

EVALUATION ON DESIGN – BUILD  
PROCUREMENT PROCESS IN  
CONSTRUCTION INDUSTRY IN MALAYSIA

IKMAL IZZAT BIN ABDULLAH KARIM

B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

## UNIVERSITI MALAYSIA PAHANG

### DECLARATION OF THESIS AND COPYRIGHT

Author's Full Name : IKMAL IZZAT BIN ABDULLAH KARIM  
Date of Birth : 13 MARCH 1995  
Title : EVALUATION ON DESIGN – BUILD PROCUREMENT  
PROCESS IN CONSTRUCTION INDUSTRY IN MALAYSIA  
Academic Session : SEMESTER 1 2018/2019

I declare that this thesis is classified as:

- CONFIDENTIAL (Contains confidential information under the Official Secret Act 1997)\*  
 RESTRICTED (Contains restricted information as specified by the organization where research was done)\*  
 OPEN ACCESS I agree that my thesis to be published as online open access (Full Text)

I acknowledge that Universiti Malaysia Pahang reserves the following rights:

1. The Thesis is the Property of Universiti Malaysia Pahang
2. The Library of Universiti Malaysia Pahang has the right to make copies of the thesis for the purpose of research only.
3. The Library has the right to make copies of the thesis for academic exchange.

Certified by:

\_\_\_\_\_  
(Student's Signature)

950313 - 06 -5745  
New IC/Passport Number  
Date:

\_\_\_\_\_  
(Supervisor's Signature)

EN. MOHAMMAD SYAMSYUL  
HAIRI BIN SAAD  
Name of Supervisor  
Date:

NOTE : \* If the thesis is CONFIDENTIAL or RESTRICTED, please attach a thesis declaration letter.



## **SUPERVISOR'S DECLARATION**

I hereby declare that I have checked this thesis/project and in my opinion, this thesis/project is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

---

(Supervisor's Signature)

Full Name : EN. MOHAMMAD SYAMSYUL HAIRI BIN SAAD

Position :

Date :



## **STUDENT'S DECLARATION**

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

---

(Student's Signature)

Full Name : IKMAL IZZAT BIN ABDULLAH KARIM

ID Number : AA14153

Date :

EVALUATION ON DESIGN – BUILD PROCUREMENT PROCESS IN  
CONSTRUCTION INDUSTRY IN MALAYSIA

IKMAL IZZAT BIN ABDULLAH KARIM

Thesis submitted in fulfillment of the requirements  
for the award of the  
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources  
UNIVERSITI MALAYSIA PAHANG

JANUARY 2019

## ACKNOWLEDGEMENTS

“In the name of Allah, the most gracious, the most compassionate”

With the greatest blessing of Allah, finally I have accomplished this final year project as a requirement to graduate and acquire in a Bachelor of Civil Engineering from Universiti Malaysia Pahang.

I would like to take this golden opportunity to express my sincere gratitude to my supervisor, Mr Mohammad Syamsyul Hairi Bin Saad. His ideas, invaluable guidance, continuous support and constant support in making this research possible and improved my piece of work. I really appreciate his consistent support from the first day of my thesis progress and I also sincerely thanks for the time spent correcting my many mistakes.

My sincere thanks to my lovely parents, Mr Abdullah Karim bin Awang Hitam and Mrs Razananahidah binti Jamaludin and my beloved sibling. Their continuous moral support and pure blessing have brought me all this way.

In addition, I would also like to thanks all my beloved friends who have provided directly and indirectly assistance to this study.

Last but not least, I would like to thank all of them who were with me throughout this project. I sincerely appreciate this valuable favour from all of you.

## ABSTRAK

Kaedah Rekabentuk dan Membina (DB) adalah pendekatan perolehan bersatu dimana kontraktor yang dipilih akan bertanggungjawab sepenuhnya untuk menjalankan kerja-kerja dan memantau aktiviti projek. Kaedah ini merupakan sebuah sistem di mana klien menjalinkan hubungan kerja secara langsung dengan kontraktor untuk kerja-kerja pembinaan projek dan memainkan peranan penting dalam merekabentuk dan membina projek. Bagaimanapun, DB boleh dipilih melalui dua cara iaitu klien melantik kompeten kontraktor di dalam sebuah organisasi yang sama bagi merekabentuk dan melakukan kerja-kerja membina atau klien melantik konsultan luar untuk membantu kontraktor semasa fasa reka bentuk dan perancangan bagi memastikan kelancaran pelaksanaan projek. Untuk kajian ini, sampel projek yang dipilih adalah projek pembinaan di Malaysia yang melaksanakan kaedah DB. Tujuan kajian ini adalah untuk mengenal pasti masalah atau isu yang wujud di dalam projek pembinaan DB, mencadangkan resolusi untuk mengendalikan dan menguruskan punca isu utama dan juga mencadangkan penyelesaian untuk meningkatkan prestasi keseluruhan projek Design - Build. Untuk mengenal pasti semua masalah dan menilai penyelesaian yang tepat dalam menangani masalah, kajian ini melaksanakan kaedah kuantitatif. Untuk kaedah kuantitatif, borang soal selidik diberikan semasa sesi pengumpulan data kepada responden. Untuk menganalisis dan menjana data yang dikumpul, Analisis Kandungan dan Analisa Purata Index telah digunakan. Dari hasil yang diperolehi, kajian ini mendapati majoriti responden bersetuju bahawa projek mereka berhadapan dengan masalah tenaga kerja yang kurang berpengalaman. Masalah ini mungkin disebabkan oleh perancangan kerja yang tidak cekap atau tidak wajar. Perancangan kerja yang tidak sistematik atau tidak wajar dapat ditingkatkan dengan mewujudkan program master yang dirancang dengan baik yang dapat di praktikkan dan dilaksanakan di tapak pembinaan. Akhirnya, kajian ini mencadangkan Prosedur Pengendalian Piawai (SOP) yang akan bertindak sebagai panduan kepada pasukan pembinaan agar dapat memperbaiki prestasi keseluruhan projek DB dan mengurangkan masalah utama.

## ABSTRACT

Design and Build (DB) delivery method is a united procurement approach where the selected builder will take sole responsibility for all aspects and activities of the project. This method also defined as a system where the clients directly pledge with the contractor to construct the project and play a decisive role to design and construct the project. However, DB can be organized by two ways which are; clients hire a competent design and build contractor in a same company or clients will hire an external consultant to assists the contractor during design and planning phase to ensure the smoothness performance of the project. For this study, the project sample selected is a construction projects in Malaysia that implementing DB method. The purpose of this study is to identify existing problems or issues in DB construction project in Malaysia, propose resolution to handle and manage major issues presence and also suggesting solutions to better improve overall performance of Design - Build project. In order to identify all the problems and evaluate proper solutions to mitigate problems, this study implementing quantitative method. For quantitative method, questionnaire forms are handed out during data collection session to the respondents. To analyze and generate the collected data, Content Analysis and Average Index Analysis are being utilized. From the assembled results, it can be conclude that, most of the respondents agreed that their project deal with inexperience workforce problem. This problem occur may due to the inefficient or improper work planning. Insufficient or improper work planning can be improved by establishing a well - planned master program that are practical and implemented on site. Finally, this study propose a Standard Operating Procedure (SOP) that will act as a guideline to construction teams in order to better improve the overall performance of DB project and reduce major problems.



## TABLE OF CONTENT

<b>DECLARATION</b>	
<b>TITLE PAGE</b>	
<b>ACKNOWLEDGEMENTS</b>	<b>ii</b>
<b>ABSTRAK</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>TABLE OF CONTENT</b>	<b>v</b>
<b>LIST OF TABLES</b>	<b>ix</b>
<b>LIST OF FIGURES</b>	<b>x</b>
<b>LIST OF SYMBOLS</b>	<b>xi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xii</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Background of the Study	3
1.3 Problem Statements	4
1.4 Research Objectives	5
1.5 Scope of Study	5
1.6 Limitations	6
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>7</b>
2.1 Project Delivery Methods	7
2.1.1 Design – Bid – Build	8
2.1.2 Design – Build	13

2.1.3	Construction Management (CM)	22
2.2	Common Issues or Limitations Related To Delivery Methods	25
2.2.1	Design Build	26
2.2.2	Design - Bid – Build	29
2.2.3	Construction Management at Risk	35
<b>CHAPTER 3 METHODOLOGY</b>		<b>41</b>
3.1	Introduction	41
3.2	Qualitative Method	43
3.2.1	Advantages of Qualitative Method	43
3.2.2	Research Questions for Qualitative Method	44
3.2.3	Tools for Data Collection of Qualitative Method	44
3.3	Quantitative Method	46
3.3.1	Advantages of Quantitative Method	46
3.3.2	Research Questions for Quantitative Method	47
3.3.3	Tools for Data Collection of Quantitative Method	48
3.4	Data Collection for Case Study	49
3.5	Sampling	50
3.6	Development of Question Protocol and Data Collection Session Protocol	50
3.7	Data Analysis	51
3.7.1	Average Index Analysis	51
3.7.2	Content Analysis	53
3.8	Validation	53
3.8.1	Flowchart and Gantt chart of Proposal	54

<b>CHAPTER 4 RESULTS AND ANALYSIS</b>	<b>56</b>
4.1 Introduction	56
4.2 Data Collection Session	56
4.3 Questionnaire Analysis	57
4.4 Section A – Analysis of General Information	57
4.4.1 Position of Respondents In Company	57
4.4.2 Years of Organization’s Experience	58
4.4.3 Working Experience	59
4.4.4 Type of Delivery Method Used	60
4.5 Section B – Analysis of the Presence Issues	60
4.5.1 Type of Arising Problems	60
4.5.2 Possible Risk Occur	66
4.5.3 Understandability of Information and Instructions	66
4.5.4 Effect of Delivery Method towards Project Completion	67
4.6 Section B – Contract / Team Selection Issues	67
4.6.1 Type of Contract	68
4.6.2 Compliance of Related Parties with Contract	68
4.6.3 Evaluation of Compliance of Respondents	68
4.7 Section C - Open – Ended Evaluation	71
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATION</b>	<b>76</b>
5.1 Introduction	76
5.2 Conclusion	76
5.3 Recommendation	77
5.3.1 Recommendation for This Study	77
5.3.2 Recommendation for Further Studies	78

<b>REFERENCES</b>	<b>79</b>
<b>APPENDIX A SAMPLE APPENDIX 1</b>	<b>89</b>

## LIST OF TABLES

Table 2.1 Dominant problems that arise during design phase that affecting quality of the project	30
Table 2.2 Possible solutions to control the problems in design phase	30
Table 2.3 Possible problems occur in bidding phase	31
Table 2.4 Solutions related to overcome possible problems in bidding phase	31
Table 2.5 Problems appear in construction phase	32
Table 2.6 Resolution to resolve problems in construction phase	33
Table 3.1 The Level of Compliance for Average Index Analysis	52
Table 4.1 Type of Delivery Method	60
Table 4.2 List of Problems and Issues in General Aspect	61
Table 4.3 List of Problems and Issues in Quality Aspect	61
Table 4.4 List of Problems and Issues in Design Aspect	63
Table 4.5 List of Problems and Issues in Financial Aspect	64
Table 4.6 List of Problems and Issues in Time Aspect	65
Table 4.7 The Level of Compliance for Average Index Analysis	69

## LIST OF FIGURES

Figure 2.1 Relationship Diagram Between Several Parties in DBB	9
Figure 2.2 Relationship Diagram For Design – Build Method	14
Figure 2.3 Relationship Diagram for Construction Management at Risk	23
Figure 2.4 Relationship Diagram for Construction Manager as Agent/Adviser	24
Figure 3.1 Flow Chart for Overall Process in Gathering Results	54
Figure 3.2 Gantt Chart for Final Year Project Schedule	55
Figure 4.1 Position of Respondents In Company	58
Figure 4.2 Year's of company's experiences	58
Figure 4.3 Working Experiences	59
Figure 4.4 Likert Scale Questions Regarding Road Construction	70

## LIST OF SYMBOLS

$A_i$	Constant expressing weight given to $i$
$X_i$	Variable that expressing the frequency of degree

## LIST OF ABBREVIATIONS

DB	Design – Build
DBB	Design – Bid – Build
CM	Construction Management
CMR	Construction Management at Risk
CMA	Construction Management as Agent
RFP	Request for Proposal
RFQ	Request for Qualification
PPP	Public – Private Partnership
GMP	Guaranteed Maximum Price
SOP	Standard Operating Procedure
AI	Average Index
CPM	Critical Path Method
NCR	Non Conformance Report



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

Construction Industry is one of the cannonading industries of today that greatly affects the economy of any country. Construction is an imperative segment that contributes enormously in the financial development of a nation. The Construction Industry is a speculation drove segment where government indicates high intrigue. Government contracts with Construction Industry to develop infrastructure related to health, transport as well as education sector. For prosperity of any nation, Construction Industry is quintessential.

The construction industry is viewed as one of the main contributors towards a nation's economy. In Malaysia, the construction industry contributes significantly to the financial development of the nation. In the course of the most recent 20 years, the industry has reliably contributed approximately three to five per cent to the national GDP (Yong & Mustaffa, 2012). To enhance to the growth of the construction industry, (Yong & Mustaffa, 2012) mentioned that an estimated RM 138 billion has been provided for this industry by the Ministry of Works under the Tenth Malaysia Plan (2011-2015). The results of development play an important role towards the production of value way of life among the local population. To put it plainly, every one of us are directly or indirectly influenced by construction procedures and its final results.

In order to increase and boost the growth of construction industry, selecting the right delivery method for procurement is one of the essentials criteria that need to be implemented. Proper delivery methods needed responsibilities, contractual correlations and roles from related organisations in construction projects. Plus, this process usually

takes place when design is completed and constructed to the clients. The project delivery system also can be distinguished based on how the contract is being made between the owners with builders and designers (Touran et al. 2011).

A project delivery system has been defined as the set of relationships, roles and responsibilities of project team members and the sequence of activities required for the organization of a capital project. In the previous study, (Gransberg, Asce, Molenaar, & Asce, 2004) mentioned that project delivery can be viewed as a three-legged stool, with the legs being defined as cost, schedule, and quality.

Procurement method's selections act as important role to ensure the projects are followed the objectives which are, time, cost and quality (Yong and Mustaffa, 2012). —Procurement method is a term that is quite broad in scope because this method needed to acquire several organizations work together to design, build and manage construction projects (Norziatul Husna, 2012). Plus, the presence of procurement also involve on handling and managing people or workers to meet all the requirements by the owners. (Rosli Abdul Rashid, 2006).

There are numerous project delivery methods that owners use on projects such as Traditional Design-Bid-Build, Design-Build, Construction Management and Construction Management at Risk. (El-sayegh, n.d.) has discovered that one of the vital explanations behind the poor performance of construction industry is the unseemliness of the type of delivery system that has been picked. Therefore, selection of any of the delivery systems to utilize may rely upon how well the project could perform under every system.

Procurement method's selections act as important role to ensure the projects are followed the objectives which are, time, cost and quality (Yong and Mustaffa, 2012). —Procurement method is a term that is quite broad in scope because this method needed to acquire several organizations work together to design, build and manage construction projects (Norziatul Husna, 2012). Plus, the presence of procurement also involve on handling and managing people or workers to meet all the requirements by the owners. (Rosli Abdul Rashid, 2006).

Hence, to ensure the effectiveness of the procurement methods, there are two procurement methods that are categorized as most common and predominant project delivery system used in many countries namely as design – bid – build (DBB) and design – build (DB) (Miller et al., 2000; Al Khalil, 2002; Arditi and Lee, 2003; Ling and Kerh, 2004). This method already implemented and documented in 1968 at United States (Plebankiewicz & Zima, 2012). In Malaysia, DB method being introduced and launched by Prime Minister in 1983 in Public Works Department for constructing Kuala Terengganu Hospital which was completed in 1985 (Mokhtar, 1993).

## **1.2 Background of the Study**

Procurement method is a process in a construction industry where all activities that related to construction project including providing materials, services and consultancy that may crucial to the project so that all the client's requirements and needs can be accomplished (Martins, 2009; Sears et al., 2008). This method already being implemented not only these recent years, but actually, already done way back before. Back to early years, application of procurement method already implemented as early as 3,000BC. In Egypt, scribes responsible to design the pyramid and used papyrus to record the materials prices that are needed for the pyramid's construction. Scribes also responsible as a clerk to observes and calculate all the expenditure for the materials and workforce for the construction. Plus, Ancient Roman also hired scribes as their clerks to make contract during trade – in activity with private suppliers. Besides that, at Great Britain, they are also applying this method back to William the Conqueror, where he wants to ensure the effectiveness way to record the tax transactions. Starts from that occurrence, procurement method starts to widening and influencing all construction projects.

Due to the rapid growth for the construction industries back then, the evolution of procurement system also evolve to a more systematically arrangement. Moreover, this system always changes from time to time to ensure the quality of the project. At first, the procurement method combined the design, maintenance, construction and operation into one, such as Design – Build – Operate (DBO) and Design – Build – Finance – Operate (known as Build – Operate – Transfer). Recently, this combined method already separated into two main categories, which are Design – Bid– Build (DBB) and

Design – Build (DB). Nowadays, constructions become more risky and very costly, executing new materials and technologies are essentials to boost the production of the projects. (Turina, RadujkoviÄ, & Car-PušiÄ, 2008)

In Malaysia, the transformation and history for procurement method also exist due to complexity and requirements for the projects. There are some commonly used procurement methods in Malaysia such as, traditional method (DBB), Design – Build (DB), management contracting and construction management. Every delivery methods have their own advantages to the projects and some of the methods may not suitable to use to all projects due to the complexity and also based on the needs of the clients. Many clients recently quite dissatisfied with the traditional method and its operation, hence the clients seeks a new methods; that are compatible with their complex demands. More than that, recently based on (Abdul, Universiti, & Hussein, 2014), they are reviewing the effectiveness of Public Private Partnership (PPP) to be implemented in Malaysia because this method already being disseminate worldwide. PPP is an effort from the private and public sectors to make collaboration for accomplishing projects. From this idea, both public and private sectors can assist for the costs, risks assessment, and also prolonged their relationship.

### **1.3 Problem Statements**

From the real road construction project as the case study that still in progress, they are having major problems whereby the main contractor does not follow the contract's regulations in terms of payment to the sub – contractor and occurred delay in terms of sub – contractor's salaries for almost four (4) months. This project implementing Design Build (DB) type of delivery system and contractor have the sole responsible to handling the project. Unfortunately, due to the lack of disciplines and professional's attitude from the contractor, the sub – contractor unable to continue their jobs due to late payment being made by the contractor. From this problem, workers cannot advance and continue their activities because they are unable to settle down the rent payment for the machineries, equipment, workforce and materials. In a nutshell, from the setback payment, the duration of the project also delay due to insufficient workers and equipment. This is supported by previous study wrote by (Nuhu Braimah & Issaka

Ndekugri, 2008), delays on contractors progress are the main reason for claims and disputes from other workers in construction industry.

On the other hand, based on previous study (Songer A and Molenaar K, 1997), even though DB system becomes popular nowadays, but it shows that DB has uncertain procedures of selecting well-establish contractors. Moreover, design – build also can be a complex process and some public sector owners still uncertain with this method. Inappropriate cash flow from the contractor to the sub-contractor also affected the performance of project due to the delayed payment. Plus, lack of risk management and identification may affect not only quality of the projects but also can cost excess money rather than using DBB (Henry Odeyinka, et al, 2016).

#### **1.4 Research Objectives**

- a) To identify the suitable resolution for client to handle and manage issues related to Design – Build in construction projects.
- b) To determine issues faced by related construction parties regarding Design – Build delivery method.
- c) To propose solutions to better improve the overall performance of projects with regards to project delivery method.

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

For the scope of this study, the limitation has been done in order to focus and narrow down the topic to the specific area and subject of study. The scopes of this case study can be stated as below:

- This study is focus about design & build contract
- This study is focusing on the contractor's Bumiputera companies
- The respondents are the registered as grade 4 contractors with construction industry development board (CIDB)
- This study consists of government agencies

- The area of this study is in Temerloh, Pahang.

## **1.6 Limitations**

Based on this study, some limitations arise in this research due to some reasons such as:

- a) This research focus on a case study that is actually undergo in Malaysia. But, there is limitation appear due to the sole focus on a project but not entire projects in Malaysia. In order to widening the focus, extension time of research may be crucial so that all the related information can be achieve.
- b) As a result of the limitation arise to achieve other project's information, time limitation also presence because time allocation provided is not enough to cover all the data. Thesis formatting has long been one of the nightmares for postgraduate students. More often than not, students find themselves spending more time than expected just to format their thesis. Starting from 2016, Universiti Malaysia Pahang (UMP) provides *Microsoft Word* template of the thesis format to UMP postgraduates. This module aims to guide users (both postgraduates and undergraduates) to effectively use the template. The module has been written with step-by-step instructions, accompanied with appropriate diagrams. Its design is aimed at facilitating users with self-practice on the computer simultaneously.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Project Delivery Methods

Every construction projects are procured by their own method to ensure the projects meet the requirements and success. There are no construction projects that are procured without using any delivery method. Plus, right selection of methods will influence many factors for example, economical issue. This is because, (Creedy et al., 2010) explained that, construction projects are exposed to face economical risk due to the complexity and dynamic nature. Hence, proper planning at the early phase will help to reduce that risk before affecting total cost of the projects. (Chalabi and Camp, 1984) focus on adequate planning at early stage plays an important role in reducing delays and cost overrun. The definition of delivery method is referred to the owner's expectation and their approach to establish the project team members that are responsible to undergo construction activities and design the project. On the other hand, delivery method's selection play a vital role in determining the project whether it will be success or not. This method may cause the owners risks but also as their desires to find the most suitable method and also team workers that can deliver the project successfully and meet all the owner's requirements and needs especially on time, cost and quality (Frederick E. Gould & Nancy E. Joyce, 2003). Plus, (Idoro & Idoro, 2012) described that, due to various type of delivery methods are already executed in construction project, clients become attracted with the advantages that the methods offer such as, diversity of their own roles in each of the methods when handling the projects.

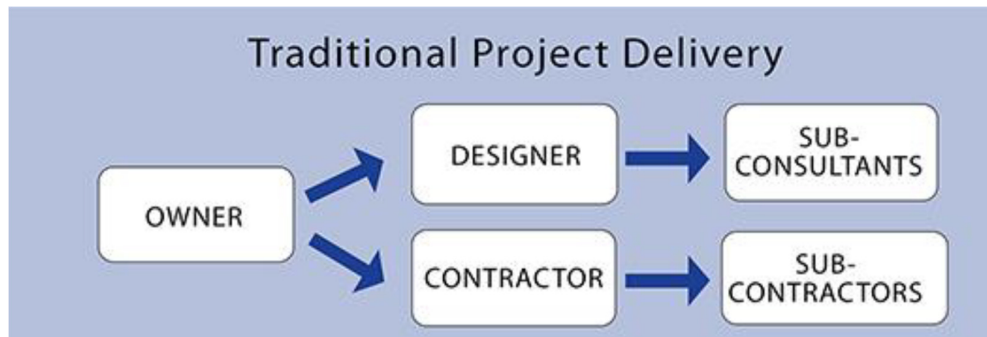
### **2.1.1 Design – Bid – Build**

In previous study, (Ibbs et al., 2003) explained about the definition of Design – Bid – Build or known as traditional method. Basically, this method is divided into two phase which are, design and construction phases. In the meantime, construction process can be executed only if the design is already completed, while drawings act as a medium for bidding process. Next, (Idoro, 2007) proves that Nigeria's most outstanding project procurement method is traditional method. This method can be classified as the ancestor of procurement arrangement in construction industry. In Design – Bid --Build, there are three important organizations which are; owner, designer (architect and engineer) and contractor (I. M. Mahdi and K. Alreshaid, 2005).

#### **2.1.1.1 Team Selection**

Team selection phase is important in any delivery methods. This is because; proper selection of team members will influence the performance and quality of the project. In DBB, the selection of team members starts with designer selection. Firstly, designer company being hired to provide design that client required and also produce contract drawings that follow client's requirements. After the completion of hiring designer, they will assist and advice the client during bidding phase and contractor selection. Next, when the client already met the suitable contractor based on the qualifications and affordable or lowest costs bid made, contract will be sealed between the client and the construction company to deliver the project. During construction process, designer will assist the client by supervise the project's performance. These two organizations; designer and contractor that are from different organizations, will enrol for design and construct the projects (S. M. El-Sayegh, 2007). Contractor selection with the most suitable and competent attitude and performance will produce tremendous construction projects. In fact, proper contractor selection is extending equally with the project performance (Erbas, 2015).





Source: (Design Build Institute of America, 2004)

Figure 2.1 Relationship Diagram Between Several Parties in DBB

### 2.1.1.2 Advantages

Design – Bid – Build delivery method not only being passed down in the past, but actually this method still being implemented by developing countries. (Chan, A.P.C., 1996a) proves that most construction projects were implementing Design – Bid – Build where the architect design the projects and contractor undergo the construction activities. Plus, some South East Asia's countries such as Indonesia and Malaysia, they are still using DBB as their delivery method and constructing various type of project (Norziatul Husna, 2012; Anak Parami Dewi, Too, & Trigunaryah, 2011).

This method may offer discrete advantages to the owner and also to the other related parties. By adopting DBB method, previous research (Fernane, 2011), proves that DBB project outperformed DB project in term of changes of cost during construction and design phase. This is because, owners had already fixed the price of the project and bidding process during contractor selection, owner will tend to choose the lowest bidder. During bidding process, owner has the advantages for calculating the possible cost that may be spent with the assist from the architect and engineer. From this approach, the contractor's possibility for claims can be reduced and total cost for the project can be controlled from exceeding. Researcher also endorse this statement that Design – Build method prone to increase and change the total cost of the project (Ibbs et al, 2003).

In addition, this process is considered as an advantageous because, even though the duration for traditional method are quite longer than other delivery methods, it is actually give the client proper duration if they want to change the design regarding to their needs during planning and design phase and can reduce cost overrun rather than produce changes during construction phase (Molenaar et al. 1998). The primary benefit by implementing this delivery system is that, separation between contractor and designer will help them to focus with their own responsibilities and created checks and balances.

### **2.1.1.3 Disadvantages**

Even though DBB promotes cost saving and high productivity, this method has its own flaws and setback. (Anak Parami Dewi et al., 2011) describes that DBB has elongated procurement periods, thus it will affect not only the duration of the projects, but also the quality of outcome, and also increase the cost. Due to the complexity and higher demands from the client for more efficient and fast – track delivery method, the clients will always seek a new method to deliver the project especially, low cost saving and also faster completion. In the same way, (Ojo et al, 2011) described in an analysis from surveying DBB and DB, and also compared those two methods, analysed that average cost overrun always presence and occurred during DBB project and recorded 42.6% while DB method just only 21.4%. Next, this analysis also proves that majority of clients (51%) are dissatisfied with the quality and outcome of the project whenever they are using DBB.

On the other hand, claims and disputes always occurred during DBB method applied. Those complications are commenced due to the separation between the designer and builder team and cause —psychological barrier‡ between these two parties (Adesanya , 1998). This barrier also being surmise by (Graves, 1982) whereby due to this —psychological barrier‡, the outcome will affect the performance of project such as, disputes, claims, and also delays. By the same token, (Higgins and Jessop, 1965) opined that the separation between those two parties have led to communication problems and produce uncertainty between the parties. Next, (Franks, 1990) described that this method has been criticized because of multi – organisations responsibility that clients need to encounter and tolerate with conflicts that happen between the parties. Lastly,

(Okereke- Onyeri, 1994) explained that this method does not have identifiable party that is willing and pleased to take important decisions on behalf of client.

#### **2.1.1.4 DBB Contract Type**

In construction industry, some of the projects may consist of unique and complex elements whereby the related parties need to give their commitment, experiences and knowledge to construct the project. They also urge to fulfil all the clients' requirements regarding to the project. Basically, clients will arrange their designers, consultants and quantity surveyors to prepare their blueprints, designate the contractor and supervise the construction activities, and extra fee for consequent function. In contracting stage, it is usually occur between the client and contractor. Normally, contract is been used to defined clearly about the project elements, roles of each related parties and also terms of bargain between the parties. Nevertheless, contract also acts as a medium to specify the client's requirements, proper actions in order to obligate the client's need, and also ensuring the contractor to comply with the client's needs. Previous study by (McCaffer, 2005), identified seven types of contract which are; Lump sum, Cost Reimbursement, Schedule of Rates, Fixed or Percentage Fee, Bill of Quantities, Direct Cost and Target Cost.

##### **a) Measurement Contract**

Usually, this method will focus on pre – estimated type of contractual, but it cannot be determine until the work is commenced and completed. The assessment of the construction work will base on the Bill of Quantities. This type of contract suitable to use for early initiation on site is needed (Kwakye, 1997).

##### **b) Cost Reimbursement**

In this method, the client will commence this type of contract to pay the contract for essential cost such as; labour cost, materials and equipment. Besides that, in the prime cost, the contractor is salaried based on agreed sum including the profit and charges. This type of contractual method is applied due to the certain circumstances such as:

- The client will play their role to control the achievement of the works and assume the entire site operation as a risk
- Fast – track type of project, but expansion of the works cannot be predicted.
- High standard and quality of work is essential

#### c) Lump Sum

Under this contract method, the contractor accepts to undergo the construction activities depends on the fixed price, including the possible risk that may be faced, and their current workforce. The contractor will be paid based on the pre – estimation regardless the original cost, and prevent any variations (Kwakye, 1997).

#### d) Schedule of Rate

This type of schedule includes all the maintenance and repair works, even though the real works are still not in place, and the contractor need to rate the listed items. This form is important to analyse and identify any difficulties where all the works are still temporary. Besides that, this method had found the inability to ensure the exact quantities that need to be taken. The payment is being done based on the effort for the work and paid them at tendered rates (Ivor, 1997).

#### e) Approximate Quantities

In some situation, guaranteed fixed price is very important to provide the exact quantities, but there are also some occurrences when approximating schedule also important (Ivor, 1997). The speed for the project is dominant and design also has been develop, it is important to hire and find the suitable contractor before the real construction commenced. Plus, with proper and detailed design information, it also able to approximate quantities that already proposed. In the same time, conditional qualities need to be included to identify any ambiguous and also seeks to re – measurement when the work already start. Lastly, with work outside, information regarding the project will be expected, but the depth and any other situation will become ambivalent.

f) Target Cost

To overcome the possible problems and weakness of typical contract, clients need to convince the contractor to informed the possible target and estimate the plan based on the design and specifications. The payments that being made by client will turnaround whether decrease or increase the original cost and agreed the probable amount of savings between the actual cost and target estimated for any changes order (Harris and McCarffer, 2005).

g) Direct Labour

Certain clients have their domestic labours such as, government party, local authorities that are employed and need to carry out each of two such as; internal or external design by the consultants. Usually, using this method, competitions may presence between the contractors and can be recommended to invite outside contractor to insert and submit their bid (Harris and McCarffer, 2005).

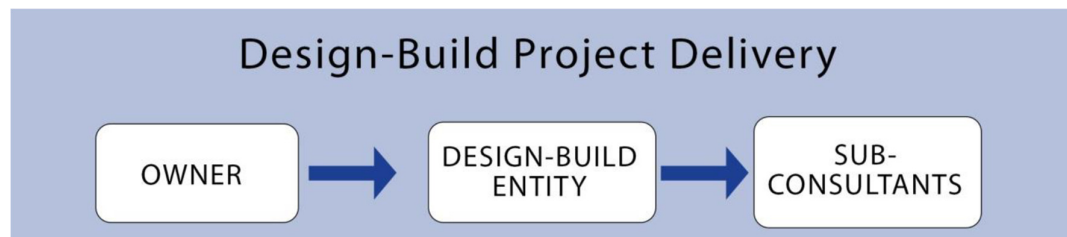
### **2.1.2 Design – Build**

Design and Build delivery method is a unified procurement approach where the selected builder will take sole responsibility for all aspects and activities of the project (Moore and Dainty 1999). DB method has provided the contractor completely responsible to organize the projects with on package (Kwakye 1997). This method also defined as a system where the clients directly pledge with the contractor to construct the project and play a decisive role to design and construct the project, plus to engage with the design team (The Chartered Institute Building of CIOB, 1983). In fact, DB has already been implemented for almost 40 years and gained popularity over the last 10 years (Ernzen and Schexnayder, 2000). At the same time, (The Chartered Institute of Building, 2010) undergo survey and described that projects cost range from 5 million to 50 million are suitable to use DB. In Malaysia, the changes from traditional method to DB method are due to the increasing number of complex projects, higher requirements from the owners and also demanding fast – track type of completion, public sector would be highly recommend DB method (Norziatul Husna, 2012). On the other hand, The USA Construction Industry proves that DB methods assist the project to increase the

productivity of the project, thus almost no delay occurred (W.G. Kriza, 1997; S.R. Thomas et al, 2002)

Some researchers define that Design – Build is a method where the clients selected sole organization to handle and manage the project in term of design and construct. However, (Hughes et al., 2006) described that DB can be organized by two ways which are; clients hire a competent design and build contractor in a same company or clients will hire an external consultant to assists the contractor during design and planning phase to ensure the smoothness performance of the project. Design and Build has been considered as the most suitable method to assist the owner and also to give full responsible to the contractors to undergo both design and construct the project (Greenhalgh and Squires, 2011).

To determine the success of DB projects, decent selection of contractor is crucial due to the higher demands and complexity of the project itself. Plus, contractor is the only organization that is responsible to commence the project. Hence, competent contractor and sub – contractor are very important to design and build the project, and ensure the quality of the project and also follow all the requirements (Hemlin, 1999; Molenaar et al., 1999).



Source: (Design Build Institute of America, 2004)

Figure 2.2 Relationship Diagram For Design – Build Method

### 2.1.2.1 Team Selection

Based on preceding study, (Palaneeswaran & Kumaraswamy, 2001) explained that contractor selection for DB project is more critical and demanding rather than the traditional method. Recent developments highlight the important role of the contractor

in every construction projects and select the most suitable and worth contractor to increase the success rate for the projects. The only difference that being made by DB method is, the owner only made contractual agreement with one party. Once the contractor being selected, they have to follow all the needs and met all the requirements. (Plebankiewicz & Zima, 2012) researched that based on analysis of case study, majority cases (92%) choose the contractor based on the lowest price proposed. This type of selection is the most attractive among the public sector client in Poland. However, this procedure for selecting contractor is not recommended in other countries that already enforce DB (K.R. Molenaar, A.D. Songer, 1998). This is because; the client should cater on the price and quality of the proposed project, and submission of prequalification tender procedures. Prequalification is important for the client to find the most suitable contractor to be award and the client should assessed the competency of the contractor. Under DB contractual method, contractor's main responsibility is to follow all the owner requirements and needs. The contractor will not rely on other external designer's plan prepared for them. They should follow all the owner's needs. Consequently, the contractors will responsible if any defects or malfunction happen during design and construction phase (Bryan S. Shapiro, 1994).

#### **2.1.2.2 Prequalification for Contractor Selection**

First and foremost, prequalification process has to be implant in construction industry especially during DB method. Prequalification also known as —pre – tendering is to empower the most suitable applicants that are willing to provide all the requirements needed and also show that they are interested in participate tendering process (E. Plebankiewicz, 2010).

This process can be divided into two types of prequalification. However, the main focus of this two process still remain at same reason, to describe technical capabilities, financial condition, contractor's reputation and multi – organisational skills.

- a) The first type of this process is exists whenever the client grouped the suitable contractors to handling several types of projects. At the end of the day, the most suitable and competent contractor will be called and drawn – up. In this event, only the permitted contractor can administer to a sole type of project.

- b) The other type is a group of contractors will be called to apply for a specific project. This type also called as —per – projectl prequalification.

In the same way, client will always explore the design and the qualities that the contractor may provide during contractual phase, thus, the contract must be include all the design for the project and also construction activities in one contract.

On the other hand, (A. Kosecki, 2003) described that there are three categories of companies that implementing DB. Every company have their own requirements and targets according to the project itself. The owner will address the most suitable category and it may changes at each project due to the complexity.

**First Category:** Every design plans and construction activities are manage single – handed by the contractor with their own resources.

**Second Category:** Due to contractor entire resources, they should provide the owner with their own design team and also their own project managers

**Third Category:** All clients requirements will explained by the contractors own resources but, they will hire external designers to assist contractor during design phase and from here, the performance and project’s flow will become smooth.

From previous research, (A. Kosecki, E. Plebankiewicz, 2009) assumed that most company will choose First Category because it was recorded as the highest rating compare to the other categories, thus the risk for the project to fail also can be reduced easily especially on the quality, time and cost.

In a nutshell, a great contractor able to understands that their designs, planning and construction abilities can affect the project performance, increasing success factor is depends on hiring a competent sub – contractors and follow the clients desires (Michael Pollick, 2006).

### **2.1.2.3 Advantages**

Design – Build delivery method grant a lot of advantages to certain projects. The clients nowadays will prefer to implement DB in their project because DB project have a great



communication among the client and the contractor due to single responsibility given to the contractor. The advantages of DB, such as cut back of project duration and early forgone of project cost, have been tested for both method; theoretically and empirically in recent years, already outstanding to the increasing popularity of DB in the international construction industries (Konchar and Sanvido 1998; Xia and Chan 2008; Hale et al. 2009). Furthermore, (P. Doherty and G.H. Suddell, 1995) described that, by applying DB, there is an absence of adversarial communication among the consultants with the contractors that is always presence in DBB project. In DB, this calamity can be prevented because the consultant usually work under the same roof with the contractor and commence the work together as a team. Selecting a competent contractor will increase the smoothness between design and construction phase. Thence, from this method, the duration can be fast – tracked (Frederick E. Gould & Nancy E. Joyce, 2003).

Besides that, this method also has the hope to reduce the overall cost for both design and construction process (K.R. Molenaar, D.D. Gransberg, 2001). This method is a far – reaching arrangement where it gives the client aid for who did not have enough knowledge and experience to preside the projects (Plebankiewicz, E., & Zima, K., 2012). (Songer and Molenaar, 1997) opined that there are two major intentions for implementing DB which are to accelerate the duration of projects and embolden inventive design solutions to the owner and also for the projects. Moreover, (S. Rowlinson, 1987) said that the greatest strength of DB is the application of single responsibility to the contractor. According to (Y.Y. Ling, and E.F.K. Leong, 2002), architects, contractors and also clients at Singapore supported that DB able to reduce overall project performance and also fasten construction time. On the other hand, previous research, (Konchar and Sanvido, 1998) uncover that DB method keen to solve problems and faulty that are presence in DBB projects such as changes made on design or during construction. (Fernane, 2011) opined that, majority of public universities in United States starts to implementing DB in order to reduce the cost, schedule and changes because it may takes excess duration. Ironically, public universities recently commit on tight completion schedule, thus, DB have the ability to fulfil the requirements.

(Turina et al., 2008) describes that DB endeavour its advantages in term of the ability to integrate the design and construction team under the same roof. The contractor has the right to involve at the early stage. Paradoxically, DBB have the barrier between the contractor and designer, hence, contractor does not obtain enough information during planning and design stage. By carry out DB as delivery method, it will form the designer – builder onto the same side.

#### **2.1.2.4 Disadvantages**

Despite all the advantages offered by Design – Build method, it is still left a few flaws and erroneous that may affect the performance of projects. Previous study by (Chan, 2000), proves that the major problem with this system is limited number of companies that explain record of both design and construct the project. Contractor may have abundance of experience in constructing the project, however, they may not have sufficient knowledge and experience in design. At the same time, DB also has difficulties for the client to assemble adequate and sufficient brief to the contractor. In conclusion, due to insufficient client's appraises, they cannot to communicate precisely their needs and requirements to the contractor, thus hardship will be bear for the contractor during tender's preparation and submission (Turina et al., 2008).

Previous studies opined that DB method only can be applied if the owner itself has the knowledge and experience to conduct the project by using DB. Hence, if the owner does not have those criteria sufficiently, the performance of the project may effect and the requirements may be too demanding and not suitable to certain projects (Ndekugri and Turner, 1994). In addition, (Latham, 1994) described that DB contract's cost is double the size or more than the traditional method and considered as the most unfair prospect because every cost that contractor and designer had underwrite, including substantial cost for preliminary design and construction activities to prepare the overall cost estimation, which will not be rectifiable if they are not success in the bid (Kawaguchi et al.,1994). Regrettably, from this situation, (Ndekugri and Church, 1996) said that many competent contractor will retreat from submit their bid if there are too many bidder.

A part from that, DB also not selected by some owner because they felt DB method has lower quality than the traditional method, aesthetics accommodation and maintenance issues are not featured by the contractors (Ling et al., 2000). Lastly, DB also inadequacy from independent checks and balances that previously offered by DBB (Dreger, 1993).

#### **2.1.2.5 DB Contract Type**

Usually, majority of the owners will choose lump sum and guaranteed maximum price (GMP) as the contract payment arrangement (Chen, Xia, Jin, Wu, & Hu, 2015). Those two types of contract have their own advantages and it may different according to the project distinctive. The main reason to choose the proper contract method is to determine award that need to be given for contractor selection.

##### **a) Lump Sum Method**

This contract method is applied in a situation of the DB contractor given the fixed price for the project and if any overrun and delays occur, the contractor needs to be responsible and bear all the overrun cost. This method will be more suitable if the owner have the responsibility to construe the job scope clearly (American Council of Engineering Companies 2005; Kaplanogu and Arditi 2009). Lump sum has the ability to obtain ambitious cost from contractors to the owners however, it may hold back some inventive ideas from the contractor as the owners seeks more design for cost determination and will lead to delays.

##### **b) GMP Method**

The main sense to choose this method is occur whenever the job scope is not defined properly, it will give an advantage to gain benefit and surpass the total project cost. This type of contract will be in place based on conceptual planning and detail design and specifications are not available compare to the traditional method (Xia et al. 2012a). More than that, owners should avoid any changes to the project during the construction works commenced to provide the owner for early price guarantee (Beard et al. 2001). GMP has advantages to increase the productivity and accelerate the schedule and better cost outcomes compared to lump sum method (Bogus et al. 2010). Paradoxically, this

method also has its own drawback especially for the owners because they cannot simply assume the price cap with very early requirements.

c) Summary

Based on recent study made by (Chen et al., 2015) and observation from (Molenaar et al.,1999) decades ago, both lump sum and GMP has their own capabilities and specialty. For lump sum method, usually civil infrastructure projects and public sector will prone to select this method because of the less complexity and gives the contractor enough time to produce design, hence to offer lump sum price to the owner. On the other hand, for private sector and industrial processing projects, they will devoted to apply GMP because design and construction process for these sectors are quite complex and urge to produce fast – track projects. Thus, it will give the contractors burden to propose the allocated price to reduce cost overrun risk if they are using lump sum.

#### **2.1.2.6 Request for Qualification (RFQ)**

RFQ is illustrated as —a formal request from the design builders for their qualifications that aspire to be considered proposal preparation stage compete with other parties of the selection process (DBIA 1995). Basically, inside the RFQ is provided all the owners' requirements and evaluation on how they will decide the suitable contractor to qualify for the second stage of selection process and the selected contractor will provide the proposal. The intention for the owner to ask for the qualifications of the contractors is to convince the owner that they are competent and experienced enough rather than other competitors. To ensure the contractors already experienced, they must prove to the owner that they are truly understand the owner's job scope and have a great ideas to completing the project with their qualified staff (Jones 1983).

In order to get hired, the contractors are obliged to fulfil all the owner requirements. (Del Puerto, Gransberg, & Shane, 2008) states that, nowadays trend, with high competitive situation to secure the project, being fully compassionate is not enough. Commonly, RFQ does not provide all the owners requirements. Thence, contractors need to provide not only stated in the RFQ but also based on their past experience project or use their own common sense regarding to the proposed project

(Gransberg and Lopez del Puerto 2004). Regularly, RFQ will ask the contractor to follow all the included requirements, but they need to understand the —unspokenl term and conditions in the RFQ (Green Bay Botanical Garden 2002).

Lastly, to assure the contractor to secure the job, they need to congregate all the related information as much as possible regarding the owner and understand their needs. Furthermore, they also need to obtain enough information from the customers and identify their requirements because it is also enshrined in the project success factor. The customer’s point of view is essential (Pugh et al. 1998).

### **2.1.2.7 Request for Proposals (RFP)**

The second stage for selecting the suitable contractor is by preparing RFP to the proposers/contractors. It must be enrich by the owner with a schedule of facility requirements, technical performance, form of proposal, application form of bids and contract bonds (DBIA 1995). An appropriate written proposal is very important because it is the final chance for owners to describe their requirements, expectations and needs before they decide the selected contractor. If the owners insist to make any changes regarding the proposal after contractor has already being awarded, the duration and cost of the project will affected (Beard et al. 2001). In design – build method, the proposal need to be done by the contractor in order to gain the request for proposal. Besides that, the proposal needs to include the owner requirements and agreements, plus, it also need to insert the limitation in case to protect the design – build team.

Based on previous research, ( Gransberg & Molenaar, 2004), they analyse that in DB system, during RFP inspection, there are six type of quality requirements that clients desire and demand, such as:

- Quality by qualifications: The RFP desire past performance and qualifications of the worker so that it will prove the owner concern about the qualification of the team.
- Quality by evaluated program: The builder needs to propose the suitable Quality Management program of the design in the proposal, and the owner itself will evaluate.

- Quality by specified program: This approach is for the builder so that it will propose a Quality Management program consistent with the owner – specified program, and the owner evaluates the compliance.
- Quality by performance criteria: The builder needs to submit the RFP with their proposed technical clarification in order to meet the client’s criteria, and they will assess the proposal.
- Quality by specification: The RFP requires the builder to insert their proposed solutions that are compassionate with the client specifications, and they will double – check the proposal.
- Quality by warranty: The RFP wish to embed with builder’s performance warranty or maintenance bond

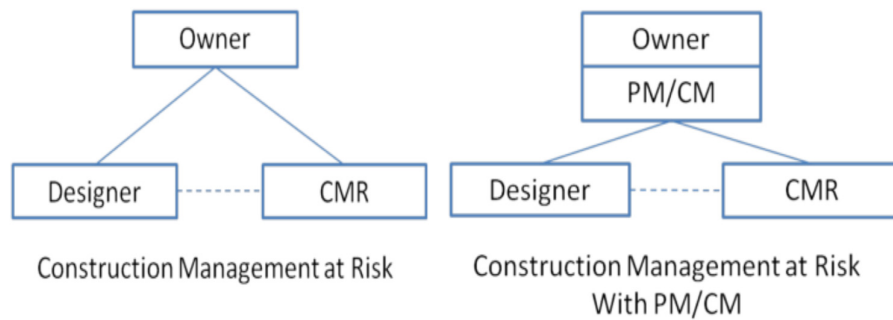
### **2.1.3 Construction Management (CM)**

The Construction Management Association of America described that, CM is a project delivery method whereby the Construction Manager pose as the consultant to the owner during design and construction stages, but it is also responsible to carry all the risk same as contractors for the project performance during construction phase (CMAA, 2012). Construction management comes in two main variants that are carry different roles, which are; Agency Construction Management (CMA) and Construction Management at Risk (CMR).

#### **2.1.3.1 Construction Management at Risk (CMR)**

Construction Management at Risk (CMR) method is almost as the same as DBB method, but in that, Construction Manager is responsible to handling and manage the project and act as a contractor during construction. The CMR handle the risks to appoint construction work to employ contractors and compliance to ensure the completion of the project, and also implementing guaranteed maximum price (GMP) as their contract method. Nevertheless, they are not only responsible for design and constructing the project but also, responsible to the owner by giving consultancy and advice regarding the project schedule and cost during planning and design phase.

Thence, the improvement that being made from DBB to CMR is that, they are not hiring traditional contractor, but they are combined consultant and contractor role into sole party which is, Construction Manager (Bender,2007). In addition, this method gives an advantage during changing order or changing design from the owner, Construction Manager able to identify the suitable specifications because they are also knowledgeable and experienced in planning the project such as, suitable materials to be used, types of equipment and other features (CMAA, 2012).

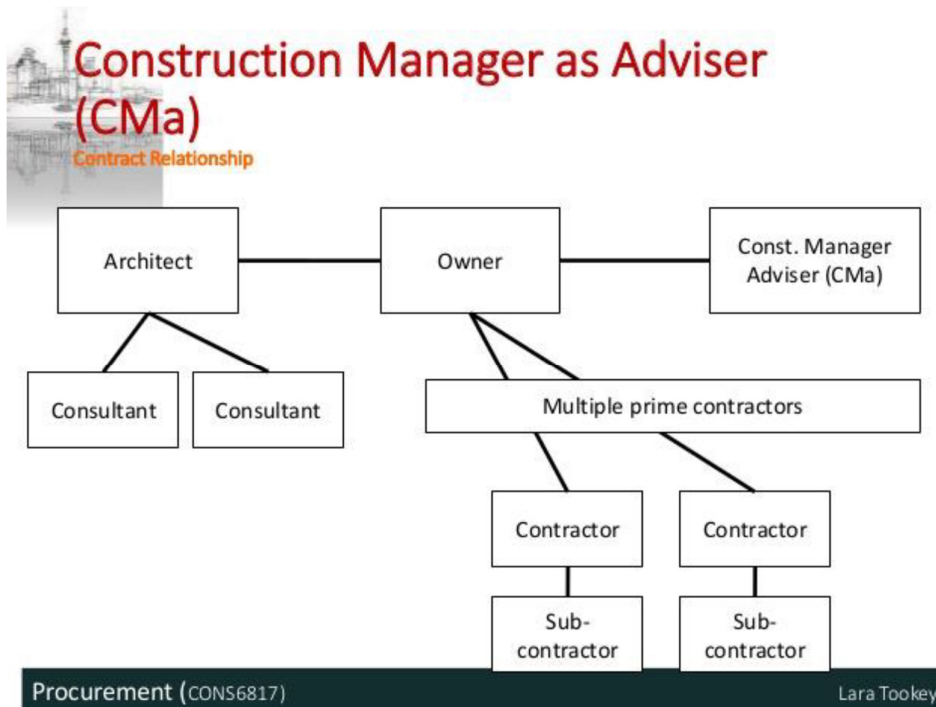


Source: (Construction Management Association of America,2012)

Figure 2.3 Relationship Diagram for Construction Management at Risk

### 2.1.3.2 Construction Management as Agent (CMA)

According to (Del Puerto et al., 2008) study, they opined that CMA delivery method is originally and quite the same with DBB method, somehow, this method offer some variations such as, the owner hired an external third - party which is, Construction Manager to assist them and act as their representative during design and construction phases. Plus, this method also a bit different with CMR, because the owner representative only as an agent for the owner but not responsible for the risk during construction activity.



Source: Lara Tookey, 2016

Figure 2.4 Relationship Diagram for Construction Manager as Agent/Adviser

### 2.1.3.3 CMR Contract Type

In this CMR method, customarily contract method that always been implement is fixed – fee contract for pre – construction, namely as Guaranteed Maximum Price (GMP). Once the design is already finished, they can proceed to choose GMP as their contract method.

Based on Associated General Contractors (AGC, 2004) CMR method contractual method is slightly different with DB method because, in CMR, the builder team hold different contracts with the clients. Besides that, for comparison with DBB method, this method usually choose the potential team based on qualifications, meanwhile, DBB method only focused on the bidders that proposed lowest – bid in order to increase the profit and reduce cost overrun. Previous study from (D D Gransberg & Delivery, 2010), they described that CMR contract is less insurgent from any changes rather than DBB (Strang, 2002) because normally, owner wants to maintain the design contract. In fact,



(Martinez et al. 2007) described that CMR is a cost – focused type of delivery method especially during design phase because the absolute reason for the owner choosing CMR is the ability to show the real – time cost estimation and planning. Hence, the main focus for the owner to implementing CMR is to ensure that the total cost of the project will not overrun from the estimated budget (D D Gransberg & Delivery, 2010).

On the other side, for team selection process, usually it will have two variants which are; one – step and two – step process. During one – step process, Request for Proposals (RFP) will be issued by the client to the builder that interested for the project. Submission terms that need to be filled by the builder team are; pre – construction cost, construction fee, and also General Condition costs. The owner will assess the capabilities and past performance of the potential builder teams that suit for the particular project.

After that, in two – step selection process, this process narrow down the criteria by evaluating performance and qualification of the team. During this process or known as Request for Qualification (RFQ), the team will submit their proposal including with their qualifications, past performance projects and expectation to meet the owner requirements. After the completion of RFQ, the team will compile together with RFP which is basically more about the proposal for the cost. Lastly, owner will identify the most suitable and preferable team (CMAA, 2012).

## **2.2 Common Issues or Limitations Related To Delivery Methods**

In construction, limitations and restraints always occur and it will affect the related parties especially clients, designers and also builders. If they did not assessed and prevent it early before construction process commenced, it will influence overall performance of the project such as, cost overrun, delays, and also inability to compliance with the client requirements. From those possible outcomes, perceptions from users and also other companies will disgrace the related organizations.

## **2.2.1 Design Build**

In this method, owner overview it offers a lot of advantages especially on quick completion of the project and also ability to reduce cost overrun (Okunlola Ojo, Aina, & Yakeen Adeyemi, 2011). However, in order to pursue those advantages, there are also some issues and limitations that arise in some particular projects.

Even though DB has already used widely all over the world, management expertise of applying DB method to particular projects are still lacking (Konchar et al., 1997). Based on previous study written by (Chritamara and Ogunlana, 2001), they restricted the dominant risks that may arise during implementation of DB method in term of financial, technical and environmental condition. In fact, all possible problems that may presence can be divided into several stages such as, pre – construction stage and construction stage.

### **2.2.1.1 Pre – Construction Stage**

#### **a) Unclear project scope and inadequate information**

When the owner carries out DB method in their project, they will try to obtain important information regarding the project and will highly demand from the builder. Due to the complexity of the project and improper documentation from the builder, it will cause disputes and change orders (Lam, 2000). Client's competency especially on the experience on handling DB project also may unsatisfactory. Similarly, (Dulami et al., 1995) explained that, insufficient briefs from the client presumably to be the vital problems to the project

#### **b) Divergence of contractor's proposal from client's needs**

During tendering process, basically DB builder will hire the consultant to assist them completing the proposal. Hence, some builder will come out with unrealistic information that does not absorb the client's requirements (Foo et al., 1999). On the other hand, this problem can be address due to the ambitious demands from client that may too complex for the builder and also miscommunication between the clients with the builders regarding the client's needs (Masterman, 2002). Plus, (Akintoye and

Fitzgerald, 1995) described that, poor communication from both parties will cause to misunderstanding. In addition, usually, the builder will submit their proposal regarding the materials, services and equipment that may not correlate with the client's requirements, hence the client may express their unsatisfactory and complaints (Lam, 2000). Furthermore, it is also found difficulty on establish instructions and adjustments for the tenderers because every tenderers promote different designs and cannot easily made assessment on the lowest bid price (Works Bureau, 1999). Lastly, there is also presence of vagueness regarding the responsibilities and procurement system in between the client with the contractor and also difference in between contractor with the sub – contractor, which can bring disorientation and disputes in design responsibilities (Lewis, 1999).

#### c) Problems in Design Administration of DB Contracts

Previous study already proved that several problems occurred with design management in DB system:

- Client unable and having complications to prepare satisfactory brief (Yu, 1998; Bubshait et al. 1999);
- Client has less power and control on the design of the project (Yu, 1998)
- Misconception by the owner regarding the contractor's proposal (Chan and Chan, 2001; Ng and Skitmore, 2002)
- Separation of the role of design with the overall design administration (Love et al. 1998)
- Segregation of design and site supervision (Chan and Chan, 2000; Chan & Chan 2001)
- Deficient time to ensure the quality of the design and detailing at tender phase which is usually only for 8 – 10 weeks for the design completion (HKIA, 1998)

- Dispute of passion from the architect/engineer's role in DB method and their chore under the Buildings Ordinance (HKIA, 1998)
- There are lack of companies that able to prove both design and construction record to compete in DB market (Yu, 1998; Chan, 2000)
- Conflict on design role and responsibility (Chan and Chan, 2000; Ng and Skitmore, 2002)

#### **2.2.1.2 Construction Stage**

- a) Inexperience project participants with ambiguous scope and roles

(Smith, 1996) explained that, contractor has a major problem on designing the project rather than the designer itself. In conclusion, lack of essential and important information in the design will cause conflicts and disputes on documentation. Obligation issues under DB method are also naturally complex and incomplete certificate by the design team will attract attention to better design administration (Dulami et al., 1995). Moreover, since the contractor involve in both design and construction phases, clients have little administration and their role to control the quality for the design also been reduced (Mo and Ng, 1997). To counter this situation, owner has to hire external consultant as representative.

Based on previous study written by (Smith, 1996; Works Bureau, 1999), they explained that due the changes of role of designer to protect client's interest, client has a little control of the project because of other business or matters. In DB project, sole responsible to the contractor makes the designer works more close to the contractor who also as their employer. As a consequence, the designer team may be drag into serious situation where the changes of design also affect the cost of project. Plus, (Ling et al., 2000) explained that, due to the unclear roles and responsibilities of team members, contractor cannot simply take as their team leader and to control their advisor.

#### b) Continual changes on critical time schedule

In construction project, especially on DB project, changes will be made by the client during construction phase due to the insufficient scope defined at the early stage (Ernzen and Schexnayder, 2000). In a multi – client organisations, changes and variations made by the client and end – users can cause to turbulence and disorientation and also lead to delays (Dulami et al., 1995). Based on (Pearson and Skues, 1999), they said that sometimes, some changes are unavoidable, but it also affected the costs and cause delays from completion. (Dulami et al., 1995) also explained that, due to DB fast – track approach, pressures will presence especially during design phase and thence, the quality of the project also changes and fluctuated. In the meantime, (Tao, 1996) also explained that, any changes for the design to find better ideas during construction phase is not eligible and numerous service installations may not proper.

### **2.2.2 Design - Bid – Build**

In this section, issues commonly related with this method basically occur in design phase, tendering phase and also construction phase. Uniquely, those three phases are hooked by each other and need to be done one by another (Meghana, Manikandaprabhu, & Potti, 2016). There are many issues that usually arise and the builder and designer need to eliminate those issues. Since there are many problems crop up, developing new strategies as an antidote to this matter. As this method has already well known as a three – step process which are; architects and engineers design the project, bids are requested from the possible contractor and the contractor will undergo the construction process.

(Ahmed and Minkarah, 1988) stated that, identification of the type of job and demand for work could be the main factors that affect the quality of the project, rather than expecting competition and profit solely. On the other hand, every problem that arise are quite various in each of tendering, design and construction phase.

#### **2.2.2.1 Design Phase**

In DBB method, proper selection of designer portrays a vital factor to ensure the outstanding result of the project right after the completion of design criteria. Design

criteria usually being done by the client which include the project requirements, purpose of the project and codes applicable. The criteria design is use to control and guide the overall budget for the project. Designers are usually architects and engineers, plus, they are also involves in the whole project activities. By reason of design is as the first major activity, any faulty or defect should be minimalized and prevented. (Meghana et al., 2016) already listed the possible common issues that presence during this stage. In addition, the author also proposed the possible solutions to overcome those issues.

Table 2.1 Dominant problems that arise during design phase that affecting quality of the project

<b>Problems that commonly occur in design phase</b>
Inadequate information
Lack of arrangement between related parties
Too demand requirements
Poor design quality
Too much changes of the design
Change control
Inappropriate documentation

Source: (Meghana et al., 2016)

Table 2.2 Possible solutions to control the problems in design phase

<b>Solutions for the problems occurred</b>
Proper communication between related parties
Documentation need to be explained clearly and acceptable by other parties
Convenient explanation to the client regarding its demand
Designer need to obtain enough information from the client
Calculations need to be precise and correct to ensure the safety of the project
Interpreting the client's requirements properly
All changes been made need to be informed to other parties

Periodical meetings with other parties to communicate properly with other parties
---

Source: (Meghana et al., 2016)

### 2.2.2.2 Bidding Phase

After the completion of the proposed design, the client will open tender to choose the most appropriate contractor for the project. Contractor selection plays an important role to ensure the successful of the project. Basically, the client will select the qualified bidders to compete among them, and usually, most of the client will focus on the lowest bid which it can produce high profitability to the company. Nonetheless, there are also presence problems that can affect the quality of overall project. Plus, there are solutions that can neutralize those problems from occurred again (Meghana et al., 2016).

Table 2.3 Possible problems occur in bidding phase

Problems emerge in bidding phase
Incomplete bids
Owner prefer lowest bid rather than high qualification contractor
Owner open tender late in order to reduce competition among the possible bidder and reduce number of bidder
Agreement of bids are not determined and not specified explained
Fault bids
Criteria for non – compliance is not stated clearly
Methods to overcome possible problems are not defined clearly
Lacking number of bids

Source: (Meghana et al., 2016)

Table 2.4 Solutions related to overcome possible problems in bidding phase

Solutions to reduce problems in bidding phase
Propose suitable time for bidding and design
Prefer quality – based rather than profit – based selection
Ensure the requirements are simple and able to understand

Use clear language in the contracts
Examine previous experience working together to
Include weekly progress and involve designers to supervise the project
Focus on client requirements that can soothe bid manipulations problem
Examine the client's requirement first and contractor's bidding contract

Source: (Meghana et al., 2016)

### 2.2.2.3 Construction Phase

To ensure the project complete with high quality regarding to the client's requirements which are; time, cost and quality is very important. During this phase, all related parties such as clients, contractors and designers must have a great decision making and communicate properly between the parties. Besides that, contractors need to communicate adequately with the sub – contractor, suppliers, and their workers to ensure they provide everything that needed. Somehow, during construction process, there a lot of problems presence and usually it will affect the overall cost and cause delays. In addition, during construction phase, usually the contractor will bear the responsible solely and mistakes usually happen from the contractor's side rather than clients and designers.

Table 2.5 Problems appear in construction phase

<b>Problems appear in construction phase</b>
Insufficient number of workers
Fault and defect materials arrived
Lack of materials and equipment at site area
Accidents happen during construction commenced
Contractors does not function well
Resources gathered are not being used adequately
Skill labour lack of quality



Work is commence without following schedule and plan, thence delays presence
--

Source: (Meghana et al., 2016)

Table 2.6 Resolution to resolve problems in construction phase

<b>Resolution to resolve problems in construction phase</b>
Proper supervision and inspection to reduce rework
Critical activities need to give more focus
Regular inspection at site area is essential
Any errors need to be rework rather than cover the flaws
Contractors should be selected based on the qualifications
Regular meetings with related parties need to be done
Safety Officer need to supervise safety of the site and handling safety program to prevent any accidents
Suggestion of value engineering

Source: (Meghana et al., 2016)

**2.2.2.4 Project Cost**

(Bubashait and Almohawis, 1994) defined cost as the honour regarding with general conditions bolster the completion of the project within the budget range. Cost is not only hinder to the tender, but it is basically the whole cost that a project arouse from initiation to completion phase, in fact, it is also including the variations, changing orders and modification during construction commenced (Chan & Chan, 2002) .

Previous study by (Keith, 1993) concluded that, using DBB method, with competitive application from the bidder to submit tender for work, an actual inevitability of construction cost need to be achieve at the early phase, for example, the receipt of the tenders. The contract made as the evidence to the tender, if fixed and solid price proposed, it should represent an actual indication of the overall construction cost.

Failure to provide proper and decent design and documentations will result to changing orders by the client and consequently, the cost need to be adjusted. Thence, from this

situation, the ultimate overall cost becomes ambiguous. By implementing DBB, design made by the designers usually represents a far from complete design at tendering phase. Meanwhile, in real construction process, this method usually represent by unpredictability due to changing orders to the contractor's work.

On the other hand, abortive from ensuring a contract amount in compare with realistic amount, can affect either inadequacy of general contractor or slow pace will cause delays and poor cash flow.

#### **2.2.2.5 Construction Time**

(Hatush and Skitmore, 1997) defined time as the duration for the project to achieve completion. Any particular project will be given an exact time to be completed and usually determined by the client. (Osei-Tutu E, 1999) revealed that DBB has inferior project time performance. Thence, this method having problems on saving overall project time and demote build ability in construction process. In addition, in fact of design and construction stage for DBB method is upright, with less correlation work, thus, the overall time and duration of the project to complete will negatively affected. To overcome those impacts, they need to increase the duration for procuring the works, hence, it will give impression on the client's finance, holding costs and consultant's payment.

In fact, during rapid expansion cycle, it will be quite difficult to follow the client's objectives and also inconceivably to speed up the duration of completing the project and difficult to achieved.

#### **2.2.2.6 Quality**

Client's long – term commitment exist in the project that offer high quality outcome. The work commenced need to be compliance to the specifications and requirements authorize to the project. Next, low cost and fast – track construction should not be accomplished at the charge of quality of the project. Moreover, feeble quality of project's performance will cause the builder to perform rework, which cost and schedule will effected (Hong and David, 2002). (Harris and McCaffer, 2001) opined

that, quality of the completed project and quality of the process for the project will reflect the experience and performance of the contractor itself.

Nevertheless, some parties will take the project's quality for granted and inadequate consideration been taken (Rad and Khosrowshahi, 1998). Plus, in a previous study written by (Rwelamila & Hall, 1995; Best and Gerard, 1999) they discovered that DBB method where they implementing competitive bidding method highlight on construction time and cost, quality also being agreed. Regrettably, there was presence discrepancy with (Osei-Tutu E, 1999) findings, where his study proves that DBB method better than DB in term of quality performance of the project. But, in this recent study and research, it was found that projects using design – build method appear as better value for budget and less disputes among the parties rather than DBB method (C.Ameyaw, 2009)

### **2.2.3 Construction Management at Risk**

Based on (AIA-AGC, 2011; Konchar & Sanvido, 1998), they stated that, new delivery method such as Construction Management at Risk offer the better performance when employ on certain projects. Besides that, nowadays projects become more complex and implementing traditional method may not be suitable to handling complex projects and high – level requirements. Thence, by choosing proper delivery method that suitable enough to control the project's budget and dominate the schedule is usually the main factor to success or vice versa (Demkin & AIA, 2009).

On previous study written by (Carpenter, 2015) regarding public schools construction project and implementing Construction Management at Risk (CMR) method. The findings prove that CMR method did not assemble the alleged cost, schedule, efficiency, or risk prevention advantages. Mean values of overall cost performance for CMR project is slightly higher than DBB method. However, on the other hand, the analysis illustrate that CMR school projects completed are considerably higher levels and better services quality offered as expressed by local district construction managers.

Early selection of Construction Manager (CM) for the project will gives an advantage to contribute information during development of documents and to equip

constructability analysis and cost reviews. Cooperation from CM at early phase is awaited serious and significance impact on whole project life cycle assisting and consulting the client and designer in order to ensure the budget and schedule are still in good shape.

More than that, competency – based selection of contractor is important to secure and obtain perfect combination of qualifications, performance and price while reducing any risks that can affect the contractor. In fact, by selecting proper contractor, the quality of the project can increase and improve, hence prevent from any reworks or changes and also to reduce cost overrun (AGC-NASFA, 2006; US DOT, 2006). Besides that, the defenders state that collaborative formation in Guaranteed Maximum Price (GMP) by the client, designers and contractor in a place of competitive lump sum bid compensation can assist to diminish risk, translucent of better environment for the related parties, which can give and implement trust, and manage better quality of the project and prevent overrun cost (Kenig, 2011).

Lastly, CMR also possible to offer to the project a fast completion and reduce any delays by scale down the duration of construction life cycle favor the construction activity start as soon as possible after the completion of documentation during design phase.

#### **2.2.3.1 Quality Feature of CMR**

There are two major benefits points out deal with quality which are, builder design input and control design by the owner. During preconstruction phase contract with CMR, the builder has to participate in design process. Based on (Anderson and Damnjanovic 2008), they stated that, contractor\_s experience and knowledge may assist the design team in qualifying more cost – saving plans, construction executing plans, and realistische schedule of the project.

(Martinez et al. 2007) opined that, constructability is achieved by effective, innovative and integration of the project duration during planning, design and construction phase. To ensure the capability, it should be started early as possible during design process and

also well planning outcomes. However, this study disagree for choosing CMR early in design stage, in order to achieve —maximum effectl or advantages from contractor’s experience and knowledge before design resolution is depleted and develop any new changes as a result of budget and reviews of constructability.

The competency of CM to aid constructability reviews, assist during construction phase, material availability and cost evaluation during design process can decrease the possibility to occur any changing orders, delays and increasing project cost due to the early identification of contractor at design phase rather than realize during construction phase (Kwak and Bushey 2000).

CMR design analysis is not a technical associate review of the design by the builder. The unexpected assumption of design responsibility through review of CMR, it was a disadvantage. In fact, (Martinez et al. 2007) explained that CM is not a competent architect or engineer to give comment on constructability and they need to avoid from give any comments, because it will be analyze by the owner. Plus, CMR validation of review only valid and limit to industry standards, previous project performance or any previous project that requires rework. (Kwak and Bushey 2000) described that, CMR delivery method provide elasticity during application of late design changes during design phase without effecting cost and delays.

By contract, CMR’s role is more to consult and focus on the budget of the project during design stage because the major reason the client implementing CMR delivery method is to have a real connection with the cost estimation (Martinez et al. 2007). Hence, the main sense of the client to carry out this method is to ensure the budget in a good condition and reduce any overrun. On the other hand, owner hires the designers to ensure the design compliance with the applicable codes, laws and regulations, while increasing the project’s aesthetic values. If the designer produces the design without following requirements, they have the liability to change the design and control from causing failure. From this issue, designer timid with during design preparation can cause the project cost surpass the allocated budget.

To make things clear, it is recognizable that CMR preconstruction services and engineering design express that collaboration between these two organizations is an unambiguous contractual requirement. According to the Memphis Shelby County International Airport case study, the company itself encourages the communication skills among the designer and CM to be enhanced. The company settles down this communication problem by increasing 10% of design fee at risk for the quality of the contract documentation. From this approach method, the company is able to change the designers and engineers' attitude regarding the CMR constructability and design reviews as unimportant criticism to a valuable component that is essential to ensure the quality of the project (Touran et al. 2008).

Consequently, from the previous case study, it has shown that CMR provides a system that is able to strengthen the quality of the design, which also may affect the construction quality due to high constructability value (Dunston et al. 2002). This improvement is also being supported by (D D Gransberg & Shane J.S, 2010), which they analyze that CMR is able to create a vital role to control the value and quality of the project rather than downplay the project cost.

### **2.2.3.2 Schedule Feature of CMR**

CMR also offers another advantage which is, the schedule aspect. The CMR method does not have to wait for the design to be complete in order to commence the construction activities unlike DB. The main advantage of CMR is the capability to arrange work in bidding packages that correspond to the design packages. This understanding helps CMR to request those parcels as soon as each of the packages' design is prepared. From this situation, it may assist the owner to produce both design and construction contracts to accelerate the duration of the project. In the meantime, a previous study written by (Martinez et al. 2007) stated that, CM needs to evaluate and analyze the overall project schedule and they should be in charge for a meeting with the designer to ensure the designs are in compliance with the real construction schedule. From this matter, it is found that it shows a disadvantage in this delivery method which is, the owners need to accommodate and supervise properly for both design and construction contracts rather than a sole contract for the DB method. This character of CMR also supports contractually by

elect both design and construction scheduling obligation for CMR. By implement this feature, it will lighten disadvantage related such as, lack of coherent leadership during design phase. To remove the disadvantage, the designer should accommodate their attempts through CMR method in order to increase the project's overall schedule. If the designer does not implement this system, it will cause the owner to deteriorate with vital disadvantage by observing different approach from the designer and builder.

Prevent and assessed any risk regarding schedule aspect is essential especially in transportation projects, especially this type of projects have a high potential in disturbing public travel route for ascertainable periods. Consequently, this type of risk can be mitigate and assessed by starts design and construction activities as soon as possible and enlarging parallel activities that arise in the project schedule (Touran, 2006). Due to the challenges of CMR to complete the project on time and exposed with many types of risks, it makes sense to implement this method to analyze, mitigate and perform risk analysis. CM is the responsible party to analyze the possible risks (Touran, 2006). This previous study also described that, the competent and experience CM will give major advantage to the client and able to understand the situation of the project schedule especially regarding on quality, time and cost of the project. Hence, the presence of CMR in a particular project, especially during pre – construction phase, roles and responsibilities need to be clarify and specific during design.

(Kuhn, 2007) described that, pre – construction schedule management is one of the important roles for CMR specifically, the CM. Producing an innovative and precise schedule during early phase such as, design, estimating, approval and purchasing materials will assist the project to be constructed on time is the main objective. For this reason, hiring CM early as possible to involve in project especially during pre – construction phase will aid the project schedule and the design team.

### **2.2.3.3 Cost Feature of CMR**

There are two advantages that are related with cost during implementation of CMR. First and foremost, the client able to recognize the exact costing earlier compare to DBB because the builder able to arrange estimates during design stage, likewise a GMP

before total completion of design. Plus, by selecting GMP as the contract method, the CMR will focus to add bid package GMPs as the design packages are completed and finalize the project's GMP when the majority of the activities has already bid out to deal with subcontractors and suppliers. This aspect of CMR will diminish the risk to the builder and also reducing the amount of probability that the CMR need to focus on and against cost risks such as; expansion of material prices, subcontractor vacancy, and delay during design.

Next, the second advantage offers by this method is usually deals with GMP as a motivation to control cost of the project. It is a fact that CMR method is authorized to provide design recommendation and prepare estimations based on the recommendation to the final design for the CMR. (Strang, 2002) explained that, the availability of CMR at early stage will assist on identifying any ambiguities presence in the plans and also need to make changes due to the ambiguities.

Those listed benefits are compensate in article requirements to implement CMR at the early phase of the project development and wait for the design completion to adopt GMP contract method without excessive probability before the actual cost is achieved by the client. Regrettably, even though this knowledge appears early than DBB approach, a lump – sum contract method of DB has shown it successful for fixing design and construction cost. The other disadvantage presence with this method is due to the designer who does not agree to blend with the CMR's design recommendations into the final decision of the design.



## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

Research is usually being done to discover particular matters, refurbish the previous works and results, figured out new or existing problems, approving related theories, or evolving a new theory. Research also can be described as expanding on the previous works. In order to ensure the legality of the experiments or procedures, research may be duplicate some vital elements from previous projects, or for the whole project. The main reason for undergoing research is for documentation, discovery and perception. Plus, research also has purpose on getting through research and development (R&D) methods for the enhancement of knowledge. Research need to follow its procedures, by using scientific methods to obtain evidence or any important information. Research cannot rely on personal perspective of view (Byrne. D, 2016)

The purpose of research is to:

- Identify the current situations or problems
- Propose brilliant solutions to the problems
- Search and analyse related common issues
- Compose a new method or procedure
- Develop new knowledge to the end – user

#### a) Definition of Method

Based on previous study written by (D.Byrne, 2016), there are also differences between method and methodology. First and foremost, method is a technique of performing analysis, such as survey investigation, documentary studies or qualitative interviews. Methods of public researches are technical procedure used to achieve and acknowledge research questions, collect and interpret data, and present outcomes. (G. Payne & J. Payne, 2011) opined that method have three levels of understanding which are; first, method can be a tool for assist during research, second level, every tools or methods used must be control by limitations whereby, the method must be suitable and appropriate for any particular research. On the other hand, in a presence of methodological pluralism approach, this system treating all methods equally, and evaluate advantages of selected method in term of how the method can solve and analyze any research properly. The selected method should be relied on what the researcher want to obtain. Methodological pluralism was being promoted in the 1970s, when assault disagreement was presence between British qualitative and quantitative researchers (Bell & Newby 1977; Payne et al., 1981)

#### b) Definition of Methodology

(D.Byrne, 2016) stated that a methodology is the theoretical environment which construct researchers understanding in order to obtain objective for a particular research before they produce knowledge about the whole world. Methodology is a strategy or plan that is consider as vital after the selection of preferred method and used of methods to achieve the possible outcomes. (G. Payne & J.Payne, 2011) also explained the term of methodology in an accurate way means the study or education of methods. Methodology compromises with the characteristic of methods, the fundamental of the operation for the method and the standards guiding the selection and application.

Methodology means awe – surprising scheme plan of ideas adapting researchers' work. This issue allows researchers valid with their choice of topic, method and outcomes.

## **3.2 Qualitative Method**

Qualitative research mainly focused on exploratory research. This method is used to gain an understanding of fundamental motivations, reasons and opinions from the respondents. In fact, this type of research seeks to discover trends from the respondents thought and opinions, and also to gain deeper knowledge into any particular problem by studying a group or individual using either unstructured or semi – structured approach. The sample size is usually smaller than in quantitative method. There are some examples of data collection from this method that can be obtained such as; focus groups, interviews and ethnographic fieldwork.

### **3.2.1 Advantages of Qualitative Method**

Based on (R.Pierce, 2008) study, it is explained that qualitative method is the most leading method approached by the UK Politics research. Qualitative method is favoured because it is recognized as the best gratify to the study, understanding and able to solve difficulties in political and social life. The durability of this method is because of the uniqueness capacity, through interviews and investigation, to obtain and understand values of individuals and group. Next, this method also gives chances to the minority group to be researched whereby this group may be neglected from surveys because they are small population or might be unfavorable to stand out.

In addition, qualitative method provides the researchers to compare the outcome from interviewing individual and also in groups. From this situation, researchers able to identify the differences and divergence that occur in between the privacy interview with individual and during group interview. In fact, by implementing this type of methodology, the researchers will able to expose and identify abuse and improve the condition of the subject through policy change. They have the ability to assist the subject to see their surrounding through different views and establish their own interpretation. Basically, this method focused on verbal communication from the respondents and the application of grammatical to the analysis. Nowadays, modern technology really helpful, such as, recording devices that really handy during interview sessions to record the conversation, act as an evidence, and able to be shared with other parties (R.Pierce, 2008).

### **3.2.2 Research Questions for Qualitative Method**

Researchers that seek qualitative questions are usually from inductive attitude. Therefore, even though qualitative questions may be pre - specified, they often appear and shaped as the study established, and the researchers gain more about phenomenon of the case study (Corbin & Strauss, 2008; Punch, 2005). In the meantime, the researchers use qualitative questions to determine their main focus and attention, but not exposed any pre – scribe direction of their research (Ridenour & Newman, 2008). Next, qualitative question’s purpose is to obtain understanding, exposed meaning, explain procedures and develop theories. Qualitative question usually asks a common question, open – ended question about any particular issues, and provide the researchers enough freedom to explore the issue in depth (Corbin & Strauss, 2008).

A good qualitative question is the ability to focus on the related issues to the individuals under research. Plus, qualitative question need to identify the topic area and provide the important information from the reader. Based on recent study written by (Creswell, 2008), qualitative question need to state the question in neutral, non – direct language, beginning the words with how or what, and acknowledge the use of issue. For example, —what is the experience during being a part of a team for engineers in electric companyll. From that question, researcher able to identify the respondents experience from their perspective.

### **3.2.3 Tools for Data Collection of Qualitative Method**

For this method purposes, it is important to implement a system of collecting data that privilege the respondent to express and deliberate themselves in ways of the respondent are not being command and ruled by the researchers. For example, questionnaire is one of the methods that limited the responses of the respondent to answer any particular questions that related to the study. Hence, interviews and focus groups have become the most preferred methods to obtain the point of views from their participants. In addition, the essential explanations and arguments that can be extracted by these methods able to provide unexpected insights into the possible issues or factors that previous may not be taken seriously about the personal perspectives, the social context which give influence that featured based on their experiences, and by enforcing these methods, it may supply

a better understanding regarding the socio – culture resource that contributes to meaning – making (Marks, D. F. & Yardley, L., 2004).

#### a) Interviews

In qualitative method, interviews are being implemented in order to discover the interviewee's own foundation of meanings and understanding. The research duty is to dodge commanding the researcher's structures and assumptions as far as possible. The researchers need to accept any information because it may varies from what they expected (Britten, 1995). Since interviews are reported as time consuming and costly because the interviews need to be transcribed into a new medium, a non – standardised systematize scheme must be often created.

- Structured interviews - utilize a structured interview schedule, including a fixed set of questions. During the interview, there is also inserted with a written questionnaire, which drawn out demographic data. In general, qualitative may asks questions regarding the interviewee's health condition but would not be portrayed.
- Semi structured interviews – based upon an interview guide with consistently five to eight questions and also give inquiry to the respondents if they are having problems to express their feelings.
- Depth interviews – containing one or two key issues related in depth detail and the interviewee's point of view shapes what the interviewer follows up.

#### b) Focus Groups

Basically, this method was being introduced and used in the 1940s by sociologist Robert Merton and his colleagues but, it getting people's attention and being implemented just about 10 years ago (Wilkinson, 1998a). First and foremost, focus group data able to obtain and collected from diversity of difference theoretical plan and scheme. Hence, the best frameworks will be selected and determine the procedures for the data to be analysed. Theoretical assumption about focus group which establish collective, socially shared, activity for the data collection. This type of data collection

aim to obtain information with interaction of large groups, rather than produce by individual in splendid segregation. By this point of view, data collection from this method opens the procedures of meaning – making to surveillance or investigation. Managing focus group will provide the interviewer with the hope to observe the process are constructed and negotiated, within the social context of the focus group. This method seeks to explore some individual experiences, feelings and opinion, in some kind of interaction with other individual in a group of 4 to 8 participants and administer by the interviewer as the moderator.

### **3.3 Quantitative Method**

Quantitative data usually being gather with a purpose to examine a hypothesis. Basically, this data comes from numerical or, if not, it can be exchanged into crucial statistics. This method also aims to assess attitudes, opinions and behaviors and the intention is to conclude results from sample to a larger scale of population. Quantitative method usually is more structured than qualitative method and also bigger size of samples. Based on previous study, quantitative data consistently refers to the investigation that are represented in the numerical form, for example, the investigation may seeks information such as the respondents ages, Likert scale for scaling value from respondents and funding levels. All from those examples interpreted as numbers or amounts.

#### **3.3.1 Advantages of Quantitative Method**

Proper selection of data collection method will assist to produce better understanding to the researchers and also to make the user or respondents at ease. In quantitative method, its greatest fortitude is based on common acceptance by the public or specifically to the selected respondents. (R.Pierce, 2008) opined that, the findings gathered from this method are trustworthy. Hence, this method is well known and favored by the public, and normally, researchers will validate their investments to gain information from the doubtful public. In the same time, quantitative method is deemed due to the straightforward value and provide the fact, even though, the statistical methods are considered as complex.

Besides that, this method engages with very large samples design to indicate and representative of the whole population for particular study. In example, uses of questionnaire as the indicator for the research need to ensure that the questions given to the respondents are the same. The respondents can express their feelings or opinions by using scale, such as; Likert Scale consists of, strongly agrees, agrees, disagrees and etc. However, face to face type of collecting data may not prefer and it can contaminate the data. Plus, this type of data able to achieve information can be surveyed from online survey, telephone or postal survey. It is also considered as the best method to utilize latest technologies.

Furthermore, data and information gathered from the survey can be re – examined, and re – analyzed or for other useful purposes. Lastly, this method allows the researchers to work in a team where specialist talents can be used and sub –contracted the work to agencies.

### **3.3.2 Research Questions for Quantitative Method**

(Tashakkori, A. & Teddlie, C., 2010) described that quantitative researchers preferred on study the questions from the literature. This will prove the linear pattern which is from the literatures, questions and lastly method selected. Quantitative questions regularly associate with variables, whereby the respondent characters or attributes from individuals or in groups will be evaluated by the researcher in numerical form. Their objectives for undergo this type of collection method usually have a wide and in – depth information for research such as, analyse patterns and trends, identify differences, and examine researcher’s theories. Plus, researchers normally will implement more than one variable and there are two types of categories which are; questions about connection among variables or another type is usually questions about correlations among groups. As conclusion, researchers will evaluate and analyse all essential data are assessed by using quantitative data and statistical procedures.

On the other hand, (Creswell, 2008; Johnson & Christensen, 2008; Onwuegbuzie & Leech, 2006) had already undergo previous research and stated that, methodologists suggest on considerable advice for writing good quantitative questions. In fact, researchers need to develop quantitative research questions in highly precise term to

indicate and determine information; hence analyses are essential to answer all the data obtained. For example, during the preparation of quantitative questions, researchers should focus on the keyword such as, *'\_why'*, *'\_how'*, or *'\_what'* and use signal phrase or style such as, *'\_differ'* and *'\_compare'* to reveal the related links between variables. Furthermore, researchers that using deductive logic tends to express their questions as hypotheses because they are able to predict due to the study or supported by existing theories.

### **3.3.3 Tools for Data Collection of Quantitative Method**

(Dahlberg, L. & McCaig, C., 2010) opined that, quantitative method is easy to executed but also easy to get wrong. Hence, this section will highlight the possible pitfalls that will be confronts when aiming for reliable and successful survey result. Hence, this method will be started by identify the most suitable method of sampling and then focus on questionnaire design.

Once the researchers already completed the research questions, they need to understand and analyse the most suitable population that is relevant. This is the theoretical population of the people, groups or companies that are suitable in making conclusions. Hence, there are several factors that need to be recognized in deciding the theoretical population depends on the research questions such as:

- Geographical factors; in example, only apply to the particular population of the town.
- Demographic factors; in example, only implement for people with low income, or ages over 60.
- Usage factors; in example, only apply to people who use a service
- Awareness factor; in example, only practice for the people that aware to the services.



#### a) Questionnaires

(Pierce, R., 2008) described that, questionnaires are crucial pre – designed lists of closed questions with alternative answers. This method used to collect data from a sample of individual such as respondents, and interviewees. Next, the data can be combined all together to create typical review of the sample and cross – tabulated to investigate the relationships between classifiable variables such as; earnings or incomes. Researchers are able to undergo inferences regarding the population from the questionnaire responses of sample. Plus, it is also use to evaluate and compare attitudes. This method offers great advantages such as, larger sample sizes rather than interview, use only closed questions, explore to use typical samples, able to administer by using telephones, face to face interviews, and also capable to self – administered by the researchers at their own house, using completion of questionnaires delivered and received by e – mail.

Plus, (Pierce, R., 2008) also stated that questionnaires recorded as the most common tool of quantitative method. Questionnaires usually designed and systematize to be easily analysed by the computers. It is also compromise between the cost, time and accuracy. Lastly, another essential component of modern questionnaire research is refuse responses rates. Nowadays, in face to face type of surveys is recorded 50% for commercial market and considered as the high percentage.

Researchers also adjust the low response rates with information assertion by embrace the assumptions of non – respondents and no – responses, including ‘\_don’t knows’ are not naturally different that respondents. A good quantitative research that rely on good responses rates demand good access to the respondents, able to motivate them and a good questionnaire design able to attract the respondents interest and maintain it.

### **3.4 Data Collection for Case Study**

Based on the previous brief explanation about qualitative and quantitative methods, it is conclude that quantitative method offers real investigation and research based on the individual perspectives without having any restrictions to express their feelings or opinions. This research seeks real information, experiences and point of view from

various parties related to the issue. Hence, by undergoing data collection session with the related construction industries and provide questionnaires for every respondent that attend the session appear as the most decent and proper method to analyse and collecting data.

### **3.5 Sampling**

For this research, it is estimated that participants that need to attend the session are consists of every construction team which are client, contractor and consultant. Before conducting the session, an e – mail or any notifications will be sent to the particular person. Besides that, attach with e – mail are the exact venue and time schedule. The duration for the session is estimated for almost one hour. Plus, questions also compiled together with the notice of questionnaires and need to be handed by the trusted party. Those selected construction parties are shown below:

- a) Client's Party
- b) Consultant's Party
- c) Contractor's Party

### **3.6 Development of Question Protocol and Data Collection Session Protocol**

- a) Question Forms

In this segment, the selected persons from three (3) different parties which are Clients, Contractors and Consultants companies need to answers the questionnaire's forms. The question will be asked relevant and linked based on their experiences and profiles especially for executing Design – Build projects or directly related with their own project which is, the road construction project. Besides that, the questions should be compatible with identifying the possible problems or risks that are arises at their project and also diagnose the better solutions or mitigations to prevent and counter the existing problems.

## b) Questionnaire's and Data Collection Session Protocol

For this part of interview, the protocol is used to preserve and store every detail during the interview period and also to protect confidential and privacy of the participants. The interview will be done for research purposes only. Plus, only researcher that responsible for the study will be privy to the recorded tapes, and will be deleted after being transcribed. Besides that, this interview will give fully privilege and flexibility to the participants whereby they need to shorten the interview's duration if they have important things to be done. Furthermore, the participants need to sign a form come up with the researcher's requirement. If the selected person unable to attend to the session, they can deliver their representative.

### **3.7 Data Analysis**

All information gathered from the session and answers from questionnaires should save as an evidence and proof for further analysis. After the completion of the session, all recorded data need to be transcribed into writing format as raw evidence. Important keywords that already accumulated need to be listed down into an excel format. After the completion of compiling all the related keywords, the data should be written into Microsoft Word's format. In conclusion, the extracted data and further analysis will come up with a Standard Operating Procedure that may be useful for every construction parties to assist them during commencing any particular construction projects.

#### **3.7.1 Average Index Analysis**

An index is a measure which is made of theoretical construct where it will needed more than one indicator that are being linked to produce a summary or rank of any information. Therefore, the usage of scale, or specifically likert scale, is one of the instrument or medium to generate the index analysis (Edward G. Carmines & James Woods, 2011).

In order to obtain data and information from the respondents, this study will provide likert scale type of question that consist of five types of numeric rating from one (1) = strongly disagree, two (2) = disagree, three (3) = fair, four (4) = agree and five

(5) = strongly agree. Hence, after the completion of questions, the rating given by the respondent will be analyzed using Average Index formula which is made up by (AlHammad,A.Mohsen and Assaf S, 1996).

$$\text{Average Index Analysis} = \frac{\sum a_i x_i}{\sum x_i}$$

Where,

$a_i$  = constant expression for the value given to  $i$

$x_i$  = variable expression of response frequency which is;  $i = 1,2,3,4$  and  $5$

$i = 1,2,3,4$  and  $5$  similar to given explanation below;

$x_1$  = Respondent's answer for Strongly Disagree,  $a_1 = 1$

$x_2$  = Respondent's answer for Disagree,  $a_2 = 2$

$x_3$  = Respondent's answer for Fair,  $a_3 = 3$

$x_4$  = Respondent's answer for Agree,  $a_4 = 4$

$x_5$  = Respondent's answer for Strongly Agree,  $a_5 = 5$

Subsequently, right after analyzing the data by using the formula above, the results will be summarized based on the level of compliance from the respondents. The value obtained from the formula will indicate the evaluation of compliance and agreement from the respondents.

Table 3.1 The Level of Compliance for Average Index Analysis

Average Index	Level of Compliance of Evaluation
$1.0 \leq \text{Average Index} < 1.5$	Strongly Disagree
$1.5 \leq \text{Average Index} < 2.5$	Disagree
$2.5 \leq \text{Average Index} < 3.5$	Fair

$3.5 \leq \text{Average Index} < 4.5$	Agree
$4.5 \leq \text{Average Index} < 5.5$	Strongly Agree

Source : (Abd Majid & Ronald Mc Caffer, 1997)

### **3.7.2 Content Analysis**

This analysis is being done by using Microsoft Excel and able to list down responses from questionnaires that answered by the respondents. Besides that, this analysis able to categorized specific main topics that related with the study which being made from the responses and answers. Plus, Content Analysis able to identify the pattern from answers by the respondents and analysed the frequency based from it.

### **3.8 Validation**

Right after the completion of guideline for the user, it needs to have validation from the related construction party, such as client's party because the clients itself who bring up the issues and request for proper solutions. Researcher needs to explain the result of analysis to the client, hence, the client will correct any faulty and comments regarding the guideline if there should be added and corrected.

### 3.8.1 Flowchart and Gantt chart of Proposal

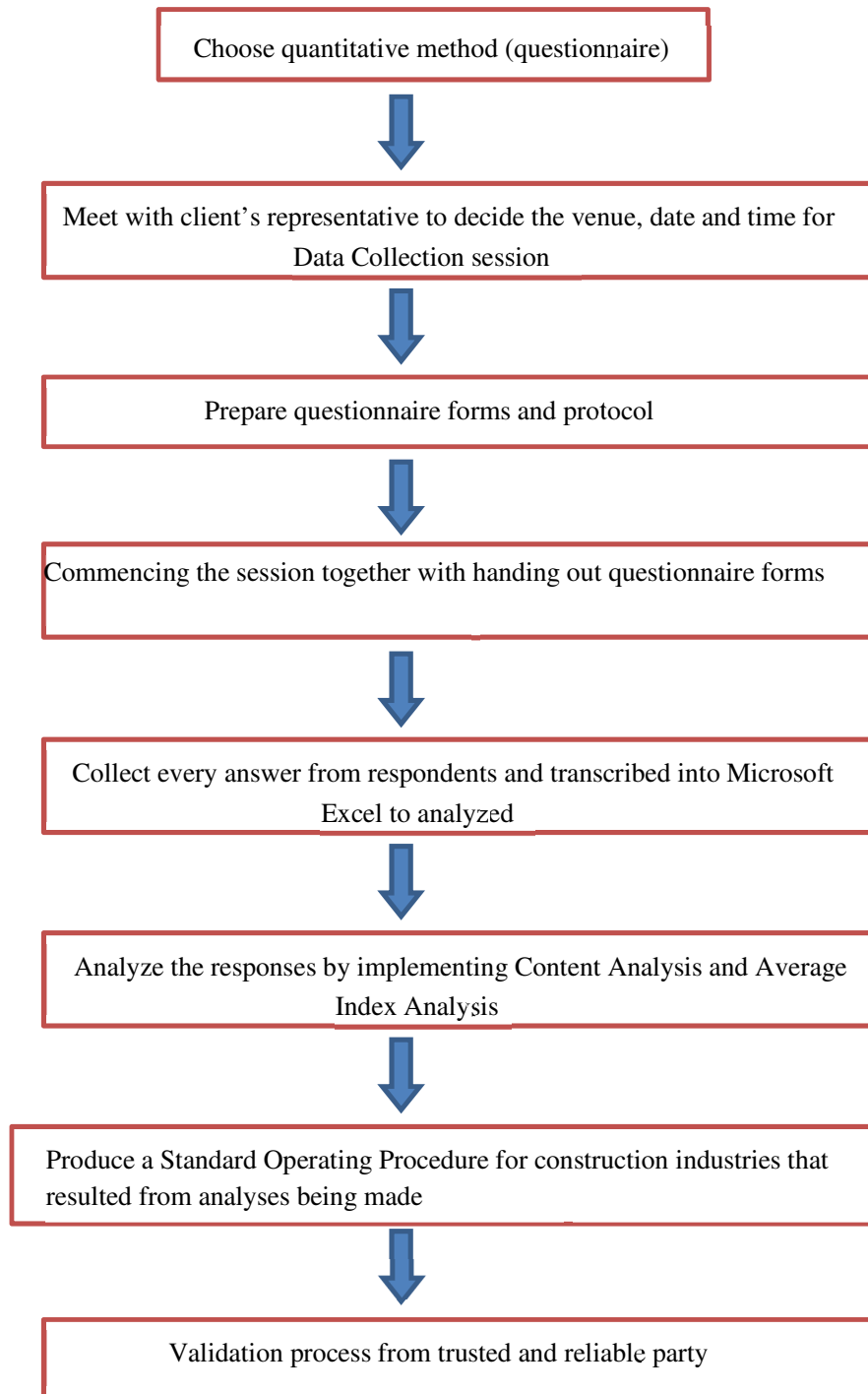


Figure 3.1 Flow Chart for Overall Process in Gathering Results

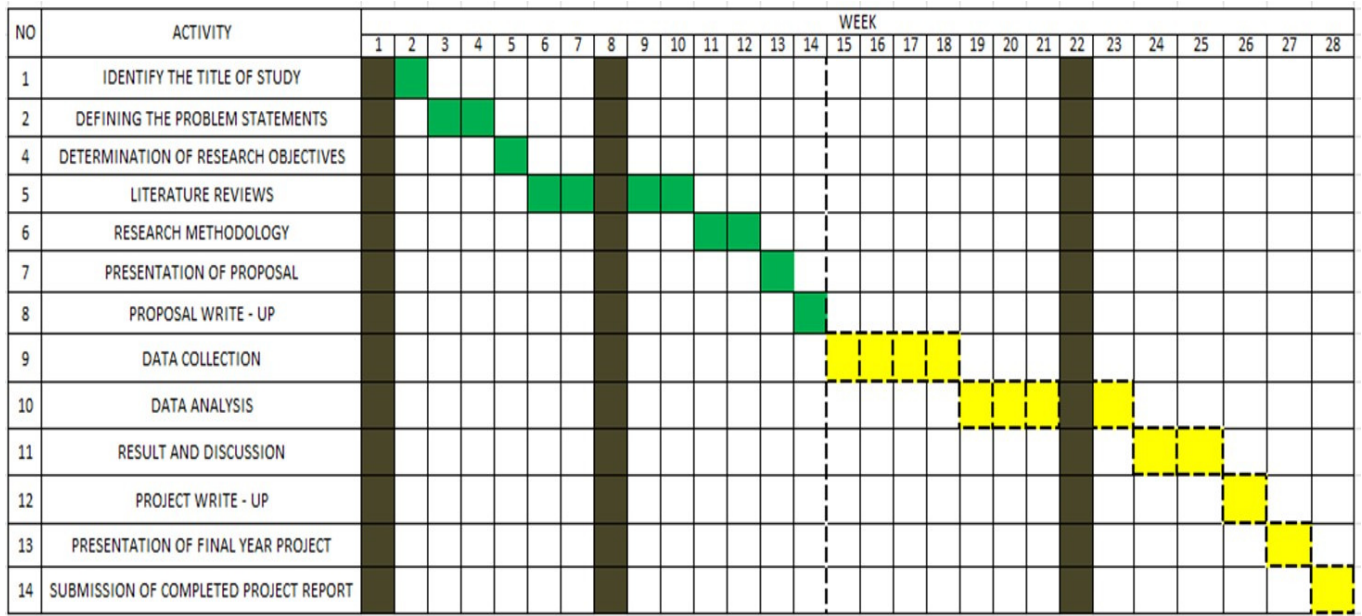


Figure 3.2 Gantt Chart for Final Year Project Schedule

## **CHAPTER 4**

### **RESULTS AND ANALYSIS**

#### **4.1 Introduction**

On this chapter, this paper will reveal and discuss the result that already obtained. The data have been gathered and analysed by using Microsoft Excel and also Average Index Analysis to point out the actual answer and idea from the respondents. A total sets of 50 questionnaires been submitted and distributed by hands to the respondents during an official meeting with the official and relevant parties, which are Client, Contractor and also Consultant. The meeting being set up by the Client party and gathered the responsible workers that involved directly with construction project.

#### **4.2 Data Collection Session**

The data collection session is being held at the Site Office Meeting Room, that already being organized and arranged by the Client party. The meeting announcement has being made one (1) week before the date of occurrence via e – mail and messages to the related persons. The Project Manager acts as the leader for the session and gathered all the linked workers. This session being held was aim to give better understanding to the related parties regarding the questionnaire questions. Besides that, it is also help to improve communication between the student and the industry people. Hence, from the questions and explanations that voiced between the construction parties and student, the questionnaires are well answered by the respondents. The duration lasted for almost one (1) hour.

The respondent's opinions and perspectives are important because they are involved directly throughout the construction activities. Plus, they understand quite well



about the project performance, Design – Build delivery method, contract method and also any issues that presence from the construction project.

### **4.3 Questionnaire Analysis**

The questions that being composed and formed are originally depend on the student initial search and investigation, and also based on the literature review and objectives that has completed earlier. Hence, after few studies and searches being done, the questions are generated and divided into three (3) sections which are, section A with four (4) questions, section B with twelve (12) questions, while section C are divided into five (5) categories with total of 27 questions. Both section B and C are likert scale questions. The questionnaires only seek information regarding the Design – Build delivery method, major issues presence, and also exploring respondent's opinions and perspectives to better improve the existed issues.

Out from 50 questionnaires given to the respondents during the meeting, total 50 sets of questionnaires are answered by them.

### **4.4 Section A – Analysis of General Information**

In this section, the questions only investigate on the general information from the respondents such as specific job positions, years of organization's experiences, years of working experiences and also delivery method that being selected for the construction project. Most of the questions in this section are consists of multiple choice answers.

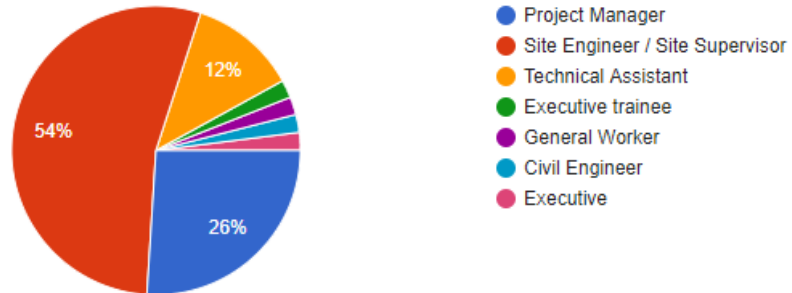
#### **4.4.1 Position of Respondents In Company**

From the data that already achieved from the questionnaires, it is recorded that 54% from the total 50 respondents are being filled up by Site Engineer and Site Supervisor. Next, 26% of them are Project Manager while 12% of respondents are filled up by Technical Assistant. There are small percentage filled up by Executive Trainee (2%), General Worker (2%), Civil Engineer (2%), and Executive (2%). The data collected are shown in Figure 4.1

Figure 4.1 Position of Respondents In Company

### 1. Position in company?

50 responses



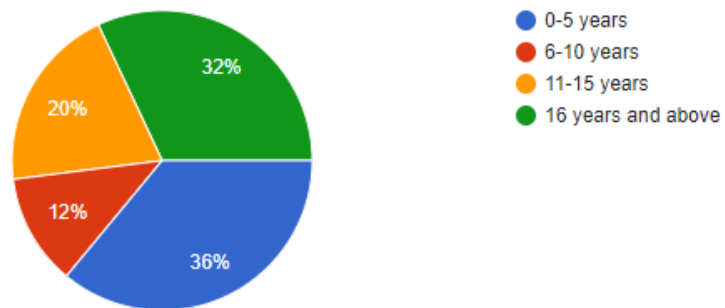
### 4.4.2 Years of Organization's Experience

For this sector, years of company's experience for the respondents are analysed and classified into several which are displayed in Figure 4.2.

Figure 4.2 Year's of company's experiences

### 2. Number of years of organization has experience in construction?

50 responses



From Figure 4.2, it has shown that from the forms that being filled up and also the meeting that already held by the respondents, 36% of respondents are working with organization that has 0-5 years' experiences have answered the questions while only 12% of respondents are from 6-10 years of organization experiences. Next, followed by

20% of respondents are from organization that has 11-15 years and 32% of respondents are from organization that has 16 years of experiences.

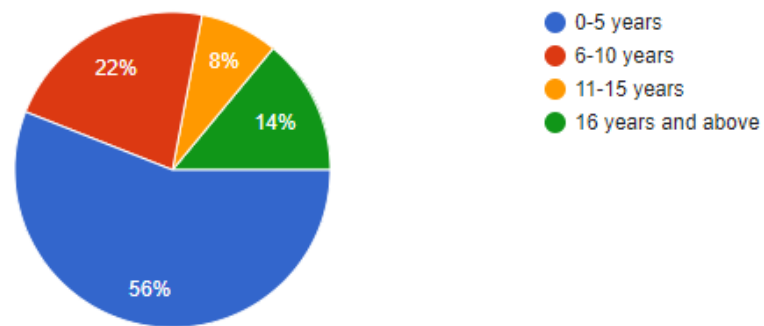
#### 4.4.3 Working Experience

Total working experience of the respondents in construction industry divided into four (4) categories. The data obtained is advertised in Figure 4.3.

Figure 4.3 Working Experiences

### 3. How many years of working experience?

50 responses



From the figure 4.3 shown above, most of the respondents of the construction industry workers got some experienced colleagues and workers too. As stated in the chart above, majority of the respondents was working there below 5 years of working experience which majority of 56% of the. Second was 6 to 10 years of working experience that consist of 22% of the respondents while, 14% of respondents got 11 to 15 years of working experience in this construction industry. Lastly, the least workers are for 16 years or above of working experience which got only 8% from the respondents.

Hence, this paper is valid because it covered a wide area of the workers with various time of working experience so that the research will get more valid results for this research.

#### 4.4.4 Type of Delivery Method Used

In this section, 36 out of 50 of respondents shows that everyone agreed that the construction project implementing Design – Build delivery method whereby the contractor itself had been provided external consultant party by the client to provide the design of the project, ensure the smoothness of the performance of the project and also act as an advisor to the client regarding the project.

Table 4.1 Type of Delivery Method

Type of Delivery Method	Number of Respondents
Design - Build	36
Design - Bid - Build	4
Construction Management	9
Others	1

#### 4.5 Section B – Analysis of the Presence Issues

For Section B, this questionnaire try to tackle down and identify the possible issues, problems or any risks that may arises during executing the construction work. This study trying to approach the individual perspectives and hence, majority of the questions being made are for them to answer by themselves and to prevent providing multiple choices answers.

##### 4.5.1 Type of Arising Problems

Questionnaires that answered by 50 respondents regarding the major problems and issues that exactly happened during the construction are tabulated in table below according to their categories.

Table 4.2 List of Problems and Issues in General Aspect

<b>Type of Problems Exist</b>	<b>Number of Respondent Agree</b>	<b>Number of Respondent Disagree</b>
Unclear project scope	24	17
Misunderstanding among parties	25	14
Owner often changing orders	29	21
Insufficient workers	22	17
Inexperience manpower	25	20

As shown in the table 4.2 above, the problems that occurred for the construction workers based on general aspect can be involved in many ways. As stated in this questionnaire, for the unclear project scope, 24 of the respondents agree that it does raise an issue to them while 17 other respondents did not agree with the statements. Secondly, the misunderstanding among parties got 25 respondents that support the issue while 14 other respondents opposed the issue stated. Meanwhile, 29 of the respondents agrees as the statement upon owner often changing orders and 21 others did not agrees with the statements given in the questionnaires. Next, the issues of insufficient workers got 22 respondents to support the statements and 17 others to disagree the issue stated. Lastly, as for inexperience manpower, 25 of the respondents agree with the issue stated while 20 others do not.

Table 4.3 List of Problems and Issues in Quality Aspect

<b>Type of Problems Exist</b>	<b>Number of Respondent Agree</b>	<b>Number of Respondent Disagree</b>
Project does not meet client's requirement	17	23

Contractor disregards quality of material in the way to making profit	30	11
Low productivity level of labour workers	24	16
Lack of construction materials and machineries	23	20
Number of materials order are not tally with materials on site	30	14
Ineffective planning and scheduling of project	25	15

Based on the table 4.3 shown above, the problems and issues in quality aspects can be affected by many causes which have been stated in the questionnaire. Each respond from 50 respondents has been tabulated as shown in the table above. The first list of problem occurred in quality aspect was the project does not meet client's requirement. As for this statement, only 17 respondents that agrees with the statement which the other 23 disagrees by the statement given. The second statement given from the questionnaire is contractor disregards quality of material in the way to making profit which majority of 30 respondents supports the statement and only 11 respondents that did not support the statement given. The third statement given was low productivity level of labour workers which 24 respondent agrees with the issue and 16 respondents did not support the problem stated above. Next problem stated was lack of construction materials and machineries, which made 23 respondents agrees with the statement given and 20 respondent disagrees with the statement given above. For the next statement given in the questionnaire, majority of 30 respondents support the issue of number of materials order are not tally with materials on site while only 14 respondents did not support the statements. Lastly, the last problem stated in the questionnaire was ineffective planning and scheduling of project which 25 respondents supported the statements and 15 other respondents said otherwise.

Table 4.4 List of Problems and Issues in Design Aspect

<b>Type of Problems Exist</b>	<b>Number of Respondent Agree</b>	<b>Number of Respondent Disagree</b>
Contractor takes control of design more than consultant	28	10
Late submission of construction drawing by consultant	33	11
Contractor always proceed their works without informing consultant	30	9
Discrepancies between Structural, Architectural & M&E in design documents	32	6
Client less involve in controlling design	36	9
Insufficient information and instruction in the project specification, drawing and design	31	11

Based on the table 4.4 shown above, those are issues that related to the design aspects. Based on 50 respondents of the questionnaire that has been answered by them, 28 respondents agrees that contractor takes control of design more than consultant meanwhile, 10 other respondents did not agree with the statement given. The second problem that has been stated in the questionnaire was late submission of construction drawing by consultant which made majority of 33 respondents supports the statements given whereas, 11 respondents did not agrees with the statement given. For the next statements given which is contractor always proceed their works without informing consultant, majority of 30 respondents supports the statements and only 9 respondents

opposed the statement given. Moving on to the next issue stated in the questionnaire which is, discrepancies between Structural, Architectural & M&E in design documents, majority of 32 respondents do support the statements given while only 6 respondents do not agree with the stated issue. Majority of 36 respondents agrees with the statement given which is client less involved in controlling design meanwhile 9 respondents said otherwise. Lastly, for the statement given which insufficient information and instruction in the project specification, drawing and design, 31 respondents supports the statements and 11 respondents opposed the issue stated for the design aspect.

Table 4.5 List of Problems and Issues in Financial Aspect

<b>Type of Problems Exist</b>	<b>Number of Respondent Agree</b>	<b>Number of Respondent Disagree</b>
Contractor has bad financial planning / lack of cash flow	26	17
Claims' items submitted by contractor are not clearly stated as in the contract documents	26	7
Quantity surveyor does not estimate work done and material on site correctly	29	14
Delay/late in progress payment by client to contractor	35	8
Actual cost for project is higher than client's target price	35	8

The questionnaire also stated upon the issues occurred based on financial aspect. The result has been shown in the table form as displayed in the Table 4.5 above. The first issue that has been stated in the questionnaire was contractor has bad financial planning / lack of cash flow in which got 26 respondents that voted that they agreed



with the statement given meanwhile, 17 respondents voted to oppose the statement. The second issue was claims' items submitted by contractor are not clearly stated as in the contract documents on 26 respondents supported the statement and 7 others are disagreed with the statement given. The other issue was quantity surveyor does not estimate work done and material on site correctly. This statement has been supported by 29 respondents and it has been opposed by 14 other respondents. Furthermore, there are majority of 35 respondents that agrees with the statement of delay/late in progress payment by client to contractor while only 8 respondents did not agree with the statement. Lastly, the issue of Actual cost for project is higher than client's target price got 35 respondents that supported the issue stated meanwhile, 8 other respondents says otherwise.

Table 4.6 List of Problems and Issues in Time Aspect

<b>Type of Problems Exist</b>	<b>Number of Respondent Agree</b>	<b>Number of Respondent Disagree</b>
Insufficient time to prepare tender documents	23	14
Insufficient time to evaluate tenders	23	16
Limited time to establish when using Design Build contract	16	20
Project are commonly finished not according to agreement	25	18
Delay happen due to obtain statutory / authorities approvals	40	6

As shown in the table 4.6 above, this table shown for the list of the problems and issues based on time aspect. The first issue was insufficient time to prepare tender documents which lead to 23 respondents to agree with the statement while, other 14 respondents to oppose the statements. Secondly, the statements of insufficient time to

evaluate tenders which got 23 respondents voted to support the issue and only 16 other respondents to disagree with the problem stated in the questionnaire. As for the next problem stated which is, limited time to establish when using Design Build contract got 16 respondents to agree with the issue stated meanwhile, 20 other respondents to not support the statement given in the questionnaire. The other issue that has been stated was project are commonly finished not according to agreement and it got 25 respondents to agree with the statement given meanwhile, other 18 respondents to oppose the issue. Lastly, the issue of delay happen due to obtain statutory / authorities approvals required majority of 40 respondents to support the issue meanwhile the other 6 respondents to oppose the issue sated in the questionnaire given to the respective respondents.

#### **4.5.2 Possible Risk Occur**

In any construction projects, risks definitely exist but in many categories and stages. Contractor or subcontractor are the most important parties in Design – Build project. Contractors have to undergo construction process and supervise every work while sub – contractors have to commence every activity. Hence, these two parties are experiencing big responsibilities and major risks that able to give impact on the DB project's performance and completion.

Besides that, construction projects will always bounded with three (3) essential indicators which are time, scope and cost that they need to secure to prevent any of them delay and will affect the performance of the project. Every party need to mitigate every possible risk that may arise and figuring out better improvement for the sake of the project performance, targeted completion date and profits.

#### **4.5.3 Understandability of Information and Instructions**

Originating from the data gathered during the meeting session and questionnaire forms, out of 50 respondents, 44 of them answered that they are completely understand and well informed with every information and instructions given by the other teams. From the meeting session, it is easily conclude that misunderstanding may happen in every project, but somehow, with their own credibility and responsibility of their own

works, they manage to prevent any misunderstanding that may led to affecting the performance of the project and hence, disturbing the completion date.

#### **4.5.4 Effect of Delivery Method towards Project Completion**

After the completion of conference meeting with consultant, contractor and also client team, everyone agrees that the construction project is implementing Design – Build delivery method. From literature review, some studies and researchers stated that this method also lead disadvantages such as, contractor unable to undergo both design and construction works (Chan, 2000).

Hence, from the real situation in this project, the contractor itself assisted by external consultant team to help them in designing works. Moreover, due to the selection of Design – Build, it can be prove that the client are competent and experience enough in handling this kind of delivery method. This statement able to convince the previous paper written by (Ndekugri and Turner, 1994), whereby they stated that DB method is not suitable for the client that is not experienced enough in handling DB construction project. However, for this paper, it is able to show that this client able to handle this project.

From the data assemblage, most of respondents agreed that this DB method is one of the main reasons that affect the completion period for this project. This method is able to make the scheduling become smoother and uncomplicated. Plus, it is also ensure the project to be on – time and stay along with the scheduling, which mean completed within the expected period for every works.

#### **4.6 Section B – Contract / Team Selection Issues**

In this section, this paper target to obtain information regarding contract and team selection issues that arise in the construction. Plus, it is also aim to identify whether every parties; contractor and consultant are being hired with proper method. Every information will be explained below together with the answers by the respondents.

#### **4.6.1 Type of Contract**

As been informed earlier, usually Design – Build method usually implementing Lump Sum contract method (Chen, Xia, Jin, Wu, & Hu, 2015). This method selection is intend to reduce the risk of the client itself such as, cost overrun, claims and variation order from the contractor. This is because; it may be benefit to the builder but not in client side due to the spending excessive money.

Therefore, expertise and experience client regarding choosing the suitable contract method is essential in order to protect the client's expenditure and also to prevent loss. From what being collected from the respondents, everyone agreed that this project elected Lump Sum contract method. Thus, from what may understand from the questionnaires is; every team agreed with client to precede the project with this type of contract.

#### **4.6.2 Compliance of Related Parties with Contract**

As already discussed in chapter Literature Review, contract is been used to describe the client requirements and needs regarding the project that the client intend to. Contract is an important procedure and it is compulsory being made by both the client and contractor. It is also called as agreement that agreed by both client and contractor with respect to the scope of works, costing and also payment for every works.

Therefore, contractor need to obey with client's demand and desire that already stated in the contract. Both client and contractor also have to follow with the law regulations in order to prevent any contract breach. Thence, from the assembled data, every respondents stated that they all obey and fulfill every requirement, demands and needs that been stated in the contract. In addition, they all declared that they are professional enough to follow every information and specification that already being agreed during contracting phase.

#### **4.6.3 Evaluation of Compliance of Respondents**

In this likert scale questions, respondents have to fill in their answer based on scale which are; (1 = Strongly Disagree), (2 = Disagree), (3 = Fair), (4 = Agree), (5 =

Strongly Agree). The questions basically related with construction works issues and responsibility issues.

This type of questions is aim to give the respondents liberty to choose the suitable scale based on the statement given. Answers from the respondents also analyzed by using Average Index (A.I) Analysis. Therefore, from the analysis, the answers will be classified into five (5) types of agreement which are, strongly disagree, disagree, fair, agree and strongly agree. The table for the classifications is given below.

Table 4.7 The Level of Compliance for Average Index Analysis

Average Index	Level of Compliance of Evaluation
$1.0 \leq \text{Average Index} < 1.5$	Strongly Disagree
$1.5 \leq \text{Average Index} < 2.5$	Disagree
$2.5 \leq \text{Average Index} < 3.5$	Fair
$3.5 \leq \text{Average Index} < 4.5$	Agree
$4.5 \leq \text{Average Index} < 5.5$	Strongly Agree

No.	Questions	1	2	3	4	5	Average Index	Rank
1	Team selection plays vital role to the project		1	2	13	34	4.60	3
2	Changing orders will delay the completion of the project			6	13	31	4.50	5
3	Competent and qualified workers improve the quality of project			3	12	35	4.64	1
4	This project achieve client's needs ( cost, time, quality)	1		9	15	25	4.26	12
5	Every construction parties well communicated with each other		2	4	21	23	4.30	11
6	Separation between contractors and consultants give benefits of their own responsibilities	1	1	5	17	26	4.32	10
7	Every parties take fully responsibilities for their own work			5	14	31	4.52	4
8	Information and requirements regarding the project already brief explained		1	4	16	29	4.46	6
9	Every parties are experienced enough undergo the selected delivery method's project		1	7	13	29	4.40	8
10	Sufficient number of workers		2	8	12	28	4.32	9
11	Materials and equipment are available and enough at the site area		2	6	12	30	4.44	7
12	Proper planning and scheduling the scope of work plays as important role to prevent delay		1	1	14	34	4.62	2

Figure 4.4 Likert Scale Questions Regarding Road Construction

From Figure 4.4, results from the Average Index proved that most of the respondents agreed that competent and qualified workers able to improve the performance of the project (4.64). Based on the level of compliance, the index has ranked into Strongly Agree category. From previous study written by (Hemlin, 1999; Molenaar et al., 1999), whereas they declared that competent contractor and sub – contractor are very important in order to secure and better improve the project.

Apart from that, from the table above, at the second position with index 4.62, agreed that proper planning and scheduling able to lessen the delay and also improve the quality of the project. (Chalabi and Camp, 1984) already stated before in their study

whereas legitimate and appropriate planning of the project portray the important role in construction due to the prevention of delay and cost overrun. From the identification of problems that arise in this construction, almost half of them, respondents answered that the project acquiring often changing orders, insufficient materials/equipment and cost overrun. Those three problems are the related part of planning and scheduling phase. Hence, from this analysis, it can be prove that this project bear big problem as early as in the planning stage / pre – construction stage.

Hence, from the relationship between both index analysis and type of problems arises topic, this paper able to resolve that this project is possessed by well – established and great experience team workers.

#### **4.7 Section C - Open – Ended Evaluation**

In this section, respondents are required to answers the given questions in terms of their own opinions and ideas regarding their construction project in Malaysia.

Open – ended term is defined as one of the medium to gathered the respondents answers, which is based on their own experience, knowledge and also their own feeling. These types of questions usually give the freedom to respondents and as their medium to confess their point of view.

The first question given is concerning on respondents' experience on this project if it is presence any major issues. Based on the collected answers, all of them answered that this project encounters many types of issues that able to assist on delaying the completion date and also affecting the performance of the project. From the various answers gathered from the questionnaires, this study able to categorize them into several main issues which are, time completion of project, attitude of related parties and transportation issues. Beginning at the time completion issue, it is recorded that this topic is agreed by the majority rather than other issues. The rising issue regarding this topic is due to the slow work progress, construction works did not follow with the contract requirement and also this project is left behind from the scheduled target date.

Hence, from the listed issues, this can be shown that this project is struggling in completing the works on time, thus delay occurred.

Next, the other issue that appear is respect with the attitude of the related parties. From the answers given, some of them are dealing with misunderstanding issue among parties and also single – minded attitude. Due to their attitude problem, it gives effect on communication among them and thence, performance of the project also affected due to the lack of professionalism manner. Errors, delay and also cost of the project will be increasing as the outcome this topic.

Second question is concerning on prevention and mitigation of delay and also cost overrun issue. Every respondent give full cooperation and also provide several ways to counter this issue based on their own experiences and knowledge. From overall opinions and approach made by respondents, their answers can be divided into four (4) main categories which are; improvement of work planning, communication, responsibility and performance.

In order to improve the work planning and scheduling, the workers need to follow every scheduled plan or establishing a well – planned master program that are practical and able to be implemented on site such as Critical Path Method (CPM). They need to aware and also obey on the CPM. Besides that, to prevent delay, they also need to follow Standard Operating Procedure (SOP) which already being setup by the top management team. From both CPM and SOP given, the related parties will urge their workers to conduct activities more well - organized and improve the discipline attitude of workers.

After that, there are also other opinions about developing communication skills among contractor, client and also consultant. Communication skills able to increase the teamwork value among them and also capable to prevent any misunderstanding or grudge issues among them because it will influence on their productivity rate and also contradiction on any information. Next, responsibility matter play an important role in order to ensure the project's scope and objectives are in right path. This is because, experience and good attitude team workers will reflect better results for the project. They are also able to supervise other worker's job and generate better decision and



judgment. Hence, possibilities for postponement or setback to any activities able to be mitigate.

In addition, boosts the performance of the project by reducing Non Conformance Report (NCR) able to develop better works and also reducing claims over unimportant matters. NCR usually being issued if any works are being done but does not included in the contract. However, if NCR being utilized and issued frequently, it will give negative consequences especially to the client due to the cost overrun problem. It is also will delay the activities if NCR is broadcasted, due to the additional materials or equipment needs to be delivered to revise the report.

For the third question, this study desire to identify the method of compliance for every activity in the contract. In order to ensure every work sequences comply with the contract, there are three (3) main components that need to be focused on, such as, better supervision, responsibility of related parties and also communication among team. Majority of respondents agreed that responsible workers that follow construction drawing that provided by consultant will secure the projects from occurring major errors or mistakes. Besides that, from the drawing, the contractor able to indicate the suitable activities and prevent from doing any works that does not meet the specifications stated in contract.

Apart from that, inspection and monitoring works from Quality Control Engineer will assure the quality of works and also performance of project is aligned with the contract requirements. On the other hand, communication and cooperation among the team workers are also essential in order to prevent from breaching any contract's requirement. Besides that, communication among parties also gives guidance and advices for them to understand every specification and objectives needed in the contract.

This study aims to uncover the key element that can lead to improve the quality of construction project in Malaysia. Hence, from the meeting session and answers in questionnaires, there are 5 main elements that vital to better improve the quality of construction industry. First, every construction project need to supervise and look after every activities and works that conducted by workers. Better supervision and control by

the competent person hired by the client will assist to improve the performance of project and also increase the productivity for every work. Plus, due to work inspection, the project can mitigate possible hazards or risks that may hit the workers. Moreover, positive monitoring work will ensure that every activity are completed on – time and follow the schedule, hence, be able to lessen delay.

Team selection also portrays the quality and performance of the project. Hiring experience and well – known team workers will give better result in conducting any projects. Besides that, they are able to make critical verdict if any conflicts and issues arises. Competent persons also more professional and have a great attitude. Past performance of the team workers are one of the essential efforts to analyze the credibility and performance before hiring any team.

Furthermore, some respondents opined that every construction team needs to implement new technologies that able to assist them in any aspects. Malaysia needs to improvise and upgrade the existing technologies because it is able to increase the productivity of activities, fasten the completion period and also scale down man forces for heavy and complicated works.

Attitude and responsibility of every worker in construction industry need to be elevated and enhanced in order to follow every orders and aware with their own roles during conducting and carry their works. Everyone need to understand with every regulation and command from other parties because to prevent any misunderstanding and setback of their works. Besides that, law and regulation in Malaysia need to be reinforced to hinder any bribe issues with regard to give any available construction projects.

For the next question, it is propose to identify the effectiveness of communication and teamwork value among the team workers. Besides that, this question also intended to study the relationship between communication skills among parties and successful rate of the project. Hence, from the answers gathered, due to the communication skills efficiency, performance of every party also will be growing and well – developed, and still, the responsibility of own work will become impressive and forceful.

Better communication among teams will lead to a better performance of the project itself. Thus, this can help to reduce the possibility of delay and cost overrun, and able to follow with every requirement and instructions given by others. Performance and work sequences will be more steady and smoothly, and will contribute to the success rate of the project. Moreover, the tendency for delay in any activities may be weaken and lessen. In the meantime, good communication skills able to ensure the quality of every work that been done. Problems such as double handling work and redo any errors or mistakes will lead to stoppage and increase in spending money. Hence, from communicating with each other, it gives benefit at quality of their job and also improves the relationship among them.

In another point of view, communication also cooperates in developing worker's responsibility. The presence of mutual relationship and good communication among party will manage to create better coordination for every activities and also able to recognize with every information and instructions given by the others. In addition, better understanding at the job scopes and objectives will increase the awareness with their own role and tends to perform better on their own works.

Contract document usually clearly stated every requirement needed for the project and everyone should obey with the obligation that being made. Therefore, contracting stage is very vital and critical because it needs to be fair and legitimate with every related party, and agreed by everyone regarding the regulations and specifications.

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATION**

#### **5.1 Introduction**

This chapter consist of two (2) main topics. The first topic is the conclusion that being made for this study, while the second topic is about the recommendation that suitable to improve this study in future.

For the conclusion section, this paper include with the suitable outcome that gathered from the results at previous chapter and related with research objectives of this study.

#### **5.2 Conclusion**

Based on the results and analyses, it can be concluded that insufficient or improper work planning can be improved by establishing a well - planned master program that are practical and implemented on site. The project also may need better supervision from competent person to prevent delay and cost overrun. Inexperience workforces is the main problem in the project because it will effect on project completion and cause delay. Thus, to better improve overall performance for DB project based on results and analysis, this study has create a SOP that will act as a guideline for every construction parties. The establishment of SOP is aim to approach the related and responsible persons that are directly involved in construction activities. The scope of the SOP is intent to control the project from any major problems and also preserve the performance of DB project. SOP also will act as a system that will reduce ambiguities, misunderstanding and easier for the workers to follow the procedures without breaching the contract's specifications. Lastly, the importance of SOP will

empower the worker's roles by standardizing their work routines and urge them to increase their awareness of their own responsibilities.

For this study, the establishment of SOP is aim to approach the related and responsible persons that are liable to supervise and conduct any construction activities. The scope of the SOP is intent to control the project from any major problems and also preserve the performance of the project. For the procedure, every works and activities need to be supervised by the competent persons. Next, every team should follow the CPM that being given in order to complete the project in targeted period. For NCR issue, it have to be verified by the legal and responsible person that being audited. To prevent misunderstanding or communication problems among team workers, they are compulsory to attend any kind of meeting session in order to increase their awareness and understanding about every progress of the project. Meanwhile, for team selection issue, the client itself have to undergo RFP and RFQ method before proceed to the tendering process in order to ensure the qualifications and experience of contractor compatible with the project offered. Next, for the sub – contractors or labourer's selection, it is also need to hired a well – experienced labourer's and need to be supervised by qualified person. Lastly, the contract documents need to be well written and explained by the client team to the selected persons in order to prevent contravention of contract, misunderstanding and ensure everyone obey with every specifications and needs stated in the contract.

### **5.3 Recommendation**

Recommendation for this paper need to be done due to the limitation and certain infirmity while undergo this study. Based on the findings drawn from this study, there are two (2) recommendations that being done:

#### **5.3.1 Recommendation for This Study**

During this study takes place, there are several recommendations that suitable to better improve the results obtained. First of all, in order to prevent delay and setback problems, the client team need to hire external competent person that able to schedule and planning the work sequences to ensure the smoothness of the project. Besides that,

for Design – Build projects, the related construction team need to be experienced enough to construct and lead the project in order to prevent critical problem that able to give bad impact to the project. Lastly, proper supervision, monitoring and proper practices should be done frequently and thoroughly by the competent person in order to prevent delay and increase the efficiency skill of workers.

### **5.3.2 Recommendation for Further Studies**

This study need to be improvised for any further or future studies. This is because it might increase the reliability and accuracy of this paper. For example, this study need to widen the scope and expand the area of the study such as make another research at any other project that implementing Design – Build delivery method. Besides that, the number of respondents also needs to be increase because it will create the results become more accurate and detailed. Lastly, implementing any reliable software or method analysis will assist in producing decisive and solid results.

## REFERENCES

- Abdul, I., Universiti, R., & Hussein, T. (2014). PPP Procurement Methods in Malaysian Construction Industry, (January).
- Carpenter, N. (2015). Comparison of the design-bid-build and construction manager at risk project delivery methods utilized for the construction of public schools. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 75(10–B(E)).
- Chen, Q., Xia, B., Jin, Z., Wu, P., & Hu, Y. (2015). Choosing Appropriate Contract Methods for Design-Build Projects. *Journal of Management in Engineering*, 32(1), 401–5029. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000393](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000393)
- Del Puerto, C. L., Gransberg, D. D., & Shane, J. S. (2008). Comparative Analysis of Owner Goals for Design / Build Projects. *Journal of Management in Engineering*, 24(January), 32–39.
- Fernane, J. D. (2011). Comparison of design-build and design-bid-build performance of public university projects, i-109.
- Floor, G., & Area, M. (2009). DESIGN-BID-BUILD ( DBB ) AND DESIGN-BUILD ( DB ) PROCUREMENT METHODS IN GHANA By Collins Ameyaw , B . Sc . ( Hons .)
- Gransberg, D. D., & Molenaar, K. (2004). Analysis of Owner ' s Design and Construction Quality Management Approaches in Design / Build Projects. *Journal of Management in Engineering*, 20(4), 162–169. [https://doi.org/10.1061/\(ASCE\)0742-597X\(2004\)20:4\(162\)](https://doi.org/10.1061/(ASCE)0742-597X(2004)20:4(162))
- Idoro, G., & Idoro, G. (2012). Comparing levels of use of project plans and performance of traditional contract and design,build construction projects in Nigeria. *Journal of Engineering, Design and Technology*, 10(1), 7–33. <https://doi.org/10.1108/17260531211211863>
- Meghana, R., Manikandaprabhu, S., & Potti, S. R. (2016). Quality Assessment for DesignBid-Build Projects, (Figure 1), 5724–5729. <https://doi.org/10.15680/IJRSET.2016.0504086>

Okunlola Ojo, S., Aina, O., & Yakeen Adeyemi, A. (2011). A comparative analysis of the performance of traditional contracting and design-build procurements on client objectives in Nigeria. *Journal of Civil Engineering and Management*, 17(2), 227–233.

<https://doi.org/10.3846/13923730.2011.574449>

Palaneeswaran, E., & Kumaraswamy, M. M. (2001). Reinforcing design-build contractor selection: A Hong Kong perspective. *HKIE Transactions Hong Kong Institution of Engineers*, 8(1), 7–12. <https://doi.org/10.1080/1023697X.2001.10667835>

Paper, C. (2016). An Assessment of Risk Factors Impacting The Cost of Contractor-Led Design and Build COBRA 2016, (September).

Rahman, N. B. A. (2009). a Survey on Problem Faced By Contractors Using Design & Build Contract.

Turina, N., Radujković, M., & Car-Pušić, D. (2008). Design and build" in comparison with the traditional procurement method and the possibility of its application in the Croatian construction industry

Al Khalil, M.I. (2002), —Selecting the appropriate project delivery method using AHPL, *International Journal of Project Management*, Vol. 20 No. 6, pp. 469-474

Akintoye, A. (1994), —Design and build: a survey of construction contractors' views, *Construction Management and Economics*, Vol. 12 No. 2, pp. 155-63.

Yong, Y.C. and Mustaffa, N.E. (2012), —Analysis of factors critical to construction project success in Malaysia, *Engineering Construction and Architectural Management*, Vol. 19 No. 5, pp. 543-556

Miller, J.B., Garvin, M.J., Ibbs, C.W. and Mahoney, S.E. (2000), —Toward a new paradigm: simultaneous use of multiple project delivery methods, *Journal of Management in Engineering*, Vol. 16 No. 3, pp. 58-67.



- Arditi, D. and Lee, D.E. (2003), —Assessing the corporate service quality performance of design-build contractors using quality function deployment, Construction Management and Economics, Vol. 21 No. 2, pp. 175-185.
- Ling, Y.Y. and Kerh, S.H. (2004), —Comparing the performance of design-build and designbid-build building projects in Singapore, Architectural Science Review, Vol. 47 No. 2, pp. 163-175.
- Seng, N. G. W., & Yusof, A. (2006). THE SUCCESS FACTORS OF DESIGN AND BUILD PROCUREMENT METHOD : A LITERATURE VISIT, (September), 5–6.
- Hale, D. R., Shrestha, P. P., Gibson, G. E., and Migliaccio, G. C. (2009).—Empirical comparison of design/build and design/bid/build project delivery methods. J. Constr. Eng. Manage., 10.1061/(ASCE)CO.1943-7862.0000017, 579–587.
- Konchar, M and Sanvido, V. (1998). Comparison of US project delivery systems. Journal of Construction Engineering and Management, 124(6), 435-444.
- Hughes, W., Hillebrandt, P.M., Greenwood, D. and Kwawu, W. (2006) *Procurement in the Construction Industry*. Taylor and Francis, London
- Ling, Y.Y., Lok, S. and Tan, E.S.M. (2001). Design-build projects: a comparison of views between South Australia and Singapore. In Proceedings of the CIB World Building Congress- Performance in Product and Practice, pp. 349-359. CIB, Wellington
- Songer, A.D., Molenaar, K.R. and Robinson, G.D. (1996). Selection factors and success criteria for design-build in the US and UK. Journal of Construction Procurement, 2(2), 69- 82.
- Chartered Institute of Building (2010) *A Chartered Institute of Building Report Exploring Procurement in the Construction Industry*, Ascot, UK.
- Nurhajar, Abd Rahman (2009) A survey on problem faced by contractors using design and build contract. Faculty of Civil Engineering & Earth Resources, University Malaysia Pahang

Nielsen, K. R. (1994). International Construction Projects - Managing Risk in the Field. Proceedings of World Congress on Construction Risk, Pads, France, April 28-29, 1994, 2.

Design-Build Institute of America (1995). Design-Build RFQ/RFP Guide for Public Sector Projects. Design-Build Institute of America. Washington, D. C.

Cohen, M. W., and Palmer, G. R. (2004). —Project risk identification and management. | AACE Int. Trans., 1013–1015.

Nieto-Morote, A., and Ruz-Vila, F. (2011). —A fuzzy approach to construction project risk assessment. | Int. J. Project Manage., 29(2), 220–231

Wang, T., et al. (2015). —Enhancing design management by partnering in delivery of international EPC projects: Evidence from Chinese construction companies. | J. Constr. Eng. Manage., 142(4), 04015099

Sears, G.A., Sears, S.K., Clough, R.H., 2008. Construction Project Management, fifth ed. John Wiley and Sons, New York.

Frederick E. Gould & Nancy E. Joyce. (2003). Construction Project Management. Prentice Hall.

Ibbs, C.W., Kwak, Y.H., Ng, T. and Odabasi, A.M. (2003), —Project delivery systems and project change: quantitative analysis |, Journal of Construction Engineering and Management, Vol. 129 No. 4, pp. 382-7

Idoro, G.I. (2007), —Comparative study of direct labour and design-tender-construct procurement systems in Nigerial, PhD thesis, University of Lagos, Lagos.

I. M. Mahdi and K. Alreshaid. (2005). Decision Support System For Selecting The Proper Project Delivery Method Using Analytical Hierarchy Process (AHP). International Journal of Project Management. [Online]. 23 (7). Pp. 564-572. Available: <http://www.sciencedirect.com/science/article/pii/S0263786305000608>

S. M. El-Sayegh, —Significant Factors Affecting the Selection of the Appropriate Project Delivery Method, Fifth LACCEI International Latin American and Caribbean Conference for Engineering and Technology (LACCEI'2007), Tampico, México, 2007

Ibbs, W. C., Kwak, Y.H., Ng, T., and Odabasi, A. M. (2003). —Project delivery systems and project change: Quantitative analysis. *J. Construc. Eng. Manage.*, 129 (4), 382-388

S.O. Ojo, O. Aina, A.Y. Adeyemi, A comparative analysis of the performance of traditional contracting and design-build procurements on client objectives in Nigeria, *Journal of Civil Engineering and management*, 17(2), 227-233, 2011

Adesanya, O. M. 1998. Management contracting and Nigeria's industry, *Building Quarterly (Arkil-dives Ltd., Nigeria)* 1(6): 26-31.

Moore, D. R.; Dainty, A. R. J. 1999. Integrated Project Teams Performance in Managing Unexpected Change Events, *Team Performance Management* 5(7): 212-222.

Chartered Institute of Building (2010) A Chartered Institute of Building Report Exploring Procurement in the Construction Industry, Ascot, UK.

Ernzen, J. J., and Schexnayder, C. (2000). —One Company's Experience with Design/Build: Labor Cost Risk and Profit Potential, *Journal of Construction Engineering and Management*, 126(1), 10-14

Hemlin, D. (1999), —Contractor's local experience on design & build projects, *Seminar Proceedings on Design and Build Procurement System*, January, Hong Kong, pp. 17-26.

Molenaar, K.R., Songer, A.D. and Barash, M. (1999), —Public-sector design/build evolution and performance, *Journal of Management in Engineering*, Vol. 15 No. 2, pp. 54-62.

K.R. Molenaar, A.D. Songer, Model for Public-sector design/build project selection, *Journal of Construction Engineering and Management*, November/December, 467-479, 1998.

- A. Kosecki, Construction project management as a service regulated by contract [in Polish], *cz.I, Przegląd Budowlany*, 3, 36-39, *cz.II, Przegląd Budowlany*, 4, s. 9-12, 2003.
- S. R. THOMAS, C.L. MACKEN, T.H. CHUNG AND I. KIM. Measuring the impacts of the delivery system on project performance design – build and design – bid – build. Construction Industry Institute, Austin, TX, 2002.
- Y.Y. LING, AND E.F.K. LEONG. Performance of design-build project in terms of cost, quality and time: views of clients, architects and contractor in Singapore. *The Australian Journal of Construction Economics and Building*, Vol.2, No.1, 2002, pp. 37 -46.
- Chan E.H and Chan A.P.C. (2000). Design-Build Contracts in Hong Kong – Some Legal Concerns, Information and Communication in Construction Procurement, Serpell, A (ed.). Pontificia Universidad Catolica de Chile, Chile, 183-200.
- Ling, Y.Y., Khee, H.Y. and Lim, K.S.G. (2000). The reasons why owners prefer to procure more projects based on design-bid-build than design- and-build. *Journal of Construction Procurement*, 6(2), 135-146.
- Xia, B., and Chan, A. (2008). —Review of the design-build market in the People’s Republic of China. *J. Constr. Procurement*, 14(2), 108–117.
- Hale, D. R., Shrestha, P. P., Gibson, G. E., and Migliaccio, G. C. (2009). —Empirical comparison of design/build and design/bid/build project delivery methods. *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO .1943-7862.0000017, 579–587
- American Council of Engineering Companies. (2005). —Project delivery systems owner’s manual. *Washington, DC*
- Kaplanogu, S. B., and Arditi, D. (2009). —Pre-project peer reviews in GMP/lump sum contract. *Eng. Constr. Archit. Manage.*, 16(2), 175–185
- Molenaar, K. R., Songer, A. D., and Barash, M. (1999). —Public-sector design/build evolution and performance. *J. Manage. Eng.*, 10.1061/ (ASCE)0742-597X(1999)15:2(54),54–62.

Xia, B., Chan, A., Molenaar, K., and Skitmore, M. (2012a). —Determining the appropriate proportion of owner-provided design in design-build contracts—A content analysis approach. *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO.1943-7862.0000522, 1017–1022.

Beard, J., Loukakis, M. C., and Wundram, E. C. (2001). *Design-build: Planning through development*, McGraw-Hill, New York.

Case Study of Construction Project Delivery Types; William J. Bender; 2007; PhD, PE, M.ASCE; Construction Management Professor, IET Department, 400 East 8th Avenue, Ellensburg

Martinez, P.H., Rashida, Y. and MacMurray V. (2007) —Construction Manager's Responsibilities: Pre-Design, Design and Pre-Construction Phases American Bar Association January, 58pp

Associated General Contractors of America (AGC) (2004). *Project Delivery Systems for Construction*, Associated General Contractors of America, Washington, D.C.

Kwakye A. A. (1997), —Construction Project Administration Practicel, Longman, First edition, pp 111 – 115

Yu, A.T.W. (1998). *Evaluation of integrated procurement systems in Hong Kong*, Unpublished MSc Thesis, City University of Hong Kong.

Bubshait, A.A., Farooq, G., Jannadi, O. and Assaf, S.A. (1999). Quality practices in design organizations, *Construction Management and Economics*, 17(6), p. 799-809

Ng, S.T. and Skitmore, R.M. (2002). Contractors' risks in Design, Novate and Construct contracts, *International Journal of Project Management*, 20(2), 119-126.

Love, P.E.D., Skitmore, M. and Earl, G. (1998). Selecting a Suitable Procurement Method for a Building Project. *Construction Management and Economics*, 16(2), 221-233.

Chan E.H and Chan A.P.C. (2000). Design-Build Contracts in Hong Kong – Some Legal Concerns, Information and Communication in Construction Procurement, Serpell, A (ed.). Pontificia Universidad Catolica de Chile, Chile, 183-200.

Chan, A.P.C. (2000). Evaluation of enhanced design and build system – a case study of a hospital project, Construction Management and Economics, 18(7), 863-871

Foo, J., Low, C., Goh, B. H., and Ofori, G. (1999). —Design and Build Procurement of Construction Projects: Hybrids in Singapore. In: Profitable partnering in construction procurement, E&FN Spon, 383-392.

Masterman, J. W. E. (2002). An introduction to building procurement systems, E&FN Spon.

Lewis, D. (1999). —Preparation of Design and Build Contract Documents to Minimize Future Disputes, Seminar Proceedings on Design and Build Procurement System, January 1999, Hong Kong, 1-7.

Ling, F. Y. Y., Ofori, G., and Low, S. P. (2000). —Importance of Design Consultants' Soft Skills in Design/Build Projects, Engineering, Construction and Architectural Management, 7(4), 389-398.

Ernzen, J. J., and Schexnayder, C. (2000). —One Company's Experience with Design/Build: Labor Cost Risk and Profit Potential, Journal of Construction Engineering and Management, 126(1), 10-14

Pearson, M., and Skues, D. (1999). —Control of Projects Implemented through Design and Build Contracts, Seminar Proceedings on Design and Build Procurement System, January 1999, Hong Kong, 49-60

Osei-Tutu E., (1999), —Construction Procurement Decisions in Ghana" unpublished Msc. Thesis, Department of Building Technology, pp.53 – 63

Hong Xiao and David Proverbs (2002), The Performance of Contractors in Japan, the UK and the USA-An Evaluation of Construction Quality, International Journal for Quality and Reliability Management, Vol. 19 No. 6, pp. 672-687

Frank Harris and McCaffer, R. (2001), Modern Construction Management 5th edition, Blackwell Science Inc

Best R. and Gerard De Valence (1999), Building in value Pre-Design Issues, Arnold Publishers, pp. 36 – 46

Kenig, M.E. (2011). Project delivery systems for construction. Arlington, VA: The Associated General Contractors of Americas.

Anderson, S.D. and Damnjanovic, I. (2008). *Selection and Evaluation of Alternative Contracting Methods to Accelerate Project Completion*, NCHRP Synthesis 379, Transportation Research Board, Washington, D.C.

Martinez, P.H., Rashida, Y. and MacMurray V. (2007) —Construction Manager's Responsibilities: Pre-Design, Design and Pre-Construction Phase American Bar Association January, 58pp.

Dunston, P.S., McManus, J.F., and Gambatese, J.A. (2002). *Cost/Benefits of Constructability Reviews*, NCHRP Project 20-07, Task 124, TRB, Washington, D.C.

Kuhn, S. (2007)—Preconstruction Services: Add Value with More than Just Estimating, Construction Business Owner, February

Marks, D. F. & Yardley, L. (2004). Qualitative data collection: interviews and focus groups. In *Research methods for clinical and health psychology* (pp. 39-55). : SAGE Publications Ltd doi: 10.4135/9781849209793.n3

Pierce, R. (2008). Questionnaire surveys. In *Research methods in politics* (pp. 140-160). : SAGE Publications Ltd doi: 10.4135/9780857024589.d15

Dahlberg, L. & McCaig, C. (2010). Quantitative data collection. In Dahlberg, L. & McCaig, C. *Practical research and evaluation : A start-to-finish guide for practitioners* (pp. 172-190). London, : SAGE Publications Ltd doi: 10.4135/9781446268346.n12

Nuhu Braimah & Issaka Ndekugri. (2008). Factors nfluencing the selection of delay analysis methodologies. *International Journal of Project Management* , 26, 789-799

Henry Odeyinka, Keren Larkin, Robert Eadie & Gervase Cunningham (2016). An Assessment of Risk Factors Impacting the Cost of Contractor-Led Design and Build Projects. The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors

The Construction Management Association of America (2012). AN OWNER'S GUIDE TO PROJECT DELIVERY METHODS CMAA Owner's Guide to Project Delivery Methods - August 2012.

Chritamara, S., and Ogunlana, S. O. (2001). —Problems Experienced on D/B Projects in Thailandll, *Journal of Construction Procurement*, 7(1), 73-93.lam

Mo, J. K. W., and Ng, L. Y. (1997). —Design and Build Procurement Method in Hong Kong - An Overviewl, *CIB W92 Symposium Procurement - a key to innovation*, University de Montreal, 20-23 May 1997, 453-462.

Corbin, J., & Strauss, A. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (3rd ed.). Thousand Oaks, CA: Sage

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches*. SAGE Publications, Incorporated.



**APPENDIX A**  
**SAMPLE APPENDIX 1**



Dear respondents,

I am a student in Bachelor Degree in Civil Engineering and I am currently conducting a survey for my final year project topic. The study entitled '**Evaluation on Design and Build Procurement Process in Construction Industry in Malaysia**'. Therefore, it would be appreciated if you would spend a few minutes to answer all of these questions. All of the information given by you will be kept confidential.

Sincerely,

(IKMAL IZZAT BIN ABDULLAH KARIM)

Researcher,

Bachelor Degree in Civil Engineering,

To become a subject in the research, you are advised to sign this Consent Form. I herewith confirm that I have met the requirement of age and am capable of acting on behalf of myself as follows:

*Untuk menyertai kajian ini, anda diperlukan menandatangani Borang Izin ini. Saya dengan ini mengesahkan yang saya telah memenuhi syarat umur dan dalam keadaan yang berkeupayaan untuk bertindak untuk diri sendiri dalam perkara-perkara yang berikut:*

1. I understand the nature and scope of the research being undertaken.  
*Saya memahami ciri-ciri dan skop kajian ini.*
  
2. I have read and understood all the terms and conditions of my participation in the research.  
*Saya telah membaca dan memahami semua syarat penyertaan kajian ini.*
  
3. All my questions relating to this research and my participation there in have been answered to my satisfaction.  
*Saya berpuas hati dengan jawapan pada kemusykilan saya tentang kajian ini.*
  
4. I voluntarily agree to take part in this research, to follow the study the study procedures and to provide all necessary information to the investigators as requested.  
*Saya secara sukarela bersetuju menyertai kajian ini dan mengikuti segala atur cara dan memberi maklumat yang diperlukan kepada penyelidik seperti yang dikehendaki.*

\_\_\_\_\_  
Signature

Date:

## Section A : General Information of the Respondent

Instruction: Please tick (√) your choice or provide the relevant information in the corresponding boxes provided.

1. Position in company?

- Project Manager
- Site Engineer / Site Supervisor
- Technical Assistant
- Others : \_\_\_\_\_

2. Number of years of organization has experience in construction?

- 0-5years
- 6-10years
- 11-15years
- >15years

3. How many years of working experience?

- 0-5years
- 6-10years
- 11-15years
- >15years

4. Type of Delivery Method that often being use so far?

- Design-Bid-Build (DBB)
- Design-Build (DB)
- Construction Management
- Others : \_\_\_\_\_

**Section B : Construction Team**

No.	Questions	1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree				
		1	2	3	4	5
1	Team selection plays vital role to the project					
2	Changing orders will delay the completion of the project					
3	Competent and qualified workers improve the quality of project					
4	This project achieve client's needs ( cost, time, quality)					
5	Every construction parties well communicated with each other					
6	Separation between contractors and consultants give benefits of their own responsibilities					
7	Every parties take fully responsibilities for their own work					
8	Information and requirements regarding the project already brief explained					
9	Every parties are experienced enough undergo the selected delivery method's project					
10	Sufficient number of workers					
11	Materials and equipment are available and enough at the site area					
12	Proper planning and scheduling the scope of work plays as important role to prevent delay					

### Section C : Common Issues in Construction Project

Please indicate your opinion based on the question below:

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Categories 1 : Problem in General Aspect						
No.	Problems	1	2	3	4	5
1	Unclear project scope					
2	Misunderstanding among parties / lack of communication					
3	Owner often changing orders					
4	Insufficient workers					
5	Lack of experience of manpower					

Categories 2 : Problem in Quality Aspect						
No.	Problems	1	2	3	4	5
1	Project does not meet client's requirement					
2	Contractor disregards quality of material in the way to making profit					
3	Low productivity level of labour workers					
4	Lack of construction materials and machineries					
5	Number of materials order are not tally with materials on site					
6	Ineffective planning and scheduling of project					

Categories 3 : Problem in Design Aspect						
No.	Problems	1	2	3	4	5
1	Contractor takes control of design more than consultant					
2	Late submission of construction drawing by consultant					
3	Contractor always proceed their works without informing consultant					
4	Discrepancies between Structural, Architectural & M&E in design documents					
5	Client less involve in controlling design					
6	Insufficient information and instruction in the					

project specification, drawing and design					
---	--	--	--	--	--

<b>Categories 4 : Problem in Financial Aspect</b>						
No.	Problems	1	2	3	4	5
1	Contractor has bad financial planning/lack of cash flow					
2	Claims' items submitted by contractor are not clearly stated as in the contract documents					
3	Quantity Surveyor does not estimate work done and material on site correctly					
4	Delay/late in progress payment by client to contractor					
5	Actual cost for project is higher than client's target price					

<b>Categories 5 : Problem in Time Aspect</b>						
No.	Problems	1	2	3	4	5
1	Insufficient time to prepare tender documents					
2	Insufficient time to evaluate tenders					
3	Limited time to establish when using Design and Build contract					
4	Project are commonly finished not according to agreement					
5	Delays happen due to obtain statutory/authorities approvals					