

**THE STUDY OF DELAY AND SUCCESS FACTORS IN  
MALAYSIAN CONSTRUCTION INDUSTRY**

By

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Dissertation submitted in partial fulfilment of  
the requirements for the  
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(Civil Engineering)

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**CERTIFICATION OF APPROVAL**

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Approved by,

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AUGUST 2013

## **CERTIFICATION OF ORIGINALITY**

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgments, and that the original work contained herein have not been undertaken nor done unspecified sources or persons.

Produced by,

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## **ABSTRACT**

Construction project management is vital for accomplishing pre-determined objectives. Despite of using construction management, most of the projects do not meet original time schedule or has been delayed. Delay is one of the biggest problems faced by construction industry.

This project is a study or research of critical success and delay factors for project management in construction focusing contractors in Peninsular Malaysia.

The objectives of this research project are to investigate success and delay factors to help contractors to reach their goals on time during construction. This research will reviewed success factors through literature review and delay factors through survey questionnaires and structural interviews targeting professionals involved in construction project. The correlation between them is examined to produce the best ways in preventing delays.

To carry out this research, comprehensive literature review is done to provide the background, history and success factors of project management in construction. The information of literature review will be is used to design and conduct a survey questionnaires to investigate delay and success factors in constructions.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

The construction industry is one of the industries that involved many uncertainties in its everyday operations. The study of recent literature shows that construction projects are normally accomplished with large cost overruns, extended schedules (delay) and quality concerns.

Oxford Dictionaries (2013) defined delay as “a period of time by which something is late or postponed”. According to Ahmad et al (2003), delay is generally acknowledged as the most common, costly, complex and risky problem encountered in construction projects. Because of the overriding importance of time for both the owner (in terms of performance) and the contractor (in terms of money), it is the source of frequent disputes and claims leading to lawsuits.

Kumaraswamy *et al.*, (1998) surveyed the causes of construction delays in Hong Kong as seen by clients, contractors and consultants, and examined the factors affecting productivity. The survey revealed differences in perceptions of the relative significance of factors between the three groups, indicative of their experiences, possible prejudices and lack of effective communication. The effects of the delay may include time overrun, cost overrun, disputes, arbitration, litigation and total abandonment.

A number of studies have been carried out to investigate the factors which lead to successful completion of projects. Some researcher evaluates the concept of success in a construction project when the evaluation dimensions are adequately defined. The first study to determine critical success factors was carried out by David Ashley (1987), who identified which factors were most important in successfully completing construction projects. Mengesha (2004) indicates that research into critical success factors has been undertaken since 1967, and demonstrates the development of information on critical success factors based on empirical and theoretical studies (Ruben and Seeling, 1967).

This study observes success and delay factors in a cohesive fashion to determine which critical success factors are most influential in avoiding certain critical delay factors. Once the critical success factors are recognized, the opportunities for improving project performance within the public sector delivery of Malaysia building construction projects are discussed.

## **1.2 Problem Statement**

A project in construction project success in Malaysia is currently low. Therefore, the research questions these studies are:

1. What are the real causes of project delays in Malaysian Construction industry?
2. How these factors are related to critical success factors within construction industry?

A survey need to be done to answer these questions to improve construction industry performance in Malaysia.

## **1.3 Objectives**

The aim of the research is to improve project management performance in construction industry in Malaysia. The objectives of the research are:

- To investigate the delay factors in construction industry in Malaysia by revealing some problems affecting construction project performance.
- To identify some success factors to prevent delay factors in construction industry in Malaysia

## **1.4 Scope of Study**

The study is mainly focus on identification of delay and success factors in Malaysian construction industry. It will be done using survey questionnaires and structural review.

It will be conducted towards professionals in construction companies that have been registered with Construction Industry Development Board (CIDB) Malaysia.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Overview of Construction Industry

According to Kasimu A. M. (2012), the construction industry is large, volatile, and requires tremendous capital outlays. A unique element of risk in the industry is the manner in which disputes and claims are woven through the fiber of the construction process. Mogbo (2004) stated that, construction is being used to control the economies of nations; it is always strongly related to politics, economics, sociology and the legal framework.

The construction industry is a sector of the economy which is responsible for the planning, design, construction, maintenance and eventual demolition of buildings and works. It is basically a service industry, gaining its inputs and outputs from many parts of the economy with which it is interconnected and interlinked, often in quite complex ways. The importance of construction comes from its role in the generation of constructed physical facilities and in employment, which in turn, play a critical and highly visible role in the process of the development of the country.

Construction covers all civil engineering works and all type of new building projects (including housing), as well as the maintenance and repair of current facilities. In developing countries, as much as one half of total construction output may be civil engineering projects – transport facilities, power projects, irrigation, drainage, water supplies, etc. housing generally makes up less than one third of the total output; the remainder is in other buildings – hospitals, schools, offices, factories, hostels and agricultural buildings (Well, 1986).

According to Gale and Fellows (1990), and Ofori (1990) Construction industries in all countries face many difficulties and challenges. However, the problems facing the construction industry in developing countries are suggestively more essential, more severe, and more complex. In developing countries, these difficulties and challenges sit alongside the general situation of socio-economic stress, chronic resource shortage and a general inability to deal with key issues (Ofori, 2000). In developing countries, the problems faced in construction industry include:

- Instability

- Scarce resources
- Relatively unskilled labour forces
- Low levels of productivity, overruns and excessive wastages
- Poor infrastructures
- Fraudulent practices, and the inability to adopt best practise
- Financing characteristics typical in developing countries
- Government influence
- Informal sector activities

## 2.2 Delay Factors

All contract parties have goals to complete a project according to the planned schedule, under the planned budget, with the highest quality and in a safe manner. However, delay has become a common problem occurred in construction industry nowadays. Delay lead to many negative effects such as disputes between clients and contractors, increased costs, loss of productivity and revenue, and termination of contract. (Kasimu A. M, 2012). The project factors and the cause of delay should be identified by construction parties in order to control and minimise construction project delays.

Delay can be defined as the additional time required to complete a construction project exceeding its original (planned) duration, whether compensated or not.

The demand of construction clients for timely delivery of construction projects and the susceptibility of project delays and cost overruns has attracted researcher all over the world, most of who tried to identify immediate as well as the root cause of project delay (Olusegun and Akintunde, 2012). Research indicates the effect of delays as (1) time overrun, (2) cost overrun, (3) disputes (4) arbitration and (6) abandonment (Murali, 2006; Aibinu and Jagboro, 2002; Chan and Kumaraswamy, 2002).

Ahmed et al (2003) indicates that delays can be divided into three major types which are:

1. Excusable and non-excusable;
2. Compensable and non-compensable;
3. Concurrent.

Non-excusable delays are caused by contractor or subcontractors or material suppliers, through no fault of the owner. The contractor might be entitled to compensation from the delaying subcontractor or supplier, but compensation cannot be sought from the owner. Therefore, non-compensable delays usually result in no additional money and no additional time being granted to the contractor (Alaghbari, 2005).

There are two types of excusable delay which is non-compensable delay and compensable delay.

Non-compensable delay is caused by third parties or incidents beyond the control of both the owner and the contractor. Example typically includes acts of God, unusual weather, strikes,

fires, acts of government in its sovereign capacity, etc. In this case, the contractor is normally entitled to a time extension but no compensation for delay damages (Kasimu A.M. 2012).

Compensable delay is caused by the owner or the owner's agents. An example of this would be the late release of drawings from the owner's architect. An excusable, compensable delay usually leads to a schedule extension and exposes the owner to financial damages claimed by the contractor. In this case, the contractor incurs additional indirect costs for both extended field office and home office overhead and unabsorbed home office overhead. (Kasimu A.M. 2012)

### **2.3 Construction Delay: A Quantitative Analysis**

Al-Momani (2000) undertook a discover to ascertain the cause and extent of delays in area undertakings in Jordan. The discover investigated the cause of delays on 130 undertakings, encompassing residential constructions, workplace and management constructions, schools, health centres, and contact facilities. The example populace was instituted by selecting 130 finished area undertakings in disparate spans of Jordan amid the years of 1990 and 1997. To examine why assembly delays and overruns transpired, the pursuing data were obtained from the projects' records: Planned duration of contract:

- Actual completion data
- Design changes
- Disputes
- Notifications
- Date of notice to proceed
- Delays encountered during construction
- Conflicts related to the drawings and specifications
- Time extensions
- Late delivery of material and equipment

As shown in Table 2.6 below, the frequencies for every single stay in five disparate assembly groups were endowed, illuminating that undertakings were postponed for assorted reasons. The discover discovered that the momentous reasons of stay were poor design, change orders, meteorological conditions, locale conditions, late transport, commercial conditions, and rise in quantities. The four main reasons of stay were poor design, change orders and locale and commercial conditions.

Facility Type	Poor Design	No Delay	Change Orders	Weather	Increase in Quantity	Late Delivery	Site Conditions	Economic Conditions	Total
House	4	3	1	3	2	0	1	0	14
Office	8	5	5	4	5	1	2	4	34
School	10	14	8	6	3	4	5	2	52
Hospital	6	2	4	2	1	3	0	2	20
Roads	4	6	2	1	1	2	0	0	10
<b>Total</b>	32	24	20	19	12	10	8	8	130

Table 2.1 summary of the Investigated project delay



## 2.4 Causes of Construction Delay: Traditional contract

Odeh and Bettaineh (2002) recognized the main reasons of stay in the assembly industry and assessed the comparative significance of these reasons for the established adversarial kind of contracts from the viewpoint of assembly contractors and consultants. First, a survey questionnaire was industrialized to assess the perceptions of contractors and consultants of the comparative significance of assembly stay causes. Second, the questionnaire was distributed to a random example of contractors and consultants working on colossal undertakings in Jordan. The survey is established on 28 well understood reasons of stay to that members were asked to ascribe levels of importance. The reasons were categorized into the pursuing 8 main clusters as shown in Table 2.4

Category	Factor	Contractors		Consultants	
		Index	Rank	Index	Rank
Client	Finance and payment of completed work	3.30	4	3.32	2
	Owner Interference	3.51	2	3.21	4
	Slow decision-making by owners	3.24	8	3.16	5
	Unrealistically imposed contract duration	3.08	13	3.11	6
Contractor	Subcontractors	3.21	9	3.26	3
	Site management	3.29	5	2.58	13
	Construction methods	3.29	5	2.37	17
	Inadequate planning	3.14	10	2.37	17

Table 2.2 Relative importance index and ranking of delay factor (Odeh and Bettaineh 2002)

## **2.5 Causes of Delay in Large Building Construction Projects**

The study undertaken by Assaf et al. (1995) encompassed of two phases. The early period encompassed a works study and interviews alongside innate contractors, architectural builders, and proprietors, whereas fifty-six reasons of stay were identified. These factors were gathered into nine main categories:

- Materials – reasons of stay connected to shortages, physical adjustments, transport, damage, and producing of materials;
- Labour – shortages of labour, labour skill, and the nationalities of the labourers;
- Equipment – stay connected to wreck, shortage, and transport of the supplies, or the productivity or skill of operators of the equipment;
- Financing – contractor’s financing necessities and progress payments paid by owners;
- Environment – climatic conditions, communal and traditional encounter, geological conditions;
- Changes – delays as a consequence of omissions, errors, and adjustments of scope by owners;
- Government relations – stay connected to permits, labour visa necessities, and power bureaucratic procedures;
- Contractual connection – setbacks including the contractual connection amid the assorted parties encompassed in a undertaking, who have fluctuating and from time to time contradictory interests;
- Scheduling and manipulating methods – poor arranging and arranging habits, lack of association expertise in undertaking domination, and poor record keeping and maintenance.

## 2.6 Success Factors

A constructing undertaking is finished across a combination of countless events and contact, projected or unplanned, above the existence of a ability, alongside changing members and procedures in a steadily changing environment. Precise factors are extra critical to a project's accomplishment than others. These factors are shouted critical undertaking accomplishment factors.

The word Critical Accomplishment Factors in the context of the association of undertakings was early utilized by Rockart in 1982 and is described as those factors forecasting accomplishment on projects. Accomplishment is described by Ashley et, al. (1987, p 71) as "results far larger than anticipated or normally noted in words of price, design, quality, protection and member satisfaction". The investigation of the accomplishment factors of assembly undertakings has enticed the attention of countless researchers and countless studies have been led, alongside the target of bestowing contract parties alongside priceless vision into how to consistently accomplish superior aftermath for their projects. Even though assembly undertakings are by their nature repetitive hobbies, every single one has its own characteristics and circumstances.

According to British Standards Association (BSI, 1996), a undertaking is a exceptional set of synchronized hobbies, alongside definite commencing and finishing points undertaken by individual or an association to encounter specific goals alongside described design, price and presentation parameters. A little factors are extra critical to a accomplishment of undertaking than supplementary factors and it is shouted as critical undertaking accomplishment factor. The word Critical Accomplishment Factors in the context of the association of undertakings was early utilized by Rockart in 1982 and is described as those factors forecasting accomplishment on projects.

Success is described by Ashley et al (1987, p 71) as "results far larger than anticipated or normally noted in words of price, design, protection and member satisfaction". There are countless studies have been grasped out to furnish critical accomplishment factors in assembly industry.

### **2.6.1 Determinants of Construction Project Success**

Ashley et al. (1987) offer insight into factors that influence construction project effectiveness through interviews with construction project personnel and a literature review of relevant studies. Researchers started with a list of approximately 2000 success factors from previous studies and construction management personnel interviews, which they reduced to 46 success factors grouped into 5 major categories, as follows:

1. Management, organisation, and communication
2. Scope and planning
3. Controls
4. Environmental, economic, political, and social
5. Technical

In order to identify which of these factors had the most significant influence on construction project success, input from several construction project personnel was obtained. Each factor was subjectively rated using a range from no influence (rated with a value of 1) to major influence (rated with a value of 5). From these ratings the top 15 factors were grouped by their respective categories. From this list, 11 factors were chosen for further analysis. These are:

1. Planning effort
2. Project manager goal commitment
3. Project team motivation and goal orientation
4. Scope and work definition
5. Project manager capability and experience
6. Safety
7. Control systems
8. Design interface management
9. Risk identification and management
10. Technical uncertainty
11. Legal political environment.

Interviews were conducted to identify factors which:

- showed differences between average projects and outstanding projects;
- identified the principal measures of project success; and
- Identified factors showing a strong correlation to project outcome.

Eight companies were asked to submit an average project and one outstanding project. The individuals surveyed were experienced in project management covering a wide range of project types. Individuals were selected who had extensive experience with the project.

Response data from these interviews were analysed and the researchers found that the first seven factors were the most significant in determining project success. The others factors showed less distinction between average and outstanding projects, and therefore were probably not as important in determining the success of a project.

Likewise, success criteria were comparatively rated for average and outstanding projects, revealing that the most important criteria for gauging the success of a construction project were:

1. Budget
2. Schedule
3. Client satisfaction
4. Functionality

### 2.6.2 Critical Accomplishment Factors for Assembly Projects Chan (2004)

Studied preceding works on empirical studies from seven major management journals to develop a conceptual framework on critical success factors (CSFs). Five main clusters of autonomous variables were recognized as crucial to undertaking success. These are shown in Table 3.9.

Table 2.3 Factors affecting the success of construction projects (Chan, 2004)

Factors affecting project success	Variables
Project-related	<ul style="list-style-type: none"> <li>➤ Type of project</li> <li>➤ Nature of project</li> <li>➤ Number of floors of the project</li> <li>➤ Complexity of project</li> <li>➤ Size of project</li> </ul> <p>Walker, (1995); Akinsola et al. (1997); Songer and Molenaar (1997); Belout (1998); Chua et al (1999); Dissanayaka and Kumaraswamy, (1999); Kumaraswamy and Chan (1999)</p>
Procurement-related	<ul style="list-style-type: none"> <li>➤ Procurement method</li> <li>➤ Tendering method</li> </ul>

### **2.6.3 Critical Accomplishment Factors above the periods in the undertaking life cycle**

Slevin and Pinto (1986, 1987) recognized ten critical factors associating to project implementation success. The ten factors are:

1. Undertaking Mission. The early clarity of aims and the finished direction
2. Top Association Support. Willingness of top association to provide the vital resources and authority/power for project success.
3. Undertaking Schedule/Plan. A methodical specification of the individual action steps needed for undertaking implementation.
4. Client Consultation. Communication, consultation, and deed on behalf of all impacted parties.
5. Personnel. Recruitment, selection, and training of the necessary personnel for the undertaking team.
6. Technical Tasks. Potential of the needed knowledge and expertise to finish the specific technical steps.
7. Client Acceptance. The deed of “selling” the final undertaking to its ultimate intended users.
8. Monitoring and Feedback. Timely ability of comprehensive control data at every single period in the implementation process.
9. Communication. The ability of an appropriate web and necessary data to all key actors in the undertaking implementation.
10. Trouble-Shooting. Skill to grasp unexpected disasters and deviations from plan.

Pinto and Prescott (1988) have investigated the connection amid the project existence series and behavioural issues. The early period of conceptualisation mentions to the period construction at that a crucial demand has been recognised by top management. The subsequent period is arranging, whereby formal strategies to finish the early aims are established. The third period is execution, across that the work of the undertaking is performed. The fourth and final period is the termination stage. After the undertaking is finished, resources assigned to the undertaking have to be released, workers from the undertaking team are normally reassigned to supplementary obligations, and the undertaking is transferred to its intended users.

Pinto and Prescott (1988) utilized a stepwise regression on the critical success factors at every single of the four periods in the undertaking existence cycle. The results demonstrated that nevertheless there is empirical justification for countless of the previously tabulated critical accomplishment factors, the comparative significance of various critical accomplishment factors are subject to change at disparate periods of the project implementation process. The discovering implies that upcoming use of critical success factor scrutiny and implementation, even though of the span to be examined, could be contingent on supplementary organisational phenomena, such as project (or organisational) existence cycle. Further, the employing undertaking manager would be in a larger locale to assist in the implementation of a project, given an increased awareness of the factors most critical to accomplishment at specific existence series stages.



## CHAPTER 3

### METHODOLOGY

#### 3.1 Survey method

Survey is the systematic collection and analysis data of selected information from all or part of a population. The statistical analysis based on survey data is used as reference for authority and beginning researcher in developing a new method besides the method that had been researched in the survey.

Conduct a survey involves a structured questionnaire based on "questioning the respondent" method. Respondents are asked questions regarding on human characteristics, attitudes, thoughts and behavior. There are many ways to ask the questionnaire such as verbally, writing and via computer.

Due to the survey method, there are several technical steps to be followed. First step is preliminary planning. Before conduct a survey, the objective of survey is define and keep on track the implementation of objective. Then, the selected topic is research on basis of literature review.

The basic criterion for conducting survey is design questionnaire. The questionnaire must be well-prepared and free from any error. To check the effectiveness of the questionnaire, Pilot Survey should be executed with the professionals from UTP such as lecturer and project manager. Their comment and suggestion must be discussed with the supervisor in case to modified the questionnaire. Instead of, the questionnaire should be easy to understand and no vague statement because the respondent might come from different level of knowledge.

Next, the method that used to conduct a survey is decided. There are four types of survey method; personal interviewing, telephone interviewing, mail survey and electronic survey. Basically in research, mail survey is chosen because this method can be used for screening as well as full survey and has drop-off or mail-back.

Conduct a survey need the sample of population. Sample is a collection of things which is some part of a larger population and which is selected as representative of that population. The target population is the type of population that will be survey such as people,

geographical areas, companies or any other discrete things. In this research, the sampling is simple random sampling where the entire sample has the equivalent chance to be chosen. Each respondent was initially given three weeks to complete the survey and then a reminder was sent allowing the additional three weeks for completion.

Based on Central Limit Theory, minimum feedback from respondent for conducting survey is 30. Using chi-square test, square of 30 is 90, but in this research, sample that used to send is 150. To design the questionnaire, there are some criteria requirement; valid, reliable and unbiased. Then, pilot survey is conduct to test the effectiveness of the questionnaire within the small population. Any confusion in questionnaire is corrected before conduct survey.

Data from survey is collected and the responses must be at least 30. If it is below than 30, interview survey will be conducted. Data collection from the survey is analysis using statistical analysis and presented in graphic aid. The graphic must be clear and free from error to present the finding of overall research that had been done.

### **3.2 Population**

The population involve in this research are construction professionals from construction companies that have been registered with CIDB.

### 3.3 Sampling

Sampling method use in this survey is simple random sampling where the sample taken randomly in a group selected. The entire sample has the same chance to be selected.

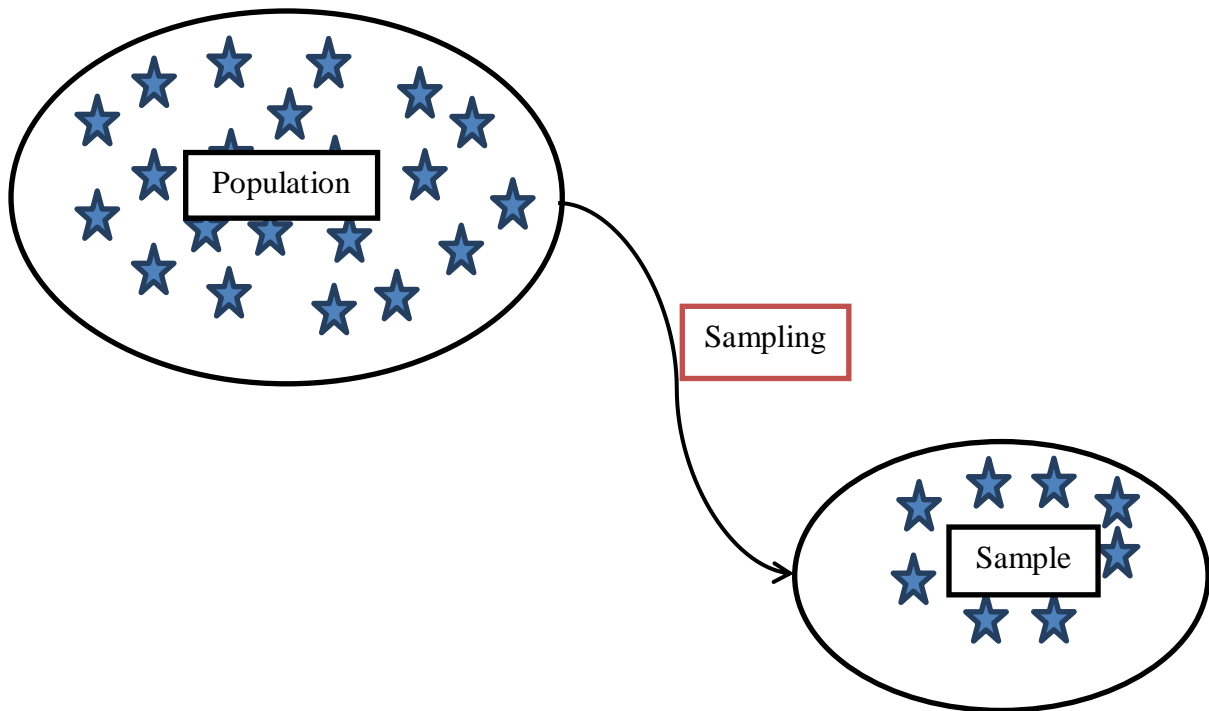


Figure 3.1: Simple Random Sampling

### 3.4 Analysis

Data management and analysis using Statistical Analysis

### 3.5 Statistical Method – Relative Importance Index

The Relative Importance Index (RII) is the statistical method to determine the ranking of different causes. The RII five-point scale, ranging from 1 to 5 was adopted and transformed the relative importance indices (RII) for each factor as follows:

$$RII = \frac{\sum W}{A \times N}$$

Where W is the weighting given to each factor by respondents (ranging 1 to 5), A is the highest weight (i.e. 5 in this case), and N is the total number of respondents. The RII value had a range from 0 to 1 (0 is not inclusive). The higher the value of RII, the more important was the cause or effect of delay and success.

The RII was used to rank the relative importance index of the different causes. Each individual cause's RII, as perceived by all respondents, was used to assess the general and an overall ranking in order to give an overall picture of the delay and success factors in Malaysia's construction industry.

### 3.6 Flowchart

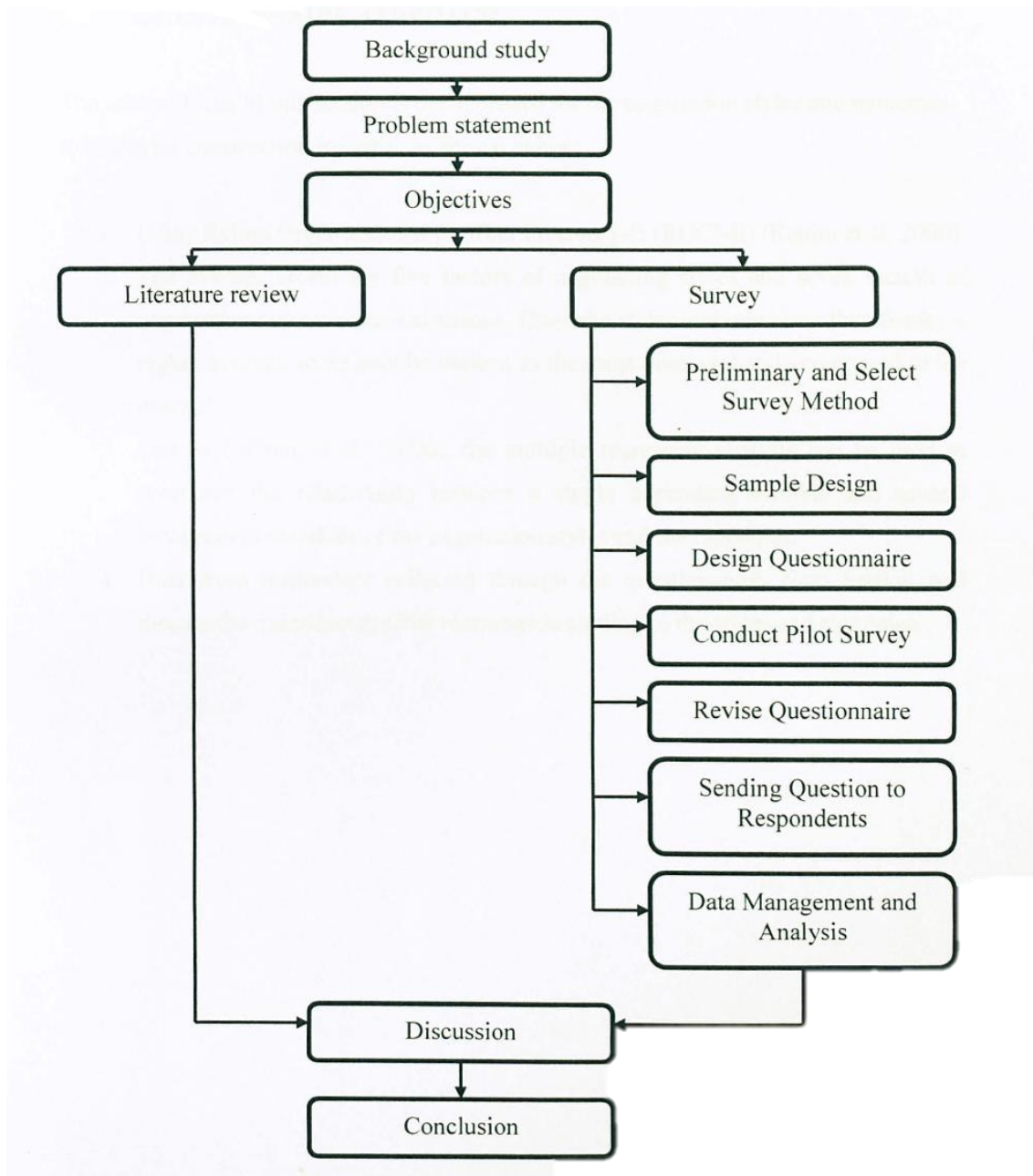


Figure 3.2: Flowchart of methodology

### 3.7 Questionnaire

#### 3.7.1 Delay Factors Questionnaire

Respondent is required to select delay factors of the project in table 3.1 below by circling a number according to the scale of occurrence

Table 3.1 Delay Factors Questionnaire

<b>1. <u>Material</u></b>
1.1. Shortages of material
1.2. Physical adjustments to material
1.3. Transportation of material
1.4. Damage of material
<b>2. <u>Labour</u></b>
2.1. Shortages of labour
2.2. Shortages of labour skill
2.3. Nationalities of labourers
<b>3. <u>Equipment</u></b>
3.1. The productivity of operators of the equipment
3.2. Shortage of equipment
<b>4. <u>Financing</u></b>
4.1. Contractor's financing necessities
4.2. Progress payment paid by owners
<b>5. <u>Environment</u></b>
5.1. Climatic conditions of environment
5.2. Geological conditions of construction site

<b>6. <u>Changes</u></b>
--------------------------

6.1. Consequences of omissions, errors and adjustments of scope by owners
---

<b>7. <u>Government Connection</u></b>
--

7.1. Connected to permits, labour visa and power bureaucratic procedures
--

<b>8. <u>Contractual Connection</u></b>
---

8.1. Contradictory interest between assorted parties
--

<b>9. <u>Scheduling and Manipulating Method</u></b>
---

9.1. Lack of association expertise in undertaking domination
--

9.2. Poor record keeping and maintenance
--

### 3.7.2 Success Factors Questionnaire

Respondent is required to select success factors of the project in Table 3.2 below by circling a number according to the scale of accomplishment.

Table 3.2 Success Factors Questionnaire

<b>1. <u>Management, organization and communication</u></b>
1.1. Effective management of the resource and people
1.2. Continuous reviews
1.3. Effective planning, controlling and organizing of the activities
1.4. Effective collaboration / communication between assorted parties and employees
<b>2. <u>Scope and planning</u></b>
2.1. Understanding on scope and work definition
2.2. Establish clear and realistic goals
2.3. Effective planning in job sequence
<b>3. <u>Controls</u></b>
3.1. Establish a clear method to measure success
3.2. Allocation of responsibilities to employees in line with competencies
<b>4. <u>Environment, economic, political and social</u></b>
4.1. Adequate resources and financial support
4.2. Project team motivation and goal orientation
<b>5. <u>Technical</u></b>
5.1. Well established conventional procedure
5.2. Having a skilled workers
5.3. Effective management for materials, equipment and supplies



### **3.8 Data Collection**

A questionnaire survey is designed under the guidance of advisor, in order to collect related data and analyze the questionnaire. Two types of data are combined in this questionnaire which are:

1. Indicator for delay factors
2. Indicator for success factors

The questions will focus on the recent project completed by the respondents. Questionnaire will be divided into three sections as below:

1. Section A: General/Background Information
2. Section B: Delay and Success Factors
3. Section C: Other Information

In section B part I, it consists of 18 questions on nine main categories of delay factors studied by Assaf et. al. (1995), involving work study and interviews. For part II, it consists of 14 questions on 5 major categories of success factors (Ashley et al, 1987).

Each of questionnaires is included with the scale of agreement that filled up by the respondent due to their opinion. The scale that had been used is Likert-Scale from I to 5 due to the degree of agreement. Number I representing "strongly disagree", number 5 representing "strongly agree- while number 3 stand for "agree". The respondents were asked to assess the degree of achievement that will indicate delay and success factors occurred in their project. 100 questionnaires were sent to construction professional in construction industry in Peninsular Malaysia. The list was compiled by identifying key personnel from the government and professional directories and web site of companies.

### 3.9 Gantt Chart

Below is the Table 3.3: Gantt chart for Final Year Project I (Completed):

Research Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Selection of Project Topic	█	█	█											
Background Study				█	█	█								
Literature Review				█	█	█	█							
Preliminary research work					█	█	█							
Submission of Extended Proposal						█								
Design Questionnaire							█	█	█					
Study on Delay & Success Factors								█	█	█	█			
Study on Project Performance Improvement										█	█	█	█	
Interim Report Submission														█

Below is the Table 3.4: Gantt chart for Final Year Project II (Completed):

Research Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Conduct Pilot Survey	█													
Revise Questionnaire	█	█												
Conduct Survey		█	█	█										
Collect Data Survey and Editing				█	█	█	█							
Data Management and Analysis							█	█						
Submission of Progress Report								█	█					
Data Presentation and Tidying Up Data								█	█					
Poster Exhibition										█	█			
Submission of Draft Report												█		
Submission of Technical Paper													█	
Oral Presentation														█
Submission of Project Dissertation														█

## CHAPTER 4

### RESULT AND DISCUSSION

#### 4.1 Statistic of Respondents

Six weeks after sending the questionnaire to the random construction industry, there are 35 respondents that give the feedbacks. 100% of respondents consist of contractors with different designation in their company. As shown in figure 4.1, the respondents consist of 20% Senior Project Manager, 14% Project Manager, 34% Engineer and 32% Quantity Surveyor.

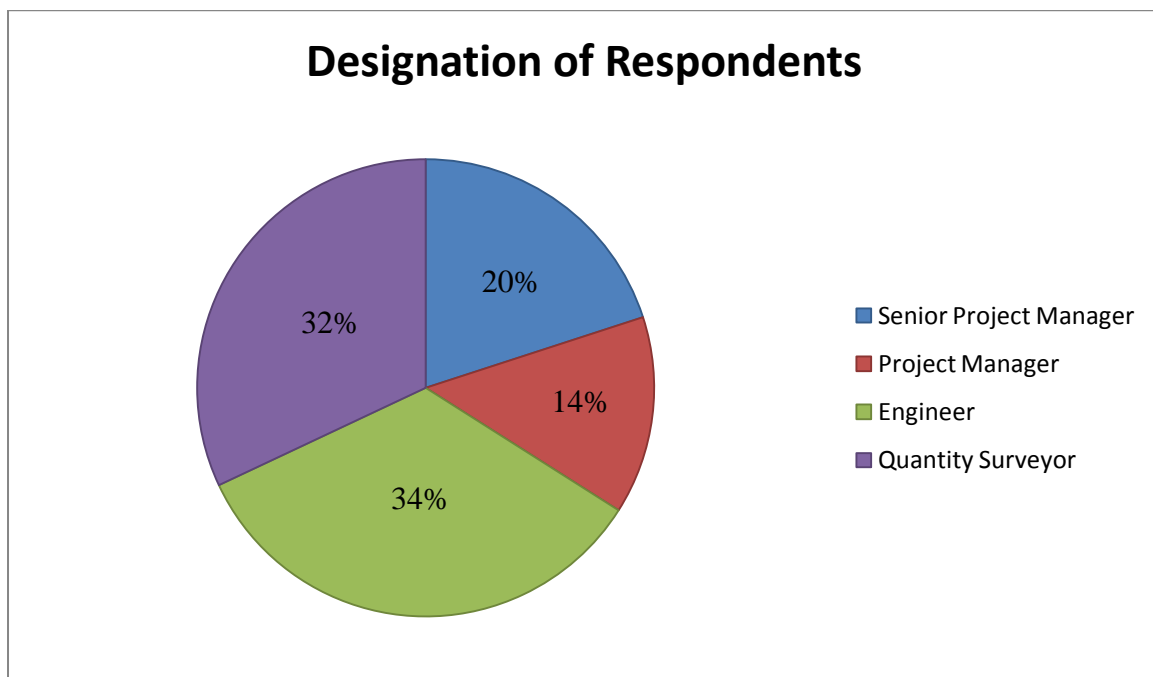


Figure 4.1 Designations of Respondents

For further detail, Figure 4.2 shows the respondent percentage experiences in the construction industry. 17% of respondents have 5 years experiences, 29% of respondents have 10 years experiences and 54% of respondents have more than 10 years experiences.

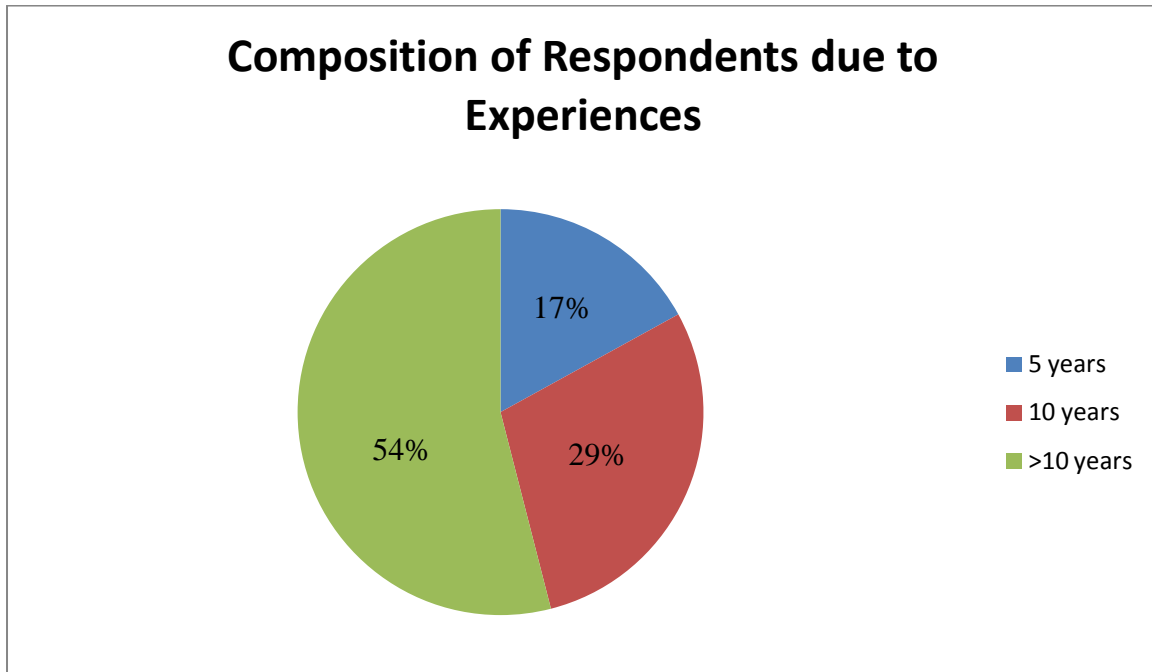


Figure 4.2: Composition of Respondents due to Experiences

## 4.2 Results of Analysis

### 4.2.1 Delay Factors

The data was analysed from the perspective of contractors. Each individual cause's RII perceived by all respondents was computed for overall analysis. From the ranking assigned to delay factors, the most important delay factors in Malaysian Construction Industry were able to be identified. Table 4.1 give the ranking of delay factors based on the responses from all respondents. Table 4.2 summarizes RII and ranking of the categories of delay factors perceived by respondents.

Table 4.1: Ranking of Delay Factors (based on overall participant)

	importance of delay					overall
	1	2	3	4	5	RII
<b>1. <u>Material</u></b>						
1.1. Shortages of material	0	7	9	10	9	0.7200
1.2. Physical adjustments to material	5	7	11	8	4	0.5943
1.3. Transportation of material	4	7	12	8	4	0.6057
1.4. Damage of material	9	13	8	5	0	0.4514
<b>2. <u>Labour</u></b>						
2.1. Shortages of labour	1	2	11	9	12	0.7657
2.2. Shortages of labour skill	0	3	8	10	14	0.8000
2.3. Nationalities of labourers	13	8	10	2	2	0.4400
<b>3. <u>Equipment</u></b>						
3.1. The productivity of operators of the equipment	5	5	9	12	4	0.6286
3.2. Shortage of equipment	0	4	8	10	13	0.7829
<b>4. <u>Financing</u></b>						
4.1. Contractor's financing necessities	1	4	10	12	8	0.7257
4.2. Progress payment paid by owners	0	4	8	10	13	0.7829
<b>5. <u>Environment</u></b>						
5.1. Climatic conditions of environment	4	5	10	11	5	0.6457
5.2. Geological conditions of construction site	6	8	7	7	7	0.6057
<b>6. <u>Changes</u></b>						

6.1. Consequences of omissions, errors and adjustments of scope by owners	0	6	11	9	9	0.7200
<b>7. <u>Government Connection</u></b>						
7.1. Connected to permits, labour visa and power bureaucratic procedures	15	10	7	3	0	0.3886
<b>8. <u>Contractual Connection</u></b>						
8.1. Contradictory interest between assorted parties	0	5	8	9	13	0.7714
<b>9. <u>Scheduling and Manipulating Method</u></b>						
9.1. Lack of association expertise in undertaking domination	6	4	11	6	8	0.6343
9.2. Poor record keeping and maintenance	7	6	10	9	3	0.5714

**\*RII: Reflective Index**

Table 4.2: Ranking Categories of Delay Factors

Delay Factors	average RII	Rank
1. Material	0.5929	8
2. Labour	0.6686	5
3. Equipment	0.7057	4
4. Financing	0.7543	2
5. Environment	0.6257	6
6. Changes	0.7200	3
7. Government Connection	0.3886	9
8. Contractual Connection	0.7714	1
9. Scheduling and Manipulating Method	0.6029	7

#### 4.2.2 Success Factors

The data was analysed from the perspective of contractors. Each individual factors RII perceived by all respondents was computed for overall analysis. From the ranking assigned to success factors, the most important success factors in Malaysian Construction Industry were able to be identified. Table 4.3 give the ranking of success factors based on the responses from all respondents. Table 4.4 summarizes RII and ranking of the categories of success factors perceived by respondents.

Table 4.3: Ranking of Success Factors (based on overall participant)

	importance of success					overall
	1	2	3	4	5	RII
<b>1. <u>Management, organization and communication</u></b>						
1.1. Effective management of the resource and people	0	7	10	8	10	0.7200
1.2. Continuous reviews	0	6	9	11	9	0.7314
1.3. Effective planning, controlling and organizing of the activities	0	6	7	12	10	0.7486
1.4. Effective collaboration / communication between assorted parties and employees	0	7	8	9	11	0.7371
<b>2. <u>Scope and planning</u></b>						
2.1. Understanding on scope and work definition	1	6	10	11	8	0.7257
2.2. Establish clear and realistic goals	0	5	8	13	9	0.7486
2.3. Effective planning in job sequence	0	6	7	9	13	0.7657
<b>3. <u>Controls</u></b>						
3.1. Establish a clear method to measure success	0	7	9	10	9	0.7200
3.2. Allocation of responsibilities to employees in line with competencies	0	6	9	8	12	0.7486
<b>4. <u>Environment, economic, political and social</u></b>						
4.1. Adequate resources and financial support	0	6	7	12	10	0.7486
4.2. Project team motivation and goal orientation	2	7	6	13	9	0.7486
<b>5. <u>Technical</u></b>						
5.1. Well established conventional procedure	1	7	8	9	11	0.7429
5.2. Having a skilled workers	0	8	5	12	10	0.7371
5.3. Effective management for materials, equipment and supplies	0	4	9	10	12	0.7714



<b>Category of Success Factor</b>	<b>average RII</b>	<b>Rank</b>
1. Management, organization and communication	0.7343	4
2. Scope and planning	0.7467	3
3. Controls	0.7343	4
4. Environment, economic, political and social	0.7486	2
5. Technical	0.7505	1

Table 5.4: Ranking Categories of Success Factors

### 4.2.3 Discussion of Results

Based on the results, the six most critical delay factors perceived by respondents are:

1. Shortages of labour skill
2. Shortage of equipment
3. Progress payment paid by owners
4. Contradictory interest between assorted parties
5. Shortage of labour
6. Contractor's financing necessities.

The Ranking for each factors are summarised in table 4.5

<b>Rank</b>	<b>Delay Factors</b>	<b>Overall RII</b>
1	Shortages of labour skill	0.8000
2	Shortage of equipment	0.7829
3	Progress payment paid by owners	0.7829
4	Contradictory interest between assorted parties	0.7714
5	Shortages of labour	0.7657
6	Contractor's financing necessities	0.7257
7	Consequences of omissions, errors and adjustments of scope by owners	0.7200
8	Shortages of material	0.7200
9	Climatic conditions of environment	0.6457
10	Lack of association expertise in undertaking domination	0.6343
11	The productivity of operators of the equipment	0.6286
12	Transportation of material	0.6057
13	Geological conditions of construction site	0.6057
14	Physical adjustments to material	0.5943
15	Poor record keeping and maintenance	0.5714
16	Damage of material	0.4514
17	Nationalities of labourers	0.4400
18	Connected to permits, labour visa and power bureaucratic procedures	0.3886

Table 4.5: Ranking for each Delay Factor

Based on the results, the five most critical success factors perceived by respondents are:

1. Effective management for materials, equipment and supplies
2. Effective planning in job sequence
3. Effective planning, controlling and organizing of the activities
4. Establish clear and realistic goals
5. Allocation of responsibilities to employees in line with competencies

The Ranking for each factors are summarised in table 4.6

<b>Rank</b>	<b>Success Factors</b>	<b>Overall RII</b>
1	Effective management for materials, equipment and supplies	0.7714
2	Effective planning in job sequence	0.7657
3	Effective planning, controlling and organizing of the activities	0.7486
4	Establish clear and realistic goals	0.7486
5	Allocation of responsibilities to employees in line with competencies	0.7486
6	Adequate resources and financial support	0.7486
7	Project team motivation and goal orientation	0.7486
8	Well established conventional procedure	0.7429
9	Effective collaboration / communication between assorted parties and employees	0.7371
10	Having a skilled workers	0.7371
11	Continuous reviews	0.7314
12	Understanding on scope and work definition	0.7257
13	Establish a clear method to measure success	0.7200
14	Effective management of the resource and people	0.7200

Table 4.6: Ranking for each Success Factor

## **CHAPTER 5**

### **CONCLUSION**

This report emphasized about the survey research that had been sent to the professionals in construction industry in Peninsular Malaysia. 35 feedbacks out of 150 respondents are analysed in order to determine the most critical delay and success factors for the construction project in Peninsular Malaysia. However, this research is mainly focused on general aspect, not stated in in specific condition of projects. The factors might applicable at any situation during the projects. In fact, future research can be continued for further detail of delay and success factors in specific condition of projects.

Subsequence with the research and survey, at the shortages of labour skill is defined the most critical delay factor and effective management for materials, equipment and supplies is defined as most critical success factor in Malaysian construction industry. Thus, the most critical delay and success factor could be taken as the mitigation measures for construction professionals in Malaysia in the future projects. By understanding the delay and success factors in Malaysia, it will help them to increase their success rate in the construction projects.

## **CHAPTER 6**

### **RECOMMENDATION**

Future studies examining the effects of critical success factors to avoid or prevent delay factors in the construction industry should consider the following suggestions:

1. Construction Project Management

Further research is needed to investigate potential improvements in the implementation of project management systems in Malaysian construction industry. Efficient project management would result in tangible outcomes for all aspects of planning, scheduling and monitoring control of time, cost and specification of projects. Implementing efficient management methods will overcome political, organisational and cultural obstacles.

2. Proper management training to assorted parties

Appropriate training for workers related to their task should be organized. For instance, proper management training should be coordinate among engineers and project managers. Skill training for labour workers is one of the mitigation measures of delay factors in construction projects.

3. Focus on the specific professional in the future

Future research should focus on the specific professional such as delay and success factors occurred or used by consultant and developer in their projects.

## REFERENCE

1. Ahmed S.M., Azhar.S., Kappagtula.P., and Gollapudil.D. (2003) “Delays in construction: a brief study of the Florida construction industry”, Proceedings of the 39<sup>th</sup> Annual ASC Conference, Clenson University, Clenson, SC, pp 357-266
2. Aibinu A.A. and Jagboro J.O. (2002), The effects of construction delays on project delivery in Nigerian construction industry, *Int J Project Management* 20, pp. 593 – 599
3. Alaghbari W.A.M. (2005), “Factors affecting construction speed of industrialized building system in Malaysia”, Master’s thesis, University Putra Malaysia, Serdang
4. BSI (1996). BSI 6079: A guide to project management. London: British Standards Institution
5. Chan D.W.M. and M.M. Kumaraswamy M.M. (2002), a comparative construction durations: lessons learned from Hong Kong building projects, *Int J Project Manage* 20, pp. 22 - 35
6. David B. Ashley, Clive S. Lurie, and Edward J. Jaskelskis “Determinants of construction project success “ *Project management Journal* , Vol. 9, No.2 June 1987.
7. Gale A.W. & Fellows R.F., (1990), Challenge and innovation: the challenge to the construction industry, *Construction Management and Economics*, 8 pp. 431 – 436
8. Kasimu A. M. and Abubakar D.I. (2012). Causes of Delay in Nigeria Construction Industry, *Interdisciplinary Journal of Contemporary Research in Business*
9. Kumaraswamy M. and Chan D. (1998), Contributors to construction delay, *Construct Manage Economy*, 16 (1), pp. 17 - 29
10. Mengesha Wubishet Jekale. (2004). Performances for Public Construction Projects in Developing Countries: Federal Road & Educational Building Projects in Ethiopia Norwegian University of Science and Technology: Doctoral Thesis 2004:45
11. Mogbo T. C. (2004). Construction and National Integration strategies for Achieving National unit through the Redesign, Construction and Privatization of new Road and Railway Network in Nigeria 1 – 2.
12. Murali Sambasivan. & Yau Wan Soon, (2007), Causes and effect of delays in Malaysian Construction Industry, *International Journal of Project Management*
13. Ofori G. (1990), *The Construction Industry: Aspects of its Economics and Management*. Singapore University Press, Singapore

14. Ofori G. (2000), Challenges of construction industries in developing countries: lessons from various countries, Proceeding of the 2<sup>nd</sup> International conference of CIB TG29 on Construction in Developing Countries: Challenges facing the construction industry in developing countries, 15 – 17 November 2000, Gabarone Botswana
15. Olusegun E.M. and Akintunde A. (2012), Stakeholders' Perception of the Causes and Effects of Construction Delays on Project Delivery, *Journal of Construction Engineering and Project Management*, Vol. 2 (4),
16. Oxford Dictionaries (2013), Oxford University Press, <http://oxforddictionaries.com/>
17. Ruben I.M. & Seeling W. (1967), Experience as a factor in the selection and performance of project managers. *IEEE Trans Eng Management*, Vol. 14 (3), pp. 131 – 134.
18. Wells J. (1986), *The Construction Industry in Developing Countries: Alternative Strategies for Development*. Croom Helm Ltd, London
19. Ashley & Jaselskis (1987), Determinants of construction project success, *Project Management Journal*, Vol. 18, (2), pp. 69 – 79
20. Assaf, S., Al-Khalil, M., and Al-Hazmi, M. (1995). "Causes of Delay in Large Building Construction Projects." *J. Manage. Eng.*, 11(2), 45–50

## **APPENDICES**



## **QUESTIONNAIRE**

## **A study of Delay and Success Factors in Malaysia Construction Industry**

Construction project management is vital for accomplishing pre-determined objectives. Despite of using construction management, most of the projects do not meet original time schedule or has been delayed. Delay is one of the biggest problems faced by construction industry. A study of success and delay factors in Malaysian construction industry involves the participation of the professionals from construction industry in Peninsular Malaysia to help contractors to reach their goals on time during construction. This research will reviewed success factors through literature review and delay factors through survey questionnaires and structural interviews targeting professionals involved in construction project. The correlation between them is examined to produce the best ways in preventing delays.

The questionnaire us divided into three (3) sections: Section A, B, and C. Please answer the questionnaire by referring to the instructions given in each section.

### **Section A: General / Background Information**

Please fill in the blanks and tick in ( ) provided.

#### 1. Company

1.1. Name of company (optional):

\_\_\_\_\_

1.2. Type of company

( ) Contractor

( ) Consultant

( ) Developer

( ) Others (please specify)

.....

1.3. Company's experience in building construction?

( ) <10 years   ( ) 20 years   ( ) 30 years   ( ) >30 years

#### 2. Respondent

2.1. What is your designation?

- ( ) Senior Project Manager
- ( ) Project Manager
- ( ) Engineer
- ( ) Quantity Surveyor
- ( ) Architect
- ( ) Others (please specify)

.....

2.2. How many years do you involve in construction industry?

- ( ) <3 years
- ( ) 5 years
- ( ) 10 years
- ( ) >10 years

**Section B: Delay and Success Factors**

Please indicate your selected answer by circling a number according to the scale of occurrence.

1. Evaluate the following factors that contribute delay in your project based on your level of occurrence.

	<div style="display: flex; justify-content: space-between; align-items: center;"> <span>Most frequent</span> <span>←————→</span> <span>Less frequent</span> </div>				
<b>1. <u>Material</u></b>					
1.1. Shortages of material	5	4	3	2	1
1.2. Physical adjustments to material	5	4	3	2	1
1.3. Transportation of material	5	4	3	2	1
1.4. Damage of material	5	4	3	2	1
<b>2. <u>Labour</u></b>					
2.1. Shortages of labour	5	4	3	2	1
2.2. Shortages of labour skill	5	4	3	2	1
2.3. Nationalities of labourers	5	4	3	2	1
<b>3. <u>Equipment</u></b>					
3.1. The productivity of operators of the equipment	5	4	3	2	1
3.2. Shortage of equipment	5	4	3	2	1

<b>4. <u>Financing</u></b>					
4.1. Contractor's financing necessities	5	4	3	2	1
4.2. Progress payment paid by owners	5	4	3	2	1
<b>5. <u>Environment</u></b>					
5.1. Climatic conditions of environment	5	4	3	2	1
5.2. Geological conditions of construction site	5	4	3	2	1
<b>6. <u>Changes</u></b>					
6.1. Consequences of omissions, errors and adjustments of scope by owners	5	4	3	2	1
<b>7. <u>Government Connection</u></b>					
7.1. Connected to permits, labour visa and power bureaucratic procedures	5	4	3	2	1
<b>8. <u>Contractual Connection</u></b>					
8.1. Contradictory interest between assorted parties	5	4	3	2	1
<b>9. <u>Scheduling and Manipulating Method</u></b>					
9.1. Lack of association expertise in undertaking domination	5	4	3	2	1
9.2. Poor record keeping and maintenance	5	4	3	2	1



**Section C: Other Information**

1. Do you have any further information regarding delay and success factors in Malaysian Construction Industry nowadays? If yes, briefly explain.

.....

**Thank you for your precious time and cooperation in completing the questionnaire. All responses will be used for research purpose only. For further information, please contact Nik Fatimah at 019-2262711 or e-mail [fetttty29@gmail.com](mailto:fetttty29@gmail.com).**