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**A STUDY OF CURRENT DESIGN & BUILD PROCUREMENT APPROACH  
PRACTICE BASED ON THE CLIENT'S SPECIFIC EXPECTATIONS IN  
THE MALAYSIAN CONSTRUCTION INDUSTRY**

**ACADEMIC SESSION: 2009/2010**

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A STUDY OF CURRENT DESIGN & BUILD PROCUREMENT APPROACH  
PRACTICE BASED ON THE CLIENT'S SPECIFIC EXPECTATIONS IN THE  
MALAYSIAN CONSTRUCTION INDUSTRY

MUHAMMAD MUSTAPHA GAMBO

A Thesis submitted in  
Fulfillment of the requirement for the award of the  
Degree of Master of Property and Facilities Management

Faculty of Technology Management, Business and Entrepreneurship  
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JUNE 2011

This thesis has been examined on date \_\_/\_\_/\_\_

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and summaries which have been duly acknowledged

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## DEDICATION

To my late father, Alhaji Gambo Dauda Paiko, May ALLAH (S.W.A) make  
AL JANNAH to be your final abode.



PTTA UTHM  
PERPUSTAKAAN TUNKU TUN AMINAH

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## ABSTRACT

Design and build procurement approach is being considered as one of the innovative procurement approaches that is widely gaining popularity globally. The Malaysian construction industry is not left out in the growing adoption of this procurement approach, this could be attributed to the several advantages that the system offers to construction clients which includes single point responsibility, fixed cost, shortened project duration and risk allocation. However, with all these inherent advantages of the procurement approach, it is yet to be effectively adopted and practiced in the Malaysian construction industry. This study is aimed at appraising the Design & Build (D&B) procurement approach in the Malaysian Construction Industry based on current practice through identifying the impeding and enabling factors to the achievement of the client's specific expectations in order to enable the better practice of D&B procurement approach in the industry. Data was collected from a two round Delphi questionnaire survey which was conducted in Malaysia in order to identify the features that characterize the D&B procurement approach, and also the impeding and enabling factors in the achievement of the client's specific expectations. The key findings in the study showed that the practice of the system in Malaysia is most importantly characterized by the fact that the system is most suitable for projects that are complex in nature. Whilst the impeding and enabling factors in the achievement of the client's specific expectations which are attributed to be client related, contractor related and also external environment related was determined. It is expected that with the consideration of these impeding and enabling factors to the achievement of the client specific expectations, it will consequently result in the enhanced D&B project delivery, the better practice of the procurement approach; and ultimately the overall improvement of the performance of the Malaysian construction industry in relation to D&B projects.

## ABSTRAK

Rekabentuk dan pendekatan perolehan bangunan merupakan salah satu sistem perolehan inovatif yang mendapat sambutan secara global dan meluas. Industri pembinaan Malaysia tidak terkecuali dalam pengembangan pelaksanaan sistem, yang menyumbang kepada beberapa kelebihan yang ditawarkan kepada klien sektor pembinaan termasuk tanggungjawab mutlak, kos tetap, memendekkan tempoh masa projek dan peruntukan dana risiko. Tetapi dengan kelebihan yang terkandung dalam sistem ini, seharusnya diaplikasikan dalam industri pembinaan Malaysia. Kajian ini bermatlamat untuk menilai reka dan bina dalam sistem perolehan industri. Pembinaan Malaysia berasaskan praktis terkini dengan mengenal pasti faktor penghalang dan faktor penggalak kepada kejayaan seperti jangkaan klien. Bagi membantu praktis terbaik dalam sistem perolehan reka bina dalam industri, data dikumpul melalui borang soal selidik menggunakan kaedah Delphi yang diagihkan sebanyak dua kali dijalankan ke atas industri pembinaan di Malaysia dalam mengenalpasti faktor yang menggambarkan sistem perolehan reka bentuk serta faktor penghalang dan penggalak terhadap kejayaan seperti jangkaan klien pembinaan Malaysia. Penemuan-penemuan utama dalam kajian ini menunjukkan bahawa amalan sistem di Malaysia yang paling penting dicirikan oleh hakikat bahawa sistem yang paling sesuai untuk projek-projek yang kompleks dalam alam semula jadi. Manakala faktor-faktor yang menghalang dan membolehkan dalam pencapaian harapan pelanggan tentu yang disebabkan oleh pelanggan yang berkaitan, kontraktor yang berkaitan dan juga persekitaran luar yang berkaitan telah ditentukan. Selain itu, faktor-faktor yang menghalang dan membolehkan pencapaian kehendak tertentu pelanggan terus menduduki tempat dalam perintah itu keutamaan mereka. Diharapkan bahawa dengan pertimbangan ini faktor-faktor yang menghalang dan membolehkan pencapaian yang jangkaan pelanggan tertentu, akibatnya akan menyebabkan peningkatan D & B projek penghantaran, itu amalan yang lebih baik sistem pemerolehan; dan akhirnya yang peningkatan keseluruhan prestasi industri pembinaan Malaysia berhubung dengan projek-projek D & B.



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## LIST OF SYMBOLS AND ABBREVIATIONS

D&B	-	Design and Build
W	-	Summation of the weighing to each success factor
A	-	Highest ranking
N	-	Total number of respondents for that factor



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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background of the study**

The construction industry is a very important aspect of a nation's economy, because it provides the basis through which basic infrastructures such as roads, hospitals, schools and other basic and enhanced facilities could be provided in the society with the sole aim of promoting and sustaining socio-economic growth and development. Construction refers to the processes of building physical structures and related activities. Currently, it is a process which has its end product to be site specific and involves the assembly of various human, financial and material resources over a period of time towards the achievement of a built facility.

The construction industry can be defined as the sector of economy which plans, designs, constructs, alters, maintains repairs and eventually demolishes buildings of all kinds. The various construction jobs often are sub-classified as civil engineering works, structural works, mechanical and electrical engineering, and architectural works.

The construction industry plays a vital role towards the development of Malaysia's economy. The sector is also known to play an important role towards improving the quality of life of the Malaysian citizenry by providing the necessary socio-economic infrastructure. The construction industry is a significant contributor to the Gross Domestic Product (GDP) of Malaysia's economy, as the sector had been

consistently contributing an average of 3.8% over the last thirty years (Construction Industry Development Board, 2010) and also the sector has provided job opportunities for approximately 800,000 people, this is besides the multiplier effect that the sector has to the other sectors such as the financial, manufacturing and professional services (Construction Industry Development Board, 2007). The sector has continued to grow despite the present global economic downturn, where the sector registered a growth of 3.5% in the year 2009, thereby making the sector an important pillar of the Malaysian economy (Construction Industry Development Board, 2007). In the Malaysian construction industry, the private sector is known to be ahead in the total value of projects executed, with the total value of private sector projects in the year 2009 totalling to around RM 29 billion, compared to that of the public sector which totals to around RM 28 billion (Construction Industry Development Board, 2010).

According to Construction Industry Development Board (2010), the activities of the Malaysian construction industry is regulated by the Construction Industry Development Board (CIDB), the board is saddled with the responsibilities of:

- coordinating the needs and wants of the construction industry;
- planning the direction of the construction industry;
- addressing the pertinent issues and problems facing the construction industry;
- making recommendations in the formulation of policies for the construction industry .

In the year 2007, a ten year master plan, Construction Industry Master Plan (CIMP 2006 – 2015) for the Malaysian construction industry was formulated by the CIDB, the master plan is aimed at ensuring that the industry develops into a world class, innovative and knowledgeable global solution provider. Additionally, the master plan is intended to ensure that the industry is in a good position to support the overall growth of the economy, as well as ensure that the industry is abreast with the global standards regarding quality and productivity (CIMP 2006-2015, CIDB).

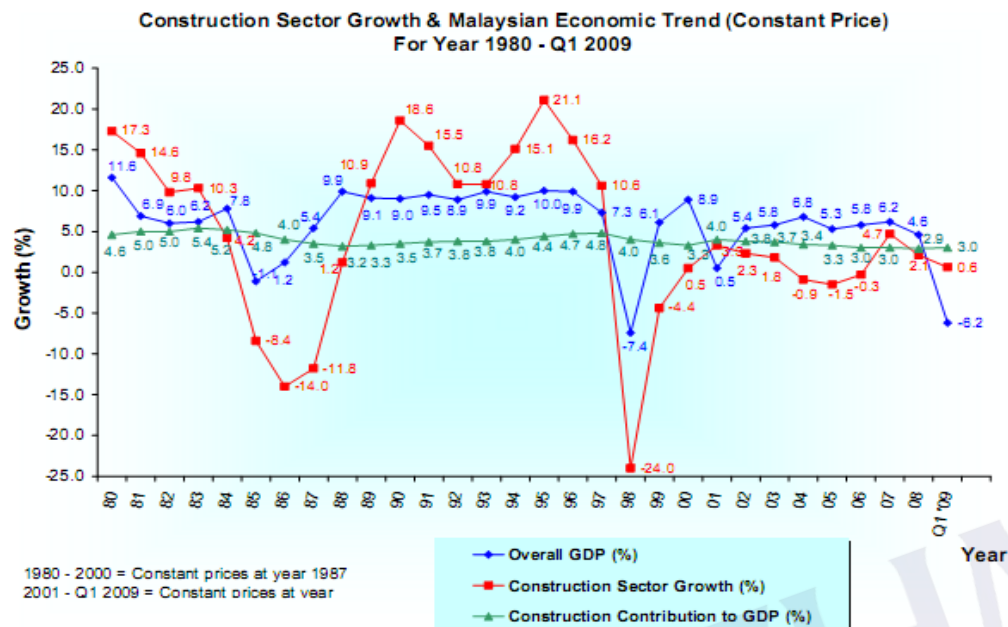


Figure 1.1: The construction sector growth and the Malaysian economic trend for the year 1980 – Q1 2009 (Construction Industry Development Board, 2010).

All construction contracting companies in Malaysia are required to register with CIDB, and they are graded from G1 to G7 in accordance to their financial capabilities, tendering capacities and the availability of human resources.

As of the year 2006, there were 3751 contractors with the highest level grade, which is G7, out of a total of 62,884 contractor organizations that do practice in the Malaysian construction industry (Construction Industry Development Board, 2007).

All construction activities are organized and achieved through a procurement system. It serves as an entry point through which the desire of a client to obtain a constructed facility is achieved. The selection of a procurement system for a construction work is one of the most important decisions that construction clients have to make. This is so because, the system has an overall impact on how the project is to be executed, ranging from the pre-contract work, to the employer's financial and human resources, as well as issues relating to the risk transfer and the allocation of responsibilities under the contract. According to Best & Devalance(2002), building procurement from inception to commissioning is a complex undertaking, bringing together the set of skills and knowledge that are

required for successful completion of building and construction projects. Since the construction procurement determines the overall framework and structure of responsibilities and authorities for participants within the construction process, therefore it is being considered to be a key factor which contributes to the achievement of the overall strategic goals of the client and project success (Ratnasabathy & Rameezdeen, 2007).

There are various forms of building procurement systems which can be adopted for organizing a building project. In construction, as identified by Masterman (2002), building procurement systems are generally categorized into the following: (a) Separated procurement systems; (b) Integrated procurement systems; (c) Management oriented procurement systems; and (d) Discretionary procurement systems.

**1.1.1 Separated procurement systems:** This is also known as the conventional system. This system is characterized with the separation of the design and construction phases of a project. The traditional procurement approach is the basic known type of the separated procurement approach. In this procurement approach, the client first approaches the independent consultants, who produce the outline designs and also prepares the bill of quantities. Tender documents are prepared to enable contractors to tender for the proposed project. Tenders are then submitted by the interested contractors, after which the successful tenderer is made to enter into a contract with the client.

**1.1.2 Integrated procurement systems:** This system involves the integration of the design and construction phases of a project. The design and build procurement approach is the main component of the integrated procurement approach. Design and build (D&B) contracts can be described as a contractual agreement in which the contractor undertakes both to design and to construct a project for a single contract sum. According to Griffith et al.,(2003), the D&B procurement approach is typically described as involving the client entering into an agreement with a party, the principal contractor, who is assigned responsibility for the total project from the initial briefing through to final completion. At the extreme, design and build can

require that the contractor purchase land, obtaining planning permission and consent, finance, design, procure resources and construct. These contracts are known as ‘turnkey’ contracts and derive their name from an employer wanting to have little involvement than simply turning the key to begin the use of the completed project.

**1.1.3 Management oriented procurement systems:** The management oriented procurement approach involves the professionalization of the contractor to the status of consultant, by which he is saddled with the task of managing the activities of the package contractors that are handling the various work sections that make up the whole works. Management contracting, construction management and design & manage are the procurement approaches that are practiced under the management oriented procurement approach.

**1.1.4 Discretionary procurement systems:** The discretionary procurement approach could be described as a framework by which the various procurement approaches can be made use of in order to achieve the client’s specific objectives by imposing the client’s specific management style. These procurement approaches in most situations are not being considered as pure procurement approach as identified in the other forms of procurement approaches, but as a means of controlling and coordinating the project environment in order to achieve the client’s objectives. Examples of procurement approaches that fall under this category include Partnering and the British Property Federation system (BPF).

The D&B procurement approach had been identified to be rapidly growing and patronized in the global construction industry. This is due to the several benefits that the procurement approach provides over the other procurement approaches, most notably the traditional procurement approach, which is characterized by inherent fragmentation which leads to time and cost overruns. D&B procurement approach is different from other procurement approaches; this is due to its advantages of offering single point responsibility, inherent build ability, fixed time and money, and also risk allocation (Gransberg et al., 2006; Seng et al., 2006 and Morledge et al., 2006).

Several authors have attested to the increasing popularity of the D&B procurement approach (Akintoye 1994), (Songer & Molenaar, 1997) and

(Hackett et al., 2007). According to Akintoye (1994), Design and build (D&B) has become a popular mode of procuring construction work. A lot of advantages have been acclaimed for its use even for complex construction work. According to Chan and Yu (2005), D&B procurement approach is one of the new procurement approaches introduced to address the problems associated with the traditional procurement approach; and innovative practices of the D&B procurement approach have been developed to cope with the complexity in both the private and the public sectors. Whilst Hackett et al., (2007) note that D&B has emerged to be the most frequently used procurement approach today, as a recent industry survey for the Royal Institute of Chartered Surveyors noted that approximately 42% of the total value of the projects undertaken was procured as D&B.

In Malaysia, the traditional procurement approach is identified as the most frequently used procurement approach, however, due to the increasing complexity of projects and the growing dissatisfaction of clients towards the use of the conventional procurement approach, D&B is thereby gaining increased popularity and patronage because of the several benefits that the procurement approach provides over the traditional procurement approach (Seng et al., 2006). Although, the last decade has seen most of the construction work implemented using the traditional procurement approach. However in recent years, as projects get more complex, demanding greater emphasis on management techniques and engineering skills, the traditional procurement approach has been found to be unsuitable. It is pointed out by Abdul Rashid (2002), that the lengthy and adversarial nature of the traditional procurement approach and the increase in project complexity has prompted the use of the D&B procurement approach in Malaysia.



## 1.2 Problem Statement

Previous studies by Gransberg et al., (2006), Seng et al., (2006) and Morledge et al., (2006) have identified the various advantages that the D&B procurement approach provides over the other known procurement approaches, which they attribute to the inherent features of the procurement which results in the client benefiting from time and cost savings. However, it is additionally noted by the following researchers that:

- (i) Client's expectations in the procurement approach are not adequately met and also the procurement approach is not practiced the ideal way in the Malaysian construction industry (Abdul Rahman et al., 2006), (Seng et al., 2006), (Isa & Hassan, 2011) and (Hashim et al., 2006) as well as
- (ii) There seems to be no significant growth of the procurement approach in the Malaysian Construction Industry (Abdul Rashid, 2002).

From the above stated facts, it is evident that D&B is not practiced in its pure form as originally intended, client's expectations are not adequately satisfied in the procurement approach and also the procurement approach has failed to be fully utilized in the Malaysian construction industry. Thereby, *there is the need for a study of the current practice of the system based on **achieving the client's expectations**, which is expected to serve as a clear guideline towards the effective practice and utilization of the procurement approach in the Malaysian construction industry.*

Hence, the issues to be addressed in this study include the following:

- *What are the client's expectations regarding D&B procurement approach in the Malaysian construction industry?*
- *What are the factors that are impeding and also enabling the achievement of these client's expectations?*

### **1.3 Aim of the study**

The aim of the study is to do a critical appraisal of the Design&Build (D&B) procurement approach in the Malaysian Construction Industry based on current practice through identifying the impeding and enabling factors to the achievement of the client's specific expectations system in order to enable the better practice of the D&B procurement approach in the Malaysian construction industry.

### **1.4 Objectives of Study**

- i. To identify the key features / characteristics of D&B procurement approach in the Malaysian construction industry.
- ii. To determine the factors impeding the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.
- iii. To determine the factors enabling the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.

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

The Scope of the study is focused on both government and non-government projects in the construction industry and is limited to the D&B procurement approach. The target respondents include both clients and contractors. The research strategy is focused on limiting respondents to major clients and G7 (CIDB classification) class of Malaysian contractors.

Note: Features and characteristics literally means the same, as features means the distinguishing trait or quality; while characteristic means the structure, form, or appearance (Webster's dictionary 2011).

## **1.6 Significance of the study**

The study is expected to be of benefit to the industry because, it identifies the underlying client's expectations in using the D&B procurement approach; as well as the factors that enable and also hinder the D&B contractors from achieving these expectations in the Malaysian construction industry. Hence, the study is expected to enable key project stakeholders to determine how to go about effectively implementing the D&B procurement approach in the Malaysian construction industry.

## **1.7 Organization of the thesis**

The Chapter One gives an outline of the background of the study, the problem statement, the aim and objectives of the study, the scope of the study and lastly significance of the study.

While Chapter Two which is the literature review presented gives an overview of the D&B procurement approach. The literature review is aimed at providing the basis for developing the survey instrument necessary to achieve the objectives of the research.

Chapter Three discusses on the research methodology adopted in order to achieve the aim and objectives of the study. The chapter discusses the research procedure adopted for the study, which includes the primary and secondary data collection and how the data collected was analyzed in order to achieve the research objectives.

Chapter Four discusses the results obtained and the findings arising from the analysis conducted, and finally;

Chapter Five discusses the conclusions arrived and also recommendations with respect to the study.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Historical development and the current status of the D&B procurement approach**

The D&B procurement approach is known to have deep historical roots, dating back to the ancient Mesopotamia periods, wherein the master builders were given the sole responsibility for the overall design, engineering and construction of several ancient monuments and structures. Examples of such structures include the Parthenon in Athens, Gothic Royal Abbey Church of Saint Denis, outside Paris and the dome of the Florence Cathedral (Palaneeswaran & Kumaraswamy, 2000).

According to Beard et al., (2001), as time went on, notably during the Renaissance period of the 15<sup>th</sup> century, rise in professionalism in the building industry gave way to the initial adoption of the separation of design and construction. A new perspective that design and construction should be completed by separate groups, which is now known as the traditional method of construction. Additionally, the period of the industrial revolution, which started in the early 18<sup>th</sup> century, was identified with the advent of mechanization, increased need for productivity and specialization in the construction industry, as well as it made a significant impact towards the separation of design and construction.

This fact was further strengthened by the formation of various professional bodies in the late 18<sup>th</sup> century. Such professional bodies include the Institution of Civil Engineers (ICE), the Royal Institute of British Architecture (RIBA), all in Britain; the American Institute of Architects (AIA) and the American Society of Civil Engineers (ASCE) in the United States of America. All these professional bodies were formed with the sole aim of advancing and standardizing the practice of the professionals of the building industry. Then as time went on, particularly after the Second World War, as building structures started becoming more technologically complex, it became apparent that there was a need for more closer collaboration between the designers, building products manufacturers and vendors, thereby the practice of the separation of design from construction evidently was perceived by major clients as an ineffective method of procuring building projects (Beard et. al., 2001). This fact, together with the open dissatisfaction of clients as regards to the inability of the fragmented building procurement system to provide adequate cost, time and quality control on projects, initially led to the advent of the construction management (CM) approach (Beard et. al., 2001).

The CM model offered building owners additional assurances that the designs developed by their Architects and Engineers were, for the most part, practical and cost effective (Beard et. al., 2001). However, the CM process still lacked the single responsibility advantage that clients were longing for, which is regarded as the distinguishing feature of the design and build procurement approach. This led to the experimentation on the use of D&B for the procurement of projects such as school buildings and military housing in the United States towards the end of the 1960's. The main reason for the adoption of the method was to take advantage of the knowledge and experience of the speculative builders so as to be able to shorten the construction period and also to achieve lower costs.

These projects turned out to be a huge success, which thereby led to the widespread adoption of the design and build for the procurement of both public and private projects, which became evident in the 1980's. This fact is attested by Akintoye (1994, p 157), who stated that: "construction enjoyed a boom in the 1980's due to favourable economic and political conditions that produced incentive and encouragement for private sector investment in construction works. This period

witnessed the urgency of clients for early procurement of their building to secure an economic windfall. Coupled with this, the clients were interested in guaranteed lower construction costs. The attributes of D&B fitted those requirements and awareness of the clients”.

Globally, the D&B procurement approach had been growing from strength to strength, as this was evident in the UK construction industry; between the years 1984 and 1991, the use of the system grew from 5% to 15% of all construction projects. At the end of the 1990's, 25% of all construction projects were executed through the D&B system, and furthermore, these projects are known to cover such areas such as housing, industrial, leisure, health, offices and utilities (Anumba & Evbuoman, 1997; Holt et al., 1996; and Ling & Liu, 2004). In the US, a similar trend took place, as by the mid 1990's; more than one third of all construction projects were executed through the D&B approach (Yates, 1995). It is noted by Puerto et al., (2008), that the continuous growth of the procurement approach is expected to continue in the US construction industry. This situation is quite similar as to what is obtained in other parts of the world, as it was reported that D&B is increasingly being adopted as the procurement approach of choice during the construction boom in the middle east, most notably at the United Arab Emirates of Abu Dhabi and Dubai (Bremer, 2007).

So from the above description of the current global trend of the D&B procurement approach, the increasing popularity of the procurement approach is evident, so thereby it is being expected that with respect to this study; the study would go a long way towards providing more insightful views that would further improve the understanding and also practice of the D&B procurement approach globally and also in the Malaysian construction industry in particular.

## 2.2 D&B procurement approach in the Malaysian construction industry

In the case of the Malaysian construction industry, D&B was firstly introduced by the public works department (PWD) in 1983 for the development of the Kuala Terengganu hospital (Abdulrashid, 2002; Seng & Yusuf, 2006), and since then the public sector had continued to lead the way in the adoption of D&B as the procurement approach of choice in the execution of construction projects in

Malaysia. This fact was attested by Abdurrahman, Rahim & Low (2006), where they described the D&B procurement approach to be growing in prevalence with respect to public works in the Malaysian construction industry, and this increased adoption of the procurement approach could be related to the advantages that the approach offers in terms time and cost savings over the known traditional procurement approach. So therefore, in the light of the above, the PWD had continued to be the party responsible for the management of D&B projects in the country. According to Isa et al., (2011) the role that the PWD plays in the executioning of D&B projects in Malaysia is usually that of implementing the project on behalf of the end user from the project inception to commissioning. And in order to do achieve this objective, the following documents are being adopted (i) DB Condition of Contracts, (ii) Guidelines for Management of Design and Build Projects, and (iii) Guidelines for Project Brief Preparation to outline the framework of the project management process. These documents are being adopted in the executioning of D&B projects in Malaysia in order to ensure that the set conditions of contracts that are related to the system are being effectively adopted and moreover to ensure that the D&B projects executed according to the set quality standards.

But then, even with this known increased adoption of the D&B procurement approach in the industry most especially with respect to the public sector projects because of the known advantages that the offers, the procurement approach is still lagging behind in terms of utilization when compared to the traditional procurement approach, and this low utilization covers all aspect of building works adopted in the industry, where with respect to refurbishment works, Ali et al.,(2009) identified that D&B procurement approach covers a mere 25% of all works, with the traditional procurement approach having the majority share. And also same goes with respect to new projects being executed in the industry, as shown in the table below



Table 2.1: Extent of use of procurement approaches (Abdul Rashid 2002, page 126).

Procurement System	Extent of Use		
	Low	Medium	High
Lump sum – drawings and specifications		√	
Lump sum – firm BOQ's			√
Approximate BOQ's		√	
Design and Build	√		
Cost Plus	√		
Management contracting	√		
Construction management	√		

From the table, it could be noted that the with respect to the Malaysian construction industry, the level of adoption of the D&B procurement approach is considered low in comparison to the various forms of the traditional procurement approach.

And moreover, the current practice of the D&B procurement approach in the industry is faced with many such issues which had continued to impede its development and also the ability of the system to effectively achieve the underlying client's expectations in the procurement approach.

Table 2.2: Procurement approaches and time and cost overruns (Abdul Rashid 2002, page 127).

	<b>Traditional</b>	<b>Design and Build</b>	<b>Management contracting</b>
Time overrun	8%	6%	5%
Cost Overrun	8%	4%	1%

Such issues that do affect the current practice of the D&B procurement approach with respect to achieving the client's expectations in a constructed facility includes time and cost overrun, where in the table above, it was shown that the D&B procurement approach does not seem to achieve a considerable time and cost savings with respect to other procurement approaches. This fact was further attested by Hashim et al., (2006) where they attributed the D&B procurement approach as not being able to utilize the cost advantage that the procurement approach offers because of the variations that are being bought up by the clients during the project execution. Another important issue facing the practice of D&B procurement approach in the Malaysian construction industry is that of achieving the quality objective of the D&B projects. Quality is a very important factor which relevance cannot be negated in any form of a constructed facility, as Arditi and Gunaydin (1997) described quality as meeting the legal, aesthetic and functional requirements of a constructed facility, and moreover the project satisfying the basic client's requirements in terms of completion on time, functionality, ease of operation and maintenance and lastly meeting the basic requirements of the regulatory authorities in terms of public safety and health, environmental considerations and protection of public property including utilities. This situation is same with respect to the Malaysian situation, where Idrus et al., (2011) described construction quality as the most important criteria for evaluating project performance in the Malaysian construction industry. This relevance of quality is also same in a project that is executed through the D&B procurement approach, as

Lee et al., (2009) stated that the single point responsibility advantage of D&B could only be utilized when the completed facility had met the minimum requirements in terms of quality.

But then, unfortunately, with respect to the current practice of the D&B procurement approach in the Malaysian construction industry, quality of the constructed D&B projects had continued to be a major source of concern, as most D&B projects executed are being lacking in terms of quality of the constructed facility. This issue was evident from the range of real life cases of failures of projects completed by the use of the D&B procurement approach, as Hashim et al.,(2006) identified, in the year 2006, the government had to rescind its decision of adopting D&B procurement approach for delivering school projects because of cases of lack of quality of the constructed D&B projects which is as a result of the haphazard manner by which the projects were executed by using inferior building materials and also poor workmanship. This situation became more prominent when in the year 2005, a school laboratory collapsed, which this led to a demand by the public to have a change in the procurement approach adopted for executing such school projects. This situation was also same with respect to the use of D&B procurement approach for delivering hospital projects in the country, so thereby, in view of these situations, the government had to order for the review of the D&B procurement approach adopted for all such schools and hospitals projects, most especially with regards to implementing the 9<sup>th</sup> Malaysian plan (2005-2010) (Isa et al., 2011).

Moreover, besides the inability of the D&B procurement approach to attend to the various client's expectations in terms of cost, time and quality, another important issue that tends to impede the development of the procurement approach is the nature of the management structure of the D&B companies in the Malaysian construction industry, where the fragmented approach is the most dominantly adopted in the industry. In the pilot survey conducted in this research, it was found out that the current practice of the D&B approach in the Malaysian construction industry is characterized by the D&B companies outsourcing consultants to execute their projects,

According to Masterman, (2002), this type of management structure is known as the fragmented D&B, it is characterized by the appointment of external design

consultants by the contractor to carry out the designs of the project. These external consultants are co-ordinated by the in-house project managers who manage their activities in order to ensure that the client's interest in terms of project brief and requirements are met. The reason why this type of management structure is adopted is because the D&B contractor believe that it is more economical for them to engage external design consultants than to have in – house, because in the event where these contractors are not involved in any project, then they do not have to engage the services of the external consultants, since the agreement made between the contractor and the external design consultants is only valid for the execution of a particular project. Masterman, (2002), further stated that such management structure is likely to result in too many problems during project execution, because of the structure's inherent separated feature, which makes the system vulnerable to the problems that are associated with the traditional procurement approach.

So therefore, with the above stated facts related to the current practice of the D&B procurement approach in the Malaysian construction industry, that is regarding the low utilization of the procurement approach, to the inability of the procurement approach to effectively satisfy such critical client's expectations in terms of cost, time and also quality, and then the nature of the management structure of the D&B companies, it could then be clearly realized that the procurement approach is faced with several issues with has continued to impede its growth and utilization in the industry, by which this is what this study is aimed at looking into, by which this is expected to provide the much needed stimulus to revamp the practice of the procurement approach , thereby consequently enabling the better practice of the procurement approach in the Malaysian construction industry.

### 2.3 Design and build project delivery method

Design and build procurement approach (known as design-build in the United States of America) can be considered as a congregation of various procurement approaches which are characterized by their integrated nature. It is a system of building procurement which is characterized by the client entering into a contract with a single contractor who is solely responsible for the design and subsequent construction of a project, whereby the extent of the design carried out by the contractor depends on the variation of the D&B procurement approach used.

Akintoye and Fitzgerald (1995) in their study described D&B as the purchase of a building from a single contractor who is responsible for both design and construction. According to Griffith et al., (2003), they describe D&B approach as a building procurement approach which involves the client entering into an agreement with a party, the principal contractor, who is assigned responsibility for the total project from the initial briefing through to final completion. Whilst for Statham et al., (2007) D&B is a contractual agreement in which the contractor undertakes both to design and to construct a project for a single contract sum. And also, according to Hale and Shrestha (2009 p.579) ‘ ‘ D&B could be described as a project delivery method in which the owner provides requirements for the specified project and awards a contract to one company who will both design and build the project. Therefore, there is only one procurement step to select one entity to complete the project, and one contract between the owner and this entity’ ’.

CIOB (1988) gives a comprehensive definition of the design and build procurement approach which has the client dealing directly with the contractor for the complete building and it is the contractor who is not only responsible for, but also coordinates the separate design and construction processes, including engagement of the design team who are, therefore, contractually linked with the contractor and the client. The construction process, whilst linked, is still separate from the design process, leaving the consultants free to concentrate on their own roles. The client may, however, directly appoint either in-house staff or a separate consultant to check that the

product the contractor is providing is value for money and that content and quality are satisfactory, and also meets his needs and expectations.

As Khalil (2002,p 470) put it, “In D&B, the owner contracts with a single entity design and construction. The approach can eliminate the adversarial relationship in the traditional approach because a single entity is responsible for both design and construction. It can also reduce the overall time of project completion and permits the incorporation of constructability information during design”. Furthermore according to Ratnasabathy and Rameezdeen (2007), D&B is a method of project delivery that facilitates innovative and flexible approaches such as phased construction, improves the ability to manage risk because there is a single point of responsibility, allows managers to take advantage of new materials and new technologies, and encourages the development of development of innovative practices that support energy efficiency and sustainability.

From the above definitions regarding the D&B procurement approach, it can be generally understood that the underlying principle behind the procurement approach is that the client is known to enter into a contract with a D&B contractor who is responsible for the bespoke design and construction of a project. Akintoye (1994) suggests that there are a few variations of D&B procurement approach, which includes the following six:

(a) **Traditional design and build:** This is regarded as the conventional or pure type of design and build procurement approach, where the contractor is totally responsible for the overall design and construction in order to meet the requirements and needs of the client. According to Knight et al., (2002) this type of design and build is characterized by the contractor being involved in the early stages of the project, where the conceptual designs are being made then subsequently proceeding to project execution in accordance to the requirements of the client.

(b) **Package deal:** In this type of D&B, the contractor provides the client with standard or system buildings which are specifically tailored to meet the client’s space and functional requirements. The main idea behind this design and build variant is that it enables the client to purchase a packaged building product which readily satisfies his building needs in a speedy and economical manner.

The majority of package deal contractors, by their virtue of providing packaged buildings, do have their own in-house designers, which enables them to produce the buildings within a shorter time frame. According to Masterman (2002), in buildings that are being produced by the package deal form, some of them do lack aesthetic appeal, but then, this problem can be avoided by the client seeing prototypes of the contractor's product before making a decision.

(c) **Design and manage:** This involves the contractor being responsible for the design and the subsequent supervision of the activities of the various subcontractors who are handling the various work sections that make up the whole works. But then, here unlike in the case of the traditional procurement approach, the contractors are being paid a fee for their management services.

(d) **Design, manage and construct:** This variation of the D&B is similar to the Design and Manage, but only that in this case, the contractor is responsible for designing and managing, in addition to constructing the facility.

(e) **Novation Design and build:** This is that type of design and build where the client initially employs a design consultant, who carries out the initial designs and all the proper documentation up to the extent that the client's needs are being clearly fulfilled, after which, the design consultant is novated (passed on) to the appointed contractor who has the responsibility of executing the project through further design and construction activities.

Neveen and Greenwood (2009) described the novated D&B as a rapidly growing form of D&B procurement approach, by which as at 2004, this variation of the D&B accounts for 25% of the value of all proposed construction projects in the UK. In the novation process of novated design and build, responsibility to the client is being transferred from the design consultant to the appointed contractor, and the novation process usually takes place after the design consultant has carried out the designs to a sufficient clear level that would enable prospective contractors to present a realistic bid for the project (Skitmore & Ng, 2002). It is a type of tri-party agreement between clients, consultants and contractors, which are often structured in such a way that



they will bring an end to existing original terms of engagement between clients and consultants, and create a new form of agreement between consultants and contractors (Abrahams & Farell, 2003).

In the pre-novation stage of a novation design and build, the client enters into a contract with design consultant to carry out the designs of the proposed project to a stage where all the clients requirements are clearly identified, by which the designs range from 30-80% of the overall design requirements, then on the basis of this initial designs and documentation, contractors are invited to tender for the project. In the pre-novation stages of this procurement approach, the contractual agreement between the client and the designers is similar to that in the traditional procurement approach (Ogunlana 1999).

In the pre-novation stage, the client is responsible for paying for the services rendered by the designers. Whilst the post-novation stage of the 'novation design and build' involves the transfer of the designer's rights and responsibilities to the selected contractor, where the designer now is required to produce all the outstanding information (mainly drawings) that is required for the execution of the project. Hence, in the post-novation stage, the contractor now becomes responsible for paying for the services rendered by the designer.

## 2.4 Characteristics of D&B procurement approach

D&B is a procurement approach which is generally characterized by the client entering into a contract with a single organization who has the responsibility for the overall design and construction of a project.

It is a system which is characterized by a wide range of inherent features which makes it distinct from the other known procurement methods. Characteristics of the D&B procurement approach, includes the following:

- (a) **Single point responsibility:** Single point responsibility is being considered as the most distinguishing feature of the D&B procurement approach. The D&B procurement approach involves the client entering into a contract directly with the contractor without any mediating consultant, and the contractual position of the



project lies solely between the client and the contractor (Seng & Yusuf 2006). The origin of the single point responsibility feature of the D&B procurement approach could be traced to the nature of some industries which are characterized by the manufacturer being responsible for providing one stop solution to its clients, ranging from facility design, and equipment selection to the adoption of the most suitable method in order to produce a required product (Beard et al., 2001).

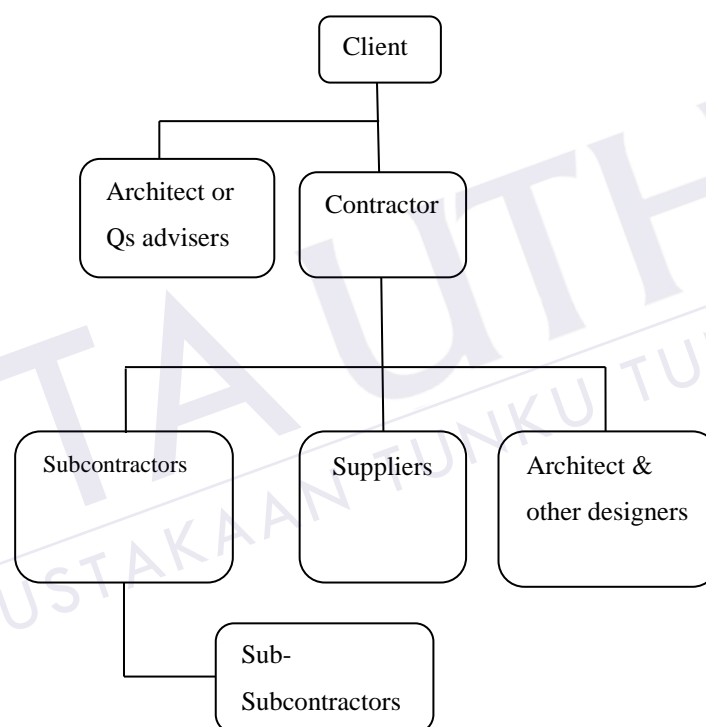


Fig.2.1: Contractual relationship under D&B procurement approach (Morledge et al., 2006 p.118)

The single point responsibility nature of the D&B procurement approach makes the contractor completely liable for the performance of the completed project, even though any such problem or faults that emerge related to the completed project could be caused by the activities of the subcontractors that were involved in the construction process. This could be attributed to the fact that, in the D&B procurement approach, the contractor is known to be liable for all the contractual

obligations and activities of subcontractors and suppliers that are involved in the D&B project.

(b) **Complexity:** The D&B is a procurement approach which is mostly adopted for use in large and complex projects. It is a procurement approach whose growing adoption by clients could be attributed to the lengthy and adversarial nature of the traditional procurement approach and also due to the growing complexity of today's construction projects (Abdul Rashid, 2002; Chan & Yu, 2005). Due to this fact, the system is mostly adopted for use in projects that are complex in nature, which necessitates the greater need for the effective planning of the D&B project from the onset in order to achieve a successful project execution. There is the need for the expert counsel of a consultant who can be in-house or could be outsourced, who is saddled with the responsibility from the project onset of carefully guiding the client towards effectively articulating his needs, to assist the client towards carefully evaluating the various proposals submitted by the bidding D&B contractors, and also to monitor the subsequent design development and the eventual construction of the project (Beard et al., 2001).

(c) **Risk allocation:** Risk has been defined as the probability of occurrence of some uncertain, unpredictable and even undesirable events that could change the prospects for the profitability on a given investment (Hassim et al., 2008). D&B is a building procurement approach which is known to transfer to the contractor risks that are associated to the project more than any other procurement approach (Muhammed, 2005).

The risk allocation nature of the D&B procurement approach could largely be attributed to its single point responsibility nature, where the D&B contractor is required to be in total responsibility of not only the design, but also the construction phases of the contract (Beard et al., 2001).

(d) **Compressed delivery schedule:** The D&B procurement approach is characterized by having a schedule for delivering the construction project in a compressed manner, by which actual construction can be started even before the

project designs are being completed, with this arrangement, the D&B project can be executed within a shorter time frame (Masterman 2002).

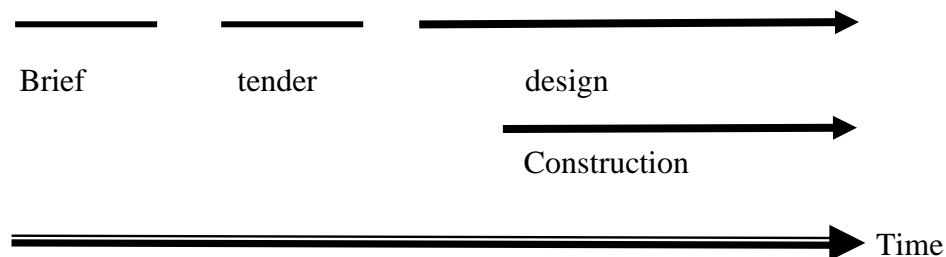


Fig. 2.2: Sequence of operations in D&B procurement approach on a horizontal time axis (adapted from Abdulrashid, 2002 p.123)

The figure above describes the sequence of operation in the D&B procurement approach, where it shows the compressed delivery schedule advantage that the procurement approach offers, whereby the design of the project could be finalized as the actual construction process is in progress. This compressed nature of executing D&B projects enables the project to be started even before certain decisions regarding the final outlook of the project have been made.

This feature of the D&B procurement approach is advantageous to all classes of construction clients. As to the private sector clients, where profit is their main concern; this enables them to have their investment projects to begin generating revenue earlier, thereby increasing the economic viability of the project. While in the case of the public sector clients, this feature is advantageous in ensuring that the public funds that are being allocated for use in executing public projects are being utilized before the period allocated for the use of such funds expires, which is usually the end of the fiscal year (Gransberg et al., 2006).

(e) **Communication:** The D&B is a procurement approach which is regarded to offer seamless communication means between the project parties. Effective communication between project parties is being regarded as the one of the key factors for ensuring successful construction projects (Chan & Scott, 2004).

The D&B procurement approach offers the client and the contractors the opportunity of interacting more often than in the traditional procurement approach which this enables mutual understanding and trust between the project parties, thereby resulting in having less conflicts, misunderstanding and other forms of disputes during the project execution (Seng & Yusuf, 2006). In D&B projects, as the design documents are known to be preliminary at the early stages of the project, so therefore, the close communication pattern that is inherent in the system enables the development of an effective strategy by which variations and claims can be effectively processed as the project is being executed, thereby ensuring the effective achievement of the overall project objectives (Xia & Chan, 2010).

With respect to this study, it is aimed at looking into these features/characteristics of the D&B procurement approach with respect to the Malaysian construction industry as it affects the practitioners in adopting the D&B as a procurement approach of choice for the execution of building projects.



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Table 2.3: Summary of Features/characteristics of D&B procurement approach from previous literature

Features/ Characteristics of D&B procurement approach	Related previous studies								Frequency of features appeared in previous studies
	Seng & Yusuf (2006)	Beard et al., (2001)	Abdul Rashid (2002)	Masterm an (2002)	Muhammad (2005)	Chan & Yu (2005)	Xia & Chan, (2010)	Lam et al., (2004)	
Single point responsibility	√	√							2/8
Compressed delivery schedule			√	√					2/8
Risk allocation		√			√				2/8
Complexity			√			√		√	3/8
Communication	√						√	√	3/8

## 2.5 Clients expectations for using D&B procurement approach

The following are the expectations that clients seek to achieve in the D&B procurement approach:

- a) **Established cost:** According to Songer and Molenaar (1997), clients do select D&B as their procurement approach of choice because it enables them to secure a fixed construction cost. This could be achieved as a result of the single point responsibility nature of the procurement approach, where a single entity is known to be responsible for the overall design, scope and the budget for the project.

The D&B procurement approach is amenable to the stipulation of a maximum guaranteed price, so therefore, for a client who has a great concern regarding the costs for construction projects, the D&B provides a better alternative to the traditional procurement approach (Ndekugri & Turner 1994). However, as Songer and Molenaar (1997) identified, for this expectation to be achieved, there is the need for the client to be able to have a clear and well - defined scope from the project inception, thereby negating any possibility of him coming up with any scope related changes as the project is being executed.

Additionally, as noted by Seng and Yusuf (2006), having good relationship and mutual understanding between the project participants most especially between the designers and contractors reduces the possibility of having liability issues which could result in increased project cost.

(b) **Reduced cost:** D&B procurement approach offers construction clients reduced costs as compared to other procurement approaches. This advantage that the procurement approach offers could be attributed to its inherent feature of having reduced project duration and the utilization of the contractor's construction abilities during the project designs (Gransberg et al., 2006). According to Akintoye (1992), the cost advantage that the D&B procurement approach offers could be attributed to the contractor's up-to-date access to the procurement market via the contractor's organization, so better opportunities exist to examine the cost implication of design options. Gransberg et al., (2006) note that D&B procurement approach is known to offer clients the opportunity of having their projects completed within budget and also cheaper than the traditional procurement approach. The D&B contractor has the opportunity of having up to date information regarding the happenings and activities of the construction industry. This gives him an edge in providing clients with cost effective solutions to their construction needs. However, it is worthy of note that the cost advantage that the D&B procurement approach offers largely depends on the extent of designs provided by the client, where the unit cost of the project is likely to be higher in such situation where the client provides more designs, this is so because the client might not propose the design that offers the most economical solution, but one that meets the client's functional needs best.

The financial capability of the contractor plays a role in determining the likely cost of a project, as there is the greater possibility for the project cost to be higher in such case where the D&B contractor has a weak financial base. This is so because it has been realized that contractors with weak financial capabilities are often less able to control costs, as they would have to channel their limited funds for use into other activities (Ling et al., 2004).

(c) **Established schedule:** D&B procurement approach enables the securing of an established schedule for the project from the onset, thereby giving the client a firm idea of the possible time when the project is to be completed. Gransberg et al., (2006) note that this is made possible as a result of the one stop responsibility feature of the procurement approach, where the contractor is known to be in total control of both the design and construction phases of the project. This feature prevents the occurrence of schedule growth which comes up as a result of communication problems that could exist between the designers and the contractors, such as design errors and design omissions, thereby ensuring the prompt delivery of the project in accordance to the project schedule.

(d) **Shorten duration:** According to Levy (2006), D&B offers clients the opportunity of having their construction projects completed in a faster pace than in the traditional procurement approach. Whilst Gransberg et.al, (2006) note that D&B is a procurement approach which greatly promotes schedule reduction for construction projects. By the adoption of D&B, projects can be completed earlier than in other procurement approaches. Having all other variables constant, the construction speed and also the overall project delivery speed (this includes both the design and construction) of D&B projects is much more than that of the traditional approaches.

Ndekugri and Turner (1994) attributed the time advantage that the D&B offers to firstly, the appointment of subcontractors and construction that can overlap with design; and secondly, during the process of drawing up of the specifications for the project, the contractor has a superior knowledge of the current situation in the industry regarding the lead times of the key items of materials, thereby enabling him



to organize his activities in such a way that delays could be avoided in the procurement of such materials.

Additionally, Akintoye (1995) attributed the time saving associated with the D&B procurement approach to its compressed delivery nature, where the design and construction phases of the project are being overlapped. Additionally, the speeding up of decision making between the project participants, and lastly, the greater empowerment that the contractor has in dealing with the professionals involved in the project, enables him to interact with them in the most professional and effective way, ensures that the set objectives regarding the project are met within a shorter project duration.

(e) **Reduced claims:** The D&B procurement approach offers the client an advantage of having fewer possibilities of disputes that could result in litigation and other dispute resolution techniques. But this advantage of the system largely goes down to the extent of the clarity of the clients brief and the contractor's proposals, and the avoidance of the initiation of variations orders during the project execution (Ndekugri & Turner, 1994).

(f) **Quality:** Quality in any type of construction project is considered to be a very important factor, due to its overwhelming effect towards enabling the end user to satisfy his needs with regards to the constructed facility. As defined by Arditi and Gunaydin (1997), quality is described as meeting the legal, aesthetic and functional requirement of a project; this clearly identifies the expectation of the client to have a construction project that satisfies his quality requirements. Quality could be described as the fulfilment of expectations (i.e. the satisfaction) of the project participants (Memon et al., 2011). As Xiao (2002 p.673) put it, 'client's long term interests lies in the quality of their projects, the work performed must conform to the specifications established for the project. Low cost and speedy construction should not be achieved at the expense of the quality of the project. In fact, poor quality performance results in rework, which has significant cost and schedule implications.'



But then however, the perceived quality objectives in a project cannot be achieved unless all the parties to the project do work hand in hand in carrying out their respective responsibilities in the project. This is by the contractor adopting measures as ensuring the use of qualitative building materials, adoption of quality management processes and also employment of effective supervisors and managers that are saddled with the responsibility of ensuring the strict adherence to the quality principles. Whilst the clients do have the responsibility of the appointment of capable client representatives whose sole responsibility is to ensure that the prescribed quality function in the project is being achieved (Ling & Poh, 2008), (Cronin & Taylor, 1992).

According to Abdul Rahman et al., (2006), this requirement is also same for an innovative procurement approach like the D&B, as the effect of poor quality of a constructed D&B project would go a long way in negating the basic objective that the system tends to portends, which is the “one stop shop” solution to the client’s need for a built facility.

As described by Arditi and Gunaydin (1997), quality in a constructed facility can be viewed in different aspects. It can be viewed from the designers perspective, where they believe quality is being measured by the aesthetics of the buildings that they design; and also quality can be viewed on the aspect of the perceived function, that is regarding how the built facility is able to conform to its requirements. But then, in the generalized approach, as Fergusson and Clayton (1988) described, quality is described as meeting the owner requirements as regards to meeting functional needs, completion within the stipulated time and also budget, and also meeting the project objective with regard to life cycle cost, operation, running and maintenance costs. It means meeting the design professionals need towards achieving a well-defined scope of work, meeting the requirements of the contractor with regards to complying with the plans, drawings and other specifications as contained in the contract documents and then finally meeting the requirements of the regulatory authorities with regards to achieving safety, health and environment objectives of the constructed facility. Regarding this study, as previous literature such as (Abdul Rahman et al., 2006), (Seng et al., 2006), (Isa & Hassan, 2011) and (Hashim et al., 2006) has shown that with respect to the practice of the D&B

procurement approach in the Malaysian construction industry, the client expectations with regards to the system are not adequately met, so thereby the study is expected to look into the impeding and also enabling factors to the achievement of these expectations, which thereby consequently will result to the better practice of the procurement approach in the industry and also the overall improvement of the Malaysian construction industry.

Table 2.4: Summary of Client's expectations in D&B procurement approach from previous literature

<b>Client's expectations</b>	<b>Related previous studies</b>						<b>Frequency of features appeared in previous studies</b>
	Songer & Molenaar (1997)	Gransberg et al., (2006)	Levy (2006)	Ndekugri & Turner (1994)	Akintoye (1995)	Ling & Poh, (2008)	
Established cost	√						1/6
Reduced cost		√					1/6
Established schedule		√					1/6
Shorten duration		√	√	√	√		4/6
Reduced claims				√			1/6
Quality						√	1/6

Table 2.5: Summary of Impeding factors to the achievement of client specific expectations from previous literature

<b>Client Specific Expectation</b>	<b>Impeding Factor</b>	<b>Author</b>
Established cost	Excessive changes requested by client.	Songer & Molenaar (1997)
Reduced cost	High cost of the bidding process	Palaneeswaran & Kumaraswamy (2000)
Established schedule	Scope of works is uncertain	Ling & Poh (2008)
Shorten duration	Delays in commencing work because of the time needed to obtain statutory approvals	Ling & Poh (2008)
Reduced claims	Initiation of variations	Ndekugri & Turner(1994)
Quality	Clients unsure of the extent they should monitor contractors as the design and construction is by the same party.	Ling & Poh (2008)

Table 2.6: Summary of enabling factors to the achievement of client specific expectations from previous literature

<b>Client Expectation</b>	<b>Enabling Factor</b>	<b>Author</b>
Established cost	Client's clear and well defined scope from the project inception.	Songer & Molenaar (1997)
Reduced cost	Contractor's up-to-date access to the procurement market via the contractor's organization, which enables him to effectively examine the cost implication of design options.	Akintoye (1992) and Ndekugri & Turner (1994)
Established schedule	Client's clear and well defined project scope.	Songer & Molenaar (1997)
Shorten duration	Client's urgency to have the project completed in a shorter time frame.	Gransberg et al., (2006)
Reduced claims	Clarity of the clients brief	Ndekugri & Turner(1994)
Quality	Contractors practice of providing training for workers on specific quality issues based on input from in house design team coordination with onsite construction team.	Arditi & Gunaydin (1997)

## **2.6 Management of D&B procurement approach**

This section includes a discussion of the aspects that relates to the management of the D&B project, which all these aspects do play an important role in achieving an effective and successful D&B project. In order to discuss the management of a D&B project, there is the need to firstly provide some background knowledge and issues regarding the relevant main parties that are involved construction projects that are related to this study.

### **2.6.1 Construction client**

Masterman (2002), described a construction client as “the organization or individual who commissions the activities necessary to implement and complete a project in order to satisfy its/his needs and then enters into a contract with the commissioned parties”. All construction projects are being initiated by clients, with the sole aim of solving their needs as regards to having a built facility.

In relation to construction projects, clients cannot be considered to be homogenous in nature, as different clients require discrete solution to their construction needs.

According to Masterman (2002), clients can be classified as experienced and inexperienced.

An experienced client can be regarded as one:

- Who is known to have a detailed knowledge and understanding of the construction industry and its procedures;
- Knows the importance of producing a concise project brief from the project inception which incorporates his time, cost, quality and functionality requirements regarding the project, and also possess the ability to produce such brief without any assistance;

- Has an experience in the management of the activities that are associated to the construction project, and also the activities of the consultant and contractors that are involved in the projects;
- Has the desire and intention to be continuously involved throughout the project duration, without causing any detriment to the rights, obligations and duties of the consultants and contractors that are involved in the project;

While an inexperienced client can be described as one who:

- Lacks the basic knowledge of the operation of the construction industry, and also the management of construction projects, other than minor maintenance works;
- Lacks the experience of the management of the activities of the consultants and contractors that are involved in the construction projects;
- Lacks the ability to produce a project brief from the project inception and also the inability to produce such brief on his own, unless he is assisted by an external consultant;
- Has the tendency to initiate changes to the project scope during the execution of the project without knowing the financial implications of such action;
- Lacks the desire to be fully involved throughout the execution of the projects, but prefers only on part time or random basis.

Furthermore, Hashim et al.,(2006) categorized construction clients into public clients and private clients.

This categorization has more to do with the manner of funding and the ownership status of the project, where the public client basically consists of the government funded development agencies and local authorities. Projects funded by such clients are basically regarded as public projects, and these projects are known to be funded by the taxpayer's money. These projects are usually executed under close scrutiny from the public authorities in order to ensure the proper accountability of the

public funds. While private clients can be regarded as those set of clients who use other sources of funds other than the public funds in order to execute the projects. Projects that are executed by the private clients can be funded through the financial institutions such as banks and also could be from the client's own finances. These categories of projects are generally executed with the sole intention of maximizing profits, thereby these are projects which are known to involve the taking of risks by the clients in order to achieve the desired goals.

Franks (1998) identified that clients, no matter what category they belong to usually have the following underlying expectations regarding a construction project:

- The project provides the client value for his money;
- It has aesthetic appeal;
- The completed project is free from defects;
- The project is being delivered on time;
- The project is fit for the purpose it is intended for;
- The project has reasonable running costs;
- and lastly,
- The project possesses the required durability to stand the test of time.

In any construction project, the general needs that the client has as regards to the project does not surpass those identified above, but then, there could be some variation from one set of clients to another, based on the individual needs of the client.

A client who adopts the D&B procurement approach plays an important role in ensuring a successful D&B project, as identified by Lam et al., (2004). It is noted by them that the overall contribution that the client offers is necessary towards ensuring that the D&B project becomes a successful one. According to Ling and Poh (2008), D&B as a procurement approach is considered to be more technically demanding and sophisticated to manage for the client than in the case of the traditional procurement approach, especially in the case of clients that are inexperienced regarding the use of

the system. Therefore, there is the need for the client to engage the services of a project manager who can assist the client during the D&B project execution phase. This project manager could work either as an in-house employee or as an external consultant engaged in the D&B project. Ling & Poh, (2008) further attested the importance of engaging the services of such project managers, as they identified that the cost advantage that would be achieved as a result of having a well-designed and managed D&B project through engaging of the services of a project manager clearly outweighs the cost involved in employing the services of such project manager.

### **2.6.2 D&B client's project manager**

A project manager is considered as a client's representative, who is saddled with the task of carrying out certain duties on behalf of the client which includes the studying of the project feasibility, obtaining consent from the various regulatory and planning authorities, drawing up of the formal brief which clearly identifies the client's needs and requirements regarding the project, preparing the concept design and outline specification, and later on, administering the execution of the project (Ndekugri & Turner 1994).

Beard et al., (2001) described the project manager as the party whose overall responsibility regarding a project is that of ensuring the meeting of the client's identified objectives. He is responsible for adopting the most appropriate method of selecting the contractor to execute the project, responsible for communicating with the design and construction entities on the function, budget, schedule, and scope aspects of the project objectives; then as the project is being executed, he is responsible for keeping the client up to date regarding the progress of the project. Then in instances where the budgets, schedules or the desired functions are being compromised, then the project manager has the further responsibility to take the relevant measures required in order to ensure that the project does not deviate from the original set plans and standards (Beard et al., 2001). The project manager is the party responsible for developing the client's requirements by clearly formulating the client's intentions as regards to the project, he always works towards ensuring the



integration of specialized knowledge in order to enable the achievement of project success; and then, the project manager, who is required to possess a sufficient knowledge of D&B documentation and dissemination, is also responsible for administration of the D&B project (Lam et al., 2004),(Peterson & Murphree, 2004).

### 2.6.3 Features of a D&B client

A D&B client is required to possess certain qualities in order to ensure the achievement of an effective D&B project. Some of these required qualities as identified by previous research include the following:

Chan et al (2001) identified the desired features of a D&B client as:

- having a precise and clear understanding of the project scope before contractors are being invited to tender;
- possess the capability to effectively manage the D&B project from inception to completion;
- able to clearly articulate the end user's needs regarding the project.

While Songer and Molenaar, (1997) went on to identify the features of a D&B client that contributes towards achieving successful D&B projects as follows:

- have a clear understanding of the project scope;
- have the ability to precisely define the project scope;
- have the necessary and adequate staff that are dedicated to the execution of the D&B project.

Whilst Ling and Liu, (2004) identified the key features of a D&B client as one who:

- has a prior experience of the use of D&B system as a project delivery system;
- has a prior experience of administering similar projects;

- possesses capable and competent staff that would attend to the contractor during the project execution.

Lam et al., (2008) described the desired competencies of the D&B client or his project manager as:

- possessing effective project management skills;
- has the ability to be actively involved throughout the entire execution of the project;
- possessing of effective decision making capabilities.

Lastly Xia and Chan (2010) suggested that a D&B client should be a client who:

- has a clear understanding of the project scope;
- has previous experience of the use of D&B as a project delivery method;
- has strong financial capability;
- possesses the requisite knowledge required to effectively manage the D&B contract;
- has effective and sufficient staff resources for the effective execution of the D&B project.

From the above identified desired features of a D&B client, based on literature review, it is understood that the client's ability to clearly understand and describe the project scope from inception as being the most consistent and important required feature of the D&B client, this is so because this feature is considered as the basic requirement for the successful execution of the D&B project. It is only after the client has been able to clearly understand his requirement as regard to the project that the other parties could be able to have a clear understanding of their expectations regarding the project.

Other important desired client features that have been identified from literature is the client having adequate and effective staffing to ensure the effective

execution of the D&B project (Songer & Molenaar, 1997; Xia & Chan 2010); this is so because these staff do play an important role right from the project onset. At the early stages of the D&B project, these project staff have the responsibility of working together with the client towards fully defining the project objectives and also to prepare all the modalities required for inviting interested contractors to bid for the project. Then as the project is being executed, the responsibilities of these staff should be more of attending to the various design and construction related questions and enquiries that would be needed to be clarified by the contractors and designers. In any such case where these staff are not available to the client on an in-house basis, then they can be outsourced, where capable and qualified personnel should be engaged in order to assist the client in the management of the D&B project.

Another important desired client's feature is that of the client's previous experience of the use of D&B procurement approach for project delivery. This is because with the client having prior experience of using D&B as a project delivery approach, then such client stands a better chance of managing any such D&B project at hand with more ease and expertise. According to Lam et al., (2008), this could be attributed to the fact that the client already has an idea of his expected role and responsibilities regarding the project execution, which thereby makes the entire management of the project more easier and effective for the client himself and also for all the other parties involved. Other desired client features identified includes the client possessing effective project management skills, strong client's financial capability and then the client's and end user's active involvement in the D&B project execution (Lam et al., 2008). With the client possessing effective project management skills, then the task of planning and co-ordination during the project execution could be much easier and effective, and also, as financial issues in any type of project is known to be a very important matter, then, the client having a strong financial capacity would surely go a long way in ensuring that all financial obligations regarding the D&B project are effectively met. Lastly, the client and end user's active involvement in the D&B project execution would go a long way in effectively sorting out their respective needs, requirements and expectations regarding the project, thereby resulting in achieving a building project which would effectively serve the purpose that it is intended to do.

Hence, based on literature review the above identified features related to a D&B client, if carefully considered and attained as regards to a D&B project, is supposed to surely go a long in ensuring the achievement of an effective and successful project that is executed by the D&B approach of project delivery. However, this has not been the case, as it has been noted that from previous studies Abdul Rahman et al., (2006), Seng et al.,(2006), Hashim et al., (2006) and Isa et al., (2011) that the established attempts to ensure client's requirements are met does not seem to have been hugely successful. This research is an attempt to verify the established knowledge regarding the current D&B practice, as well as to determine the key enabling and hindering (impeding) factors in achieving client's specific expectations through the use of the D&B procurement approach and address the challenge of meeting client's expectations.

#### **2.6.4 D&B contractor**

The D&B contractor is that party in the D&B project delivery approach that has entered into a contract with the client to design and then eventually construct the proposed built facility according to the requirements and specifications of the client. The D&B contractor organization can be in the form of an individual, a joint venture, a single firm or a corporation. According to Beard & Loulakis (2001), the D&B contractor organization is a combination of design professionals who are vested with the responsibility of carrying out the design requirements of the project and also the constructor, whose main task is that of translating the designs made by the design professionals into a project reality.

### 2.6.5 Features of a D&B contractor

The D&B contractor plays an important role towards the effective execution of a D&B project. This could be related to the fact that the contractor is the party who is vested with the responsibility of achieving the set objectives of the project. The D&B contractor is expected to possess certain qualities and features which would enable him to effectively carry out all the responsibilities that are vested upon him. Among these features, as identified by Lam et al.,(2008) include:

- possessing effective project management skills;
- possessing adequate technical skills;
- should have requisite experience of handling similar D&B projects;
- is fully committed towards the achievement of the overall objectives of the project.

Lastly, for the construction team leader of the D&B company to be able to carry out his duties effectively, he should have the overwhelming support of the parent organization towards the realization of the set project goals.

Ling and Liu (2004) have further identified other desired features that a D&B contractor is required to possess for the successful execution of D&B projects, they include:

- D&B contractor having good financial management capabilities;
- D&B contractor should earn himself a good reputation of being able to execute projects on schedule and on budget;
- D&B contractor organization should be one that has adequate and competent staff that would ensure the execution of the D&B project in accordance to the set standards, and lastly;
- the D&B contractor is required to have good quality control capabilities, this is necessary in order to ensure that the quality aspect of the project is not being negated.

Since the D&B contractor is also responsible for the design of the facility, Muhammad (2005) has additionally identified a desired feature that a designer who is part of a D&B organization is expected to possess. He is required to exercise reasonable skill and care in the conduct of his design activities, this is so in order to ensure that effective designs are being produced which would thereby enable the contractor to execute a D&B project that clearly serves its intended purpose and also of high quality standard.

Lastly, Ling (2002) described the features of the D&B contractor with respect to his roles in the D&B project as having the capacity to carry out the following activities, which these includes;

- Contractors submit bids and proposals in the bidding and contracting stage;

Then in the project implementation stage, achieving the following expected roles, which are:

- The contractors developing the detailed design;
- contractors proceeding with construction and commissioning;

And also additionally,

- training operators and other skilled personnel involved in the project

In view of all the above identified features of the D&B contractor, Ling and Liu (2004) noted that these identified features are very important towards ensuring the effective execution of a D&B project, and it is expected that any D&B contractor organization that possesses such features is very likely to be able to execute a D&B project that is of high quality and performance. Hence, the implication is that D&B contractors, who handle literally all the risks associated with a project, are lacking in some aspects of the above mentioned features that has resulted in their rather inconsistent performance, especially in reference to the Malaysian Construction Industry. This research aims to review these key features (characteristics) and verify their significance in the delivery of successful projects. Further to this, by establishing the enabling and impeding factors for achieving

client's specific expectations, this research attempts to be of significance in the successful delivery of D&B projects by emphasising on providing knowledge and understanding regarding the relevant issues related specifically to contractors.

## **2.7 Tendering methods in D&B procurement approach**

In the context of construction activities, procurement is described as the process which the client or his representative takes in order to engage the services and commodities that are required for the execution of a construction project under the chosen project delivery method (Beard et al., 2001). Contractor procurement or selection is regarded as a very important component of project execution, once a client has clearly identified his needs and requirements that he has regarding a project, then selecting the contractor who is to be responsible for executing the project is the next duty that comes into line.

Palaneeswaran and Kumaraswamy (2000) stressed on the relevance of selecting a suitable contractor for achieving successful projects. They identified that the selection of a contractor is a very important task in any construction project, and the success of these projects largely depend on selecting the most suitable and qualified contractor to execute such projects. This fact is further attested by El Wardani et al., (2006) and Kashiwagi & Byfield (2002); they all attribute project performance as being crucially dependent on selecting the most suitable contractor to execute a construction project.

Ascot (1979) and El- Sawalhi et al.,(2007) pointed out that the inability of the clients to achieve the best value for their money in construction projects is as a result of their shortcomings in selecting the most suitable contractors or the methods adopted in selecting them, which thereby stresses the need to adopt the most effective methods in order to select the most qualified contractor to execute these construction projects as the selection of a qualified contractor gives confidence to the client that the selected contractor can achieve the project goals.



In the case of D&B procurement approach, contractor selection is being regarded as a process whose relevance is even more critical than in the other procurement approaches. This fact could be attributed to the one stop shop nature of the system, where one organization is responsible not only for the design, but also the construction phases of the contract. According to El Wardani et al., (2006), proper care should be put into place when selecting a contractor for a D&B project, as selecting an unqualified and unsuitable contractor could lead to having poor project performance and unsatisfied owner's expectations.

It is noted by Palaneeswaran & Kumaraswamy (2001) that due to the inherent nature of the D&B procurement approach, which assigns more responsibilities to the contractor, it results in the reduced scrutinization of the contractor's activities. This then necessitates the need to ensure that only the most qualified and suitable contractor is to be engaged in the D&B contract. And as Paek et al., (1992) identified, as the processes adopted in the selection of the suitable D&B contractor has been evolving with time, as this is necessary in order to meet up with the changing needs and wants of clients, so thereby an in-depth description into the tendering and contractor selection processes adopted in D&B procurement approach cannot be overemphasized, as this plays a major role towards the overall effective delivery of D&B projects.

### **2.7.1 Contractor selection processes under D&B**

Previous researches such as Ling & Poh, (2008), Gransberg et al., (2006), Songer & Molenaar (1997), Molenaar et al., (1999) and Palaneeswaran & Kumaraswamy (2000) have identified the various processes involved in the contractor selection processes of D&B procured projects. It includes the prequalification of contractors, which is the streamlining of the potential contracting firms in order to ensure competitive selection process, then the obtaining of the Request for qualification (RFQ) or Request for proposal (RFP) and then the main selection processes. These processes are described below:



### **2.7.1.1 Request for Proposals (RFP) or Request for Qualifications (RFQ)**

Preparing a RFP/RFQ is the first process involved towards engaging a contractor once a client decides to adopt D&B procurement approach in order to deliver a construction project. A RFP/RFQ is a document which clearly describes the client's needs as regards to the project. The RFP/RFQ also describes how certain critical issues are to be handled in the D&B project, such as the issues of risk allocation and the requirements for creativity and innovation from the contractors. The RFP also describes the contractor selection criterion that is to be adopted (Ling & Poh, 2008). According to Gransberg et al., (2006), the RFP/RFQ is described as the heart and soul of D&B contracting, it is a document which clearly describes the client's intentions regarding the project, and also describes how matters relating to the D&B project execution are to be handled. The RFP/RFQ is a very important document because it sets the stage for the relationship that would evolve between the client and the contracting organization during the execution of the project. The RFP/RFQ document is a clear reflection of the client's knowledge and experience of the D&B project delivery, therefore there is the need for the document to be prepared by an experienced client; or in such case where the client is inexperienced, then he should endeavour to engage the services of a project manager to assist him in the RFP/RFQ preparation (Ling & Poh, 2008), (Topeu, 2004). By doing this, the contracting organizations would be more interested to bid for the project because they believe that they would be dealing with a client organization that has a good understanding of the D&B procurement approach, which this would surely help towards a successful project execution.

According to Gransberg et al., (2006), the RFP/RFQ is prepared to achieve the following objectives:

- 1) To describe clearly the project's scope of work.
- 2) To define the operational and quality requirements of the project.

- 3) To describe in clear and unambiguous terms, the method to be adopted for evaluating the various design solutions to be offered in order to achieve the operational and quality requirements of the project.

As described by Gransberg et al., (2007) in the RFP for D&B projects, the factors that are being given highest consideration are the factors that have to do with the project schedule, followed by those related to the project cost and then lastly those factors that are associated with the technical design approach with regards to the proposed D&B project. It should be noted that due to the fact that the cost of preparing a D&B proposal is much more higher than that in the conventional construction project because of the fact that elements of design will have to be completed as a part of the bidding process, so therefore it is recommended that the basic project information for design be provided by the client so that each bidder does not have to duplicate such effort. This information needed to be provided among other things includes preliminary geotechnical investigations, initial surveys, permitting studies and other similar activities (Fredrickson, 1998).

RFP's which are prepared by the client with the assistance of his in-house or outsourced project managers clearly states out and defines the scope of work of the proposed D&B project. Hence, this is considered as another factor that enables the achievement of successful D&B projects. The RFP/RFQ also describes in detail the operational and quality requirements for every major aspect of the project, and also the methods to be adopted in evaluating the bids to be submitted by the interested contractors. It is important that the client and user's expectations regarding the completed built facility are also clearly spelt out in the RFP, so that interested contractors would have a clear understanding of what is expected of them in the project (Songer & Molenaar 1997).

#### **2.7.1.2 Prequalification**

Once a RFP has been prepared, then contractor prequalification is the next stage involved in the contractor selection processes of D&B.

According to Molenaar et al., (1999), contractor prequalification is a means of streamlining the list of prospective bidders for a project. The main aim of the prequalification process is to reduce the list of the prospective bidders to the possible minimum, thereby increasing competition among the contractors that are interested in the project. Palaneeswaran & Kumaraswamy (2000) note that contractor prequalification processes aims to identify competent contractors who are interested in submitting bids for a proposed project; the process involves the evaluation of the financial and management capabilities of the prospective contractors, their equipment and human resources, and also their previous track record in handling projects. Fig 2.4 below gives a diagrammatic description of the contractor selection process, where the interested contractors are initially prequalified and then subsequently made to undergo the bidding process where the most qualified contractor is selected and then appointed to execute the proposed construction project.

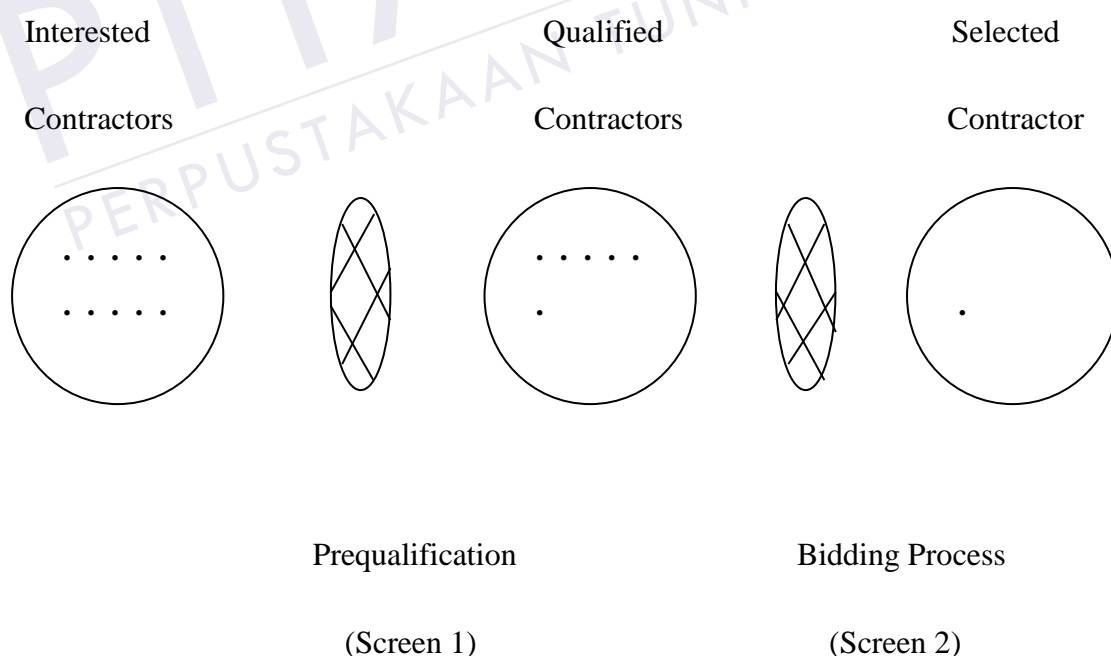


Fig 2.3: Contractor Prequalification Process (Russell, 1996 p.34)

Due to the nature of the D&B procurement approach, where both the design and construction aspects of the project are being handled by one organization, therefore the prequalification processes also involves the review of the qualification and experience of the design and supervision consultants that are being proposed by the bidding D&B contractors. This is in order to ensure that only capable and reputable D&B teams are being engaged for the proposed project (Al Rashid & Kartam,2005). According to Palaneeswaran & Kumaraswamy (2000) due to the high costs involved in bid preparation and evaluation in D&B project delivery approach, the number of prequalified contractors are being limited to between three to five contractors. This also enables a more stringent scrutinization of the bidding D&B contractors.

Contractors can be prequalified based on projects that are being proposed at hand or on a periodical time frame, which is usually annually. In the periodical prequalification, the clients basically carry out the prequalification and then maintain a list of the prequalified contractors, whereby whenever projects are being proposed, only the prequalified contractors are invited to tender (Palaneeswaran & Kumaraswamy 2000).

Figure 2.5 outlines the business criteria to be used in evaluating the contractors to be prequalified, which includes issues relating to their financial capability, professional practice registration status and also the performance element of the D&B contractor.



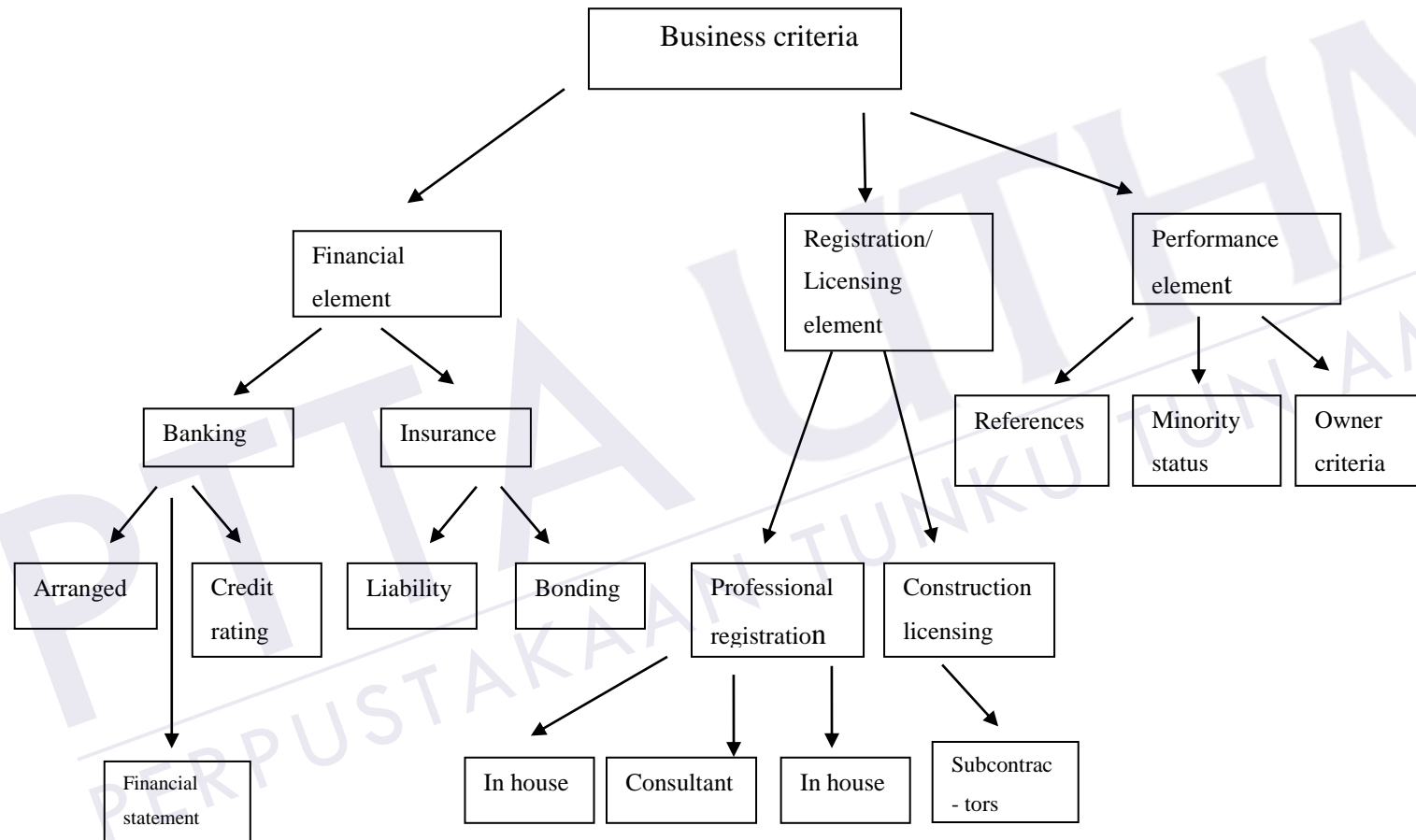


Fig 2.4: Summary of business criteria for D&B prequalification (Potter, 1994 p.34)

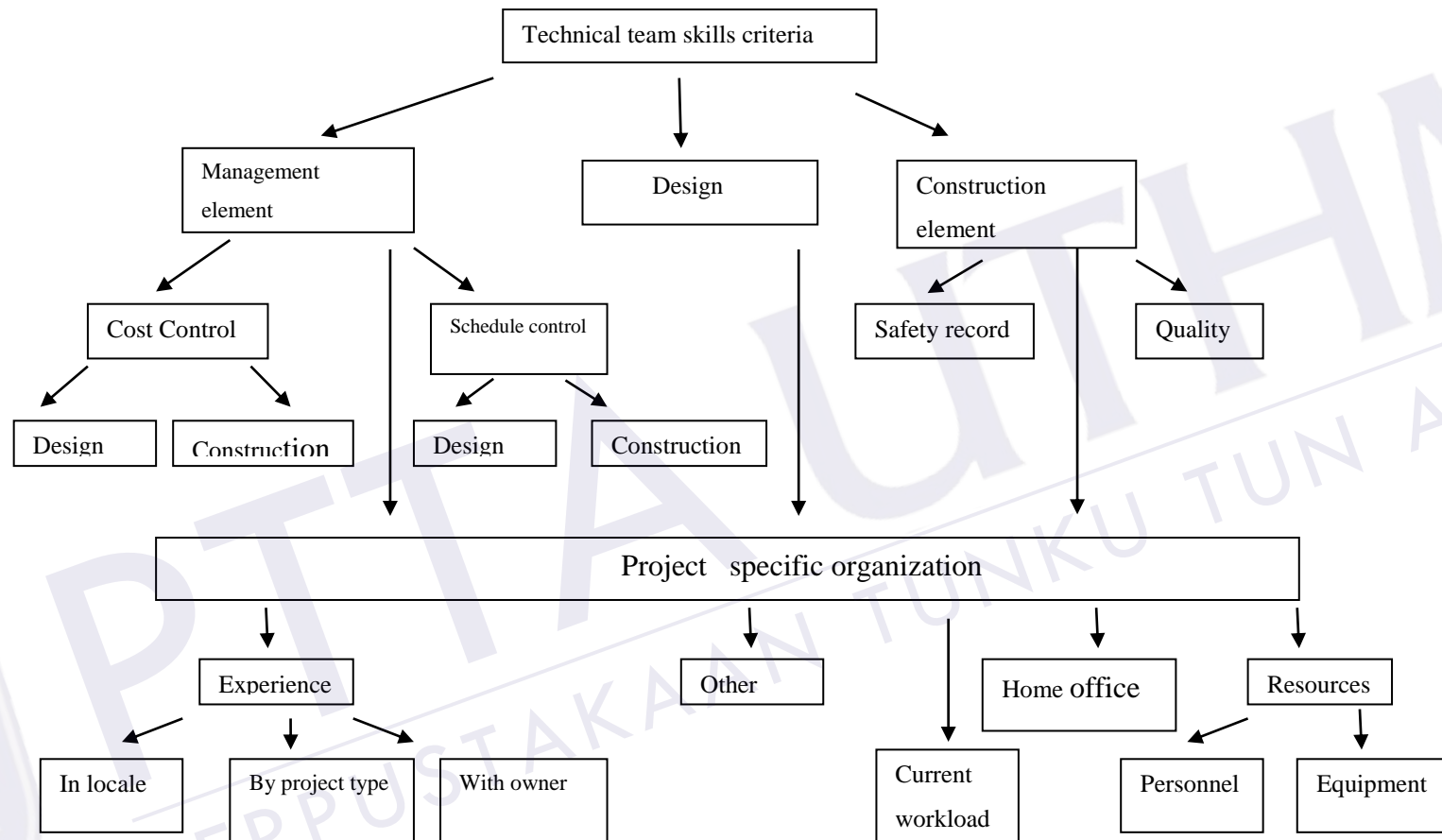


Fig 2.5: Summary of technical skills criteria for D&B prequalification (Potter, 1994 p.35)

In Fig 2.5, the business criteria of a D&B contracting organization was identified, where the financial, registration and performance elements of the organization together with the various sub-elements that constitutes them are established, indicating how they enable the contracting organization to operate as a business entity. Whilst Fig 2.6 outlines the technical team skills criteria of D&B contractor organization, where the management, design and construction elements of the D&B organization to be prequalified are considered. Other aspects that are considered include the working experience and the personnel and equipment resources of the contractor. The management element identifies the cost and schedule control capabilities of the contractor, while the construction element identifies the safety and also the quality management capabilities of the D&B contractor organization.

With these criteria formulated by Potter (1994) it could then be understood that prequalification is a process that encompasses all the aspects of the project, which would ensure the selection of capable, reputable and qualified contractors to be engaged for D&B project execution.

Russell (1996) identified the various advantages that contractor prequalification offers, as:

- It enables the identification of contractors that are willing to submit a bid or proposal;
- It provides an opportunity of phasing out contractors who do not have sufficient qualification and experience needed to execute the project;
- It provides an opportunity to identify contractors who have a backlog of projects ongoing as this would reduce their capacity and resources in handling new projects;
- The process enables the establishment of an organized and professional working environment as this would assist towards creating a conducive working environment for project executioning;

- The process spares most bidders the expense of preparing a proposal or an estimate and also the embarrassment of disqualification;
- It protects contractors from awarding them contracts that they do not have the capacity to execute.

Furthermore on the general note, another advantage of the prequalification process is that it provides an opportunity of steering away from the known traditional method of selecting contractors based on the submission of the lowest bid, as evaluating not only the designer but also the contractor negates the chances of awarding the project to a non-qualified contractor based on his submission of a lowest bid (Gransberg, 1999).

But then, contractor prequalification is not without its own disadvantages, which include the following:

- There are huge costs involved in developing, implementing and evaluating the contractors prequalification;
- There are difficulties in developing prequalification criteria that suits the particular project circumstances which would enable reaching accurate and logical decisions;

There is the difficulty of developing acceptable prequalification criteria that would enable the reaching of sound decisions without the possibility of having biases, partiality or subjective decisions; there is the limitation for contractor organizations to expand their services to new areas where they do not have any previous project track records.

According to Chan et. al., (2002), even with these identified disadvantages related to the prequalification process, its importance to contractor selection processes in D&B cannot be overemphasized, as it serves as the initial step towards engaging capable contractors to handle D&B projects.



### 2.7.2 Contractor selection methods

Beard et al (2001) identified the following contractor procurement strategies for the D&B procurement approach as:

a) **Sole source selection:** Also called direct selection method, this process involves selecting contractors based on an established long term relationship that exists between the client and the bidding D&B organizations.

In this method of contractor selection, the client selects the contractor based on a prior working relationship that exists between the parties, where factors such as the contractor's known past performance, reputation, technical and managerial competencies are being considered to serve as the basis for the his selection for the proposed project.

This method is mostly adopted by the private sector clients because it gives them the freedom to select the contractor of their choice, the reason why this approach is not favoured by the public clients is because it does not encourage competition, as price is not the criteria for selecting the contractor but rather existing relationship that exists between the contracting parties. But then, this approach can be best adopted in such situations where there are no other potential contractors that are bidding for the project or in emergency situations, for example, in an instance of a *force majeure* (act of god) such as hurricane, flood or earthquake, warranting emergency reconstruction activities in order to safeguard the lives and properties of the citizenry (Molenaar & Gransberg 2001).

b) **Qualification based selection:** This method involves selecting contractors for a proposed project based on their qualification. Here, the factors used for considering the most "qualified" contractor includes the contractor's previous experience in handling similar projects to the one being presently proposed, and also his technical and financial capability. The contractors are then ranked on the basis of these qualifications after which the client then enters into discussions with the best ranked contractor.

In the ranking process of the bidding contractors, price is not a consideration factor, but rather the contractor's technical and financial competencies. Once the

contractors are being ranked, then the client enters into negotiation with the highest ranking contractor in order to agree to a “fair and reasonable” price for the execution of the proposed D&B project (Beard et al., 2001).

c) **Best value selection:** In this method of contractor selection, the bidding contractors are made to submit a proposal based on the technical and price aspects of the proposed project, after which the client studies these proposals and then enters into negotiations with the contractor whose proposal offers the best value to the client as regards to the project to be executed (Beard et al 2001). Contractors which are being selected through this method are being selected on the basis of their technical competence and also the price by which they are willing to execute the project, but then, this price need not necessarily be the lowest among that of all the contractors that have bid for the project (Molenaar & Gransberg 2001).

In the best value selection, a weighing criterion is adopted by the client party in order to evaluate the proposals submitted, where weights are assigned to each of the factors that the client organization considers to be crucial to the project.

d) **Low bid selection:** The low bid method primarily adopts price and other cost related factors as the main criteria for selecting the D&B contractor to execute a project. The low bid selection method of selecting contractors is generally suitable for adoption in simple and less complex projects, because the method provides the opportunity of negating the possibility of resulting to higher project cost than initially envisaged, and also, other benefits other than low costs which would add value to the project (Palaneeswaran & Kumaraswamy 2000).

These methods for contractor selection for D&B projects identified based on different criteria gives the clients the opportunity to select contractors that would best serve their needs and also achieve the purpose for which the project is intended to achieve.

## 2.8 Risks in D&B procurement approach

Dey & Ogunlana, (2004) note that all human endeavour involve risks; it is an aspect that forms part of the daily activities of any form of an entity, and this could be human or an organization. In any situation, risk always has two possible outcomes, by which one of these outcomes is being considered to be unfavourable (Oztas & Okmen, 2004). Bahar & Crandall, (1990) described risk as the exposure to the chance of occurrences of events that are adversely or favourably affecting the project objectives as a consequence of uncertainty. Akintoye & Macleod (1997) attested that the construction industry is being considered as one that is faced with so many risks and uncertainties. This fact could be associated to the nature of the activities and processes that are involved in the industry, the organizations and also the working environment in which the industry operates; and the risks in the construction industry is inherent to any type of a construction project, irrespective of its size nature, complexity and the purpose by which it is intended to serve. As risks are known to form part of any human venture and activity, inclusive of the construction industry, so it is how these risks are being handled and managed by the respective parties that ensures whether such venture would be successful or not. As identified by Dey & Ogunlana (2004), risk management is an important aspect which plays a crucial part in ensuring the success of a construction project and furthermore can be described as a process which involves the effective identification and management of all risks that a construction project could be exposed to. These risks have the possibility of affecting the project in an unfavourable manner (Adnan et al., 2008).

According to Hackett et al., (2007), risk management is a systematic process to identify, assess and manage risks in order to enhance the chance of a successful project outcome. While Kartam & Kartam (2001) described construction risk management as the processes involved in the transfer, mitigation and retention of the risks involved in any construction activity by the appropriate parties concerned.

Latham (1994) in his report on the proposals made in order to improve the performance of the construction industry in UK, Constructing the Team report, indicated that there is no construction project that is risk free. Therefore, these risks need to be effectively managed, minimized, shared and transferred to the appropriate

parties in order to ensure the achievement of a successful project. This fact is in tandem to what Kangari (1995) earlier identified, that as risk is known to form part of every construction project and as such, risks do affect the performance, productivity and quality of a construction project. Hence, these risks need to be effectively managed for the successful execution of the project.

### 2.8.1 Risk management in D&B project

As identified in the Figure 2.7 below, the D&B is a project delivery approach that makes the contractor carry majority of the risk burden in the project. This thereby underscores the reason why there is the need for the contractor to properly manage such risks in order for the primary objective of the project to be achieved.

Table 2.7: Distribution of risk under the D&B system (Abdulrashid 2002 p.123).

<b>Risk</b>	<b>Client</b>	<b>Funder</b>	<b>Designer</b>	<b>Contractor</b>
Time				√
Price				√
Schematic design			√	
Detailed design				√
Specialist design				√
Project finance		√		
Effectiveness of the project in operation	√			
Quality				√

The high risk nature of the D&B procurement approach from the contractor's perspective could mainly be attributed to its single point responsibility nature where the contractor is known to be responsible for all the aspects of the project, ranging from the design to the construction, to ensuring that the completed D&B project complies with the set quality standards and then also serves the purpose it is intended for.

Risk management in D&B procurement approach involves the identification, analyses and allocation of the risks involved in the execution of projects using the project delivery approach. The process is mainly aimed at ensuring that the risks involved in the D&B project approach are effectively allocated and managed in order to ensure the successful execution of the D&B project (Adnan et al., 2008). Risk management is not a means by which the potential risks facing a project are to be eliminated, but it is only aimed at identifying such potential risks and then effectively managing them in order to prevent these risks from negatively affecting the project (Oztas & Okmen 2004).

According to Mills (2001 p.248), the advantages of risk management includes the following:

- questioning of the assumptions that most affects the success of your project;
- concentrates attention on actions to best control risks; and
- assesses the cost benefits of such actions.

Adnan et al., (2008) and Bajaj et al., (1997) identified that the processes involved in risk management for D&B projects, does not differ from that of any other method of procurement. The risk management process includes risk identification, risk analysis and risk response as identified in the Figure 2.9 below.

Uncertain project outcome

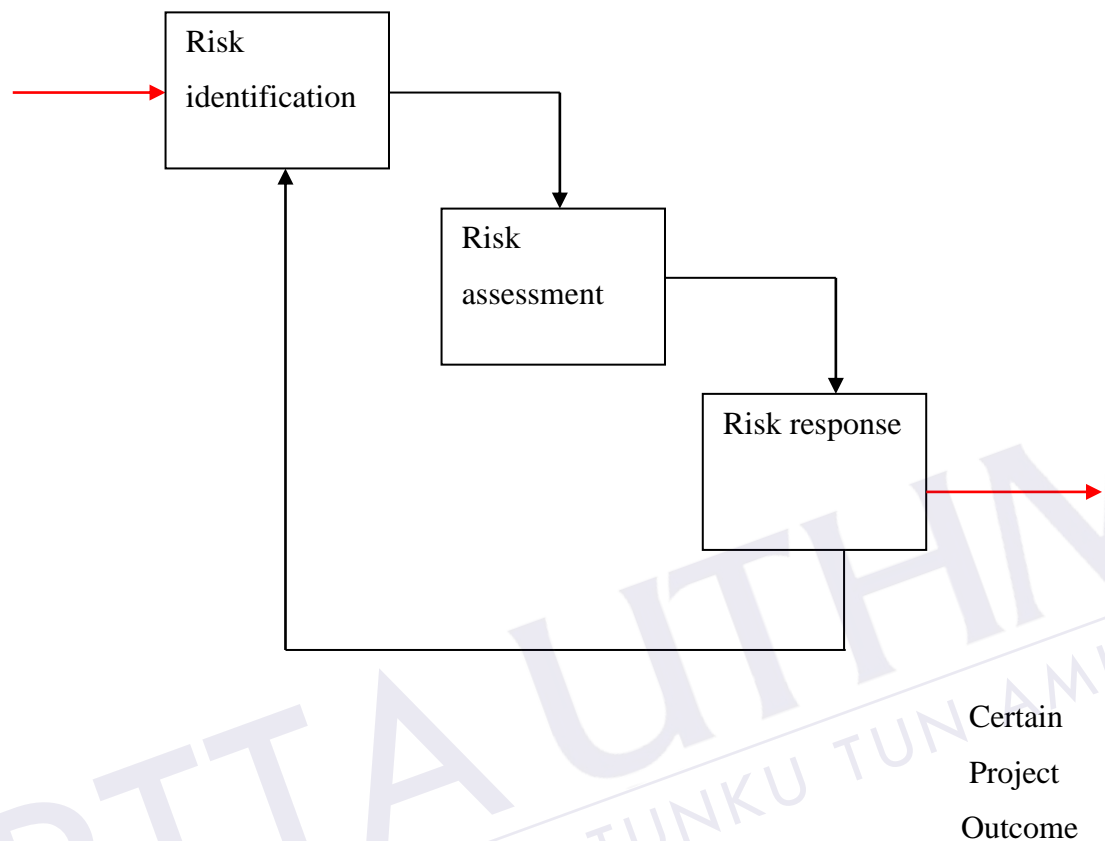


Fig 2.6: Risk management processes (Osipova,2008 p.42)

#### (a) Risk identification

Bahar & Crandall (1990) defined risk identification as the process of systematically and continuously identifying, categorizing, and assessing the initial significance of risks associated with a construction project. Risk identification is the first process involved in any risk management process; it is a process in risk management which plays a very important role in the overall risk management process because all the other preceding processes depends solely on the effective identification of the potential risks facing the construction project (Wang et al., 2004). The success of any risk management processes adopted clearly depends on how these risks are being

identified right from the project inception, and an effective risk identification process largely depends on how experienced and insightful are the project managers (Bajaj et al., 1997).

Adnan et al. (2008) identified the checklist method and brainstorming sessions as techniques that are deployed for risk identification process. These methods depend solely on the experience and knowledge of the contractor's project managers, as the process involves the project managers using their past experience in brainstorming and identifying all the possible risks that could be related to the project. These risk identification techniques are widely adopted because it is inexpensive and also its application is simple and consumes less time, although the process also depends on the overall nature of the construction project, regarding its complexity and the project location.

#### **(b) Risk analysis**

This is the next stage involved in the risk management processes after risk identification. It is the intermediary stage between the risk identification and the risk management actions, and the process involves the use of quantitative and qualitative approaches in order to analyze and evaluate the possible impact that the identified risks could have on the project and it also tends to identify the various outcomes of any decision that could be taken in relation to the project (Oztas & Okmen, 2004; and Wang et al., 2004). This process incorporates uncertainty in a quantitative or qualitative manner to evaluate the potential impact of risk. The evaluation should generally concentrate on risks with high probabilities, high financial consequences or combinations thereof which yield a substantial financial impact on the project (Wang et al., 2004). The qualitative approach basically makes use of the information gathered as a result of the direct judgments, comparing options and the descriptive analyses of the construction project, while the quantitative approach involves the use of various statistical models and simulations in order to show the numerical representation of the effect that these risks have on the construction project. Examples of such quantitative techniques are the Monte Carlo simulation and the sensitivity analysis. The Monte Carlo simulation technique involves the carrying out of a number of iterations in order to determine the probable outcome of a project; it



is also described as a method of evaluating all the permutations of uncertain events that might in any way impact the projected debt coverage for each year of the project life. While the sensitivity analysis basically provides information on the project risks that are being considered to have an impact on the time and cost aspects of the project. The sensitivity analysis is the most widely adopted risk analysis approach that is being adopted by contractors; this could be attributed to its less complicated nature and ease of application (Adnan et al., 2008; Akintoye & Macleod, 1997; Oztas & Okmen, 2004; Songer & Pecsok, 1997).

### **(c) The risk response**

This is the last stage involved in the risk management process. In the risk response processes, the results of the activities taken in the preceding processes are gathered together and discussed so as to enable the identification and then the deployment of the techniques and tools that would effectively manage those identified risks facing the construction project (Oztas & Okmen, 2004; and Osipova, 2008).

According to Baker et al. (1999), Baldry (1998) and Akintoye & Macleod (1997), there are four main strategies for risk response in construction projects, these include: risk avoidance, risk reduction, risk transfer and risk retention. Risk avoidance which is also called risk elimination, involves taking appropriate measures that would totally eliminate the occurrence of a particular risk in a construction project. This process can also be described as the refusal to accept risks in a construction project (Osipova, 2008).

According to Baker et al. (1999) and Baldry (1998), the refusal of a client to enter into a contract is an example of risk avoidance techniques that could be adopted in a construction project. Whilst, risk reduction has to do with the taking of necessary actions that would reduce the probability of the occurrence or the consequences that a risk could have in a project. Risk reduction techniques that could be adopted in a project includes the implementation of measures that would improve the overall performance and the quality of the services of the contractor organization, such as increasing the manpower and/or the equipment that are used in a project; increase the working hours of the workers on site and closer supervision of the activities of the subcontractors working on a project (Osipova, 2008). Having considered options for



risk avoidance and risk reduction, the other aspect in risk management is risk transfer. In this process, all the risks that still remain in the project after the risk avoidance and reduction actions are being deployed are transferred to the appropriate party that is in a better position to handle such risks (Osipova, 2008).

Insurance is a popular risk transfer technique that is widely adopted in construction projects. Lastly, is the risk retention strategy or risk acceptance. As part of the risk management process, finally it will be evident that there will be risks that remain present in the project. Hence, in this risk management process, the risks that exist in a project which could be planned or unforeseen are finally handled and controlled by the contractor organization that entered into a contract with the client to execute the construction project. However, the common practice is that risks accepted by the contractor are usually those that do occur frequently but its financial implication on the project is negligible (Baker et al., 1999).

## **2.9 Success factors for D&B projects**

As identified by Lam et al. (2004) and Parfitt & Sanvindo (1993), all projects are executed with the sole aim of achieving success and the term success is a dynamic one whose meaning and concept varies from one project to another and also from one set of clients to another. This varying meaning of project success can be attributed to the various parties that are involved in construction projects who all have their own understanding of what they regard as project success. A contractor's view of project success could be attaining profit, while the architect's understanding of success in a project could be the aesthetics criteria of the project, while that of a client could be the project serving his needs as regards to the project (Chan et al., 2002).

But then, with all the varying understanding of project success among the various project participants, it is certain that there is a common consensus that success in a project is a factor which makes all project stakeholders have a feeling of satisfaction and a feat all them aim to achieve.

The term success factor was first adopted by Rockhart (1982), he defined critical success factors (CSF's) as those specific areas of a certain activity, where the achievement of favourable results are critical to the attainment of the manager's goals in relation to the project (Parfitt & Sanvido, 1992).

A review of relevant literature has shown that the study of project success has been an area of focus of many researchers, this fact could be attributed to the relevance the aspect has in a project and also the impending challenge that exists to deliver projects successfully as a result of the increasing risks, complexities and uncertainties that are associated with today's construction projects (Nguyen et al., 2004).

According to Chan et al. (2002), in general terms, a project is considered a success if it is delivered at the right time, with the right quality and at the right price, and also furthermore providing the client with the highest level of satisfaction.

Whilst Parfitt & Sanvido (1993) described project success as the overall achievement of a project's goals and objectives, these goals and objectives are in relation to the financial, technical, educational and social requirements that the project seeks to achieve. Whilst Ling (2004) described success in a project as achieving the product success (i.e. meeting the quality output standards of the project) and also achieving success in the process itself, that is in relation to meeting the time and budget objectives of the project.



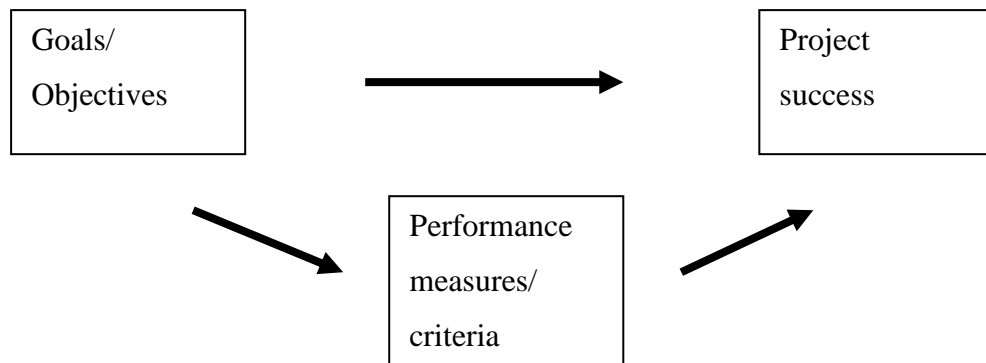


Fig 2.7: Relationship among goals, performance measures, and project success (Chan et al., 2002 p.121).

According to Chan et al., (2002), as indicated in Figure 2.8 above, project success is a function of the goals/objectives and the performance measure that the project seeks to achieve in terms of cost, schedule and quality aspects of the project. Hence, a project can be considered to be successful when it satisfactorily achieves the set goals and objectives that it seeks, which is measured in terms of the performance of the completed built facility.

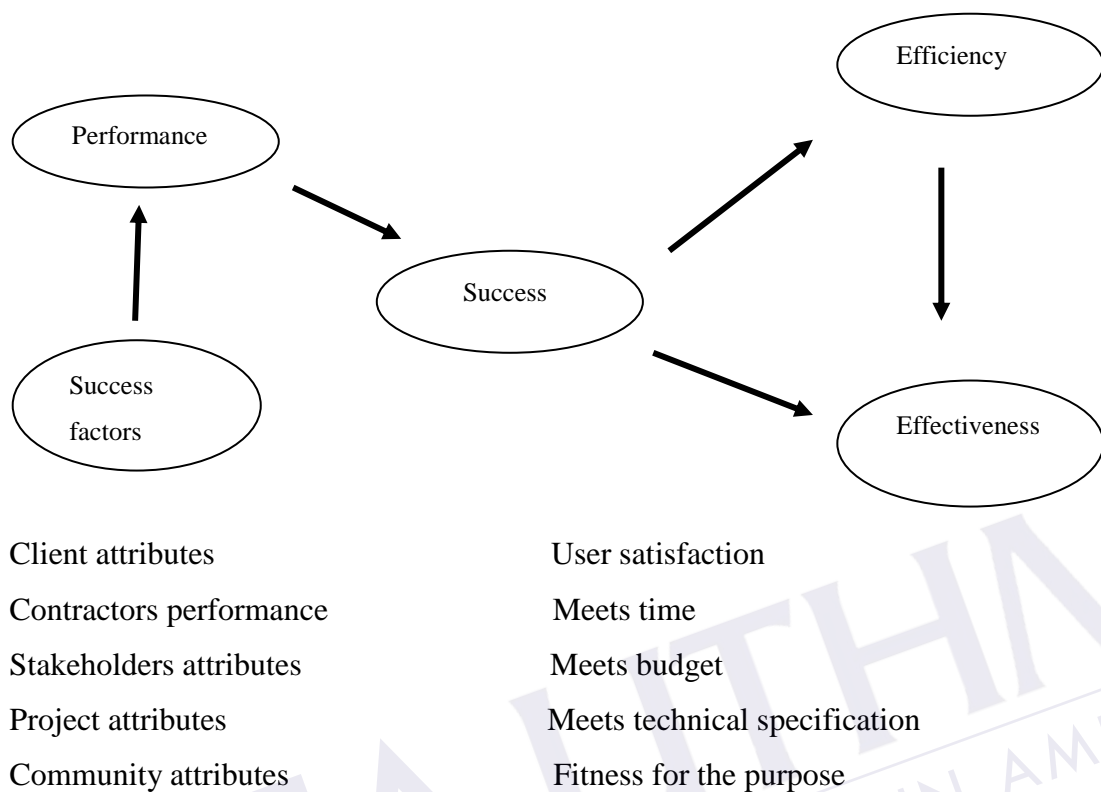


Fig 2.8: The relationship between success factors, project performance and project success (Takim & Akintoye, 2002 p.551)

According to Takim and Akintoye (2002), as represented in Figure 2.9 above, success in a construction project can be achieved once the appropriate factors are put in place by the relevant parties which form part of the project, and the achievement of such success generally indicates that the project has turned out to be effective and serving the general purpose it is intended to. However, in relation to an innovative procurement approach like D&B, project success should additionally be considered in relation to the uniqueness of the approach in relation to other known procurement approaches, this uniqueness could be in terms of issues like contractor selection, design management, and the project execution (El Wardani & Messner, 2005; Palaneeswaran & Kumaraswamy, 2000; and Chan et al., 2001).

D&B is a procurement approach which involves several parties, all of them have important roles to play in ensuring the success of the project, these parties include the client, end users, contractors, the architect and other design consultants.

Therefore this stresses the need to identify those factors that could result in the success of D&B projects in relation to the duties, responsibilities and capabilities of these parties. The essence of this is to enable these parties to have a clear idea of expected roles and responsibilities towards achieving a successful D&B project.

### 2.9.1 Success criteria for D&B projects

Songer & Molenaar (1997) set out a summary of the factors that serves to classify a D&B project as a success. They are as follows:

**(a) On budget:** A D&B project is considered to be successful when it is completed within the agreed contract cost. The word ‘‘within’’ literally means that the cost of the execution could be below or exactly, but not exceeding the agreed contract fee. Completion within budget is being considered to be a success factor because of the relevance that cost has in a D&B project, as fixed cost is considered to be one of the major driving forces to clients selecting D&B as a project delivery approach (Songer & Molenaar, 1996).

**(b) On schedule:** Executing a D&B project on or before the contract due date is another success criteria for D&B projects. Executing projects within the stipulated time frame is known to be an important area of concern for construction clients, that is the reason why so many researchers in the construction management field have always been working towards identifying the underlying reasons behind what causes delays in construction projects and then proffering solutions on how such delays could be avoided (Sweiss et al., 2008; and Chan & Kumurawasanmy, 2002). Since D&B is considered to be a procurement approach which is known to offer clients with advantages regarding construction time, which this could be attributed to the compressed project delivery schedule nature of the procurement approach (Konchar & Sanvido, 1998); hence, in every such case where a D&B project actually lives up

to its expectation of providing clients with projects on schedule without having any problem of time overruns, that project could be considered to be a success.

**(c) Meets specification:** A completed project that is being executed through D&B procurement approach that is able to meet or exceed the technical performance criteria (technical quality) set by the client is regarded as a successful one.

However, Quality in a constructed facility can be described as the facility meeting its legal, aesthetic and functional requirements. These requirements could be simple or complex, depending on the nature of the project. It could be in terms of the end results that the project seeks to achieve or as a description of what the completed project needs to perform. Nevertheless, in which ever case, a built facility is regarded to be of quality where the facility meets the quality requirements set for the project (Arditi & Gunaydin, 1997).

According to Gransberg & Molenaar (2004), the quest to achieving quality in D&B projects is a task that begins right from the initial stages of the project, not only during the actual execution of the project. Therefore in order to achieve D&B projects of high quality, D&B clients should request for effective design and construction quality management plans in the proposals submitted by the bidding D&B contractors and the quality specific qualifications of both the design and construction members of the D&B team. Furthermore, the client organization should work towards the establishment of an effective and workable quality management system right from the project onset. These quality management tasks, if effectively implemented, would surely result to achieving D&B projects of high quality and consequently successful D&B projects.

**(d) Conforms to users expectation:** A D&B project is considered to be a success if it meets or exceeds the end user's predetermined functional goals regarding the project; that is to say the project has achieved the "fitness of purpose" objective of the project.

According to Ndekugri & Turner (1994) and Chan & Yu (2005), D&B is a project delivery approach which gives the contractors an added responsibility regarding the nature of the finished project. In the system, contractors do play a role

that is comparable to that of a manufacturer, where they are being required to provide a constructed facility that exactly fits the purpose that is intended to serve. That is, the project strictly conforms to the end user's expectations regarding the completed facility. Therefore, in any such situation where a completed D&B project does not meet up with the user's expectations, then that project could be considered to be a failure.

**(e) High quality of workmanship:** Another success criteria for D&B projects is the project meeting the set quality standards regarding workmanship. Achieving a completed D&B project that is of high quality is also as a result of quality workmanship that had been deployed during the project executioning.

In order to achieve high quality workmanship during the executioning of the D&B project, all quality related problems that may come up during the project execution should be attended to in a joint collaborative effort of the design and construction team. This design and construction team would include the architect, structural and services engineers for the design team and the personnel that are responsible for the construction related tasks of the project. Furthermore, regular site visits should be conducted by the D&B team and the client's representative in order to ensure that quality standards are being strictly adhered to in accordance to the set standards (Levy, 2006).

**(f) Minimizes construction aggravation:** A D&B project is regarded to be successful when the construction processes does not unnecessarily overburden the client and his project management team. D&B is a project delivery approach which provides clients with the advantage of a single point responsibility; that is having the contractor to be responsible for all the aspects of the design and construction. A D&B project is not expected to overburden the client organization, as the system is expected to serve as a one stop solution to the building procurement needs of the client, thereby lessening the administrative burden that could be associated with project delivery (Beard et al., 2001).

But then, achieving this benefit that D&B procurement approach offers does not come naturally, as the necessary fundamentals needs to be put into place right



from the early stages of the project, as the client should ensure that only capable contractors are being engaged for the project. These contractors should have strong design capabilities, have a track record for completing projects on time, on budget and to acceptable quality, and also have a high level of competent and reputable staff who will effectively attend to the project without unduly overburdening the client team (Ling, 2004).

### **2.9.2 Critical Success Factors (C.S.F's) for D&B projects**

According to Rockhart (1982), the achievement of success in any project largely depends on the actions of the parties which are considered as stakeholders to the project, whose roles and actions are critical to the attainment of the project success. In view of this, below is an overview of the success factors for D&B projects based on the roles, capabilities and duties of the project stakeholders that are involved in the execution of projects under the D&B project delivery approach.

#### **(a) Client**

The client is the initiator of all construction projects; he is the party who desires to have a constructed facility in order to suffice his needs, which this need could be profit driven as is in the case of private sector clients or for the benefit of the public, that is regarding the public sector clients (Masterman, 2002). Therefore, this important role the client plays in a project further identifies the relevance that the client has in ensuring the achievement of a successful D&B project (Seng et al., 2006).

In order for a D&B project to be successful, the client should have a clear understanding of the project scope (Songer & Molenaar, 1996); provide a clear and unambiguous project brief (Ndekugri & Turner, 1994); and have a representative that is highly experienced (Akintoye, 1994); possesses the necessary project management and technical skills (Lam et al., 2008); engage contractors that have good design capabilities, and lastly; have a good track record for completing projects on time, within budget and to acceptable quality (Ling, 2004).



### **(b) Contractor**

The D&B contractor is described as the organization that has a binding agreement with the client to design and construct the project in accordance to the set requirements, standards and performance specifications of the contract.

The D&B contractor can be a in the form of an individual, a partnership, joint venture, a single firm or a corporation (Beard et al., 2001). In order to achieve a successful D&B project, the contractor is required to possess good leadership skills in order to be able to effectively manage and co-ordinate the activities of the various design and construction professionals that are working under him (Lam et al., 2004). The D&B contractor should have a good understanding of the design processes involved and also have made a substantial input of his building knowledge into the designs, especially regarding build - ability. Additionally, the contractor should have the capability to utilize special and innovative building techniques and materials which would speed up the project executioning (Chan et al., 2001).

### **(c) End user**

The end users are usually a party that is different from the client. They are those whom the project is expected to ultimately benefit; and usually have their requirements and wants different from that of the client. They play a major role in ensuring the success of a D&B project.

In order to achieve a successful D&B project, the end user has the responsibility of having clear and unambiguous needs regarding the project; this is so because it enables the client to develop a comprehensive brief. This is regarded as an integral factor for achieving success in D&B projects (Lam et al., 2004, Chan et al., 2001, Sohail & Baldwin, 2004)

The role of the end user in ensuring a successful D&B project is usually more of during the initial stages of the D&B project. The client should device a means by which the users can effectively review and criticize the design proposals, and also offer their own additions and comments to the proposals. Such user's needs that should be properly considered in the designs include matters such as provisions for the disabled, security matters, indoor air quality and the environmental concerns. All these factors when they are properly looked into and considered during the design

proposals development would surely go a long way in ensuring the achievement of a successful D&B project (Beard et al., 2001).

#### **(d) Architect and other design consultants**

The architects and other design consultants, including the structural engineers, services engineers, landscape designers all do play a major role in ensuring the success or failure of a D&B project. According to Masterman (2002), the nature to which these designers are being engaged by the D&B contractor usually determines how the D&B contractor's management entity is being structured. The D&B contractor can be a pure D&B organization, that is one which has a complete set up of all the design and construction expertise and other resources in-house, which would enable him to effectively execute any construction task that arises. Otherwise it could be an integrated D&B organization, this is that type which has all the required entities, but then, they are prepared to engage the services of other external consultants in order to complement the existing ones whenever the needs arises. There is also the fragmented D&B organization, this is the one which adopts a fragmented approach to executing D&B projects, whereby external design consultants are being engaged by the parent D&B Company and then their activities are being co-ordinated by the in-house project managers.

The nature of how the design consultants are being engaged by the D&B organization plays a major role in ensuring the success of a D&B project. It is expected that D&B organizations that are of the fragmented approach are more likely to face problems similar to that related to the traditional procurement approach. This is because the team members are of different backgrounds, and are bought together for the purpose of executing a particular D&B project. Hence, there is the possibility for them to lack that cohesiveness and mutual understanding that is required of a D&B entity; which plays a major role in ensuring a successful D&B project (Seng et al., 2006). Furthermore, in order to ensure success in D&B projects, the design consultants are expected to have a good understanding of the build-ability concept adopted in the design development, they should be able to produce designs that strictly complies to the time and budget schedules of the project and also have a

proper understanding of the construction processes adopted by the contractor during the project executioning (Chan et al., 2001).

According to Lam et al. (2008), success in any type of project is an achievable task, but then, the achievement of this success can only be determined by the clear understanding of how a D&B project is considered to be a success and also the identification of the various factors that could result to the achievement of such success. Therefore, it is expected that with the stakeholders in a D&B having a clear understanding of the success criteria in D&B projects and also what is expected of them in the project, then successful D&B projects can be achieved.

## 2.10 Summary

The literature review presented in this section gives an overview of the D&B procurement approach. The literature review is aimed at providing the basis for developing the survey instrument necessary to achieve the objectives of this research.

The following were discussed in the literature review:

- The historical development of the D&B procurement approach

Here, the historical development and evolution of the D&B procurement approach was described starting from the master builders era of the Mesopotamia period, to the fragmentation of the industry in the 15<sup>th</sup> century and subsequently its integration in the post-world war two era, and then finally to its present status in the 1960's. The current state of utilization of the system in the world and also in Malaysia was also discussed.

- D&B procurement approach in the Malaysian construction industry

In this aspect, the history, current status and also the issues pertaining the practice of the D&B procurement approach in the Malaysian construction industry were discussed.

- General overview of the D&B procurement approach

This involved the description of the D&B procurement approach in terms of its features, contractual arrangement and also its variations.

- Characteristics of D&B procurement approach

Here, the characteristics that are inherent in the D&B procurement approach were identified and discussed.

- Client's expectations in D&B

Here, the client's expectations in D&B procurement approach were identified and also discussed.

- Features of D&B client

Here the D&B client was discussed in terms of his features to his categorizations and also his expected functions and duties with respect to the D&B project.

- Features of a D&B contractor

This involved the discussion of the various features of the D&B contractor with respect to his role as the party responsible for the execution of the D&B project.

- Tendering methods D&B procurement approach

The various processes and types of tendering and contractor selection methods were identified and discussed.

- Risk management in D&B procurement approach

This involved the description of risk and its management processes in D&B projects.

- Critical Success Factors (C.S.F) for D&B project

Here, the success criteria and also the Critical Success Factors (C.S.F's) for D&B projects were identified and discussed.



## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter discusses the various methods that were employed in achieving the aim and objectives of the study. The chapter discusses the research procedure adopted for the study, which includes the primary and secondary data collection and how the data collected was analyzed in order to achieve the research objectives.

#### **3.2 Research approach**

In research, there are basically two general approaches that are widely recognized, these are the quantitative and qualitative research. According to Saunders et al., (2007), quantitative technique is described as an investigation into an identified problem, based on testing a theory, measured with numbers or other known numerical entities, and then the data obtained are being analyzed using statistical techniques or methods. A quantitative research is confirmatory if the research involves the use of underlying data collected to test hypothesis (Shore, 1998).

Furthermore, as Horna (1994) and Nau (1995) identified, a quantitative technique is characterized by the assumption that human behaviour can be explained by what can be termed as ‘‘social facts’’ which can be investigated by known methodologies that adopt the and utilize the ‘‘deductive logic of the natural sciences ‘’, thereby quantitative techniques look for distinguishing features and characteristics, elemental properties, and also empirical boundaries and limitations. The major goal that the quantitative technique seeks to achieve is to determine whether the predicted generalizations regarding a theory is true. While the qualitative technique research approach can be described as a research approach which is conducted through prolonged association with a certain field of life endeavor or situation, by which these situations are considered normal and a reflection of the day to day activities of a individuals, societies, groups or organizations (Miles & Huberman, 1994). According to Saunders et.al, (2007) and Moller & Picker (2005), qualitative research is conducted in a natural setting and involves a process of building a complex and holistic picture or situation of the phenomenon of interest. It is a research approach which provides a better, precise and clear understanding of the research interest and it is characterized by providing the researcher an opportunity to thoroughly examine the subject matter in the most realistic aspect. As Kandampuli (2003) further elaborated, he described the qualitative research approach as a research methodology which seeks to develop an understanding through the detailed description of the research interest, and the process often consists having participants responses that are coded, categorized and furthermore reduced to numbers so as to enable the data obtained to be analyzed by the use of the various statistical tools.

In this research, a qualitative research approach involving the use of the Delphi survey was adopted in order to obtain the views and opinions of experts regarding the current practice of the D&B procurement approach in the Malaysian construction industry, as well as provide the final consensus on the enabling and impeding factors for achieving client’s specific expectations for D&B construction projects. The quantitative technique was adopted in this research because of the known advantages that the approach offers with regards to research in the built environment, which according to Amaratunga et al., (2002) includes:

- The methodology's contribution to theory generation;
- Its ability to look at change processes over time;
- Its ability to understand people's meaning.

And lastly,

- Its ability to adjust to new issues and ideas as they emerge.

So thereby, it is expected with the adoption of the qualitative technique in conducting this research, the research objectives will be effectively achieved and consequently better insightful views and opinions could be obtained in order to enable the better practice of the D&B procurement approach practice in the Malaysian construction industry.

### **3.2.1 Data collection**

The approach adopted regarding data collection in this research was the use of both primary data (first hand survey) and secondary data (documented sources). For the secondary data, various documented sources such as journals, various publications of government bodies, reports prepared by researchers and professional and regulatory bodies, and other sources of published information were used to formulate the list of relevant criteria or factors. While for the primary data, the *qualitative* approach in the form of Delphi survey was adopted to finalize the list of criteria or factors based on current practice and expert knowledge.

### **3.2.2 Qualitative Research Approach using Delphi survey**

The Delphi survey is a structured group communication method for soliciting expert opinion about problems or ideas, through the use of a series of questionnaires and controlled feedback (Day & Bobeva, 2005).



It is a group process which involves interaction between the researcher and the group of identified respondents who are being considered as experts in the research topic. The interaction between the researcher and these experts is in the form of questionnaires which are administered in the form of rounds, and the technique is useful where the opinions, views and judgments of experts and practitioners are necessary (Youssuf, 2007). It is a highly formalized method of communication that is designed to extract the maximum amount of unbiased information from a panel of experts.

The Delphi survey was originally developed by the American defence industry, where a study was conducted by the Rand Corporation in the 1950's for the United States Air Force to find out the opinions of experts regarding policy formulation (Chan et al., 2001).

The Delphi survey usually involves the administering of questionnaires which can be formulated in a structured or unstructured form, which are sent out to the respondents that are considered experts in the research area. The responses of these experts are collected, analysed and then the original or revised questionnaire is re-administered to these respondents where they are further asked to confirm or modify their responses made in the previous round. This procedure is being repeated for a predetermined number of rounds or until a certain consensus or lack of it has been reached. In the survey, the experts are given the opportunity to provide further explanation or justification regarding their responses (Mullen, 2003).

According to Loo (2002) the Delphi survey is basically characterised by the following features:

- A panel of carefully selected respondents who are considered as experts and who represents a wide spectrum of opinion on the issue being discussed.
- There is a condition of anonymity between the participants
- The survey involves the researcher administering a series of questionnaires to the respondents.
- The process involves two to four rounds but depending on the nature of the research and the aim by which the research sets to achieve.

- The output is usually in the form of a policy, forecasts and programs which tends to identify the problems or weaknesses regarding the research area and also gives recommendations on how such problems or weaknesses could be solved in order to enable the effective utilization of the topic being considered.

Hence, it is evident that the Delphi technique is characterized as being a highly formalized method of communication that is designed to obtain the maximum amount of unbiased information and judgement from the panel of experts. Hence, with the above stated facts, in relation to this study, it is suggested that the Delphi survey serves as the most appropriate technique to be adopted that can provide the most formidable, unbiased information and judgement regarding issues relating the current practice of D&B procurement approach in the Malaysian construction industry, especially in relation to 'impeding' and 'enabling' factors for achieving client specific expectations.

### **3.2.3 Selection of panel for the Delphi survey**

Selecting the most appropriate panel for the Delphi survey is considered as the most important factor to be considered. This is because the quality and validity of the feedback and the study in general directly depends on the nature of the respondents that constitute the panel (Ludwig, 2001; and Stone & Busby, 1996). Therefore in this study, as what was practised in previous research using Delphi survey, such as in Xia & Chan (2010) and Chan et al., (2001), the following criteria was used to select the respondents that formed the panel for the Delphi survey.

- a) The respondents should have sufficient working experience or knowledge regarding the D&B system in the Malaysian construction industry.
- b) The respondents have worked in relevant organizations that have a direct relationship with the Malaysian construction industry.

- c) The respondents have held senior managerial positions in their respective organizations.

The sufficient working experience, sound knowledge about the practice of D&B in the industry, the relevant organizations of the selected experts and also their positions in their respective organizations thereby ensures the validity of the Delphi research conducted.

#### **3.2.4 Delphi questionnaire design**

The Delphi questionnaire is often designed with the aim of arriving at degree of consensus among the respondents regarding the particular issue of study, as identified by Walker & Selfe (1996) and Phillips (2000). They described the Delphi technique as a research technique which enables the achievement of a consensus on a particular field being studied by soliciting the views of experts.

But then, this may not be the case for all Delphi surveys, as some do not seek to achieve that needed consensus (Walker & Selfe, 1996). As suggested by Critcher & Gladstone (1998) the intended outcome of a Delphi survey may include any or all of the following: (i) identifying the degree of consensus or lack of it by the respondents; (ii) identifying their range of differing positions; and also (iii) revealing the rationale behind the respondent's judgements. In the analysis of the feedback of the Delphi survey, all the above intended outcomes were met.

#### **3.2.5 Presentation and format of feedback for the Delphi survey**

The presentation of the respondent's views and the subsequent feedback plays an important role in the Delphi survey, this so because it is through these that the respondents are being given the opportunity to amend or confirm their earlier responses.

According to Mullen (2003), feedback to respondents and the opportunity to revise earlier responses are arguably the defining features of Delphi; thereby such provision obviously requires at least two rounds. Hence, in this study, a two round Delphi survey was adopted. In the first round, the respondents were asked to provide information and also ratings on some key aspects regarding the practice of the D&B system in the Malaysian construction industry; and then in the second round, these respondents were required to confirm or modify their ratings that they made in the first round.

### **3.2.6 Administering the Delphi survey**

In this study, the Delphi survey was administered by electronic mail (e-mail), where the questionnaires were sent to the respective respondents, filled and then mailed back. According to Okoli & Pawlowski (2004), the reason for adopting this means of communication, is that it speeds up the turnaround time between the questionnaires; and this is an important factor regarding the Delphi survey. Posts are known to take longer periods, while the e-mail is an instant and effective means of communication.

### **3.3 Pilot study**

In this research, a pilot study was conducted in order to describe the current trend of construction procurement approaches and also to identify the factors that are impeding the development and the practice of D&B procurement approach in the Malaysian construction industry. The pilot study was based on a series of in depth semi structured interviews which were conducted with four practitioners from the public and private sectors who have relevant experience in D&B procurement approach and have actively participated in D&B project executioning and management over the period of their working experience, as these respondents that participated in the pilot study were among those that were adopted in the Delphi survey in the research conducted. In this pilot study, the qualitative research instrument used was the semi structured interview, the semi structured interview was

adopted because it allows the respondents to brainstorm on the issue being discussed, as there is no intentional question and answer format. This enables the researcher to gain a more accurate and clear picture of the respondent's views, this is so because the respondent is being given the liberty to answer the questions in his own thinking and without any constraints (Ghauri and Gronhaug, 2005). In the pilot study, the data obtained was analyzed by the use of the interpretive research approach.

The following are the results and their following discussions obtained from the pilot study:

Question 1: The most widely used form of procurement approach in the Malaysian construction industry.

Table 3.1: Results of the interviewees on the most widely used form of procurement approach

Interviewee	The most widely used form of procurement approach
A	Traditional procurement approach
B	Traditional procurement approach
C	Traditional procurement approach
D	Traditional procurement approach

From the semi structured interviews conducted, it was found out that the majority of the respondents identified the traditional procurement approach as the most frequently used procurement approach in the Malaysian construction industry; the study further found out that D&B is majorly procured for use in complex projects and largely by the public sector. The general adoption of the traditional procurement approach could be related to the lack of adequate information on the availability of alternative procurement approaches like the D&B, and this factor was also identified as the reason why the procurement approach is mostly restricted for use in only

complex and public sector projects. These findings are in tandem to the findings of Abdul Rashid (2002), where he identified the traditional procurement approach as the most dominant procurement approach in the Malaysian construction industry, and also in tandem with the findings of the study of Seng and Yusuf (2006), where it was showed that the increased use of the D&B procurement approach is synonymous with the growing complexity of projects in the Malaysian construction industry.

Question 2: Form of D&B that is widely used

Table 3.2: Results of the interviewees on the form of D&B that is widely used

Interviewee	Form of D&B that is widely used
A	Traditional D&B
B	Traditional D&B
C	Traditional D&B
D	Traditional D&B

Regarding the form of D&B procurement that is generally used, the pilot study showed that the traditional D&B is identified as the most widely adopted form of D&B used. Other forms of D&B which includes novation D&B, design and manage, design, manage and construct, develop and construct are not widely adopted in the Malaysian construction industry. The general use of the traditional D&B in the Malaysian construction industry is attributed to the fact that the traditional D&B is regarded as the most popular form of D&B, rather than the other forms of D&B. Akintoye (1992) described the traditional D&B as that form of D&B where the contractor is totally responsible for the design and construction of the project. This is regarded as the classical form of D&B where the contractor is fully responsible for the bespoke design and construction.

### Question 3: The management structure of D&B companies

Table 3.3: Results of the interviewees on the management structure of D&B companies

Interviewee	The management structure of D&B companies
A	Outsourced consultants
B	In house consultants
C	Outsourced consultants
D	Outsourced consultants

The findings also showed that the management structure of the D&B companies in Malaysia in majority of the cases is of the type where consultants are outsourced by the contractors to execute D&B projects. According to Masterman (2002), this type of management structure is known as the fragmented D&B, it is characterized by the appointment of external design consultants by the contractor to carry out the designs of the project. These external consultants are co-ordinated by the in-house project managers who manage their activities in order to ensure that the client's interest in terms of project brief and requirements are met.

The reason why this type of management structure is adopted is because the D&B contractor believe that it is more economical for them to engage external design consultants than to have in – house, because in the event where these contractors are not involved in any project, then they do not have to engage the services of the external consultants, since the agreement made between the contractor and the external design. But then, Masterman (2002) stated that such management structure is likely to result in too many problems during project execution, because of the structure's inherent separated feature, which makes the procurement approach vulnerable to the problems that are associated with the traditional procurement



approach, which this thereby underscores the need to adopt an integrated rather than the fragmented management approach to deliver D&B projects

Question 4: Problems facing D&B procurement approach.

Table 3.4: Results of the interviewees on the problems facing D&B procurement approach

S/N	Problems facing D&B procurement approach practice
I	Client do not have a full understanding of the project scope when the tenders are being submitted, there by leading to the problem of the clients initiating variation orders as the project is being executed
II	Clients lack of experience in the use of the D&B procurement approach.
III	The time taken to obtain planning approvals, permits and other required consents is long, thereby leading to the situation where the projects take so much time before they are being executed
IV	Quality in D&B projects is lacking
V	Lack of proper government commitment towards the effective practice of the procurement approach
VI	Lack of adequate technical expertise by the contractors to effectively manage D&B projects
VII	Ineffective nature of the standard form of contract of D&B used

Regarding the problems facing the practice of D&B in the Malaysian construction industry, these problems can be categorized into client related problems, contractors related problems and government related problems. The client related problems includes the client's lack of experience of the use of the D&B procurement approach and the clients lack of providing adequate briefing at the inception of the project. The problem of the client not having experience of the D&B procurement approach usually leads to the situation where the client engages the procurement approach without having a full knowledge of the mode of its operation, thereby leading to



many problems as the project is being executed. While the problem of the client not providing adequate briefing at the project inception leads to the situation where the client initiates variation orders as the project is being executed, thereby leading to time and cost overruns in the project.

The contractor related problems facing the practice of D&B includes the lack of competent technical expertise that would effectively manage the execution of projects under the system and most importantly the lack of quality of the D&B projects in the Malaysian construction industry.

These problems could be considered to be interrelated because it is being perceived that the lack of competent technical expertise could lead to having low quality D&B projects. The respondents showed that the problem of low quality in D&B projects could also be attributed to the lack of an effective client representative who is responsible for ensuring strict compliance to the set rules relating to quality during the execution of the project. Due to the fact that contractors are always known for their desire to maximize their profits at the expense of quality, so therefore it is the responsibility of the client representative to ensure that the contractor complies with the set quality standards of the project. This problem was also identified in the work of Abdurrahman, Rahim & Low (2006) where they showed that the lack of qualitative D&B projects have been a problem which have bedeviled the practice of the D&B procurement approach in the Malaysian construction industry.

While the government related problems facing D&B procurement approach practice in the Malaysian construction industry includes the lack of proper government's commitment towards the effective practice of the system, the long period of time required to obtain planning approvals and consents and the inability of the standard form of contract to effectively address issues relating to the practice of the D&B procurement approach.

Relating to the problem of lack of government commitment towards the effective practice of the system, the government engages in ineffective practices during the tendering procedures of the D&B projects, thereby leading to the selecting of less competent contractors to execute the D&B projects. This problem is a major problem facing the practice of the procurement approach in the Malaysian construction industry, due to the fact that the public sector is being regarded as the sector which

most patronizes the D&B procurement approach in the Malaysian construction industry (Abdul Rashid, 2002). So therefore as a result, this problem could generally affect the entire practice of the procurement approach in the Malaysian construction industry. Other government related problems facing the practice of the D&B procurement approach is the ineffective nature of the standard form of contract that is used for D&B projects in the Malaysian construction industry. The respondents showed that the standard form of contract does not adequately and effectively address issues relating to the practice of the procurement approach, most importantly issues relating to risk transfer in the D&B procurement approach practice in the Malaysian construction industry. The respondents show that the standard form of contract used does not favor the contractors, as they are made to carry unnecessary risk burden much more than what is required of them in the D&B procurement approach, thereby hampering their effectiveness in the execution of the D&B projects.

Lastly, another government related problem facing the D&B practice is the long period of time that is being required before approvals and permits are being granted by the public authorities. The respondents showed that this problem leads to the situation whereby so much time is being wasted before the project is being started, thereby resulting to variations orders being initiated as the project gets underway, these variation orders are as a result of alterations to the initial designs that are being carried out in order to enable the project designs to comply with the fast rate of innovations regarding building materials and equipments.

Question 5: Desired features of D&B clients

Table 3.5: Results of the interviewees on the desired features of D&B clients

S/N	Desired features of D&B clients
I	The client should have a clear scope of the project from inception.
II	The client should have a representative who is working on his behalf in order to guide the client and also to protect his interests during the execution of the project.
III	Previous experience with similar D&B projects
IV	Strong financial commitment

Regarding the issue of the desired features of a D&B client, the findings disclosed that the most important desired feature of a D&B client is for him to have a clear understanding of the project scope from the project inception. This feature is regarded as an important one very because it is being perceived that the ability of the client to have a clear scope from the inception of the project would enable him to have a clear understanding of his needs and requirements relating to the project, thereby preventing the initiation of variation orders by the client as the project is being executed, and would also enable the contractor to have a firm understanding of his expectations regarding the project, thereby enabling the contractor to focus fully towards delivering the project within the stipulated time. This finding is supported by the studies conducted by Songer and Molenaar (1997), Xia and Chan (2010) & Lam et.al, (2004), where they all showed that the client understands of the project scope is an important feature which a D&B client should possess.

Another requirement that the D&B client should possess is the availability of a client representative who is working in order to ensure that the client's interests related to the project are being protected. This representative can guide the client towards developing his brief during the initiation of the project and then can serve as a supervisory body during the execution of the project in order to ensure that the

contractor is complying with the set quality standards. This finding is in tandem with the finding in the study of Xia and Chan (2010) where they identified the need of the D&B client to have a representative in a D&B project in order to ensure that the client's objectives regarding the D&B project are met. Also, a client's prior experience of D&B project is another relevant feature that is required. This is because; client's prior experience of the use of the D&B procurement approach can enable him to have the requisite knowledge that is required to go about effectively executing a D&B project from inception to completion.

Lastly, another desired feature of the client identified in the study is the client to be financially capable in order to ensure that the financial requirements of the project are adequately met. This feature is very important because finance is the most important pillar of every of every project, and any form of ineffectiveness in meeting the financial requirements of the contractor could lead to time overruns, and subsequently abandonment, which this should be avoided in order to ensure the successful execution of the project.

#### Question 6: Required features of D&B contractor

Table 3.6: Results of the interviewees on the desired features of D&B contractors

S/N	Desired features of D&B contractors
I	Strong financial capability
II	A reliable and strong relationship with suppliers in order to ensure the smooth execution of the project.
III	Strong and effective technical expertise.
IV	Effective project management capabilities.

The respondents showed that on the issue of the desired features of D&B contractors, the respondents identified the need of the contractor to have a good and mutual relationship with suppliers in order to ensure the effective supply of materials during project execution, the respondents stressed on the relevance of this feature, where they identified that any form of ineffectiveness regarding to material supplies could lead to delay in the project delivery, thereby resulting to the possibility of having time overrun in the D&B project. Secondly, the contractor should have a strong financial capability in order to ensure a smooth and effective cash flow during the execution of the project, thereby preventing the possibility of having any financial related problem which could hamper the smooth execution of the project.

Another desired feature of a D&B contractor as identified by the respondents is the ability of the contractors to have strong technical expertise. The respondents stated that this feature enables the contractor to effectively manage the complexities that are associated with today's D&B projects. This desired feature of the D&B contractor is important due to the increasingly complex nature of D&B projects in Malaysia, as identified in Seng and Yusuf (2006). Lastly, effective project management practice is also identified as a desired feature of the D&B contractor. The effective project management practice is essential in order to ensure the effective and smooth running of the project. The importance of deploying effective project management practices cannot be over emphasized as it enables the execution of the project in accordance to the set plans and targets, and also in accordance to the set quality standards.



### Question 7: Success factors for D&B projects

Table 3.7: Results of the interviewees on the success factors for D&B projects

S/N	Success factors for D&B projects
I	The project proposals should be clear and acceptable in terms of cost and quality.
II	The client should have a clear project scope from the inception of the project.
III	Effective communication between the client and the D&B contractor.
IV	Mutual trust and understanding between the project parties.
V	Enabling working environment.

Relating to the success factors for D&B projects, the respondents identified that firstly, the project proposal should be made to be clear regarding to the cost and quality aspects of the project. The proposal should clearly state out what is the project expectation relating to the issue of cost and quality on the project. This is important in order to enable all the project participants, most importantly the client and contractor to have a clear understanding of the cost and quality expectations of the project right from the project inception.

Secondly, another success factor for the D&B project is that the client should be able to have a clear project scope from the initiation of the project.

This factor was also identified as a desired feature of the D&B client, which this further reinstates its relevance and importance as a factor for achieving success in D&B projects. Mutual trust and understanding between the project participants is also identified as another success factor for D&B projects. The project participants should be able to have a good working relationship and should be able to work in peace and harmony with the sole aim of achieving the overall project objectives. Another success factor for D&B projects is effective communication between the

client and the contractor. The client and the contractor should be able to communicate clearly and effectively, this is so in order to prevent all miscommunications, misunderstandings and misconceptions, in order to ensure the effective actualization of the project objectives. Lastly, another success factor for D&B projects that was identified in the study was the presence of an enabling working environment.

Due to the fact that every construction project is not carried out in isolation, but within an environment, so therefore the presence of an enabling working plays a very important role in achieving success in every construction project. The project working environment should be enabling in terms of the social aspects, that is regarding favorable government policies, political stability and favorable economic situations and also the physical aspects that is the presence of conducive weather and climatic conditions. All these are factors that play important role towards achieving success in D&B projects.

With these findings obtained related to the current practice of the D&B procurement approach in the Malaysian construction industry from the pilot study conducted, it is expected to serve as a basis for the conduct of the research itself, by understanding the underlying issues relating to the practice of the procurement approach in the industry; thereby enabling the achievement of the identified objectives of the research, which this ultimately resulting to the stakeholders in the D&B project execution being informed on how to go about setting up and managing effective and successful D&B project, and consequently resulting to the effective utilization of the procurement approach in the Malaysian construction industry.

### **3.4 Research aim and objectives and methods adopted to achieve them**

The aim of the study is to do a critical appraisal of the Design&Build (D&B) procurement approach in the Malaysian Construction Industry based on current practice through identifying the impeding and enabling factors to the achievement of



the client's specific expectations system in order to enable the better practice of the in the D&B procurement approach in the Malaysian construction industry.

### 3.4.1 Objective 1

Objective: To identify the key features / characteristics of D&B procurement approach in the Malaysian construction industry

In order to achieve the first objective, the following processes were involved:

- A literature review was initially conducted where the key features/characteristics of D&B were identified, as shown in table 2.3
- the Delphi first round survey was conducted, where the respondents were asked to rate the characteristics in the order of their level of agreement on a 5 point scale, where 1= strongly agree and 5 =strongly disagree; additionally, they were asked to add any other feature/characteristic of D&B that they considered relevant and important that has not been included in the list;
- then in the Delphi second round survey, the results obtained in the first round Delphi were presented and the respondents were asked to further confirm or modify their ratings that they made in the first round;
- The data obtained from the Delphi second round survey were then analysed by the use of the descriptive analysis technique with the aid of the SPSS, where the frequencies of the responses were determined;
- Furthermore, the identified features/characteristics were ranked in the order of their priority, where the relative importance index (RII) was adopted to achieve the ranking.



### 3.4.2 Objective 2

Objective: To determine the factors impeding the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.

In order to achieve the first objective, the following processes were involved:

- a summary of the client's specific expectations in D&B procurement approach was identified from previous research and literature, as shown in table 2.5
  - Then, the respondents were required to identify the factors that are impeding the D&B contractor towards achieving client's specific expectations in the Malaysian construction industry, and these respondents were further asked to rate each of these impeding factors that they had identified in the order of their severity in the five point Likert scale provided; where 5 = Highly impeding and 1= Less impeding.
  - Then, these responses were then collated and a list of the impeding factors to the achievement of the client's specific expectations with their ratings was finalized.
  - In the Delphi survey round two, these respondents were asked to reconfirm or modify their ratings of the impeding factors to the achievement of these expectations that they had identified in the first round.
  - Based on this final feedback, an agreed list of the factors that impedes the achievement of the client's specific expectations in the Malaysian construction industry with their corresponding ratings was achieved, where these impeding factors were categorized into highly impeding and impeding according to the responses that were provided by the respondents.
- This categorization was based on the majority of where the responses provided lies in accordance to the Likert scale adopted in the survey.

### 3.4.3 Objective 3

Objective: To determine the factors enabling the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.

In order to achieve the first objective, the following processes were involved:

- a summary of the client's specific expectations in D&B procurement approach was identified from previous research and literature, as shown in table 2.6
- Then, the respondents were required to identify the factors that are enabling the D&B contractor towards achieving client's specific expectations in the Malaysian construction industry, and these respondents were further asked to rate each of these impeding factors that they had identified in the order of their severity in the five point Likert scale provided; where 5 = Highly enabling and 1= Less enabling.
- Then, these responses were then collated and a list of the enabling factors to the achievement of the client's specific expectations with their ratings was finalized.
- In the Delphi survey round two, these respondents were asked to reconfirm or modify their ratings of the enabling factors to the achievement of these expectations that they had identified in the first round.
- Based on this final feedback, an agreed list of the factors that enables the achievement of the client's specific expectations in the Malaysian construction industry with their corresponding ratings was achieved, where these enabling factors were categorized into highly enabling and enabling according to the responses that were provided by the respondents. This categorization was based on the majority of where the responses provided lies in accordance to the Likert scale adopted in the survey.

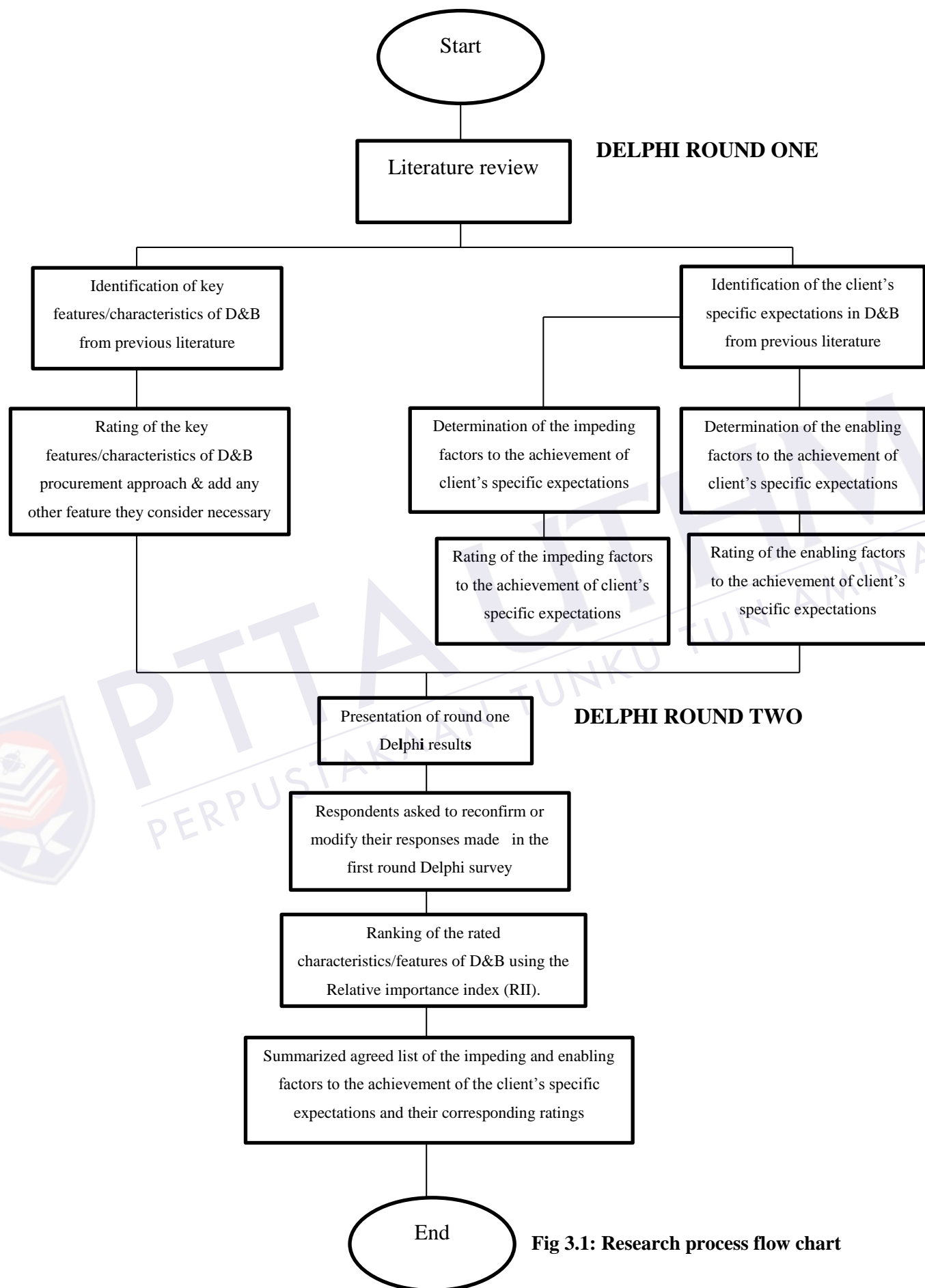


Fig 3.1: Research process flow chart

### 3.5 Research process flow chart

The research process is initiated with the Delphi first round, which starts with the literature review where the key features/characteristics of D&B and also the client specific expectations in D&B are identified from previous literature, the respondents are then asked to rate the identified features/characteristics of the D&B procurement approach and also add any other feature they consider necessary, then these respondents were further asked to identify and also rate the impeding and also the enabling factors to the achievement of the client's specific expectations in D&B. The results of the round one Delphi are then presented and in the second round Delphi, the respondents are then asked to reconfirm or modify their responses made in the first round Delphi. Lastly in the research process is the rating of the client features/characteristics identified in the Delphi process using the relative importance index (RII) and the drawing up of a summarized agreed list of the impeding and enabling factors to the achievement of the client's specific expectations and their corresponding ratings.

### 3.6 Summary

Research methodology is essential in providing the valuable results of the study. The methodology used in this study was literature review, data collection and data analysis. The chapter discusses generally on the research approach adopted in order to achieve the identified research objectives. The chapter begins with an overview of both the quantitative and qualitative research approaches, and then a concise description of the research data collection technique adopted in the research i.e. the Delphi survey, which these includes the description of the Delphi survey process, furthermore, the factors to be considered in the selection of panel for the survey was also discussed; the Delphi questionnaire design and the presentation and format for the Delphi survey were described, and then the method adopted in administering of the Delphi survey was also described.

Furthermore, the results of the pilot study conducted in relation to the research was also presented and described. Lastly in the chapter, a full description of the methods adopted in order to achieve each of the research objectives was given, and also a research flow chart which gives a diagrammatical layout of the processes invol achieving the research objectives.



## **CHAPTER 4**

### **RESULTS AND DISCUSSIONS**

#### **4.1 Introduction**

This chapter presents and discusses the results obtained and the findings arising from the analysis conducted.

#### **4.2 Delphi survey**

The Delphi survey is the qualitative research technique adopted in this research in order to obtain the opinions, views and ideas of experts through the use of questionnaires in the form of rounds.

#### 4.2.1 Sample Data Characteristics

Regarding the size of the Delphi panel, Cavalli & Ortolano (2004) recommend that a panel of about 8-12 members is desirable, while according to Phillips (2000) the optimum size of the panel should be 7 - 12 members. This factor is very important to be considered as it plays a major role in determining the viability of the survey conducted.

In this study, 9 -15 experts who are experienced and knowledgeable in the research area were expected to be involved in the survey. 15 letters of invitation for the respondents to participate in the first round Delphi survey were distributed, but only 11 respondents agreed to participate in the first round Delphi survey. The number of the questionnaires received for the first round Delphi were considered to be valid as it complies with the requirement for the number of respondents for the Delphi survey.

These respondents represent a wide spectrum of practitioners that have an established knowledge of the Malaysian construction industry; this is aimed at giving the Delphi survey a high level of credibility. Importantly, and additionally these respondents all were identified as having extensive knowledge and experience of the D&B procurement approach as practised in the Malaysian construction industry. All the respondents were those who held senior positions in their respective organizations. Hence, the 11 members of the Delphi survey panel represent a wide distribution of professionals, with 4 from public organizations, 5 from the private sector, and 2 were academics in Malaysian universities. The composition of this group of experts provides a balanced view for the Delphi survey. All these are necessary in order to obtain the most reliable responses for the Delphi survey.

Table 4.1: List of Panel of experts for the Delphi Survey

NAME	POSITION	SECTOR	ORGANIZATION	EXPERIENCE IN D&B
Mr A	Former Director	Public	AA Department	<p>a) Project : Road Infrastructure project Role: Client representative Cost: 960 million RM Year:1998</p> <p>b) Project: Nursing school project Role: Project manager Cost: 70 million RM Year:2002</p> <p>c) Project: University projects (Including faculties, hostels and lecture theatres) Role: Client representative Cost: 260 million RM Year:2004</p>
Mr B	Project Manager	Private	BB Construction Company	<p>a) Project: Road Infrastructure upgrade project Role: Project manager Cost: 214 million RM Year:2002</p> <p>b) Project: Secondary school project Role: Project Manager Cost: 20 million RM Year: 2002</p> <p>c) Project: Hospital project Role: Project Manager Cost: 340 million RM Year:2008-date</p>



NAME	POSITION	SECTOR	ORGANIZATION	EXPERIENCE IN D&B
Mr C	Director	Public	CC Department	<p>a) Project: Naval Infrastructure project Role: Site engineer Cost: 640 million RM Year: 1982</p> <p>b) Project: Military Complex/Camp Role: Project engineer Cost: 422 million RM Year: 2001</p> <p>c) Project: University Library complex Role: Project Director Cost: 284 million RM Year: 2008</p> <p>d) Project: University Faculties Complex Role: Project Director Cost: 238 million RM Year: 2009</p>
Mr D	Former Director	Public	DD Department	<p>a) Project: Hospital project Role: Project Manager Cost: 280 million Year: 2001</p> <p>b) Project: Quarantine unit building project complete with related infrastructure Role: Project director Cost: 950 million RM Year: 2003</p> <p>c) Project : Bridge infrastructure project Role: Project manager (planning stage) Cost: Not determined as the project was subsequently cancelled) Year: 2005</p>

NAME	POSITION	SECTOR	ORGANIZATION	EXPERIENCE IN D&B
Mr E	Project Manager	Public	EE Bureau	<p>a) Project: Aeronautical laboratory building project Role: Client Quantity Surveyor Cost: 30 million RM Year: 1992</p> <p>b) Project: University lecture theatre project ( 2,500 seating capacity) Role: Client Quantity Surveyor Cost: 30 million RM Year:1993</p> <p>c) Project: University hostel project (18,000 bed capacity) Role: Client Quantity Surveyor Cost: 200 million RM Year: 1995</p> <p>d) Project : Educational hub Role: Task force committee member Cost: 1billion RM ( funded under PFI (private finance initiative) Year : 2010 - date</p>
Mr F	General Manager	Private	FF Construction Company	<p>a) Project: Secondary school project Role: Project Manager Cost: 20 million RM Year: 2002</p> <p>b) Project : 20 storey office project Role: Project manager Cost : 120 million Year : 2003</p> <p>c) Project: Hospital project Role: Project Manager Cost: 340 million RM Year:2008-date</p>

NAME	POSITION	SECTOR	ORGANIZATION	EXPERIENCE IN D&B
Mr G	Head of Department	Private	GG Property Developers	<p>a) Project: Mass housing project (10,000 units) Role: Project Manager Cost: 600 million Year : 2001</p> <p>b) Project: Hospital project Role: Project Manager Cost: 340 million RM Year:2008-date</p> <p>c) Project: Road infrastructure upgrade project Role: Project Manager Cost: 65 million RM Year: 2010-date</p>
Professor H	Project director	Academic	University of HH	<p>a) Project: University Projects under the Rancangan Malaysia 8, (8<sup>th</sup> Malaysian Plan) which includes technology faculties complex, academic complex and 1000 bed capacity student hostel. Role: Project director Cost: 150 million RM Year: 2001</p> <p>b) Project: University Projects under the Rancangan Malaysia 9, (9<sup>th</sup> Malaysian Plan) which includes library, faculties complexes and 1000 bed capacity student hostel. Role: Project director Cost: 340 million RM Year: 2006</p>

NAME	POSITION	SECTOR	ORGANIZATION	EXPERIENCE IN D&B
Dr J	Project supervisor	Academic	JJ University	<p>a) Project: University students hostel (1,500 bed capacity) and related infrastructure Role: Project supervisor Cost: 65 million RM Year: 1999</p> <p>b) Project: University ICT centre Role: Project supervisor Cost: 76 million RM Year: 2001</p> <p>c) Project: Project: University lecture theatre project ( 1,000 seating capacity) Role: Project manager Cost: 45 million RM Year:2006</p>
Mr K	Chief Consultant	Private	KK Consultants	<p>a) Project: Secondary school building project Role: Project consultant Cost: 25 million RM Year: 2005</p> <p>b) Project: Referral Hospital project Role: Project consultancy team Cost: 46 million RM Year: 2008</p> <p>c) Project: Infrastructure upgrade project Role: Project consultancy team Cost: 31 million Year: 2010</p>

Table 4.1 above gives a description of these respondents and their affiliations, although the names of the experts and their organizations are relabelled in order to comply with the anonymous nature of the survey. From the table, it could be seen that these respondents have being involved in various types of D&B projects covering all the known categories of the construction sector, ranging from civil engineering to building projects, and also the extent of the construction involved ranging from upgrade/modification to overall new construction. Moreover, it could be seen that these respondents have played roles in such projects which gives them the opportunity to be fully involved in decision making processes that are critical to the actualization of the project objectives. And also, these projects represents a vast coverage of the level of complexities, ranging from less complex to sophisticated and technically complex D&B projects. So thereby in this study, it is worth noting that the major criteria that was adopted for qualifying the respondents to be included in the survey was their vast experience and in-depth knowledge of the D&B projects, having all of the respondents have handled a minimum of 3 D&B projects of various scope and complexities as identified during the course of their working experience, rather than their years of working experience in the construction industry, which this thereby tends to give the study a more insightful approach into the practice of the D&B approach in the Malaysian construction industry. All these regarding the respondents experience in the researched area is necessary as it shows their high level of experience and knowledge with respect to the D&B procurement approach practice in the Malaysian construction industry, by which consequently this will enable to achieve a high level of credibility and validity in the responses and opinions provided by them in the Delphi survey.

Table 4.2: List of panel of experts based on their affiliated organizations

Type of firm	Number
University	2
Government Department	4
Property Developer	1
Construction company	3
Design consultant company	1

Table 4.3: Respondents classification by years of working experience in the construction industry.

Years	Number of respondents	(%)
0 - 5	2	18
5-10	2	18
10-20	5	46
20+	2	18

Table 4.2 gives a list of the respondents based on their affiliated organization, where it was shown that these respondents covers a wide spectrum of D&B procurement approach related areas ranging from the academics to the government departments, property developers, construction companies and lastly design consultant companies. This indicates the wide variety of the respondent's affiliated organizations and also

their wide scope of experience of the D&B procurement approach from the various aspects of the industry. Whilst, table 4.3 shows the working experience of the respondents in the construction industry, where a majority of the respondents i.e. 46%, have a working experience of more than 10 years and 18% having more than 20 years working experience in the industry and also the practice of the D&B procurement approach, while table 4.4 identifies the academic qualification of the respondents where a majority i.e. 63% of them are degree holders, while the others includes, 18 % with doctorate degree, and 9% with masters degree and 9 % with diploma. In adopting the respondents to be included in the Delphi survey, although it is expected that a degree qualification to be the minimum qualification for the respondents, but then the respondent with the diploma qualification (Mr G) was also included in the survey by virtue of his vast and wide experience in the D&B project execution in the industry over a considerable long period of time (11 years), where he has handled D&B projects ranging from building to infrastructure projects, and also from upgrade to overall new project execution, by which this is expected to make up for his low academic qualification. So thereby, this composition of this group of experts all thereby further indicates the eligibility of the respondents to be included in the Delphi survey.



Table 4.4: Respondents classification by highest academic qualification

Highest academic qualification	Number	Percentage (%)
Diploma	1	9
Degree	7	63
Masters	1	9
Doctorate	2	18

## 4.2.2 Results and Analysis

The results and the analysis of the data collected from the Delphi surveys which are aimed towards achieving the objectives of the research are as follows:

### 4.2.2.1 Identifying the key features / characteristics of D&B procurement approach in the Malaysian construction industry.

In order to achieve this objective, in the first round Delphi survey, a literature review was firstly conducted where the client's specific expectations in D&B procurement approach were identified, then the Delphi survey was conducted, the respondents were asked to rate the level of their agreement to the features/characteristics of D&B on a five point Likert scaling, ranging from 1 = strongly agree and 5 = strongly disagree. The respondents were asked to add any additional feature/characteristic they considered as relevant and important that was not in the existing list. Table 4.5 shows the responses provided by the experts in the Delphi round one in respect to



identifying the features/characteristics of D&B procurement approach in the Malaysian construction industry.

Table 4.5: Frequency of expert's response in Delphi Round One with respect to identifying the features/characteristics of D&B system in the Malaysian construction industry.

<b>FEATURE/ CHARACTERISTIC OF D&amp;B SYSTEM</b>	<b>FREQUENCY OF EXPERTS RESPONSE</b>				
	<b>STRONGLY AGREE</b>	<b>AGREE</b>	<b>UNSURE/ UNCERTAIN</b>	<b>DISAGREE</b>	<b>STRONGLY DISAGREE</b>
Single point responsibility	6	4	1	-	-
Compressed delivery schedule	1	9	-	1	-
Fair allocation of risk	3	8	-	-	-
Suitable for complex projects	10	-	-	1	-
Enhanced communication	1	7	3		
Facilitates use of latest innovative technologies	11	-	-	-	-
Effective client representation	4	7			

Additionally, below are the frequencies of the responses of the characteristics/features of D&B procurement approach that were added by the respondents in the Delphi round one.

Table 4.6: Frequencies of the responses of the characteristics/features of D&B procurement that were added by the respondents in Delphi round one.

FREQUENCY OF EXPERTS RESPONSE					
FEATURE/ CHARACTERISTIC OF D&B SYSTEM	STRONGLY AGREE	AGREE	UNSURE/ UNCERTAIN	DISAGREE	STRONGLY DISAGREE
Fit for purpose	4	3	0	0	0
Price certainty	3	4	0	0	0

Then in the second round Delphi, the results obtained from the first round were presented and the respondents were further asked to confirm or reconsider their ratings. In the second round Delphi, only seven respondents agreed to participate, as against eleven in the Delphi first round, thereby indicating a drop of four respondents.

However, this drop in the number of the respondents has not in any way affected the validity of the survey as the number of the respondents is still within the acceptable range as suggested by Philips (2000); where he indicated that for the Delphi survey to be conducted, a panel of 7 – 12 number of respondents is sufficient and acceptable. Table 4.6 below shows the responses provided by the experts in the Delphi round two in respect to identifying the key features/characteristics of D&B procurement approach in the Malaysian construction

Table 4.7: Frequency of expert's responses in Delphi round two in respect to identifying the features/characteristics of D&B procurement approach in the Malaysian construction industry

	FREQUENCY OF EXPERTS RESPONSE				
FEATURE/ CHARACTERISTIC OF D&B SYSTEM	STRONGLY AGREE	AGREE	UNSURE/ UNCERTAIN	DISAGREE	STRONGLY DISAGREE
Single point responsibility	6	1	0	0	0
Compressed delivery schedule	1	6	0	0	0
Fair allocation of risk	1	6	0	0	0
Suitable for complex projects	7	0	0	0	0
Enhanced communication	2	5	0	0	0
Facilitates use of latest innovative technologies	6	0	1	0	0
Effective client representation	1	5	1	0	0

Below are the graphical representations and discussions of the expert's response from the Delphi round two regarding identifying the features/characteristics of D&B procurement approach in the Malaysian construction industry.

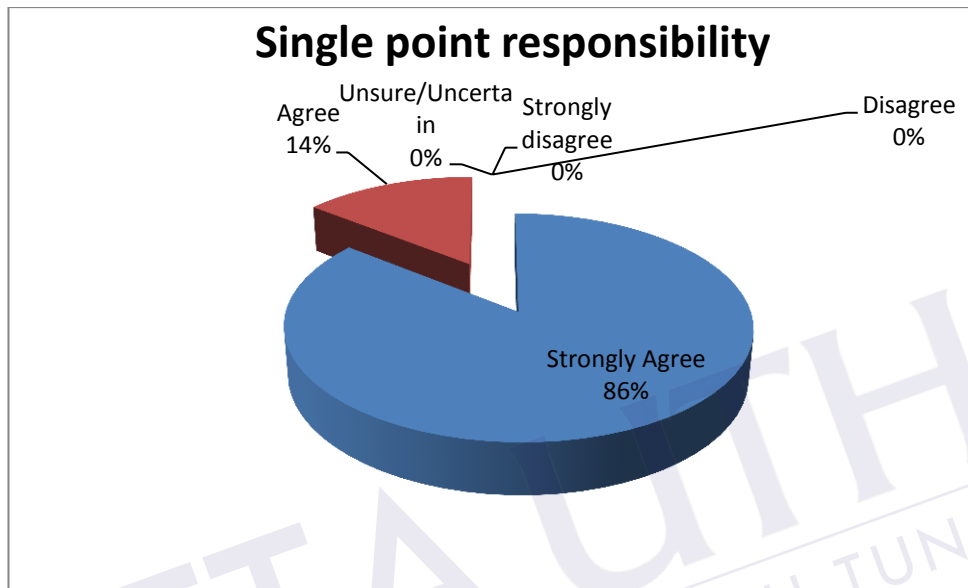


Fig 4.1: Graphical representation of single point responsibility as a feature of D&B procurement approach in the Malaysian construction industry.

#### **Feature/characteristic of D&B procurement approach 1: Single point responsibility**

From the responses obtained in the second round Delphi survey, it showed that the majority, which is 80% of the respondents, *strongly agreed* that single point responsibility is a feature/characteristic of D&B procurement approach in the Malaysian construction industry, while 14% *agreed*. The majority acceptance of the single point responsibility to be a feature of the system in the industry, where it was overwhelmingly strongly agreed, This is consistent to the underlying principle which the procurement approach is based on, where the client enters into a contract directly

with the D&B contractor, and the contractual position of the project lies solely between the client and the contractor (Seng et al., 2006).

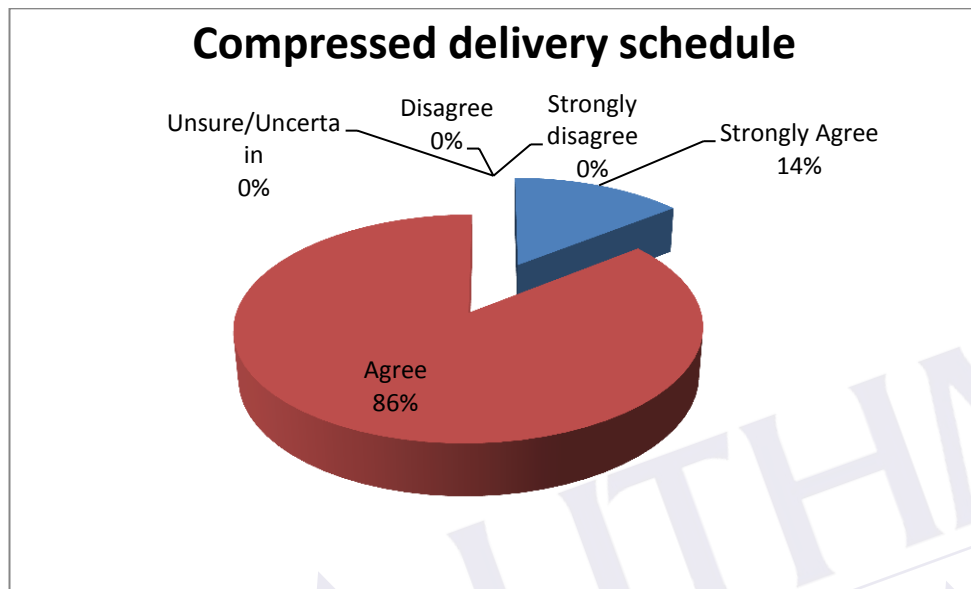


Fig 4.2: Graphical representation of compressed delivery schedule as a feature of D&B procurement approach in the Malaysian construction industry.

#### **Feature/characteristic of D&B procurement approach 2: Compressed delivery schedule**

From the survey conducted, it showed that 86% of the respondents *agreed* to compressed delivery schedule as being a feature/characteristic of D&B procurement approach in the Malaysian construction industry, while 14% *strongly agreed*. This response showed that the overwhelming majority of the respondents have agreed, but not strongly, to the fact that compressed delivery schedule is a feature/characteristic of D&B procurement approach in the Malaysian construction industry. Hence, this reflects that the D&B practice in Malaysia is not able to achieve a highly compressed project delivery schedule currently. Generally, this is achieved due to the fact that the actual work on site could be started while the project designs are still on progress, which thereby enables the completion of the project within a shorter time frame

(Abdulrashid, 2002) and (Masterman, 2002). This implies that the project design and site work progress is not well managed currently to enable compressed schedule as is originally intended through the use of D&B procurement approach.

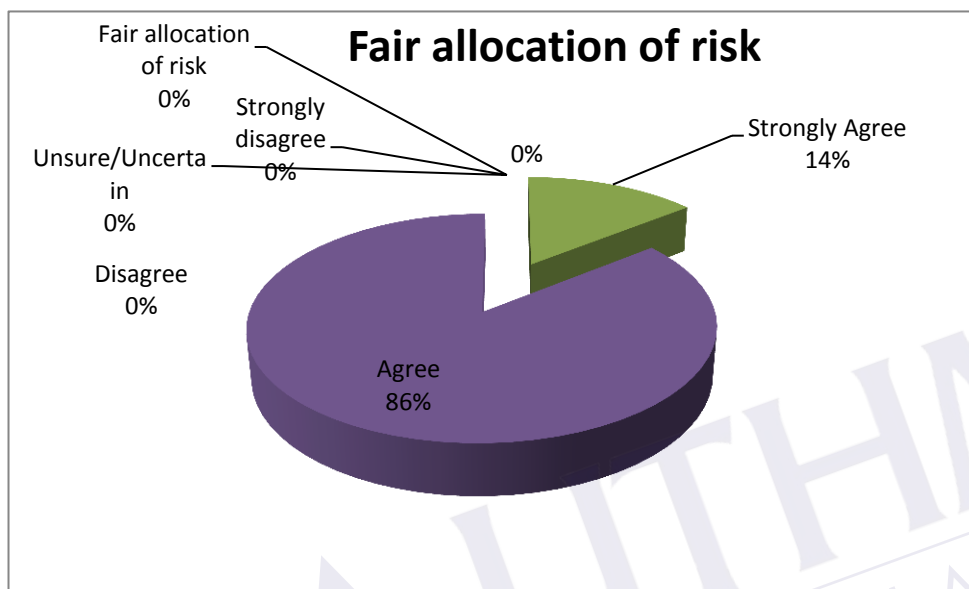


Fig 4.3: Graphical representation of fair allocation of risk as a feature of D&B procurement approach in the Malaysian construction industry.

### Feature/characteristic of D&B procurement approach 3: Fair allocation of risk

The responses from the survey showed an overwhelming agreement to fair allocation of risk being a characteristic/feature of D&B in the Malaysian construction industry, where 86% of the respondents *agreed* to that fact and 14% *strongly agreed*.

This finding has tallied with that of Muhammad (2005) and Abdul Rashid (2002) where they considered D&B as a procurement approach which allocates to the contractor, risks that are associated to the project more than any other procurement system. The risk allocation nature of the system is attributed to the single point responsibility nature of the procurement approach, where the contractor is known to be generally responsible for all the aspects of the project, ranging from

the designs to the construction and ultimately to ensuring that the built facility complies with the set quality requirements and also serves the intended purpose it is meant for. However, the low response in terms of ‘strongly agreeing’ implies that there is still avenue to improve on the fairness of risk allocation.

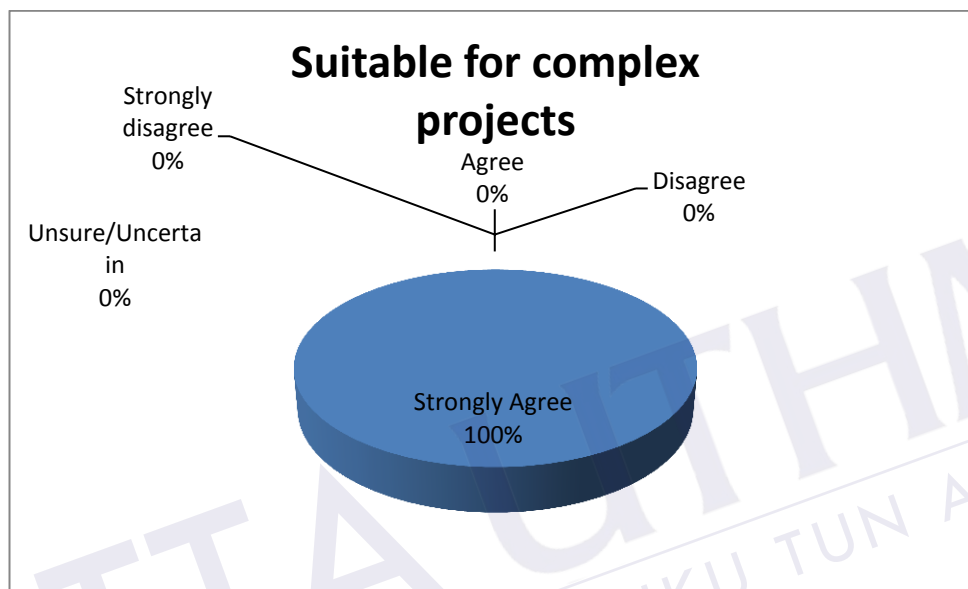


Fig 4.4: Graphical representation of suitable for complex projects as a feature of D&B procurement approach in the Malaysian construction industry.

#### **Feature/characteristic of D&B procurement approach 4: Suitable for complex projects**

Regarding the suitability of D&B procurement approach for use in complex projects, the survey showed that all the respondents strongly agreed to that fact. This response showed that it is generally agreed that D&B as a procurement approach is most suited for use projects that are complex in nature. This fact was attested by Abdul Rashid (2002) where he attributed the increasing adoption of the procurement approach in the Malaysian construction industry to the increasingly complex nature of today's construction projects, which thereby the procurement approach serves as

the best option to solve the increasingly complex needs and requirements of today's clients.

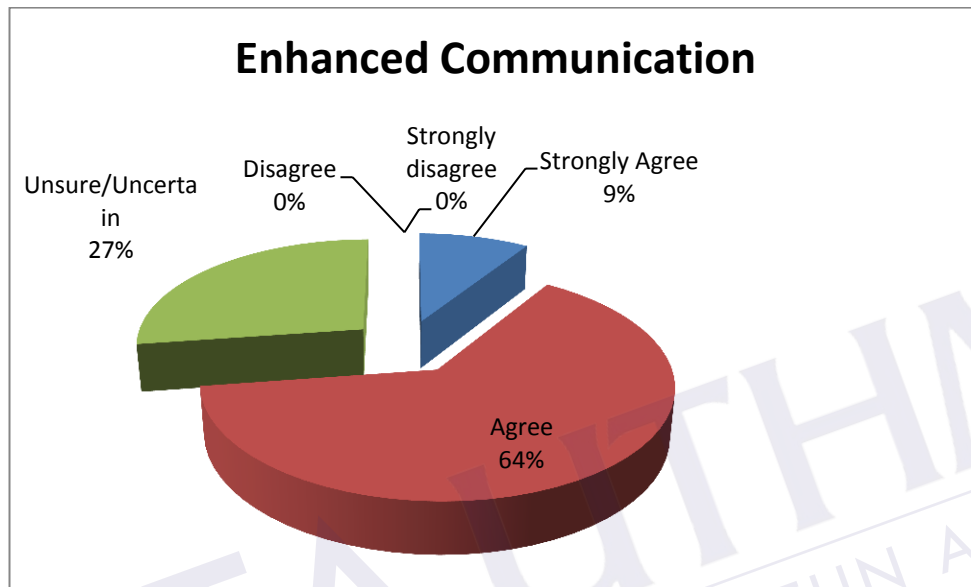


Fig 4.5: Graphical representation of enhanced communication as a feature of D&B procurement approach in the Malaysian construction industry.

#### **Feature/characteristic of D&B procurement approach 5: Enhanced communication**

The survey conducted indicated that 64% of the respondents agreed and 9% strongly agreed enhanced communication to be a feature/characteristic of D&B procurement approach, while 27% of the respondents were unsure/uncertain regarding enhanced communication being a feature/characteristic of D&B procurement approach in the Malaysian construction industry.

A majority agreement of the respondents to this feature is in line with that identified by (Seng & Yusuf 2006), as the D&B procurement approach offers the



client and the contractor the opportunity to have closer interaction than in the case of traditional system. Hence, in a relative sense, the D&B procurement approach as practised in Malaysia does indicate that it serves to enhance communication this goes a long way in enhancing the relationship that exists between the two parties, which in turn enables mutual understanding between the project parties and ultimately ensuring the achievement of the project set goals.

However, this fact is not agreed by all of the respondents, as 27% of the respondents were unsure/uncertain regarding the feature being one of the features/characteristics of the procurement approach in the Malaysian construction industry.

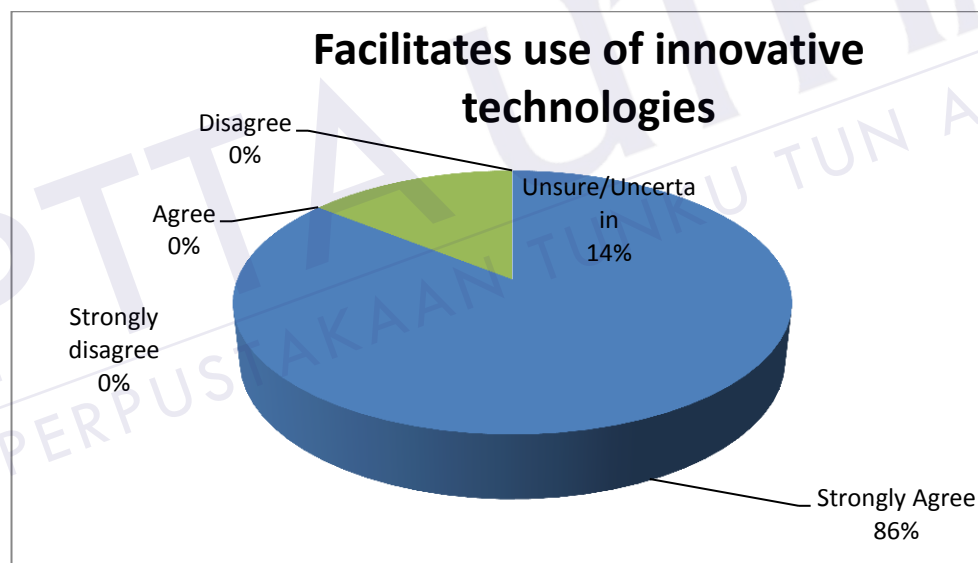


Fig 4.6: Graphical representation of facilitates use of innovative technologies as a feature of D&B procurement approach in the Malaysian construction industry.

### **Feature/characteristic of D&B procurement approach 6: Facilitates use of latest innovative technologies**

Regarding the D&B procurement approach characteristic/feature of facilitating the use of innovative technologies, 86% of the respondents *strongly agreed*, while 14 % of them were *unsure/uncertain* on the fact that the feature is one of the characteristics/features of D&B procurement approach in the Malaysian construction industry.

This strong acceptance of this feature could be related to one of the main advantages that the system offers, as identified by Songer and Molenaar (1996) with regards to constructability/innovation. The D&B procurement approach encourages the early involvement of the client in the design process, thereby giving the contractor the opportunity of adopting the most suitable construction method that would offer the most effective solution to the construction needs of the client. Furthermore, the use of latest innovative technologies in D&B could be as a result of the compressed delivery nature of the procurement approach, where work progresses as the designs are being completed, thereby also resulting in the completion of the project within a shorter time frame (Masterman, 2002; Abdul Rashid, 2002). This cannot be achieved unless with the adoption of latest building techniques, which enables faster delivery of projects. Latest technological processes that are commonly adopted to achieve the faster delivery includes the adoption of industrialized building systems and the use of latest project management techniques.

It is worth noting, as shown in Figure 4.8 above representation, that this view is still not held by all of the respondents, as a minority of them were still unsure/uncertain as to whether D&B procurement approach enhances the adoption of latest innovative technologies.

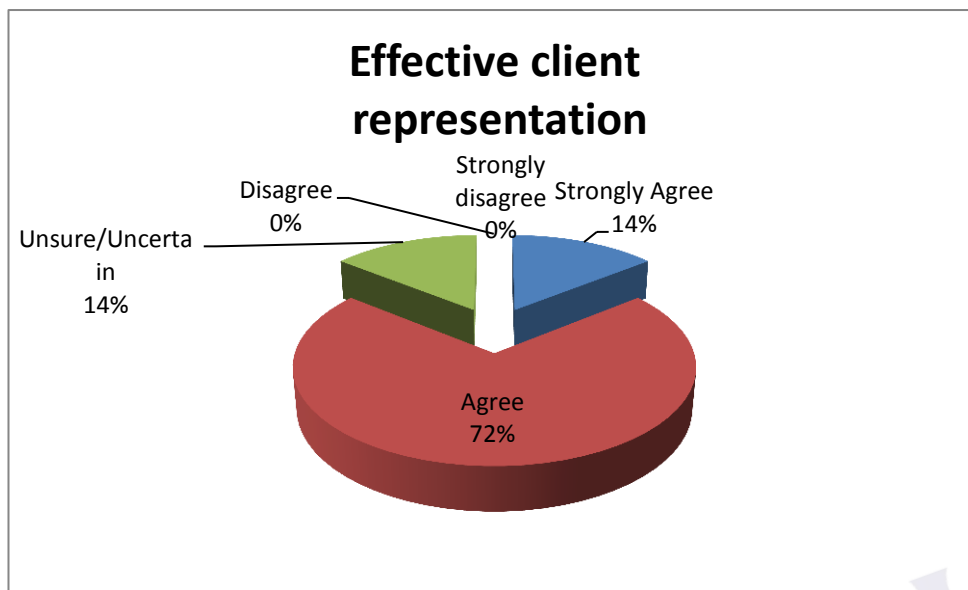


Fig 4.7: Graphical representation of effective client representation as a feature of D&B procurement approach in the Malaysian construction industry.

#### **Feature/characteristic of D&B procurement approach 7: Effective client representation**

The survey showed that 72% of the respondents *agreed* while 14% *strongly agreed* and also 14% were unsure/uncertain regarding considering effective client representation as a feature/characteristic of D&B procurement approach in the Malaysian construction industry.

This response, where it indicates the majority agreeing to this fact is obviously related to the important role that the client representative plays towards ensuring the effective management of D&B projects. The client's representative is known to play an active role from the project inception to its completion, the client representative has the responsibility of guiding the client towards developing his needs, liaising with the contractor in the development of the concept designs and outline specifications, and then subsequently administering the project execution in order to ensure the achievement of the client's objectives as regards to the project (Ndekugri & Turner 1994).

However, noting that the strongly agreed portion is only 14%, it is an indicator that this feature is still not a strong characteristic of the Malaysian client in the D&B procured projects. Therefore, this identifies the necessity to improve on effective client representation towards achieving successful D&B projects.

#### 4.2.2.2 Ranking of the features/characteristics of D&B procurement approach

The rankings that were provided by the Delphi respondents using the five point Likert scaling were combined and then converted into relative importance indices for each of the features/characteristics, by adopting the relative importance index (RII) ranking technique.

$$RII = \frac{\sum W}{A \times N} \quad (4.1)$$

Where W: Summation of the weighting to each feature/characteristic

A: Highest ranking (5)

N: Total number of respondents for that factor

Table 4.8: Ranking of the features/characteristics of D&amp;B procurement approach

<b>Characteristics/Features of D&amp;B procurement approach</b>	<b>Relative Importance Index (RII)</b>	<b>Ranking</b>
Suitable for complex projects	1.00	1
Single point responsibility	0.97	2
Facilitates use of latest innovative technologies	0.94	3
Fit for purpose	0.91	4
Price certainty	0.89	5
Enhanced communication	0.86	6
Compressed delivery schedule	0.83	7
Fair allocation of risk	0.83	7
Effective client representation	0.80	8

From Table 4.8 above, which displays the ranking of the characteristics/features of the D&B procurement approach, it shows that the characteristic/feature of the system ‘‘ Suitable for complex projects’’ is the feature with the highest RII and consequently the first in ranking. This ranking is a clear attestation to the fact identified by Abdul Rashid (2002) where he relates the growing adoption of D&B as a project delivery system in the Malaysian construction industry to the nature of today’s construction projects, which are becoming complex in nature and also the concern of clients to have project delivery systems that attends to their complex needs and requirements,

This feature is being followed by ‘single point responsibility’ in the second position, and ‘facilitates the use of latest technologies’ in the third position; fit for purpose in the fourth; the fifth in ranking is ‘price certainty’; ‘enhanced communication’ is the sixth; while ‘compressed delivery schedule’ and ‘fair

allocation of risk' are both tied at the seventh position. Then the last ranking feature/characteristic that is 'effective client representation' which occupies the eight position. Hence, accordingly these last two ranking features, that is 'compressed delivery schedule' and 'fair allocation of risk' which are both in the seventh position and 'effective client representation' in the eight position are regarded as the least prominent features/characteristics of the D&B procurement approach in the Malaysian construction industry.

#### **4.2.2.3 Results of the two round Delphi survey conducted to determine the factors that are impeding and then enabling the D&B contractors in achieving client's specific expectations in using D&B procurement for building projects in Malaysia**

This section comprehensively provides the results of the analysis of data obtained from the Delphi Survey aimed at determining the factors that are 'impeding' as well as the factors that are 'enabling' D&B contractors in achieving client's specific expectations.

**Note:** Refer to appendix 1 for the above results.

#### 4.2.2.4 Discussion on the impeding and enabling factors to the achievement of client's specific expectations identified from round two Delphi survey

From the results shown, analyses were conducted, where the impeding and the enabling factors were determined by categorizing them in terms of their frequency ratings by the respondents in the second round Delphi survey. Based on this final feedback, an agreed list of the factors that impedes and also enables the achievement of the client's specific expectations in the Malaysian construction industry with their corresponding ratings was achieved, where these impeding and enabling factors were categorized into highly impeding and impeding and also highly enabling and enabling, in accordance to the responses that were provided by the respondents. This categorization was based on the majority of where the responses provided lies in accordance to the Likert scale adopted in the survey.

Below are the summary of the impeding and enabling factors for the achievement of the client's specific expectations.

#### 4.2.2.5 Summary of Impeding Factors for Achievement of Client's Specific Expectation

##### Client Expectation 1: Established Cost

**Definition:** "Established cost" means securing a project cost before the start of detailed design.

From the Delphi round two survey conducted, a summary is made based on the factors that were identified in the survey; therefore, the impeding and enabling factors to the achievement of this expectation can be summarized into the following:

Table 4.9: Impeding and enabling factors to the achievement of client expectation 1:  
Established cost

<b>IMPEDING FACTORS</b>
<b>Highly impeding factors</b>
<ul style="list-style-type: none"> <li>- Initiation of variations</li> <li>- Unfavourable economic condition</li> </ul>
<b>Impeding factors</b>
<ul style="list-style-type: none"> <li>- Lack of client's clear scope</li> <li>- High cost of materials</li> <li>- Lack of complete working details before the start of the project</li> <li>- Unavailability of materials locally</li> <li>- Lack of adequate funding</li> <li>- Obtaining authorities approvals</li> </ul>
<b>ENABLING FACTORS</b>
<b>Highly enabling factors</b>
<ul style="list-style-type: none"> <li>- Established requirements and needs of clients</li> <li>- Experienced Contractor in D&amp;B</li> <li>- The contractor's familiarity of the construction industry</li> <li>- Well defined project scope</li> <li>- Adequate funding covering total project cost</li> </ul>
<b>Enabling factors</b>
<ul style="list-style-type: none"> <li>- Fair profit margin</li> <li>- Complete working drawings before the start of the project</li> <li>- Stable prices of materials</li> </ul>



The client expectation” *Established cost*” is defined as securing a project cost before the start of detailed design. Therefore with these factors put into consideration by the parties involved in the D&B project, it is expected for this expectation to be achieved.

In order for the expectation to be achieved, the parties to the D&B are required to work towards improving the enabling factors and reducing the impact of the impeding factors. With this strategy considered, the D&B project therefore stands the chance of having a stipulated guaranteed maximum price, thereby giving the D&B client a reliable figure for the expected project cost at the initiation of the project itself. Hence, this gives the client an advantage and better alternative than what is being obtained in the other procurement systems, most notably the traditional procurement approach (Ndekugri & Turner 1994).

#### **Client Expectation 2: Reduced Cost**

**Definition:** ‘*Reduced cost*’ means decreasing the overall project cost as compared to other procurement approaches.

The identified impeding and enabling factors to the achievement of this expectation based on the Delphi survey can be summarized into the following:

Table 4.10: Impeding and enabling factors to the achievement of client expectation 2:  
Reduced cost

<b>IMPEDING FACTORS</b>
<b>Highly impeding factors</b>
<ul style="list-style-type: none"> <li>- Inexperienced contractor in D&amp;B</li> <li>- The nature of tendering adopted in the industry, where direct negotiation is widely used to open tender</li> <li>- Increase in the cost of materials</li> </ul>
<b>Impeding factors</b>
<ul style="list-style-type: none"> <li>- Unclear client's needs</li> <li>- Contractor's single point responsibility</li> <li>- Initiation of variations by client</li> </ul>
<b>ENABLING FACTORS</b>
<b>Highly enabling factors</b>
<ul style="list-style-type: none"> <li>- Experienced Contractor in D&amp;B</li> <li>- Contractor's effective networking in the industry</li> <li>- Early procurement of materials</li> <li>- Adoption of more effective construction techniques</li> </ul>
<b>Enabling factors</b>
<ul style="list-style-type: none"> <li>- Adoption of value management techniques</li> <li>- The contractor's adoption of effective project management techniques</li> <li>- Experienced client representative</li> </ul>

The client expectation ‘*Reduced cost*’ means decreased overall project cost as compared to other procurement approaches.

Clients in any construction project are always seeking for reduced costs. Therefore this identifies the need to consider those factors that would enable the client to achieve this advantage. As Gransberg et al, (2006) identified that the D&B is such a procurement approach which offers the client the opportunity of having his project completed cheaper and also within budget than what could be achieved in other alternative procurement approaches. In view of this advantage that the procurement approach offers, by the parties to a D&B project adopting and putting in place these identified factors; and by negating the chances of the impeding factors coming up in the project, the client stands the chance of benefitting from the reduced cost advantage that is inherent in the D&B procurement approach.

### **Client Expectation 3: Established schedule**

**Definition:** ‘*Establish schedule*’ means securing a project schedule before the start of detailed design

The impeding and enabling factors to the achievement of this expectation can be summarized into the following:

Table 4.11: Impeding and enabling factors to the achievement of client expectation 3:  
Established schedule

<b>IMPEDING FACTORS</b>	
<b>Highly impeding factors</b>	
<ul style="list-style-type: none"> <li>- Lack of adequate information about the site condition prior to the start of the project</li> <li>- Delay in obtaining approvals from the authorities</li> <li>- Non-committal attitude of the workers</li> <li>- Initiation of variations by the client</li> </ul>	
<b>Impeding factors</b>	
<ul style="list-style-type: none"> <li>- Lack of effective co-ordination between the project contractors and the consultants</li> <li>- Changes in climatic conditions</li> </ul>	
<b>ENABLING FACTORS</b>	
<b>Highly enabling factors</b>	
<ul style="list-style-type: none"> <li>- Competent Project Planner</li> <li>- Experienced D&amp;B team</li> <li>- Experienced contractor's project manager</li> <li>- Availability of the necessary resources, i.e. money, plants, materials, manpower</li> </ul>	
<b>Enabling factors</b>	
<ul style="list-style-type: none"> <li>- Favourable climatic conditions</li> <li>- Established/constant number of workers on site</li> <li>- Absence of any site encumbrances</li> <li>- Client's clear project scope</li> </ul>	

The client's expectation 'Established schedule' is being described as securing a project schedule before the start of detailed design. According to Songer and Molenaar (1996), clients do select D&B as their procurement approach of choice because it offers them the advantage of giving them an idea of the expected schedule of the project much earlier before the project is being initiated. And this advantage that the procurement approach offers is as a result of its single point responsibility nature, which thereby as a result minimizes the problems associated with communication problems which is inherent in the traditional procurement approach.

So thereby, for the parties to a D&B project to benefit from this initiative, they should work on prioritizing the enabling factors and then minimizing these impeding factors identified above, with these, it is expected that the D&B project stands the chance of catering for the needs of the client and consequently becoming a success.

#### **Client Expectation 4: Shortened Duration**

**Definition:** 'Shortened duration' means decreasing the overall project completion time as compared to other procurement approaches.

The impeding and enabling factors to the achievement of this expectation can be summarized into the following:

Table 4.12: Impeding and enabling factors to the achievement of client expectation 4:  
Shortened duration

<b>IMPEDING FACTORS</b>
<b>Highly impeding factors</b>
<ul style="list-style-type: none"> <li>- Inexperienced contractor</li> </ul>
<b>Impeding factors</b>
<ul style="list-style-type: none"> <li>- Lack of adoption of latest construction techniques</li> <li>- Delay in obtaining approvals from the relevant authorities</li> <li>- Delay in the approval of materials by the client</li> </ul>
<b>ENABLING FACTORS</b>
<b>Highly enabling factors</b>
<ul style="list-style-type: none"> <li>- Clear project scope</li> <li>- Absence of labour disputes</li> </ul>
<b>Enabling factors</b>
<ul style="list-style-type: none"> <li>- Adoption of latest construction techniques</li> <li>- Constant supply of materials</li> </ul>

“*Shortened duration*” means decreasing the overall project completion time as compared to other procurement methods. According to Levy (2006) and Gransberg et al., (2006), D&B procurement approach offers the client the opportunity of having his project completed within a shorter time frame than what could be obtained in the other procurement approaches, most notably the traditional procurement approach..

So therefore, for the client to benefit from this advantage that the procurement approach offers, there is the need for the parties to the project to consider these impeding and enabling factors to the achievement of this client expectation. It is expected that with this, the much needed shortened duration in the D&B project could be achieved.

#### **Client Expectation No 5: *Reduced claims***

**Definition:** ‘‘ *Reduced claims*’’ in terms of decreased litigation due to separate design and construction entities.

The impeding and enabling factors to the achievement of this expectation can be summarized into the following:

Table 4.13: Impeding and enabling factors to the achievement of client expectation 5: Reduced claims

<b>IMPEDING FACTORS</b>
<b>Highly impeding factors</b>
<ul style="list-style-type: none"> <li>- Lack of an experienced Quantity surveyor</li> <li>- Initiation of variations by the client</li> <li>- Lack of effective communication between project participants</li> <li>- Lack of complete working drawings before the start of the project</li> </ul>
<b>ENABLING FACTORS</b>
<b>Highly enabling factors</b>
<ul style="list-style-type: none"> <li>- Sharing of contractor’s responsibility</li> <li>- Experienced contractor</li> </ul>
<b>Enabling factors</b>
<ul style="list-style-type: none"> <li>- Prompt payments by the client</li> <li>- Ensure the commencement of works with complete working drawings and details.</li> </ul>

The term ‘ ‘ Reduced claims’ ’ in respect of D&B procurement approach means decreased litigation due to separate design and construction entities that exists in the procurement approach. As Ndekugri & Turner (1994) identified, D&B procurement approach offers the client the advantage of having fewer disputes which could result to litigation or other dispute resolution matters. But then, for this advantage that the system offers to be utilized, there is the need for these parties to the D&B project to adopt these impeding and enabling factors identified by ensuring that these enabling factors are effectively considered and implemented and the impeding factors are being effectively discouraged from occurring, so thereby with this, it is expected that a litigation free and consequently successful D&B project could be achieved.

#### **Client Expectation 6: Quality**

**Definition:** ‘ ‘*Quality*’ ’ means achieving a finished project that is of high technical standards.

The impeding and enabling factors to the achievement of this expectation can be summarized into the following:





Table 4.14: Impeding and enabling factors to the achievement of client expectation 6: Quality

<b>IMPEDING FACTORS</b>	
<b>Impeding factors</b>	
<ul style="list-style-type: none"> <li>- Lack of effective client supervision</li> <li>- The contractor's lack of effective project management techniques</li> <li>- Contractor's lack of adoption of quality management processes</li> <li>- Inexperienced contractor</li> </ul>	
<b>ENABLING FACTORS</b>	
<b>Highly enabling factors</b>	
<ul style="list-style-type: none"> <li>- Experienced contractor</li> <li>- Use of qualitative and standard building materials</li> <li>- Established contractor's organizational hierarchy</li> <li>- The contractor's use of effective project management techniques</li> </ul>	

Quality in any construction project irrespective of the procurement approach adopted is a very important factor that cannot be ignored, because as identified by Arditi & Gunaydin (1997), quality is the bedrock of any project, as it is being described as meeting the legal, aesthetic and functional requirement of a project. Therefore, in order to achieve the much needed quality function of D&B projects, there is the need for the project participants to consider these identified impeding and enabling factors to the achievement of this client expectation with the view of implementing them, whereby it is the being expected to result to overall improvement of the quality of the completed D&B projects which would thereby satisfy the client's functional and aesthetic requirements regarding the project.

### 4.3 Summary

This chapter presents the results obtained from the Delphi survey and also the findings arising from the analysis conducted which are aimed at achieving the identified research objectives. The sample data characteristics were given which includes the number of the respondents adopted for the Delphi survey, where a total of 11 respondents participated in the survey, these respondents are considered eligible for the survey because of their capabilities in terms of experience and knowledge of the practice of the D&B procurement approach in the Malaysian construction industry, where it was shown the various types of D&B projects that they have handled, which these ranges from civil engineering to building projects, from refurbishment to overall new construction and also the complexities of these projects ranging from less complex to sophisticated and complex D&B projects. In the findings arising from the results obtained in the Delphi survey, it showed that suitability for use in complex projects was considered the highest ranking and also effective client representation the lowest ranking feature/characteristic of the D&B procurement approach in the Malaysian construction industry.

Furthermore, with regards to the factors that are impeding and also enabling the achievement of the client's specific expectations in the Malaysian construction industry, the findings showed that these factors were categorized into highly impeding and impeding and also highly enabling and enabling. This categorization was based on the majority of where the responses provided lies in accordance to the Likert scale adopted in the Delphi survey. It is expected that with the D&B project's stakeholders working towards improving these enabling factors and also negating or minimizing these impeding factors then the practice of the D&B procurement approach will surely improve in the industry and consequently the overall improvement and development of the Malaysian construction industry.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

##### 5.1.1 Introduction

Based on the objectives that the study seeks to achieve and the analysis conducted in this regard, the following conclusions are drawn:

##### **5.1.2 Features / characteristics of D&B procurement approach in the Malaysian construction industry.**

Objective: To identify the key features / characteristics of D&B procurement approach in the Malaysian construction industry.

In the study, seven features/characteristics of the D&B procurement approach in the Malaysian construction industry were identified, where these features/characteristics were further ranked by the use of the relative importance index (RII). The rankings showed that '*suitability for complex projects*' is considered the most important, while '*effective client representation*' is the least important feature/characteristic of the D&B procurement approach with regard to the Malaysian construction industry.

These ranking would enable D&B clients, contractors and other stakeholders to have a clear idea of the features that characterizes the D&B procurement approach in the Malaysian construction industry. This provides the client and contractor a clear rationale for adopting a more robust D&B as their procurement approach of choice for delivering their construction projects, and consequently enhancing the achievement of successful construction projects based on the knowledge that certain characteristics that are key to the D&B procurement practice are currently not achieving their advantage compared to traditional or other procurement practices.

### **5.1.3 Factors impeding the performance of D&B contractors in achieving client's specific expectations in using D&B procurement for building projects in Malaysia.**

Objective: To determine the factors impeding the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.

From the study conducted, thirty two factors were identified to be impeding or serves as a stumbling block towards the achievement of the client's specific expectations based on the adoption of D&B as a procurement approach in the Malaysian construction industry. These impeding factors were categorized into 'highly impeding' and 'impeding' depending on the level of their severity as it affects the achievement of the client's specific expectations in D&B procurement approach.

The study has shown that these impeding factors to the achievement of the stated client's specific expectation could be categorized into the following based on client, contractor related factors and environment related factors. This categorization is aimed at giving the study a more definite and insightful approach into the factors that are regarded as impeding to the achievement of the client's specific expectations as it affects each of the aspects and stakeholders that do play a role in the executioning of the D&B project in the industry, as this was obtained in relevant similar literature such as Belassi (1996), Chan et al., (2001) and Lam et al., (2008). With this, it is

being expected that with these, a more robust approach will be adopted to this study, as it tends to identify these factors that impedes the achievement of the client's specific expectations with regards to the D&B project execution.

### **Client related factors**

The results of the Delphi survey identified the client related Impeding Factors as:

- Initiation of variations by the client;
- lack of client's clear scope;
- Lack of adequate funding;
- Unclear client's needs;
- Delay in the approval of materials by the client;
- Lack of effective client supervision.

### **Contractor related factors**

While the contractor related impeding factors are:

- Inexperienced contractor in D&B;
- lack of complete working details before the start of the project;
- contractor's single point responsibility in the system;
- Lack of adequate information about the site condition prior to the start of the project;
- Non-committal attitude of the workers;
- Lack of effective co-ordination between the project contractors and the consultants;
- Lack of adoption of latest construction techniques;
- Lack of an experienced quantity surveyor;
- The contractor's lack of effective project management techniques;
- The contractor's lack of adoption of quality management processes;

Whilst the **external environment related factors**, which has to do with the government, economy and the physical environment related factors were finalized as:

- Unfavourable economic condition;
- High cost of materials;
- Unavailability of materials locally;
- Delay in obtaining authorities approvals;
- The nature of tendering adopted in the industry; where direct negotiation is widely used to open tender;
- Changes in climatic conditions, but this factor is considered as natural, which is beyond the control of human ability.

It is expected that with the reduction of these impeding factors during the execution of the D&B project, the clients expectations could be achieved and subsequently the delivery of effective and successful D&B projects.

#### **5.1.4 Factors enabling the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.**

Objective: To determine the factors enabling the performance of D&B contractors in achieving client's specific expectations in using D&B procurement approach for building projects in Malaysia.

In the study, thirty five factors were identified as enablers towards achieving the client's specific expectations in using D&B procurement approach for building projects in the Malaysian construction industry. In this case, these factors were identified as highly enabling and enabling depending on their level of their severity.

Also in this aspect, the enabling factors could be client related, contractor related and also related to the external environment as it affects the project. The rationale behind

this adoption is same as that described earlier with respect to the impeding factors to the achievement of the client's specific expectations.

### **Client related factors**

The client related enabling factors includes:

- Established requirements and needs of clients;
- Clear and well defined project scope;
- Adequate funding covering total project cost;
- Experienced client representative;
- Prompt payments by the client.

### **Contractor related factors**

The contractor related enabling factors includes:

- Experienced contractor in D&B;
- The contractor's familiarity of the construction industry;
- Fair profit margin;
- Complete working drawings before the start of the project;
- Early procurement of materials;
- Contractor's effective networking in the industry;
- Adoption of value management techniques;
- The contractor's adoption of effective project management techniques;
- Experienced contractor's project manager;
- Established/constant number of workers on site;
- Adoption of latest construction techniques;
- Sharing of contractor's responsibility;
- Use of qualitative and standard building materials;
- Established contractor's organizational hierarchy.

Furthermore, there exist a factor which is both **client and contractor related**, which is the availability of the necessary resources, i.e. money, plants, materials, manpower.

### **External environment related factors**

The external environment related enabling factors which could be in relation to the government, the economy and the physical environment includes:

- Stable prices of materials;
- Favourable climatic conditions;
- Absence of any site encumbrances;
- Absence of labour disputes.

So thereby, it is expected that with respect to the D&B procurement approach in the Malaysian construction industry, with the improvement of these enabling factors to achieving the client's specific expectations, the clients expectations could be achieved and subsequently the better delivery of D&B projects.

## **5.2 Significance of the study and recommendations**

D&B has been adopted in the Malaysian construction industry for some time now, as the procurement approach is gaining increased popularity in the industry in order to attend to the dissatisfaction of clients in the use of the conventional traditional procurement approach and also to cope with growing complex nature of today's construction projects (Abdul Rashid, 2002; Seng et al., 2006).

Therefore, the study is expected to be of significance to the industry as it is to serve as a clear guideline to the D&B project participants towards guiding them in identifying their expected roles and responsibilities in achieving the client's specific expectations as regards to the D&B procurement approach. This can enable the



optimum utilization of the procurement approach in the industry and consequently the overall improvement of the construction industry in Malaysia.

Furthermore in this regard, recommendations could be made on how the study could be further improved with respect to the D&B procurement approach, as a further study that comprises of a larger Delphi panel would be appropriate. Within this Delphi survey, additionally more insightful views and opinions could be obtained with regards to the practice of the system. And also, a further study would be appropriate to develop a conceptual framework which describes the relationship that exists between these identified characteristics/features of D&B procurement approach, the impeding and enabling factors to the client's specific expectations and then the better practice of the D&B approach in the Malaysian construction industry, which this will surely provide better and more improved views on how these factors could be adopted so as to result to the improved D&B project delivery in the industry, and also additionally, a further study which explores the relationships between the client's specific expectations and other aspects with respect to achieving effective D&B project delivery such as client's satisfaction with regards to the completed D&B project and also the critical success factors (CSF's) of the D&B procurement approach will also be appropriate, as this will provide an opportunity for the relationships that exists between these aspects to be effectively utilized, then lastly, as this study was conducted based on the Malaysian construction industry, further research should be conducted in other geographical locations to determine their differences and similarities for comparisons, which this would go a long way in enhancing the use of the D&B procurement approach in the construction industry globally.

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## APPENDICES



PTTA UTHM  
PERPUSTAKAAN TUNKU TUN AMINAH

APPENDIX 1: Results of the two round Delphi survey conducted to determine the factors that are impeding and then enabling the D&B contractors in achieving the client's specific expectations in using D&B procurement approach for building projects in Malaysia

**Client Expectation 1: Established Cost**

**Definition:** ‘*Establish cost early*’ means securing a project cost before the start of detailed design

**IMPEDING FACTORS**

No.	Impeding Factors	Delphi Round	Frequency				
			Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Lack of client's clear scope	1 <sup>st</sup> Round	1	1	0	0	0
		2 <sup>nd</sup> Round	3	4	0	0	0
2	High cost of materials	1 <sup>st</sup> Round	0	2	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
3	Lack of complete working drawings before the start of the project	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	4	3	0	0
4	Unavailability of materials locally	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	5	1	0	0
5	Lack of adequate funding	1 <sup>st</sup> Round	1	1	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
6	Initiation of variations	1 <sup>st</sup> Round	2	0	0	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0
7	Unfavourable economic condition	1 <sup>st</sup> Round	4	0	0	1	0
		2 <sup>nd</sup> Round	5	1	0	1	0
8	Obtaining authorities approval	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	4	1	0	0

### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling	Enabling	Moderately Enabling	Mildly Enabling	Less Enabling
1	Established requirements and needs of clients	1 <sup>st</sup> Round	1	0	1	0	0
		2 <sup>nd</sup> Round	5	1	1	0	0
2	Fair profit margin	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	7	0	0	0
3	Adequate funding covering total project cost	1 <sup>st</sup> Round	1	2	0	0	0
		2 <sup>nd</sup> Round	5	1	1	0	0
4	Experienced Contractor in D&B	1 <sup>st</sup> Round	2	3	1	0	0
		2 <sup>nd</sup> Round	4	3	0	0	0
5	Complete working drawings before the start of the project	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	1	4	0	2	0
6	The contractor's familiarity of the construction industry	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	4	3	0	0	0
7	Well defined project scope	1 <sup>st</sup> Round	3	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
8	Stable prices of materials	1 <sup>st</sup> Round	0	4	0	0	0
		2 <sup>nd</sup> Round	0	7	0	0	0

### Client Expectation 2: Reduced Cost

**Definition:** ‘‘Reduced cost’’ means decreasing the overall project cost as compared to other procurement methods

### IMPEDING FACTORS

No.	Impeding Factors	Delphi Round	Frequency				
			Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Inexperienced contractor in D&B	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	The nature of tendering adopted in the industry, where direct negotiation is widely used to open tender	1 <sup>st</sup> Round	1	0	0	1	0
		2 <sup>nd</sup> Round	5	1	0	1	0
3	Unclear client's needs	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	4	3	0	0
4	Increase in the cost of materials	1 <sup>st</sup> Round	4	2	3	2	0
		2 <sup>nd</sup> Round	4	3	0	0	0
5	Contractor's single point responsibility	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	5	0	0	0
6	Initiation of variations	1 <sup>st</sup> Round	2	4	1	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0

### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling	Enabling	Moderately Enabling	Mildly Enabling	Less Enabling
1	Experienced Contractor in D&B	1 <sup>st</sup> Round	2	1	0	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0
2	Adoption of value management techniques	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	4	0	1	0
3	The contractor's adoption of effective project management techniques	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	4	1	0	0
4	Experienced client representative	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	4	1	0	0
5	Contractor's effective networking in the industry	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
6	Early procurement of materials	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
7	Adoption of more effective construction techniques	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0

### Client Expectation 3: Established Schedule

**Definition:** ‘Established schedule’ means securing a project schedule before the start of a detailed design

#### IMPEDING FACTORS

			Frequency				
No.	Impeding Factors	Delphi Round	Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Lack of adequate information about the site condition prior to the start of the project	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	Delay in obtaining approvals from the authorities	1 <sup>st</sup> Round	4	2	0	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0
3	Non-committal attitude of the workers	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0
4	Initiation of variations by the client	1 <sup>st</sup> Round	1	1	1	2	0
		2 <sup>nd</sup> Round	5	2	0	0	0
5	Lack of effective co-ordination between the project contractors and the consultants	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	4	1	0	0
6	Changes in climatic conditions	1 <sup>st</sup> Round	0	1	1	0	0
		2 <sup>nd</sup> Round	0	4	3	0	0

### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling	Enabling	Moderately Enabling	Mildly Enabling	Less Enabling
1	Competent Project Planner	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	Experienced D&B team	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	1	0
3	Favourable climatic conditions	1 <sup>st</sup> Round	1	1	0	0	0
		2 <sup>nd</sup> Round	3	4	0	0	0
4	Experienced contractor's project manager	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	4	0	0	0
5	Established/constant number of workers on site	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	3	4	0	0	0
6	Absence of any site encumbrances	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
7	Availability of the necessary resources, i.e. money, plants and materials	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
8	Client's clear project scope	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	5	0	0	0

#### Client Expectation 4: Shortened Duration

**Definition:** ‘‘Shortened duration’’ means decreasing the overall project completion time as compared to other procurement methods.

#### IMPEDING FACTORS

No.	Impeding Factors	Delphi Round	Frequency				
			Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Inexperienced contractor	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	Delay in obtaining approvals from the relevant authorities	1 <sup>st</sup> Round	1	1	1	0	0
		2 <sup>nd</sup> Round	2	5	0	0	0
3	Lack of adoption of latest construction techniques	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
4	Delay in the approval of materials by the client	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	6	1	0	0



### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling Enabling	Enabling	Moderately Enabling	Mildly Enabling	Less
1	Clear project scope	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	Adoption of latest construction techniques	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	7	0	1	0
3	Constant supply of materials	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	2	5	0	0	0
4	Absence of labour disputes	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0

**Client Expectation No 5: *Reduced claims***

**Definition:** “*Reduced claims*” in terms of decreased litigation due to separate design and construction entities.

**IMPEDING FACTORS**

No.	Impeding Factors	Delphi Round	Frequency				
			Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Lack of an experienced Quantity surveyor	1 <sup>st</sup> Round	2	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
2	Initiation of variations by the client	1 <sup>st</sup> Round	1	1	0	0	0
		2 <sup>nd</sup> Round	5	2	0	0	0
3	Lack of effective communication between project participants	1 <sup>st</sup> Round	1	1	0	0	0
		2 <sup>nd</sup> Round	5	2	0	0	0
4	Lack of complete working drawings before the start of the project	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0

### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling	Enabling	Moderately Enabling	Mildly Enabling	Less Enabling
1	Prompt payments by the client	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	3	4	0	0	0
2	Sharing of contractor's responsibility	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	6	1	0	1	0
3	Experienced contractor	1 <sup>st</sup> Round	2	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
4	Ensure the commencement of works with complete working drawings and details	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	3	4	0	0	0

### Client Expectation 6: Quality

**Definition:** ‘‘Quality’’ means achieving a finished project that is of high technical standards.

#### IMPEDING FACTORS

No.	Impeding Factors	Delphi Round	Frequency				
			Highly impeding	Impeding	Moderately Impeding	Mildly Impeding	Less impeding
1	Lack of effective client supervision	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	0	5	2	0	0
2	The contractor's lack of effective project management techniques	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
3	Lack of adoption of quality management processes	1 <sup>st</sup> Round	0	1	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0
4	Inexperienced Contractor	1 <sup>st</sup> Round	0	2	0	0	0
		2 <sup>nd</sup> Round	1	6	0	0	0

### ENABLING FACTORS

No.	Enabling Factors	Delphi Round	Frequency				
			Highly enabling	Enabling	Moderately Enabling	Mildly Enabling	Less Enabling
1	Experienced contractor	1 <sup>st</sup> Round	3	0	0	0	0
		2 <sup>nd</sup> Round	7	4	0	0	0
2	Use of qualitative and standard building materials	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0
3	Established contractor's organizational hierarchy	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	6	1	0	0	0
4	The contractor's use of effective project management techniques	1 <sup>st</sup> Round	1	0	0	0	0
		2 <sup>nd</sup> Round	7	0	0	0	0

## APPENDIX 2: QUESTIONNAIRES

### DELPHI ROUND ONE QUESTIONNAIRE

Dear Respondent

A research is being conducted titled “**The Study of Current Design & Build Procurement approach Practice based on the client’s specific expectations in the Malaysian Construction Industry**”

The aim of the study is to do a “Critical appraisal of the Design&Build (D&B) procurement approach in the Malaysian Construction Industry based on current practice through identifying the impeding and enabling factors to the achievement of the client’s specific expectations” in order to enable the better practice of the D&B procurement approach in the Malaysian construction industry

The research is conducted by Muhammad Mustapha Gambo, a master’s student of the Faculty of Technology Management, Business & Entrepreneurship at Universiti Tun Hussein Onn Malaysia, under the Supervision of Dr Christy Pathrose Gomez.

Attached is a Delphi questionnaire intended for two round Delphi survey for the purpose of identifying the **impeding** and **enabling** factors for the achievement of better D&B practice based on client’s specific expectations. This study can only be undertaken with your co-operation and assistance, and hence your valuable contribution will definitely be acknowledged in the thesis.

It would be appreciated if the questionnaire could be completed within a week so that the data obtained from this round could be analysed in good time and the next improved questionnaire can be distributed for further consensus.

The data obtained from the survey will be treated as **strictly confidential** if required and no reference will be made to companies or persons.

Thank you in advance.

Muhammad Mustapha Gambo

Master by research student, Faculty of Technology Management, Business  
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**NOTE:** Thank you very much for your participation, please kindly return the completed questionnaire by mail to gambomuhammad@yahoo.com.



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**PART A:**

**Please provide details regarding yourself & your organization**

1. Company/Organization

2. How long have you worked in the construction industry?

3. Highest academic qualification?



4. What is your present job position?

5. How long have you been at this present position?

6. Do you have experience in work related to design and build procurement system?

☐

Yes

☐

No

Note: Mark 'X' in the selected box

7. If answer to Question 5, is YES, please identify the different types of Design and Build Projects previously executed e.g. Traditional design and build, Novated Design and Build, Design and Manage.

8. If answer to Question 5 is NO, In your opinion what is your level of knowledge of Design and build procurement project delivery process

☐

Excellent

☐

Good

☐

Fair

☐

Poor

Note: Mark ‘X’ in the selected box

**PART B:**

In this section please state your level of agreement to the list of key features/ characteristics of D&B procurement as well as **list any additional features characteristics.**

Note: Features and characteristics literally means the same, as features means the distinguishing trait or quality; while characteristics means the structure, form, or appearance (Webster’s dictionary 2011).

**Features/Characteristics of D&B procurement approach****Rating**

i) Single Point Responsibility ☐ ☐ ☐ ☐ ☐

Strongly Agree Unsure/ Disagree Strong

Agree Uncertain Disagree

NOTE: Same format was adopted for the other client features/characteristics, which includes Compressed Delivery Schedule, Fair Allocation of Risk, Suitable for Complex Projects, Enhanced Communication, Facilitates Use of Latest Innovative Technologies and lastly Effective Client Representation.

And then, these respondents were further asked to add any additional feature/characteristic that they do consider necessary and also rate them in the likert scaling.



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TABLE 1: A summary of the client's specific expectations in D&B procurement approach from previous research and literature

Client Expectation		Definition
i)	Establish accurate cost early	Secure a project cost before the start of detailed design
ii)	Reduced cost	Decrease the overall project cost as compared to other procurement methods
iii)	Establish a reliable project schedule	Secure a project schedule before the start of detailed Design
iv)	Shortened duration	Decrease the overall project completion time as compared to other procurement methods.
v)	Reduced claims	Decrease litigation due to separate design and construction entities
vi)	Quality	Achieving a finished project that is of relatively high quality standards compared to conventional procurement method.

For each of the client's specific expectations identified in the Table 1 above, name **Three (3) IMPEDING & ENABLING factors** in achieving **each** of the above client expectations in the D&B procurement approach in the Malaysian construction industry, and please rate each of these in order of their severity in the five point Likert Scale provided.

Note:

- a) **IMPEDING** factors are described as factors that prevent, hinder or obstruct contractors from achieving the client's specific expectations in D&B procurement approach.
- b) In the Likert rating, 5 = Highly impeding, 4 = Impeding, 3 = Moderately impeding, 2 = mildly impeding, 1 = Less impeding

Note:

- a) **ENABLING** factors are described as those factors that enable, make feasible or possible for the contractors to achieve the client's specific expectations in D&B procurement approach in the Malaysian construction industry.
- b) In the Likert rating, 5 = Highly enabling, 4 = enabling, 3 = Moderately enabling, 2 = mildly enabling, 1 = Less enabling

i) **Client Expectation No 1: *Established cost***

**Definition:** Establish cost early means securing a project cost before the start of detailed design.

Please identify **Three (3) Impeding factors** to the achievement of **this** client expectation and then rate them according to the Likert scale provided.

An example of these **impeding factors** could be “**excessive changes requested by client**”.

**Impeding Factors**

**Likert Rating**

a)



b)



c)

Please identify **Three (3) Enabling Factors** to the achievement of this client expectation and then rate them.

An example of these **enabling factors** could be “**client’s clear and well defined scope from the project inception**”.

**Enabling Factors**

**Likert Rating**

a)	<input type="text"/>	<input type="text"/>
b)	<input type="text"/>	<input type="text"/>
c)	<input type="text"/>	<input type="text"/>

NOTE: Same format was adopted for the other client’s expectations as identified in table 1, where for each expectation, the respondents were asked to identify three impeding and also enabling factors, and furthermore rate them in accordance to the likert scale provided.

### APPENDIX 3: QUESTIONNAIRES

#### DELPHI ROUND TWO QUESTIONNAIRE

#### **The Study of Current Design & Build Procurement approach Practice based on the client's specific expectations in the Malaysian Construction Industry**

##### **Delphi Round 2 questionnaire**

Name of respondent

Organization

The following is the Delphi round two questionnaire for the study which is aimed at carrying out the ‘Critical appraisal of the Design&Build (D&B) procurement approach in the Malaysian Construction Industry based on current practice through identifying the impeding and enabling factors to the achievement of the client's specific expectations’ in order to enable the better practice of the D&B procurement approach in the Malaysian construction industry.

This 2<sup>nd</sup> round Delphi is intended to provide the opportunity for the ‘experts’ to arrive at a consensus or greater agreement as to the status of the factors. However, this consensus seeking exercise is not meant to be viewed as a form of coercion



towards obtaining agreement, but to provide an opportunity for reflection based on having reconsidered differing opinions and further serious contemplation.

And as stated earlier in the first round Delphi, the data obtained from the survey will be treated as **strictly confidential** if required and no reference will be made to companies or persons.

Thank you for the anticipated co-operation and assistance.

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**NOTE:** Thank you very much for your participation, please kindly return the completed questionnaire by mail to [gambomuhammad@yahoo.com](mailto:gambomuhammad@yahoo.com)



## **PART A**

### **Features/Characteristics of D&B procurement approach**

The following are the *features/ characteristics* of D&B procurement approach that were provided from past research and literature which you rated in the Delphi round one questionnaire.

We would like you to reconsider the ratings , which you have included in the first round by inserting “Y” in the appropriate box for the second round Delphi

#### **Example:**

<b>Single Point Responsibility</b>	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting “Y” in the appropriate category
	Strongly Agree	5	Strongly Agree	Y
	Agree	7	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

### Features/Characteristics of D&B procurement approach 1: Single Point

#### Responsibility

Single Point Responsibility	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	6	Strongly Agree	
	Agree	4	Agree	
	Unsure/uncertain	1	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

### Features/Characteristics of D&B procurement approach 2: Compressed delivery schedule

Compressed Delivery Schedule	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	1	Strongly Agree	
	Agree	9	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	1	Disagree	
	Strongly disagree	0	Strongly disagree	

### Features/Characteristics of D&B procurement approach 3: Fair Allocation of Risk

Fair Allocation of Risk	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	3	Strongly Agree	
	Agree	8	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

### Features/Characteristics of D&B procurement approach 4: Suitable for Complex Projects

Suitable for Complex Projects	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	10	Strongly Agree	
	Agree	0	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	1	Disagree	
	Strongly disagree	0	Strongly disagree	

**Features/Characteristics of D&B procurement approach 5: Enhanced Communication**

<b>Enhanced Communication</b>	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	1	Strongly Agree	
	Agree	7	Agree	
	Unsure/uncertain	3	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

**Features/Characteristics of D&B procurement approach 6: Facilitates Use of Latest Innovative Technologies**

<b>Facilitates Use of Latest Innovative Technologies</b>	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting "Y" in the appropriate category
	Strongly Agree	11	Strongly Agree	
	Agree	0	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

**Features/Characteristics of D&B procurement approach 7: Effective Client Representation**

<b>Effective Client Representation</b>	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting “Y” in the appropriate category
	Strongly Agree	4	Strongly Agree	
	Agree	7	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

**Features/characteristics of D&B procurement approach provided by the respondents**

<b>Fit for purpose</b>	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting “Y” in the appropriate category
	Strongly Agree	1	Strongly Agree	
	Agree	0	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

Price certainty	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting ‘Y’ in the appropriate category
	Strongly Agree	1	Strongly Agree	
	Agree	0	Agree	
	Unsure/uncertain	0	Unsure/uncertain	
	Disagree	0	Disagree	
	Strongly disagree	0	Strongly disagree	

## **PART B**

The following are the *impeding and enabling factors* to the achievement of the client’s specific expectations in D&B procurement approach which you have provided and rated in the Delphi round one questionnaire.

We would like you to reconsider the ratings of factors, which you have included in the first round by inserting “Y” in the appropriate box for the second round Delphi.

**Below is an example:**

Lack of client’s clear scope	Delphi 1 <sup>st</sup> round (completed)		Delphi 2 <sup>nd</sup> round (current)	
	Rating category	Frequency of experts response (based on 1 <sup>st</sup> round Delphi)	Rating category	Experts response by inserting ‘Y’ in the appropriate category
	Highly impeding	4	Highly impeding	Y
	Impeding	3	Impeding	
	Moderately impeding	0	Moderately impeding	
	Mildly impeding	0	Mildly impeding	
	Less impeding	0	Less impeding	

NOTE: Same format was adopted for all the impeding and enabling factors, with the results of the Delphi round one shown in appendix 1 (the results of the Delphi surveys).

## APPENDIX 4: VITA

The author was born in May 5, 1983, in Kano, Nigeria. He went to Kano Capital School for his primary school education and then St. Thomas Secondary School for his secondary school education. He pursued his degree at the Ahmadu Bello University, Zaria, Nigeria, and graduated with a B.Sc. in Quantity Surveying in 2006. Upon graduation, he practiced with a Quantity Survey/ Project Management consultancy for two years before enrolling for his master's program in Property and Facilities Management in Universiti Tun Hussein Onn Malaysia in 2009. During the period of his master's program, he was a beneficiary of the prestigious Universiti Tun Hussein Onn Malaysia Scholarship for International students and furthermore he presented 3 conferences papers and also attended various courses/seminars on research methodology, Design and Build procurement approach; health, safety and environment and other aspects of the construction industry.



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## APPENDIX 5: PUBLICATIONS

- Gambo M.M. and Gomez C.P ‘’ The Study of the Current Design and Build Procurement System Practice in the Malaysian Construction Industry’’

Presented at International Conference on Engineering, Science and Humanity (IGCESH 2010), November 2010, UTM, Skudai, Johor, Malaysia

- Aliyu A.A, Kasim R. Martin, D and Gambo M.M ‘’ A Research Design and Methodology to Determine the Impact of Violent Ethno-Religious Conflicts on Residential Property Value Determination in Jos Metropolis of Northern Nigeria.

Presented at Post Graduate Seminar (PGS 2010), November 2010, UTHM, Batu Pahat, Johor, Malaysia

- Gambo M.M. and Gomez C.P ‘’A Study of the Critical Success Factors of the Design and Build Procurement System’’Presented at International Conference on Built Environment in Developing Countries (ICDEBC 2010), December 2010, USM, Penang, Malaysia.

