A STUDY OF DELAY SOURCES OF CONSTRUCTION PROJECT IN KUANTAN AREA

TAN KEAN WEI

PB12035

SPINE LABEL:

PM – TAN KEAN WEI

BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

UNIVERSITY MALAYSIA PAHANG

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TAN KEAN WEI

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of degree of Bachelor of Project Management with Honours.

Signature
Name of Supervisor : DR. SHAHRYAR SOROOSHIAN
Position : LECTURER
Date :

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature :
Name : TAN KEAN WEI
ID Number : PB12035
Date : 10 DECEMBER 2015

DEDICATION

Dedicated to my beloved parents, my honourable supervisor, my course mate and my best friend

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ABSTRACT

Delays are general phenomenon because construction projects are considered to be a common national issue in almost every construction project around the world and Malaysia could not an exception. This research study about the delay sources of construction project which located in Kuantan area. The objective of this project is to identify the delay sources in construction project and also to analyze the risks of delay sources for construction project in Kuantan area. This study is conducted to find out the numerical value of Risk Priority Number (RPN) from the data and information gained by the targeted respondents through the survey questionnaires. Through RPN, we can identify that most important problem(s) and gives a model to allocate the limited resource in order to minimize the effect on project by delay. The findings of research could increase the awareness and contribute to the construction industry especially in Kuantan area. The identified risk of delay sources are categorized to delay factors related to contractor, consultant, owner and external factors. The findings indicate that the risk of delay sources that related to contractor should be emphasized and focus to minimize the occurrence of delay incident in construction project. To address this issue, the project team should conduct proper risk management to ensure that the progress of project is smoothly. All the result are obtained by performing analysis by SPSS version 2.0 and Microsoft Excel 2012, all the data is been recorded in this research.

ABSTRAK

Kelengahan dalam projek pembinaan dianggap sebagai isu umum dalam setiap projek pembinaan di seluruh dunia dan Malaysia tidak dapat pengecualian. Kajian ini menyelidikan mengenai sumber-sumber kelewatan projek pembinaan yang terletak di kawasan Kuantan. Objektif projek ini adalah untuk mengenal pasti punca kelengahan dalam projek pembinaan dan juga untuk menganalisis risiko sumber kelengahan projek pembinaan di kawasan Kuantan. Kajian ini dijalankan untuk mengetahui nilai berangka Nombor Keutamaan Risiko (RPN) daripada data dan maklumat yang diperolehi oleh responden yang disasarkan melalui soal selidik kajian. Melalui RPN, kita dapat mengenal pasti bahawa masalah yang paling kritikal dan menunjukkan garisan bantuan untuk mengbahagikan sumber yang terhad untuk mengurangkan kesan ke atas projek oleh isu kelengahan. Hasil kajian boleh meningkatkan kesedaran dan menyumbang kepada industri pembinaan terutamanya di kawasan Kuantan. Risiko yang dikenal pasti punca kelengahan dikategorikan untuk faktor kelegahan yang berkaitan dengan kontraktor, perunding, pemilik dan faktor luaran. Hasil kajian menunjukkan bahawa risiko sumber kelengahan yang berkaitan dengan kontraktor perlu ditekankan dan menumpukan untuk mengurangkan berlakunya kejadian kelengahan dalam projek pembinaan. Untuk menangani isu ini, pasukan projek perlu menjalankan pengurusan risiko yang berkesan untuk memastikan bahawa kemajuan projek adalah lancar. Semua keputusan yang diperolehi dengan melakukan analisis SPSS versi 2.0 dan Microsoft Excel 2012, semua data yang direkodkan dalam kajian ini.

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RESEARCH PROPOSAL

1.1 INTRODUCTION

The construction industry is a very significant sector of the economies worldwide because it provides the fundamental things needed by other sectors in order to conduct their activities. These include; construction of education facilities, office facilities, public infrastructures, settlements, and other amenities of the nation. Construction is important in the growth of economy and brings influence in every sector in the world and also in Malaysia. According to the Department of Statistics Malaysia (2014), there a total value of RM25.2 billion for the construction project in 2014 which has a significant growth of 10.8% compare in year 2013 which the total value of construction is RM 22.7 billion.

Meanwhile there are numerous challenges that are faced by the worldwide construction projects. A lot of projects have failed and those failed construction projects are due to delays, budget overrun, failure to meet customer requirements, and others. This does not only affect the company's financial ability, but also damage on the company's reputation as well as influencing the social and the economic development of a country. According to Abdullah et al. (2010), project team should acquire a deep understanding of the factors that would affect projects in order to help projects to be completed on time. Thus, we have to identify those sources of delay in construction project because it is crucial and critical to deal with those problems. This research is conducted to identify the delay sources of construction project in Kuantan, Malaysia. Also, the risks associated with the sources will be identified. It has been observed that risk identification is needed before doing every planning activity because it helps to minimize the percentage of the failure for a project.

1.2 BACKGROUND OF STUDY

The main process of construction is developing and forming buildings, facilities and building systems for end users. Construction involves planning, designing, developing and financing and this continues until the end user starts to use the product or facility. Construction industry is a dynamic and complicated that has a huge contribution in the economy of U.S. (Behm M., 2008). They are various parties such as contractors, client, regulators and others stakeholders which involve in the construction project for a desire outcome. Construction works involve in developing of new structures. In general, construction work involved with subdividing land for sale as building sites, preparation of sites for new construction, build physical infrastructure such as roads, houses, and workplaces. Construction work also includes renovations involving additions, alterations, maintenance or reconstruction of building and engineering project for example building highways, bridge, or utility systems.

To understand the knowledge in the construction industry, a lot of studies have been conducted on projects and its management. Project is simply defined as a unique and a series of related tasks usually directed to achieve desired output within a time period to complete. Project Management Institute (PMI) had described project as a temporary endeavour undertaken to produce a unique product or service with a defined scope and resources. It has a definite starting and finishing period with unique set of coordinated activities, the desired outcome had to meet specific goal within defined scope, schedule, cost and performance parameters by an individual or organization. According to Atkinson R. (1999), Project Management is an application of collection of tools and techniques, which used to manage the usage of resources toward the accomplishment of a unique, complex, within the triple constraints which are time, cost and quality constraints (Stackpole S.C., 2013). However, the construction project is defined as a process is subject to conditions of continuous change and uncertainty in the construction industry which have a straightforward relation align with the strategy vision and mission of an organization or a company (Whelton M.G., 2004). Physical facilities become a basic need for the organization to operate their task. Thus, the physical facilities are necessities for all the organization and company in order for operate their business, which also contributed to the economy growth of a country.

Also, construction project involves operation activities that must be run smoothly. Operation in construction consists of the repairing task, alteration, extension and installation in building and structural system. In the construction industry, activity delays are common issue which can increase the project costs and schedules. Delays in building construction project is defined as over time in finalization of building works compared with the planned schedule which was stated in the original contract schedule. Sanders et. al. (2001) defined delay as an incident that results in an extension of the time necessary to fully finalize the project. Each and every construction projects experiences some significant delays but the nature of these delays may differ relying on the project and where the project is situated (Alaghbari W.E. et. al., 2007). Delays in construction project could bring impact on all of the participants. For instance, the project had delay in delivering to owner, the consultant's fixed fees will be inadequate to cover the new project length, and the contractor's costs are increased due to the extension of project duration.

Delay issue occurs in construction project consider as one of the most common problems that causing a mass of adverse effects among those participating parties in the project. Therefore, it is important to spot the risk of delay sources in order to reduce and avoid the occurrence of delays and the corresponding expenses. The risk of construction projects can be unpredictable because there are external factors that may cause the delays such as weather, economic, political and currency fluctuation and some other climatic conditions are not easy to sometimes predict their occurrence. Risk management in construction projects has been recognized as a necessary process to accomplish project objectives within time, cost, quality, safety and environmental sustainability. Delays bring expensive consequences to all the participated parties in the projects and result in clash, claims, total desertion and much difficulty for feasibility and decelerate the growth of construction industry (Salunkhe A.A. and Patil R.S., 2014).

1.3 PROBLEM STATEMENT

According to Ravisankar K.L. et. al. (2014), World Bank reported that most projects completed worldwide between years 1999 – 2005 faced time overrun varied between 50% - 80%. The construction companies across the world experience significant delays in construction projects in difference scenario. In previous few years, almost 25% of 1.7 million construction projects claims were submitted to the American Arbitration Association (AAA) in past 74 years (Ravisankar K.L. et. al., 2014). In 2001, report by the National Audit Office in United Kingdom (U.K), entitled "Modernizing Construction", show that 70% of the projects handle by Government department and private agencies were delayed. Furthermore, there is a recent research by Building Cost Information Service (BCIS) show that around 40% of studied projects faced time and cost overrun within the contract period (Ravisankar K.L. et. al., 2014).

According to a report from CNN in 2013, the report by the Government Accountability Office found that delays and mismanagement contributed to a total cost increase of $1.5 billion at VA construction projects in Denver (Devine C., 2015), Las Vegas, New Orleans and Orlando. An average construction delay of 35 months at each project contributed to the increment of project cost, such as in Las Vegas, where construction was delayed more than six years. Meanwhile in Malaysia, delay occurs in 45.9% of construction project during the construction stage (Razak A. et. al., 2010). In 2005, there are about 417 government contract project in Malaysia which is about 17.3% of the total number of project are delayed more than 3 month or being abandoned (Sambasivan M. and Soon Y.W., 2006). Delays are general phenomenon because construction projects are considered to be a common national issue in almost every construction project around the world and Malaysia could not an exception. MARA (Majlis Amanah Rakyat) is one of the government agencies that play an important role in implementing government agencies which indirectly involved in construction industry in Malaysia. But MARA is not performing well by the justification that over 90% of the management procurement projects are delayed. In the study from Memon A.H. (2014), there only 20.5% of public projects and 33.35% of the private sector projects were done within the planned completion period in Malaysia.

The effects of delays of project cause result in clash, time overrun, dispute and damage on reputation, and slow down the growth of construction industry (Aibinu A.A. and Jagboro G.O. 2002). Construction is a risky industry with plenty unpredictability events due to both external and internal factors that influence the construction progress. There are lot delays sources which can cause the construction project failed to be delivered on time. As we know time is money, delays in project construction may cause overruns, loss of capital and revenue; increases market risk, delays in production, addition material cost, as a consequence lack of efficiency to deliver the end product to clients. To the risk that the delays for construction projects, we have to tackle those delay sources which may have made the company loss profitability. Thus, the completion product of the project can accept by the client and reach their satisfaction. The organization should prioritize the risk which will bring a costly effect to the entire project. This is due to there are only limited resources can be assigned to the risks which are being prioritized to minimize the failure of construction projects.

1.4 RESEARCH OBJECTIVES

i. To identify delay sources in construction project.

ii. To analyse risks of the delay sources for construction projects in Kuantan area.

1.5 RESEARCH QUESTIONS

i. What are the delay sources of construction project?

ii. How the delay sources will be risk to construction project?

1.6 RESEARCH APPROACH

The research will be conducted using quantitative approach. All the numerical data is gathered to generate the Risk Priority Number (RPN) value. The questionnaire will be design and distribute to the targeted respondents. Also, quantitative method will be used to find delay sources face by previous construction projects that contribute the data in analysing the identification of delay sources and the severity, probability, and detectability values in following quantitative scale for the numerical value.

1.7 SCOPE OF STUDY

This study is carried out in Malaysia, targeted at Construction Companies in Kuantan. In order to achieve the objectives of this study, the research will be conducted on 30 construction companies in Kuantan. To achieve the data statistical significance, the research of Lieber, R. L. (1990) and Filho et. al. (2013) concluded that the minimum suitable number of respondent is 30 which are the close fit for the normal distribution. The targeted respondents are senior manager, engineer, project manager and supervisor which are employed in contractor company grades of registration G7 in Construction Industry Development Board (CIDB), which are the highest class of contractors registered with Construction Industry Development Board (CIDB) which are the contractor have a no limit tendering capacity, paid-up capacity can reach RM750.000 and come from the large size company (Kamal E.M. and Flanagan R., 2014). Data will be gathered through questionnaires distributed to the targeted respondents.

1.8 SIGNIFICANT OF STUDY

The findings from the research will create awareness to the construction sector by providing information about the delay sources which are common or experienced by the construction companies. It will also contribute to the solution for overcoming the sources of delays that occur in construction industry. Thus, increase the awareness and knowledge of the contractors and the project teams to solve delay problems in Kuantan, Malaysia.

Besides that, this research can clarify the risk or delay sources by categories which might happen in any parties in the construction project and also the external environment. Thus, this research finding could give a guideline to the construction company in Kuantan area for managing their projects as well as to help them allocate limited resource to the risks of delay sources that may influence and bring damage on projects.

1.9 EXPECTED RESULTS

In the findings of the research, the identification of source of delay in construction industry in Kuantan, Malaysia can help the contractor and their team to understand the impact of the delay sources and increase their awareness when constructing project. It would help to increase the percentage of project's success through the identification of the delay sources. Also, by using the research priority number (RPN), project teams can assign limited resources to solve the crucial risks of delay that bring huge challenges on projects. By ranking the importance of the risk, project team could identify the priority risk that should be solve in order to minimize the loss. RPN application brings success, help an organization or project team to evade repeating costly mistakes as well as help project teams to deal with the risks of delay that occur in construction projects.

1.10 OPERATION DEFINITION

Delay

The time over run exceed the completion date specific in a contract for delivery end product to the end user (Ravisankar K.L. et. al., 2014).

Project Management

The tool and application of principle approach and practice to achieve the definite requirement of project (Bakouros Y. and Kelessidis V., 2000).

Construction industry

Industry that encompassed all the business that builds houses and office facility, highways and bridge, and engages with those people in specialized work of electrician, plumbers and masons.

Contractor Grades of Registration G7

Contractor which has no limit of tendering capacity and their paid-up capital can reach RM 750,000(USD 247,500) and come from a large construction company. (Kamal E.M. and Flanagan R., 2014)

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The construction delay is a globalize issue not only happen in Malaysia however all the country face this reality. Construction industry directly contributes to a nation's economic growth and reacts rapidly to external economic pressure, tight money or national recession. Construction industry occupies a fundamental position in worldwide economic. According to the national statistic of China (2012), there is the increment of 22.6% in 2011 which the total output is CNY 11.77 billion. The value added by the construction industry of China had increase 20.6% for each year from 2006 to 2010. The Global Construction 2020 (GCP, 2009) stated that the total output value of China construction market will be the number 1 in the world which will be US$ 2.4billion (Anbang Q. and Chen H., 2014).

Meanwhile in the United Arab Emirates (UAE), the construction industry had contributed 14% to the gross domestic product (GDP) for the country's economic (Ravisankar K.L. et. al., 2014). In the findings of Khan et. al. (2014), there is 1.02 millions of people who employ in the construction sector which is 9.2% of total available workforce in Malaysia in year 2010. Khan et. al. (2014) prove that construction industry contributed the most high average 7.2% growth of GDP in Malaysia compare with other industry. The total output of construction industry had achieved RM 15325 million in 2001 to 2010. Meanwhile there are challenges and risks that always occur in construction industry. Construction project is high risk industry due to hug number of stakeholder and long duration of the project. To avoid the collapse of economy and unemployment, proper management against the failure of project, identification of sources and investigation of the risk should be taken.

2.2 CONSTRUCTION PROJECT

According to Gerard (2004), the strategic vision and mission of a company or organization are directly linked with the construction project. The aim of a construction project is to provide a physical facility to an organization. The construction project is heterogeneous and enormously complex. It involve multiple number of parties such as facility owners, contractors, consultants, regulators, project managers and others interested group which have difference stake and value system, expertize or experience, and desire outcome. The major classifications of construction can be categories as residential housing, institutional and commercial building, infrastructure and heavy, and specialized industrial. To be more specializes, the type of construction can be divided to electrical, concrete, excavation, flooring, and roofing. Hence, the difference between the construction industry compare with other industries is that project are large, build on-site and has a unique features (Emad E., 2009).

Meanwhile, the construction management is a contract approach which involve in project planning, design and construction as integrated task in the construction system to achieve the owner interest in an optimum fashion. It refers to the controlling of the four basic resources, 4M which are Men (labor), Material, Machinery and Money into the execution of a construction project without delays and within the budget with an acceptable level of quality. The most essential areas that highlighted in construction projects are time and cost. It is important to control the cost of interest for both contractors and also the client of the project (Olawale et. al., 2014). Construction project can differ in size, time duration, objectives, uncertainty, complexity, and pace (Aziz and Remon F., 2013). Successful projects consist of the well performance in controlling time, cost and quality which are the management dimension for projects and the essential to meet the stakeholder's expectation. The participant in construction project point out the three elements which are time, cost and quality as the basic criteria to measure project successfulness (Chan A., 2001)

2.3 PROJECT MANAGEMENT

Project management is the science with apply the skills, tools and technique to accomplish the project objectives with satisfy the expectation and requirement of project stakeholder or involve parties (Kerzner H.R., 2013). In general, project management can be defined as the application of principle, techniques and practice to meet the specific requirement of project (Bakouros Y. and Kelessidis V., 2000). PMI had summarized project management into nine knowledge areas, which are integration, scope, time, cost, quality, human resource, communication, risk and procurement management (Stackpole S.C., 2013). Recent year, Stakeholder Management is also included in the knowledge area of Project Management. The PMBOK Guide of the PMI recognizes the five processes in process groups:

1. Initiating: An important early stage process that define a new project and determine that the feasibility of the project. New project is defining its goals, scope, purpose and deliverables that need to produce.

2. Planning: A plan is create to help organization to manage time, cost, quality, changes, and risk. It also contributes in managing human resources, external supplier and resources that needed to accomplish the objective of project.

3. Executing: Phase of building project deliverables and present to customer. The work defined in the planning stage has to complete to attain project specification. It consumes most resources in the whole project life cycle.

4. Monitoring and controlling: This process require to track, review the progress and comparing the actual performance with the planned performance. Corrective action should be taken if there is a significant difference occurs. This process helps to manage procurement, customer acceptance and communications.

5. Closing: In this phase, the end product is delivering to client, project team had to dismiss and handover the report to sponsor and stakeholder. Then the project is formally closed.

Every project is different but same in the nature. The life cycle for each project have not significance difference. Project management provides a framework to help project team to achieve the project's objective and goals. While the construction project management (CPM) defines as the overall planning, coordination, and controlling from begin to completion of a project. The aim of CPM is to meet the end user's requirement and satisfaction in order to provide a functionally and financially viable project. Effective project management is the essential tools to achieve the construction project successfully. Utilization of management techniques such as time management, problem solving skill, contract management and project quality which are contributed to project success (Nwachukwu, C. C. and Emoh F. I., 2011).

2.4 DELAYS IN CONSTRUCTION PROJECT

Delays in construction project occur in every phase of the project. Delay can describe as time overrun that exceed the completion date, which was specified in the contract that the parties agree to submit the delivery of product (Ravisankar et. al., 2014). Occurrence of delay in construction project is common issues rise dissatisfaction of the participating parties within the project. In the study of Desai et. al. (2013), they found that the delay factors occur in construction work consist of labor, material, design, equipment, project characteristic, contractor, developer, consultant and also external factor. Construction delays happen while there is the different pace compared with the baseline of the construction schedule (Taher E.F. and Pandey R.K., 2013). Project time overrun will cause negative impacts for the organization and company such as cost overrun, damaging the reputation of company, lawsuits between owners and contractors, loss of revenue and penalties or claim due to the late deliver the end product on time (Aibinu A.A. and Jagboro G.O., 2002). Therefore, delays in construction project not only affect the reputation of company but also cause dissatisfaction to all involved parties. In order to have proper management for tracking the project progress, identification of delay is important in early stage to minimize the possibility occurrence.

2.5 CLASSIFICATION OF CONSTRUCTION DELAYS

In the findings of Ravisankar K.L. et. al (2014), delays are been categories as critical, excusable, non-excusable, and concurrent delays, which the responsibility for the delays is among the owner or consultant, contractor and also the fault of third party. Excusable delays can be categories as compensable delays which caused by the owner and non-compensable which cause by the third part (Sanders et. al., 2007). The type of delays are been categorized as critical delays, excusable delays and concurrent delays. Meanwhile, excusable delays can be classified as compensable delays and non-compensable delays.

2.5.1 Critical Delays

In the construction schedule, they will have many activities that are independent and dependent on each other, which called critical path. If critical activities is not managed well and it will cause the critical delays which will result in an extended duration on projects (Sanders et. al., 2001). Ravisankar K.L. et. al. (2014) indicates that critical delays bring impact on the milestone date and completion date of project. Critical path is the longest path throughout a project network or schedule. It has no slack or float; therefore all the critical path activities must be completed as schedule. The completion date of the project will begin to slip if the critical activity is delayed. The activities which bring impact on the project completion date are depending on the plan and schedule of the contractor and the requirement of the contract for sequence and phasing. Delays occur in critical paths are should be emphasize because it will require time extension to reach the completion date of the project.

2.5.2 Excusable Delays

Alaghbari W.E. et. al. (2007) state that the excusable delay is the “act of God”; it should not be the mistake or responsibility from any parties. Contractor is entitled to have time extension but not addition budget for project if excusable delay happened. Sanders et. al. (2001) defined that excusable delay usually results in entitlement to the

time extension. Excusable delay is beyond the control of contractor and without any parties fault or negligence. The contractor will not terminate if the delay is excusable.

Ravisankar K.L. et. al (2014) define that delays happen due to unpredictable events that are not under control by the contractor and subcontractor is an excusable delay. The following event would be considered as excusable delays which are general labor strikes, fires, flood, owner-requested changes, error and omissions in the plans and specification, unusual climate and lack of action by government bodies such as building inspection.

2.5.2.1 Compensable Delays

Taher E.F. and Pandey R.K. (2013) categories the excusable delay with compensation and without compensation. Compensable delay is the delay where the contractor has authority to time extension with an addition of compensation for the construction project (Ravisankar K.L. et. al., 2014). Generally, compensable delays are caused by the facility's owner or its agents (Alaghbari W.E. et. al., 2007). The compensable delays happen due to the owner failure to respond to change the design or material, and the disruption in the sequence of the progress. Contractor is entitled to have an adjustment for the extension of time and also additional costs to performance of the contract.

2.5.2.2 Non-Compensable Delays

Non-compensation delay will not provide compensation for the contractors. It is unpredictable and beyond the control and not the mistake or failure by the owner or contractor (Taher E.F. and Pandey R.K., 2013). It might happen if the contractor had inadequate scheduling or management and cause mistake in the construction project. The contractor is responsible for the compensation from the delaying subcontractor and supplier (Alaghbari W.E. et. al., 2007). Client can claim for their loss within the agreement in the contract. This type of delay extends the completion date of construction project without offer any compensation to the contractor. Protest from the

labor, issue in delivery instrumentality and delivery of material are the factor that contribute to occurrence of non-compensation delays.

2.5.3 Concurrent Delays

To identify the concurrent delays, each delay is evaluated separately and brings effect on the other activity and cause the project completion time has to be recalculated. Usually concurrent delays happened when there are more than one factor delays overlapping in the project at the same time (Alaghbari W.E. et. al., 2007). According to Ravisankar K.L. et. al. (2014), there is the ways to identify the classification of concurrent delays that affect the entitlement of a contractor to have an addition compensation for time extension or the responsibility to the liquidated damages through the contract language. Liquidated damages are happen while one party fail to accomplish the contractual obligation and compensation is been collected by the injured party. Firstly, if excusable and non-excusable delays occur concurrently, the contractor only will receive the time extension. If there is the excusable delay with compensation occur concurrently with excusable without compensation delays, the contractor is given a time extension but not to liquidated damages on the contract. Last but not least, if two excusable with compensation delay occur concurrently in the project, both times extension and the liquated damages are entitled to the contractor.

2.6 SOURCES OF DELAYS

The delays in construction project cause by many factors that usually related to the performance of time, cost and quality (Aziz and Remon F, 2013). Time is the most consideration element in project management and it determining the successfulness of a project. According to Alaghbari W.E. et. al. (2007), the sources of delays in construction project in Malaysia can be classified as 4 types:

1. Delay factors related to Contractor
2. Delay factors related to Consultant
3. Delay factors related to Owner/Client
4. Delay factors related to External Factors

2.6.1 Delay Factors Related to Contractor

The delay factors related to contractor are more concerned with the contractor's financial condition, site management, experiences, supervision, the information flow and control system. Contractors that are registered with Construction Industry Development Board (CIDB) are awarded grades of registration from G1 to G7. These grades reflect the tendering capacity of the construction company and its capacity to accept a range of construction projects of different values. In the findings of Nwachukwu, C.C. and Emoh F.I. (2011), contractor and subcontractors are the individuals or firms that proceed with the task needed in the construction work in return of a contract price. Contractors are the parties bring all the diverse elements and input of the construction process into a single and coordinated effort. Contractors can be classified as the general (prime) contractors have a contractual relationship with the owner, where he is responsible for construction of the entire project; meanwhile subcontractors (specialty) have a contractual relationship with the prime contractors or with another subcontractor, where he is responsible for construction a limited aspect of the construction project (Nwachukwu, C.C. and Emoh F.I., 2011). A successfulness of a project is mainly depending on the contractors. The contractor's responsibility is to ensure the construction work can be proceeding as planned. The findings of Sanders et. al. (2001) found that delays cause by the contractors may have a clause on money and time extension, the cost and duration of the project will increase as the project is delay in delivered. According to Alaghbari W.E. et. al. (2007), the possible factors that risk of causing delay in construction work among the contractor's responsibility:

- Construction error and defective work
- Insufficient of material
- Insufficient of labor
- Insufficient of equipment and tools
- Late in delivery of materials
- Poor site management
- Poor coordination with others parties
- Poor subcontractor's skills

- Poor skills and experience of labor

2.6.2 Delay Factors Related to Consultant

According to Nwachukwu, C.C. and Emoh F.I. (2011), consultant plays an important role in achieving the successfulness of a construction project. Consultant or specialist professional advisers will be appointed by the employer or the contractor to design and build the structure and also provide the advice in relation to the project. In the findings of Hughes W. and Murdoch J.R. (2001), consultant is an individual or organization that creates the design, cost management and other advisory services to the customer. Consultant can be in architects who are leading in the design function and management function, specialist engineer, or the site inspector and also the cost advisor. Consultant can be an architect, structural engineer, mechanical and electrical engineer, or be more specialized included archaeological consultant, surveyor and other specialist engineer. In the research of Haseeb M. et. al. (2011) and Alaghbari W.E. et. al. (2007), there is risk of delays factors that are related to the responsibility of consultants:

- Ability of design with details drawing
- Incomplete documentation
- Lack of experience
- Delayed in giving instruction and making decision
- Completeness and timeliness of project details
- Provision for ease of communication
- Level of understanding owner requirement

2.6.3 Delay Factors Related to Owner/Client

Client or owner is the organization that launch and pay for the project with define objective (Hughes W. and Murdoch J.R., 2001). Client is being responsible for the execution of the project with the initial idea to the implementation. Under the Construction (Design and Management) Regulation 2007 in Great Britain, client have to ensure that there are suitable management arrangement for the project welfare facilities

in the construction site and also allow sufficient time and resources for all stage in the construction work. Client need to make sure that there are sufficient of welfare facilities on site to provide access to health and safety precaution as the construction work is started. The responsibility of client included in appoints advisors, approve cost and timetable and assign the professionals to the project. The involvement of client in the implementation process determines the nature of the project. Client is responsible for the payment of contract after sign and payment to the contractor after take handover of the completion of building. Delay in payment process by client is a critical cause of delays of project. The findings of Alaghbari W.E. et. al. (2007) and Haseeb M. et. al. (2011) stated the risk of delay factor that relevant to clients:

- Financial adjustment for project
- Slow in decision making
- Possible modification to initial drawing
- Poor coordination within contractors
- Contract modification (addition of new work and changes in specification)

2.6.4 Delay Factors Related to External Factors

Unforeseeable and unavoidable is the characteristic of external factors that have the probability happened in construction work and usually it is categorized as excusable delay. According to Khodeir et. al. (2014), eternal factors that can cause delay in project include economic, political, legal, logistical and environmental factors. Weather, site condition and economic conditions which are unpredictable are the element of causes of delay in construction project (Alwi S. and Hampson K.D., 2003). In Indonesia, the neighbor country of Malaysia, both of them facing the rainy season which might cause flooding that might lengthen the schedule of construction project. According to Ministry of Science, Technology and Innovation (MOSTI) Malaysia, Kuantan will face a typical expected monthly rainfall maximum to 600 mm in November. In the findings of Haseeb M. et. al. (2011) and Alaghbari W.E. et. al. (2007), risk of external factors that cause delays had been identified:

- Natural disasters
- Unpredicted Climate
- Changes in regulation and government policy.
- Poor economic condition (currency, inflation)
- Delay in transportation of material
- Lack of material, tools and equipment on market

2.7 EFFECT OF DELAY SOURCES IN CONSTRUCTION PROJECT

When the project facing a delay problem, they have to accelerate the project or have to extend the duration which will go beyond the scheduled completion date (Aibinu A.A. and Jagboro G.O., 2002). The construction project will face the effects/risks if the delay occurs. There are a lot of previous studies from Aibinu A.A. and Jagboro G.O. (2002) and Sambasivan M. and Soon Y.W. (2007) found that there are many effects in construction project if delays happened. In the findings of Salunkhe A.A. and Patil R.S. (2014), the top four risks of construction delays is cost overrun, time overrun, litigation and affect company reputation are discussed at below.

2.7.1 Cost Overrun

Aibinu A.A. and Jagboro G.O. (2002) stated that cost overrun is the most significant effect of delay in Nigeria. This statement is supported by Sambasivan M. and Soon Y.W. (2007) about the cost overrun is the second ranked on delay effect of construction industry in Malaysia. According to Salunkhe A.A. and Patil R.S. (2014), cost overrun can be defined as the exceeding of estimated budget for the project which bring a huge effect to the delayed construction project in Ghana. He also found that the common reason which leads to project cost overruns include under estimation of project cost, unrealistic project design, project task exceeds the assigned duration and changing of project scope.

2.7.2 Time Overrun

According to Ameh, John O. and Osegbo E.E. (2011), time overrun is described as the extension of time in addition to the agreed estimated and actual completion date. Time overrun affect the project clients, contractors and all the participants of construction project. Contractors may have to spend for extra labor to reach completion date or pay penalties and lose other profitable contract. According to Taher E.F. and Pandey R.K. (2013), time overrun in the phase of construction activity will also lead to cost overrun in the overall construction project. Aziz and Remon F. (2013) also prove that time overrun is one of the main risks of delay sources in construction industry. Memon A.H. (2014) stated that time overrun is a major problem needed to be controlled because it is the key indicator of project success.

2.7.3 Litigation

Litigation can be defined as an action brought in court to enforce a particular right. Charles et. al stated that the ligation is considered the third most important effect of delay to construction industry. This will happen when client reject to accept surprise or accept the risk without receiving proper compensation and a litigation action will be taken. According to Sambasivan M. and Soon Y.W. (2007), there are some parties who involved in project use litigation as the utmost alternative to solve the disputes. In the finding's result from Aibinu A.A. and Jagboro G.O. (2002), litigation placed sixth in the ranking of the risk of delay in construction project.

2.7.4 Affect Company Reputation

Reputation of a company or organization is an essential for survival in the competitive market. The company with better reputation will hold a big market share compared with others. Establishing a good reputation could help an organization immensely in market and also build the confidence of consumers. Moreover, in this modern age of technology advance, social networking and website could be a medium for the public to access and judge us base on the comment and sharing of others user. In

the study of Murray K. (2008), reputation risk is considered as a greatest threat to the business today. Djordjević and Djukić (2008) stated that reputation is the public assessment of the key identity and image of an organization to maintain a long term position in marketplace. Failure to deliver project on time will affect the reputation risk for the company and organization; client may have a preference for the other companies which product the similar product and service although they are less competitive in price but obtain a good reputation. Consumer could avoid to have relationship trade with the organization which having bad reputation, they could judge on the company based on what they hear about.

2.8 RISK MANAGEMENT IN CONSTRUCTION PROJECT

Every project consists of various risks that should be properly analyzed and dealt with them to avoid the failures of the project. Risk is any occurrence or action that might affect the accomplishment of project objectives (Mahendra et. al., 2013). Construction industry is a risky industry with various uncertainties which the management have to deal with them (Mousa A.J., 2005). Construction projects are basically unique and consist of risk that arises from different sources. Risks occur among parties that involved in the construction project such as client, consultant, labor, safety, external factors and government regulation. In the findings of Mahendra et. al. (2013), the risk faced in the construction industry of developing countries can be categorized as:

1. Technical Risk: incomplete design, lack of site investigation, modification of project scope, and lack of resource availability.

2. Construction Risk: Productivity of labor, site condition, failure on equipment, and design changes.

3. Physical Risk: Damage on structure and equipment, labor safety, fire in construction workplace and theft.

4. Organization Risk: relation of contractual, contractor's experience, lack of experienced work force, communication of organization and attitude of the people.

5. Financial Risk: Cost increment on material, low market demand, currency rate fluctuation, delay of payment, underestimation, and taxes charged by government.

6. Social-political Risk: Changes in laws and regulation, pollution and safety regulation, corruption, cultural and language obstacle, war and civil disorder, requirement for permit and approval.

7. Environmental Risks: Natural disasters, monsoon season and unpredictable climate.

Risk management is the process of planning, leading and allocating the resources and activities of an organization. Risk management should be emphasized to project managers in order to avoid the failure of the project (Alberto D.M. and Muhammad J.T., 2013). It protects and grows corporate assets as well as enhances the shareholder value. Risk management is important to be undertaken for all industry especially construction industry to ensure the reputation and the earning of the company. It is included in the identification of influencing factors that cause negatively impact to the budget, quality and the way to attain the objective of the project. Risk management is the process of identification, assessment, response plan, monitoring and controlling (Mahendra et. al., 2013).

2.8.1 Risk Identification

The first process in the entire project is to identify the risk that have the potential occurrence which will cause damage on project. One of the most popular techniques in risk identification is brainstorming (Mahendra et. al., 2013). All the relevant people related to the project will be gathered in one place. A facilitator will initiate the discussion by briefing the aspect that is much risky. Participants will note down the

risky factors by their own opinion and the facilitator will review the data and proceed to the next stage. Somehow, that is similar technique that is called Delphi technique, which has a structuring of information flow and feedback mechanism. Through the Delphi technique, the consensus can be achieve among the respondents within the domain of expertize although they are in difference place. Delphi technique is aim to conducting a detailed examination and discussion with a certain issue, and result in the objective setting, investigation of policy and predicting the occurrence of the risk of entire project (Hsu et.al, 2007). Project team can refer the history or experience of previous project that is similar to the current project to find out the likelihood of risk occurrence, and make a solution to overcome it to ensure the successfulness of the project. Engage with the expertize person who have sufficient experience in the construction industry would gain the expert opinion and recommendation in identifying the risk would exist in the project. By the simple way, a checklist of the risk identified in project in the past and the respond to dealing with the risk would be a less cost and simple to understand method for all parties.

2.8.2 Risk Assessment

After the identification of the risk, a risk assessment can be conducted to categorize the risk according to the likelihood and the impact on the project. Recruit the staff and project team which is expertise and experience can ensure that there is sufficient knowledge to dealing with the risk associated with project delays problem. Risk can be categorized as quantitative and qualitative according to the nature of the project (Alberto D.M. and Muhammad J.T., 2013). According to Mazareanu and Valentin P. (2007), the qualitative risk has the characteristic in the use of subjective index, low-medium-high and benchmark. Generally, qualitative method consists of the investigation of seeking answers to a question. Control banding model can be used to evaluate and control the hazards in the workplace that express the inferences about the exposures and control needed to minimize the risk (Zalk et. al., 2011). Qualitative risk is being ranked with the impact of risk and the probability of occurrence. While quantitative risk can be expressed in numerical result, that show the probability of risk factor impact on the project, and identify the priority of risk factors of the project. Scenario analysis can be conducted to making a fair decision and option to the risk that

will give a less loss or hazard to the project. Risk Priority Number can be used in prioritizing the allocation of resources to the risky issues to avoid the major costly impact on both the budget and timeframe of the project. In the findings of Mahendra et. al. (2013), decision trees can be carried out with tree diagrams that help to formulate the problem and evaluate options. It is presented in a graphical model with a clear outline of the effect of each decision taken to the entire project.

2.8.3 Risk Response Planning

Planning for the step to respond to the risk after the risk assessment is aim to avoid the impact that risk brings to the objective of the project (Banaitiene N. and Banaitis A., 2012). According to Mahendra et. al. (2013), there is four main response strategies for the negative risks:

- Risk avoidance: eliminating the threat or specific risk by changing the project management plan. Extend in schedule and reduce the scope of project and help to avoid the risk, depend on the nature of the project activities.

- Risk acceptance: Accepting the consequences of occurrence of a risk or take advantage from the opportunities. It is applied when there is no possible to use other strategy to respond to the risk. Project teams have to conduct a plan to deal with the risk if and when it is happened.

- Risk Transference: Shifting the impact of risk and responsible to a third party which is willing to bear on the risk for a fee, or premium (the insurer). Insurance can be purchase while if there is the occurrence of risk such as fire or natural disaster, the insurance company will be responsible to deal with the consequences.

- Risk Mitigation: Minimize the consequences of a risk event by reducing the probability of occurrence. Risk mitigation can be done by taking systematic reduction strategy to reduce the adverse effects. An early

action is taken to reduce the chance of occurrence is more effective compare with repair the damage after the risk happens.

By doing the risk response planning, organization or project team could clearly identify the risk that exist in the entire project. It could identify the consequences before the occurrence of an adverse event. However, conducting the risk response planning can improve the focus or the project team to pay attention to the risk data that was collected.

2.8.4 Risk Monitoring and Control

Risk monitoring and control will be preceded after the implementation of risk response action. It ensures the execution of the risk plans and evaluates their effectiveness in minimizing the risk within the project. Project team need to monitor and record the effectiveness and the result to the project risk profile after implementing the risk response action (Mahendra et. al, 2013). Risk control involves choosing the alternative strategies, implementing the contingency plan and corrective action (PMI, 2000). The response plan implemented to overcome the risk is necessary to be documented and updated for the future reference for the organizational process assets.

2.9 SUMMARY

Construction industry is a complex industry, which can bring huge profit and also loss to the organization. Through the literature review, we can notice that there are issues arising with delays in construction that is happening in every project. Risk is costly and would bring loss in profit if it does not have a proper management. Although the delay problem in construction project is not able to avoid, but organization can minimize it by using the proper risk management procedure that can be done with a proper documentation and expertize.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Delay in construction project is a critical problem that happened in most of the country around the world. It will cost the client and the constructors having the negative financial output at the end of the projects if the delay and risk related problem is not being solved. The requirement of client is not being achieved and causes a negative impression on organization's reputation and confidence level. Organization will face deficit income and loose the potential revenues in the entire project; meanwhile the contractor will do rescheduling and rearrangement of work because of the increment of cost in overhead (Alghbari et. al, 2007). Thus, determination of the delay factor in the construction project is very important to generate positive income for the entire project.

3.2 RESEARCH METHOD

In this research, quantitative methodology is selected as the procedure for data collection and prioritization of the risk that exist in the construction project. Quantitative method of risk assessment is frequently being used in construction industry. Risk can be compared by placing with a number of matrixes of risk impact against a probability. Tolmie A. et. al. (2011) defined that quantitative research is express by gathering the numerical data that will be analysed by using mathematically based formula. A survey questionnaire method has been use to collect the data required for the research analysis. According to Martin E. (2006), questionnaires are commonly used in the sample surveys to obtain the reports of the facets, behaviours and the other subjective opinion. The objective of the questionnaire is to collect the primary source data from the sample population. The survey questionnaires were distributed to the contractor grades of registration G7 in CDIB from 30 construction companies in Kuantan.

The types of question are closed-ended and consist of categorical questions. A closed-ended question is ease for respondent to choosing the limited number of responses. The questionnaire is designed as closed-ended question which are easier to code, analyse and measure across the surveys (Martin E., 2006). The categorical question is used for the possible answer are categories and the respondent must belong to one category of group. The reason that the question will be set as categorical due to the clarification of respondent to the question stated which can reduce the confusion to the question objective (Dashen, et. al., 2001). Thus, this can improve the quality of the data gathered from the respondents. To determine the risk of delays which are critical to the construction project, the Risk Priority Number (RPN), one of the key methods to identify the numerical value of the risk of delays. This enables industry to tackle those delay sources starting from the most important to the least. Participants are asked to choose the value from 1 to 5 of Severity, Occurrence and Detection of the delay sources that could occur in construction project.

3.3 POPULATION AND SAMPLING

3.3.1 Research Population

This research is conducted in Kuantan and 30 construction companies will be chosen as the participants. In the study of Lieber, R. L. (1990) and Filho et. al. (2013) proved that the minimum number of respondent is suitable for 30 to meet the close fit for the normal distribution in order to achieve statistical significance. The population for this study is senior manager, engineer, project manager and supervisor which work at contractor company with grade of registration G7 in Construction Industry Development Board (CIDB). This group is selected as respondent due to the fact that they are working at the highest class of contractors registered with Construction Industry Development Board (CIDB) and these contractor have a no limit tendering capacity, paid-up capacity can reach RM750, 000.00 and come from the large size company (Kamal E.M. and Flanagan R., 2014), and also their involvement in the construction project and experienced on the obstacles happened in the construction project. Data will be gathered through questionnaires distributed to the targeted construction companies.

Table 3.1: List of Construction Company with registration of G7 in CIDB

BIL	LOCATION	CONTRACTOR
1	A-37, TINGKAT 1, JALAN IM3/11, BANDAR INDERA MAHKOTA 25200 KUANTAN,PAHANG	AKS BINA CORPORATION SDN. BHD
2	B-38 1ST FLOOR, LORONG SERI TERUNTUM 139, OFF JALAN BUKIT UBI, 25100 KUANTAN, PAHANG	ASPHALT INNOVATION SDN BHD
3	B-172 2ND FLOOR, JALAN DATO LIM HOE LEK, 25200 KUANTAN, PAHANG	ASAS BAYU SDN BHD
4	A33, 1ST FLOOR, LORONG TUN ISMAIL 10, SRI DAGANGAN KUANTAN 25000 KUANTAN, PAHANG	BINAAN DESJAYA SDN. BHD.
5	NO.53, 1ST FLOOR, JALAN TELUK SISEK,25000	DERMAGA BUILDERS

	KUANTAN, PAHANG	SDN. BHD.
6	B8012 TINGKAT 2 & 3, SRI KUANTAN SQUARE, JALAN TELUK SISEK 25050 KUANTAN, PAHANG	COSMIC ACCORD SDN. BHD.
7	NO.42 2ND. FLOOR, JALAN HAJI ABDUL AZIZ 25000 KUANTAN, PAHANG	DINSLEE SDN. BHD.
8	A11, TINGKAT 1, JALAN IM 2/3, BANDAR INDERA MAHKOTA, 25200 KUANTAN, PAHANG	DUTA KORPORAT SDN. BHD.
9	NO. 8A, 1ST FLOOR(CHINA TOWN), JALAN PUTRA SQUARE 2, PUTRA SQUARE, 25000 KUANTAN, PAHANG	FAMCON STRENGTH SDN. BHD.
10	A-7370, GROUND FLOOR, JALAN KUBANG BUAYA, 25250 KUANTAN, PAHANG	FRANKY CONSTRUCTION SDN. BHD.
11	A-31 TINGKAT 1, JALAN IM 3/11, B.I.M POINT, BANDAR INDERA MAHKOTA, 25200 KUANTAN, PAHANG	HA TECHNICAL SERVICES SDN. BHD.
12	B-72, TINGKAT 1, LORONG IM 8/3, BANDAR INDERA MAHKOTA, 25200 KUANTAN, PAHANG	HASCITA SDN. BHD.
13	NO. 90 1ST FLOOR, JALAN BESAR, 25000 KUANTAN, PAHANG	HIKMAT INDAH SDN. BHD.
14	A-77 JALAN TELUK SISEK, 25000 KUANTAN, PAHANG	HO KENG CONSTRUCTION SDN. BHD.
15	A33, 1ST. FLOOR, LORONG TUN ISMAIL 10, SRI DAGANGAN KUANTAN, 25000 KUANTAN, PAHANG	INTER-GRANITE SDN. BHD.
16	B62 TING.2, LORONG AIR PUTIH 2, 25300 KUANTAN, PAHANG	JENTEC SDN. BHD.
17	B-172 2ND FLOOR, JALAN DATO' LIM HOE LEK, 25200 KUANTAN, PAHANG	KOH LEK CONSTRUCTION & RENOVATION SDN. BHD.
18	SUITE 2.01, NO. 45/3, TINGKAT 2, JALAN TELUK SISEK, 25000 KUANTAN, PAHANG	LEGASI LESTARI SDN. BHD

19	B-3110,TAMAN SEKILAU MAJU 11, BUKIT SEKILAU, 25200 KUANTAN, PAHANG	MALEJA CORPORATION SDN. BHD.
20	B-8010, 2ND & 3RD FLOOR, JALAN TELUK SISEK, SRI KUANTAN SQUARE 25250 KUANTAN, PAHANG	MAXWAY BINA SDN.BHD.
21	B-172, 2ND FLOOR, JALAN DATO LIM HOE LEK 25200 KUANTAN, PAHANG	MIKRO GLOBAL SDN BHD
22	B64 TINGKAT ATAS, TAMAN BELUKAR MAJU, BATU 4, JALAN GAMBANG 25150 KUANTAN, PAHANG	MJN INDAH ALAM SDN. BHD.
23	4TH FLOOR HSBC BANK BUILDING, NO.1 JALAN MAHKOTA, 25000 KUANTAN, PAHANG	PAYA MUTIARA DEVELOPMENT SDN. BHD.
24	NO.98 TINGKAT 2, WISMA RANGKAIAN ,JALAN TELUK SISEK, 25000 KUANTAN, PAHANG	RANGKAIAN DELIMA REALTY SDN. BHD.
25	A-4380 TINGKAT 1, JALAN TELOK SISEK, 25000 KUANTAN, PAHANG	SBB RESOURCES SDN. BHD.
26	NO.5A1 TINGKAT 1, JALAN BESAR, 25000 KUANTAN, PAHANG	TRUE APEX SDN BHD
27	NO.11A 1ST FLOOR (MALAY TOWN), JALAN PUTRA SQUARE 2, PUTRA SQUARE 25200 KUANTAN, PAHANG	TWIN FLAGS DEVELOPMENT SDN BHD
28	NO.B-62 GROUND FLOOR, JALAN 3/10 BIM POINT, BANDAR INDERA MAHKOTA 25200 KUANTAN, PAHANG	UNIBINA CONTRACT & LANDSCAPE SDN. BHD.
29	B34, FIRST FLOOR, LORONG HAJI AHMAD 4, SRI PAHANG BUSINESS CENTRE 25300 KUANTAN, PAHANG	WISHTEAM DEVELOPMENT SDN BHD
30	NO. 5, LORONG SERI SETALI 71, PERKAMPUNGAN SETALI, 25300 KUANTAN, PAHANG	YIT HING CONSTRUCTION & TRADING

3.3.2 Research Sampling

The sample is the selected people chosen for the participation in a study. The sample is the subset of a population. According to Mugo F.W. (2002), sample is the part of the statistical population which is studied to obtain the information. The process of sampling in this research is to select a group of people which to conduct a study. Probability sampling is used as sampling techniques in which all participants has the same chance of selection. This can minimize the bias and simplifies analysis of result. By this probability sampling, simple random sampling has been used in this research. The participant has the equal chance of being selected to belong to the sample (Puerto and Barreiro et. al., 2001).

3.4 DATA COLLECTION TECHNIQUES

This research will be conducted with quantitative data collection method, which relies upon the survey questionnaire to conduct the data analysis and result. Sampling will be conducted by distributing the survey questionnaire to collect the data from the respondents who are contractor grades of registration G7 in Construction Industry Development Board (CIDB) from the 30 construction companies that are located in Kuantan, Pahang. The respondents needed to answer the question based on personal experience and expertise knowledge. A simple random sampling method is used to select the study sample in the “CIDB Malaysia” to find out the related construction company which located in Kuantan area. The questionnaire will be personally sent through email to the related company. This can speed up the process to collect the data.

3.5 DEVELOPMENT OF MEASURES

3.5.1 Design of Questionnaire

The questionnaire will be conducted using close-ended question. This survey questionnaire will be distributed to the respondents which are the contractor's grade of registration G7 in Construction Industry Development Board (CIDB) from 30 construction companies in Kuantan. The questionnaire is created with two parts; part A and B.

The part A of the questionnaire consists of the demographic of the respondents includes age, gender, education level, position and working experience in the company.

Part B of the questionnaire is to collect the severity, occurrence, detection of the risk of delay in construction which needed in conducting the risk priority number (RPN). According to Ming et. al, (2009), the severity, occurrence and detection are defined as:

- Severity (S) = Severity of potential effect of the risk.
- Occurrence (O) = Likelihood of the risk to occur.
- Detection (D) = Likelihood of the detection of risk.

The respondent could note down any additional information for the risk of delay sources. After that, the value obtain from severity, occurrence and detection are used to calculate the RPN with a numerical value. Risks of delay sources in construction project are categorize as below:

Table 3.2: The delay sources type and risk of delay sources.

Delay sources type	Risk of delay sources
Delay factors related to Contractor	Construction error and defective work
	Insufficient of material
	Insufficient of labour
	Insufficient of equipment and tools
	Late in delivery of materials
	Poor site management
	Poor coordination with others parties
	Poor subcontractor's skills
	Poor skills and experience of labour
Delay factors related to Consultant	Ability of design with details drawing
	Incomplete documentation
	Lack of experience
	Delayed in giving instruction and making decision
	Completeness and timeliness of project details
	Provision for ease of communication
	Level of understanding owner requirement
Delay factors related to Owner/ Client	Financial adjustment for project
	Slow in decision making
	Possible modification to initial drawing
	Poor coordination within contractors
	Contract modification
Delay factors related to External Factors	Natural disasters
	Unpredicted Climate
	Changes in regulation and government policy
	Poor economic condition (currency, inflation)
	Delay in transportation of material
	Lack of material, tools and equipment on market

3.6 DATA ANALYSIS TECHNIQUE

Data analysis will be conducted by using the Statistical Package for Social Science software (SPSS) to create a demographic profile of respondents and the descriptive statistics represent by the usage of mean, median, and mode which are mostly used to measure the central tendency. According to Gaur A.S. and Gaur S.S. (2009), they mention that:

1. Mean: the average of the sum values of a variable divided by the number of observations

2. Median: the listed values of the data set in a numerical order and identify the value (point) appears in the middle of the list.

3. Mode: The value in the data set which appear frequently.

The analysis of risk of delay sources can be measure by the Risk Priority Number (RPN) to help identify the critical risk of delay exist in the construction project with a numerical value. RPN can be used to identify and assigned severity, probability, and detectability values.

1. Severity (S): a numerical subjective estimate of how seriousness (effect) to a project.

2. Occurrence (O): a numerical subjective estimate of the likelihood that cause of a failure mode will occur in the construction project.

3. Detection (D): a numerical subjective estimate of the effectiveness of control to prevent or detect the cause before the failure reaches the end user.

The following table shows the generic five point scale for severity, occurrence and detection:

Table 3.3: The generic five point scale for Severity

Rating	Description	Criteria
1	Very low or None	Would not effect on project execution progress
2	Low or Minor	Minor effect on project execution progress (within 1 week)
3	Moderate	Moderate effect on project execution progress (within 1 month)
4	High	High effect on project execution progress (within 3 month)
5	Very high	Significantly delay on project execution progress (over 3 month)

Table 3.4: The generic five point scale for Occurrence

Rating	Description	Criteria
1	Not Likely	Failure is unlikely
2	Low or Minor	Relatively few failures
3	Moderate	Occasional failures
4	High	Frequent failures
5	Very Likely	Persistent failures

Table 3.5: The generic five point scale for Detection.

Rating	Description	Criteria
1	Very High	Almost certain detection
2	High	High chance of detection
3	Moderate	Moderate chance of detection
4	Low	Very low chance of detection
5	Almost Impossible	No design control or no chance of detection

After the ratings have been assigned, the RPN for each issue is calculated by multiplying Severity (S) x Occurrence (O) x Detection (D):

$$RPN = (S) \times (O) \times (D)$$

This common approach used for indicate the numerical value of the risks associated with RPN that use as a visualization of the risk with a numerical value. Through RPN, we can identify that most important problem(s) and gives a model to allocate the limited resource in order to minimize the effect on project by delay. Prioritize correction action will be taken based on the RPN value of the risk of delay.

3.7 SUMMARY

From the research methodology, the data are gathered from the respondents after they are sent through the e-mail and telephone call. From the research data, the figure and chart of analysis are preceded and the RPN value with the recommendation action by the respondents to overcome the risk in construction industry. RPN value will determine the most important risk of delay with a numerical value, in order of priority that should be solved to avoid the greatest delay damage on the construction project.

CHAPTER 4

DATA ANALYSIS

4.1 INTRODUCTION

There are numerous delay sources that exist in construction project that cause the project cannot to be completed on time. By the distribution of survey questionnaire to 80 G7 construction companies in Kuantan area, 30 completed questionnaires were return back. The data will be presented in descriptive statistics of the sample which outline the frequency distribution for demographic factors. The data gathered have being interpreted into Risk Priority number (RPN) to determine the priority risk of delay that effect on the construction projects.

4.2 RESPONDENTS PROFILE

Table 4.1: Respondent's Demographic

Item	Frequency	Percentage (%)	Mean	Median	Mode	Standard Deviation
Gender						
Male	18	60.0	1.40	1.00	1	0.49827
Female	12	40.0				
Age						
Under 27	3	10.0	2.90	3.00	3	1.06188
28 – 35	8	26.7				
36 – 43	9	30.0				
44 – 50	9	30.0				
50 and above	1	3.3				
Education Level						
STPM	4	13.3	3.3333	3.00	3	0.80230
Diploma	14	46.7				
Degree	10	33.3				
Master	2	6.70				
Position						
Senior Manager	3	10.0	2.2667	2.00	2	0.73968
Engineer	18	60.0				
Project manager	7	23.3				
supervisor	2	6.7				
Others	0	0.0				
Working Experience						
Less than 1 year	1	3.3	2.9000	3.00	3	0.80301
Under 5 years	8	26.7				
5 – 9 years	14	46.7				
10 years and above	7	23.3				

Table 4.1 shows the respondent's demographic, there are 30 respondents that employed in contractor companies grades of registration G7 in Construction Industry Development Board (CIDB), 60% of them are male and the rest 40% are female. They have a mean of 1.30 and median of 1.00 which indicated that male have a greater percentage of participating in this survey questionnaire. Follow by next is the age group, the mean and median is followed by 2.90 and 3.00 respectively. Both of the age groups of 36 – 43 and 44 – 50 have 9 persons, which both of them are dominate 30% among these participants of survey questionnaires. The mean and median of the age group are 2.90 and 3.00. In the education part, there are 4 STPM holders, 14 Diploma Holders, 10 Degree holders and 2 Master holders, which the mean and median of the education level group are 2.2667 and 2.00 respectively. Following by the position of the participants of this survey questionnaire, there are 3 senior managers, 18 engineers, 7 project managers and 2 supervisors involved. They have the mean if 2.2667 and median of 2.00 in this research. The last is the working experience of the participants, there are only 1 person has the working experience which less than 1 year which are 3.3% in this survey questionnaire, the others are working under 5 years, 5 to 9 years, 10 years and above which are 8, 14,7 persons respectively. There are the mean of 2.90 and 3.00 of mean and median in the working experience of the participants who involve in this survey questionnaires.

4.2.1 Age

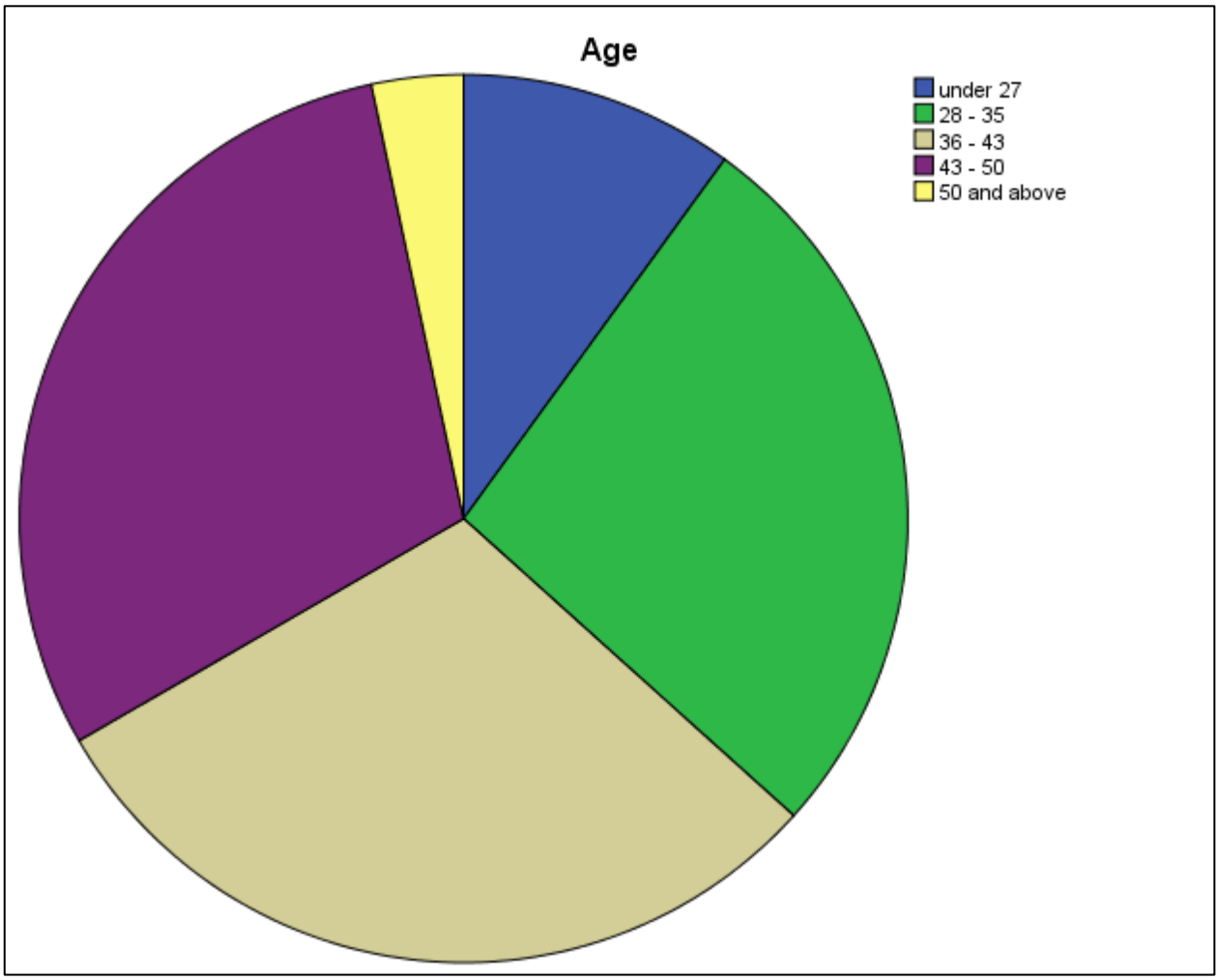


Figure 4.1: Age

Figure 4.1 show that the age of respondent who participate in this survey questionnaire. The greatest percentage of this chart is dominate by participant who are in age categories of 36 – 43 and 43 – 50 which both of the frequency are 9. The following age group is 28 – 35 which has the frequency of 8 and 26.7%. The frequency and percentage of age group under 21 years old are 3 and 10%. The age group of 50 and above has the least frequency and percentage which are 1 and 3.33% in this survey questionnaire.

4.2.2 Gender

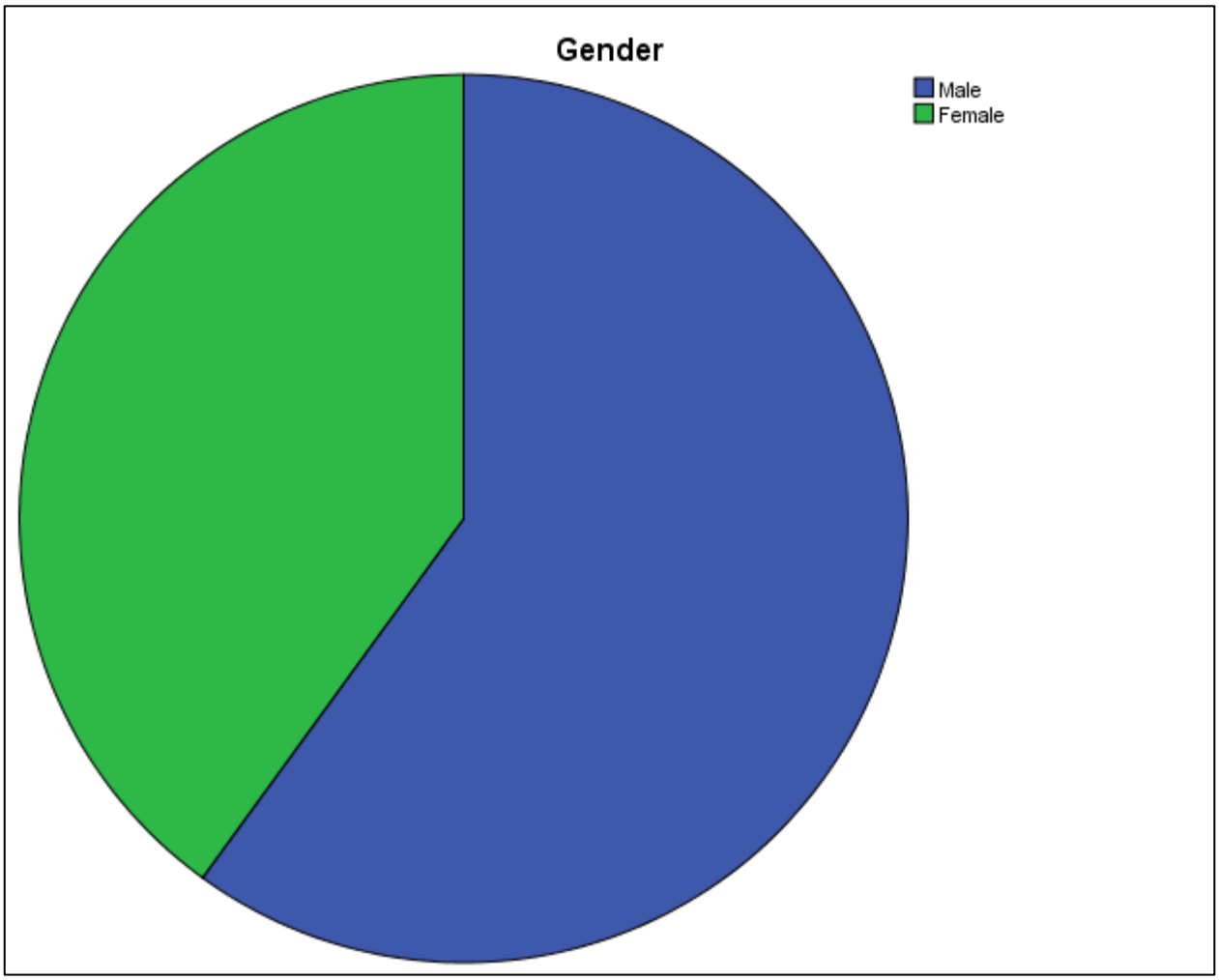


Figure 4.2: Gender

Figure 4.2 shows that among the 30 respondents that employed in contractor company grades of registration G7 in Construction Industry Development Board (CIDB). 18 people are male with 60% and the others 12 people is female with 40%. This indicates that there are more male are participate in this survey questionnaire.

4.2.3 Education Level

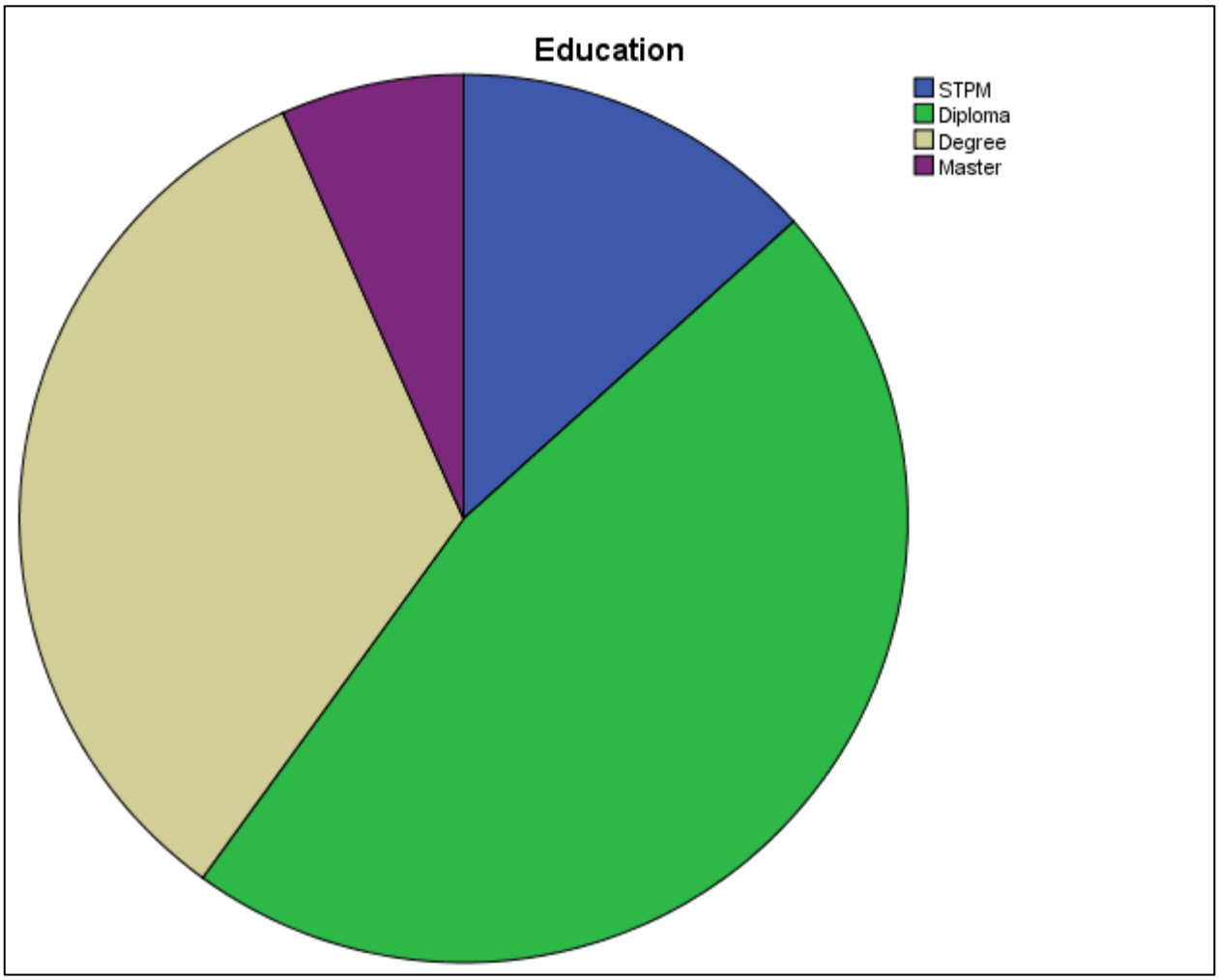


Figure 4.3: Education Level

From the survey questionnaire, the highest frequency and percentage of the education level among the 30 participants are Diploma holders, which dominating the frequency of 14 and 46.7%. The following is the Degree holders which are 10 respondents with 33.3% in this survey questionnaire. STPM holders consist of 4 participants with 13.3%. The last is the Master holders which are only 2 persons with 6.7%.

4.2.4 Position

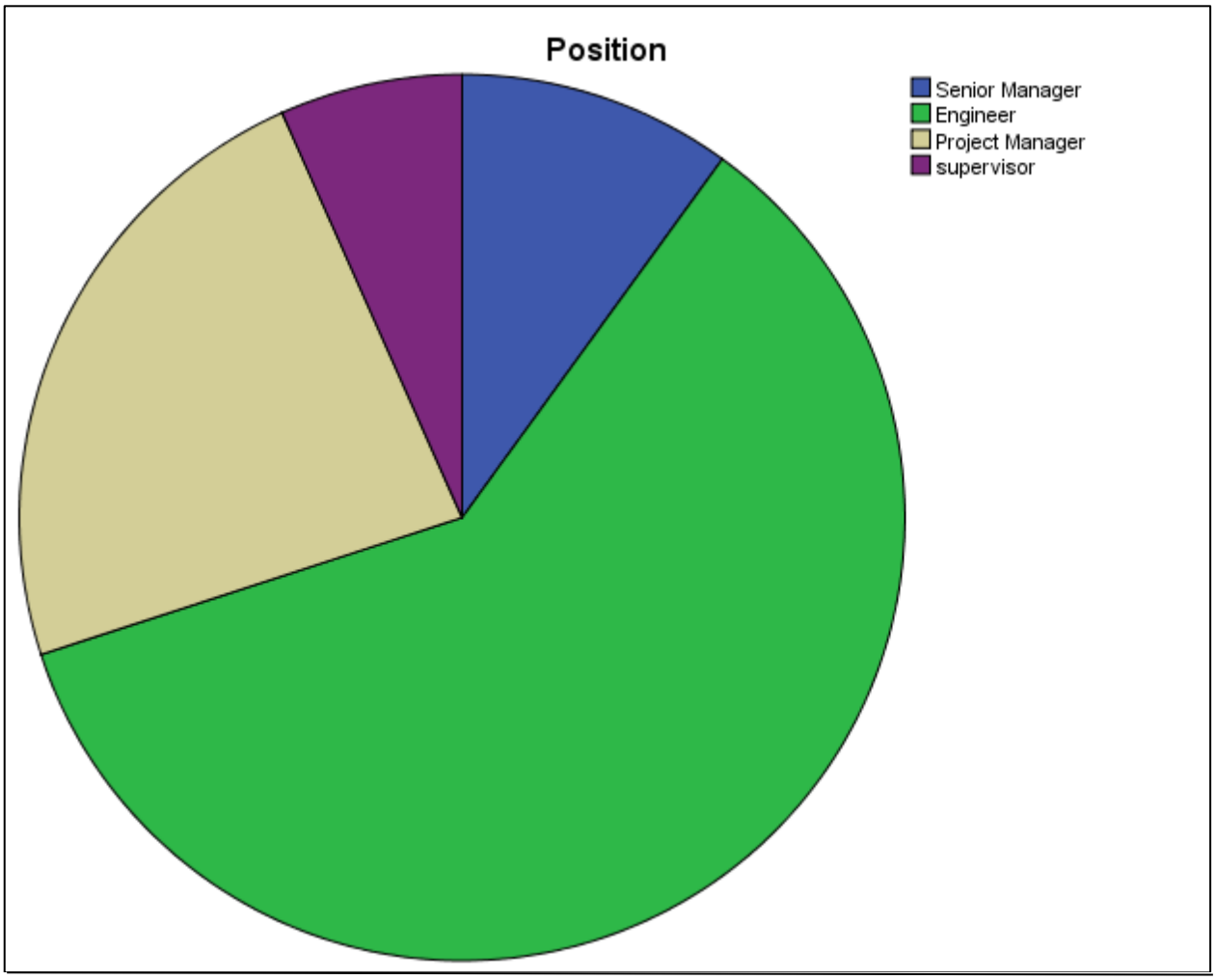


Figure 4.4: Position

Figure 4.4 show that 60% of the participants, which 18 of them are the engineer in this survey questionnaire. There are 7 persons are holder the position of project manager which is 23.3% in this survey questionnaires. The participants of senior manager are 3 persons; they are 10% in this survey questionnaire. Lastly, there are 2 supervisors participate, which are 6.7% and least percentage of participants in this survey questionnaire.

4.2.5 Working Experience

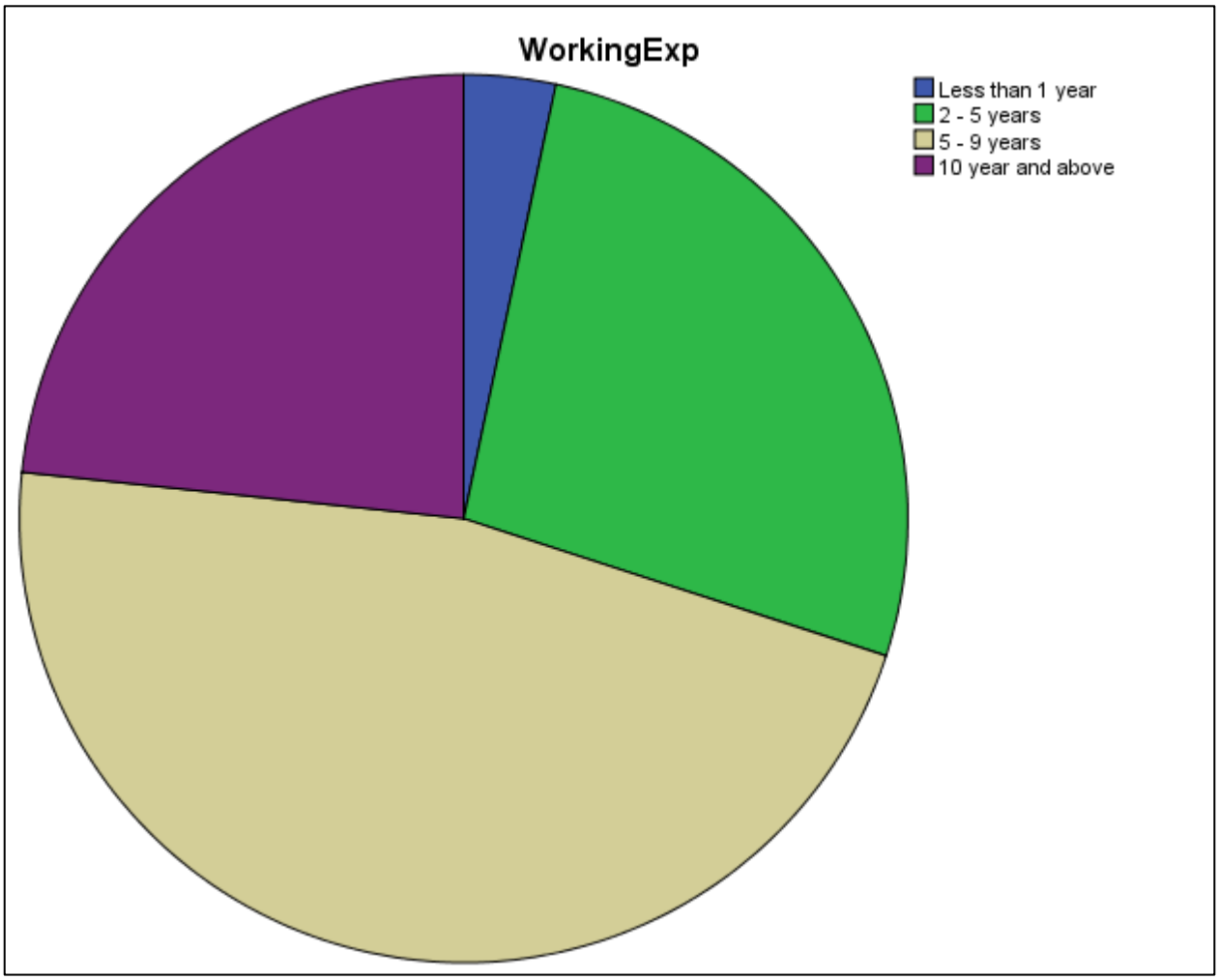


Figure 4.5: Working Experience

Figure 4.5 show that there are 14 participants with 46.7% in this survey questionnaire having 5 to 9 years of job experience in construction industry. Next, 8 participants with 26.7% of them are having 2 to 5 years working experience. 7 participants of this survey questionnaires with 23.3% having 10 years and above experiences. There is only 1 participant having less than 1 year working experience with 3.3% among 30 participants.

4.3 Average Value

Risk priority number is a numeric assessment about the risk that assigned to the process, which consist of likelihood of occurrence, detection and severity of impact. These elements are ranked with the numeric value from 1 to 5. Data analysis is done by using Average value method in the formulation by using Microsoft Excel. Average is a useful tool that can use when there are large amount of data with different categories of data.

$$A = \frac{1}{n} * \sum_{i=1}^{n} x_i$$

Where,

A= Average value

n= number of respondent

x_i = the value of each item in the list of numbers being given by respondent

Table 4.2: Average value

Risk of delay sources	Average Value		
	Severity (S)	Occurrence (O)	Detection (D)
Poor skills and experience of labour	4.5667	3.8667	3.7667
Contract modification	4.5000	3.6667	2.9667
Poor economic condition (currency, inflation)	4.5667	2.1667	3.9000
Possible modification to initial drawing	3.8333	3.0333	3.0667
Poor subcontractor's skills	4.5333	2.3667	3.0667
Construction error and defective work	4.7333	3.3333	2.0667
Natural disasters	4.4000	1.7667	3.8667
Completeness and timeliness of project details	4.6667	2.1667	2.9333
Level of understanding owner requirement	3.0333	2.0667	3.8667

Poor site management	4.4667	2.2333	2.2667
Insufficient of material	2.2000	3.2000	2.9667
Unpredicted Climate	2.9000	1.8333	3.8000
Financial adjustment for project	3.0333	2.9000	2.2333
Insufficient of labour	2.4333	3.8333	2.0667
Poor coordination with others parties	2.2333	3.8667	2.1667
Incomplete documentation	2.9667	2.1333	2.9333
Lack of experience	2.9333	2.9667	2.0333
Slow in decision making	2.0000	2.0333	3.7667
Delay in transportation of material	2.1667	2.9667	2.2000
Delayed in giving instruction and making decision	2.9667	1.4000	3.1333
Late in delivery of materials	2.3000	2.2000	2.3000
Insufficient of equipment and tools	2.3667	2.2000	2.1000
Poor coordination within contractors	2.1667	2.2333	2.1000
Provision for ease of communication	2.2333	2.2667	1.5667
Ability of design with details drawing	2.2333	1.4333	2.1333
Lack of material, tools and equipment on market	2.0333	2.2000	1.5000
Changes in regulation and government policy	1.2333	1.5333	2.1667

From the table 4.2, the highest average value of severity is the construction error and defective work, which is 4.7333. Follow by completeness and timeliness of project details, 4.6667 which is the top 2 among the average value of severity. Both poor skills and experience of labour and poor economic condition (currency, inflation) are two risks of delay sources which are placed at 3rd highest with 4.5667. This means that the top 3 items could bring a significant impact to the project progression is this risk of delay is occurred.

The poor skills and experience of labour have the same score with poor coordination with others parties which are 3.8667 in the score of occurrence and the highest score among the other risk of delay sources. Follow by the 2nd highest occurrence value which is insufficient of labour which is 3.8333. The 3rd highest value

of occurrence value is contract modification, which have the score of 3.6667. The higher the occurrence of the risk of delay sources will lead to this incident is always occurring in the duration of the construction project.

The detection value of poor economic condition (currency, inflation) is rated as the highest score which is 3.9000. Follow by the 2nd highest value of detection are natural disasters and level of understanding owner requirement which are 3.8667. The 3rd highest value of detection is unpredictable climate, which have the score of 3.9000 among the other risk of delay sources. The higher the value of detection, the lower the possibility to design control or there is no chance of detection of these risks of delay sources.

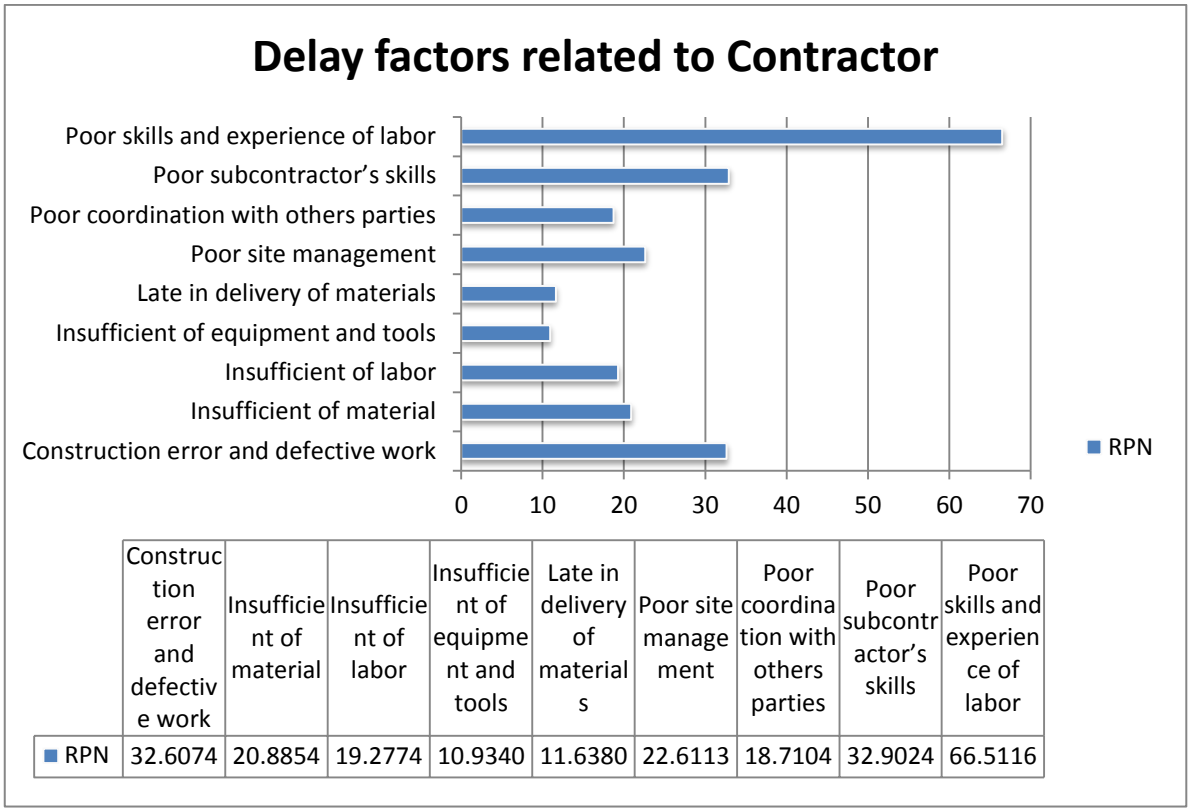
4.4 RISK PRIORITY NUMBER (RPN)

The value of Risk Priority number is the product of severity, occurrence and detection which rated by the 30 participants. From the table above, the average value of severity, occurrence and detection is calculated. Next, data will proceed to generate the value of Risk Priority Number which is calculated as:

RPN = (S) x (O) x (D)

Where,

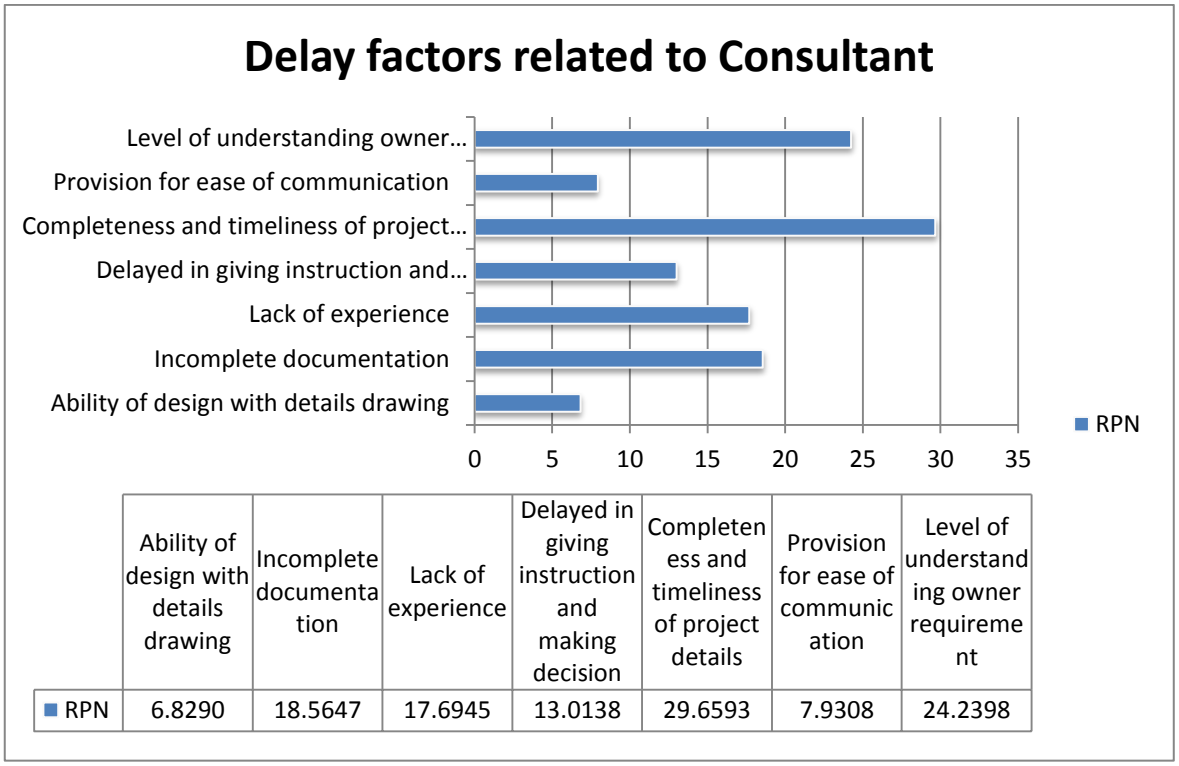
S = Severity
O = Occurrence
D = Detection



	Construction error and defective work	Insufficient of material	Insufficient of labor	Insufficient of equipment and tools	Late in delivery of materials	Poor site management	Poor coordination with others parties	Poor subcontractor's skills	Poor skills and experience of labor
RPN	32.6074	20.8854	19.2774	10.9340	11.6380	22.6113	18.7104	32.9024	66.5116

Figure 4.6: RPN value for risk of delay sources related to contractor.

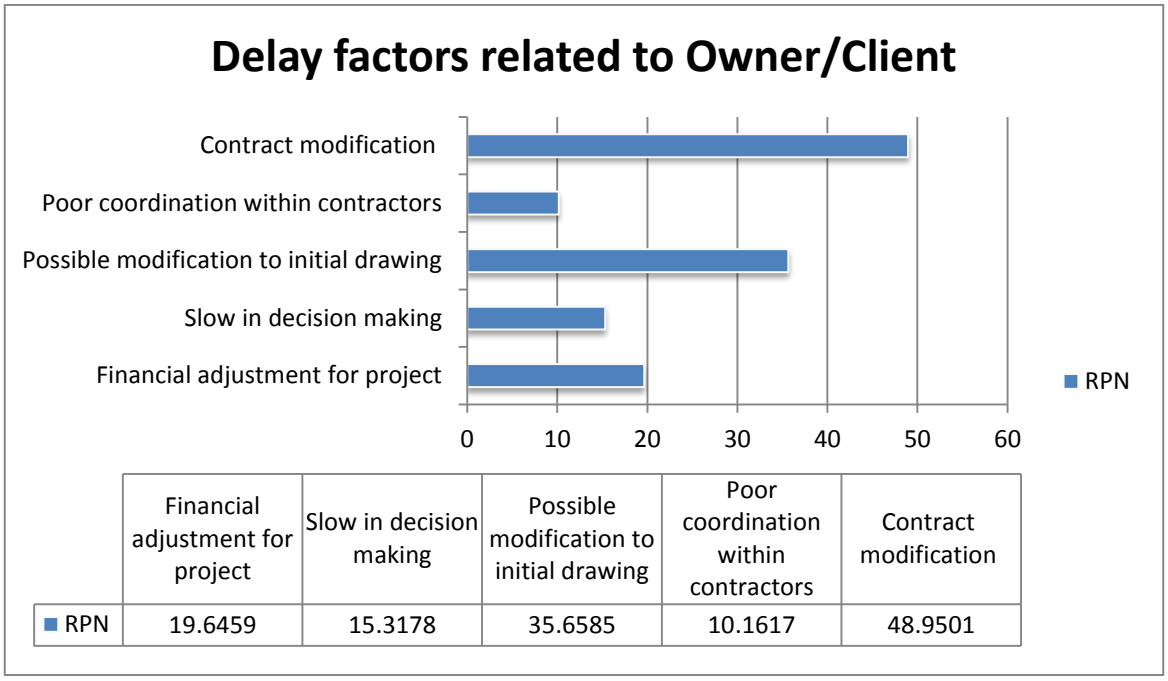
Figure above show the RPN value for the risk of delay factors related to contractor. The construction error and defective work has the value of 32.6074. RPN for both insufficient of material, labor and equipment and tools have the value of 20.8854, 19.2774 and 10.9340. Follow by the late in delivery of materials, with a RPN value of 11.6380. The next is poor site management, with the value of 22.6113. The poor coordination with others parties have the value of 18.7104. The poor subcontractor's skills have the RPN value of 32.9024. Lastly the poor skills and experience of labor have the greatest value of 66.5116 in this category.



	Ability of design with details drawing	Incomplete documentation	Lack of experience	Delayed in giving instruction and making decision	Completeness and timeliness of project details	Provision for ease of communication	Level of understanding owner requirement
RPN	6.8290	18.5647	17.6945	13.0138	29.6593	7.9308	24.2398

Figure 4.7: RPN value for risk of delay sources related to consultant.

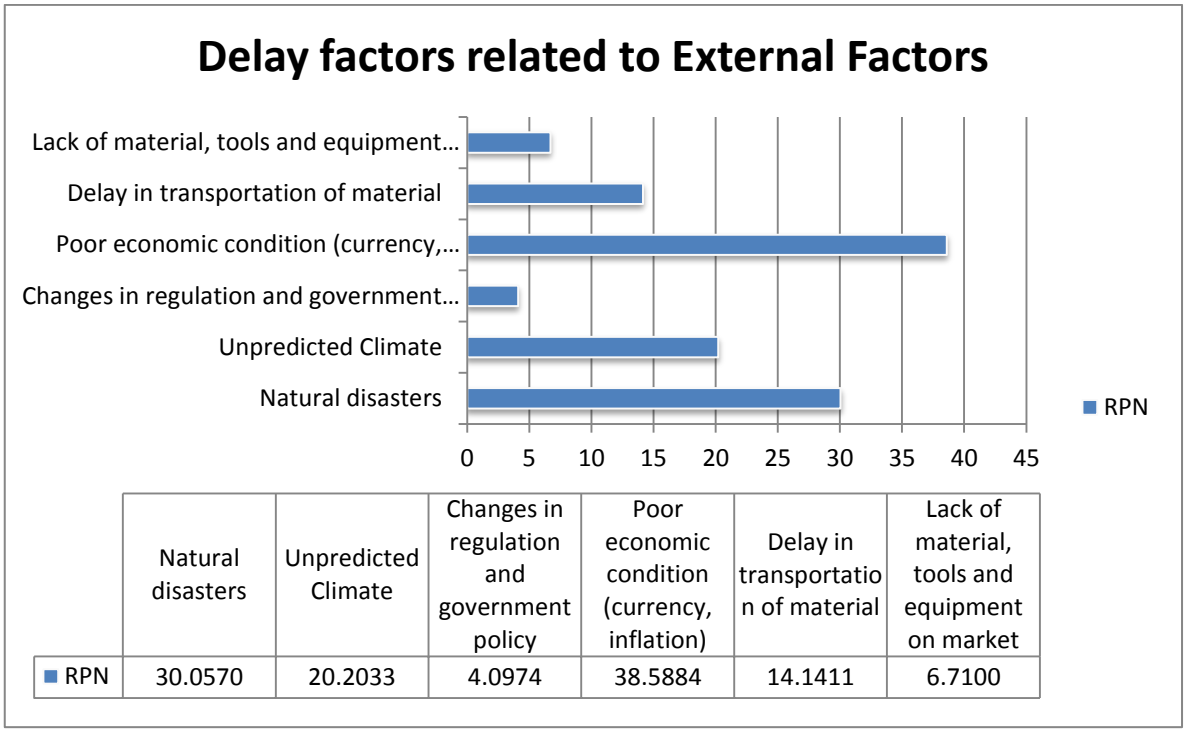
The figure above show the RPN value for the risk of delay factors related to consultant. Ability of design with details drawing has the RPN value of 6.8290. Next, the incomplete documentation has the value of 18.5647. Lack of experience acquired the RPN value of 17.6945. Delayed in giving instruction and making decision obtained the RPN value of 13.0138. Completeness and timeliness of project details have the value of 29.6593, which is the highest RPN value among this category. Provision for ease of communication has the RPN value of 7.9308. Lastly, level of understanding owner requirement has achieve 24.2398 of RPN value.



	Financial adjustment for project	Slow in decision making	Possible modification to initial drawing	Poor coordination within contractors	Contract modification
RPN	19.6459	15.3178	35.6585	10.1617	48.9501

Figure 4.8: RPN value for risk of delay sources related to owner/client.

Figure 4.8 indicate the RPN value for the risk of delay sources related to owner/client. The financial adjustment for project has the RPN value of 19.6459. Slow in decision making acquired the RPN value of 15.3178. The possible modification to initial drawing is achieving 35.6585 in RPN value. Next, the poor coordination within contractors has the RPN value of 10.1617. Lastly, contract modification acquired the RPN value of 48.9501 which is the highest RPN value in this category.



	Natural disasters	Unpredicted Climate	Changes in regulation and government policy	Poor economic condition (currency, inflation)	Delay in transportation of material	Lack of material, tools and equipment on market
RPN	30.0570	20.2033	4.0974	38.5884	14.1411	6.7100

Figure 4.9: RPN value for risk of delay sources related to external factors.

Figure 4.9 indicate the value of risk of delay sources related to external factors. The natural disasters have the RPN value of 30.0570. Follow by the unpredicted climate, with the RPN value of 20.2033. The changes in regulation and government policy have the RPN value of 4.0974. The poor economic condition, which included the currency and inflation, acquired the RPN value of 38.5884 which is the highest RPN value in this category. The delay in transportation of material has the RPN value of 14.1411. Lastly the lack of material, tools and equipment on market acquired the RPN value of 6.7100.

Table 4.3: Ranking of Risk Priority Number (RPN)

Risk of delay sources	Risk Priority Number (RPN)	Rank
Poor skills and experience of labour	66.5110	1
Contract modification	48.9500	2
Poor economic condition (currency, inflation)	38.5883	3
Possible modification to initial drawing	35.6585	4
Poor subcontractor's skills	32.9019	5
Construction error and defective work	32.6074	6
Natural disasters	30.0569	7
Completeness and timeliness of project details	29.6593	8
Level of understanding owner requirement	24.2397	9
Poor site management	22.6113	10
Insufficient of material	20.8853	11
Unpredicted Climate	20.2033	12
Financial adjustment for project	19.6459	13
Insufficient of labour	19.2774	14
Poor coordination with others parties	18.7104	15
Incomplete documentation	18.5647	16
Lack of experience	17.6945	17
Slow in decision making	15.3178	18
Delay in transportation of material	14.1411	19
Delayed in giving instruction and making decision	13.0138	20
Late in delivery of materials	11.6380	21
Insufficient of equipment and tools	10.9340	22
Poor coordination within contractors	10.1617	23
Provision for ease of communication	7.9308	24
Ability of design with details drawing	6.8290	25
Lack of material, tools and equipment on market	6.7100	26
Changes in regulation and government policy	4.0974	27

In table 4.2, the RPN value show that the highest risk of delay sources is poor skills and experience of labour, which has the RPN value of 66.5110. This delay source is under the category of delay factor related to contractor. The employee from company of G7 contractor rating this factor as the main risk that will cause the delay happened. The second highest ranking of RPN value is contract modification, which acquired 48.9500. This shows that the contract modification is one of the main sources that will effect on the progress of construction project, while the category of contract modification fall on the delay factors related to owner. Next risk of delay source is poor economic condition, which involve in value of currency and inflation, has 38.5883 of RPN value which is the top 3 of among the 28 risk of delay sources. The participants are agreeing on this risk of delay sources would be a critical decision in both financial and progression of the project. Possible modification to initial drawing is the 4th highest ranking RPN value with 35.6585, and follows by poor subcontractor's skills with the 5th highest ranking RPN value of 32.9019.

The last 5 risk of delay sources which have the least RPN value of the risk of delay sources are poor coordination within contractors (10.1617), provision for ease of communication (7.9308), ability of design with details drawing (6.8290); lack of material, tools and equipment on market (6.7100); changes in regulation and government policy (4.0974). Participant of this survey questionnaire rated these 5 risks of delay sources with a lower severity, occurrence and detection, thus they have the top 3 least RPN value in the data. This indicates that these 5 risks of delay are less significant which cause the delay of the construction project among the opinion of 30 participants.

4.5 SUMMARY

The delay sources in construction project are categories to 4 categories which are delay factors related to contractor, consultant, owner/client and external factors. Each of the categories consists of different risk of delay sources. The 27 identified risk of delay sources are being ranked by the participants and as a result that the most concern risk of delay sources which could bring a huge impact and consequences is poor skill and experience of labour which fall in the category of delay sources related to contractor.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

There is numerous delay sources which cause the progress of construction project forced to be slow down. It might bring negative effect on the time, cost, and litigation which will damage the reputation of organization. By identifying the risk of delay sources, and allocate the necessary resources on the critical risk of delay source, this can help to minimize the delay issue significantly. Hence, this research is conduct to identify the delay sources and also analyse the risk of delay sources in construction project.

5.2 LIMITATION

There are some limitation exist during the progress of this research. Fortunately this research can conduct smoothly with the help of my supervisor, colleagues, senior, and also collaboration from people who work in construction industry. The first part is for the research. To conduct this research, researcher need to obtain a lot of information related to construction project which are occurring the delay issue. Meanwhile, the categorization of the delay sources is a challenge for the researcher because they are ambiguity if the researcher has not clearly understood the characteristic of the delay sources. Next is the data collection part, since the delay sources are being category by 4 parts which are delay sources related with contractor, consultant, owner and external environment, so that there are existence of sub-categories for risk of delay sources. The data collection process is difficult since the participant of survey questionnaire need to fill in all of the risk of delay sources which happened in construction project, which are in huge quantity of amount which required quarter minute to fill in. For this I sincerely

apologize and thank for those participants of this survey questionnaires. The last difficulty is the data analyse part. Since there are 30 respondents for this research, hence there are a lot of data that need transfer from the survey questionnaire to analyse the data, such as demographic of respondents, average of severity (S), occurrence (O), detection (D) for each risk of delay sources, and also the RPN value for the risk of delay sources. The duration for conducting this research is not enough to gather the precise data and analyse it. Researcher requires transferring the data without mistake and generating the needed data to ensure the analysis process in accordance with fact.

5.3 RECOMMENDATION

To conduct this research clearly without doubt, the researcher should refer more article and facts that related to the risk of delay sources in construction project. These articles are available online, library and also research paper. This is important for the understanding of the characteristic and category of delay sources before conducting data analysis process. Next, researcher should able to identify the suitable research method for the future research. RPN is a good method to identify the priority of the risk of delay sources with a numerical number, which can help researcher to indicate that the significant of this risk of delay source is crucial and need to be overcome to minimize the delay happened during the progression of project. PRN is not a complicated tools but very useful and easy to use, it visualize the numerical value of the risk of delays so that everyone in the project team are understand the importance and able to overcome it. Another that, this research can be a reference for the future research which contributed in the understanding of delay sources and also the risk might occur in construction industry.

This research brings beneficial to construction industry. Industry may use the data analysed to find out the risk of delay sources which are significant to the delay issue in construction project. Delay brings financial damage for the budget and also may worsen the relationship between contractor and owner. Proper planning and resources allocation could be made to avoid the delay issue regarding to the RPN value. Hence, project team and organization can prevent the time and cost overrun in the project. Thus, the findings of this research can help industry to avoiding this risk of delay, made the

progress and completion of construction project could be complete on time and bring desire profit for organization.

5.4 CONCLUSION

In conclusion, delay is the most common, expensive, and the problem encountered in construction project. Delay could cause the cost overrun, time overrun, litigation and affect the reputation to the organization. These effects could lower the profit and increase the losses of the project. In this research, the delays sources of construction project could be categorized in four categories which are delay occur due to contractor, consultant, owner and external environment. In both of the categories, there are many risk of delay sources could exist in the construction project. By the summary of the risk of delay sources, project team could adopt the alternative to overcome the delay problem. For instance, the top three risks of delays with the highest RPN value are poor skill and experience of labour, contract modification and poor economic condition. From the date above, we can indicate that the most influencing risk of delay source is poor skills and experience of labour which fall to the category of delay factors related to contractor. To effectively and significantly minimize the delay incident in construction project, project team should emphasize in this risk of delay to ensure the project would not being delayed.

To address this issue, the project team should conduct proper planning, communication, resource allocation, risk analysis, monitoring and controlling to ensure that the progress of project is smoothly. By RPN method to identify and recognize the risk of delay sources, project team able to analyse the risk of delay sources and find out the alternative to remove or minimize the occurrence or impact of the delay sources. The findings of research could increase the awareness and contribute to the construction industry especially in Kuantan area. Prevention is always better than cure, a good analysis of risk of delay can help the organization and project team maximize the profit and minimize the losses that due to the delay occur in construction project.

REFERENCES

Abdullah A.A., Rahman H.A ., Z. Harun, Alashwal A.M. and Beksin , 2010. A bird's Eye View on Classification of Factors Influencing Project Success. *African Journal of Business Management.* **4**(19): 4174 – 4182.

Aibinu A.A. and Jagboro G.O. 2002. The Effects of Construction Delays on Project Delivery in Nigerian Construction Industry. *International Journal of Project Management*. **20**:593–599.

Alaghbari W.E., Razali M.A., Kadir, Azizah Salim, Ernawati. 2007. The Significant Factors Causing Delay of Building Construction Projects in Malaysia. *Engineering, Construction and Architectural Management.* **14**(2): 192 – 206.

Alberto D.M. and Muhammad J.T., November 2013. Risk Analysis in Construction Projects: A Practical Selection Methodology. *American Journal of Applied Sciences.* **11** (1): 74-84

Alwi S. and Hampson K.D. 2003.Identifying the Important Causes of Delays in Building Construction Project. *Proceedings of the 9th East Asia-Pacific Conference on Structural Engineering and Construction, Bali, Indonesia, pp.1 – 6.*

Ameh , John O. and Osegbo E.E., 2011, Study of Relationship between Time Overrun and Productivity on Construction Sites. *International Journal of Construction Supply Chain Management.* **1**(1):56 – 67.

Anbang Q. and Chen H. 2014. Research on China Construction Project Management Paradigms Change and Development in the Last 30 years. *Procedia - Social and Behavioral Sciences.* **119** : 321- 328.

Atkinson R. 1999. Project Management: Cost, Time and Quality, Two Best Guesses and a Phenomenon, It's Time to Accept Other Success Criteria. *International Journal of Project Management*, **17**(6): 337 – 342.

Aziz and Remon F. 2013. Ranking of Delay Factors in Construction Projects After Egyptian Revolution. *Alexandria Engineering Journal*. **52**(3): 387 – 406.

Bakouros Y. and Kelessidis V. 2000，INNOREGIO: Dissemination of Innovation and Knowledge Management Techniques. Technical Report. University of Thessaly. EC funded project 2000.

Banaitiene N. and Banaitis A. 2012. Risk Management in Construction Projects. *INTECH Open Access Publisher.* (online). Available : http://cdn.intechopen.com/pdfs-wm/38973.pdf (14 April 2015)

Barreiro, Lagares P., and Albandoz, J.P. (2001). Population and Sample. Sampling Techniques. Management Mathematics for European Schools MaMaEusch (994342-CP-1-2001-1-DECOMENIUS-C21.

Behm M. 2008. Rapporteur's Report, Construction Sector. *Journal of Safety Research 39*, 39(2): 175–178.

Chan A. 2001. Framework for Measuring Success of Construction Projects. Project Report. Queensland University of Technology: 2001-003-C-01

Construction Industry Development Board Malaysia (CIDB, 2015) is referred to as CIDB (2015).

Dashen, Monica and Fricker S. 2001. How Do People Interpret Open-Ended Categorical Questions? Proceedings of the Annual Meeting of the American Statistical Association.

Department of Statistics Malaysia (DOSM, 2014) is referred to as DOSM (2015).

Desai, Megha, and Bhatt R. 2013. Critical Causes of Delay in Residential Construction Projects: Case Study of Central Gujarat Region of India. *International Journal of Engineering Trends and Technology*. **4**(4): 762-768.

Devine C. 2015. Controversial VA Projects Waste Billions, Say Government Reports and Lawmakers. *Cable News Network.*

Djordjević B., Djukić S., 2008, The Impact of Downsizing on the Corporate Reputation, Economics and Organization**.** *Economic and Organization.* **5**(1): 51–62.

Emad E. 2009. Lecture Notes on Construction Project Management Ph.D., P.Eng., Mansoura University. Egypt.

Filho F., Britto D., Paranhos R., Rocha E. C. D., Batista M., Silva Jr. J.A.D., Santos M.L.W.D. & Marino J.G. 2013. When is Statistical Significance Not Significant? *Brazilian Political Science Review*. **7**(1): 31-55.

Gaur A.S. and Gaur S.S. 2009. Statistical Methods for Practice and Research. A guide to data analysis using SPSS 2nd ed. *SAGE Publications India Pvt Ltd.***1**(1):37–46

Haseeb M., Bibi A., and Rabbani W. 2011, Problems of Projects and Effects of Delays in The Construction Industry of Pakistan. *Australian Journal of Business and Management Research.* **1**(5):41 – 50.

Hsu, Chia-Chien, and Brain A.S., 2007. The Delphi Technique: Making Sense Of Consensus. *Practical Assessment, Research & Evaluation.* **12**(10): 1 – 8.

Hughes W. and Murdoch J. R., 2001, Roles in Construction Projects: Analysis and Terminology. *Construction Industry Publications, Birmingham*.**1**:71-76.

Kamal E.M. and Flanagan R. 2014. Key Characteristics of Rural Construction SMEs. *Journal of Construction in Developing Countries*. **19**(2): 1–13

Kerzner H.R. 2013. Project Management: A Systems Approach to Planning, Scheduling, and Controlling 11th ed. *John Wiley and Sons. Inc.***1***:*124-136

Khan, Ali R., Liew M.S. and Ghazali Z. 2014. Malaysian Construction Sector and Malaysia Vision 2020: Developed Nation Status. *Procedia-Social and Behavioral Sciences*. **109** :507-513.

Khodeir, Mohamed L. and Mohamed A.H.M. 2014. Identifying the Latest Risk Probabilities Affecting Construction Projects in Egypt According to Political and Economic Variables. *Housing and Building National Research Center (HBRC) Journal.***11**(1):129 - 135.

Lieber, R. L. 1990. Statistical Significance and Statistical Power in Hypothesis Testing. *Journal of Orthopaedic Research*. **8**(2):304-309.

Mahendra, Ankit P., Jayeshkumar R. P., Bhavsar J. J. 2013. A Study of Risk Management Techniques for Construction Projects in Developing Countries. *International Journal of Innovative Technology and Exploring Engineering (IJITEE).* **3**(5): 139 – 142.

Martin E. 2006, Survey Questionnaire Construction. Research Report Series. *Survey Methodology*. **13**.

Mazareanu and Valentin. P. 2007. Risk Management and analysis: Risk Assessment (Qualitative and Quantitative). Available at SSRN 1549186.

Memon A.H. 2014. Contractor Perspective on Time Overrun Factors in Malaysian Construction Projects. *International Journal of Science, Environment and Technology.* **3**(3): 1184 – 1192.

Ministry of Science, Technology and Innovation Malaysia (MOSTI, 2015) is referred to as MOSTI (2015). Mousa A.J. 2008. Risk Management in Construction Projects from Contractors And Owners" Perspectives. Diss. Master Thesis, Islamic University Of Gaza. Gaza.

Mugo F. W. 2002. *Sampling In Research* (online). Available: http://trochim.human.cornell.edu/tutorial/mugo/tutorial.htm (15 April 2015)

Murray K. 2008. Reputation — Managing the Single Greatest Risk Facing Business Today. *Journal of Communication Management*. **8**(2): 142 – 149

Nwachukwu, C. C. and Emoh F. I. 2011. Building Construction Project Management Success as a Critical Issue in Real Estate Development and Investment. *American Journal Of Social And Management Sciences.* **2**(1): 56 – 75.

Olawale, Yakubu, and Sun M. 2015. Construction project control in the UK: Current Practice, Existing Problems and Recommendations for Future Improvement. International Journal of Project Management. 33(3): 623-637.

Project Management Institute (PMI). 2000. A Guide to the Project Management Body of Knowledge (PMBOK Guide), 2000 ed. *Electronic Imaging Services* (online). Available: http://www.eiservices.com/ (13 April 2015)

Project Management Institute (PMI). 2006. Executive Guide to Project Management. Electronic Imaging Services (online). Available: http://www.pmi.org/~/media/PDF/Publications/PMIEXEC06.ashx (13 April 2015)

Ravisankar K.L., Kumar S.A., Krishnamoorthy V. 2014. Study on the Quantification of Delay Factors in Construction Industry. *International Journal of Emerging Technology and Advanced Engineering*. **4**(1): 105 – 133.

Razak A., Roy M.H., Zafar Ahmed, Ghaffar Imtiaz, 2010. An investigation of the status of the Malaysian construction industry. *Benchmarking: An International Journal.* **17**(2): 294 - 308.

Salunkhe A.A. and Patil R.S. 2014. Effect of Construction Delays on Project Time Overrun: Indian Scenario. *International Journal of Research in Engineering and Technology.* **3**(1): 543 – 547.

Sambasivan M. and Soon Y.W. 2006. Causes and Effects of Delays in Malaysian Construction Industry. *International Journal of Project Management*. **25** : 517–526.

Sanders, Douglas, and Eagles W.D. 2001. Delay, Disruption and Acceleration Claims. *Borden Ladner Gervais LLP*. **3**.

Stackpole S.C. 2013. A Project Manager's Book of Forms 2nd ed.: A Companion to the PMBOK Guide. *John Wiley and Sons. Inc*.

Taher E.F. and Pandey R.K. 2013. Study of Delay in Project Planning and Design Stage of Civil Engineering Projects. *International Journal of Engineering and Advanced Technology (IJEAT).* **2**(3): 456 – 461.

Tolmie A., Muijs D., and McAteer E. 2011. Quantitative Methods in Educational and Social Research Using SPSS2nd ed. *McGraw-Hill Education (UK*).

Wang Y. M., Chin K. S., Poon G. K.K. and Yang, J. B. 2009. Risk Evaluation in Failure Mode and Effects Analysis Using Fuzzy Weighted Geometric Mean. *Expert Systems with Applications.* 36(2):1195-1207.

Whelton M.G. 2004. The Development of Purpose in the Project Definition Phase of Construction Projects - Implications for Project Management. Doctoral dissertation, University of California, Berkeley

Zalk, David M. Spee T., Gillen M., Lentz T.J., Garrod A., Evans P. and Swuste P. 2011. Review of Qualitative Approaches for the Construction Industry: Designing a Risk Management Toolbox. *Occupational Safety and Health Research Institute.* **2**(2): 105 – 121.

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APPENDICES

Appendix A

Project Gantt Chart

TASK	MONTH										
	2	3	4	5	6	7	8	9	10	11	12
Discussed title, research objective and problem statement with supervisor											
Waiting faculty to approve the title, research objective and problem statement											
Faculty approval list released											
Meeting with supervisor to develop research proposal											
Check and revise on research proposal											
Meeting with supervisor to develop research methodology											

Check and revise on research methodology											
Final Year Project 1 presentation											
Revise on Final Year Project 1 research report											
Approach company											
Send questionnaire											
Data collection and analysis											
Meeting with supervisor to develop final report											
Check and revise on final report											
Final Year Project 2 presentation											
Final revise on research report											
Compile and submit report											

Appendix B

FACULTY OF INDUSTRY MANAGEMENT

Survey Questionnaire

Dear Sir/Madam:

First and foremost, thank you for participate in this survey. I would invite you to participate as a member of panel experts for this survey interview. This study intends to study the delay sources of construction project in Kuantan. I hope to successfully collect sufficient data to identify the value of the risk of delay sources in construction project in Kuantan. All the responses will be treated as strictly confidential and the respondents will remain anonymous. The result of this research will be submitted to the University Malaysia Pahang (UMP) in partial fulfilment of the degree in Project Management.

Thank you for your co-operation and the contribution to this study is highly appreciated.

Prepared by:

TAN KEAN WEI (PB12035)

BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

FACULTY OF INDUSTRY MANAGEMENT

UNIVERSITY MALAYSIA PAHANG

Tel: 017-3066141

Email: tankeanwei92@gmail.com

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENT

In this section, we would like to know about your personal information in general. After validation, your response will be kept anonymous and all panels will be treated with high level of confidentiality.

1. Personal information

   Name :_____

   _____

   Organization :_____

   _____

2. Age:

   ( ) Under 27 ( ) 28 – 35 ( ) 36 - 43

   ( ) 43 - 50 ( ) 50 and above

3. Gender:

   ( ) Male ( ) Female

4. What is your education background?

   ( ) STPM ( ) Diploma

   ( ) Degree ( ) Master

5. Position:

   ( ) Senior Manager ( ) Engineer

   ( ) Project Manager ( ) Supervisor

   ( ) Other (Please specify):_____

6. Working Experience:

   ( ) Less than 1 year ( ) 2 – 5 years ( ) 5 – 9 years

   ( ) 10 years and above

SECTION B: RANKING THE SCORE OF THE RISK OF DELAY SOURCES

In this section, we would like to figure out the factors (risk of delay sources) that delays the progress of construction project in Kuantan area. Please rank the score to the following risks of delay sources that occur in construction project.

- **Note** = addition information to add-on

- **Severity (S)** = Severity of potential effect of the risk.
  (1 = Very low or none, 5 = Very high)

- **Occurrence (O)** = Likelihood of the risk occur.
  (1 = Not Likely, 5 = Very Likely)

- **Detection (D)** = Likelihood of the detection of risk.
  (1 = Very High, 5 = Almost Impossible)

The following figure shows the generic five point scale for severity, occurrence and detection:

Table 1: The generic five point scale for Severity

Rating	Description	Criteria
1	Very low or None	Would not effect in overall progress
2	Low or Minor	Minor effect (within 1 week)
3	Moderate	Moderate effect (within 1 month)
4	High	High effect (within 3 month)
5	Very high	Significantly delay (over 3 month)

Table 2: The generic five point scale for Occurrence

Rating	Description	Criteria
1	Not Likely	Failure is unlikely
2	Low or Minor	Relatively few failures
3	Moderate	Occasional failures
4	High	Frequent failures
5	Very Likely	Persistent failures

Table 3: The generic five point scale for Detection.

Rating	Description	Criteria
1	Very High	Almost certain detection
2	High	High chance of detection
3	Moderate	Moderate chance of detection
4	Low	Very low chance of detection
5	Almost Impossible	No design control or no chance of detection

Table 4: Delay factors related to Contractor

Delay Sources Type	Risk of delay sources	Severity (S)	Occurrence (O)	Detection (D)	Note
Delay factors related to Contractor	Construction error and defective work				
	Insufficient of material				
	Insufficient of labour				
	Insufficient of equipment and tools				
	Late in delivery of materials				
	Poor site management				
	Poor coordination with others parties				
	Poor subcontractor’s skills				
	Poor skills and experience of labour				

Table 5: Delay factors related to Consultant

Delay Sources Type	Risk of delay sources	Severity (S)	Occurrence (O)	Detection (D)	Note
Delay factors related to Consultant	Ability of design with details drawing				
	Incomplete documentation				
	Lack of experience				
	Delayed in giving instruction and making decision				
	Completeness and timeliness of project details				
	Provision for ease of communication				
	Level of understanding owner requirement				

Table 6: Delay factors related to Owner/ Client

Delay Sources Type	Risk of delay sources	Severity (S)	Occurrence (O)	Detection (D)	Note
Delay factors related to Owner/ Client	Financial adjustment for project				
	Slow in decision making				
	Possible modification to initial drawing				
	Poor coordination within contractors				
	Contract modification (addition of new work and changes in specification)				

Table 7: Delay factors related to External Factors

Delay Sources Type	Risk of delay sources	Severity (S)	Occurrence (O)	Detection (D)	Note
Delay factors related to External Factors	Natural disasters				
	Unpredicted Climate				
	Changes in regulation and government policy				
	Poor economic condition (currency, inflation)				
	Delay in transportation of material				
	Lack of material, tools and equipment on market				

This survey is ended. Thanks for cooperation.