THE CAUSES AND EFFECTS OF DELAY IN A CONSTRUCTION OF INTERNATIONAL AIRPORT

By

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CERTIFICATION OF APPROVAL

Research on the Causes and effects of Delay in a construction of International Aiport: a Case Study on Construction Project of Kuala Lumpur International Aiport 2 (KLIA2), Malaysia

By

Diah Novitasari

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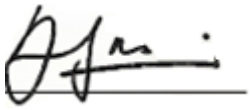
CERTIFICATION OF ORIGINALITY

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 acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



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DIAH NOVITASARI

ABSTRACT

Nowadays, the development of buildings, airports, harbors and many other important structures to support country's economy growth are rapidly growing. One of the important structures is international airport. Airports are required by country as a main, fast and reliable gateway for trading, supporting country's economy and as crucial transportation system. To have construction of airport finished on schedule and within budget would expedite country's economy growth significantly. The delay in international airport construction would disturb the timeliness of construction project which will impact on additional amount of expenditure and cause several social related problems. Thus, the airport construction project management would be required to ensure the international airport construction is carried out on time and within the planned budget.

The project management dictates the success of the construction project. With excellent construction project scheduling and the cost control, all possible risk of delay could be identified and resolved earlier. Therefore, by identifying causes and effect of delay comprehensively, the way forward of proper planning and risk management for international airport construction project is expected to be better and improved in terms of project schedule and budget. Thus, the objective of this research are comprised of identification of delays in international airport construction, analysis of the effect of identified causes in international airport construction delays and recommendation of several solutions that could be implemented in controlling and minimizing future delays in international airport construction project.

This research is emphasizing on the case study of the on-going international airport construction project. The project is selected based on the actual delay that has been occurred at airport construction project. To ensure the objectivity of the data, data collection will be captured by comprehensive data gathering from the contractors, consultants and client of this project. For this research, a case study utilizing questionnaire and data analysis method are used in order to analyze the causes and effects of delays in construction of Kuala Lumpur International Airport 2 (KLIA2). With the identification and analysis of causes and effect of delays, the future delays in airport construction project could be minimized and avoided.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Delay in construction could be defined as the time overrun either beyond completion date which was specified in a contract, or further than the agreed date of project delivery by the parties. Delay is a common problem in construction projects. To the contractor, delay means higher operating costs due to extended work period, increase in labor cost and higher costs of material due to inflation. To the owner, delay means loss of profits due to lack of production facilities and rent-able space or a dependence on present services. (Assaf and Al-Hejji, 2006)

Construction projects may differ in size, complexity, objectives, duration, uncertainty, pace and some other dimensions (Luu et al. 2009). One of the distinguished construction projects which has a high complexity, giant-typed construction and long duration is a construction of international airport.

Nowadays, airports are among the most important elements of the modern infrastructure. It is used as a gateway for all people around the world with various business purposes and also economy related purposes for the country. Airport is very essential for the country economy growth. For example airports could increase revenue of hotels and tourism sectors. The airport's roles progressively became more important since sea travel is replaced by air travel.

With significance of the airport existence, a country will constantly build an airport to connect its region and to support its economy growth. Thus, the construction of airport shall be planned and monitored properly so that the risk of delays could be minimized or even avoided prior to conduct construction operation. With the early stage of identification and delay analysis, the proactive and remedial actions could be taken faster to minimize such negative impacts that may occur due to airport construction delays.

This delay is not only gives negative impacts to the contractors and client only, but also to the pride of the country. Therefore, it is very important to mitigate the causes and effects of delay in construction of international airports.

1.2 Problem Statement

Delay is common or inevitable to occur in every project, especially in construction of mega project such as international airport. Delay could disturb the timeliness of the project which then impact on additional amount of expenditure and cause several social related problems. Thus, the importance of having the construction project finished on time and on budget is desired by all parties.

The construction project delay could occur when the poor project management is actualized. The project management dictates the success of the construction project. With excellent construction project scheduling and the cost control, all possible risk of delay could be identified and resolved earlier. Therefore, by identifying causes and effect of delay comprehensively, the way forward of proper planning and risk management for international airport construction project is expected to be better and improved in terms of project schedule and budget.

1.3 Objective

The objectives of this research are explained as below

- To identify causes of delays in international airport construction.
- To analyze the effect of delays in international airport construction.
- To recommend several solutions to be implemented in controlling and minimizing the future delays.

1.4 Scope of Study

This research is emphasizing on the case study of the on-going international airport construction project. The project is selected based on the actual delay that has been occurred at airport construction project. To ensure the objectivity of the data, data collection will be captured by comprehensive data gathering from the contractors, consultants and client of the airport construction project.

1.5 Background of Case Study

1.5.1 Details of project

Table 1.1 below shows all the detail of construction project of Kuala Lumpur International Airport 2 (KLIA2).

Table 1.1 Details of project

Contract Title	Package TB01, Design, Construction, Completion, Testing & Commissioning and Maintenance of Main Terminal Building, Satellite Building, Sky Bridge and Piers for Proposed Development of New LCC Terminal and Associated Works at KL International Airport, Sepang, Selangor, Malaysia.
Contractor Name	UEMC – Bina Puri Joint Venture
Original Contract Sum	RM 997,227,000.00
Original Start Date	15 July 2010
Original Completion Date	15 April 2012
Application of EOT No. 1	26 September 2012
Application of EOT No. 2	23 January 2013
Application of EOT No. 3	2 November 2013
Application of EOT No. 4	17 October 2013
EOT Granted No. 1	26 December 2011
EOT Granted No. 2	4 January 2013
EOT Granted No. 2	9 April 2013
Defect Liability Period	24 months from the date of CPC
LAD	RM199,445.40 per day

1.5.2 Location of the project

Figure 1.1: Location of KLIA2 in Sepang, Selangor, Malaysia

Kuala Lumpur International Airport 2 (KLIA2) is located in Sepang, Selangor, Malaysia. The location is next to the existing KLIA (Kuala Lumpur International Airport) which is only two kilometers away from the main KLIA terminal.

1.5.3 Structure constructed

KLIA2 consists of the Satellite Building, 4 stories of Main Terminal Building, Sky Bridge which links the Main Terminal to Satellite Building, the Underpass Tunnel, and piers. The Sky Bridge will be recorded as the 1st Sky Bridge for airport in Asia. Meanwhile, the proposed KLIA2 will be the largest Low Cost Carrier Terminal in the world which will be able to handle 43 million of passenger per annum to replace the existing LCCT.

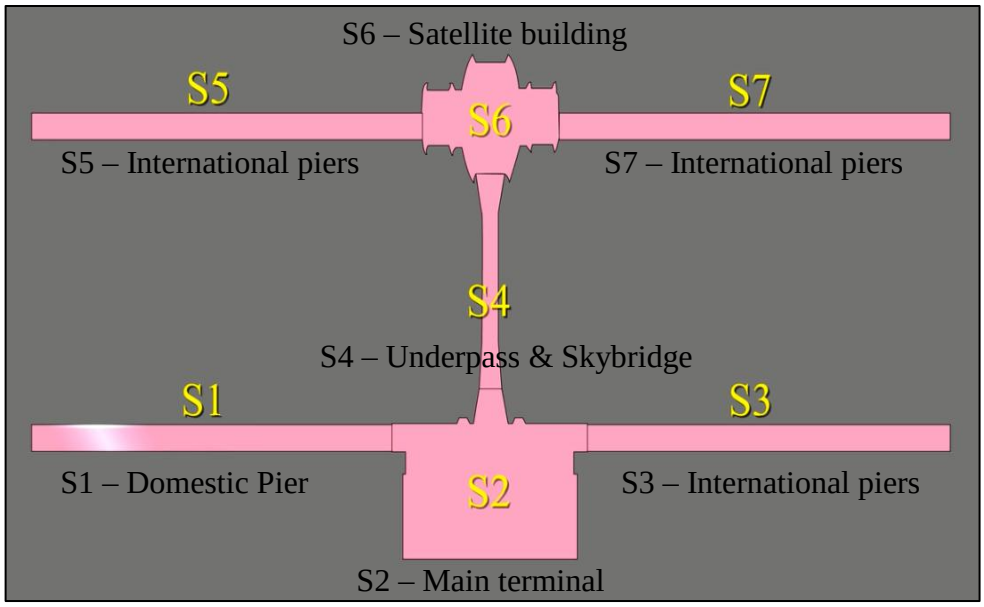


Figure 1.2: KLIA2 Project Layout Plan

Figure 1.3: KLIA2 Construction Progress

1.5.4 List of Consultants

Table 1.2 and 1.3 below shows all the consultants that have contributed to this project.

Table 1.2 UEM-BP JV's Consultant List

Item	Name of Company	Remarks
1	A.Hanapiah Architect	*Architect Consultant & Facade Specialist & Town Planner
	Architek ICB Sdn Bhd	
2	SMA Bersekutu Sdn. Bhd.	*C&S Consultant
3	SSP (E&M) Sdn. Bhd.	*M&E Consultant
	Juruukur Bahan Annor (JUBA)	*QS Consultant
4	MTS Interior Sdn Bhd	*ID Consultant
5	Safety Services & Logistic Sdn Bhd	*Fire Specialist
	LEAPP	*Airport Planner
6	CPP	*Wind Consultant
7	Environmental Science (M) Sdn Bhd	*Environmental Consultant
	Universiti Teknologi Malaysia	*Acoustic Specialist
8	SSP (E&M) Sdn. Bhd.	*IT Consultant & Lighting Consultant

Table 1.3 Client's Consultant List

Item	Consultant Name	Remarks
1	JUB5 International	*Quantity Surveyor
2	KLIA Consultancy Services Sdn. Bhd.	*Project Management Consultant
3	KTA Tenaga Sdn. Bhd.	*M&E Consulting Engineer
4	LKMD Architecture Sdn. Bhd.	*Architect
5	MALAYSIA AIRPORTS TECHNOLOGIES SDN BHD	*ICT Consultant
6	Ranhill Bersekutu Sdn. Bhd.	*Civil &Structure Engineer
7	Rekarancang Sdn. Bhd. - Naco JV	*Airport Planner
8	SKALA DESIGN CONSULT SDN BHD	*Interior Design Consultant

1.6 Relevancy and Feasibility of The Project

Airport is the most important transportation port in every country. Airport construction cost is also considered as one of the biggest expenditure spent on the transportation method compared to land or sea-based transport system. Moreover, airport is the most crucial factor for the economy growth in every country besides sea port and land port. Nowadays, the needs of airport in every developed, developing and even under-developed country are rising significantly. Thus, the construction of international airport is also increasing significantly.

The delay in the airport construction is undesirable due to time and cost consideration. Thus, the analysis of delays which consist of causes and effect in international airport and its analysis outcome could be relevant and useful with every international airport construction projects in many countries.

The research studies of cause and effect of delays in the international airport construction are feasible in terms of schedule, cost and resources. The actual data taken from ongoing construction international airport is available and actualized.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of Construction Project Delay

According to R.F. Aziz (2013), Time is one of the main considerations of the entire project management life cycle. It is considered as one of the most important parameters of a project and as a booster of the project success. Time delay is a global phenomenon and is associated with almost all construction projects all over the world.

Doloi et al. (2012) evaluated that the construction projects in India are facing widespread of delays. Therefore, the necessity of a systematic analysis of the causes of delays and expanding a clear understanding among the industry professionals are very essential. Iyer and Jha (2005) reported that over 40% of construction projects have been suffering from poor performance across the country.

Ahsan and Gunawan (2010) compared the performance of international development projects in India, Bangladesh, China, and Thailand. This research concluded that the construction projects in India have the worst schedule performance in term of time compare to the other nations.

In a separate study, Sambasivan and Soon (2007) found that the construction project sector in Malaysia as a rapid developing country in South-East Asia has not able to escape from the delays either. In 2005, about 17.3% of 417 government contract projects in Malaysia were suffered from extension of time delay and this problem is frequently occurred.

Trigunarsyah (2004) observed the time performance of construction project in Indonesia. The procedure of construction project is extremely complicated. Numerous phases of work holds a lengthy period till the completion date with the combination of assorted parties' endeavors. He concluded that only 47% of the projects were completed within the scheduled completion date, 15% ahead of schedule, and 38% were behind schedule.

Similarly, Faridi and Elsayedh (2006) investigated the factors causing delay in construction projects in United Arab Emirates. They found that over 50% of construction projects experience delay due to factors such as delay in approval of construction drawings, poor pre-planning and slow decision making process.

In Saudi Arabia, Assaf and Al-Hejji (2006) conducted a survey of different types of construction project. This survey outlined that rarely the project in Saudi Arabia is completed within the specified time. Only 30% of construction projects were completed within the targeted time and the average time infested was between 10% and 30%. In other study, Odeyinka and Yusif (1997) found that seven out of ten projects surveyed in Nigeria was suffered from delays during their execution.

Understanding causes and the effect of delay would provide a betterment of next project performance. The comprehensive analysis of project delay and its effect also useful to improve the decision making process for any actions taken to combat the delay and to get back on track in terms of project timing.

2.2 Causes of Delay

Al-Momani (2000) carried out an investigation on construction delays in Jordan. He investigated the causes of delay in 130 public project construction and the result of his study indicated that the major causes of delay were related to designers, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

In other study, Odeh and Battaineh (2002) identified the main causes of delays in construction projects from the perspective of construction, contractors and consultants. They concluded that contractors and consultants agreed that the top ten most important factors are owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors.

Assaf and Al-Hejji (2006) investigated the causes of delay in large construction projects in Saudi Arabia. Through the research, he identified 73 causes of delay. These identified causes then were merged into nine major related factors which are project, owner, contractor, consultant, design, materials, equipment, labors

and external related factors. The outcome from his research showed that the construction projects delay is mostly invented by owner and followed by contractor. Design, labor, consultant, and other related factors are less important.

Similarly, Lo et al. (2006) carried out an identification of 30 causes of delay in Hong Kong construction projects. He divided the causes to 7 categories namely client related, engineer related, contractor related, human behavior related, project related, external factors and resource related.

Sambasivan and Soon (2007) observed the causes and effects of delays in Malaysian construction industry. 150 questionnaires were prepared and distributed to the three major groups of participant which are owners, consultants, and contractors. The result for this study indicated 10 main causes of delay in Malaysian construction industry which are contractor's improper planning, contractor's poor site management, inadequate contractor experience, inadequate owner's finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage.

Sweis et al (2007) conducted a survey and interviews with senior professionals in the field as the basis of their research. The result of this research revealed that one of the most significant reasons of construction delay is the financial difficulties faced by the contractor and too many change orders by the owner. However, the weather conditions and changes in government regulations and laws classed among the least important causes.

In similar study, Doloi et al (2012) formed a questionnaire survey and personal interviews to examine the significance delay factors of the Indian construction industry by using factor analysis and regression modeling. From this factor analysis, most important causes of construction delay were lack of commitment, inefficient site management, poor site coordination, improper planning, lack of clarity in project scope, lack of communication, and substandard contract. From the regression model, the factors that affect overall delay were slow decision from owner, poor labor productivity, architects' reluctance for change and rework due to mistakes in construction

Marzouk and El-Rasas (2013) analyzed delay causes in Egyptian construction industry. The questionnaire surveys were designed and distributed to thirty-three construction experts who correspond to owners, consultants, and contractor's organizations. The most important delay causes in the research were owner related caused which followed by contractors and external related causes. In other side, the consultant related causes, labor and equipment related causes, project related causes and material related causes gave a small contribution to the delay project in Egyptian construction Industry.

Correspondingly, R.F. Aziz (2013) invited practitioners and experts to contribute in a structured questionnaire assessment. From the brainstorming, 99 factors were short-listed. These factors were classified into nine major categories which were the consultant related factors category, contractor related factors category, design related factors category, equipment related factors category, external related factors category, labor related factors category, material related factors category, owner related factors category and project related factors category. The records were analyzed using Relative Importance Index (RII), ranking and simple percentages.

Majority causes of delay are due to project owner change order, contractor inadequate experience which leads to poor performance, improper planning and slow decision making from project owner. With identification of the major causes, it is expected from the project owner or the contractor could take some action to combat the delay and to expedite the project process.

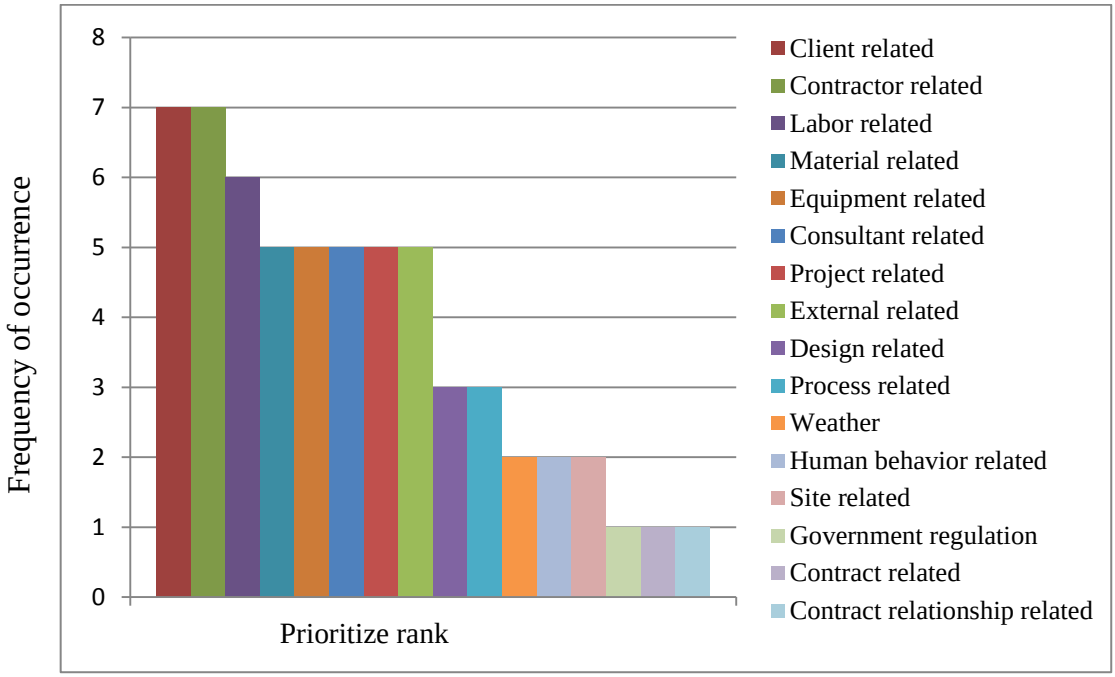
Table 2.1: Summary of Literature reviews from various authors for causes of delay in construction project based on group factors

Causes of delay in construction project based on group factors	Authors								
	Al-Momani (2000)	Odeh & Battaineh (2002)	Assaf & Al-Hejji (2006)	Lo et al. (2006)	Sambasivan & Soon (2007)	Sweis et al (2007)	Doloi et al (2012)	Marzouk &El-Rasas (2013)	R.F. Aziz (2013)
Project related			✓	✓			✓	✓	✓
Client related		✓	✓	✓	✓	✓		✓	✓
Contractor related		✓	✓	✓	✓	✓		✓	✓
Consultant related			✓		✓	✓		✓	✓
Design related	✓		✓						✓
Material related			✓		✓	✓		✓	✓
Equipment related			✓		✓	✓		✓	✓
Labor related		✓	✓		✓	✓		✓	✓
External related			✓	✓	✓			✓	✓
Contract related					✓				
Contract relationship related					✓				
Weather	✓					✓			
Government regulation						✓			
Site related	✓						✓		
Process related	✓	✓					✓		
Human behavior related				✓			✓		

Table 2.2: Prioritization of delay causes in construction project

Causes of delay	Frequency of occurrence	Prioritized rank
Client related	7	1
Contractor related	7	1
Labor related	6	2
Material related	5	3
Equipment related	5	3
Consultant related	5	3
Project related	5	3
External related	5	3
Design related	3	4
Process related	3	4
Weather	2	5
Human behavior related	2	5
Site related	2	5
Government regulation	1	6
Contract related	1	6
Contract relationship related	1	6

Graph 2.1 Priorities Rank for Causes of Delay



From the table analysis and graph 2.1 as shown above, the majority of authors agreed that client related, contractor related, and labor related are the most important factors causing delay in construction projects. However, material related, equipment related, consultant related, project related and external related are ranked to be the third most important factor in construction project delay.

2.3 Effects of Delay

Chan and Kumaraswamy (1997) studied construction project delays in Hong Kong construction industry. They emphasized that failure to achieve targeted time, budgeted cost and specified quality caused various unexpected negative effects on the projects. Normally, when the projects are delayed, they are either extended or accelerated and therefore, incur extra cost.

Fong et al (2006) mentioned that delays in construction are frequently encountered in building industry and countless claims would be arisen with a few of them ended up in litigation.

Aibinu and Jagboro (2002) surveyed the effects of construction delays on project delivery in Nigerian construction industry. The survey questionnaires were sent to three groups of construction practitioners which were mainly quantity surveyors, architects, engineers, and contractors. The effects of construction delays were assessed through empirical method. The findings showed that time and cost overruns were frequent effects of delay. Besides, they found the six effects of construction delay which were time overrun, cost overrun, dispute, arbitration and litigation and total abandonment.

Chan and Kumaraswamy (2002) proposed a strategy of compressing construction periods of diverse types of building projects. A survey was conducted to explore the construction time performance of projects in three building sub-sectors namely public housing, public non-residential and private sector. Derived from the basis of the lessons learned from Hong Kong based surveys and other research findings, they formulated specific technological and managerial strategies for reducing construction periods in particular building sub-sectors in order to improve the construction time performance of Hong Kong building projects.

Sambasivan and Soon (2007) established the link between causes and effects of delays in Malaysia construction industry. The findings indicated six main effects of delay which mainly time overrun, cost overrun, disputes, arbitration, litigation, and total abandonment. Earlier studies either identified the causes or the effects of project delays, separately. This study took an integrated approach and analyzed the impact of specific causes on specific effects. Identification of causes and effects only

does not help the project managers to obtain a proper remedial or preventive step. The project managers have to understand, for example, what are the causes or factors which resulting in time overrun or cost overrun. When these factors become clear, the project managers will be able to take proactive steps to avoid such situations.

Ability to predict and identify the effect of delays would help all decision makers to avoid any circumstances that will lead to delays.

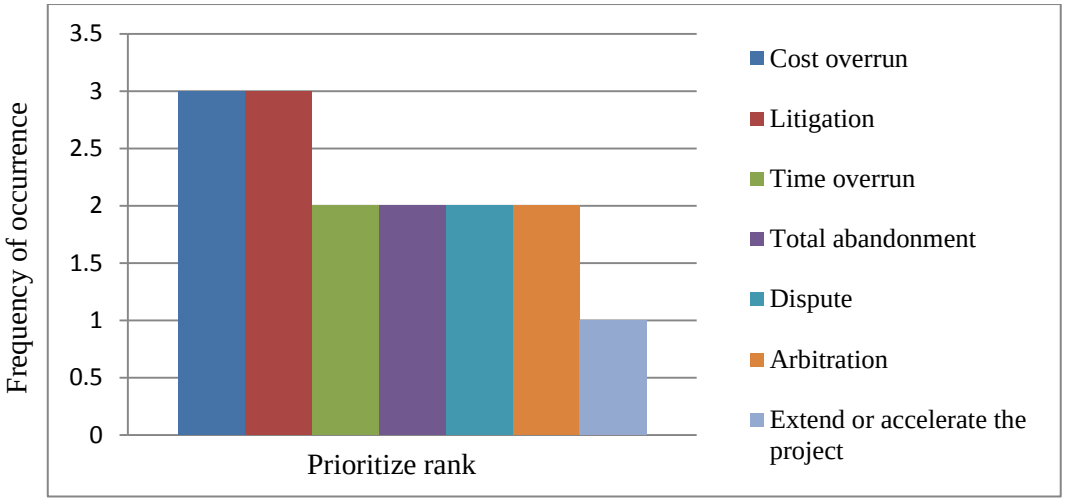
Table 2.3: Summary of Literature reviews from various authors for effects of delay in construction project.

Effects of delay in construction project based on group factors	Authors			
	Chan & Kumaraswamy (1997)	Fong et al (2006)	Aibinu &Jagboro (2002)	Sambasivan & Soon (2007)
Extend or accelerate the project	✓			
Time overrun			✓	✓
Cost overrun	✓		✓	✓
Total abandonment			✓	✓
Dispute			✓	✓
Arbitration			✓	✓
Litigation		✓	✓	✓

Table 2.4: Prioritization of delay effects in construction project

Effects of delay	Frequency of occurrence	Prioritized rank
Cost overrun	3	1
Litigation	3	1
Time overrun	2	2
Total abandonment	2	2
Dispute	2	2
Arbitration	2	2
Extend or accelerate the project	1	3

Graph 2.2 Priorities Rank for Effects of Delay



From the table analysis and graph 2.2 as shown above, the majority of authors agreed that cost overrun, litigation, time overrun, total abandonment, dispute and arbitration are the major effects in construction project delays.

2.4 Type of Delay and Delay Responsibility

Yates and Epstein (2006) explain the four types of delays that occur on construction projects. They mentioned that in actual practice, delays are frequently difficult to sort out, separate, and accurately access. As a result, the responsibility for delays on construction projects is often disputed and can become the subject of protracted litigation.

The types of delays have been labeled as:

1. compensable delays
2. non-excusable delays
3. excusable delays
4. concurrent delays (Ahmed et al., 2003)

2.4.1 Compensable Delays

Compensable delays are delays that are generally caused by the owner and resulted in both a time extension and compensation to the contractor. The most common form of compensable delay is inadequate drawings and specifications, but compensable delays can also arise from the owner's failure to respond in a timely fashion to requests for information or shop drawings, owner's changes in design or materials, and owner's disruption and/or change in the sequence of the work (Alaghbari, 2005).

2.4.2 Non-excusable delays

These delays are caused by actions or inactions by contractors or subcontractors or materials suppliers. The contractor might be entitled to compensation from the delaying subcontractor or supplier, but no compensation is due from the owner. Therefore, non-compensable delays usually result in no additional money and no additional time being granted to the contractor (Alaghbari, 2005).

2.4.3 Excusable delays

Excusable delays are delays that are not the fault of the owner or the contractor. It is also known as "force majeure" delays. They are "Acts of God" or other

unforeseeable causes beyond the control of both parties. It is most often entitle the contractor to an extension of time, but not to additional costs, although this depends on the contract language (Alaghbari, 2005).

2.4.4 Concurrent delays

Concurrent delays are more complicated but also more typical situation. It is when more than one factor at the same time or in overlapping periods of time cause delay to the project. Different methods are available for assessing responsibility for concurrent delays, but it is difficult to determine which delays are concurrent. If this cannot be done between the owner and the contractor legal proceedings may be needed to resolve the issue. (Alaghbari, 2005).

2.5 Mega Project Airport Construction Delay

According to Goetz and Szyliowiz (1997), the Denver International Airport (DIA) originally scheduled to be opened in October 1993. However, it finally opened on 28 February 1995 after four time postponements. The delay was reported due to difficulties with its automated baggage system. As a result of extension of time (EOT), the project which was originally cost $1.7 billion, had escalated its price to over $5 billion.

The new Hong Kong International Airport originally scheduled to open in April 1997 with the original price of $1.3 billion. Nevertheless, the construction was not able to achieve the targeted time. This airport construction experienced delays by about one year and four months due to political disputes regarding funding between the United Kingdom and the People's Republic of China. According to Crowley and Livengood (2002), the delay occurred because of a variety of causes, design changes, differing work conditions, the late finishing by general contractor joint venture and acquired substantial costs beyond those anticipated. Finally, the delays and disruptions caused an increase in the overall onsite project overhead.

In another case, Berlin Brandenburg Airport Germany has become a national and international attention due to its continued delay due to the large number of construction flaws and problems that were surfacing. It was originally planned to be opened in 2010. However, a series of delays encountered due to poor construction planning, management and execution. When the terminal building construction began in 2006, 30 October 2011 was announced as inauguration day for the new airport. Nevertheless, Construction deadlines could not be met, and the opening date was postponed to 3 June 2012. As of early September 2012, the opening date was indeed further postponed, this time to 27 October 2013. By January 2013, four official opening dates have not been met. By March 2013, it is not known when the airport will be inaugurated, though any dates prior to 2014 have been discarded was declared that the airport would be even further delayed, at least until 2014 even though no definite date has been announced. Due to these problems, the initially stated construction budget will be greatly exceeded.

Hamad International Airport is the international airport which currently under construction in Doha, Qatar. It is formerly known as New Doha International Airport

(NDIA). It was originally scheduled to replace the old Doha International Airport as Qatar's only international airport in 2009. Nevertheless, after a series of costly delays, the opening is then set to be in the middle of 2013. Currently, the airport was scheduled to open on 1st April 2013, and was set to initially serve airlines which will not utilize lounge access. National carrier Qatar Airways is due to move into the new airport once all the lounges and duty free shops are completed with the move slated to take place gradually from June to September 2013. At last, after three years of delays and postponed openings, this $15.5 billion project's inauguration was cancelled at the last minute because it had not met the new safety standards set by the Civil Defense.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

For this research, a case study concept is used in order to analyze the causes and effects of delays in construction of international airport. KLIA2 project is selected for this research based on the following criteria mentioned as below:

- The project must be an international airport construction project.
- The project must be an on-going project for more practical and feasible research.
- The project must face the delay problem during its construction.

A questionnaire is then developed to evaluate the causes and effects of delays. This questionnaire was designed in 4 major parts which are the general information of respondents, factors contribute to the delay, effects of delays and open ended questions to add any factors that the respondents think are important to be listed.

Heterogeneity of respondents is an important criteria in discovering the impact of various attributes on construction delay (Sambasivan and Soon, 2007). Therefore, the heterogeneity in the survey will be maintained by approaching to the 3 selected groups of respondents which are mainly client, consultants and contractors.

3.2 Project Activities

3.2.1 Pilot Survey

To improve the efficiency of the survey, a pilot survey was conducted. The questionnaires for the pilot survey were distributed to the nine respondents which are mainly from client, consultant, and contractor firm.

3.2.2 Preparation and Distribution of Questionnaire

For this research, 30 sets of questionnaire were distributed to the three groups of respondents which are client, consultants and contractors for this project. This questionnaire was prepared by integrating the key of causes and effect of delay as

reported in the literature. The delay attributes was identified under seven major categories based in the most occurrence attributes from literature review as follow:

- Client related factors: slow decision making by clients, change orders / additional works by clients during construction, poor communication by client with other construction parties, improper project feasibility study, delay in approving shop drawing, sample material, and revising & approving documents by client, delay in finance and payments of completed work by client, lack of clients experience in construction projects and client interferences.
- Contractor related: inappropriate construction methods, mistakes during construction stage, inadequate contractor experience for the type of project, ineffective planning and scheduling of the project, poor qualification of contractor's technical staff, conflict between contractors and other parties, poor site management and supervision by contractor, and unreliable subcontractor.
- Labor related: shortage of labors supply, absenteeism, low productivity of labors, unskilled labors or lack of skilled operators for specialized equipment, personal conflict between labor and management team, personal conflict between labors, poor communication between labors with contractors, and labor injuries on site.
- Material and equipment related: shortage of construction materials in market, changes in material types & specifications during construction, delay in material delivery, damage of sorted materials, equipment breakdowns, lack of high technology mechanical equipment, shortage of equipment, low of productivity and efficiency of equipment.
- Consultant related: slow preparation and approval of drawings, unclear and inadequate details in drawings, quality assurance/control, inflexibility of consultant, poor communication by consultant with other construction parties, delay in performing inspection by consultant, incapable and insufficient inspectors, and inadequate experience of consultant.
- Project related: original contract duration is too short or unrealistic, complexity of the project, ineffective delay penalties, rework due to change of design, rework due to errors during construction, unforeseen site condition,

"lowest bid wins" system, ambiguity in expectations and conflicting interpretation by parties.

- External related: unfavorable weather condition, regulatory changes, accident during construction, delay in providing services from utilities such as (water, electricity, etc), political situation, natural disaster, inconvenient site access, and exchange rate fluctuation.

The respondents were requested to choose one degree of each cause and effects of delay which is on scale of 1 (not important) to 5 (extremely important).

The Appendix C shows the questionnaire which were distributed to the clients, contractors and consultants.

3.2.2 Test for Reliability of the Questionnaire

The Cronbach's Coefficient Alpha is used to measure the reliability (the internal consistency). The range of Cronbach's alpha is between 0 to +1. Where the higher the value shows the higher reliability.

This Cronbach's Coefficient Alpha is measured by using SPSS software program (statistical package for the social sciences software program).

3.2.4 Data Analysis

The collected data from questionnaire is entered into SPSS program and analyzed by using the RII (Relative Important Index) method. This analysis is used to determine the relative importance of various causes and effects of delay in this research according to the relative importance indicates with the range from 1 to 5 as mentioned above.

Equation 3.1 will be used to calculate this index.

$$RII = \frac{\sum W}{A * N} \quad \text{---------- (3.1)}$$

Where W = Weighting given to each factor by the respondents (ranging from 1 to 5).

A = Highest weight (i.e. 5 in this case)

N = Total number of respondents.

The RII value has a range from 0 to 1. The higher the value of RII, the more important was the cause or effect of delays. Subsequently, the ranking from this calculation is used to cross-compare the relative importance of the factors as perceived by the 3 selected group of respondent (clients, consultants and contractors). From this ranking, we will be able to identify the most important factors which contribute to delay and also define the major effects of delays in international airport construction.

3.3 Gant chart

Detail/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FYP1															
Selection of project topic															
Preliminary research work															
Preparation of preliminary report															
Submission of preliminary report															
Preparation of viva (project defense)															
Viva and progress evaluation															
Preparation of questionnaire															
Preparation of draft report															
Submission of draft report															
Submission of final report															
FYP2															
Project work continues															
Distribution of questionnaire to the respondents															
Questioner feedback from respondents															
Submission of Progress Report															
Project Work Continues															
Pre-SEDEX															
Submission of Draft Report															
Submission of Dissertation (soft bound)															
Submission of Technical Paper															
Oral Presentation															
Submission of Project Dissertation (Hard Bound)															

Process

Suggested Milestone

CHAPTER 4
RESULT AND DISCUSSION

3.4 The Reliability of the Questionnaire

The Cronbach's Coefficient Alpha was used to check the reliability (internal consistency of the questionnaire by using SPSS software program (Statistical Package for the Social Sciences software program).

The result of the reliability test by Cronbach's Coefficient Alpha is shown in the table below.

Table 4.1 The Reliability Statistics

Group of respondence	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Client	0.931	0.933	64
Contractor	0.834	0.842	64
Consultant	0.872	0.865	64
All group of respondent	0.882	0.883	64

The range of Cronbach's Alpha is between 0 to +1. Where the higher the value shows the higher reliability. From the results shown on the table 4.1 above, the reliability is considered as good reliability which is 0.882 for all groups of respondents, 0.931 for the group of client, 0.834 for the group of contractors, and 0.872 for the group of consultants.

In the social sciences research, a Cronbach’s alpha of more than 0.70 is considered acceptable, and a Cronbach’s alpha of more than 0.80 is preferred and is considered as “good reliability”. Hence, the data collected from the author’s questionnaire is considered as good reliability and have a good internal consistency.

3.5 The Analysis of Data

The analysis of data is divided into 3 parts which are the demographic characteristics of respondent, the causes of delay, and the effects of delay.

3.5.1 The Demographic Characteristics of Respondent

Table 4.2 below shows the demographic characteristics of the respondent. The total number of respondents are 30 which classified by clients, contractors and consultants.

Table 4.2 the demographic characteristics of the respondent

Demographic Characteristic	Frequency	Percent
Age		
20-29 years old	13	0.43
30-39 years old	12	0.40
40-49 years old	4	0.13
50 years old	1	0.03
Gender		
Male	19	0.63
Female	11	0.37
Education		
Diploma	6	0.20
Bachelor	20	0.67
Master	3	0.10
Nature of company		
Client	10	0.33
Consultant	10	0.33
Contractor	10	0.33

3.5.2 The Causes of Delay

4.2.2.1 The Causes of Delay Based on Clients point of view

The table 4.3 below shows the rank of the causes of delay based on client's point of view.

Table 4.3

The rank of the causes of delay based on client's point of view

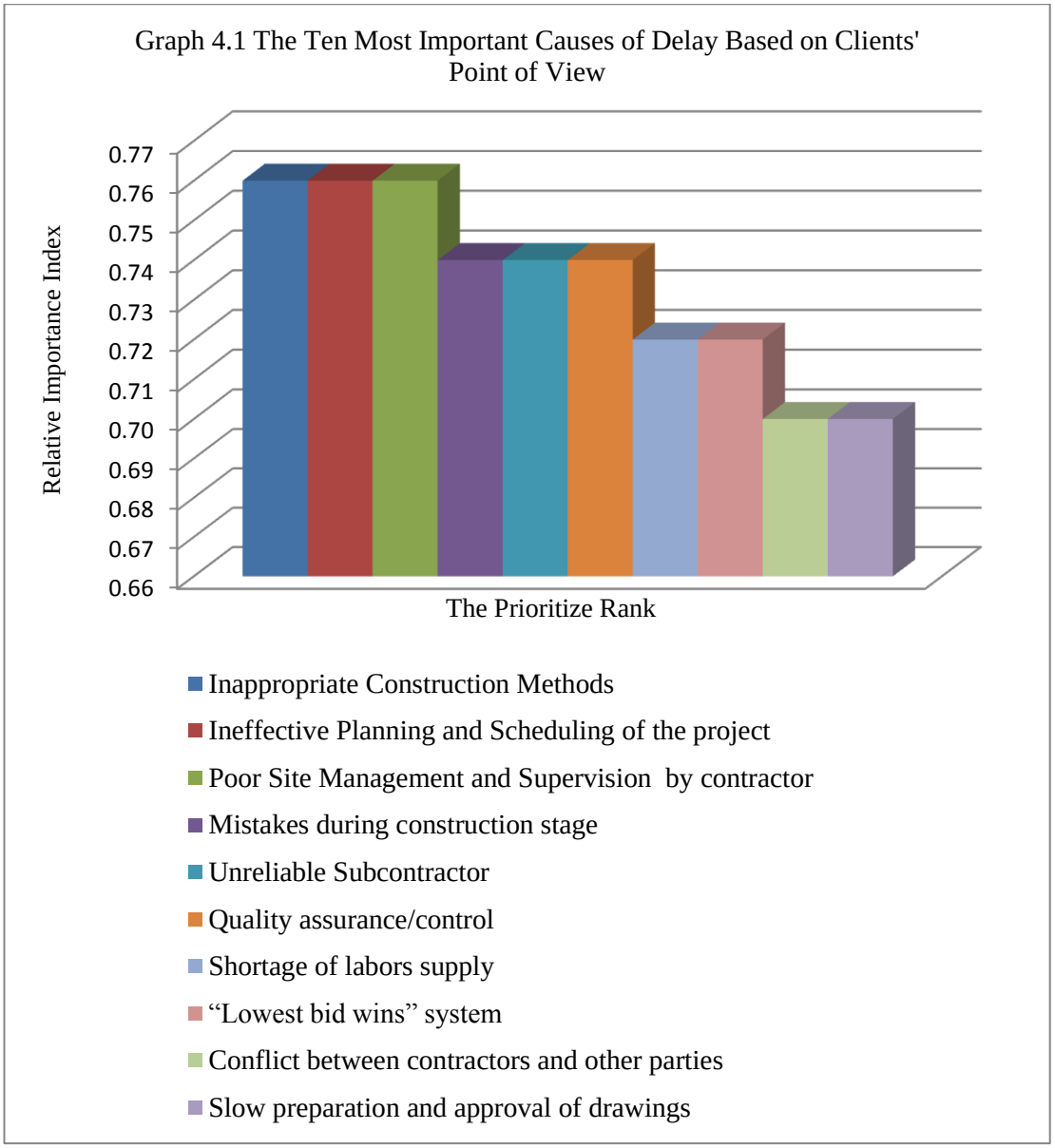
Causes of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Client related							
Slow decision making by clients	0.00	0.50	0.50	0.00	0.00	0.500	42
Change Orders / additional works by Clients during construction	0.00	0.20	0.60	0.20	0.00	0.600	22
Poor communication by client with other construction parties	0.10	0.60	0.30	0.00	0.00	0.440	55
Improper project feasibility study	0.10	0.30	0.50	0.10	0.00	0.520	38
Delay in approving shop drawing, sample material, and revising & approving documents by client	0.10	0.30	0.60	0.00	0.00	0.500	42
Delay in finance and payments of completed work by client	0.20	0.30	0.50	0.00	0.00	0.460	53
Lack of clients experience in construction projects	0.10	0.60	0.30	0.00	0.00	0.440	55
Client interferences	0.10	0.40	0.40	0.00	0.10	0.520	38
Contractor related							
Inappropriate Construction Methods	0.00	0.00	0.30	0.60	0.10	0.760	1
Mistakes during construction stage	0.00	0.00	0.40	0.50	0.10	0.740	4
Inadequate Contractor Experience for the type of project	0.10	0.10	0.50	0.20	0.10	0.620	18
Ineffective Planning and Scheduling of the project	0.00	0.00	0.30	0.60	0.10	0.760	1
Poor qualification of contractor's technical staff	0.10	0.10	0.30	0.40	0.10	0.660	13

Conflict between contractors and other parties	0.00	0.10	0.40	0.40	0.10	0.700	9
Poor Site Management and Supervision by contractor	0.00	0.00	0.30	0.60	0.10	0.760	1
Unreliable Subcontractor	0.00	0.10	0.30	0.40	0.20	0.740	4
Consultant related							
Slow preparation and approval of drawings	0.00	0.10	0.40	0.40	0.10	0.700	9
Unclear and inadequate details in drawings	0.00	0.10	0.50	0.30	0.10	0.680	11
Quality assurance/control	0.00	0.00	0.50	0.30	0.20	0.740	4
Inflexibility of consultant	0.00	0.30	0.60	0.10	0.00	0.560	31
Poor communication by consultant with other construction parties	0.00	0.30	0.60	0.10	0.00	0.560	31
Delay in performing inspection by consultant	0.00	0.40	0.40	0.20	0.00	0.560	31
Incapable and insufficient inspectors	0.00	0.20	0.50	0.30	0.00	0.620	18
Inadequate experience of consultant	0.10	0.30	0.40	0.20	0.00	0.540	36
Material and equipment related							
Shortage of construction materials in market	0.00	0.40	0.40	0.20	0.00	0.560	31
Changes in material types & specifications during construction	0.00	0.20	0.30	0.50	0.00	0.660	13
Delay in material delivery	0.00	0.00	0.70	0.30	0.00	0.660	13
Damage of sorted materials	0.00	0.50	0.40	0.10	0.00	0.520	38
Equipment breakdowns	0.00	0.60	0.30	0.10	0.00	0.500	42
Lack of high technology mechanical equipment	0.00	0.40	0.30	0.30	0.00	0.580	27
Shortage of equipment	0.00	0.60	0.30	0.10	0.00	0.500	42
Low of productivity and efficiency of equipment	0.00	0.40	0.30	0.30	0.00	0.580	27
Labor related							
Shortage of labors supply	0.00	0.00	0.50	0.40	0.10	0.720	7
Absenteeism	0.00	0.30	0.50	0.20	0.00	0.580	27

Low productivity of labors	0.00	0.20	0.20	0.60	0.00	0.680	11
Unskilled labors or lack of skilled operators for specialized equipment	0.00	0.20	0.30	0.50	0.00	0.660	13
Personal conflict between labor and management team	0.00	0.50	0.50	0.00	0.00	0.500	42
Personal conflict between labors	0.00	0.60	0.40	0.00	0.00	0.480	52
Poor communication between labors with contractors	0.00	0.20	0.60	0.20	0.00	0.600	22
Labor injuries on site	0.00	0.60	0.30	0.10	0.00	0.500	42
Project related							
Original contract duration is too short or unrealistic	0.00	0.40	0.50	0.10	0.00	0.540	36
Complexity of the project	0.00	0.30	0.40	0.30	0.00	0.600	22
Ineffective delay penalties	0.00	0.50	0.40	0.10	0.00	0.520	38
Rework due to change of design	0.00	0.30	0.30	0.40	0.00	0.620	18
Rework due to errors during construction	0.00	0.30	0.20	0.50	0.00	0.640	17
Unforeseen site condition	0.00	0.30	0.40	0.30	0.00	0.600	22
“Lowest bid wins” system	0.00	0.00	0.40	0.60	0.00	0.720	7
Ambiguity in expectations and conflicting interpretation by parties	0.10	0.10	0.50	0.30	0.00	0.600	22
External related							
Unfavorable weather condition	0.00	0.40	0.20	0.30	0.10	0.620	18
Regulatory changes	0.00	0.60	0.30	0.10	0.00	0.500	42
Accident during construction	0.00	0.60	0.30	0.10	0.00	0.500	42
Delay in providing services from utilities such as (water, electricity, etc)	0.00	0.40	0.40	0.20	0.00	0.560	31
Political situation	0.00	0.50	0.50	0.00	0.00	0.500	42
Natural disaster	0.00	0.50	0.20	0.20	0.10	0.580	27
Inconvenient site access	0.20	0.40	0.30	0.10	0.00	0.460	53
Exchange rate fluctuation	0.10	0.40	0.40	0.10	0.00	0.500	42

Based on the result shown in the table 4.3 above, The 10 highest ranks of the causes of delay based on the clients point of view is summarized in the graph 4.1 below.

Graph 4.1 The Ten Most Important Causes of Delay Based on Clients' Point of View



Based on the ranking shown above, the 10 most important causes of delay in a construction of international airport based the clients points of view are: Inappropriate Construction Methods (RII=0.760), Ineffective Planning and Scheduling of the project (RII=0.760), Poor Site Management and Supervision by contractor (RII=0.760), Mistakes during construction stage (RII=0.740), Unreliable Subcontractor (RII=0.740), Quality assurance/control (RII=0.740), Shortage of labors supply (RII=0.720), "Lowest bid wins" system (RII=0.720), Conflict between contractors and other parties (RII=0.700), and Slow preparation and approval of drawings (RII=0.700).

4.2.2.2 The Causes of Delay Based on Contractor's point of view

The table 4.4 below shows the rank of the causes of delay based on contractors' point of view.

Table 4.4

The rank of the causes of delay based on contractor's point of view

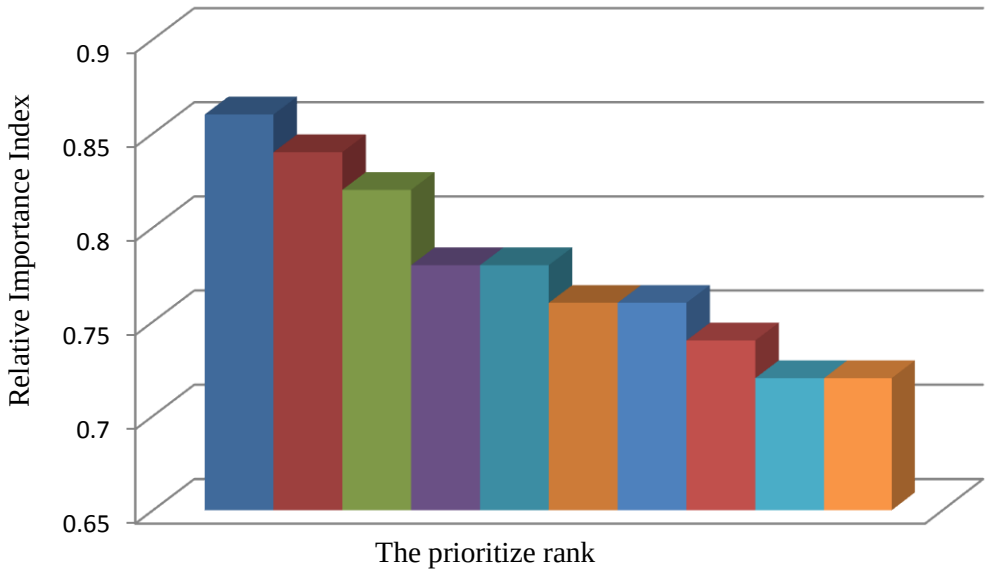
Causes of delay	Percentage of respondent scoring					RII	Rank
	1.00	2.00	3.00	4.00	5.00		
Client related							
Slow decision making by clients	0.00	0.00	0.30	0.60	0.10	0.760	6
Change Orders / additional works by Clients during construction	0.00	0.00	0.20	0.40	0.40	0.840	2
Poor communication by client with other construction parties	0.00	0.00	0.60	0.30	0.10	0.700	12
Improper project feasibility study	0.00	0.00	0.70	0.30	0.00	0.660	17
Delay in approving shop drawing, sample material, and revising & approving documents by client	0.00	0.00	0.10	0.70	0.20	0.820	3
Delay in finance and payments of completed work by client	0.00	0.00	0.50	0.40	0.10	0.720	9
Lack of clients experience in construction projects	0.00	0.50	0.20	0.20	0.10	0.580	33
Client interferences	0.00	0.10	0.40	0.50	0.00	0.680	16
Contractor related							
Inappropriate Construction Methods	0.00	0.10	0.80	0.00	0.10	0.620	22
Mistakes during construction stage	0.00	0.10	0.90	0.00	0.00	0.580	33
Inadequate Contractor Experience for the type of project	0.00	0.50	0.50	0.00	0.00	0.500	54
Ineffective Planning and Scheduling of the project	0.00	0.40	0.50	0.10	0.00	0.540	44
Poor qualification of contractor's technical staff	0.00	0.40	0.50	0.00	0.10	0.560	40
Conflict between contractors and other parties	0.00	0.50	0.30	0.20	0.00	0.540	44

Poor Site Management and Supervision by contractor	0.00	0.30	0.50	0.20	0.00	0.580	33
Unreliable Subcontractor	0.00	0.20	0.50	0.30	0.00	0.620	22
Consultant related							
Slow preparation and approval of drawings	0.00	0.10	0.30	0.50	0.10	0.720	9
Unclear and inadequate details in drawings	0.00	0.30	0.60	0.10	0.00	0.560	40
Quality assurance/control	0.00	0.10	0.90	0.00	0.00	0.580	33
Inflexibility of consultant	0.00	0.00	0.90	0.10	0.00	0.620	22
Poor communication by consultant with other construction parties	0.00	0.30	0.60	0.10	0.00	0.560	40
Delay in performing inspection by consultant	0.00	0.30	0.50	0.20	0.00	0.580	33
Incapable and insufficient inspectors	0.00	0.40	0.40	0.20	0.00	0.560	40
Inadequate experience of consultant	0.00	0.30	0.50	0.20	0.00	0.580	33
Material and equipment related							
Shortage of construction materials in market	0.00	0.40	0.60	0.00	0.00	0.520	49
Changes in material types & specifications during construction	0.00	0.10	0.20	0.70	0.00	0.720	9
Delay in material delivery	0.00	0.20	0.50	0.30	0.00	0.620	22
Damage of sorted materials	0.00	0.20	0.60	0.20	0.00	0.600	29
Equipment breakdowns	0.00	0.40	0.60	0.00	0.00	0.520	49
Lack of high technology mechanical equipment	0.00	0.50	0.40	0.10	0.00	0.520	49
Shortage of equipment	0.00	0.30	0.70	0.00	0.00	0.540	44
Low of productivity and efficiency of equipment	0.00	0.20	0.70	0.10	0.00	0.580	33
Labor related							
Shortage of labors supply	0.00	0.00	0.40	0.30	0.30	0.780	4
Absenteeism	0.00	0.00	0.10	0.90	0.00	0.780	4
Low productivity of labors	0.00	0.00	0.50	0.50	0.00	0.700	12
Unskilled labors or lack of skilled operators for specialized equipment	0.00	0.10	0.70	0.20	0.00	0.620	22

Personal conflict between labor and management team	0.00	0.00	0.50	0.50	0.00	0.700	12
Personal conflict between labors	0.00	0.30	0.40	0.30	0.00	0.600	29
Poor communication between labors with contractors	0.00	0.10	0.70	0.20	0.00	0.620	22
Labor injuries on site	0.00	0.70	0.30	0.00	0.00	0.460	56
Project related							
Original contract duration is too short or unrealistic	0.00	0.00	0.40	0.50	0.10	0.740	8
Complexity of the project	0.00	0.00	0.50	0.20	0.30	0.760	6
Ineffective delay penalties	0.00	0.10	0.50	0.40	0.00	0.660	17
Rework due to change of design	0.00	0.00	0.20	0.30	0.50	0.860	1
Rework due to errors during construction	0.00	0.10	0.40	0.40	0.10	0.700	12
Unforeseen site condition	0.00	0.10	0.50	0.40	0.00	0.660	17
“Lowest bid wins” system	0.00	0.40	0.30	0.20	0.10	0.600	29
Ambiguity in expectations and conflicting interpretation by parties	0.00	0.00	0.80	0.20	0.00	0.640	20
External related							
Unfavorable weather condition	0.00	0.20	0.50	0.30	0.00	0.620	22
Regulatory changes	0.00	0.20	0.40	0.40	0.00	0.640	20
Accident during construction	0.00	0.50	0.40	0.10	0.00	0.520	49
Delay in providing services from utilities such as (water, electricity, etc)	0.00	0.10	0.80	0.10	0.00	0.600	29
Political situation	0.20	0.30	0.20	0.20	0.10	0.540	44
Natural disaster	0.00	0.50	0.50	0.00	0.00	0.500	54
Inconvenient site access	0.10	0.20	0.60	0.10	0.00	0.540	44
Exchange rate fluctuation	0.10	0.30	0.50	0.10	0.00	0.520	49

Based on the result shown in the table 4.4 above, The 10 highest ranks of the causes of delay based on the contractors point of view is summarized in the graph 4.2 in the following page.

Graph 4.2
The Causes of Delay based on Contractors point of view



- Rework due to change of design
- Change Orders / additional works by Clients during construction
- Delay in approving shop drawing, sample material, and revising & approving documents by client
- Shortage of labors supply
- Absenteeism
- Slow decision making by clients
- Complexity of the project
- Original contract duration is too short or unrealistic
- Delay in finance and payments of completed work by client
- Slow preparation and approval of drawings

Based on the ranking shown above, the 10 most important causes of delay in a construction of international airport based the contractors points of view are: Rework due to change of design (RII=0.860), Change Orders / additional works by Clients during construction (RII=0.840), Delay in approving shop drawing, sample material & approving documents by client (RII=0.820), Shortage of labors supply (RII=0.780), Absenteeism (RII=0.780), Slow decision making by clients (RII=0.760), Complexity of the project (RII=0.760), Original contract duration is too short or unrealistic (RII=0.740), Slow preparation and approval of drawings (RII=0.720), and Changes in material types & specifications during construction (RII=0.720).

4.2.2.3 The Causes of Delay Based on Consultant's point of view

The table 4.5 below shows the rank of the causes of delay based on consultant's point of view.

Table 4.5

The rank of the causes of delay based on Consultant's point of view

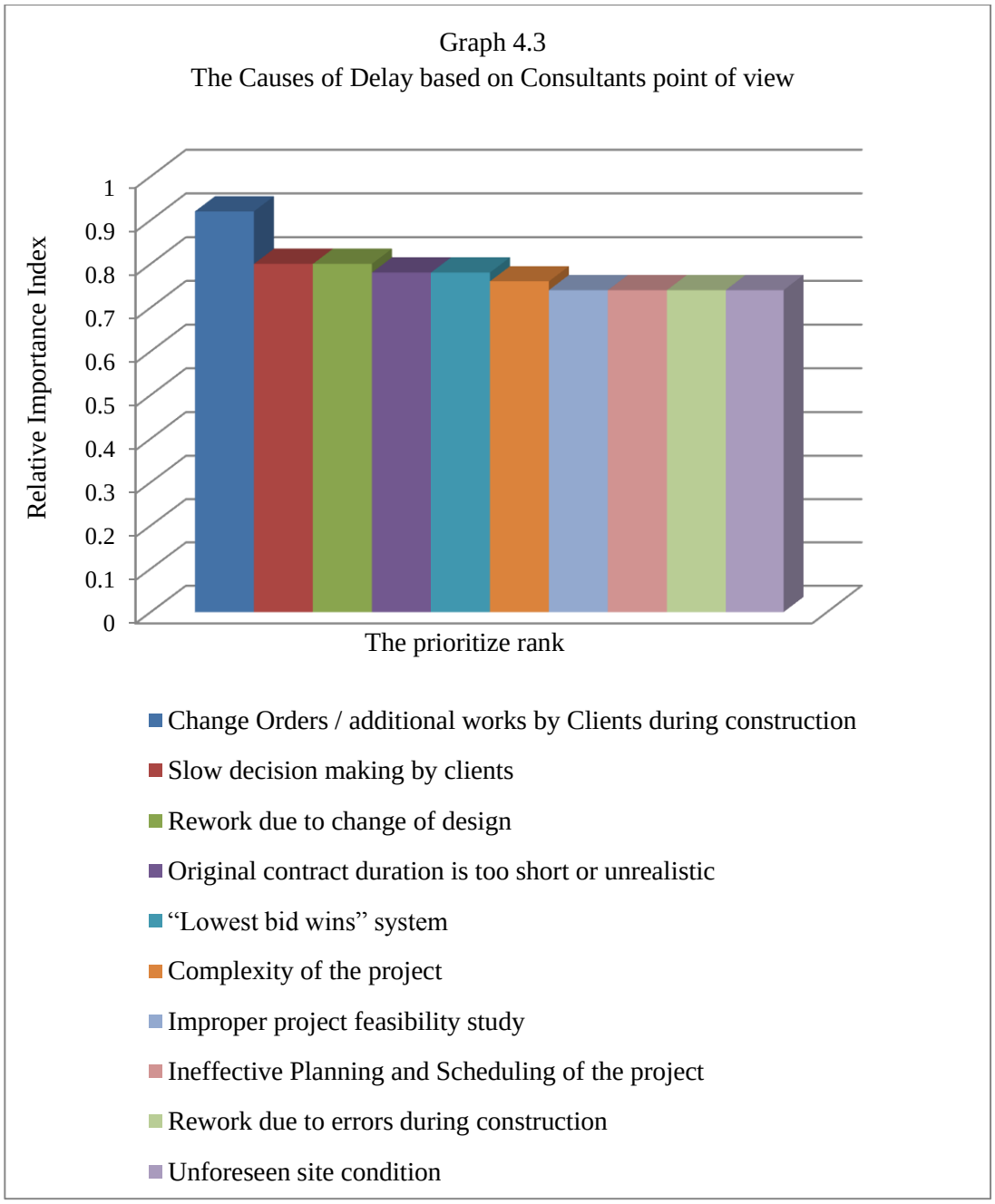
Causes of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Client related							
Slow decision making by clients	0.00	0.00	0.30	0.40	0.30	0.800	2
Change Orders / additional works by Clients during construction	0.00	0.00	0.00	0.40	0.60	0.920	1
Poor communication by client with other construction parties	0.00	0.00	0.50	0.40	0.10	0.720	11
Improper project feasibility study	0.00	0.00	0.50	0.30	0.20	0.740	7
Delay in approving shop drawing, sample material, and revising & approving documents by client	0.00	0.30	0.70	0.00	0.00	0.540	32
Delay in finance and payments of completed work by client	0.00	0.30	0.70	0.00	0.00	0.540	32
Lack of clients experience in construction projects	0.00	0.70	0.20	0.10	0.00	0.480	47
Client interferences	0.00	0.00	0.70	0.20	0.10	0.680	14
Contractor related							
Inappropriate Construction Methods	0.00	0.30	0.70	0.00	0.00	0.540	32
Mistakes during construction stage	0.00	0.10	0.60	0.10	0.20	0.680	14
Inadequate Contractor Experience for the type of project	0.00	0.30	0.70	0.00	0.00	0.540	32
Ineffective Planning and Scheduling of the project	0.00	0.00	0.30	0.70	0.00	0.740	7
Poor qualification of contractor's technical staff	0.00	0.10	0.50	0.30	0.10	0.680	14
Conflict between contractors and other parties	0.00	0.20	0.10	0.60	0.10	0.720	11

Poor Site Management and Supervision by contractor	0.00	0.10	0.30	0.50	0.10	0.720	11
Unreliable Subcontractor	0.00	0.20	0.20	0.60	0.00	0.680	14
Consultant related							
Slow preparation and approval of drawings	0.00	0.10	0.80	0.10	0.00	0.600	24
Unclear and inadequate details in drawings	0.00	0.60	0.40	0.00	0.00	0.480	47
Quality assurance/control	0.10	0.20	0.60	0.10	0.00	0.540	32
Inflexibility of consultant	0.00	0.80	0.20	0.00	0.00	0.440	53
Poor communication by consultant with other construction parties	0.20	0.50	0.20	0.10	0.00	0.440	53
Delay in performing inspection by consultant	0.00	0.70	0.30	0.00	0.00	0.460	52
Incapable and insufficient inspectors	0.00	0.50	0.30	0.20	0.00	0.540	32
Inadequate experience of consultant	0.00	0.70	0.20	0.10	0.00	0.480	47
Material and equipment related							
Shortage of construction materials in market	0.00	0.20	0.70	0.10	0.00	0.580	25
Changes in material types & specifications during construction	0.00	0.10	0.50	0.30	0.10	0.680	14
Delay in material delivery	0.00	0.00	0.80	0.20	0.00	0.640	20
Damage of sorted materials	0.00	0.20	0.50	0.30	0.00	0.620	22
Equipment breakdowns	0.00	0.40	0.50	0.10	0.00	0.540	32
Lack of high technology mechanical equipment	0.00	0.50	0.50	0.00	0.00	0.500	43
Shortage of equipment	0.00	0.60	0.30	0.10	0.00	0.500	43
Low of productivity and efficiency of equipment	0.00	0.30	0.60	0.10	0.00	0.560	30
Labor related							
Shortage of labors supply	0.00	0.10	0.40	0.50	0.00	0.680	14
Absenteeism	0.10	0.40	0.40	0.10	0.00	0.500	43
Low productivity of labors	0.00	0.10	0.70	0.20	0.00	0.620	22
Unskilled labors or lack of skilled operators for specialized equipment	0.00	0.30	0.50	0.20	0.00	0.580	25

Personal conflict between labor and management team	0.10	0.20	0.60	0.10	0.00	0.540	32
Personal conflict between labors	0.00	0.50	0.40	0.10	0.00	0.520	40
Poor communication between labors with contractors	0.10	0.20	0.40	0.30	0.00	0.580	25
Labor injuries on site	0.20	0.30	0.00	0.50	0.00	0.560	30
Project related							
Original contract duration is too short or unrealistic	0.00	0.10	0.20	0.40	0.30	0.780	4
Complexity of the project	0.00	0.20	0.00	0.60	0.20	0.760	6
Ineffective delay penalties	0.00	0.30	0.30	0.30	0.10	0.640	20
Rework due to change of design	0.00	0.00	0.30	0.40	0.30	0.800	2
Rework due to errors during construction	0.00	0.10	0.30	0.40	0.20	0.740	7
Unforeseen site condition	0.10	0.00	0.30	0.30	0.30	0.740	7
“Lowest bid wins” system	0.00	0.10	0.30	0.20	0.40	0.780	4
Ambiguity in expectations and conflicting interpretation by parties	0.10	0.30	0.20	0.40	0.00	0.580	25
External related							
Unfavorable weather condition	0.10	0.30	0.30	0.20	0.10	0.580	25
Regulatory changes	0.20	0.30	0.40	0.10	0.00	0.480	47
Accident during construction	0.20	0.40	0.40	0.00	0.00	0.440	53
Delay in providing services from utilities such as (water, electricity, etc)	0.20	0.40	0.40	0.00	0.00	0.440	53
Political situation	0.20	0.40	0.20	0.10	0.10	0.500	43
Natural disaster	0.10	0.30	0.50	0.10	0.00	0.520	40
Inconvenient site access	0.20	0.30	0.40	0.10	0.00	0.480	47
Exchange rate fluctuation	0.20	0.20	0.50	0.00	0.10	0.520	40

Based on the result shown in the table 4.5 above, The 10 highest ranks of the causes of delay based on the consultants point of view is summarized in the graph 4.3 in the following page.

Graph 4.3
The Causes of Delay based on Consultants point of view



Based on the ranking shown above, the 10 most important causes of delay in a construction of international airport based the Consultants' points of view are: change orders / additional works by clients during construction (RII=0.920), slow decision making by clients (RII=0.800), rework due to change of design (RII=0.800), Original contract duration is too short or unrealistic (RII=0.780), "lowest bid wins" system (RII=0.780), complexity of the project (RII=0.760), improper project feasibility study (RII=0.740), Ineffective Planning and scheduling of the project (RII=0.740), Rework due to errors during construction (RII=0.740), and unforeseen site condition (RII=0.740).

4.2.2.4 The Causes of Delay Based on all group of respondents' point of view

The table 4.6 below shows the rank of the causes of delay based on all group of respondents' point of view.

Table 4.6

The rank of the causes of delay based on all group of respondents' point of view

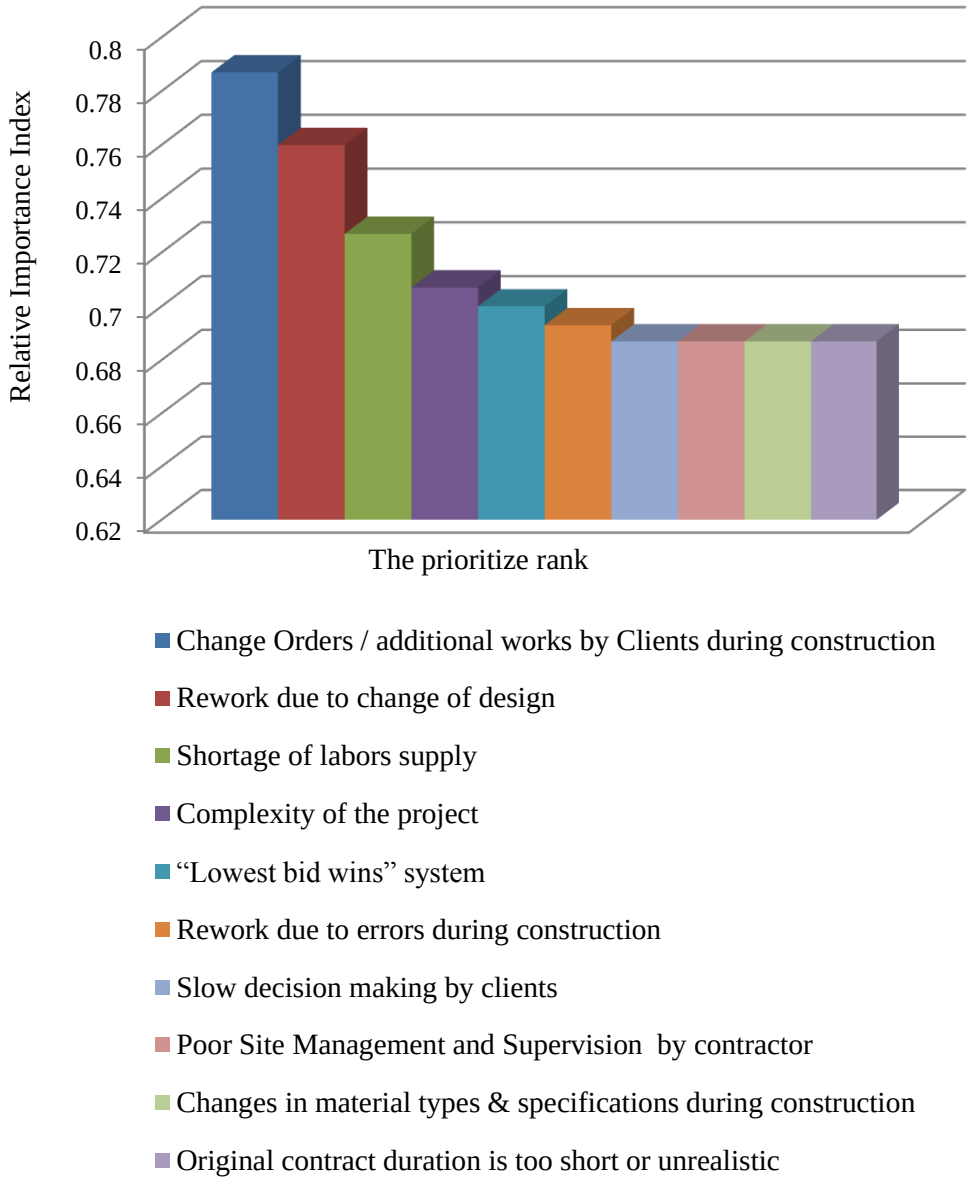
Causes of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Client related							
Slow decision making by clients	0.00	0.17	0.37	0.33	0.13	0.687	7
Change Orders / additional works by Clients during construction	0.00	0.07	0.27	0.33	0.33	0.787	1
Poor communication by client with other construction parties	0.03	0.20	0.47	0.23	0.07	0.620	23
Improper project feasibility study	0.03	0.10	0.57	0.23	0.07	0.640	18
Delay in approving shop drawing, sample material, and revising & approving documents by client	0.03	0.20	0.47	0.23	0.07	0.620	23
Delay in finance and payments of completed work by client	0.07	0.20	0.57	0.13	0.03	0.573	34
Lack of clients experience in construction projects	0.03	0.60	0.23	0.10	0.03	0.500	54
Client interferences	0.03	0.17	0.50	0.23	0.07	0.627	22
Contractor related							
Inappropriate Construction Methods	0.00	0.13	0.60	0.20	0.07	0.640	18
Mistakes during construction stage	0.00	0.07	0.63	0.20	0.10	0.667	14
Inadequate Contractor Experience for the type of project	0.03	0.30	0.57	0.07	0.03	0.553	38
Ineffective Planning and Scheduling of the project	0.00	0.13	0.37	0.47	0.03	0.680	11
Poor qualification of contractor's technical staff	0.03	0.20	0.43	0.23	0.10	0.633	21
Conflict between contractors and other parties	0.00	0.27	0.27	0.40	0.07	0.653	17

Poor Site Management and Supervision by contractor	0.00	0.13	0.37	0.43	0.07	0.687	7
Unreliable Subcontractor	0.00	0.17	0.33	0.43	0.07	0.680	11
Consultant related							
Slow preparation and approval of drawings	0.00	0.10	0.50	0.33	0.07	0.673	13
Unclear and inadequate details in drawings	0.00	0.33	0.50	0.13	0.03	0.573	34
Quality assurance/control	0.03	0.10	0.67	0.13	0.07	0.620	23
Inflexibility of consultant	0.00	0.37	0.57	0.07	0.00	0.540	40
Poor communication by consultant with other construction parties	0.07	0.37	0.47	0.10	0.00	0.520	48
Delay in performing inspection by consultant	0.00	0.47	0.40	0.13	0.00	0.533	42
Incapable and insufficient inspectors	0.00	0.37	0.40	0.23	0.00	0.573	34
Inadequate experience of consultant	0.03	0.43	0.37	0.17	0.00	0.533	42
Material and equipment related							
Shortage of construction materials in market	0.00	0.33	0.57	0.10	0.00	0.553	38
Changes in material types & specifications during construction	0.00	0.13	0.33	0.50	0.03	0.687	7
Delay in material delivery	0.00	0.07	0.67	0.27	0.00	0.640	18
Damage of sorted materials	0.00	0.30	0.50	0.20	0.00	0.580	32
Equipment breakdowns	0.00	0.47	0.47	0.07	0.00	0.520	48
Lack of high technology mechanical equipment	0.00	0.47	0.40	0.13	0.00	0.533	42
Shortage of equipment	0.00	0.50	0.43	0.07	0.00	0.513	50
Low of productivity and efficiency of equipment	0.00	0.30	0.53	0.17	0.00	0.573	34
Labor related							
Shortage of labors supply	0.00	0.03	0.43	0.40	0.13	0.727	3
Absenteeism	0.03	0.23	0.33	0.40	0.00	0.620	23
Low productivity of labors	0.00	0.10	0.47	0.43	0.00	0.667	14
Unskilled labors or lack of skilled operators for specialized equipment	0.00	0.20	0.50	0.30	0.00	0.620	23

Personal conflict between labor and management team	0.03	0.23	0.53	0.20	0.00	0.580	32
Personal conflict between labors	0.00	0.47	0.40	0.13	0.00	0.533	42
Poor communication between labors with contractors	0.03	0.17	0.57	0.23	0.00	0.600	31
Labor injuries on site	0.07	0.53	0.20	0.20	0.00	0.507	53
Project related							
Original contract duration is too short or unrealistic	0.00	0.17	0.37	0.33	0.13	0.687	7
Complexity of the project	0.00	0.17	0.30	0.37	0.17	0.707	4
Ineffective delay penalties	0.00	0.30	0.40	0.27	0.03	0.607	28
Rework due to change of design	0.00	0.10	0.27	0.37	0.27	0.760	2
Rework due to errors during construction	0.00	0.17	0.30	0.43	0.10	0.693	6
Unforeseen site condition	0.03	0.13	0.40	0.33	0.10	0.667	14
“Lowest bid wins” system	0.00	0.17	0.33	0.33	0.17	0.700	5
Ambiguity in expectations and conflicting interpretation by parties	0.07	0.13	0.50	0.30	0.00	0.607	28
External related							
Unfavorable weather condition	0.03	0.30	0.33	0.27	0.07	0.607	28
Regulatory changes	0.07	0.37	0.37	0.20	0.00	0.540	40
Accident during construction	0.07	0.50	0.37	0.07	0.00	0.487	56
Delay in providing services from utilities such as (water, electricity, etc)	0.07	0.30	0.53	0.10	0.00	0.533	42
Political situation	0.13	0.40	0.30	0.10	0.07	0.513	50
Natural disaster	0.03	0.43	0.40	0.10	0.03	0.533	42
Inconvenient site access	0.17	0.30	0.43	0.10	0.00	0.493	55
Exchange rate fluctuation	0.13	0.30	0.47	0.07	0.03	0.513	50

Based on the result shown in the table 4.6 above, The 10 highest ranks of the causes of delay based on all groups of respondents is summarized in the graph 4.4 in the following page.

Graph 4.4
The Causes of Delay based on all groups of respondents



Based on the ranking shown above, the 10 most important causes of delay in a construction of international airport based on all the groups of respondents point of view are: change orders / additional works by Clients during construction (RII=0.920), rework due to change of design (RII=0.760), shortage of labors supply (RII=0.727), complexity of the project (RII=0.707), "lowest bid wins" system (RII=0.700), rework due to errors during construction (RII=0.693), slow decision making by clients (RII=0.687), poor site management and supervision by contractor (RII=0.687), changes in material types & specifications during construction (RII=0.687), and original contract duration is too short or unrealistic (RII=0.687).

3.5.3 The Effects of Delay

4.2.3.1 The Effects of delay based on Clients point of view

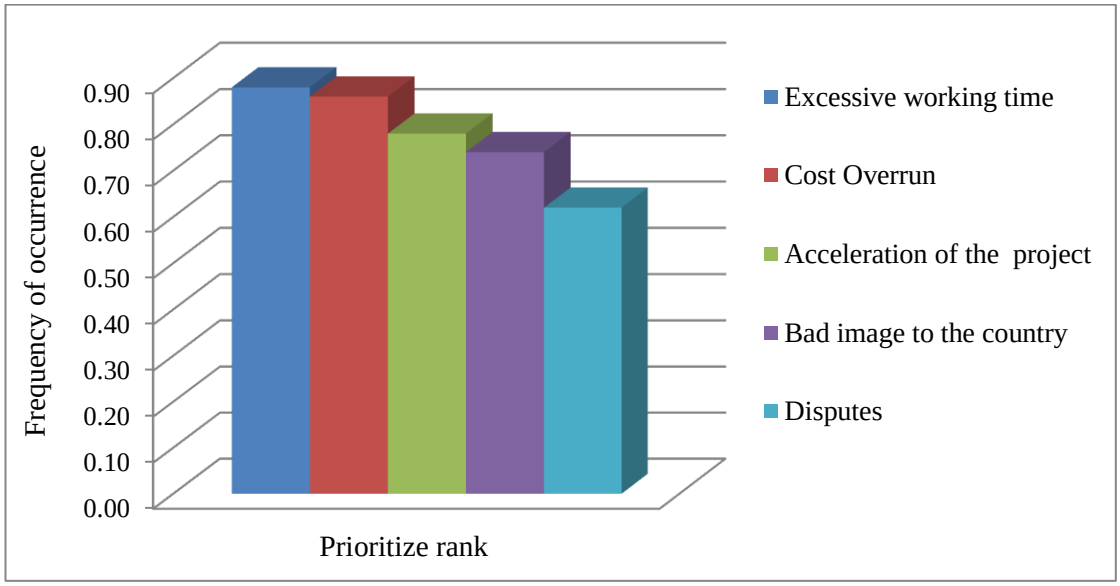
The table 4.7 below shows the rank of the effects of delay based the clients' point of view.

Table 4.7

The rank of the causes of delay based on the clients' point of view

Effect of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Excessive working time	0.00	0.00	0.00	0.60	0.40	0.88	1
Cost Overrun	0.00	0.00	0.00	0.70	0.30	0.86	2
Acceleration of the project	0.00	0.10	0.00	0.80	0.10	0.78	3
Bad image to the country	0.00	0.10	0.10	0.80	0.00	0.74	4
Disputes	0.10	0.10	0.40	0.40	0.00	0.62	5
Litigation	0.10	0.10	0.50	0.30	0.00	0.60	6
Arbitration	0.10	0.40	0.10	0.40	0.00	0.56	7
Total abandonment	0.10	0.40	0.30	0.20	0.00	0.52	8

Graph 4.5 The Five Most Important Effects of Delay based on clients' point of view



Based on the ranking shown above, the 5 most important effects of delay in a construction of international airport based on clients' point of view are: Excessive working time (RII=0.88), Cost Overrun (RII=0.86), Acceleration of the project (RII=0.78), Bad image to the country (RII=0.74), and Disputes (RII=0.62).

4.2.3.2 The Effects of delay based on Contractors point of view

The table 4.8 below shows the rank of the effects of delay based the contractor's point of view.

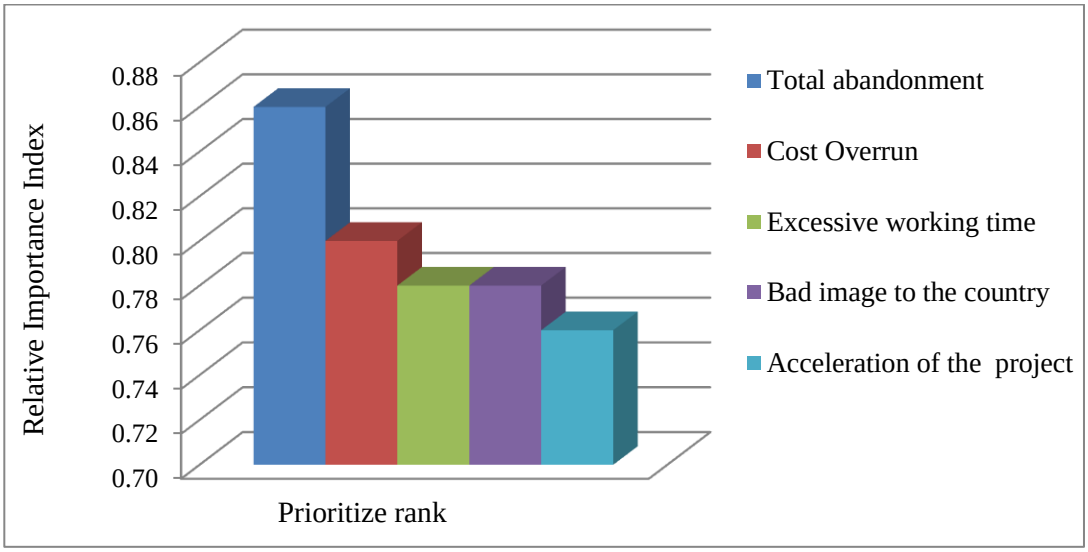
Table 4.8

The rank of the effects of delay based on the contractors' point of view

Effect of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Total abandonment	0.00	0.00	0.20	0.30	0.50	0.86	1
Cost Overrun	0.00	0.00	0.20	0.60	0.20	0.80	2
Excessive working time	0.00	0.00	0.20	0.70	0.10	0.78	3
Bad image to the country	0.00	0.00	0.20	0.70	0.10	0.78	3
Acceleration of the project	0.00	0.00	0.30	0.60	0.10	0.76	5
Litigation	0.00	0.00	0.40	0.60	0.00	0.72	6
Disputes	0.00	0.00	0.40	0.60	0.00	0.72	6
Arbitration	0.00	0.20	0.30	0.50	0.00	0.66	8

Graph 4.6

The Five Most Important Effects of Delay based on contractors' point of view



Based on the ranking shown above, the 5 most important effects of delay in a construction of international airport based on contractors' point of view are: Total abandonment (RII=0.86), Cost Overrun (RII=0.80), Excessive working time (RII=0.78), Bad image to the country (RII=0.78), and Acceleration of the project (RII=0.76).

4.2.3.3 The Effects of delay based on Consultants point of view

The table 4.9 below shows the rank of the effects of delay based the consultants' point of view.

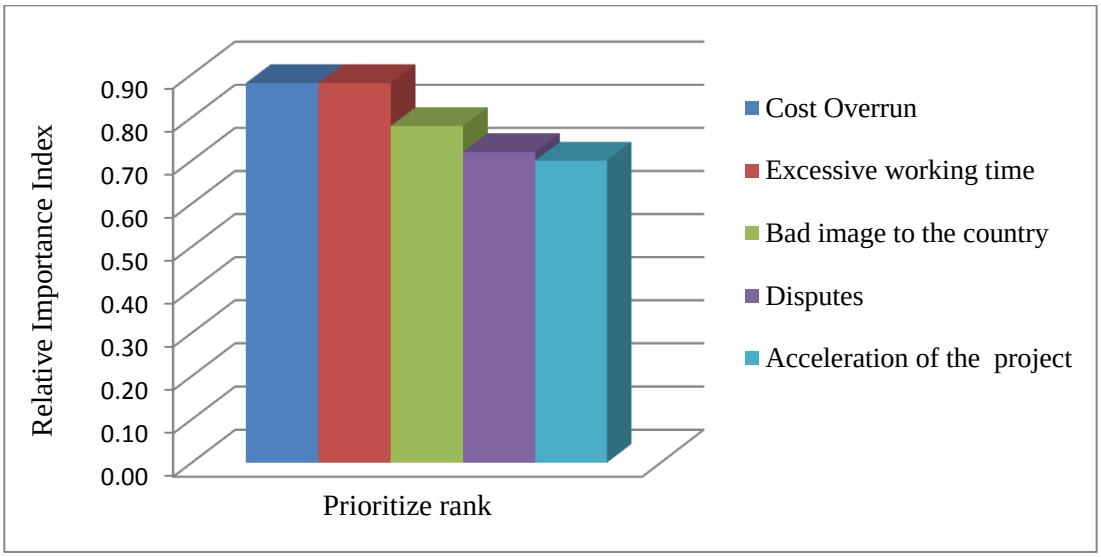
Table 4.9

The rank of the effects of delay based on the consultants' point of view

Effect of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Cost Overrun	0.00	0.00	0.00	0.60	0.40	0.88	1
Excessive working time	0.00	0.00	0.00	0.60	0.40	0.88	1
Bad image to the country	0.00	0.00	0.20	0.70	0.10	0.78	3
Disputes	0.00	0.10	0.30	0.50	0.10	0.72	4
Acceleration of the project	0.00	0.00	0.50	0.50	0.00	0.70	5
Litigation	0.00	0.10	0.40	0.40	0.10	0.70	5
Arbitration	0.00	0.20	0.30	0.40	0.10	0.68	7
Total abandonment	0.10	0.40	0.40	0.10	0.00	0.50	8

Graph 4.7

The Five Most Important Effects of Delay based on consultants' point of view



Based on the ranking shown above, the 5 most important effects of delay in a construction of international airport based on consultants' point of view are: cost overrun (RII=0.88), excessive working time (RII=0.88), bad image to the country (RII=0.78), disputes (RII=0.72), and acceleration of the project (RII=0.70).

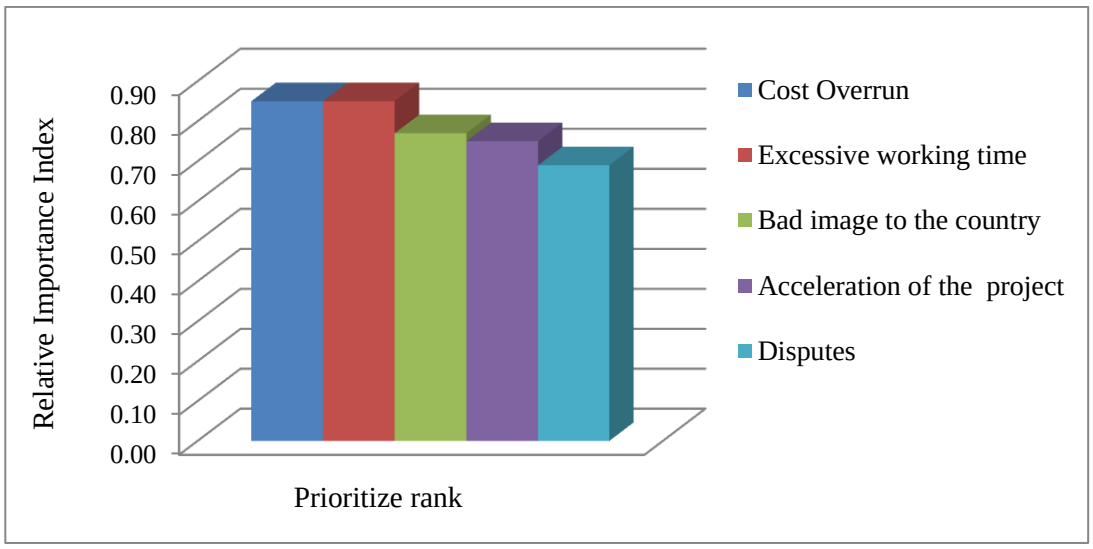
4.2.3.4 The Effects of delay based on all the groups of respondents' point of view

The table 4.10 below shows the rank of the effects of delay based on all the groups of respondents' point of view.

Table 4.10 The rank of the effects of delay based on all the groups of respondent's point of view.

Effect of delay	Percentage of respondent scoring					RII	Rank
	1	2	3	4	5		
Cost Overrun	0.00	0.00	0.07	0.63	0.30	0.85	1
Excessive working time	0.00	0.00	0.07	0.63	0.30	0.85	1
Bad image to the country	0.00	0.03	0.17	0.73	0.07	0.77	3
Acceleration of the project	0.00	0.03	0.27	0.63	0.07	0.75	4
Disputes	0.03	0.07	0.37	0.50	0.03	0.69	5
Litigation	0.03	0.07	0.43	0.43	0.03	0.67	6
Arbitration	0.03	0.27	0.23	0.43	0.03	0.63	7
Total abandonment	0.07	0.27	0.30	0.20	0.17	0.63	8

Graph 4.8 The Five Most Important Effects of Delay for all groups of respondents



Based on the ranking shown above, the 5 most important effects of delay in a construction of international airport based on all groups of respondents' point of view are: Cost Overrun (RII=0.85), Excessive working time (RII=0.85), Bad image to the country (RII=0.77), Acceleration of the project (RII=0.75), and Disputes (RII=0.69).

3.6 Discussion of Results

This section discusses the results which acquired from the previous section. There are two things that we discuss in this part which are mainly the causes of delay in a construction of international airport and the effects of this delay. Besides, the result which acquired from the open ended section is also discussed here.

4.3.1 Discussion on the Causes of Delay

As shown in the previous section in table 4.6 and the graph 4.4, the 10 most important causes of delay in a construction of international airport based on all the groups of respondents' point of view are:

1. Change of orders/additional works by Clients during construction (RII=0.920)
2. Rework due to change of design (RII=0.760)
3. Shortage of labors supply (RII=0.727)
4. Complexity of the project (RII=0.707)
5. "Lowest bid wins" system (RII=0.700)
6. Rework due to errors during construction (RII=0.693)
7. Slow decision making by clients (RII=0.687)
8. Poor Site Management and Supervision by contractor (RII=0.687)
9. Changes in material types & specifications during construction (RII=0.687)
10. Original contract duration is too short or unrealistic (RII=0.687).

The following paragraph discusses the ten most important causes of delay in a construction of international airport based on all groups of respondents' point of view.

4.3.1.1 Change Orders / additional works by Clients during construction

Based on this study, the change of orders / additional works by clients during construction is shown to be the major cause of delay in a construction of international airport. When the client decides to add something, he should keep in mind that it will cause the contractors to do something more than he has been budgeted for and included in the scope of work, hence it can impact to the overall work progress which may lead to the delay during the construction.

4.3.1.2 Rework due to change of design

Rework due to change of design is also act as a major factor in causing the project delay here. When the design is changed, the additional works will be conducted and if the work on that specific area is already started, it is even more difficult. The subcontractors and the contractors need do the rework/redo the work which not only requires additional time, but also additional cost, labors and materials. Hence, reducing rework can enhance the construction performance.

4.3.1.3 Shortage of labors supply

Shortage of labors supply leads to an imbalance between the demand for labor in the site and the available labor supply which leads to low performance and can cause delay in completion of the work.

4.3.1.4 Complexity of the project

International Airport construction is considered as a mega project which has a high complexity and has larger numbers of activities which need to be dealt with. In addition, it also involves a large number of key participants, such as a client's project, the main contractors, consultants, subcontractor and a range of specialist suppliers. Besides, the lack of understanding of the project complexity will lead to time overrun; hence a proper management technique is highly required for a high complexity project such as a construction of international airport.

4.3.1.5 “Lowest bid wins” system

Most clients appoint the lowest bidder to carry out their projects in order to save on the cost. Whereas on generally, the lowest bidder is actually contractors which are not qualified enough, lack of resources and have low ability compare to other contractors, thus it has the guts to give a low offer. Unqualified contractor may not capable to cope with the progress of work or may not understand the complexity of project which then leads to misinterpretation and confusion.

4.3.1.6 Rework due to errors during construction

Rework due to errors during construction leads to delay because it requires extra load of works to be done, hence it will disturb the timeliness of the work

progress. Therefore it is important to reduce the errors during contraction by following the proper guidelines and carefully conducting the step by step procedures.

4.3.1.7 Slow decision making by clients

The slow decision making by client contributes to delay because the contractors will not be able start their work before it is agreed by client.

4.3.1.8 Poor Site Management and Supervision by contractor

A poor site management and supervision by contractors contributes to delays in taking action for the issues that occur at the site and causes negative impact on the work progress.

4.3.1.9 Changes in material types & specifications during construction

Changes in material types & specifications during construction disturbs the timeliness of the project due to the extra time taken for changing the material types and specification, ordering and the time consumed for delivery of the construction materials on site.

4.3.1.10 Original contract duration is too short or unrealistic

The original contract duration is supposed to be realistic and attainable. The goals are neither out of reach nor below standard performance, as these may be considered meaningless. When the duration is realistic and attainable, we begin to figure out ways we can make them come true by developing the attitudes, abilities, skills, and financial capacity to reach them. An extreme goal will be too hard to handle.

4.3.2 Discussion on the Effect of Delay

As shown in the previous section in table 4.10 and graph 4.8, the 5 most important effects of delay in a construction of international airport based on all groups of respondents' point of view are:

1. Cost Overrun (RII=0.85)
2. Excessive working time (RII=0.85)
3. Bad image to the country (RII=0.77)
4. Acceleration of the project (RII=0.75)
5. Disputes (RII=0.69)

The following paragraph discusses the 5 most important effects of delay in a construction of international airport based on all groups of respondents' point of view.

4.3.2.1 Cost Overrun

When the delay happened, it means that the unexpected cost increases in excess of budgeted amount due to underestimation of the actual cost, besides when the delay happen, the longer time it takes to complete the work, hence it also increase in amount of money which need to be pay to the labors and material cost increase due to inflation.

Moreover, cost overrun also can occur due to change of orders/additional works by clients during construction, rework due to change of design, rework due to errors during construction, and changes in material types & specifications during construction.

4.3.2.2 Excessive working time

To reduce the delays, the excessive working time and additional resources need to be implemented so that the work progress will increase quickly. Excessive working time cannot be avoided when the project is facing the delays problem.

4.3.2.3 Bad image to the country

Delay in a construction of international airport is not only gives negative impacts to the contractors and client only, but also to the image of the country because it is a symbol of national pride and can become both a national and international attention.

4.3.2.4 Acceleration of the project

To reduce the delays, the acceleration of the project needs to be implemented so that the work progress will increase quickly. The acceleration of the project cannot be avoided when the project is facing the delays problem.

4.3.2.5 Disputes

When the delay occurs, all groups of parties which are clients, contractors, and consultants tend to blame each other. Hence the disputes are occurred. Besides, both clients and contractors also dispute about the extension of time (EOT) entitlement which both parties have their own assessment and justification.

4.3.3 Discussion on the Open Ended Section of the Questionnaire

Based on the open ended section of the questionnaire, there is no other aspects were suggested regarding the causes of delay in the construction of international airport. However, there are two other aspects were suggested regarding the effects of delay in a construction of international airport. Those other effects which were suggested are:

- The air transportation system is disturbed because the needs of airport in term of its capacity; be it runaway, taxiway and passengers capacity are not able to meet the demand. Hence, the existing airport will face the over capacity problem while waiting the new airport to be completed.
- The country income is reduced.

Besides, several suggestions regarding the recommendation to mitigate the delays were also suggested. Those recommendations as suggested by the respondents from the open ended question are as listed below.

- The preliminary planning is needed to be done effectively to avoid clashing between the schedules which can cause delays.
- Careful study on the machineries, money, manpower, material and management/marketing.
- Concept of design needs to be developed more completely before calling of tender because having the main contractor to liaise with each group of end user on their requirement during construction stage is unfair and can cause unnecessary delay.
- All parties which are clients, contractor and consultants need to cooperate well and work as a whole team.
- Increase the resources, re-sequence the works and increase the working hours when the delay is already occurred.
- Reprogramming of the works to suit the new work program and to focus on sector by sector to tidy the work flow.
- ID design work shall be coordinated with architectural layout at early stage.

4.4 Recommendation to Control and Minimize the Future Delay

Based on the result and discussion as explained in previous section, there are some recommendations which need to be implemented in controlling and minimizing the future delay in construction of international airport. Those recommendations are as explained below.

4.4.1 Recommendation for the clients

- Client should minimize the changes of orders and design and also reduce the additional works during construction if it is possible. However, if those changes are necessary to be done, a careful plan needs to be created and a controlling procedures need to be conducted effectively.
- Client should conduct a proper project feasibility study which includes technology and system feasibility, legal feasibility, operational feasibility, economic feasibility, technical feasibility, schedule feasibility, resource feasibility, cultural feasibility, and financial feasibility (Wikipedia, 2013)
- Client should make a fast and efficient decision making because it helps to meet the project schedule and improve the quality of the delivered project. A slow decision making will disturb the timeliness of the project and causes the unnecessary delay, besides give bad impact to the quality of the project.
- Client should give realistic contract duration. An extreme deadline makes a project is extremely hard to be delivered on time and can be considered as meaningless. The average construction period of international airport is eight years (W.M Abdullah, 2010).
- Client should not select the contractors only based on "The Lowest Bid System". Besides, a careful background study about the contractors needs to be conducted to ensure the contractors are reliable enough to execute the project.

4.4.2 Recommendation for the contractors

- Contractor should provide sufficient numbers of labors supply. It is important to ensure the balance between the demand for labor in the site and the available labor supply because the people who work directly on construction projects play an important role towards project completion.

- Contractor should not take a job at which they did not have adequate expertise. A construction of international airport is a mega project which has high complexity. Therefore, to ensure the project can be executed smoothly, the contractors should have adequate expertise on this project.
- Contractors should have a good quality of site management and supervision so that the works can be executed smoothly.
- Contractors should prepare an effective planning and scheduling of the project because it is a roadmap for how the project will be executed. A successful project schedule requires proper estimation of resource requirement, manpower and work durations. It also includes how the team will monitor the schedule and manage changes after the baseline schedule has been approved. Therefore, a proper project planning and scheduling is important in order to deliver the project on time or ahead of agreed timeline and also to complete the project within approved cost plan.
- Contractors should reduce the rework due to errors during construction by ensuring the work is done correctly right in the beginning. Errors during construction can be reduced by having a quality supervision and training. However, when the rework is occurred, careful steps need to be taken to reduce its impacts.

4.4.3 Recommendation for the consultants

- While the consultants conduct inspection and test for QA/QC purpose, it needs to be conducted in timely manner. Hence, the construction can be delivered with a good quality and not causing delay due to the waiting time for this process.
- Consultant should prepare and approve the drawings on time so that the works can be executed without delay.

CHAPTER 5

CONCLUSION AND FUTURE WORKS

5.1 Conclusion

This research has achieved its objectives which are to identify and analyze the causes and effect of delays in international airport construction and to recommend several solutions to be implemented in controlling and minimizing the future delays.

The ten most important causes of delay in a construction of international airport was identified, these causes of delay are: (1) change of orders/additional works by clients during construction, (2) work due to change of design, (3) shortage of labors supply, (4) complexity of the project, (5) “lowest bid wins” system, (6) rework due to errors during construction, (7) slow decision making by clients, (8) poor site management and supervision by contractor, (9) changes in material types & specifications during construction and (10) original contract duration is too short or unrealistic.

The 5 most important effects of delay in a construction of international airport also were identified, those effects of delay are: (1) cost overrun, (2) excessive working time, (3) bad image to the country, (4) acceleration of the project, and (5) disputes.

The identification of causes of delays in international airport construction would greatly help the decision maker to proactively take action on the related causes in order to minimize or even to avoid the risk of delays.

At last, this research gives a series of recommendation and several solutions which can be implemented by the decision makers or management level for minimizing, avoiding and controlling the future delays.

5.2 Future works

To make this research to be more significant in the future, there is several future works need to be considered. Those future works are explained below.

4.2.1 *Increasing the number of respondents*

Increasing the number of respondent will boost up the validity of the result that can be obtained from the questionnaire survey.

4.2.2 Comprehensive interview to related parties

Conducting an interview with related parties will help to gain larger amount of information compare to the data obtained from the questionnaire only. Besides, by conducting an interview, we will know how much thought that the respondent has put to answer the question.

4.2.3 Data gathering from more than one case study

Data gathering which obtained from more than one international airport construction project as a case study will help to explore the more accurate data for this research because each and every construction projects may have a different problem or challenge during its construction period that can affect the timeliness of the project.

4.2.4 Data gathering from project in different countries

For the reason that the causes and effects of delay in construction of international airport may be unique for some countries, a data gathering which obtained from international airport construction project from different countries will be more significant for this research.

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APPENDICES

APPENDIX A:

PROJECT ORGANIZATION STRUCTURE/LINE OF COMMUNICATION

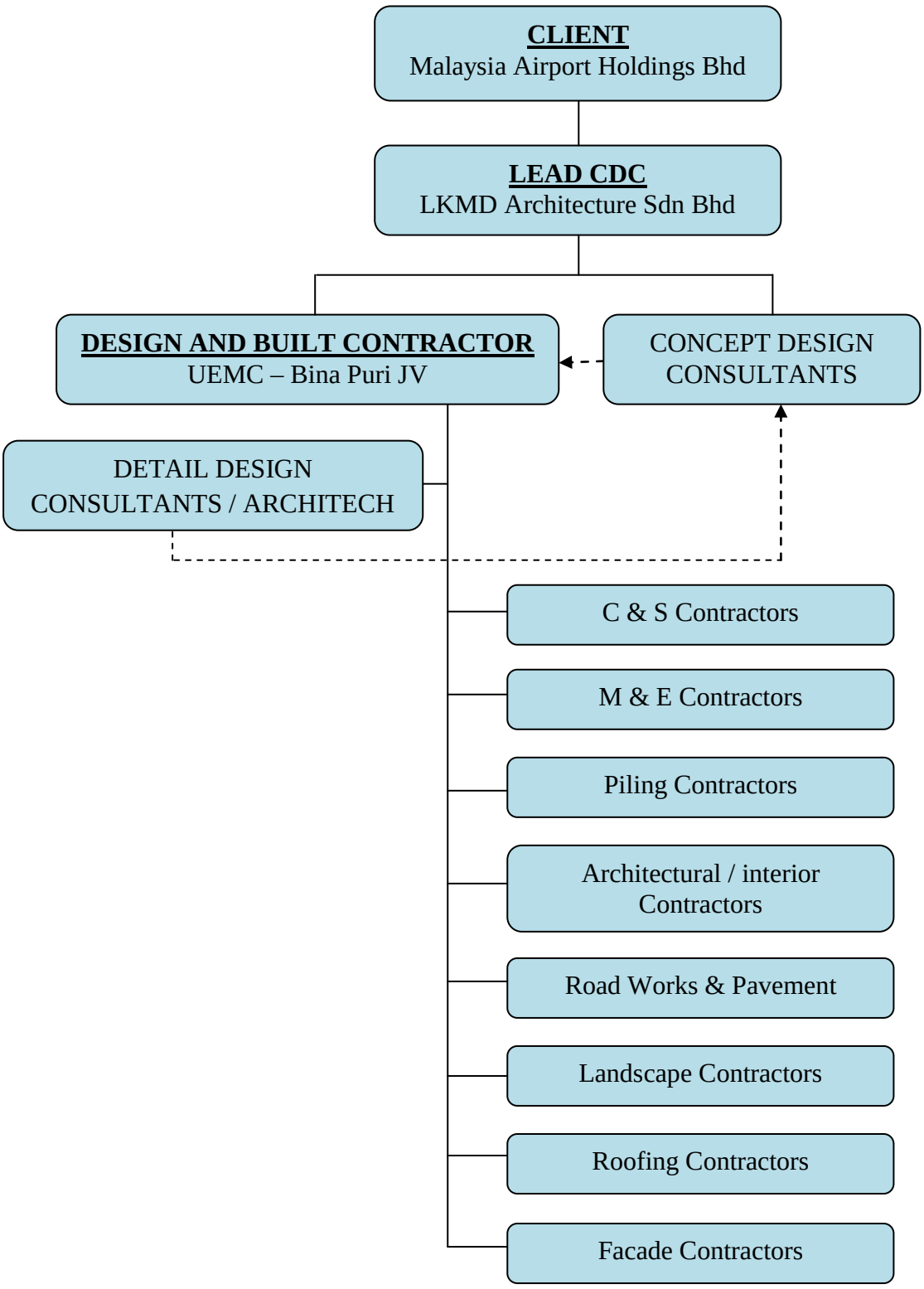
APPENDIX B:

THE LATES PROGRESS PHOTO OF KLIA2 CONSTRUCTION AS OF 17 DECEMBER 2013

APPENDIX C:

THE QUESTIONNAIRE SURVEY

Appendix A: Project Organization Structure/Line of Communication



Appendix B: The Latest Progress Photo of Klia2 Construction as of 17 December 2013

STRIP CEILING INSTALLATION WORKS IN PROGRESS AT ZONE 7, GL. 19-22/H, SECTOR 2

STRIP CEILING INSTALLATION IN PROGRESS AT ZONE 8, GL. 24-27/H, SECTOR 2

VERTICAL ROOF COMPLETED AT ZONE 1 & 2, GL 19/B-H, SECTOR 2

VERTICAL ROOF COMPLETED AT ZONE 3 & 4, GL 27/B-H, SECTOR 2

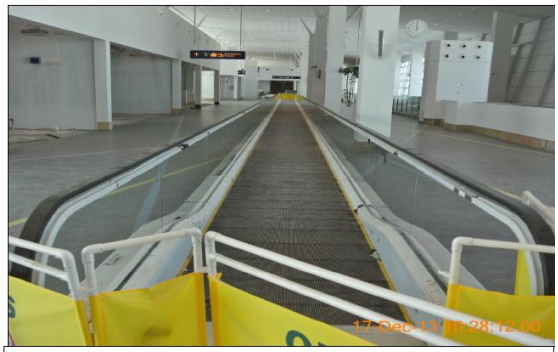
ID WORKS FOR DEPARTURE GANTRY AT LEVEL 3, SECTOR 2

GLASS PANEL INSTALLATION IN PROGRESS AT BOARDING PASS CONTROL, LEVEL 3, SECTOR 2

ID WORKS FOR CHECK IN ISLAND NO. 1 AT ZONE 3B, LEVEL 3, SECTOR 2

ID WORKS FOR CHECK IN ISLAND NO. 4 AT ZONE 4B , LEVEL 3, SECTOR 2

TOILET AT ZONE 1, LEVEL 1A, SECTOR 1



TRAVELATOR, ZONE 4, SECTOR 1

GLASS WALL STICKER IN PROGRESS AT ZONE 3, LEVEL 1A, SECTOR 3

SKIM COAT IN PROGRESS AT ZONE 3 LEVEL 2, SECTOR 3

ROOF WORK IS COMPLETED AT SECTOR 6

LINOLEUM INSTALLATION IS IN PROGRESS AT SECTOR 6

Appendix C: The Questionnaire Survey

QUESTIONNAIRE SURVEY

THE CAUSES AND EFFECTS OF DELAY IN A CONSTRUCTION OF INTERNATIONAL AIRPORT

Disclaimer: I am Diah Novitasari, currently doing undergraduate program in Civil Engineering. This questionnaire is intended to gather information for my research for a final year project concerning the causes and effects of delay in a construction of international airport. Information collected and shared from this questionnaire will strictly be confidential and will not be used for any intentions other than this research study. Result from this questionnaire will only be reported as numbers or percentages and individual details will not be revealed in publication.

Instructions:

1. Please answer ALL the following questions.
2. Please fill in the space available and thick √ in the box available
3. All information will be treated as CONFIDENTIAL and shall be used for academic purpose only.
4. All information will be on aggregated basis and no individual data will be published.
5. For more information, please contact me at:
   Phone no: 013-6155604 or email address: diah.rbs.novitasari@gmail.com

SECTION A:

GENERAL INFORMATION OF RESPONDENT

1. Name: ……..
2. Gender:

    ☐ Male

    ☐ Female

3. Age:

    ☐ 20-29 years old

    ☐ 30-39 years old

    ☐ 40-49 years old

    ☐ > 50 years old

4. Qualifications: ……..
5. Position in the company:

    ☐ Owner

    ☐ Project Director

    ☐ Project Manager

    ☐ Design Engineer

    ☐ Project Engineer

    ☐ Quantity Surveyor

    ☐ Others: ……

6. Nature of company:

    ☐ Client

    ☐ Consultant

    ☐ Contractor

    ☐ Others: ……

SECTION B:

FACTORS CONTRIBUTE TO DELAY IN A CONSTRUCTION OF INTERNATIONAL AIRPORT

Please tick √ in the appropriate box to indicate whether it is:

1- Strongly disagree

2- Disagree

3- Moderately

4- Agree

5- Strongly Agree

Client related	1	2	3	4	5
Slow decision making by clients					
Change Orders / additional works by Clients during construction					
Poor communication by client with other construction parties					
Improper project feasibility study					
Delay in approving shop drawing, sample material, and revising & approving documents by client					
Delay in finance and payments of completed work by client					
Lack of clients experience in construction projects					
Client interferences					

Contractor related	1	2	3	4	5
Inappropriate Construction Methods					
Mistakes during construction stage					
Inadequate Contractor Experience for the type of project					
Ineffective Planning and Scheduling of the project					
Poor qualification of contractor's technical staff					
Conflict between contractors and other parties					
Poor Site Management and Supervision by contractor					
Unreliable Subcontractor					

Consultant related	1	2	3	4	5
Slow preparation and approval of drawings					
Unclear and inadequate details in drawings					
Quality assurance/control					
Inflexibility of consultant					
Poor communication by consultant with other construction parties					
Delay in performing inspection by consultant					
Incapable and insufficient inspectors					
Inadequate experience of consultant					

Material and equipment related	1	2	3	4	5
Shortage of construction materials in market					
Changes in material types & specifications during construction					
Delay in material delivery					
Damage of sorted materials					
Equipment breakdowns					
Lack of high technology mechanical equipment					
Shortage of equipment					
Low of productivity and efficiency of equipment					

Labor related	1	2	3	4	5
Shortage of labors supply					
Absenteeism					
Low productivity of labors					
Unskilled labors or lack of skilled operators for specialized equipment					
Personal conflict between labor and management team					
Personal conflict between labors					
Poor communication between labors with contractors					
Labor injuries on site					

Project related	1	2	3	4	5
Original contract duration is too short or unrealistic					
Complexity of the project					
Ineffective delay penalties					
Rework due to change of design					
Rework due to errors during construction					
Unforeseen site condition					
“Lowest bid wins” system					
Ambiguity in expectations and conflicting interpretation by parties					

External related	1	2	3	4	5
Unfavorable weather condition					
Regulatory changes					
Accident during construction					
Delay in providing services from utilities such as (water, electricity, etc)					
Political situation					
Natural disaster					
Inconvenient site access					
Exchange rate fluctuation					

SECTION C:

EFFECTS OF DELAY IN A CONSTRUCTION OF INTERNATIONAL AIRPORT

Please tick √ in the appropriate box to indicate whether it is:

1- Strongly disagree

2- Disagree

3- Moderately

4- Agree

5- Strongly Agree

And please give your comments on each elements that affected by the delay problem.

	1	2	3	4	5
Cost Overrun					
Comment					

	1	2	3	4	5
Bad Image to the Country					
Comment					

	1	2	3	4	5
Litigation					
Comment					

	1	2	3	4	5
Total abandonment					
Comment					

	1	2	3	4	5
Disputes					
Comment					

	1	2	3	4	5
Arbitration					
Comment					

	1	2	3	4	5
Acceleration of the project					
Comment					

	1	2	3	4	5
Excessive working time					
Comment					

SECTION D:

OPEN ENDED QUESTIONS

Please add any other factors which you think are important but not listed before.

1. Do you wish to give any suggestions in regard to factors causing the airport construction delay?

   ……
   ……
   ……
   ……
   ……
   ……

2. Do you wish to state any other effects of delay in the airport construction?

   ……
   ……
   ……
   ……
   ……
   ……

3. What are the relevant actions taken to overcome construction project delay?

   ……
   ……
   ……
   ……
   ……
   ……
   ……

THANK YOU FOR YOUR TIME AND COOPERATION IN COMPLETING THIS QUESTIONAIRE. YOUR EARLY RESPONSE IS HIGHLY APRECIATED.