PROJECT PROCUREMENT METHOD: THE CONFLICTS IN CONSTRUCTION PROJECTS PROCURED UNDER DESIGN AND BUILD METHOD

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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 Bachelor of Project Management with Honors.

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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.

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DEDICATION

I would like to dedicated my thesis to

My Beloved Family

Father,

Mother,

Brother,

Grandmother,

Niece

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ABSTRACT

Design and build procurement method is one of the procurement methods where the contractor is responsible to carry out both the design and construction work of the project. Design and build contract give convenience to the client by combining project cost, schedule, design and quality into one single point of responsibility. Even though, design and build contract give many benefits to contractor and client but there are contractors and clients who still feel less excited with the benefits offered. The number of projects procured under design and build method are also decreasing in recent years. Therefore, this research purpose is to identify the conflicts in design and build construction project and propose the solution to overcome the conflicts in design and build contract. A research questionnaire was designed and distributed to 92 grade 7 contractors in Pahang state. The data obtained from respondents were analyzed using mean value analysis. The result of the survey indicated that five mostly occurred conflicts in design and build projects are variation order, delay in work activities, client delay (lack of payment), client lack interaction with contractor and time overrun or project delay. By referring to the literature review, contract form (Standard Form of Design and Build Contract – PWD Form DB (Rev.1/2010), Standard Form of Contract Be Used Where Drawings and Specifications Form Part of the Contract – PWD Form 203 (Rev. 1/2010) and Agreement and Conditions of PAM Contract 2006 with Quantities and interview with two experts from Perbadanan Kemajuan Negeri Pahang (PKNP) which are an engineer and an quantity surveyor, five solution flowcharts was proposed to overcome the five mostly occur conflicts in design and build projects. The result of this research will help the construction team, design team and client of design and build projects to systematically and effectively manage their conflicts and indirectly will help them in maintaining their good relationship. In the future study, it is proposed for the future researcher to increase the number of respondent by expanding the scope of study. When the scope of study is bigger, the researcher can know the various types of conflicts and propose a more accurate solution to overcome the conflicts.

ABSTRAK

Kaedah perolehan reka and bina adalah salah satu kaedah perolehan di mana kontraktor bertanggungjawab untuk melaksanakan kedua-dua kerja reka bentuk dan kerja pembinaan bagi sesebuah projek. Kontrak reka dan bina memberi kemudahan kepada klien dengan menggabungkan kos projek, jadual kerja, reka bentuk dan kualiti menjadi satu skop tanggungjawab. Walaupun kontrak reka dan bina menawarkan banyak faedah kepada kontraktor dan klien, masih ada kontraktor dan klien yang kurang berminat dengan manfaat yang ditawarkan dan bilangan projek yang menggunakan kontrak reka dan bina semakin berkurangan. Oleh sebab itu, kajian ini bertujuan untuk mengenalpasti konflik di dalam projek reka dan bina dan mencadangkan cara penyelesaian untuk mengatasi konflik di dalam projek reka dan bina. Satu soal selidik telah dibuat dan diedarkan kepada 92 firma kontraktor gred 7 di negeri Pahang. Kemudian, data yang diperolehi daripada responden dianalisis dengan menggunakan analisis nilai purata. Keputusan kaji selidik telah menunjukkan lima konflik yang paling kerap berlaku di dalam projek reka dan bina iaitu arahan perubahan kerja, kelambatan dalam aktiviti kerja, kelewatan klien dalam pembayaran, klien kurang berinteraksi dengan kontraktor dan kelambatan projek. Dengan merujuk kepada kajian literatur, borang kontrak (Borang Kontrak Reka dan Bina- Borang JKR DB (Rev.1 / 2010), Borang Kotrak JKR 203 (Rev. 1/2010) dan Perjanjian & Syarat Kontrak PAM 2006 dan temuduga 2 pakar dari Perbadanan Kemajuan Negeri Pahang (PKNP) iaitu Jurutera dan Juruukur Bahan, lima carta aliran untuk penyelesaian konflik telah dicadangkan bagi mengatasi lima konflik yang paling kerap berlaku di dalam projek reka dan bina. Hasil kajian ini dapat membantu pihak pembinaan, pihak reka bentuk dan klien dalam menyelesaikan konflik dengan cara yang bersistematik dan berkesan dan secara tidak langsung dapat mengekalkan hubungan yang baik antara pihak yang terlibat. Untuk kajian pada masa depan, penyelidik perlu meluaskan skop dengan meningkatkan jumlah responden. Apabila skop kajian semakin besar, penyelidik dapat mengetahui pelbagai jenis konflik dan mencadangkan penyelesaian yang lebih tepat untuk mengatasi konflik tersebut.

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LIST OF ABBREVIATIONS

CIDB	Construction Industry Development Board
DB	Design and Build
EOT	Extension of Time
JKR	Jabatan Kerja Raya
LAD	Liquidated and Ascertained Damages
MBAM	Master Builders Association Malaysia
PAM	Persatuan Arkitek Malaysia
PD	Project Director
PM	Project Manager
PWD	Public Work Deparment
QS	Quantity Suveyor
SO	Superintending Officer
SPSS	Statistical Package for Social Science
VO	Variation Order

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Construction is a process which thing is constructed. It involves the process of converted owner's idea or concept into physical structures and facilities. In addition, construction process included organization and management of all resources such as manpower, raw materials, machinery, method and money to complete the project within time and budget and should according to the standard of quality (Babatunda et al., 2010). The contractor and client are played important roles in construction process. Contractor is a group or individual that responsible to executed construction for client and while client is owner of the project.

The construction project should be perfectly and systematically managed in order to achieve the good quality of final product. One of the most important management in construction project is project procurement management. According to PMBOK (2008), project procurement is a process which client purchase goods or services from outsides the company. In construction management, procurement process is method whereby the client searching, finding and contracting contractor or someone with professional skill to perform the project.

Choosing the right project procurement method is important for project complete success of the project. Nowadays, there are several types of project procurement method for client to choose based on their own needs. According to

Building C. I. (2011), the construction procurement method can be classified into four types, which are traditional/conventional method, design and build method, management contracting and construction management.

Traditional/conventional method also known as separated and co-operative system. The main characteristic of traditional method is design and construction works are separate and will responsible by different firm. In this type of system, architect will full responsible for design work of the project and design will be done before tender process for contractor begins. Other than that, architect also will act as consultant of client in supervise the construction process and protect the interest of client (Masterman, 1992).

However, the main characteristic of design and build method is one organization/firm is responsible for both design and construction work. Therefore, there have only one main contract between the client and main contractor for use as reference. This system seems to be popular in construction industry in nowadays because provide shorten project completion duration, high quality of end product and can early know about the project cost. Because contractor responsible for all aspect in project, therefore it convenience for client to estimate their total cost of the project. Design and build method also known as integrated procurement system (Masterman, 1992).

Management contracting method and construction method can be categorized into management-oriented procurement system. The entire process of this system will be managed by contracted consultant. Normally, consultants will performed their function or responsibility under the supervision of client. The consultants will manage the overall process of the project by focus on the construction aspects (Masterman, 1992).

1.2 PROBLEM BACKGROUND

The nature of construction industry has changed greatly in recent years because construction project become more complex and more emphasize on management and technical skills. Other than that, project's client also request for shorter project delivery

time and request contractor to early show the total project cost at the initial stage of project. According to Rashid K. A. (2002), in Malaysia, the traditional procurement system is most frequently used because it allow fixed price in complex construction and architect have full responsible in design work. But the implemented of traditional procurement method was found not suitable to current demands; traditional procurements method required more time to complete the project and also encourage adversary between stakeholders. This situation led to increase in the use of design and build method (Yusof A, 2006). By using the design and build method, the conflict associated to traditional procurement method can be solved. For example, design and build method can use to overcome the fact that different parties are responsible to different works which is design work and construction work.

Nowadays in Malaysia, design and build method become an alternative method to traditional procurement method either in public sector or private sector. Design and build method give the better performance when compared to others contract and procurements methods. According to Yusof A. (2006), design and build method is beneficial to all stakeholders such as project's client, contractors, architects and engineers. By using the design and build method, design work and construction work could be performed by one company at the same time. Therefore, client need only have a single agreement with one contractor who agree to performe both design and construction work.

According to Yusof A., (2006), project's client interest to design and build method because it provides a single source of responsibility. Client no need liabe for defect that caused by error in design or construction work. The contractor have single responsibility toward defects of error and contruction work. Other than that, contractor also need to responsible for any additional cost that associated to defective or inadequate plans by contractor. In addition, the design and build method may result in lower the total project cost because contractor have high control over in the project.

According to Majid M. A. (2007), athough design and build method bring many benefit to client but it also have some drawbacks. The final product may not satisfied the client needs and specifications performance because client have limited in the input

of detailed design. In addition, client also have less control toward the construction work and the cost of any variation orders required (Malconlaw, 2014). Futhermore, the design and build contract have a very costly tender process. It is difficult for client to make decision or comparison of prices between the contractors because their design is differ. When the detailed checking of design and specification is needed, the long-term cost of tender process will increased because client need person who have expertise and professional skill to check the project cost and design criteria.

1.3 PROBLEM STATEMENT

The design and build contract is a substitute to the traditional procurement method because successful design and build contract can add value to the project and bring many benefits to the client. Design and build contract give convenient to the client by combine project cost, schedule, design and quality into one single point of responsibilities. By using the design and build contract, it can improved the project quality because contractor will engage with design team to achieved the client requirement.

Some clients and contractor are less excited with the benefits offer by design and build contract because if compare to traditional method, clients have less control and influence to the design matters and inflexibility in makes change. While, contractor need to responsible for both design and construction of the project as different to traditional method which the client will assign different parties such as architect to performed design work. In addition, the number of projects procured under design and build method decreasing from March 2012 to March 2014, CIDB (2014).

When the clients have less control and influence in their project, they may unsatisfy with the finished product. High risk will more on the contractor when clients more demand on design work. Other than that, if the contractor need to responsible for both design and construction work they need to liability to all risk resulting from design and construction work in order to complete the project. It is very different to traditional method, which risk from design work will liability by architect.

Investigating and finding the problem in project procured under design and build method may attract the contractors and clients to use the design and build method in their project. Contractors and client may more interested with the benefits offer by design and build contract compare to traditional method when have the solution to overcome the conflict. Therefore, this research is proposed to investigate the conflict of design and build method and propose the solution to overcome the conflict.

1.4 RESEARCH OBJECTIVE

Research Objective 1: To identify the conflicts in design and build construction projects.

Research Objective 2: To propose the solution to overcome the conflict in design and build construction projects.

1.5 RESEARCH QUESTION

Research Question 1: What are the ranking of each conflict in design and build construction projects?

Research Question 2: How to overcome the conflicts in design and build construction projects?

1.6 PROJECT SCOPE

This study will focus on the construction company in one of the east coast state in Malaysia which is Pahang. The company should be the construction company that registered as contractor Grade 7 with Construction Industry Development Board (CIDB). According to CIDB (2013), contractor Grade 7 is a private limited company (Sdn Bhd) or limited company (Syarikat Berhad) that has paid up capital about RM750, 000.00 or sole proprietorship/partnership in the form of bank statement for last 3 month that have capital accumulation about RM750, 000.00. In addition, cost of work/tender for contractor Grade 7 should more than RM10, 000,001.00. The technical personnel of

contractor Grade 7 should has construction personnel registration card that still valid and should either have 2 degree holders technical personnel or 1 degree holder and 1 diploma holder technical personnel. The respondents should be the company director, project manager, engineer, architect or quantity surveyor of the company.

1.7 SIGNIFICANCE OF STUDY

The major purpose of this research is gain more knowledge about design and build method in project procurement management. Besides that, this research also uses to know the ranking of each conflict in design and build construction projects because nowadays many problems occur in project procurements system of construction project. This research can help the parties involve such as contractor, client, design team and construction team in determine the conflicts that frequently occurs in design build construction projects.

By having the solution to overcome the conflicts in design and build construction project. It can help the parties involved such as contractor, client, design team and construction team in confidently faced with the conflict and can systematically and effectively manage their conflict. Indirectly, they also can maintain a good relationship between parties involved. Furthermore, this research can use as guideline for construction company in future improvement and manage the conflict systematically.

1.8 OPERATIONAL DEFINITION

1.8.1 Procurement

Procurement is a process of purchasing goods or services from outside companies. The organization can be either seller or buyer of the product and services (PMBOK, 2008).

1.8.2 Design and build method

Design and build method is a project procurement method which contractor are responsible for both design work and construction work. Client can directly deals with the contractor for the complete of building.

1.8.3 Conflict

Conflict is an expressed struggle or disagreement of people or group in the project. Normally, conflict will occur within two or more parties that have different level or position and believed there is a threat to their interest, need and concern.

1.9 EXPECTED RESULT

1.9.1 Expected Result for Objective 1

After identify and rank the conflicts in design and build construction projects, the construction company can easily determine the conflicts that may occur between the parties' involve in design build construction projects. For instance, time issue, administrative issue, technical issues, resources issue, cost issue and others. It will be presented in ranking table.

1.9.2 Expected Result for Objective 2

By propose solution to overcome conflict in design and build construction project, the construction company can systematically and effectively manage their conflicts that frequently occurs and indirectly can help the parties involves in maintain a good relationship. The conflict's solution will be proposed in form of solution process flow.

1.10 CONCLUSION

In Chapter 1 Introduction, all basic information about the research title was discussed. In this chapter, problem statement and research questions are carried out to generate the research objectives. Research scope, significance of study and expected result also was discussed. In the next chapter which is Chapter 2 Literature Review, all information related to research title will be discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter 2 explained about the relevant literature that had related to the research title. Therefore, the elaboration about the research title will be clearly defined. The literature review will focused on the contract, procurement, contract and procurement method and the common conflicts in design and build construction projects.

2.2 PROCUREMENT

Procurement can be describe as the process of purchasing good or services from an outside the organization (Schwalbe K., 2013). Usually, term procurement will use in government sector; while, private sector will use term purchasing or outsourcing to describe the action buying product or services. Schwalbe K. (2013) stated the person or organizations that provide procurement service is such as contractors, subcontractors, sellers, suppliers, vendors and others. The contractors, subcontractors, sellers, suppliers and vendors are usually will provide product and services or work for person called client (owner of project).

In the construction project, procurement process is representing the effort of client in obtaining efficient construction product and services (Charvat W. C., 2000).

Clients are motivated to implement the procurement process when they do not have enough resources or expertise to implement the project. Usually, architect are selected to provide advice regarding the procurement method of the project, identify the procurement method risk, cost and time. But in reality, the competitors in the construction procurement market argue that architect is not suitable for procurements work (Charvat W. C., 2000). According to Ashworth A. (2013), initially, in order to construct a project, client will invariably commission a designer and normally an architect will responsible for architecture work and civil engineer will responsible for civil work. Besides these two important parties, there have one more party that will influence the successful of project, which is quantity surveyor. Usually, Quantity surveyor will responsible to the contract and procurement work which they will prepare estimation of budget, tender documents and contract document.

According to Building C. I. (2011), procurement can consider as the process of identification, selection and accreditation of the contributions required for the execution phase of the project. Different organization has different alternative method of procurement process to reflect the appropriate contribution. But the several of procurement method mean the different allocation of risk and responsibility to achieve the project's goals. In order to select the best method for project procurement process, it should consider the characteristic of the project, and the project and client requirement.

Procurement process is an important process/procedure to every project. This is because every project is depending on the purchasing of raw materials and machinery in order to execute the project (El-Reedy M., 2011). In order to achieve specific objective and goals of the project, it is necessary to prepare systematic process in order to create relation with external suppliers. In addition, execution phase of the project can be effective with the early define the purchasing strategies as well as the characteristics of the contract and determine the systematic way to monitor and tracking the procurement process. Besides that, it is also necessary to consider the quality of the product and services provided by the suppliers.

2.2.1 Procurement Process

According to Charvat W. C. (2011), the scope of procurement work will be affect by the contract types, the numbers of contract, the duration to awards the contract and the use of fast-tracking system. Charvat W. C. stated there have five basic steps that involved in the construction procurement process, which are:

(i) Plan procurement

In this step, the preparation for bidding and negotiation will start. It includes the decision in selecting the project procurement method and determining the structure, award system, payment system and duration of the contract. In addition, this step also will involve the make or buy decision, make or buy decision is making decision whether the work is implement in-house or outsourcing.

(ii) Identify the pre-qualification sellers

Identify and prepare pre-qualification sellers list based on selection criteria such as company's reputation, financial flow, skill and knowledge, performance's quality and company's experiences. Evaluate the sellers by based on the selection criteria can help the project to meet the appropriate standard.

(iii) Prepare bidding documents

Bidding documents should be prepared based on the client's requirement such as types of contract and the characteristics of the sellers. The bidding document will include the details information about the project and define the term and condition that include in the contract, advertisement for sellers, instruction to the seller, contract/agreement form, drawing, specifications and others.

(iv) Receipt of Bids

The construction procurement often using open tendering, close tendering and negotiate tendering in order to select the potential sellers. Observing the proper protocol is essential to prevent bid protest. The selection decision is based on decision of the project's client and normally will assists by project manager or architect.

(v) Award the contract

Contract will award to the sellers that win the bids. Procurement consultant such as quantity surveyor, project manager and architect will prepare the documents for any modification and change in the contract. The project's client and sellers should sign the contract as agreement.

2.3 PROCUREMENT METHOD

According to Ashworth A. (2013), the procurement process is the one of the elements that helping the successful of construction project. Each construction project has own variables in order to determine the choice of procurement method. The selected procurement method should provide the most advantageous for project and client. It also needed to ensure that the selected procurement will performed the project on time, on budget and on the require specification. Other than that, in order to choose the appropriate procurement method, there have some matters that need to consider such as bidding document, bidding procedure, seller's bid evaluation criteria, the risk level for both client and contractor, solution for the risk, contract types and payment system (Sutt J., 2011).

According to Building C. I. (2011), the construction procurement method can be classified into four types, which are traditional/conventional method, design and build method, management contracting and construction management. Not all method is the best because each method has their own advantages and limitation. Each method has brought different level of risk to the construction project. Therefore, the selection of procurement method should consider all aspect require by project and project team.

2.3.1 Traditional / Conventional Procurement Method

Traditional procurement method has been used for at least past 150 years by project's client of the construction industry (Squires B. G., 2011). According to Sutt J. (2011), in the traditional procurement method, the client will enter into the contracts separately with architect and contractor. The architect will responsible for design work, while contractor will responsible for construction work. The traditional procurement method has been identified as the slowest delivery method due to their sequential approach. By using the traditional method, the project design phase should finish before the constructions phase of the project begin. Since the pre-contract phase of this method is longer, the project's client and project team have more time to review and correct the project design before construction is start.

Traditional procurement method provides more price certainty to the client at the every phase of the project. It can reduce any design and construction uncertainty which often causes the contractor to unnecessary increase the project cost. Cost of project will be more lower when use the bill of quantities to bid the tender. According to Building C. I. (2011), usually the contractor will be paid based on fixed price or by lump sum price of the project and work for within the time period for lump sum payment. In terms of quality, traditional procurement method also provides high level of quality and functional certainty. This is because the method gives the client opportunity to integrate the parties that have expertise for working together such as best architect and best contractor.

According to Peter D. et al (2008) and Sutt J. (2011), the advantage of the traditional procurement method is the project's client is able to have full influences toward the overall process of the project. This action can increase the quality and functionality of the project. Other than that, best quality of project is guarantee when the building contract attached with the bill of qualities and project specification. Traditional procurement method is easy to develop the project and arrange, manage and evaluate the effect of change and reduce the number of contract conflict. In addition, it having balanced allocation of risk between project's client and contractor compare to design

and build method. It also known as tried procurement method because it have been tested in the long term period and is a very familiar procurement method.

Meanwhile the disadvantages of using traditional procurement method are it can lead to the contract conflict about the defects whether the defects are in design or defects are in materials and labour, this is due to separation between design and construction work. In addition, the overall duration of the project may longer than other project procured under others procurement method because the process or traditional method is sequential. Besides that, project's client can't tender a specific contractor until the project's design is finalized and can cause the time consuming and project duration longer (Peter D. et al., (2008) and Steven Y. (2011)).

2.3.2 Design and Build Procurement Method

Design and build procurement method is a one of procurement methods which contractor is responsible to carry out both design and construction work of the project (Ogunsanmi O. E. et al, 2011). Due to unsatisfied with traditional procurement, many project's client now are choosing design and build method for their procurement process because project completion time is fast, can reduce project cost and single responsibility roles. In addition, contractors are interest to design and build procurement because it allows them to use the relationship with project's client to get more percentage of construction prices. Furthermore, design and build procurement is flexibility in term of money such as profit.

According to Peter D. et al (2008), in design and build procurement, contractors are responsible for some or all of the design work. As a single organization responsible for design and construction work, the contractors are able to control time and the overall of the project's design. In the design and build procurement, level of design liability should be clearly stated. Usually, the liability of the design is incurred under the contractor, unless was stated in the clause of contract. The design and build procurement also known as fast tracking method (Thomas J. et al, 2005). Design and build procurement is consider as fast tracking method because project delivery system are integrated between design work and construction work. The close integration

between both activities and overlap of both activities ensure the quicker of project implementation.

Design and build procurement provides certainty on the contract sum and benefit in term of cost. Normally, price for design and build method are fixed at the tender stage and changes are not allowable, unless instructed by client. Project's cost can save if the contractors are expertise and experience to design and construction work. In term of quality, the quality of project will good when the contractor utilizes their expertise and experience to develop more effective and efficiency project control system. It also allow contractor to be innovative in improve the project process and technique used. Sometimes, the quality of project procure under design and build project are not good because lack or manage and control of client due to client lose their influence in the design work and construction work.

2.3.3 Management Contracting Method

According to Jeremy G. (2014), the management contracting method is one of the procurement methods where the contractors are contract to carry out the work through work contractors position and at the same time contractually responsible as management contractor. Normally, project's client will engaged with management contractor in order to manage the early phase of the project because management contractor usually is an expertise and experience contractor. Management contracting method is an effective method for client to maintain control toward design work while seeking on the experience of construction specialist. Nowadays, this method becomes more popular in some areas and popular on the mega project.

According to Consult R. (2014), the design work in management contracting project will responsible by consultant of the project's client. Otherwise, management contractor is responsible for defining work packages and determine the systematic procedure to carry out the work package. Usually, management contractor are not contract to undertake the construction work but manage the process of the work. Therefore, all the construction work will contract to subcontractors and directly contract under management contractor. The roles of project's client on this types of method is

approve the terms and condition in the work packages before subcontracted to subcontractors.

Normally, the management contractor will make the written document which includes the management fee and will elected after have interview session with project's client and their project team (Peter D. et al, 2008). The management fee will include total management services, which expressed in the percentage of the total project cost. The management contractor will implement the work based on the cost plan which prepare by quantity surveyor, project drawing by architect and project specification as required by project client. Mostly, risk will be incurred by project client because there have uncertainty about project cost and work. In addition, this type of method usually lump sum contract with bill of quantities.

According to Consult R. (2014), the advantages of the management contracting method; First, Suitable for fast-track and complex project where less information about design work has at the beginning of the project. Besides that, the quality of design work can be control by design team because contractor will not responsible for design work as design and build method. Management contracting method is beneficial to client because changes to project scope are allowable. This method also has high certainty on project cost because preliminaries and management fee can be fixed.

While, the disadvantages of using management contracting method are low risk strategy for management contractor as management contractor has little responsibility on the contractor mistake; usually, client with incurred highest risk. Other than that, project's cost can be increase in the large amount and probability for initial cost plan increase is high (Consult R., 2014).

2.3.4 Construction Management Procurement

Construction management procurement is a method where the management contractors (construction manager) responsible to implement the work through trade contractors. Although the trade contractors are manage and control by management contractor but actually they are have contract relationship with project's client and be a

client's risk (Consult R., 2014). The completion of the contract is not guarantee because the management contractor just acts like agent. The roles and responsibilities of the management manager are supervised and control the project. The management manager will pay a fee to covers the cost of staff and overheads (Building C. I., 2011). This method will very effective if responsive by client which have quick decision making skill.

According to Consult R. (2014) and Steven Y. (2011), the advantages of using construction management procurement are project's client has more influence on the project through employment of management contractor and trade contractors. Client also has good control in cost and budgetary of the project. Because of this method fully integrated design and construction work. Therefore, it is suitable for fast-track project which work are allow to be implemented before the design is finished. In addition, it is flexible in the project changes, the client can make changes to design elements if have any problem. Besides that, project's client has high flexibility in evaluate and choosing potential sellers or contractors. Therefore, quality of the end product is guarantee. This method also provides smoother project progress because potential for claims is less.

Although construction management procurement has many advantages but according to Consult R. (2014) and Steven Y. (2011), this method also has some drawback which is this method usually required the project's client that has expertise and related experience to manage the procurement process. The project client needs to responsible for risk of non-performance of the trade contractors because trade contractors have contract relationship with project's client. Besides that, it has uncertainty to the completion date of the project because no single contractor that agreed on the completion date.

2.4 DESIGN AND BUILD METHOD

In Malaysia, design and build method is a substitution or alternative method to conventional procurement method, especially in public sector (Yusof A., 2006). This is because client dissatisfied with the project delivery performance of conventional

method and lead to using the design and build method which can save more time and based on fixed price lump sum tender. In Malaysia, the history of design and build method began in 1983 when Malaysia Prime Minister on that time launched first design and build system in the Public Works Department. The first project responsible by this unit was the Kuala Terengganu Hospital (Yusof A., 2006) and nowadays design and build method has become a popular procurement method in construction industry either public sector or private sectors in Malaysia. According to (Yusof A. (2006), large mega projects in Malaysia such as Twin Petronas Tower, Kuala Lumpur International Airport, Malaysia North South Highway, Penang Bridge and others was adopting the design and build procurement method.

According to Yusof A. (2006), the term "design and build" can be define as procurement method which required the contractor to carry out the work; the design works and construction work. Therefore, the design and build procurement is single entity which normally contractor will responsibility for the whole design phase and construction phase of the construction project. MABM (2012) supported that application of design and build method was originally driven by employers who wish to have a project procurement method with single responsibility, which contractor responsible not only for construction work but also include the design aspects.

Design and build method also can define as contract which one contracting company takes sole responsibility and usually is based on lump sum fixed price basis. This method normally contains three main elements which are contractor responsibility for design and construction, payment for contractor are based on fixed price lump sum and project should design and build to meet the client's satisfaction (Masterman, 1992). According to Building C. I. (2011), design and build procurement is a process where client will deals directly with the contractor to complete the project. Therefore, client no need deals with design team because design team only have engagement with contractor and not the client.

Therefore, it can summarised that design and build method provides the sole responsibility for both design and construction. By using this method, contractor has

power to control whole the projects process. However, requirements or demand of client still been taken into consideration. Client still has power in making changes to the project but they should know the total financial commitment at the early stage of the project. Because design and build method is no provision for bill of quantities; therefore, effective procedure for evaluating any changes on the project cost should be carried out on the early stage and include in the contract.

2.4.1 Design and Build Method Structure / Contractual Relationship

According to MBAM (2012), design and build method is process integrating and managing the design and construction team which is the contractor of the project. Contractor is person who directly deals with client in order to meet client's requirements by using their own design and construction technique and normally this approach is more effective and efficient.

In design and build method, contractor will directly responsible to the client but the project design team such as architect, engineer, quantity surveyor and others will directly engage and have contractual relationship with the contractor. According to MBAM (2012), the client also may have contractual relationship with their own professional consultant or representative, which usually known as employer's representative. Other than that, the client may engage with preliminary design team to prepare the tender document for choosing appropriate design and build contractor for the project. This procurement usually only used by clients who have expertise in design and build system and contractor who has experience and expertise in managing the design and build process. In addition, design and build contractor should have confident in managing all processes such as planning and administrating, as well as handling whole project team such as design team, sub-contractors and suppliers. Usually, the design and build contractor has better financial and more experience in managing multiple resources compared to conventional contractors.

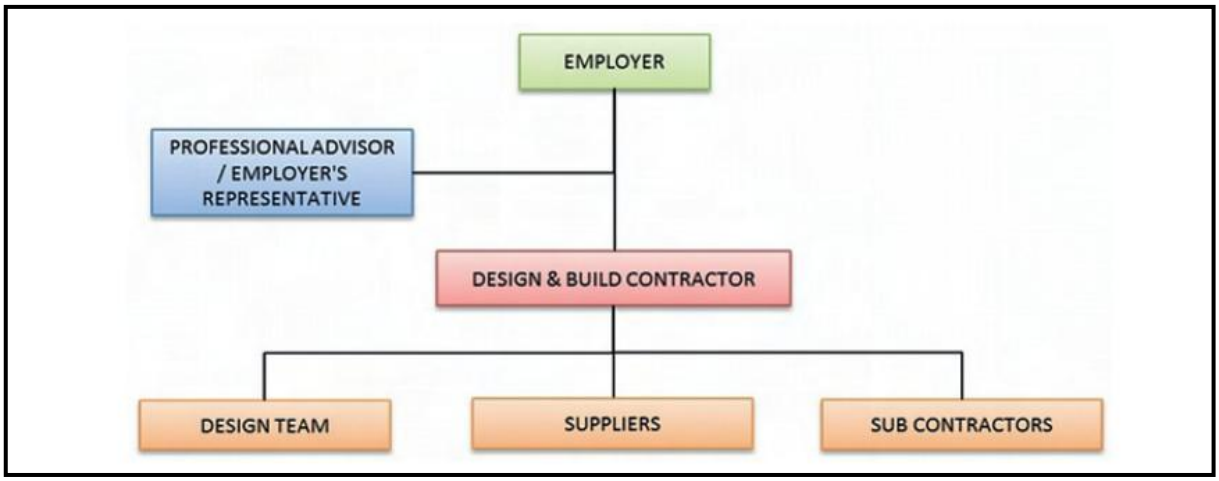

Figure 2.1: Design and Build Structure / Contractual Relationship

Source: MBAM (2012)

According to Yusof A. (2006), design and build method can structured in one of two ways which are: first, the client employ a dedicate design and build organization with its own in house design team. Second, the client will contract with general contractor who will engage with external design team for the duration of the project. The Figure 2.2 shows the organization and management structure of design and build method.

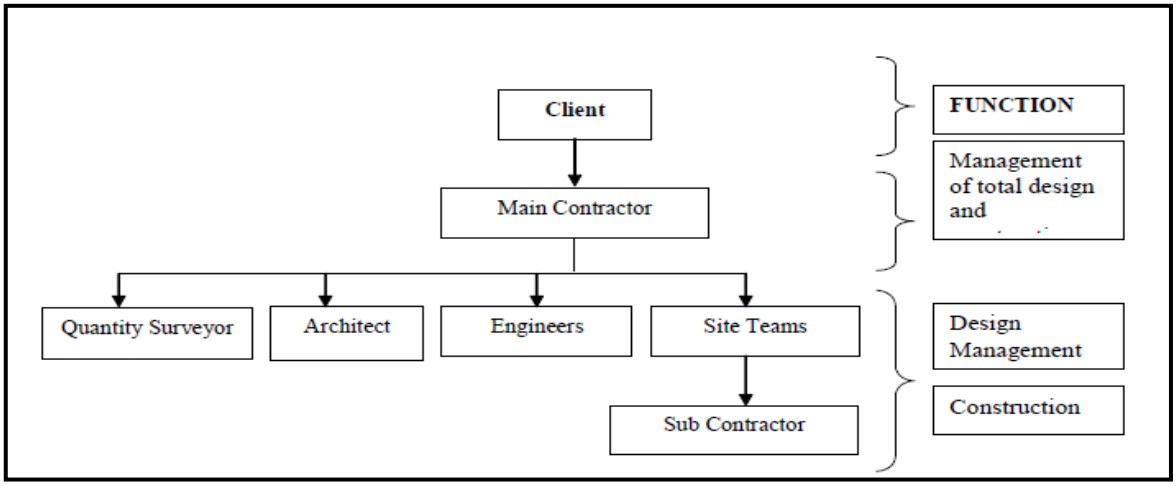

Figure 2.2: Organizations and Management Structure of Design and Build Method

Source: Yusof A. (2006)

2.4.2 Design and Build Framework and Operation

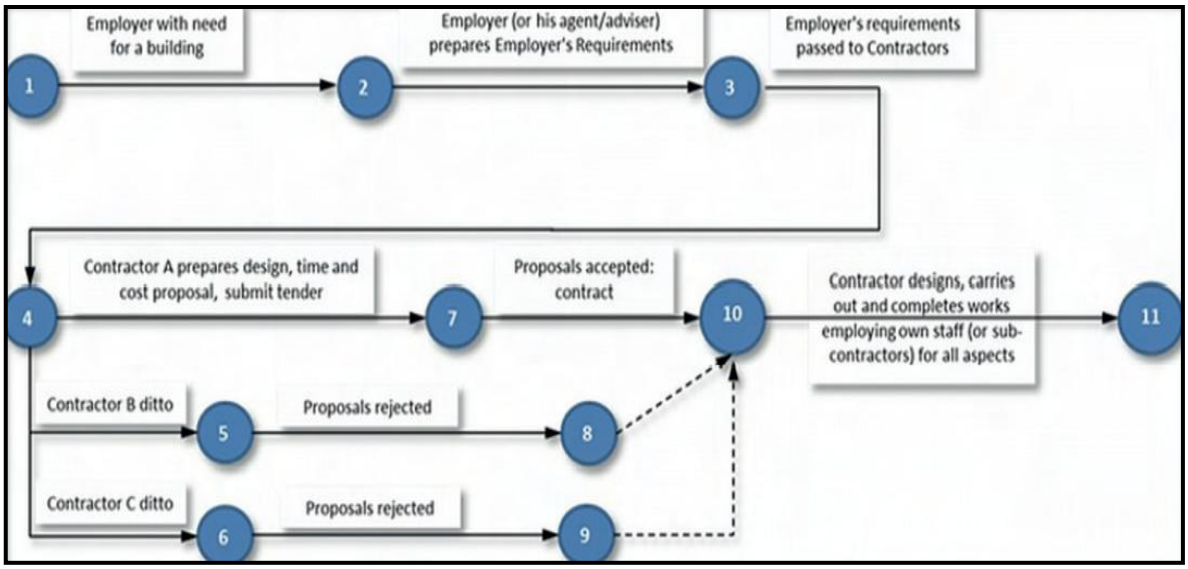

Figure 2.3: Design and Build Method Framework and Operation

Source: Frank J. (1984)

According to Frank J. (1984), there have 11 steps in the design and build framework and operation based on Figure 2.3 Design and Build Method Framework and Operation.

1. Step 1 to Step 2

   Client will identify their requirement on the project.

2. Step 2 to Step 3

   Client will assign their own representative and usually is a consultant firm, who then will help client formulating the requirement and documenting their objective and requirement. Requirement document will include purpose, scope, design concept, specification of the project. The requirements document of the client will be the basis for tender documents for tendering by selected contractors.

3. Step 4 to Step 7

   The tendering contractor will select their own design and construction teams, prepare and establish preliminary design, specification, time and cost proposal based on the client's requirement and submit the tender.

4. Step 5 to Step 10

   The contractor's proposal will assess and evaluate by client's representative. The unsuccessful proposal will be rejected and accepted proposal will awarded the project.

5. Step 10 to Step 11

   The successful contractor will proceed with prepare detailed drawing and gathered all resources to proceed the construction works with their own project personnel, sub-contractors, suppliers and others.

2.4.3 Advantages of Design and Build Method

According Yusof A. (2006) and MBAM (2012), design and build method have several advantages such as:

I. Single Point Responsibility

   Design and build method provide single point responsibility to contractor in design and construction work of the project. Therefore, contractual relationship between client and contractor should be carried out without any mediating consultants. Unlike the traditional procurement which design team is responsible for the design work to the client, design and build method is liable for design, although some design and build contractor will assign design team from outside the company.

II. Effective Communication

   The ability of design and build method in integrate all process and project team was create open communication and produce effective communication. Direct communication between contractor and client was creating a systematic communication line and allow contactor in faster respond to client's requirements. The communication between contractor and client

will start at the beginning of project and become closely during the process stage. Therefore, design and build contract allow contractor interact with client more often than traditional procurement.

III. Time Saving

The ability of integration between the design and construction processes also make the project which procured under design and build method have shorter overall project period than traditional procurement.

IV. Project Cost Certainty

Design and build method provide client a better chance to obtaining project complete within the budget. Normally, private sectors have used the design and build method because of financial factor. Sometime, design and build method is sense that "time is money" because project can finished faster and save the money. Design and build method provide high certainty in final cost because it used on lump sum basis and have limitation to changes or variations. Changes are allowable only with instruction from client and should depend on accuracy and clarity.

2.4.4 Disadvantages of Design and Build Method

According MBAM (2012), although design and build method have many advantages but it also have some limitation, which are

I. High Tendering Cost

The tendering process of design and build method are more costly than other procurement method especially traditional method. This is because in traditional method, the contractor only tender based on the design, bill of quantity and specification provided by client. While in design and build method, contractor need to prepare proposal which include the design, specifications, contract sum analysis and client's requirement.

II. Inaccurate Information

Inaccurate information about the land or environment provided by client may cause dispute when contractor rely on the inaccurate information to prepare the project's design. Therefore, contractor can't fully rely on the information provided by client unless there have warranty that the information is accurate.

III. Contractor Has High Risk

Because contractor has single point of responsibility, therefore any risk related to design and construction phase will responsible by contractor. In term of design, contractor not only responsible to establish the design based on the client's requirement but they also must guarantee that the design is fit with the intended purpose.

IV. Drawing Approval Difficulty

Design or drawing is one of the most important elements in design and build contract. But to get the drawing approval from client is not easy; it required passing some process such as verification, checking, commenting and approval from client representative or sometimes independent consultant assign by client.

2.5 CONFLICT

According to Muhkerjee K. (2009), conflict is a process which two parties perceived that their interests are being restrained by the others or believed that other parties will give the negative impact to them. Usually, disagreement between two individuals or parties can bring the conflicts to the project. Conflict can be arise due to economic; the limited amount of resources such as labours, raw materials, equipments and modal can cause the conflict between parties involved. Conflict also will may occurs due to different belief and value between the parties, every people have their own value and principles, and it not easy makes all people have same ideologies with us. Power also is one of the factors that lead the project to have conflict, conflict may occurs when the parties involved try to maximize their influences to others. Muhkerjee

K. (2009) stated the common factor that usually lead the conflict to occur is two or more parties that involve in the project doesn't taking into account about the common objective that made together.

Conflict also can define as expression or action resulting from the incompatible or resists the needs of individual. Usually, the action is between two or more parties who have incompatible objective, limited resources and believed that others people will hinder them from achieved the project objective (Dada M. O., 2012). According to Li et al. (2012), the possibility of conflict occurs on private projects is come from the incompatible of perception and expectations between the stakeholders. Every stakeholder has their own perspective and perception and sometimes will different between each others. Hamilton P. (2007) stated conflict can be act as positive driver for social changes and give the positive respond to change. But usually conflict will give negative impact to construction industry. When conflict occurs, the progression of work may interrupt.

2.5.1 Category of Conflict

Conflict usually will bring the negative impact to the project as well as the organization. But Muhkerjee K. (2009) state that conflict is not necessary to bring negative impact to project or organization only but it also can bring the positive outcome to the project and organization too. Therefore, conflict can be categorized into two main categories which are:

(i) Functional conflict

Functional conflict is conflict that help project or organization to achieve the goals or objective. According to Muhkerjee K. (2009), functional conflict can be define as conflict that help project or organization gained more details information on the problem occur and create new and innovative ideas. Other than that, functional conflict is conflicts which support the objective of the project or the organization and help in improve the project performance. Functional conflict drive the project to have productive result and lead to change and innovative in project.

Functional conflicts bring a valuable outcome to the project but functional conflict still need to properly manage (Whitfield J. 2012). By allowing the functional conflict assists in project, projects are in risk of it conflict will turn into dysfunctional conflict. It's risky but very worth if the functional conflict successful.

(ii) Dysfunctional Conflict

Dysfunctional conflict is conflicts that prevent the performance of the project or organization from achieved the project goals and will drive to disruptive behaviour (Muhkerjee K., 2009). This type of conflict brings the negative influence to the project as well as the organization and should stop or avoid at any cost.

According to Whitfield J. (2012), this conflict usually will block the progress of the project, disrupt achievement and reduce the probability of successful. This type of conflict is unbeneficial; therefore, it is important to have systematic managing and controlling. To categorized the conflict into the functional and dysfunctional is difficult and very few people can properly categorized it; therefore, Whitfield J. (2012) suggest to manage every conflict whether is functional or dysfunctional carefully and systematically and can't simply forecast the outcome of the conflict at the early stage of project.

2.6 CONFLICTS ASSOCIATED WITH DESIGN AND BUILD PROCUREMENT

A conflict is a challenge and obstacles in the construction industry. One of the issues that usually influence the performance of construction project is conflict in the procurement process. In recent years, design and build procurement method is one of the system that use to overcome the weakness of the traditional procurement method (Edmond W. M. et al, 2005). Now, many clients are not dissatisfied with the traditional procurement method because of ineffectiveness of the method. Design and build

procurement method offers benefits to construction project but no single procurement method that perfect and doesn't have any conflict; therefore, no exception for design and build procurement.

According to research of Dada M. O. (2012), the conflict associate with design and build procurement can be categorize into four issues, which are administrative issue, resources for project execution, personality issues and technical issues. Administrative of the procurement process have to do with the administration of the project. Administrative process include the structure and established a systematic procedure for execute the project (Dada M. O. (2013). Conflicts may occur when what plan in the administrative process not align with the actual performance f the project.

According to Dada M. O. (2013), technical issues and performance trade-offs also one of the conflicts in design and build procurement. Technical issues have to do with the core professional and should regard to the project implementation. Conflict may occur when the contractor doesn't have expertise or enough resources about technology in the construction work. While, personality issues should be done with the interpersonal or group relationship. Personal issues are conflict that related to individual and relationship of individual with others people. Misunderstanding is one of the conflicts that usually occurs in design and build project. For the last issues, resources for project execution; resources of project include modal, labour, equipments, raw materials and others that required for project execution. Conflict may occurs when the project's resources is not adequate for implement the project.

According to the research of Hamimah A. et al. (2008), conflict of project procured under design and build method can identified into seven types which are time overrun, over budget, project delay caused by the owner or the government, overlapping in roles and responsibilities of project team, unclear instruction cause the difficulty in following the instruction, lack of client's brief, conflict in term of interest and variation order or changes in design work. Therefore, this conflict can be categorized into six issues as shown in Table 2.1 Conflict Associated with Design and Build Method.

Table 2.1: Conflict Associated with Design and Build Method 1

Conflict Issues	Types of conflict
1. Time issue	• Time overrun
2. Cost issue	• Over budget
3. Client issues	• Lack of client's brief
4. Administration issues	• Variation order / changes in design work • Overlapping in roles
5. Personal issues	• Conflict of interest • Difficulty in following instruction
6. Rules and Regulation issues	• Delay caused by government

Source: Hamimah A. et al. (2008)

Whereas Edmond W. M. et al. (2003) categorized the problem in design and build project into four viewpoints which are viewpoint of client, contractor, consultant and other consideration. Although implement design and build procurement can cause the conflict but it still can be one of the most effective procurement method if have appropriate management, monitoring and controlling toward the project. The conflict in four viewpoints can be categorized into 5 issues as shown in Table 2.2 Conflict Associated with Design and Build Method.

Table 2.2: Conflict Associated with Design and Build Method 2

Conflict Issues	Types of Conflict
1. Technical issue	• Technical problem
2. Personality issues	• Misinterpretation of client requirement
3. Administrative issues	• Unclear about responsibilities • Resistance to change • Lack of management expertise • Unclear client requirement
4. Client issues	• Frequent changes from client • Lengthy evaluation of tenders • Delay in design approval • Little interact with contractor
5. Rules and regulation issues	• Late approval from related statutory organisations.

Source: Edmon W. M. et al. (2003)

While Tam V. W. Y et al. (2013) state that there have ten types of conflict in adopting design and build procurement method, which are tight in time schedule, frequent changes are introduced by clients, difficult to control workmanship, ineffective communication, not clear about client's design brief and requirement, conflict interest between design consultants and contractor, contractor are not competent with design issue, difficult to control design quality, lengthy evaluation of tender , high bidding cost and lack of experience. The ten conflicts can be categorized into 6 issues as Table 2.3 Conflict Associated with Design and Build Method.

Table 2.3 Conflict Associated with Design and Build Method 3

Conflict Issues	Types of Conflict
1. Client issues	• Lengthy evaluation of tender • Not clear client design brief and requirements • Frequent changes are introduced by clients
2. Administration issues	• Difficult to control workmanship • Difficult to control design quality
3. Personality issues	• Lack of experience • Ineffective communication
4. Technical issues	• Contractor are not competent with design issue
5. Time issues	• Tight time schedule
6. Cost issues	• High bidding cost

Source: Tam V. W. Y et al. (2013)

Table 2.4: Conclusion of Conflict Associated with Design and Build Method.

Author	Conflicts							
	Administration Issue	**Technical Issue**	**Personality Issue**	**Resources Issue**	**Client Issue**	**Time Issue**	**Cost Issue**	**Rules and Regulation Issue**
Dada M. O. (2012)	√	√	√	√				
Hamimah A. et al. (2008)	√		√		√	√	√	√
Edmon W. M et al. (2003)	√	√	√		√			√
Tam V. W. Y et al. (2013)	√	√	√		√	√	√	

Source: Dada M. O. (2012), Hamimah A. et al. (2008), Edmon W. M. et al. (2003) and Tam V. W. Y. et al (2013)

2.7 CONCLUSION

In Chapter 2 Literature Review, all information about research topic was discussed. It's included all information about design and build procurement method. Other than that, this chapter also had describe the conflict that may occurs in construction project that procured under design and build procurement method. For the next chapter which is Chapter 3 Research Methodology, this chapter will discuss about the selection of appropriate methodology in order to conduct the research.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter 3 Research Methodology described about the appropriate research design that will use as supporting tools in order to achieve the research objectives. Research design is an instrumentation method and analysis method that will use to analyze the collected data. In addition, this chapter also describes about the population and sampling, data collection technique, data analysis technique and expected of finding.

3.2 RESEARCH DESIGN

This research start with researcher determines the problem background and problem statement of the research title. The problem background and problem statement are use to describe what problem that actually happened and enforce the researcher to doing this research. After clearly determine the problem background and problem statement of the research, research objectives and research questions will be identified. For this research, the first objective is to identify the conflicts in design and build construction projects and the second objective is proposing solution to overcome the conflicts in design and build construction projects.

In order to achieve the objective of the research, researcher will construct literature review. The literature review is important to find out the related information about the research title and objective. Usually Literature review will construct through study of book, journal, article, magazine, website and others. In this research, literature review also important to help researcher in proposing solution for the conflicts in design and build method.

After construct the literature review, researcher will develop a questionnaire to collect the data. In this research, quantitative data and qualitative data are needed. Quantitative data is use to achieve the Objective 1 and it will collect through the distribution of questionnaire. The survey questionnaire of this research consists of two sections which are (1) general information of the respondents, (2) types of conflicts that mostly occur in design and build construction projects. In order to achieve Objective 2 of this research, researcher will use quantitative data and study of literature review in proposing solution flow for five conflicts that mostly occur in design and build construction projects. Qualitative data will obtain from the interview with experts in design and build projects.

The collected data will then be analyzing through Statistic Package for Social Science (SPSS) to carry out reliability test and ranking of mean. The data of the types of conflicts in design and build construction project will rank based on level of occurrence's frequencies. After analyze the data and identified the mostly occur conflicts, researcher will draft the conflicts flowchart and then bring to experts for comment and suggestion. After interview and get some information and recommendation from experts, researcher will create full flowcharts for the conflicts. Researcher will then make a conclusion and recommendation for the overall research.

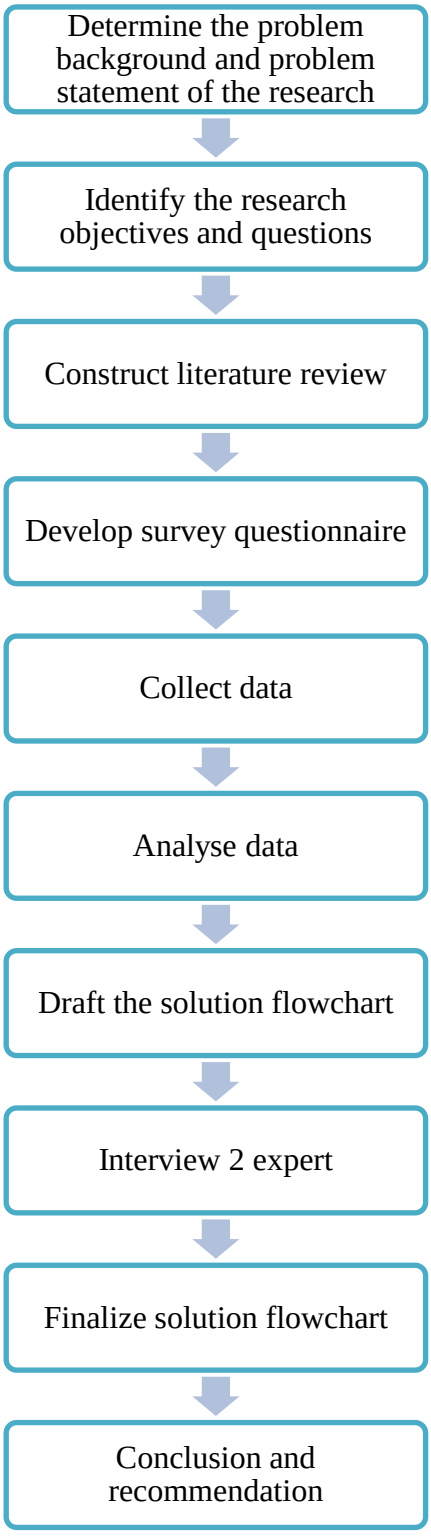

Figure 3.1: Research Design Flowchart

3.3 RESEARCH METHOD

Research method is a technique that the researcher used to conduct the research. The research method that will be use in this research is quantitative method for Objective 1 and qualitative method for Objective 2. The quantitative research is purpose to achieve the objective 1, which is to identify the conflicts in design and build construction projects. Quantitative method will use to obtain the qualitative data about the types of conflicts that mostly occur (ranking) in the design and build project. While the qualitative method will use to get some information, recommendation and suggestion from experts in design and build projects. This method is purpose to propose some flowcharts for mostly occur conflicts.

3.4 POPULATION AND SAMPLING

The population for this research is all the construction companies that registered as a contractor Grade 7 with Construction Industry Development Board (CIDB) in Pahang state. According to CIDB (2013), there are 121 companies in Pahang that registered as contractor Grade 7. Contractor Grade 7 is a private limited company (Sdn Bhd) or limited company (Syarikat Berhad) that has paid up capital about RM750, 000.00 or sole proprietorship/partnership in the form of bank statement for last 3 month that have capital accumulation about RM750, 000.00. In addition, cost of work/tender for contractor Grade 7 should more than RM10, 000,001.00. The technical personnel of contractor Grade 7 should has construction personnel registration card that still valid and should either have 2 degree holders technical personnel or 1 degree holder and 1 diploma holder technical personnel.

In order to find out sample for this research, researcher use the Table for Determining Sample Size from a Given Population (refer to appendix) provide by Morgan (1970). Therefore, the sample size of this research is 92 companies form the 121 companies of population. The sampling will then randomly select from the 121 Grade 7 Contractor companies in Pahang. In addition, the respondents should be the

director, project manager, engineer, architect or quantity surveyor of the company because they are more knowledgeable about the design and build procurement and they are usually the person who always deals with project's client.

3.5 DATA COLLECTION TECHNIQUES

In order to achieve Objective 1, this research will use survey questionnaire to collect the data from the respondents. The questionnaire will distributed to Grade 7 contractor of the construction company in Pahang. The questionnaire will send to respondents by using internet posting (e-mail) and distribute by hand. The survey questionnaire is seem most appropriate and effective compare to other method because less cost consuming and easy for respondent to respond. In order to make sure respondent give the feedback, researcher will make phone call to respondent after send the e-mail. Other than that, researcher also will distribute the questionnaire by hand to some company because this technique is faster than waiting for the email. In other to achieve Objective 2, the researcher will have an interview session with experts in design and build projects. This techniques is purpose to get more information, recommendation and suggestion for the solution that have been proposed.

3.6 DEVELOPMENT OF MEASURE: DESIGN OF QUESTIONNAIRE

The questionnaire design for this research is closed-ended question. Close-ended question is a question which provide limit to respondents in answer the question. Usually, close-ended question is in multiple choice forms but in this research question will in form of likert scale. In addition, closed-ended question will refer to quantitative data. The questionnaire of this research will designed based on the research objectives and research questions.

Measurement scales that use in this research are nominal scale and ordinal scale. The nominal scale is use in the Section A which the collected data have no set order, no

ranking and hierarchy of value. While ordinal scale is use in Section B which collected data can be rank and order.

The questionnaire of this research consists of three sections, which are:

i. Section A: General information of the respondents
   In this section, question that will ask is related to demography such as types of organization, company's operation period and position of respondent in company.

ii. Section B: Conflicts in design and build construction projects
   This section will consists of questions that related to the conflict in design and build construction projects. The conflicts will be categorized into 8 issues which are administration issues, personality issues, technical issue, resources issue, time issue, cost issue, client issue, and rules and regulations issue. In this section, five point likert scale of frequency will be use. According to Vagias W. M. (2006), the five point scales of frequency are "Never", "Rarely", "Sometimes", "Often" and "Always".

3.7 DATA ANALYSIS METHOD

In order to achieve Objective 1 of this research, researcher will use Statistic Package for Social Science (SPSS) 18 to analyze the collected data. Before analyze all the collected data, researcher will implement the pilot test. Pilot test as known as feasibility studies is a pre-testing of the questionnaire or interview schedule of each research (Edwin R., 2001). The purpose of pilot test in this research is to evaluate the reliability of each question in the survey questionnaire.

In order to measure the reliability of the research, Cronbach's Alpha coefficient will be used. According to Santos J. (1999), Cronbach's Alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct". The Cronbach's Alpha coefficient range can hold a value of 0 to 1. The

closer the Cronbach's Alpha coefficient value gets to 1; the higher is the internal consistency reliability. According to George (2003), Cronbach's Alpha coefficient can be divide into six level which are more than 0.90 is excellent, more than 8 is Good, more than 7 is acceptable, more than 6 is questionable, more than 5 is poor and lower than 5 is unacceptable. In addition, the value of Cronbach's Alpha will increase depend on the number of item in the scale.

In order to analyse the data collected from Section A, the descriptive statistic analysis method will be used. This method will summarize the collected data in form of pie chart and analyze by using percentage. In addition, this research also will use mean value analysis method to carrying out the data collected from Section B. Once the mean of the item in Section B had been calculated, it will be ranked accordingly.

3.8 CONCLUSION

In Chapter 3 Research Methodology, all methods that will use to conducting this research are described. In order to collect data from the respondent, questionnaire survey will be used. Other than that, Statistical Package for Social Science software will use to analysis the collected data. All collected data will be discuss and analyse in next chapter, Chapter 4 Data Collection and Analysis.

CHAPTER 4

DATA COLLECTION AND ANALYSIS

4.1 INTRODUCTION

Chapter 4 Data Collection and Analysis present the finding and the result of this research. The objectives of this research are to identify the ranking of the conflicts in design and build construction projects and propose the solution to overcome the conflicts in design and build construction projects. In order to analyze the collected data for Objective 1, researcher used the Statistical Package for Social Science (SPSS) 18. The results are interpreted in several sections which are pilot test, reliability analysis, descriptive analysis and mean value analysis. In addition, to achieve the Objective 2, researcher has proposed five solutions to overcome five most common conflicts in design and build construction projects. In order to make the solution in Objective 2 more reliable, researcher has interviewed two experts in design and build contract from Perbadanan Kemajuan Negeri Pahang (PKNP) to get more information and recommendation about the solutions that have been made. The solutions are shown in the form of flowchart.

4.2 PILOT TEST

In order to conduct the pilot test of this research, researcher used data collected from 9 respondents (10% from the 92 respondents) to evaluate the reliability of the survey question. Table 4.1 shows the reliability statistic of pilot test for this research's questionnaire. The Cronbach's Alpha coefficient of this research is 0.873.

Table 4.1: Reliability Statistics for Pilot Test

Cronbach's Alpha	N of Items
0.873	27

4.3 RELIABILITY OF MEASUREMENT

Table 4.2 shows the reliability statistic for reliability test of this research. The reliability statistics of this research is created from all data collected (92 respondents). The reliability test show that the Cronbach's Alpha value is 0.728 which more than 0.70. This condition indicates that the data of this research is acceptable. Detail of reliability test shown in Appendix.

Table 4.2: Reliability Statistics for Reliability Test

Cronbach's Alpha	N of Items
0.728	27

4.4 DESCRIPTIVE ANALYSIS

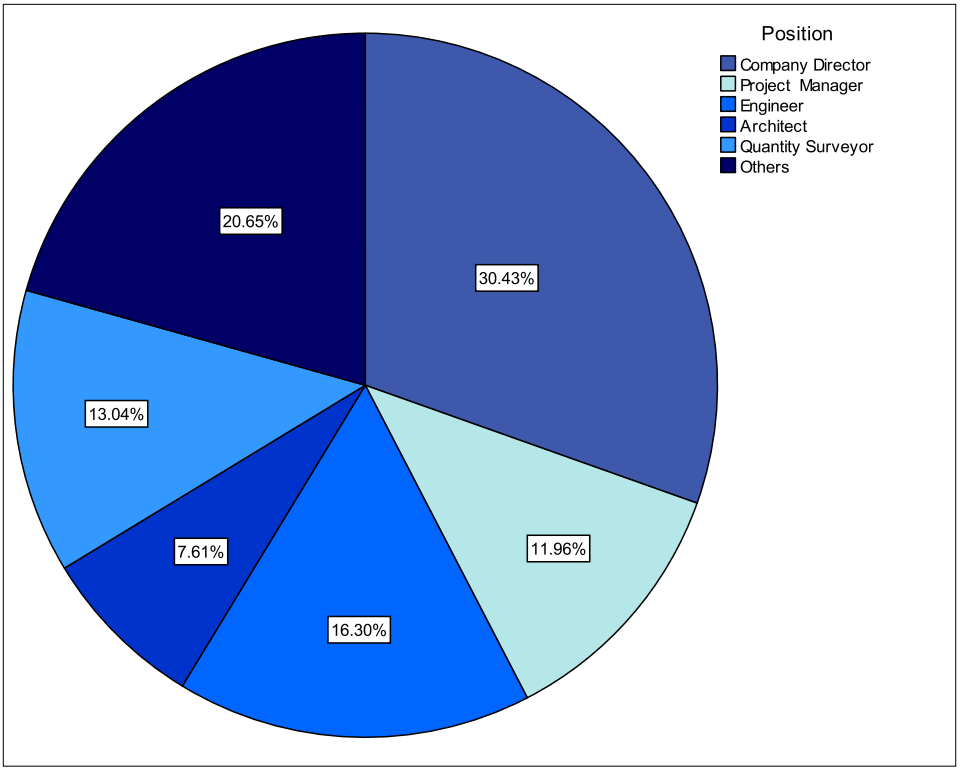

Figure 4.1: Position of Respondent

Figure 4.1 illustrated the position of the respondent in each company. The position of the respondent is categorized into six positions which are company director, project manager, engineer, architect, quantity surveyor and other. From the total 92 data collected, 30.43% is company director, 20.65 % is other, 16.30% is engineer, 13.04% is quantity surveyor, 11.96% is project manager and 7.61% is architect.

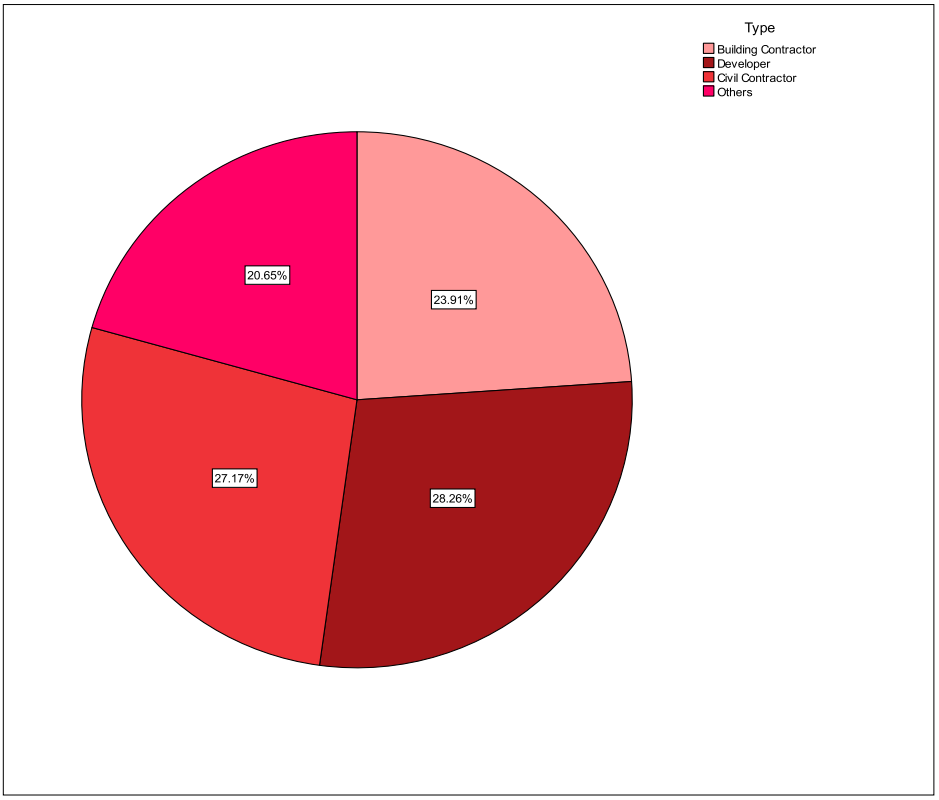

Figure 4.2: Types of Company

Figure 4.2 illustrated the type of the respondent's company. The type of the company is categorized into four types which are building contractor, civil contractor, developer and other. Based on Figure 4.2 Types of Company, there are 28.26% of developers, 27.17% of civil contractor, 23.91% of building contractor and 20.65% of others type of company.

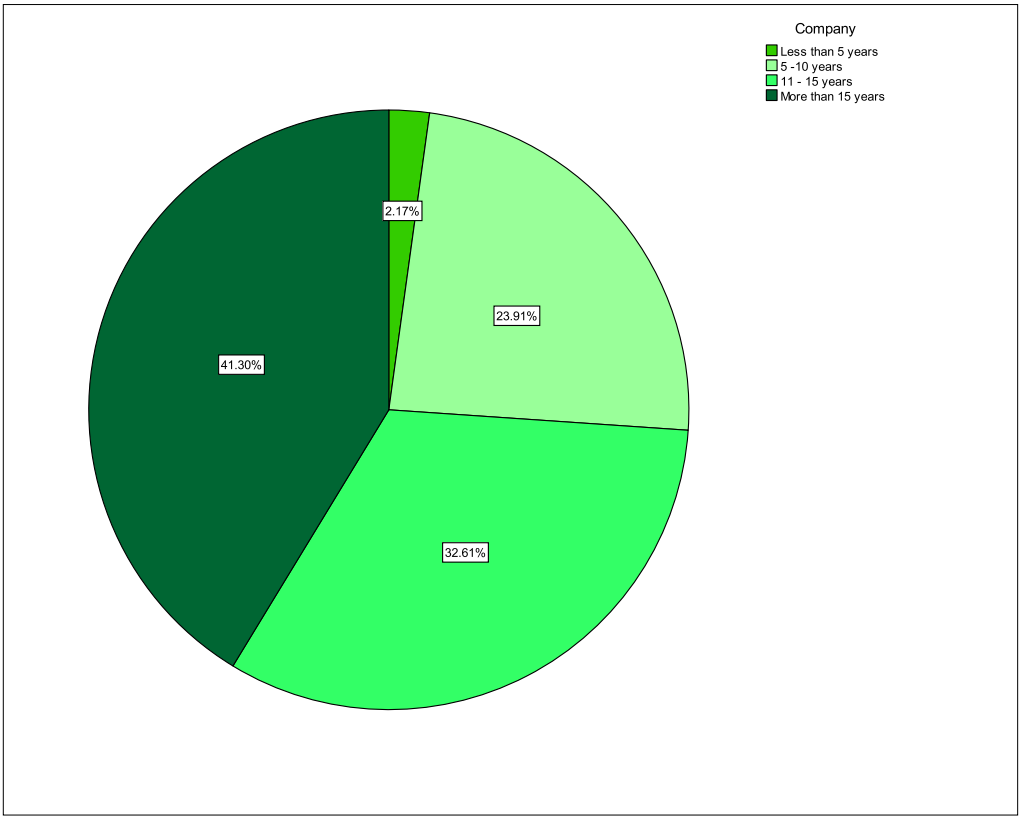

Figure 4.3: Company Operation period

Figure 4.3 illustrated the operation period of respondent's company. The company operation period is divided into four levels which are less than 5 years, 5 – 10 years, 10 – 15 years and more than 15 years. Based on Figure 4.3 Company Operation period, there are 41.30 % companies that have operation period more than 15 years, 32.61% companies in between 11 – 15 years, 23.91% companies in between 5 -10 years and only 2.71% companies that less than 5 years.

4.5 MEAN VALUE ANALYSIS

Mean value analysis was carried out to achieve Objective 1 of this research which is to identify the conflicts in design and build construction projects. Mean value analysis is use to rank the frequency of occurrence of conflicts in design and build construction projects. From the literature review, conflict in design and build construction project can be divide into 8 issues which are administration issues, client issues, personality issues, technical issue, time issues, cost issues, rules and regulation issues, and resources issue. In these 8 issues, there have 24 types of conflict in design and build construction project. In order to achieve objective one of this research, Statistical Package for Social Science (SPSS) was used to carried out the mean value analysis and rank all the conflicts. Table 4.3 shown the five main conflicts in design and build construction projects.

Table 4.3: Ranking of Conflicts in Design and Build Projects

Code	Types of Conflicts	Mean	Rank
A1	Overlapping in roles	2.36	13
A2	Unclear about responsibilities	2.20	17
A3	Resistance to change	2.42	11
A4	Unclear about client requirement	2.67	7
A5	Difficult to control workmanship	2.61	8
A6	Difficult to control design quality	2.55	10
B1	Delay in design approval	2.61	8
B2	Lengthy evaluation of tender	2.61	8
B3	Lack of client brief	2.89	6
B4	Variation order / Change request from client	3.88	1
B5	Lack interaction with contractor	3.60	4
B6	Client loss of control and involvement in design	2.58	9
C1	Difficulty in following instruction	2.04	19
C2	Misinterpretation of client requirement	2.40	12
C3	Lack of experience	2.20	17
C4	Ineffective communication	2.27	15
D1	Design error	2.42	11
E1	Time overrun / Project delay	3.50	5
E2	Delay in activity	3.73	2
F1	High bidding cost	2.21	16

F2	Over budget	2.36	14
F3	Client delays (lack of payment)	3.64	3
G1	Late permits and approval from related statutory body	2.21	16
H1	Limited resources / workmanship	2.17	18

Table 4.3 Ranking of Conflicts in Design and Build Projects shows the mean value analysis and ranking of the 24 conflicts in design and build projects. By refer to the Table 4.3, the result show the variation order or change request from client is a main conflict in the design and build construction project. It shows the highest mean value which is 3.88. Second conflict that mostly occurs in design and build construction project is delay in work activity which the mean value is 3.73. Client delay in payment is a third conflict that mostly occurs in design and builds construction projects which is 3.64. For the forth conflict that mostly occurs in design and build project is client have lack interaction with contractor, the result show the mean value is 3.60. The time overruns or project delay is the fifth conflict that mostly occurs in the design and build project, the mean value of this conflict is 3.50.

4.6 CONFLICT'S SOLUTION FLOWCHART

In order to achieve objective two of this research, researcher has proposed five conflict's solution flowchart to overcome five conflicts that mostly occur in design and build projects. This solution flowchart is proposed based on the literature review, contract form (Standard Form of Design and Build Contract – PWD Form DB (Rev.1/2010), Standard Form of Contract Be Used Where Drawings and Specifications Form Part of the Contract – PWD Form 203 (Rev. 1/2010) and Agreement and Conditions of PAM Contract 2006 with Quantities) and information given by Engineer and Quantity Surveyor of Perbadanan Kemajuan Negeri Pahang (PKNP).

4.6.1 Solution Flowchart for Variation Order or Request Change from Client

According to PWD Form DB, PWD Form 203 (Rev. 1/20) and PAM contract 2006, variation order (VO) is a change in the government requirements or project which force contractor to change or modify the design, quantity or quality of the project. Variation order including: (1) the addition, omission or substitution of work activities, (2) alteration or changes in the standard of materials, goods that intended to be used in the project and (3) any removal of work or materials from the project site. The conflict about variation order or change request from the client can be overcome based on the Figure 4.4 Solution Flowchart for Variation Order or Request Change from Client.

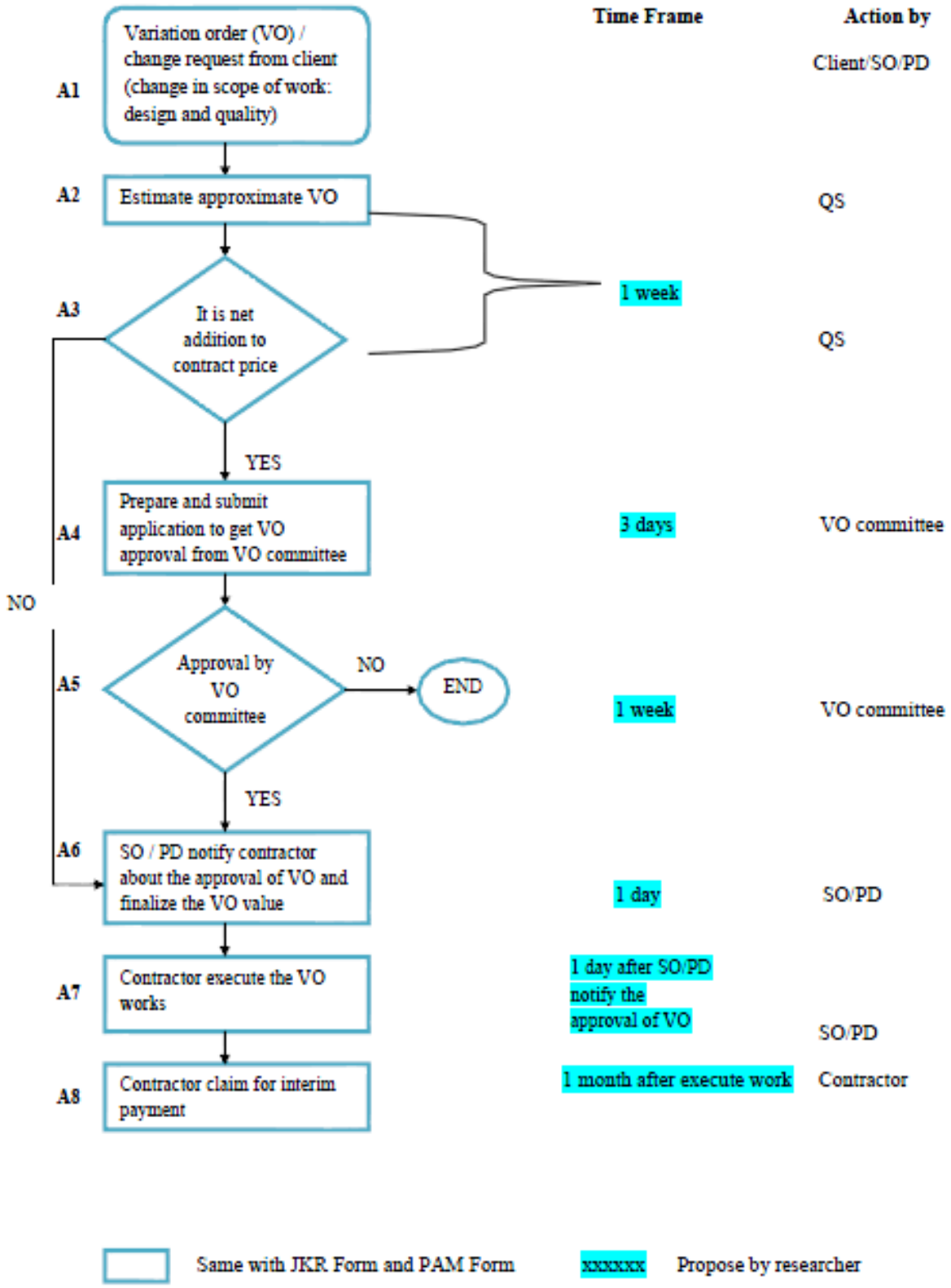

Figure 4.4: Solution Flowchart for Variation Order or Request Change from Client

Step 1 – A1

Client or Superintending Officer (SO) give an instruction to contractor about the requesting of variation order (VO) or change in project scope either in design or quality of the project. The scope of the VO should based on the contract form such as Clause 23.1 in PWD Form DB (Rev. 1/2010), Clause 24.2 in PWD Form 203 (Rev. 1/2010) and Clause 11.1 in PAM Contract 2006. For example: the addition, omission or substitution of work activities, alteration or changes in the standard of materials, goods that intended to be used in the project and any removal of work or materials from the project site

Step 2 – A2

Quantity surveyor (QS) will prepare the estimated cost for the VO request by the client or SO as soon as possible or within 1 week. The estimated cost must be accurate and should be based on the information from the supporting document such as the new drawing, the price of the materials, labor rate and so on.

Step 3 – A3

After prepared the cost estimate, QS should immediately determine whether the cost is net additional to contract sum. If the cost estimated is no addition to contract sum, SO can directly notify contractor about approval of VO and finalize the variation order value in the same time.

Step 4 – A4

If the estimates show the cost is additional to contract sum, QS should prepare and submit the application document of the variation order approval to VO committee within 1 week or as soon as possible for not wasting the time.

Step 5 – A5

Within the 1 week time, VO committee should check all the documents and evaluate whether the project's budget is enough for the variation order work or not. If the application for approval is fail, then no VO works will execute.

Step 6 – A6

If the application for VO approval is approved, SO will immediately notify contractor about approval of variation order and finalize the variation order value. So that, contractor can starts their work soon.

Step 7 – A7

Contractor will immediately execute the work 1 day after the SO notify the application is approved.

Step 8 – A8

Contractor can claim for the payment after 1 month of the execution of work.

4.6.2 Solution Flowchart for Delay in Work Activities

Based on objective one, delay in activities is second conflicts that mostly occurs in the design and build construction projects. According to Gonzalez P. et al. (2012), delay in work activity is a common problem in construction project and it may increase the project completion period and cost. Usually, delay in work activities occurs when the percentage of work activity progression behind the planned schedule. Delay of work activities will not affect the whole project completion time if the delay activities is not any activities in the critical path. Normally, delay of work activities is caused by the weather condition, lack of resources and others. In order to overcome this conflict, researcher proposed one solution flow for delay in work activities as shown in Figure 4.5.

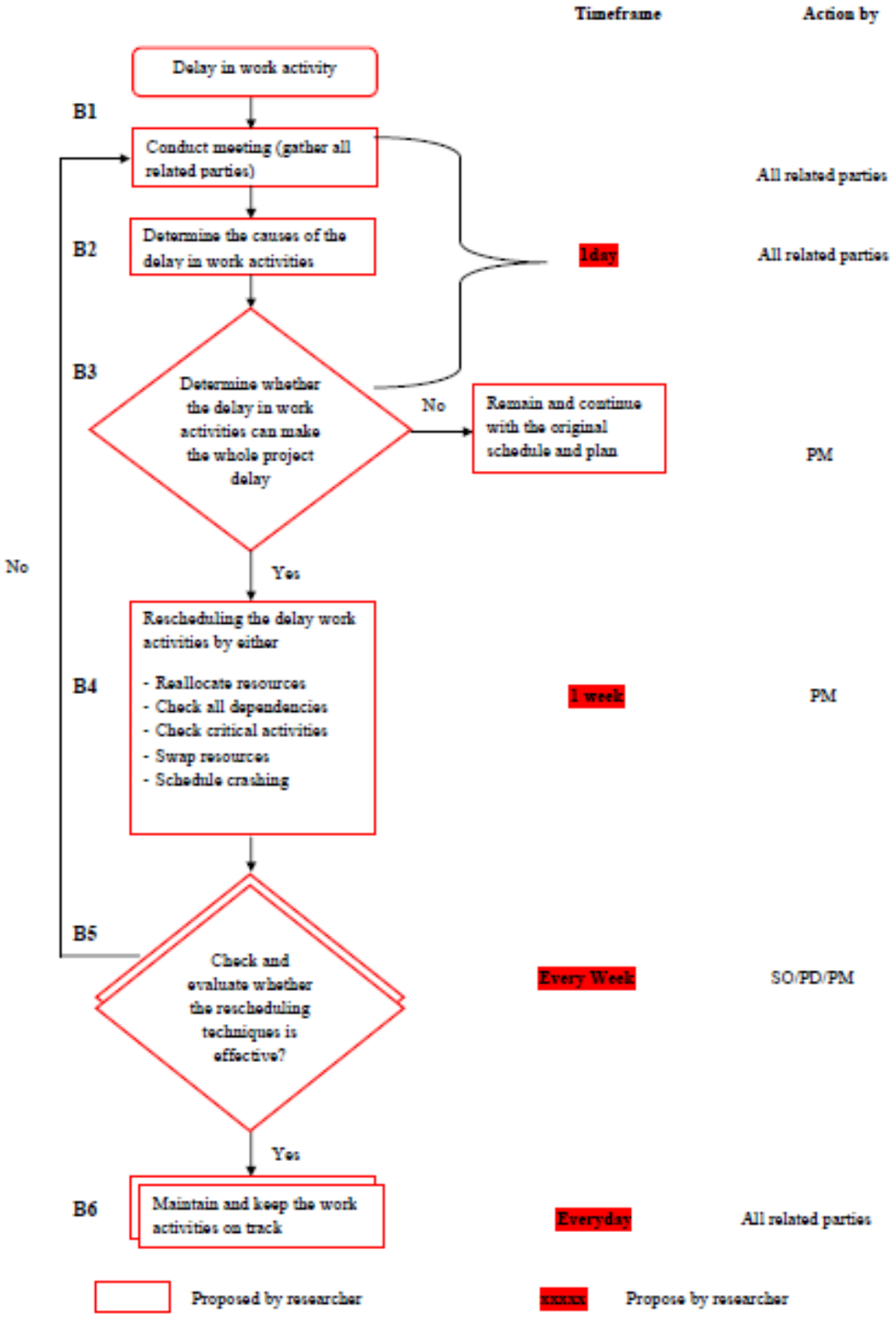

Figure 4.5: Solution Flowchart for Delay in Work Activities

Step 1- B1

When the project obtain delay work activities, client or SO should conduct a meeting which include all the related parties such as client, main contractor, engineer, architect, quantity surveyor, subcontractor and others. This is a good opportunity for all parties to discuss about problem occur in the work activities.

Step 2 - B2

All related parties should determine the causes of the delay in work activities and brainstorming about the solution to overcome this problem in 1 day time in order to solve the problem as soon as possible.

Step 3 - B3

Project manager should determine and evaluate whether the delay in work activities can make the whole project delay. If the delay in work activities does not delay the project completion time, then contractor can remain and continue execute the work with the original schedule and plan.

Step 4 - B4

If the delay in work activities can cause the delay of project completion time, project manager should reschedule the delay activities in 1 week. Reschedule the delay work activities can be done by reallocate the resources, check all the dependencies, check the critical activities, swap the resources and crash the project schedule.

Step B5

After apply the reschedule techniques on the delay activities, SO and project manager should every week check and evaluate whether the techniques is effective and efficient. If the technique not effective, repeat the step 1 to step 5.

Step B6

If the technique is effective, all related parties should maintain and keep the work activities on schedule.

4.6.3 Solution Flowchart for Client Delay (Lack of Payment)

Sometimes payment issue will create conflict between client and contractor as in this research, lack of payment from client became third conflict that mostly occur in design and build construction projects. According to Cambridge Dictionaries Online (2014), interim payment is an amount of money that client should pay to contractor before the final payment. Usually, contractor will apply the interim payment in monthly basis or based on work progress. Usually conflict about payment issue occur when the client delay to pay the interim payment to contractor. In order to overcome this problem, researcher proposed one solution flowchart as shown in Figure 4.6 Solution Flowchart for Client Delay (Lack of Payment) based on the Clause 53.0 PWD Form DB (Rev. 1/2010), Clause 28.0 in PWD Form 203 (Rev. 1/2010) and Clause 30.0 in PAM Contract 2006.

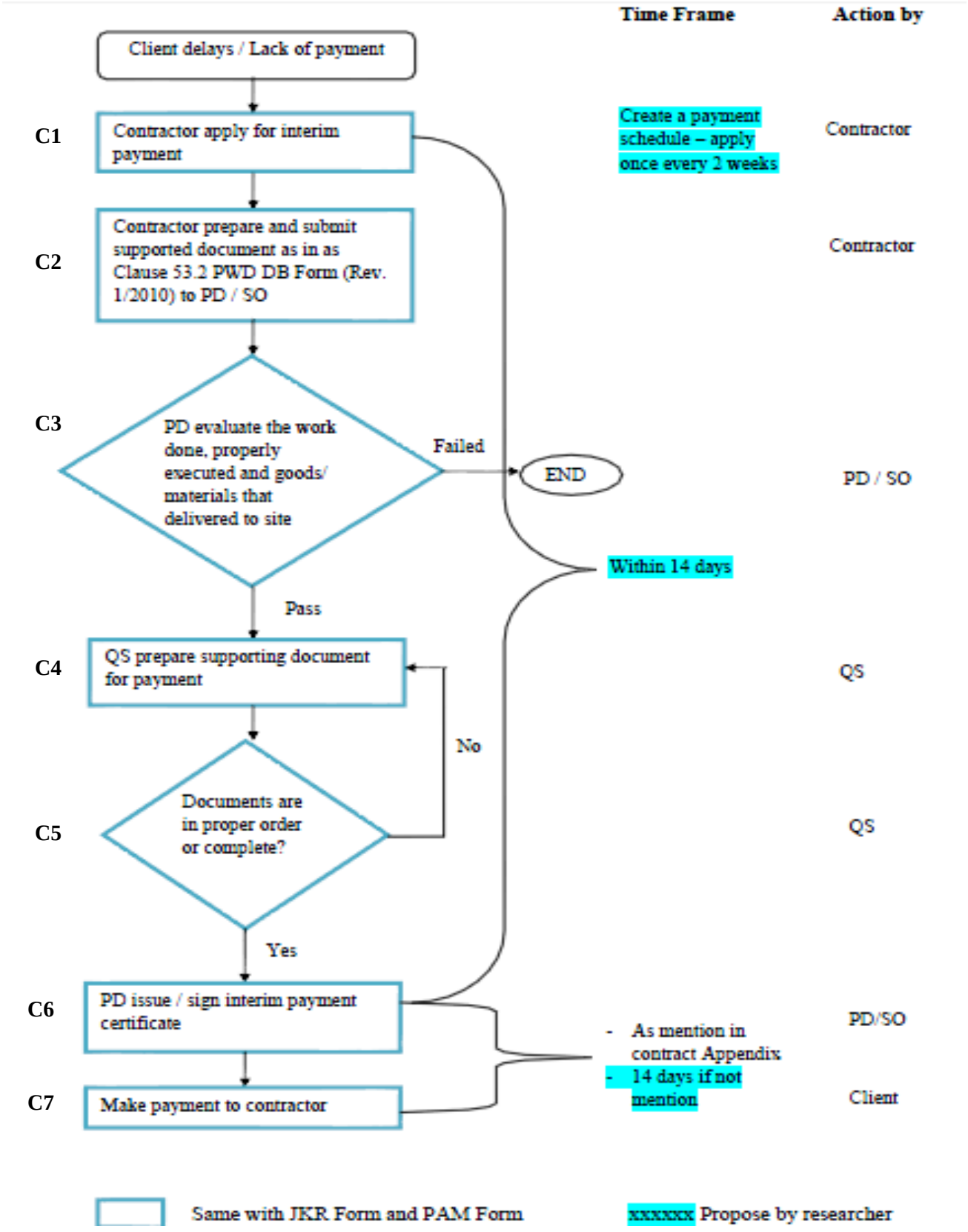

Figure 4.6: Solution Flowchart for Client Delay (Lack of Payment)

Step 1 - C1

After execute the work, contractor should apply interim payment at least 2 week or based on payment schedule if included in the contract.

Step 2 - C2

Contractor prepare and submit supported document as in as Clause 53.2 PWD DB Form (Rev. 1/2010) to Project Director (PD) / Superintending Officer (SO). The supporting document is such as amount of works done and properly done, amount of variation valuation, the value of materials that delivered to site and intended for use, expenditure of Provisional Sum and supervision report.

Step 3 - C3

PD / SO evaluate the works done and properly done, materials that delivered to site and intended for use and supervision report. If the evaluation failed, there is no interim payment for the contract.

Step 4 - C4

If the evaluation by PD / SO is passed, quantity surveyor should prepare supporting document for payment. The supporting document is such as Form JKR 66, consultant certification and task list.

Step 5 - C5

Before submit the document to PD / SO, quantity surveyor should ensure the document is in proper order and complete. If not proper and complete, quantity surveyor should prepare the document again.

Step 6 - C6

If the document is proper and complete, quantity surveyor should submit to PD / SO for evaluation. PD / So then will issue and sign the interim payment certificate to contractor. PD / SO should issue the interim payment certificate within the 14 days from the contractor application for interim payment date.

Step 7 - C7

Client should make payment for contractor work within 14 days or as mention in Appendix 1 of contract or if not mention in contract then should pay within 30 days from the date issue of interim payment certificate. So that, contractor can continues their work smoothly.

4.6.4 Solution Flowchart for Client Lack Interaction with Contractor

According to Engstrom S. et al. (2004), the key success factors of project is client satisfaction and it can get through the client requirements on the project. But conflict occurs when the client have lack interaction with contractor because contractor may not know the client requirement and may misinterpret the client requirement. Based on objective one, the conflict about client lack interaction with contractor became the forth conflict that mostly occurs in the design and build construction project. In order to improve the interaction between client and contractor, Figure 4.7 Solution Flowchart for Client Lack Interaction with Contractor can be used.

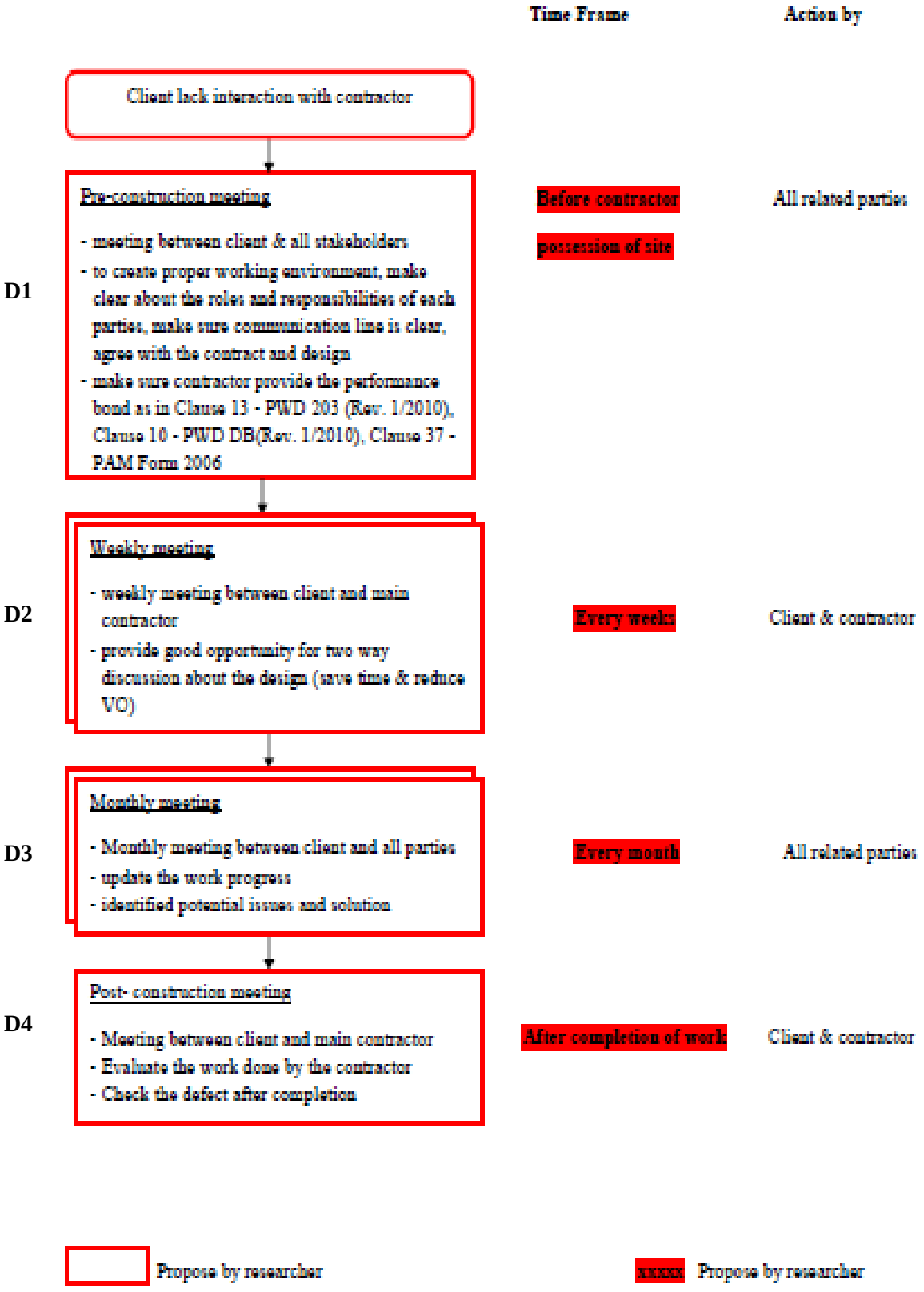

Figure 4.7: Solution Flowchart for Client Lack Interaction with Contractor

Step 1 - D1

Client and contractor should conduct a pre-construction meeting before the contractor possession of site. Pre-construction meeting include client and all stakeholders. Pre-construction meeting is purpose to create good working environment, make sure each parties clear about their roles and responsibilities, ensure the communication line is clear and ensure all term in the contract and design are agreed. In this step, client should make sure contractor provide the performance bond as in Clause 13 - PWD 203 (Rev. 1/2010), Clause 10 - PWD DB (Rev. 1/2010), Clause 37 - PAM Form 2006

Step 2 - D2

Weekly meeting should be conduct in order to increase the interaction between client and stakeholder. Weekly meeting provide good opportunity for two way discussion about the design and construction. By conducting the weekly meeting, contractor will more clear about the client requirement and will produce a good design which can reduce the variation order from client.

Step 3 - D3

Client and all stakeholders should always conduct monthly meeting in order to update the work progress. In addition, monthly meeting is purpose to identified potential issue or problem that may occur and brainstorming to carried out the solution.

Step 4 - D4

After the work complete, client and contractor should conduct post-construction meeting to evaluate the work done and check the defect after the completion date.

4.6.5 Solution Flowchart for Time Overrun / Project Delay

In order to overcome the project delay problem and prevent from get loss, contractor should apply for extension of time (EOT). According to PWD Form DB, PWD Form 203 (Rev. 1/20) and PAM contract 2006, EOT is a reasonable period of time that gives to contractor when the progress of work delayed. The Figure 4.8 shows the process flow to apply the EOT in order to overcome the project delay problem.

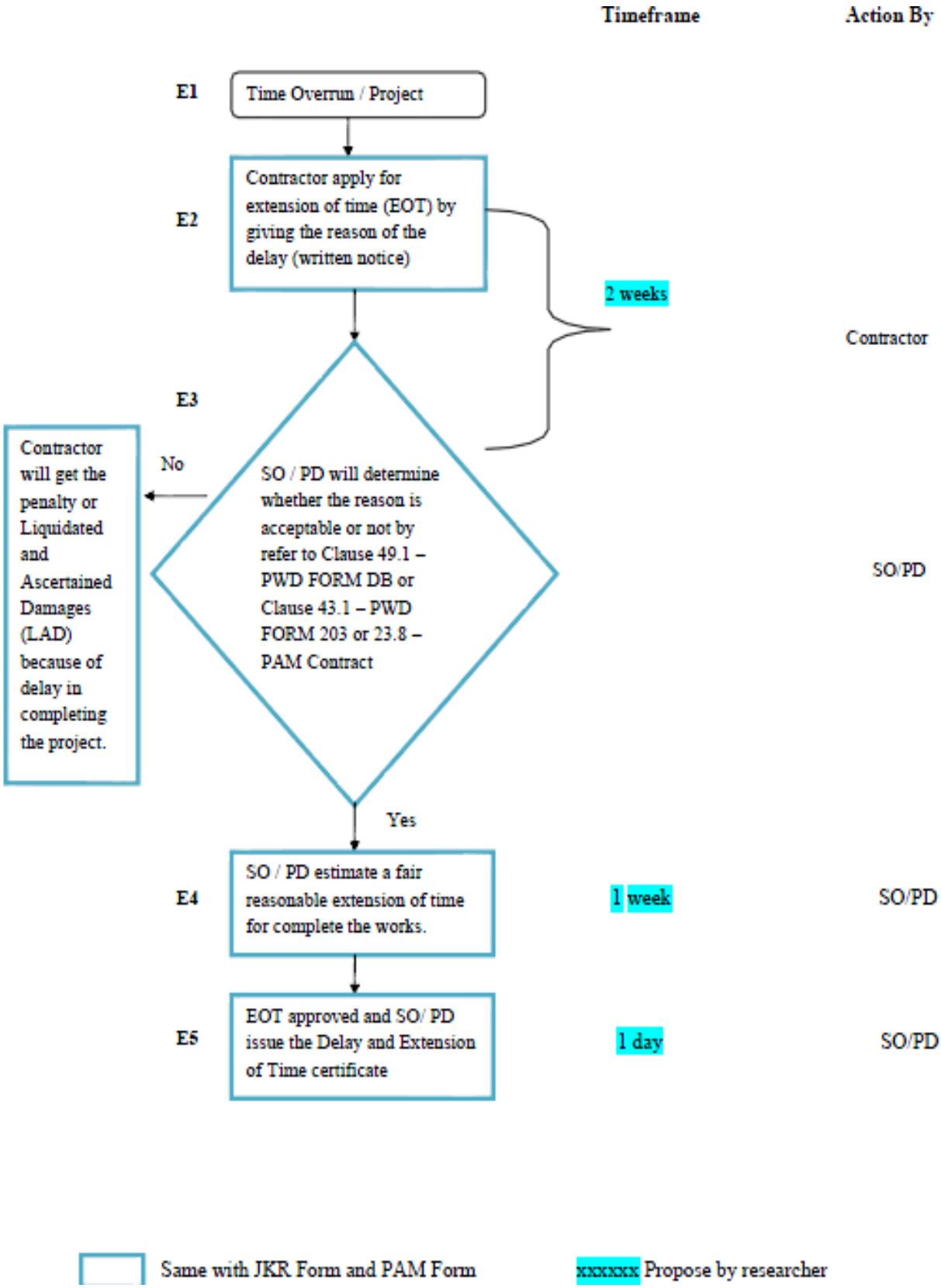

Figure 4.8: Solution Flowchart for Time Overrun / Project delay

Step 1 - E1

When the project time overrun / project delay, contractor should apply the extension of time (EOT) by submit the written notice to SO / PD. In the written notice, contractor should include the reason of the delay.

Step 2 - E2

Within 1 week, after receive the written notice from contractor, SO / PD should determine whether the reason of delay is acceptable. The acceptable reasons to get the EOT approval can refer to Clause 49.1 – PWD FORM DB or Clause 43.1 – PWD FORM 203 or 23.8 – PAM Contract 2006. The acceptable reasons are such as delay that cause by force majeure, weather condition, delay in giving possession of site and so on. If the reason of delay is not acceptable, the contractor will get the penalty or liquidated and ascertained damages (LAD) because of delay in completing the project.

Step 3 - E3

In the 1 week time, if the reason of delay is acceptable, the SO / PD will estimate a fair reasonable extension of time to complete the delay work. The EOT period is depend on the reason of the delay.

Step 4 - E4

After finished estimate the fair reasonable extension of time and the EOT approved, the SO / PD will issue the EOT certificate and inform the new completion date to contractor.

4.7 CONCLUSION

In Chapter 4 Data Collection and Analysis, all collected data was analyzed using the statistical package for social science (SPSS). In order to solve the conflict, some solution was proposed based on PWD FORM DB (Rev. 1/2010), PWD FORM 203 (Rev. 1/2010) and PAM Contract 2006. The overall conclusion and recommendation for chapter 4 will discuss in Chapter 5 Conclusion and Recommendation.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

Chapter 5 Conclusion and Recommendation discussed about the conclusion and recommendation for this research. There are 4 sections in this chapter which are discussion, limitation of study, recommendation and conclusion. In the discussion section, researcher concluded all the finding, result and analysis of this research. In the limitation of study, researcher described about the limitations and challenges that faced during implementing this research. In addition, researcher gives some recommendations and suggestion for the future study in the recommendation section and conclude the benefit and significant of this research in the conclusion section.

5.2 DISCUSSION

Based on the result and data analysis in Chapter 4 Data Collection and Analysis, researcher can conclude that the Objective 1 identify the ranking of conflicts in design and build construction projects and Objective 2 propose solution to overcome the conflicts in design and build projects were achieved.

Based on the result in Chapter 4, all types of conflict were indentified and ranked. From the previous Chapter 2 Literature Review, there are 8 issues in the design and build construction project which are administration issues, client issues, personality issues, technical issue, time issues, cost issues, rules and regulation issues, and resources issue. In these 8 issues, there are 24 types of conflict in design and build construction project. By refer to the mean value analysis in the Chapter 4, the ranking of the conflicts in design and build construction projects are (1) variation order / change request from client, (2) client delay (lack of payment), (3) client lack interaction with contractor, (4) delay in activities, (5) time overrun / project delay, (6) lack of client brief, (7) unclear about client requirement, (8) difficult to control workmanship, delay in design approval, lengthy evaluation of tender, (9) client loss control and involvement in design, (10) difficult to control design quality, (11) resistant to change, design error, (12) misinterpret of the client requirement, (13) overlapping roles, (14) over budget, (15) ineffective communication, (16) high bidding cost, late permits and approval from related statutory, (17) unclear about responsibilities, lack of experience, (18) limited resources workmanship and (19) difficult in following instruction.

For the Objective 2, by refer to the literature review, contract form (Standard Form of Design and Build Contract – PWD Form DB (Rev.1/2010), Standard Form of Contract Be Used Where Drawings and Specifications Form Part of the Contract – PWD Form 203 (Rev. 1/2010) and Agreement and Conditions of PAM Contract 2006 with Quantities and information given by Engineer and Quantity Surveyor of Perbadanan Kemajuan Negeri Pahang (PKNP), researcher has successfully proposed five solutions for five conflicts that mostly occur in the design and build construction projects. The solutions of each conflict present in form of flowchart as shown in Chapter 4 (Figure 4.4 – Figure 4.8).

5.2 LIMITATION OF STUDY

There are several challenges and limitations in implementing this research. The first limitation is about the time issue. Time issue became the limitation of this research when respondent late reply the survey questionnaire. Although this research have specific time schedule but it was influence by the respondents. Because limited of time in producing this research, it's became problem when the respondent late reply the questionnaire. It is because when the respondents failed to reply the questionnaire on time, researcher needs to delay the time for key in the data for analysis purpose and indirectly the planned schedule for producing the research is delay.

The second limitation of this research is respondent issue. Because of respondent is one of the most important party in this research, it becomes a limitation when the respondent does not give cooperation and feedback. For example, in order to achieve Objective 2, researcher needs to interview the respondent. But it became the limitation when the respondent keeps on postponing the interview appointment and does not confirm the exact date for interview session. In order to solve this problem, the researcher decided to find another respondent for interview and it consumes time. Other than that, it becomes limitation when the respondents do not update their profile with the Construction Industry Development Board (CIDB) because when researcher wants to email the questionnaire to the respondent, the email address does not exist.

Lastly, the limitation of this research is references issue. Reference is a foundation for every research because references will become the literature review for researcher. Lack of past research studies related to the topic became limitation to this research because the researcher might not understand in details about the topic and might have difficulty in achieving the objective. In addition, for the Objective 2 of this research, researcher difficult to propose solution because there are some difficulties to search and find related and good references about the solution.

5.4 RECOMMENDATION FOR FUTURE STUDIES

Future studies on the conflicts in design and build project should be established to improve the solution to overcome the conflicts in design and build construction projects. There are some recommendations that can be used in the future study:

a) In order to make the study more reliable, the future study should increase the number of respondent by expanding the scope of study. When the scope of study bigger, researcher can know the variety types of conflicts and propose more specific solution to overcome the conflicts.
b) In addition, future study should focus on the area where the construction sector is rapidly growing because the company in those area may be using more the design and build contract and more facing with conflicts in design and build projects.
c) Future study also can identify and determine the types of conflict based on phases of design and build project. For example: planning phase, executing phase, controlling phase and closing phase. It can be more detail and more focus on the project.

5.5 CONCLUSION

As the conclusion, this research is benefited to the parties who are interested with the design and build method because it contains a lot of information about design and build procurement method and also about the conflicts that usually occur in this project. In addition, it is helpful for the construction companies and clients who want to use design and build method in their project, because this research helps in determining and ranking the conflicts that mostly occurred in the design and build project. Other than that, this research also helps the construction team, design team and client to systematically and effectively manage their conflicts and indirectly help them in maintaining a good relationship with each other.

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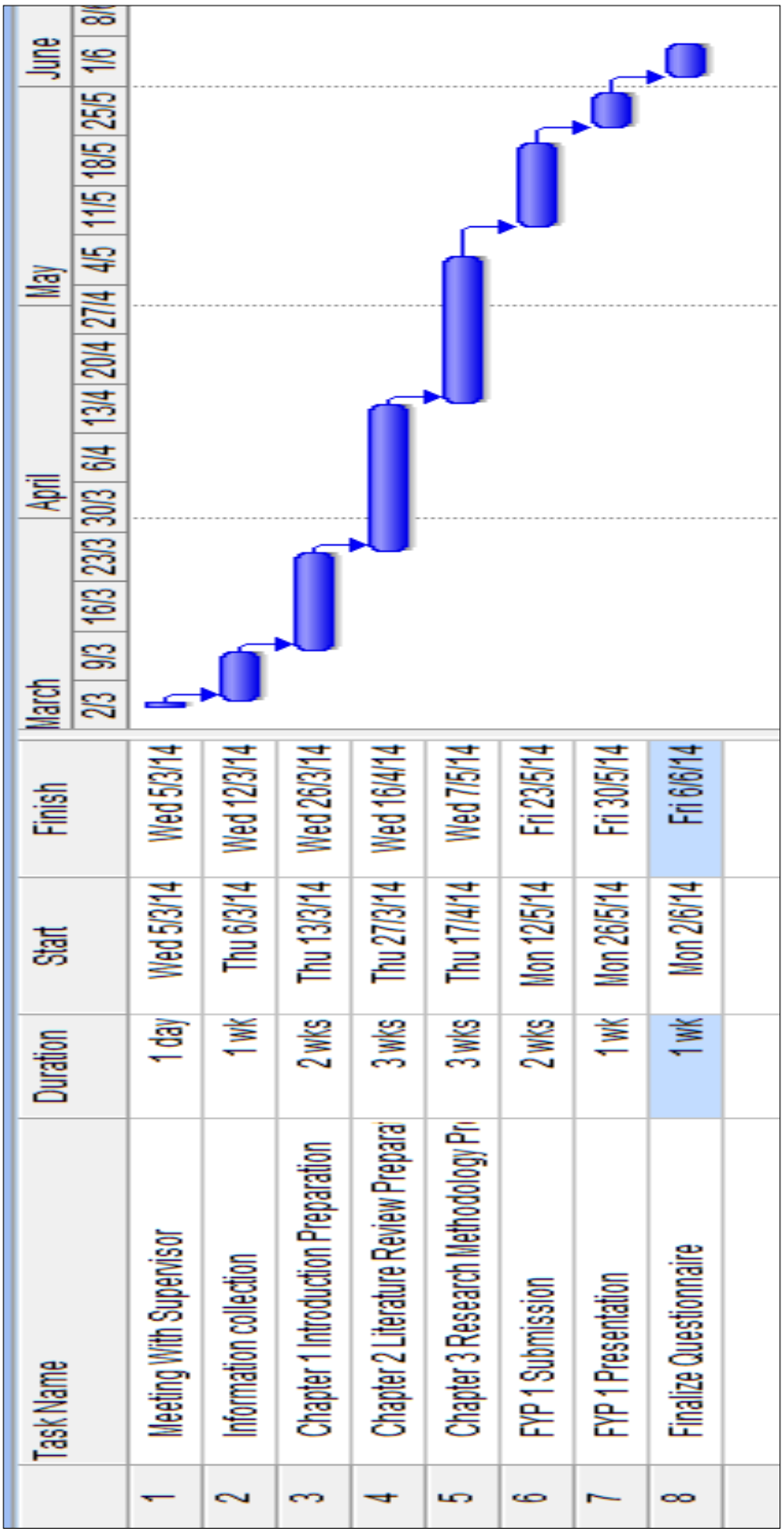
APPENDIX A

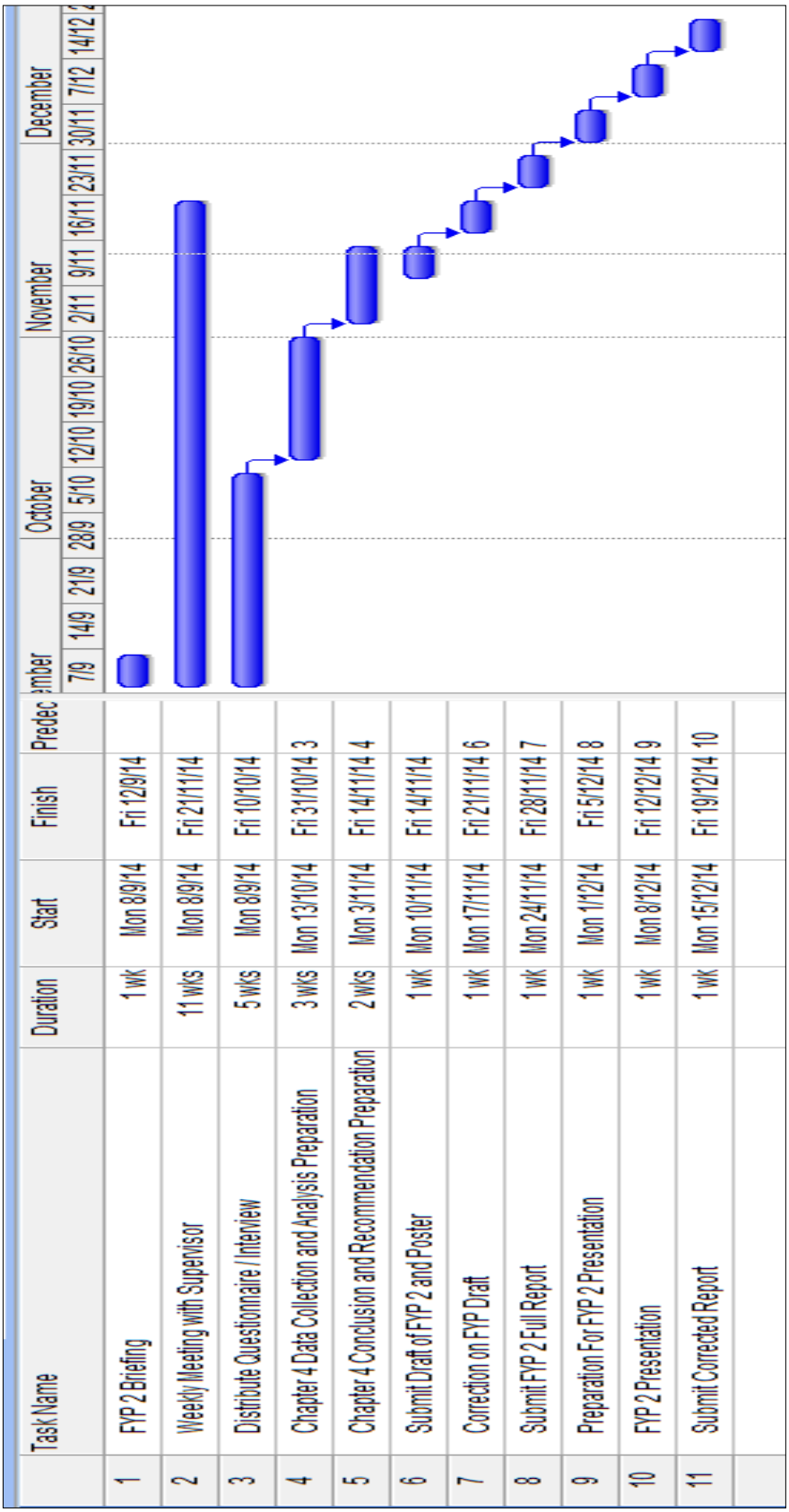
GANTT CHART FOR FYP 1



	Task Name	Duration	Start	Finish
1	Meeting With Supervisor	1 day	Wed 5/3/14	Wed 5/3/14
2	Information collection	1 wk	Thu 6/3/14	Wed 12/3/14
3	Chapter 1 Introduction Preparation	2 wks	Thu 13/3/14	Wed 26/3/14
4	Chapter 2 Literature Review Prepara	3 wks	Thu 27/3/14	Wed 16/4/14
5	Chapter 3 Research Methodology Pr	3 wks	Thu 17/4/14	Wed 7/5/14
6	FYP 1 Submission	2 wks	Mon 12/5/14	Fri 23/5/14
7	FYP 1 Presentation	1 wk	Mon 26/5/14	Fri 30/5/14
8	Finalize Questionnaire	1 wk	Mon 2/6/14	Fri 6/6/14

APPENDIX A

GANTT CHART FOR FYP 2



	Task Name	Duration	Start	Finish	Predec
1	FYP 2 Briefing	1 wk	Mon 8/9/14	Fri 12/9/14	
2	Weekly Meeting with Supervisor	11 wks	Mon 8/9/14	Fri 21/11/14	
3	Distribute Questionnaire / Interview	5 wks	Mon 8/9/14	Fri 10/10/14	
4	Chapter 4 Data Collection and Analysis Preparation	3 wks	Mon 13/10/14	Fri 31/10/14	3
5	Chapter 4 Conclusion and Recommendation Preparation	2 wks	Mon 3/11/14	Fri 14/11/14	4
6	Submit Draft of FYP 2 and Poster	1 wk	Mon 10/11/14	Fri 14/11/14	
7	Correction on FYP Draft	1 wk	Mon 17/11/14	Fri 21/11/14	6
8	Submit FYP 2 Full Report	1 wk	Mon 24/11/14	Fri 28/11/14	7
9	Preparation For FYP 2 Presentation	1 wk	Mon 1/12/14	Fri 5/12/14	8
10	FYP 2 Presentation	1 wk	Mon 8/12/14	Fri 12/12/14	9
11	Submit Corrected Report	1 wk	Mon 15/12/14	Fri 19/12/14	10

NUMBER OF PROJECTS PROCURED UNDER DESIGN AND BUILD CONTRACT (2012-2014)

CIDB MALAYSIA

Jadual 2.18 - Bilangan dan Nilai Projek Diawad Berdasarkan Status Kontraktor dan Jenis Kontrak Pada Mac 2014.
Table 2.18 - Number and Value of Projects Awarded By Status of Contractors and Type of Contract as of March 2014.

Jenis Kontrak *Type of Contract*	Jumlah Bilangan Projek *Total Number of Projects*	Jumlah Nilai Projek (RM j) *Total Project Value (RM m)*	Kontraktor Tempatan / *Local Contractors*				Kontraktor Asing / *Foreign Contractors*			
			Projek Kerajaan *Government Projects*		Projek Swasta *Private Project*		Projek Kerajaan *Government Projects*		Projek Swasta *Private Project*	
			Bilangan *Number*	Nilai (RM j) *Value (RM m)*	Bilangan *Number*	Nilai (RM j) *Value (RM m)*	Bilangan *Number*	Nilai (RM j) *Value (RM m)*	Bilangan *Number*	Nilai (RM j) *Value (RM m)*
2012	7,781	125,190.28	1,958	18,361.32	5,674	91,613.54	1	144.86	148	15,070.56
Konvensional / *Conventional*	7,336	113,188.74	1,804	14,330.38	5,416	87,624.98	1	144.86	115	11,088.52
Reka & Bina / *Design & Build*	252	7,565.68	100	3,004.70	131	1,862.38	-	-	21	2,698.60
Turnkey	122	3,680.02	41	927.10	70	1,492.51	-	-	11	1,260.41
Built, Operate & Transfer (BOT)	41	497.19	7	24.28	34	472.91	-	-	-	-
Engineering, Procurement, Construction and Commissioning (EPCC)	30	258.65	6	74.86	23	160.76	-	-	1	23.03
2013	7,273	116,905.87	1,778	22,244.31	5,381	80,039.33	0	0.00	114	14,622.23
Konvensional / *Conventional*	6,938	97,755.15	1,659	17,744.69	5,186	72,951.21	-	-	93	7,059.25
Reka & Bina / *Design & Build*	194	6,370.13	88	3,651.35	93	1,315.42	-	-	13	1,403.36
Turnkey	87	12,194.71	18	818.36	63	5,237.18	-	-	6	6,139.17
Built, Operate & Transfer (BOT)	23	92.03	7	11.29	16	80.74	-	-	-	-
Engineering, Procurement, Construction and Commissioning (EPCC)	31	493.85	6	18.62	23	454.78	-	-	2	20.45
2014	671	12,545.97	131	1,990.85	537	9,773.99	0	0.00	3	781.13
Konvensional / *Conventional*	651	12,173.05	127	1,863.80	521	9,528.12	-	-	3	781.13
Reka & Bina / *Design & Build*	9	175.80	1	68.73	8	107.07	-	-	-	-
Turnkey	7	182.61	1	47.82	6	134.79	-	-	-	-
Built, Operate & Transfer (BOT)	2	8.00	1	4.50	1	3.50	-	-	-	-
Engineering, Procurement, Construction and Commissioning (EPCC)	2	6.51	1	6.00	1	0.51	-	-	-	-

Jumlah tidak semestinya sama disebabkan oleh pembundaran angka.
Nota : Semua angka tertakluk kepada penyelarasan pemakluman lewat.

Total may not necessarily add up due to rounding.
Note : Figures are subject to change due to late notification

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION

TABLE 1

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

SURVEY QUESTIONNAIRE

FACULTY OF INDUSTRIAL MANAGEMENT

QUESTIONNAIRE

PROJECT PROCUREMENT METHOD: THE CONFLICTS IN CONSTRUCTION PROJECTS PROCURED UNDER DESIGN AND BUILD METHOD

The purpose of this questionnaire is to collect data for fulfilment of the final year project.

The objectives of this research are:

1) To identify the conflicts in design and build construction projects.
2) To propose the solution to overcome the conflicts in design and build construction projects.

Name : Teon Mai Ling

E-mail : teon_mailing@yahoo.com

Phone number : 013-9637927

All data will be kept confidential and used anonymously for research purposes only.

SECTION A: GENERAL INFORMATION OF RESPONDENTS

1. Company Name:

Please tick (√) which appropriate.

2. Position of respondent in company:

☐ Company Director ☐ Project Manager ☐ Engineer

☐ Architect ☐ Quantity Surveyor ☐ Others _____

3. Types of organization of your company:

☐ Building Contractor ☐ Developer

☐ Civil Contractor ☐ Others

4. Company Operation Period

☐ Less than 5 years ☐ 11-15 year

☐ 5-10 years ☐ more than 15 years

SECTION B: CONFLICTS IN DESIGN AND BUILD CONSTRUCTION PROJECTS

Question: What are the conflicts in your design and build construction projects?

Please state the frequency of occurrence of each conflict in your design and build construction projects. Mark the appropriate column that applies.

A) Administration Issues	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Overlapping in roles					
2. Unclear about responsibilities					
3. Resistance to change					

4. Unclear about client requirement					
5. Difficult to control workmanship					
6. Difficult to control design quality					

B) Client Issues	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Delay in design approval					
2. Lengthy evaluation of tender					
3. Lack of client brief					
4. Variation order / Request change from client					
5. Client lack interaction with contractor					
6. Client loss of control and involvement in design					

C) Personality Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Difficulty in following instruction					
2. Misinterpretation of client requirement					
3. Lack of experience					
4. Ineffective communication					

D) Technical Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Design error					

E) Time Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Time Overrun / Project Delay					
2. Delay in activity					

F) Cost Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. High bidding cost					
2. Over budget					
3. Client delays (lack of payment)					

G) Rules and Regulation Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Late permits and approval from related statutory body					

H) Resources Issue	**Frequency of Occurrence**				
	Always 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**
1. Limited resources / workmanship					

END OF QUESTIONS

THANK YOU FOR YOUR COOPERATION

INTERVIEW QUESTIONS

FACULTY OF INDUSTRIAL MANAGEMENT

PROJECT PROCUREMENT METHOD: THE CONFLICTS IN CONSTRUCTION PROJECTS PROCURED UNDER DESIGN AND BUILD METHOD

The purpose of this interview is to get information and recommendation for fulfilment of the final year project.

The objective of this research is to propose the solution to overcome the conflicts in design and build construction projects.

Questions

1. **Variation Order (VO)**
   i. Did your company have facing the variation order problem in the design and build projects?
   ii. Do you have any specific technique of procedure to overcome this problem?

   - Researcher show the VO solution flowchart draft to the experts

   iii. Is it possible to use the solution flowchart that I have made as one of the solution to solve the VO problem?
   iv. Can you give some recommendation or suggestion in order to make the solution flowchart more accurate?

2. **Delay in work activities**
   i. Did your company have facing the delay in work activities problem in the design and build projects?
   ii. Do you have any specific technique of procedure to overcome this problem?

   - Researcher show the delay in activities solution flowchart draft to the experts

   iii. Is it possible to use the solution flowchart that I have made as one of the solution to solve the delay in work activities problem?
   iv. Can you give some recommendation or suggestion in order to make the solution flowchart more accurate?

3. **Client delay (lack of payment)**
   i. Did your company have facing the client delay (lack of payment) problem in the design and build projects?
   ii. Do you have any specific technique of procedure to overcome this problem?

   - Researcher show the client delay (lack of payment) solution flowchart draft to the experts

   iii. Is it possible to use the solution flowchart that I have made as one of the solution to solve the client delay (lack of payment) problem?
   iv. Can you give some recommendation or suggestion in order to make the solution flowchart more accurate?

4. **Client lack interaction with contractor**
   i. Did your company have facing the client lack interaction with contractor problem in the design and build projects?
   ii. Do you have any specific technique of procedure to overcome this problem?

   - Researcher show the client lack interaction with contractor solution flowchart draft to the experts

   iii. Is it possible to use the solution flowchart that I have made as one of the solution to solve the client lack interaction with contractor problem?
   iv. Can you give some recommendation or suggestion in order to make the solution flowchart more accurate?

5. **Time overrun / project delay**
   i. Did your company have facing the time overrun / project delay problem in the design and build projects?
   ii. Do you have any specific technique of procedure to overcome this problem?

   - Researcher show the time overrun / project delay solution flowchart draft to the experts

   iii. Is it possible to use the solution flowchart that I have made as one of the solution to solve the time overrun / project delay problem?
   iv. Can you give some recommendation or suggestion in order to make the solution flowchart more accurate?

PILOT TEST

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	9	90.0
	Excluded[a]	1	10.0
	Total	10	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.873	27

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Position	78.11	140.361	.434	.877
Type	78.89	164.361	.029	.882
Company	77.89	170.611	-.235	.881
A1. Overlapping in roles	78.56	143.028	.599	.863
A2. Unclear about responsibilities	79.11	146.361	.632	.862
A3. Resistance to change	79.00	149.500	.765	.861
A4. Unclear about client requirement	78.22	150.444	.625	.864
A5. Difficult to control workmanship	78.22	150.444	.625	.864
A6. Difficult to control design quality	78.67	158.000	.416	.869
B1. Delay in design approval	78.33	151.750	.698	.863

B2. Lengthy evaluation of tender	78.22	157.694	.279	.873
B3. lack of client brief	78.33	155.250	.667	.865
B4. Variation order / request change from client	78.22	156.194	.571	.867
B5. Lack interaction with contractor	79.11	154.111	.462	.868
B6. Client loss of control and involvement in design	79.22	150.944	.709	.862
C1. Difficulty in following instruction	79.00	158.000	.452	.869
C2. Misinterpretation of client requirement	79.00	154.500	.651	.865
C3. Lack of experiance	79.00	177.500	-.783	.886
C4. Inffective communication	78.89	167.611	-.084	.877
D1. Design error	78.78	160.694	.176	.876
E1. Time overrun	78.44	160.028	.420	.870
E2. Delay in activity	78.00	150.250	.898	.860
F1.High bidding cost	78.44	158.778	.259	.874
F2. Over budget	78.67	160.000	.312	.872
F3. Client delays (lack of payment)	77.89	143.611	.818	.857
G1. Late permits and approval from related statutory body	78.00	154.750	.513	.867
H1. Limited resources / workmanship	78.22	151.194	.696	.863

RELIABILITY TEST

Case Processing Summary

		N	%
Cases	Valid	92	100.0
	Excluded[a]	0	.0
	Total	92	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.728	27

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Position	69.71	79.748	.165	.741
Type	70.49	86.868	.061	.734
Company	69.80	87.720	.050	.732
A1. Overlapping in roles	70.58	78.818	.449	.705
A2. Unclear about responsibilities	70.74	81.118	.403	.710
A3. Resistance to change	70.51	84.494	.267	.720
A4. Unclear about client requirement	70.26	78.744	.499	.702
A5. Difficult to control workmanship	70.33	79.585	.483	.704
A6. Difficult to control design quality	70.38	84.304	.235	.721
B1. Delay in design approval	70.33	81.321	.382	.711

B2. Lengthy evaluation of tender	70.33	81.761	.362	.713
B3. lack of client brief	70.04	83.339	.273	.719
B4. Variation order / request change from client	69.05	86.887	.120	.728
B5. Lack interaction with contractor	69.34	89.742	-.084	.746
B6. Client loss of control and involvement in design	70.36	83.661	.278	.719
C1. Difficulty in following instruction	70.89	83.263	.376	.714
C2. Misinterpretation of client requirement	70.53	82.581	.453	.710
C3. Lack of experience	70.74	88.459	-.004	.736
C4. Ineffective communication	70.66	85.413	.197	.724
D1. Design error	70.51	84.363	.288	.719
D1. Time overrun / Project delay	69.43	88.996	-.033	.737
D2. Delay in activity	69.21	84.913	.284	.719
E1.High bidding cost	70.73	84.288	.258	.720
E2. Over budget	70.58	84.159	.288	.718
E3. Client delays (lack of payment)	69.29	83.990	.312	.717
F1. Late permits and approval from related statutory body	70.73	79.936	.391	.709
G1. Limited resources / workmanship	70.76	79.459	.467	.705

MEAN VALUE ANALYSIS

Descriptive Statistics

	N	Mean	Std. Deviation
A1. Overlapping in roles	92	2.36	.144
A2. Unclear about responsibilities	92	2.20	.986
A3. Resistance to change	92	2.42	.829
A4. Unclear about client requirement	92	2.67	.060
A5. Difficult to control workmanship	92	2.61	.005
A6. Difficult to control design quality	92	2.55	.942
B1. Delay in design approval	92	2.61	.005
B2. Lengthy evaluation of tender	92	2.61	.994
B3. lack of client brief	92	2.89	.988
B4. Variation order / request change from client	92	3.88	.782
B5. Client lack interaction with contractor	92	3.60	.168
B6. Client loss of control and involvement in design	92	2.58	.929
C1. Difficulty in following instruction	92	2.04	.783
C2. Misinterpretation of client requirement	92	2.40	.742
C3. Lack of experience	92	2.20	.929

C4. Ineffective communication	92	2.27	.853
D1. Design error	92	2.42	.802
E1. Time overrun / Project delay	92	3.50	.896
E2. Delay in activity	92	3.73	.728
F1.High bidding cost	92	2.21	.884
F2. Over budget	92	2.36	.833
G3. Client delays (lack of payment)	92	3.64	.806
F1. Late permits and approval from related statutory body	92	2.21	.144
G1. Limited resources / workmanship	92	2.17	.044
Valid N (listwise)	92		

FACULTY FORMAL LETTER & RESPONDENTS COP

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Fakulti Pengurusan Industri
Faculty of Industrial Management

NO. RUJ: UMP.27.02/13.16/6/3 Jld 7 (99) 26 Jun 2014

KEPADA PIHAK YANG BERKENAAN

Tuan/Puan,

PERMOHONAN MENJALANKAN PROJEK TAHUN AKHIR BAGI PROGRAM IJAZAH SARJANA MUDA PENGURUSAN PROJEK

Dengan segala hormatnya, sukacita saya merujuk kepada perkara di atas.

2. Dimaklumkan bahawa pelajar dari program Ijazah Sarjana Muda Pengurusan Projek, Fakulti Pengurusan Industri, Universiti Malaysia Pahang terlibat di dalam kajian penyelidikan tahun akhir **(BPP3522: *FINAL YEAR PROJECT 1)*** bagi memenuhi keperluan bergraduat. Berikut adalah maklumat pelajar berkenaan:

NAMA PELAJAR	NO. IC	NO. MATRIK
Teon Mai Ling	901201-03-5508	PB11095

3. Sehubungan itu, pihak kami ingin memohon jasa baik pihak tuan/puan untuk memberi kebenaran kepada pelajar berkenaan untuk untuk mendapatkan maklumat berkaitan dari organisasi tuan/puan. Maklumat tersebut hanya akan digunakan bagi tujuan akademik sahaja.

Segala kerjasama daripada pihak tuan/puan amatlah dihargai dan diucapkan ribuan terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan tugas,

FADZIDA BINTI ISMAIL
Pensyarah
Fakulti Pengurusan Industri
Universiti Malaysia Pahang
Tel : 09-549 2335
Faks : 09-549 2167

➢ *FILE: Surat Kelulusan Aktiviti Pelajar*

ctju

Engr. Mohd Hasnzal bin Haji Hasim
Pengurus
Bahagian Teknik
Perbadanan Kemajuan Negeri Pahang

AZLINA BINTI MOHAMAD
Pembantu Teknik Ukur Bahan
Bahagian Perkhidmatan Teknik
Perbadanan Kemajuan Negeri Pahang