURE REVIEW</b>	
2.1	Introduction	6
	2.1.1 Construction Delays	6
2.2	Definition	7
2.3	Contractors	9
2.4	Classification of Project Delays	10
	2.4.1 Classification of Delays Based on Causes (Origin)	10
	2.4.1.1 Owner Caused Delays	10
	2.4.1.2 Contractor Caused Delays	11

2.4.1.3	Delays Caused By Third Party	11
2.4.2	Classification of Delays Based on 'Timing'	12
2.4.2.1	Concurrent Delays	12
2.4.2.2	Non-Concurrent Delays	13
2.4.3	Classification Based on Compensability	13
2.4.3.1	Excusable Non-Compensable Delays	15
2.4.3.2	Excusable Compensable Delays	15
2.4.3.3	Non-Excusable Delays	16
2.5	Conclusion	17
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	
3.1	Introduction	18
3.2	Research Methods	18
3.2.1	Literature Review	20
3.2.2	Empirical Study	20
3.3	Questionnaire Review	21
3.3.1	Population of Questionnaire Survey	22
3.3.2	Questionnaire Design	22
3.3.2.1	Section A: Respondent Information	22
3.3.2.2	Section B: To Determine The Causes of Non-Excusable Delays	23
3.3.2.3	Section C: To Determine The Effects of Non-Excusable Delays Towards Contractor	23
3.4	Distribution of Questionnaire	24
3.4.1	Distribution Method Via Mail	24
3.4.2	Distribution Method By Hand	25
3.5	Interview	25
3.6	Data Analysis	25

	3.6.1 Frequency Analysis	26
	3.6.2 Relative Index	27
3.7	Conclusion	27
<b>CHAPTER 4 DATA ANALYSIS</b>		
4.1	Introduction	28
4.2	Data Analysis	29
	4.2.1 Section A: General Information of Respondent	29
	4.2.1.1 Age of Respondent	30
	4.2.1.2 Position of The Respondent	30
	4.2.1.3 Type of Project Undertaken By Company	31
	4.2.1.4 Percentage Progress of Ongoing Project	32
	4.2.1.5 Project Experiencing Delay	33
	4.2.1.6 Stage of Delay Occur	34
	4.2.1.7 Conclusion	35
	4.2.2 Section B: Causes of Non-Excusable Delays	35
	4.2.2.1 Analysis Causes of Non-Excusable Delays of Construction Project	36
	4.2.2.2 Discussion on Causes of Non-Excusable Delays	41
	4.2.2.2.1 Financial Problems faced by the contractor	42
	4.2.2.2.2 Delay in Supplying Shortage of Materials and Equipments	42
	4.2.2.2.3 Not Selecting Competent Subcontractors	43
	4.2.2.2.4 Poor Management of Project Site	44
	4.2.2.2.5 Poor Management of Project Changes	44
	4.2.2.3 The Main Causes of Non-Excusable Delays in Construction Project	45
	4.2.2.4 Conclusion	45
	4.2.3 Section C: Effect of Non-Excusable Delays towards	45

	Contractor	
	4.2.3.1 Analysis Effect of Non-Excusable Delays towards Contractor	46
	4.2.3.2 Discussion on Effects of Non-Excusable Delay	52
	4.2.3.2.1 Cost Overrun Due To Inflation and Fluctuation	52
	4.2.3.2.2 Extension of Time on The Project	53
	4.2.3.2.3 Rescheduling and Rearrangement of Works	53
	4.2.3.2.4 Disputes between parties involved	54
	4.2.3.2.5 Arbitration Among The Parties Involved	55
	4.2.3.2.6 Poor Quality of Work Due To Hurry	55
	4.2.3.2.7 Total Abandonment of The Project	56
	4.2.3.2.8 Declination of Reputation	56
	4.2.3.2.9 Litigation To The Contractor	57
	4.2.3.2.10 Late Payment To Contractor	57
	4.2.3.3 The Main Effects of Non-Excusable Delays in Construction Project	57
	4.2.3.4 Conclusion	58
<b>CHAPTER 5</b>	<b>CONCLUSION</b>	
5.1	Introduction	59
5.2	Conclusion	59
	5.2.1 Objective 1: To Identify The Causes of Non- Excusable Delays	59
	5.2.2 Objective 2: To Identify The Effects of Non- Excusable Delays Towards Contractor	60
5.3	Research Limitation	61
5.4	Contribution of Study	62
5.5	Recommendation	62
	5.5.1 Recommendation for This Study	63

	5.5.1.1 Contractor	63
	5.5.2 Recommendation for Future Study	64
5.6	Summary	64
	<b>REFERENCES</b>	66
	<b>APPENDICES</b>	
A	Sample Questionnaire Form	68



## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>Page</b>
3.1	Classification Likert Scale for Section B	23
3.2	Classification Likert Scale for Section C	24
3.3	Likert Scale scores from five levels to three levels	26
4.1	Percentage of Respondents Response	29
4.2	Causes of non-excusable delays in construction project according to relative index	37
4.3	Causes of non-excusable delays according to the percentage of agree	40
4.4	Main causes non-excusable delays in construction project	45
4.5	Effects of non-excusable delays according to relative index	47
4.6	Effects of non-excusable delays according to the percentage of agree	50
4.7	Main effects non-excusable delays in construction project	58
5.1	Causes of non-excusable delays according to relative index	60
5.2	Effects of non-excusable delays according to relative index	61

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>Page</b>
2.1	Project Components	8
2.2	Delay Categories	14
3.1	Research Methodology Flowchart	19
4.1	Age of Respondents	30
4.2	Position of Respondents	31
4.3	Type of project undertaken by the company	32
4.4	Percentage progress of ongoing project	33
4.5	Project experiencing delay	34
4.6	Stage of delay occur	35
4.7	Graph of Relative Index- Causes of non-excusable delays in construction project	39
4.8	Graph of Percentage of Agree – Causes of non-excusable delays in construction project	41
4.9	Graph of Relative Index- Effects of non-excusable delays in construction project	49
4.10	Graph of Percentage of Agree – Effects of non-excusable delays in construction project	51

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The construction industry is wide, unpredictable and requires high capital outlays. The era of the 21<sup>st</sup> century which towards the 2020 vision, construction industry is one of the most important sector and acts as main catalyst to the economic development and growth of the country. Construction sector contribute to the highest percentage in economy of the development of country. In the year 1997, for example construction industry had distributed 4.8% to Gross Domestic Product (GDP) and required 9.2% for total of manpower in order to upgrade the country standards headed to modern developed country (Department of Prime Minister, 1998).

Construction sector is becoming systematic and complex due to the improvement in the science and technology. Nowadays, modern approach is vital to planning and managing activities in construction project. Although the country is well developing, there are still weakness in management and implementation of the projects which surge the construction industry today. As stated by Ozdemir (2010), the construction industry has very weak status when dealing with delays. Sometimes, often neglected the objective of the construction project is to accomplish within the time, estimated cost and with the desired quality. Time, cost and quality are the key element of successful construction with regards to the safety and environmental friendly. Thus, the key elements that must be emphasized are time factor, quality and cost (Chan et al., 2002).

Delays exist in each of the construction project and the important of delays indicate the different considerably from project to project. Delays often happened in all phases of construction project and have been seen as unavoidable which results to the increase of cost and time. It is seen as the mainly productive factor which influenced project performance. Due to this factor, many main projects fail to encounter the estimated date. When time is come to money in construction project, managing of time is critical (Duran, 2006), thus forecasting a probability that delay of schedule plays an important role in overall project success (Luu et al., 2009).

The main concern of each contractor is to guarantee the construction project will be delivered in the excellent performance level. Even though performance is measured on the achievement of the project objective, it would only be achieved if the causes and effects of non-excusable delays can be minimized by well practices in reducing compensable delays. Non-excusable delays are caused fully by the contractor and its supplier (Fugar and Agyakwah-Baah, 2010). Ongoing incidents of non-excusable delays explicitly sign to contractors in construction industry consider to be careful of the usual factors caused to non-excusable delays and thus, take the actions to prevent the repetition.

Although the completion of the project within the allocated time is a formidable task to be achieved and perhaps impossible in construction environmental which is rapid develop, sometimes erratic, complex and involving many parties. Most of the previous construction projects completed with surplus or lack of specification from contract document but rarely completed in estimated time using the financial allocation given. In this decade, more projects are prone to the time limit and contractor ability to complete construction projects in the shortest possible time becomes the important element in tender victory.

## **1.2 Background of Study**

Delay is phenomenon that always happened in construction sector and it is becoming trend that very synonym in construction industry. Ozdemir (2010) stated that when related with delay, the construction industry has a very low reputation. If this still

continue and still no mechanism to solve and find the solution, so it will give a great impact to the construction project in this country. It is also can affect the growth of development economic country. This is so because construction sector is the ten most important industries in growth of economy country (Malaysian Industrial Classification (MIC), 1972). The ability in completing a project within the time estimated is contributing to the efficient of planning and management of time.

Non-excusable delays are caused mainly by the party resulted the delays and will involve the loss of money due to delays. This type of delays usually caused by the contractors or its supplier. Contractor's responsibility delays are caused to the inability of the contractor to continue with the project persistently and efficiently due to insufficient labour or plant allocation and incompetence of contractors. Completing projects on time is an indicator of efficiency, but the construction process is leading to many variables and unpredictable factors which result from many sources. These resources are comprises of the party performance, availability of resources, condition of environment, parties involvement and relation contractual. However, the project is rarely completed within the estimated time (Assaf, 2006).

Hence, it is important to have insight and understanding regarding the non-excusable delays issues. Non-excusable delays should be exposed to the organization involved in identifying causes and effects in order to minimizing issue of non-excusable delays. When the causes and effects are identified surely non-excusable delays in construction project can be lessen. This is vital to ensure the future project free from delay.

### **1.3 Problem Statement**

Project success is defined as achieving goals and objectives as prescribed in the project plan, while a successful project mean that the project has meeting its technical performance, maintained its schedule and remained within budgetary constraints (Frimpong, Oluwoye and Crawford, 2003). Delays of the construction projects in Malaysia always happened in order to execute it. Usually non-excusable delay is caused by various unpredictable causes faced by contractor or its suppliers. When these causes

happened, contractor faced problems in completing the projects because of non-excusable delays.

Non-excusable delays in the construction projects are due to contractor's failure of the contractor assigned responsibilities regarding of the time management. Time management is crucial for construction projects to be completed within the allocated time. Thus, further studies will be conducted to identify the causes of the failure of a construction project to be completed within a reasonable time and the effects of these problems for all parties. Therefore, it is important to identify the causes and effects of non-excusable delays prior to the completion of the projects. Thus, it will reduce non-excusable delays in construction projects for the sake in the future projects.

#### **1.4 Research Objectives**

The aim of this study is to identify and investigate the major effects of non-excusable delays in construction projects toward contractors. In order to achieve this aim several objectives were set to facilitate the implementation of research and study objectives were to focus on. Among the objectives outlined are:

1. To determine the causes of non-excusable delays.
2. To determine the effects of non-excusable delays towards contractor.

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

The scope of the study is aimed to narrow the field of study so that the study would be more organized and efficient. Scope of study is focus on all construction activities related with non-excusable delays time in construction and management. Limitations of the study are as follows:

1. The study involves the construction companies selected around Kuantan, Pahang.
2. The selected construction companies will be as respondents which comprises of construction companies which acts as a contractor.
3. The information and data collected is based on the literature review, interviews, questionnaires that will be conducted.

### **1.6 Significant of Study**

This study is aimed to meet some of the advantages that are seen as vital to the guidelines and references by the parties directly involved in construction projects, especially the contractors. The significance is as follows:

1. Identifying the reasons that contributed to the non-excusable delays in construction projects and their impact to help the parties involved to coordinate the system of management and supervision of projects and works, so order early to ensure a degree of delay in construction projects and further reduced to zero.
2. Study the effects of non-excusable delays in construction projects. The results of this study can serve as a lesson to the parties involved remaining vigilant in the task entrusted to ride smoothly thus reducing project delays.
3. Improving the performance of the construction industry from the perspective of management, supervision, planning as well as how things work more efficiently in a project and the ability to be competitive with international companies in Malaysia in obtaining contracts.
4. Increase the country's construction industry equivalent advanced nations in terms of the smooth management and be able to compete internationally in obtaining contracts.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The literature review is a vital form part process of ways in carry out research as it serves to disseminate the formulation based on problems statements as well as identify the boundary of knowledge. It also able to create a strong foundation and gives a platform for generates the knowledge throughout the subjects. Delays were discussed by several authors in many researches. Delays were still being reported among the construction projects despite several research projects being conducted to address these problems. The situation of delays in the construction project has driven the researcher to study into more detail the problems related to delays. The broad literature review has revealed some issues that need to be addressed in order to enhance knowledge related to construction delays.

This chapter discovers the results of the literature search, since it is important to recognize an appropriate process research methodology. Before focusing on a definite issue all types of delays were explored including an examination of the issues of definition of delays, types of delays and delays damages. Previous work has helped in details examination the researcher to formulate the research topic and identify the scope of study.

##### **2.1.1 Construction Delays**

The success of construction projects can be accessed through the achievement of project goals and objectives as set in the early stages of project planning in construction



projects. Successful of construction projects must be able to accomplish the technical tasks well, be organized and on schedule completion within the estimated cost. Delays in construction project are a phenomenon that often occurs in construction industry. Ozdemir (2010) stated that when dealing with delays construction industry is in a low status. It is not only because of the construction works were delayed but also will contribute to time consuming and increasing cost.

Time is one of the most vital elements in a construction project. Usually, the period of time is categorized as contractual period in construction projects. Therefore, within the execution of contract, contractors must be responsible in executing and completing the projects perfectly within the estimated time as agreed in the contract. If the contractor failed in finishing the project within the estimated time, delays in construction project will be happened. Delays happened because of the poor time managements or many others cause during the execution of the construction projects.

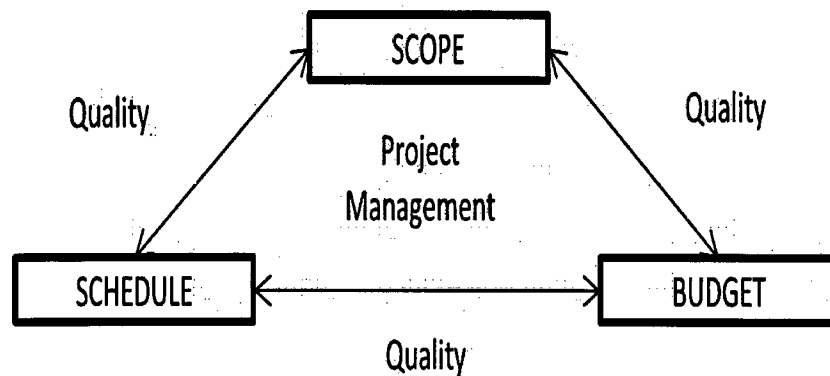
Therefore, it is a common thing in such a construction projects to minimizing and controlling for delays to happen and delays in construction works. Delays give great impacts to the completion of the projects and thus increase the overall cost of construction projects. As a result of delays in the construction projects, deeper understanding related to delays issue must need to be generated in order to ensure early on prevention action will taken, so delays in construction projects will be at the lowest one. This is because, nowadays problems of delays in construction projects status in the critical and frequently happened in the construction industry.

Hence, before going any further and understand deeper the detail aspects in scope of study, understand and basic concept need to be revealed. This is because there will be many incoming challenges in completing the construction projects within the estimated time.

## **2.2 Definition**

Construction projects are one-off effort with unique characteristics such as long-term, complicated process, a very difficult environment, the financial problem and

dynamic organizational structure (Zou, Zhang and Wang, 2007). Project is stated as the need to finish a duty on estimated time, within budget and with appropriate technical performance or quality. According Oberlender (1993:4), the project comprises of three components namely scope, budget (financial) and schedule. In the diagram it is described by Oberlender as shown in Figure 2.1.



**Figure 2.1:** Project Components

Source: Oberlender (1993)

In construction, the word “delay” refers to situation occurs exceeds the estimated time that has been planned, suppose, agreed in a contract or exceed the date that the parties agreed upon for the delivery of a project (Pickavance, 2005).

According to Lo, Fung and Tung (2006) stated that delay as the deliberate of construction works without completely end the construction projects and that can lead to time overrun either exceed the contract date or exceed the date that the parties have agreed upon for the delivery of the project.

According Sadi A. Assaf (2004), delay can be defined as the construction work exceeds either the date specified in the contract or the date agreed upon by all parties involved during project delivery.

Sanders and Eagles (2001) describe delay as a situation that causes time-consuming to finish entire construction works of a project. It may be defined as the time overrun whether exceed the finish date as stated in the contract.

Stumpf (2000) defined that delay is an action or situation that beyond the estimated time required carry out the duty based on contract.

Bramble and Callahan (1987) described delays as extension of time during executing of construction projects because some construction works cannot be perform due to unexpected situations.

Delay can be defined as to make something happen later than estimated resulting in something that can be done later than planned or not act in an appropriate time (Mahdavinejad and Molaei, 2011)

According to A.A. Aibinu et al (2002) delay is a situation when the contractor and project owner jointly or severally contribute to the unfinished of the project within the estimated time agreed in the contract. Delays are considered costly, since there is usually a construction finance involved which charges interest, management staff dedicated to the project whose cost and time consuming and increasing in inflation in pay and material prices.

Inexcusable delays (non-excusable delays) are caused fully by the contractor or its suppliers (Fugar and Agyakwah-Baah, 2010).

### **2.3 Contractors**

A contractor is people who getting into a binding agreement to carry out certain service or give a certain product in exchange for valuable consideration, financial, services, goods, even barter arrangement.

In a construction business, a contractor is one who engaged in the construction building related services for a client. The construction site is monitored by a "Prime",

General or specialty contractor who may manage the work with employees, subcontractors or any combination

## **2.4 Classification of Project Delays**

Delays can exist in various types in the construction sector. It will be concluded that delays of project can be classified according to causes or origin and timing and based on compensability. Figure 2.2 below shows the summary of the types of delays depending on its classification.

### **2.4.1 Classification of Delays Based on Causes (Origin)**

Delays in construction projects can be generated by various basic factors and causes. Usually, delays may be caused from clients or owner responsibility (Owner Caused Delays), contractor (Contractor Caused Delays) and third party (Third Party Caused Delays). Third party means other party that contributes directly or indirectly in execution construction projects besides owner and contractor. For examples sub-contractor, trades, labour and others.

#### **2.4.1.1 Owner Caused Delays**

Owner or in construction industry called developer is among party that contributes to the causes of delays in construction projects. Among the causes of delays that is caused by owner or clients can be divided to four main categories which are:

- Delays as a result of fail to fulfill the contracts responsibility
- Delays caused changes in job scope contractual provision of construction projects
- Delays caused by disruption or interfere owner to the contractors responsibility
- Delays due to poor coordination each of activities that execute by contractor or sub-contractor which for the project that involve multi contractors

It can be concluded that client or owner are responsible based on allocation which are based in contract. The responsibilities of the owner to provide the contractors with the preparation of project site, sanctions and approval in every documentation which related owner duty, owner's responsibility to provide financial resource on specification design and contract administration, change of works that need to be carried out and coordination of the main contractors activities.

#### **2.4.1.2 Contractor Caused Delays**

Contractor is one of the parties that contribute to the delays in construction project. Usually delay that is caused by contractor is contractors that have poor competency and skills and lack of experience in execution of the construction project. Delays that are caused by contractor can be comprised by five main causes which are:

- Poor management of project site
- Contractor management problems
- Lack of financial, material and labor
- Lack of competence and skills of contractors
- Delay in awarding subcontractors contract

#### **2.4.1.3 Delays caused by third party**

Third party is the party that contributes in the construction project besides contractor and client or owner as supplier of materials, designers and others. Delays in construction project not only caused by human, but one of the main causes of delays are adverse weather thus do not allow the construction works to be carried out.

For examples in Malaysia, monsoon season always happened at the end of the year caused the continuous raining. This will affects the construction works and caused to be delayed such as concreting works and painting works. Besides delays in project also may be caused by lack of labors without planning. Extension of time will be given to the contractors if the delays in the activities influence the entire duration of the projects.

Other causes of the delay by third party are difficulty in obtaining loans from the financial institution, bad weather such as flood, mistakes on specification plan, workers strike, economic crisis, force majeure and many more.

#### **2.4.2 Classification of Delays Based on 'Timing'**

Duration of construction project is one of the elements that can contribute to the types of delays in construction projects. Thus, relationship time towards causes and types of delays can be divided to two categories which comprises of Serial/ Con-current Delays and Independent/ Non Concurrent Delays.

##### **2.4.2.1 Concurrent Delays**

In this serial delays, relationship series of time for each construction activities link each other in a time. This means serial delays happen when there are two or more independent delays at a time. When this type of delays happened can give a great impact to the entire operation project. In this serial delays, possibility of delays happened from owner or contractor which delays happened in the same activities (example, activity Y) at the same time (example, day-5<sup>th</sup>). For this case, both delays happened at the same time and relate to each other thus will bring the effects to the project duration. Delays that happened at the same time and in the serial critical activities is called as concurrent delays. Too much works and poor in scheduling and organization will caused this delays happened.

##### **2.4.2.2 Non- Concurrent Delays**

If the delays happened with its owned, where there is no delays happened at the same time and non serial it can be stated as independent delays. This type of delays will affect the duration of the project which can be evaluated through network schedule. Through this, delays that can be predicted happen can be identified and early precaution steps can be taken to minimize these delays from happened.

### **2.4.3 Classification based on Compensability**

Delays are classified into several categories based on the specific factors that lead to delays. Generally, the delay is divided into two categories which are non-excusable delays and excusable delays. Obviously, the differences between these two are important because it will determine which party is responsible with delay. Classifications of delays are based on contracts that have been stated. Excusable delays are a delay that is caused by third party which cannot be avoid, meanwhile non-excusable delays are delays that is caused by contractor.

Excusable delays can be further divided into two categories based on liquidated a damage which is excusable non-compensable and excusable delays with liquidated damages which excusable compensable delays.

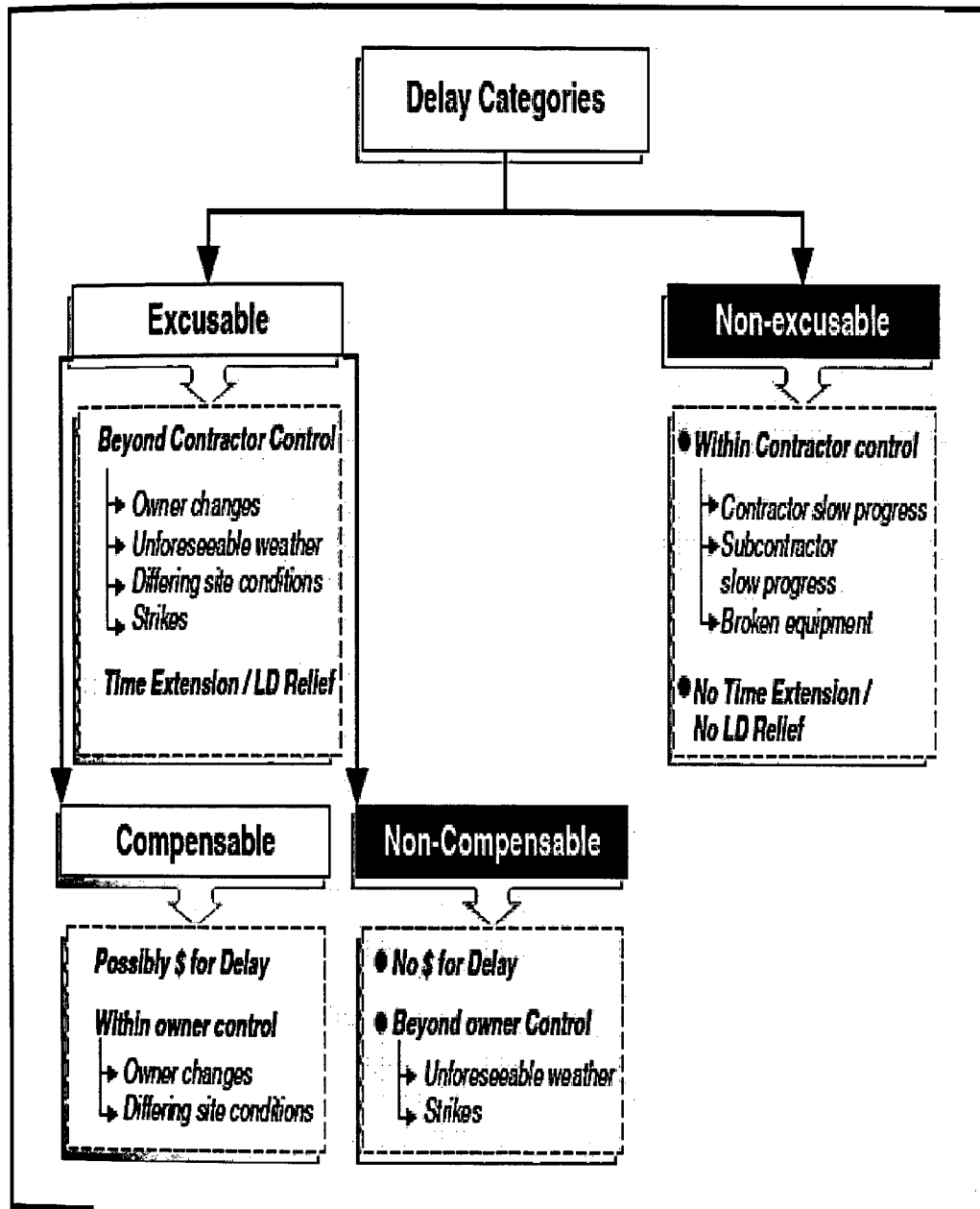


Figure 2.2: Delay Categories

Source: Theodole (1990)