

**A STUDY OF THE SUCCESS OF DESIGN AND BUILD
PROCUREMENT METHOD FOR BUILDING
PROJECTS IN SRI LANKA**

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(09/9782)



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Degree of Master of Science in Project Management

Department of Building Economics

University of Moratuwa
Sri Lanka

January 2013

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Dissertation submitted in partial fulfillment of the requirements for the
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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Prof. (Mrs.) C. Weddikkara Date
Dissertation Supervisor

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Last but not least, my thanks also to those who have directly or indirectly gave their helpful advice and comments for the success completion of this dissertation.



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ABSTRACT

A Study of the Success of Design and Build Procurement Method for Building Projects in Sri Lanka


Design and build procurement method is a delivery method in which the design and build contractor is contractually responsible for the design and build. According to Konchar and Sanvido (1998), the design and build procurement system has been shown as a method of efficient delivery and has gained its popularity abroad. However it does not receive the same popularity in the Sri Lankan construction industry because the traditional procurement method has been widely adopted in the Sri Lankan construction industry. This study first conducts a literature review to identify the factor that affects the selection of the design and build procurement method in general and then it gives an overview of the Sri Lankan Construction industry.

In this research, the success of adopting Design and Build procurement method is investigated through analyzing the feedback of project stakeholders in the Construction industry in Sri Lanka by questionnaires. In this study, the surveyed parties include professional from consulting firms and construction firms (contractors) who has handle both private and public sector projects in Sri Lanka. Furthermore, the popularity of the procurement method adopted in Sri Lanka is discussed to gain a better understanding of trends of the construction industry. The characteristics of different Design and Build procurement methods are also introduced and discussed.

Apart from the above objective, this research also provides information for the stakeholders in the construction industry for reviewing and selecting an appropriate procurement method for the up-coming projects respectively.

Keywords: *Design and Build, Procurement, Key success factors*

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LIST OF ABBREVIATIONS

Abbreviation	Description
BOQ	Bill of Quantities
BOT	Build Operate Transfer
D&B	Design and Build
RICS	Royal Institute of Chartered Surveyors
QS	Quantity Surveyor
SL	Sri Lanka



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CHAPTER 1

INTRODUCTION

1.1 Introduction

Increased complexity, uncertainty, and time pressure in construction projects have increased the need for cooperation among different project actors (Anvuur and Kumaraswamy, 2007). Traditionally, relationships are, however, very competitive and adversarial in the construction industry (Cheung et al., 2003), which, to a large extent is due to the customary procurement procedures potentially causing many problems in all stages of the buying process (Eriksson and Laan, 2007). Therefore, procurement procedures are one key improvement areas that can contribute substantially to project success (Cheung et al., 2003, Eriksson, 2007). Effecting a change of procurement procedures is, however, impeded by Employers' habitual behaviour (Laedre et al., 2006). Although procurement procedures need to be tailored to enhance the fulfilment of different project objectives (Cox and Thompson, 1997, Love et al., 1998, Wardani et al., 2006), employers tend to choose those procurement procedures which they have a habit of using, regardless of any differences between projects (Laedre et al., 2006). In order to increase change, it is essential that the Employers make the correct choice in building procurement methods in an increasingly complex market situation, with a wide range of objective criteria and procurement systems available to them. Morledge (1987) has properly described how construction Employers range from experienced Employers who may have their own professional team and an effective procurement method to the inexperienced Employer with a basic or no knowledge of procurement methods and who requires extensive professional advice. Further, Employers are very concerned with regard to certainty of cost, cost limits, time, complexity of design etc.

During the past three decades however, the use and interest in Design-and-Build contracting in the USA and UK has greatly accelerated, as Sell points out (2003).

This has become one of the most significant trends in the design and construction industry. Design-and-Build procurement method has gained attention, because Employers, including government agencies, found it attractive for complex projects. It reduced project time, eliminated major gaps in building a project.

Design-and-Build is a delivery method where one entity or consortium is contractually responsible for both design and construction. According to Konchar and Sanvido (1998), it has been demonstrated as an effective delivery method and gained its popularity in many countries in the world. However, it does not receive the same popularity in the construction industry of the Sri Lanka, which is dominated by the traditional procurement systems.

The Design-and-Build concept, as originally conceived, was based on the concept that a single firm had the in-house staff and expertise to perform all planning, design, and construction tasks. Later, increased interest in the concept had engineers, architects, and conventional contractors seeking to compete with the original Design-and-Build firms to meet the growing interest by owners in the project delivery process. Being the single party responsible for design and construction work, the design-build (D&B) contractor have a better control over the project. Many researchers (Song and Molenaar 1997; 1998; Mo and Ng, 1997; Pearson and Skues, 1999; Leung, 1999) have proposed that if D&B projects are under the control of experienced D& B contractors, D&B projects have better chances of success. Further, the Design-and-Build system is considered to be beneficial to all parties such as employers, architects, engineers and contractors (Gwen Flora, 1998).

The Annual Survey of Construction Industries 2011, conducted by Department of Census & Statistics of Sri Lanka indicated that, the highest contribution to construction activities in Sri Lanka has been made by the building construction sector. Construction had industry accounted for 48.0 % of the total value of work done. The major share of the value of work done of building construction sector has come from the private and public sector.

In Sri Lanka, many construction projects have been implemented using the traditional procurement method over the last decade. But in recent years, Design-and-Build procurement method has become popular in the Sri Lankan construction industry as an alternative to traditional procurement method (Rameezdeen, 2007).

According to research carried out by Rameezdeen and Ratnasabapathy (2006), traditional procurement method is widely adapted from 1970's to 2000's in Sri Lanka. However, disadvantages of using this method were discovered and gained acceptance. . It has been started to seek for the alternative method to solve those problems. The Design-and-Build procurement method is widely used in the public projects initially in the Sri Lankan Construction Industry. The mature of using Design-and-Build procurement has been entered into various private projects recently such as Residential/ Condominium Development Projects, Hotel Development Projects, Entertainment Facility Building, etc.

The aim of this research is to find out whether the Design-and-Build procurement method is successful in Sri Lanka. To understand the success of the Design-and-Build project in Sri Lanka, the factors affect the use of Design-and-Build project should be identified. The reason for the increased of use of Design-and-Build contract method is subjected to discussion in this chapter. The feature of the Design-and-Build should be understood to find out the advantages and disadvantages. Design-and-Build A questionnaire is administered to gather details on the success of the Design-and-Build procurement method in Sri Lanka. To understand the success of the Design-and-Build procurement method, the meaning of success should be identified. The meaning of success may be different to each Employer. It is difficult to measure the success of the project in quantifiable terms, but the goal achieved with the Employer's requirements will be regarded as success of the Design-and-Build project.

1.2 Research Objectives

The main aim of this study is to assess the success of Design-and-Build procurement method in Sri Lanka. This study also provides insights into the factors that influence the adaptation of Design-and-Build method.

A successful procurement method should lead to efficient use of money and resources and maximization of benefits. To understand the success of the Design-and-Build procurement method, it is necessary to define the concept of 'success'. The meaning of success may differ from employer to employer. Besides, it is difficult to measure the success of a project in any subjective manner. Therefore, there is a need to develop a material definition of success. In this study on the Design-and-Build method, success is defined as the goals achieved as per the Employer's requirements. Design-and-Build

Within this aim the following objectives are pursued:

1. To understand the trend of the Design-and-Build procurement method in Sri Lanka
2. To identify the factors that affect the selection and the success criteria of the Design-and-Build procurement method.
3. To qualitatively and quantitatively analyze the results based on the collected data using questionnaire in order to understand the current situation of the Design-and-Build procurement method
4. To find out the reasons for using the Design-and-Build procurement method.
5. To summarize the findings from the questionnaire to recognize the advantages and disadvantages of using Design-and-Build procurement method.

1.3 Methodology of the Study

The methodology is designed to achieve the aforementioned objectives. The first step is to rationalize the issue to help set up the topic of study. Then the aim and objectives are set. For the knowledge acquisition phase, the literature in connection

with this study is reviewed including materials published in journals, books, newspapers, standard contract forms, conference papers, and websites. As an empirical study, a survey questionnaire was developed and distributed among 50 construction industry professionals and employers with experience in at least one design-build project. The data collected are to be analyzed and conclusions are drawn with reference to the objectives.

1.4 Summary

The introductory chapter presents the reasons for the study and discusses the background, identifying the reasons for the Design-and-Build is becoming a popular alternative method in Sri Lanka. It provides opportunities for innovation and excellence while rewarding both employers and contractors who choose that route. The reason to adapt better procurement methods is to optimize the project design, schedule, and quality while fostering pleasant and, therefore, constructive working relationship among employer and contractors.

Methodology of study is essentially critical to obtain high quality results. Methodology used in this study is literature review, data collection, data analysis, and drawing of conclusions. The literature review is used to identification of the issues; a questionnaire was used to collect the data while interviews were being conducted to collect data related to the study. The qualitative and quantitative analysis method were used to analyze data. Finally, the conclusion and recommendation with reference to the objectives are created, subsequent to the analysis from the interviews and questionnaires.



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CHAPTER 2

LITERATURE REVIEW

2.1 General

Design-Build is sometimes compared to the "master builder" approach, one of the oldest forms of construction procedures. Comparing Design-Build to the traditional method of procurement, the authors of "*Design-Build Contracting Handbook*" noted that: "*from a historical perspective, the so-called traditional approach is actually a very recent concept, only being in use approximately 150 years. In contrast, the design-build concept -- also known as the "master builder" concept -- as been reported as being in use for over four millennia.*" (Songer,1996).

The disadvantage of the traditional procurement method has been identified in many reports. Lathem Report (1994) stated that the traditional method has the problem of adversarial and inefficient way of doing things and separation of the roles and responsibility of team members. Further Construction Industry Review Committee Report (2001) stated that a high degree of fragmentation with an adversarial culture and a contractual and confrontational culture would be developed. An alternative procurement method would be sought for solving those problems.

Describing "Design and Build" as a "viable alternative method", Songer and Molenaar (1996) concluded that there are a number of advantages associated with Design-and-Build approach, such as: cost savings, improved constructability, time savings and claim reduction. From the Employer's perspective, the single point of responsibility is the most attractive benefit derived from the D&B procurement approach (Chan 2000). With the support of case studies and quantitative data, Hale et al. (2009) pointed out the Design-and-Build approach is superior to the traditional procurement systems, and they recommended to use Design-and-Build approach in both public and private sectors. Levy (2006) even suggested that "the design-build

delivery system appears to be a perfect vehicle by which to pursue sustainable or green building construction”.

According to Chan and Chan (2004), the completion time as it relates to speed of a project depends on the procurement method adopted for the project. They attributed the slow delay observed in one of the projects to be due to the use of the traditional procurement method. However, they recognize the possibility of other factors playing a role that it was noted as the project who has suffered delays; obtained better results in terms of cost compared those obtained through the method of Design-and-Build method.

Design-and-build system is one of the procurement systems introduced to overcome the problems associated with the traditional procurement, such as delay and over-budget, while the innovative practices of the Design & Build system have been developed to cope with the growth in both private and public sectors (Chan and Yu, 2005). These innovations are referred to as reducing construction cost, shortening a tight construction programme, eliminating particular construction risks, and improving quality and durability of the finished tunnel structure (Marshall, 1999). However, Chritamara and Ogunlana (2002) argued that Design-and-Build procurement is imperfect due to unclear Employer’s brief, lack of standard forms of contract, inadequate and insufficient information and coordination among parties, and late design changes. Lam et al. (2004) and Ling (2004) had identified key determinants that lead to success in Design-and-Build projects so that project managers would know the important variables that they must pay closer attention to, in order that their Design-and-Build projects can be completed within budget and schedule, to an acceptable level of quality, and to the Employers’ satisfaction.

There are many alternative procurement methods that have been developed in recent years such as Novated Design-and-Build and Enhanced Design and Build. The traditional procurement method is not the only choice for the Employer. Design-and-Build is now one of the most frequently used procurement routes in construction and it is a radical departure from the traditional Design-bid-build method. The use of

Design-and-Build is on the increase with many Employers perceiving it as providing better value for money and giving rise to less disputes than other procurement methods. As per the surveys of Royal Institution of Chartered Surveyors (2004), new procurement trends can be identified which may be associated with the boom period in construction in the early part of the decade and it clearly shows that the Design-and-Build has become the single dominant method since the previous survey in 1995, it was the traditional method. Under a Design-and-Build contract the contractor assumes primary responsibility for the design of the development, in addition to its traditional role to supply work and materials. The contractor engages the design consultants, or more usually, has the appointments of the design Consultants novated to him. (Royal Institution of Chartered Surveyors, 2004).

2.2 The Definition of the Design-and-Build Procurement Method

“Design-and-Build is an arrangement in which a building contractor enters into a contract with you to design and construct your new building. It is the simplest approach, as one firm is responsible for producing the building you want rather than this responsibility being divided amongst several firms, as is the case with every other approach” (Bennett and Grice, 1992).

Masterman (1992), states that the term Design-and-Build has almost been unanimously interpreted and defined as being an arrangement where one contracting organization takes sole responsibility, normally on a lump-sum fixed price basis, for the bespoke Design-and-Build of an Employer’s project. This contains three main elements: the responsibility of design-and-build, contractor’s reimbursement is generally by means of a fixed price lump sum and the project is designed and built specifically to meet the Employers’ needs.

According to David Chappell (1997), Design-and-Build contracts place responsibility for both design and erection in the hands of the contractor one point of responsibility for everything. In this system, the contractor will carry out two functions: design and construct.

In another definition, Design-and Build is an arrangement where one organization designs and builds for the Employer based on a single financial transaction. The Chartered Institute of Building (CIOB-1983) defines Design-and-Build as the process where the Employer deals directly with the contractor for the complete building and it is the contractor who is not only responsible for but also coordinates the Design-and-Build process, including the engagement of the design team who are, therefore contractually linked with the contractor and not the Employer.

The diagram below shows the contractual relationship in the Design-and-Build procurement method.

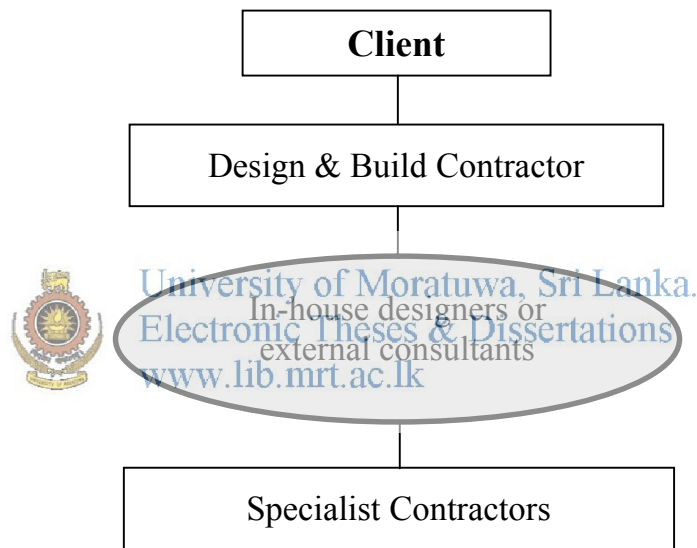


Figure 2.1: How to use a design build approach for a construction project
(Source: Bennett and Grice ,1992, CIOB, P2)

In practice, Design-and-Build procurement is generally structured in one of the two ways below:

1. The Employer employs a dedicated Design-and-Build organization with its own in-house design team.
2. The Employer engages a general building contractor who employs external design consultant members of the contractor's team for the duration of the project.

Basically there are three kinds of Design-and-Build methods in construction industry, including Pure Design-and-Build, Enhanced Design-and-Build and Novated Design and Build. They have different features which can be applied in the project according to the needs of the Employer.

2.2.1 Pure design and build

Pure Design-and-Build is the procurement method which the contractor is responsible for the Design-and-Build of a project. However, Janssens (1991) differentiates pure Design-and-Build into two categories; Single stage tender and two stages tender.

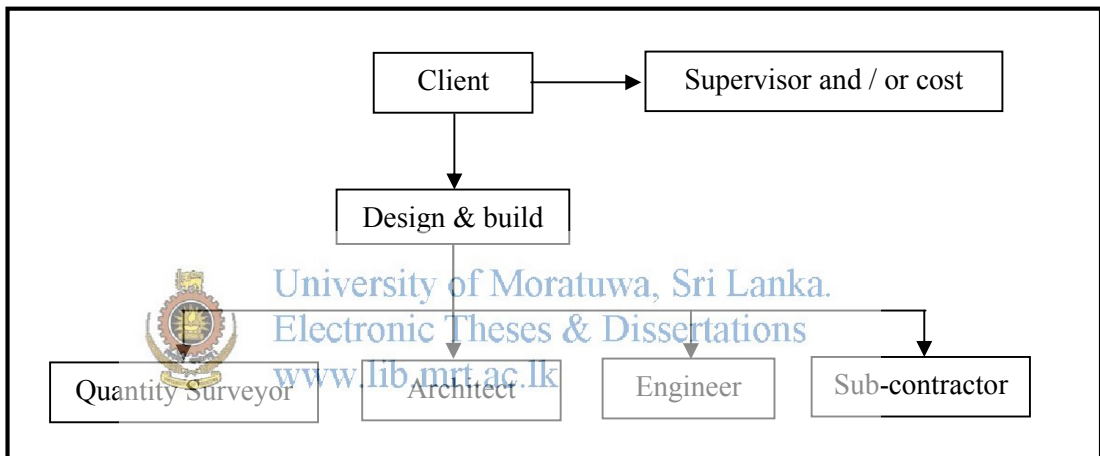


Figure 2.2: Pure/ Traditional Design and Build: Contractual relationships (Mosley 1990)

2.2.2 Enhanced design and build

Enhanced Design-and-Build is the procurement method that the contractor is responsible for designing and building, but the initial design is provided by the Employer and his design team. The detailed Design-and-Build of the project will be produced by the contractor afterwards. The contractor is responsible for detail design in the design and build.

Turner (1997) has described how, in this type, consultants design the building to a partial stage, often called 'scope design', and competitive tenders are obtained from contractors who develop and complete the design and then construct the building.

Figure 2.2 shows the relationship between the Employer, Design-and-Build contractor and other professionals involved in enhanced Design-and-Build contracts.

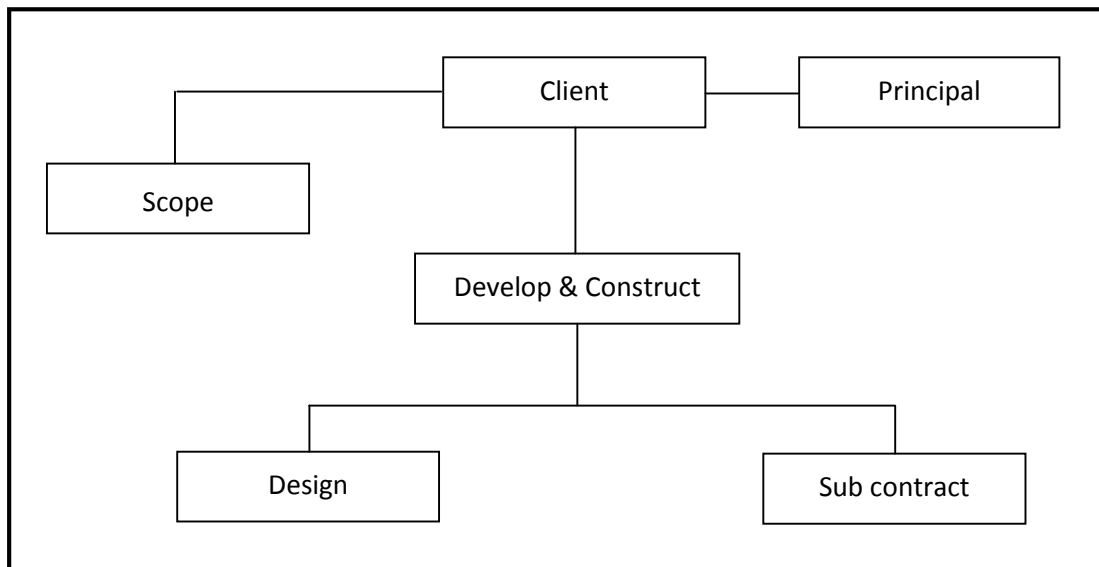


Figure 2.3: Develop and construct: contractual relationship (Turner, 1990)

2.2.3 Novated design and build

Novated Design-and-Build is the procurement method which the Contractor is responsible for design development and construction. The design will be provided by the Employer. Novation may be defined as a form design and develop an agreement, in which the Employer initially employs the Consultant team to carry out design and documentation to the extent that the Employer's need and intentions are clearly identified and documented. Based on these documents, tenders are called and a building contractor is selected. Then the design team will transfer it to the Contractor for the design development. The detail design will be provided by the Contractor afterwards.

Siddiqui (1996) notes that the Employer initiates the project by commissioning the design consultant to develop the project brief and to commence design work. The engagement of the consultant is specified by an agreement between Employer and Consultant. The contractual arrangement before novation is shown in figure 2.3.

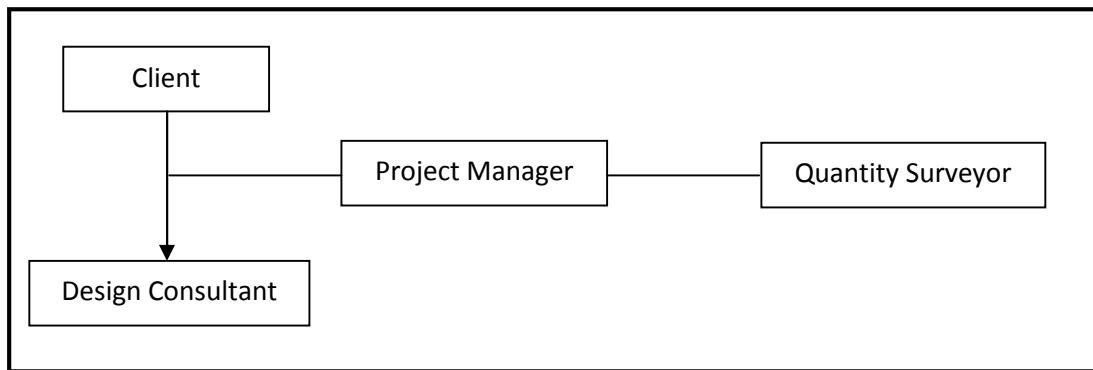


Figure 2.4: Pre novation contractual arrangement (Siddiqui, 1996)

Figure 2.4 shows the post novation contractual arrangements where the contract between the Employer and the design consultants is novated to the contractor after the award of the building contract. The contractor is required to keep the Employer informed on design matters, while still maintaining the prime responsibility for meeting the performance criteria set down in the design brief (Siddiqui, 1996).

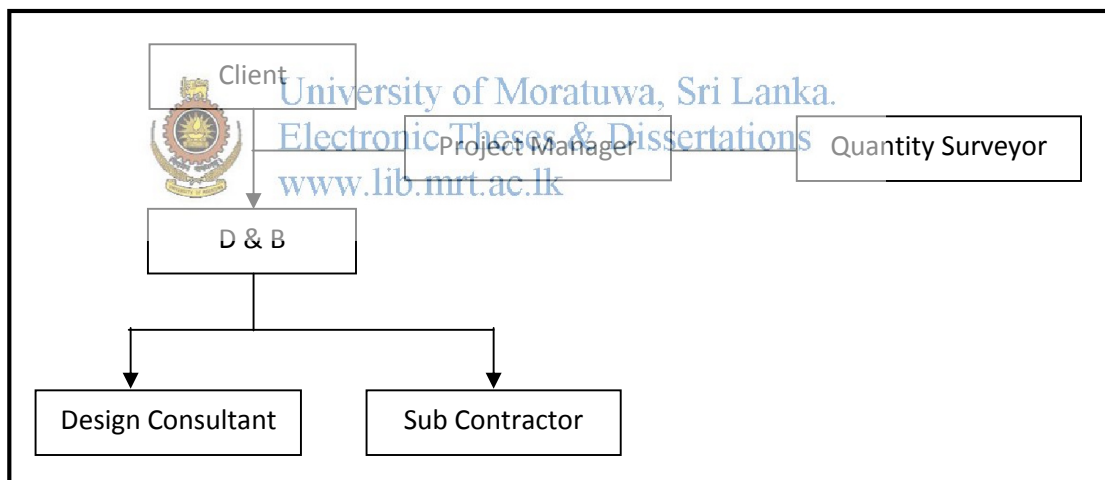


Figure 2.5: Post novation contractual arrangements (Siddiqui, 1996)

2.3 Strengths of Design-and-Build Procurement System

After the above definition of the Design-and-Build system, it is important to reveal the strengths and advantages of Design-and-Build as procurement system. This section discusses the advantages of Design-and-Build as a procurement system. The discussion, thus, provides justification for the selection of Design-and-Build as a procurement system in construction industry.

One of the prominent features of Design-and-Build is to provide a single point responsibility. This is achieved by allocating all design responsibility and liability to the contractor alone. The owner may have more design options to choose from the respective design builders who enter the tender. The owner will tend to have variation of design ideas together with the expected cost that was proposed based on his requirements. Unlike traditional approach, which only appoint a single unit of design team to come out with the design ideas, Design-and-Build will produce much more different design ideas from the design builder who enters the tender (P. Chan et al., 1997).

The owner's administrative burdens may be reduced because the procurement of Design-and-Build services are consolidated into a single selection process. After awarding of the Design-and-Build contract, the owner will not be required to spend time and effort coordinating and arbitrating between separate Design-and-Build contracts. While the process does require the owner to provide prudent oversight of the Design-and-Build Design-and-Build process, this responsibility is considerable less time consuming and exposes the owner to far fewer risks than the traditional approach (P. Chan et al., 1997; Dennis Turner, 1986).

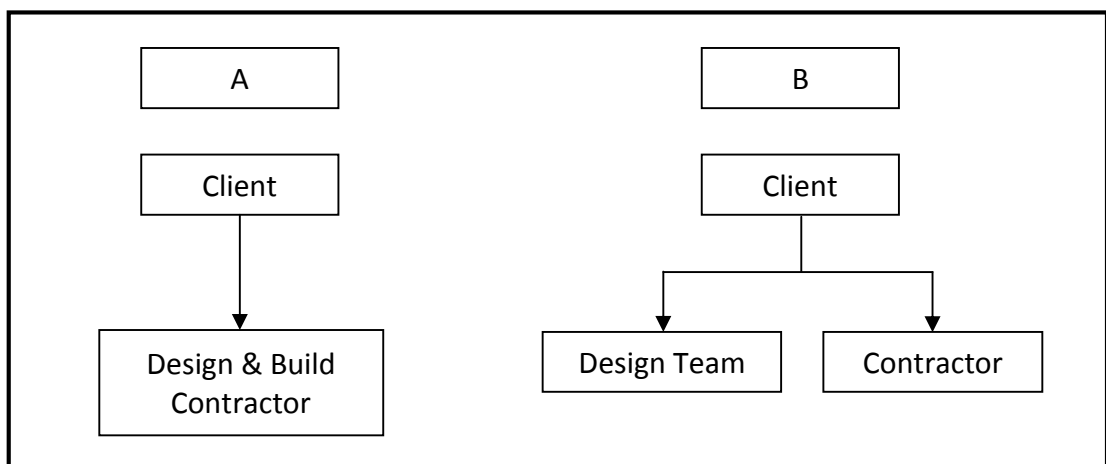


Figure 2.7: (A): Single point responsibility – D & B Contract,
 (B): Fragmented responsibility – traditional contract
 (Source: Bennett and Grice, 1992, P.188)

In addition to the single point responsibility, cost and completion time is firm in the Design-and-Build procurement method. This means the Employer knows his total financial commitment in the initial stage of the project, provided he does not introduce any changes during the project.

The Design-and-Build entity is responsible for quality, budget, schedule, and performance of the completed facility. With the single point of contact, Employers can concentrate on the definition of needs and timely decision-making rather than on coordination between the designer and the contractor. Besides, the Design-and-Build entity has total responsibility for the finished product and cannot shift design errors of construction defects to another party.

Therefore, it is likely to end up with the expected or higher quality of end product. Unlike Design-and-Build approach, traditional approach contracts rely on restrictive wording, adversarial audit and inspection requirements and a stricter legal system to assure project quality (Beard et al., 2001).

Cost has always become the key considerations affecting adoption of Design-and-Build procurement method. Whilst project time is relatively easy to interpret and potential savings clearly identified, project cost is more ambiguous and therefore difficult to evaluate. A prominent consideration for the Employer, in any procurement form, is that the final cost does not exceed the projected project budget. In this respect, Design-and-Build certainly presents a better chance of the Employer obtaining his completed building within budget. Jerry Adanison (2001), explained that several financial considerations make Design-and-Build desirable. Private sector have implement Design-and-Build for financial reasons. Completing a project quickly can save Owners used to finance projects.

On the question of cost, real cost savings can also be made in Design-and-Build. According to Mastermann (1992), when using this system, the initial and final costs are lower than when using other methods of procurement because of diminished design costs, the integration of the Design-and-Build elements and in-built build ability of the detailed design. Cost savings may also result in timesaving. The overall

effects is reduction in the Employer's financing charges, lesser effect of inflation and faster building operation, which, in a commercial context, produces an earlier return on the capital, invested, (Frank, 1998).

In terms of certainty in time, Design-and-Build can provide complete contractual certainty on completion for Employers from the very earliest stages of their projects if there are not many changes by then Employer (Bennett and Grice, 1992) for most Employers' time is crucial in forming their perspective of the building process. Time savings with Design-and-Build are maximizes at the pre contract stage with the procurement process up to commencement on site. Studies by Fitchie (1996) indicate that procurement time under the traditional process can be up to twice as long as that of Design and Build.

However, quality of the project is not simply compromised by using the Design-and-Build form of procurement. However, its reputation has suffered from criticism by some construction professionals whose preference is for system building and standardization.



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Quality control and quality assurance are the essential elements of project review. It has to make sure that what is being paid for is up to the standard specified. Design-and-Build allows for better control of quality particularly in designer lead Design-and-Build team. However, considering the assurance of quality, the Employer has no direct control over the contractor's performance. Therefore, the standard of quality must be properly selected at the tender stage to ensure that the contractor's proposal to meet his requirements. This also means that the Employer has a little say in the choice of specialist subcontractors (Clamp & Cox, 1989). This is because some proprietary Design-and-Build products may opt for options that lack aesthetic appeal, though the basic requirements of the specifications are met.

Design-and-Build has a considerable ability to improve quality in construction. When procured in isolation, the design has always pre-supposed that employer himself has identified his genuine needs, defined his requirements and specified them clearly, the Employer often have little clear definition of what he wants

Effective communication is never been ignored as one the driven factors on selection of Design-and-Build procurement method. One of the major reason for choosing Design-and-Build arrangement is to benefit from the good communication that can occur between the design team and the construction team (Gould, 2003). Many of the large Design-and-Build companies specialize in particular areas and have developed a smooth flow between the Design-and-Build phases of the project. This collaboration allows the project to be easily fast-tracked, cutting down on overall schedule for the project.

Direct contact between the Employer and the contractor provides any Design-and-Build system with solid lines of communication and enables the contractor to adapt more promptly to the Employer's needs. Integration is encouraged inherently within the system (Griffith, 1989).

The Employer and the contractor will communicate closely with each other during the process of the project. Communication between them will start at the beginning stage of the project. Therefore, the Design-and-Build provides the Employer and contractor an opportunity to interact more often and more directly than in a traditional contract. In general, this arrangement allows easier incorporation of changes due to scope or foreseen conditions since their coordination occurs within the same contractual entity. The Employer is less heavily involved in and stays outside the direct day-to-day communication between the designer and the constructor. This keeps the owner staffing to a minimum and reaffirms the full responsibility for good communication and problem solving.

In terms of suitability, Design-and-Build is relatively more suitable for large and complex projects. For projects of exceptional size, the firm must have the managerial expertise to hold a balance between design and construction interests. It is also simple and more efficient for managing subcontract arrangements, as it integrates design and construction expertise within an accountable organisation. This is because there are no nominated subcontractors or nominated suppliers.

Claims for errors or omissions or for time delays tend to disappear because the Design-and-Build team would have no one to blame for these shortcomings but itself. At the same time, the burden on the owner to mediate disputes between the designer and the constructor is eliminated because a sole design builder may be held contractually accountable and responsible for the entire project Beard, et. al. (2001) . The Design-and-Build process also allows the contract to assign risks in a way that produces the most efficient agreement among the parties. Risks can be assigned, as appropriate to the owner, to the design builder, shared between the two principal parties or mitigated by the securing of insurance coverage. All risks can be accounted for discussed and dealt with in a manner that is more clear and comprehensive than with other delivery method (Beard et al., 2001).

Under Design-and-Build, all parties are being treated as professionals regardless of their denominations as designer or constructor. Design-and-Build approach places the designer and the constructor on equal professional footing so that they can provide unified recommendations and jointly developed solutions to the Employer (Beard et al., 2001). There is an old workplace adage that says that ‘if you treat individuals as professionals, they will respond as professionals’.



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As the strengths identified above, relatively firm and lower cost are always the critical strength on Design-and-Build procurement method. The project costs of the Design and Build delivery method can be lowered because of the close working relationship between the designer and the constructor who are on the same Design-and-Build team. This may lead to the incorporation of more economical design features and the application of cost saving construction methods (NSPE, 1995; Beard et al., 2001). Therefore, the contractor can take full advantage of his own judgment and expertise in procuring only those sub contractor and suppliers with whom he expects to have a successful working relationship and the Employers are not involved in this relationship at all (Griffith, 1989.)

2.4 Risks in Design-and-Build Procurement System

The Design-and-Build contracts bring in more risks to the contractor than any other construction contract. Among a variety of risks, a contractor usually takes on many speculative risks. Risks that can vary in incidence between the parties as they wish.

Speculative risks can be within or out of the control of a contractor (Turner 1990). However, the suitability of a project to the Design-and-Build approach must be carefully undertaken by ensuring that the contractor is able, willing and has relevant experiences to control the risk satisfactorily, otherwise they may pass these back to the Employer (Hogg & Morledge, 1995).

Contract type	Risk	
	Employer	Contractor
Design and Build	[]	
Traditional Contract	[]	
Management Contract	[]	

Figure 2.8: Risk allocation for each type of procurement system
(Hogg & Morledge, 1995)

2.5 The Factor Affecting the Success of the Design-and-Build

Traditionally, researchers and organisations have focused on the three project performance criteria of cost, time and quality (Dainty *et al.*, 2003, Chan and Chan, 2004, Swan and Khalfan, 2007). Recently, many studies have, however, included also other performance aspects, such as health and safety (Chan and Chan, 2004), environmental performance (Chan and Chan, 2004, Swan and Khalfan, 2007), customer satisfaction (Chan and Chan, 2004, Collins and Baccarini, 2004), and innovation (Harty, 2008).

Large and complex projects take longer construction durations. It is difficult to use the Design-and-Build procurement in such projects, because it is unfair to transfer the risk of price inflation of material to the contractor on a fixed lump-sum. Therefore, the size and the complexity of the project should be considered before opting for Design-and-Build procurement.

According to Bennett and Grice (1992), it is very important for the selection of the contractor to process the Design-and-Build project. From the figure shown above it become clear that the usage Design-and-Build project procurement is increasing because the government is willing to use apply procurement method. There is a set of 'Procurement Guide Lines' that the government should follow when it adopts Design-and-Build procurement method to select a Design-and-Build contractor.

The selecting the Contractor is not only concern the tender price, but also the quality Time, Contractor's financial status, potential contractor with good reputation, manpower good record for the previous project as per the pre-qualification marking scheme of National procurement guide lines. Therefore, the contractor who meets the Employer's requirement for time and quality at the best price would be selected.



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According to Ashley et al. (1987) identified four factors contributing to project success and grouped them into five areas including (1) management, organization and communication; (2) scope and planning; (3) controls; (4) environmental, economic, political and social; and (5) technical. The implications of the Employer should develop a thorough project plan in which the scope of work is clearly defined, and the contractor should understand and commit to the achievement of project objectives. The contractor's capability and experience in managing Design-and-Build project is critical to project success and project team members' commitment toward the project goals is also important.

According to Pinto and Slevin (1998) proposed ten factors influencing project mission, top management support, project schedule/ plans, Employer consultation, personnel, technical tasks, Employer acceptance, monitoring and feedback,

communication and troubleshooting. All of them were considered as critical for success at various stages of project life cycle. Pinto and Slevin (1998), highlighted the importance of establishing a set of clear project goals and directions at the outset. This is particularly true for Design-and-Build projects because any misunderstanding of what to achieve can be avoided, which is instrumental in completing a building project in a short time. Moreover, the contractor's expertise in using appropriate building technology and input of building knowledge to design development can speed up project delivery time.

The importance of communication among project participants to project performance was evident in the findings of Mohsini and Davidson (1992). Getting enquired information in a timely manner for prompt decision making in influencing Design-and-Build project is crucial. Project participants are willing to share important information if they cooperate and trust each other. Therefore, mutual trust, cooperation and communication among project participants contribute to influencing Design-and-Build project success.



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Songer and Molenaar (1997) identified fifteen characteristics of successful Design-and-Build. They found that the top five important project characteristics were well-defined scope, shared understanding of scope, owner construction sophistication, adequate owner staffing, and establish budget.

Although the Design-and-Build projects are expected to deliver the project faster and cheaper as compared to the traditional bid and build projects, not all the Design-and-Build projects can really accomplished it. Many empirical studies have been conducted to examine the impact of various project success factors such as the study of factors for a successful public sector Design-and-Build projects by Songer and Molenaar (1997), study on architects' and builders' views on Design-and-Build procurement method in Hong Kong by Mo and Ng (1997) and many others (Chan et al., 2001)

Accordingly Chan et al., (2001) have developed a series factors contributing to the success of Design-and-Build projects. These factors are the duties, responsibilities and capabilities of different project participants including end-users, the contractor, architect and design consultants in Design-and-Build projects.

2.6 The Design-and-Build Procurement Method in Sri Lanka

Design-and-Build is the procurement system which the Employer buys the product from the producer who manages the aspects of design and build. In the Design-and-Build procurement process, the employer should describe the requirements for the project and stated it in the employer's requirement. The contractor should respond to those requirements in the contractor proposals including all production method and its work. Once the employer accept the contractor proposal, the contractor is responsible for all design work and construction work. Therefore, the Design-and-Build becomes the responsibility of one organization. The contractor is responsible for the design and the construction in the progress. The Employer has only one organization to deal with. It is single responsibility of the contractor. Since Sri Lanka is a developing country that requires high efficiency and effectiveness for the construction, Design-and-Build can provide this package to the Employer. Design-and-Build is the fast track procurement method which the contractor involves in Design-and-Build process.

2.7 The Trend of the Design-and-Build Project in Public Sector and Private Sector

According to the research conducted by Rameezdeen and Ratnasabapathy (2006), the traditional system dominates the Sri Lankan construction industry, but decrease in certain periods making way for other systems. The Majority of public works in Sri Lanka are found to be using to these methods by considering accountability and transparency. The statistic from the survey result of trend procurement systems in Sri Lanka, the figure shows that the Design-and-Build procurement system had a usage rate of 20% to 35% during the 1977 to 2003.

% of Use (average)	1977	1982	1987	1992	1997	2001
Procurement System	-81	-86	-91	-96	-00	-03
Measure and Pay	55	50	58	50	64	72
Lump Sum	12	10	8	7	10	5
Prime Cost	10	8	5	4	3	1
Design and Build	22	31	28	35	21	22
Management Contracting	1	1	1	1	1	0
Joint Venture	0	0	0	3	1	0
Total	100	100	100	100	100	100

Figure 2.6 The survey result of trend procurement systems in Sri Lanka
(Rameezdeen and Ratnasabapathy, 2006)

2.8 Summary

The intention of this chapter is to present an overview of the literature published on the criteria based on which factors are defined for selecting the procurement method from the current construction industry. The objective of the Employer in terms of time, cost, quality and risk would be calculated and also the factor that may determine the successful of the procurement method would be identified. They are the project characteristics, the contractor selection and the employer's requirement.

In general, it can be summarized that Design-and-Build provides single point responsibility for the whole Design-and-Build task. Contractors, who are responsible for the implementation of the project, have the power to control many aspects of the projects.

In conclusion, it is essential that whoever really wants to procure using the Design-and-Build method needs a thorough understanding of the types and characteristics of this kind of procurement. Therefore, benefits of Design-and-Build can be exploited with proper knowledge of the system. Many studies also showed that the characteristics of Design-and-Build that makes Design-and-Build different from other procurement systems in offering single point responsibility, fixed time and

money, communication, allocation of risks and others. Achieving success in Design-and-Build projects enables an assurance of getting the project completed at the right time and within allocated budget. The Design-and-Build procurement system has better time performance and cost benefits, which are essentially what the end-users are concerned about. This research can be a key to assessing the performance level of Design-and-Build projects, and the project participants can learn about the important factors for setting up an effective management system to turn Design-and-Build projects with excellent performance.



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CHAPTER 3

RESEARCH METHODOLOGY

As discussed in the preceding section, Design-and-Build method is becoming popular in Sri Lanka, as the construction projects are complex and consume a significant amount of time. The construction industry also relies heavily on experience, knowledge, and work styles of its practitioners. Therefore, any changes to the state of the art methods utilized in the industry merits investigations to assess the level of success of alternative methods. Such studies could provide valuable insights that can, in turn, contribute to the advancements of the industry.

Various studies reviewed in chapter two have provided some insights into the benefits and level of success of Design-and-Build procurement method in different countries. However, no structured study on the level of success of the Design-and-Build method in Sri Lanka was found in the published literature. It is difficult to infer the level of success based on studies conducted in other jurisdictions due to the local specificities in the construction industry. This study aims to fill this gap by surveying a wide spectrum of local construction industry professionals. By analyzing the responses obtained, the level of success of Design-and-Build method in Sri Lanka is assessed.


The research methodology used for this study is described in the following section. This methodology consists of survey questionnaire design, data collection and interviews, analysis of data, and drawing of conclusions and recommendations.

Given the empirical nature of this study, the selection of the mixed method research strategy using both qualitative and quantitative approaches in a single study, is defined as the appropriate strategy to answer this research question. The methodology and procedures are identified to present the source of data, collection procedures, nature, and content analysis to provide answers satisfying the objectives of this study.

According to Denzin and Lincoln (2005), research is scientific, it provides the foundation for, reports about, and representations of “the others”. Pugh (1998), defined research as:

“The act of finding something you do not know and to reorient our thinking, to make us question what we think we do not know, and to focus on new aspects of our complex reality” (Pugh 1998, 45).

According to (Marshall and Rossman 2006) a good piece of research seeks to answer specific questions, solve a particular problem, explain or extend an understanding of a particular phenomenon. Phenomenology is also defined as the art or practice of “letting things show themselves” (Husserl, 2001). Creswell (2003) indicated that a solid piece of research involves a good theoretical base and a clear and defined methodology and strategy of inquiry. It must have some distinguishing characteristics to make it truly scientific. All research findings must be able to be tested and valid for generalization to a broader population.

 According to Silverman (2005), Creswell (2003), Goulding (2002), there is no single standard research method appropriate for every research study, considerable assessment was made in the literature review to select the appropriate research methodology that would best guide this study and provide the framework for answering the research question.

There are two main research methods or approaches that dominate the research work these methods are:

- Quantitative method
- Qualitative method

Several writers including (Bryman 2006, Silverman 2005, Sekaran 1992) studied these two approaches and argued that there is no dominance of one method over the other. Each approach is appropriate in its own right for a specific problem and under specific conditions, as long as, the research objectives are clear and the research

approach is well defined. Sekaran (1992) argued that there should be some “purposiveness” in scientific research and researchers must have a definite aim or purpose for research. Bryman (2006) stated that the two methods have some unique characteristics to make them scientific and their findings are testable.

The Quantitative Method

Quantitative research is objective in nature and embodies the basic principles of scientific investigations. This method according to Creswell (2003), is iterative, and can be traced back to the time of Aristotle when he challenged the principles of science. This method tests a theory or a hypothesis composed of variables, measured with numbers that analyzed with statistical procedures identifying whether the theory or hypothesis holds true under different circumstances. It is tightly structured (Creswell 2003) and uses statistical analysis to provide quantitative description of trends, attitudes or opinion of a selected population.

Recently writers added that this approach is largely based on a well-developed research question, and often examines the relationships between and among variables in order to answer a central question or test a hypothesis, Creswell and Garrett (2008). Fellow and Liu (1997) indicated that the prime reason for testing a hypothesis in construction research is to enable the researcher to produce models that indicate the variables postulated in the theory that are hypothesized to interact in a particular situation. are There accepted and tested methods for determining the relationships between variables.

In quantitative studies, the analysis starts after all the data is collected. Testing, retesting, and developing new understandings or models require statistical and numeric data to report the findings. Quantitative results are released numerically, usually comprising of tables charts, graphs and matrices and other scales of measurements. Other methods for quantitative data analysis include the use of scaling, rating and ranking measurement techniques to analyze the results.

The Qualitative Research

According to Marshall and Rossman (2006), qualitative research refers to research that produces findings not arrived at by statistical processes. Patton (2002) described the qualitative approach as multidimensional, using multiple methods that are interactive and humanistic. It does not entail relationships between a dependent variable and an independent variable, as is common in quantitative studies, because its purpose is not to test hypotheses.

According to (Goulding, 2002), the researcher filters the data through a personal lens that is situated in a specific socio-political and historical moment. Rossman and Rallis (1998) proposed that qualitative detailed analysis should begin with a coding process. They defined coding as: “*The process of organizing the materials into “Chunks” before bringing meaning to those chunks*” (Rossman and Rallis, 1998).

Basically the case study researches, ethnography, action research and grounded theory approach coming under qualitative approach.

According to Bryman (2004) summarized the main distinctive features of these two research paradigms as follows;



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Method	Quantitative Research	Qualitative Research
Observation	Preliminary work, e.g. prior to framing questionnaire.	Fundamental to understanding another culture.
Textual analysis	Content analysis, i.e. counting in terms of researchers' categories.	Understanding participants' categories
Interviews	Survey research, mainly fixed- choice questions to random samples.	Open-ended questions to small samples
Transcripts	Used infrequently to check the accuracy of interview records	Used to understand how participants organize their talk and body movements

Method	Quantitative Research	Qualitative Research
Role	Fact-finding based on evidence or records	Attitude measurement based on opinions, views and perceptions measurement.
Nature of data.	Hard and reliable	Rich and deep
Scope of findings	Nomothetic.	Idiographic.
Relationship between researcher and subject	Distant	Close.
Relationship between theory/ concepts and research.	Testing/confirmation.	Growing/developing.

Figure 3.1: Differences Between Quantitative and Qualitative Research Methodology
 [Source: Bryman (2004)]

Having scrutinized the above two methodologies with respect of their suitability for satisfying the objectives of this study, comparing the methods for the data collection, analysis and reporting shown by (Creswell 2003, Strauss and Corbin 1998, Bryman and Burgess 1994), it was concluded that the most suitable methodology for this study is Mixed Method using both qualitative, inductive grounded theory and deductive, quantitative methods into a single study.

3.1 Achieving the Objectives

In order to test the proposed hypothesis in the correct manner, it is essential to answer and meet the tactical objectives highlighted in Part 1.2. In order to do this the correct research methodology must be adopted early on, to ensure that the right data is obtained from the process.

The objective 1, 2 and 4 will be achieved by questionnaire from industry professionals such as; Employers, Architects, Quantity Surveyors, Project Managers, Claim Consultants, Design Engineer, Builders to understand the trend for the

Design-and-Build procurement method in Sri Lanka and advantages and disadvantages of Design-and-Build procurement path.

To meet the second objective, an extensive literature review has been carried out, providing pre-written in depth information on the subject regarding to identify the factors will be considered before selection of procurement path.

3.2 Research Project Formulation

The author has conducted the research using both qualitative and quantitative methods, so that comparisons can be made on the views of the respondents through structured questionnaire. In the methodology of this study, four steps of research have been identified, and these steps are listed as follows:

- Literature Review
- Data Collection
- Data Analysis
- Conclusion and Recommendation



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3.2.1. Literature review

Literature review in Chapter 2 explains the Design-and-Build procurement method in detail. For the knowledge acquisition phase, the literature in connection with the study to be carried out is reviewed through journals, books, newspapers, standard contract forms, conference papers, websites and online document libraries e.g. RICS. All relevant information regards to the Design-and-Build were gathered. Based on the literature, the problems of the study will be determined and will aim to meet the main objective for this study. The literature review, provides guidance to the questionnaire preparation, which is discussed below.

3.2.2 Data collection

A survey questionnaire was developed and distributed to Employers, Contractors and Consultants in Sri Lanka for finding the importance and characteristic of the Design-and-Build method.

The research was begun with an initial literature review of public, company and university libraries, as well as Internet resources to establish what has been previously written on the subject. Further information and data has been reviewed through trade journals and manufactures' literature, etc.

3.2.2.1 Questionnaire

Utilizing the questionnaire, it is possible to tailor the conversation in a particular manner. The questionnaire will be allowed the author to delve deeper into specific areas of the chosen topic. The results of the questionnaire will aim to meet main objectives stated in the section 1.2 of the study.

It will also allow the author to obtain a greater understanding of their feelings with regard to Design-and-Build procurement path in the construction industry. This will be achieved by manipulating the questions in such a manner, to study the subject in depth.

3.2.2.2 Survey questionnaire design

The questionnaire used for this study is formulated based on literature reviewed in chapters 2 and factors specific to Sri Lankan construction industry. Care was taken to ensure that local specificities are captured by the questionnaire. The questions asked in the questionnaire were in the form of multiple choice or open-ended questions. Multiple-choice questions require the anticipation of the whole range of likely answers, which would be given, and formulating the options as such. The intention is to make the questionnaire as easy and least time-consuming to fill up in order to achieve a highest response rate. The Questionnaire has been divided into two sections as follows:

1. Section A consists of the research title and the general information from the respondent;
2. Section B consists of multiple-choice questions based on Likert's scale.

The research is based on 50 questionnaires that were posted to the Employers, Contractors and Consultants in Sri Lanka. A brief introduction of the was given to the appropriate person over the phone prior to sending the questionnaire to the relevant person by e-mail and by post.

The full list of questions is presented in appendix 1.

3.2.3 Data analysis

The gathered data is then qualitatively and quantitatively assessed. Level of success of Design-and-Build method is assessed using this analysis. Other factors such as procurement method selection criteria and other concerns of the practitioners are also identified.



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The findings of this study may help to identify the factors of causation towards the advantages and disadvantages occur associated with Design-and-Build procurement method.

Following methods are used to analyze the collected data:

Likert's scale

The multiple-choice questions are based on Likert's scale of five ordinal measures of agreement towards each statement (from 1 to 5) as shown in Figure 3.2

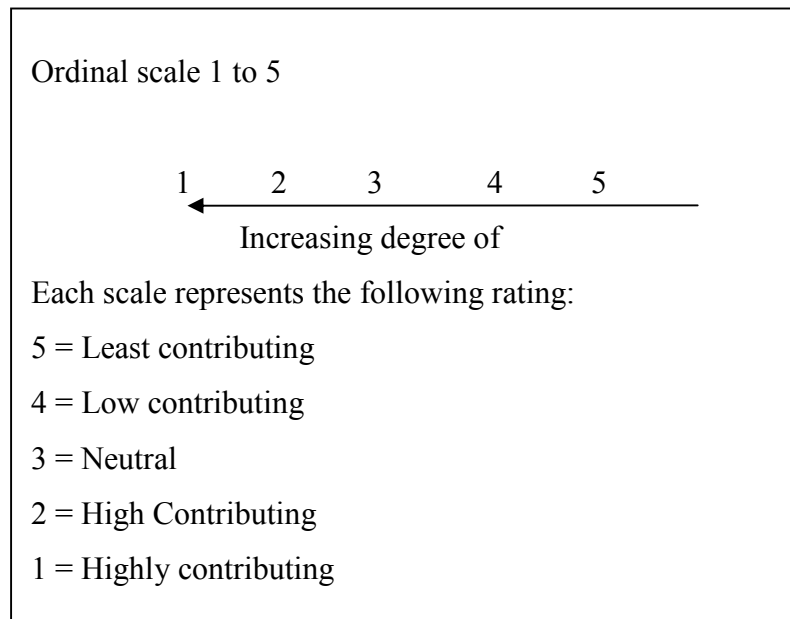


Figure 3.2: Five ordinal measures of agreement of Likert's scale

The data collected from the questionnaire was analyzed using frequency analysis, modified frequency, ranking and ratings, "Relative Indexes" (RI) and T-Tests Table, techniques.



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T-Tests Table output provides an adjustment to deal with the problem of unequal variances and as it is customary to use t test to compare two groups. T-Test is a good statistical test to compare one group or sample to a hypothesized mean.

The Mean values are predominantly used to represent and interpret voting scores of the frequencies of the answers. Low mean value indicates a high voting score since the scale of priorities is given to the respondents starting with (1). This indicates that (1) is the highest, most important and critical answer. Descending values indicate answers of lower significance. Therefore, the weight assigned for each of the criterion was based on this order.

The frequency analysis used to represent results of data analysis of the number of response that the respondent gives to different variables in the questionnaire. The result

tabulated in the form of frequency number and percentage according to the total respondents.

Relative Indexes (RI) was calculated using the following formula:

$$RI = \frac{\Sigma (1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_x)}{5(n_1 + n_2 + n_3 + n_4 + n_x)}$$

n_x = the number of respondent agreeing with the x choice.

The computation of the RI using this formula yields the value of RI ranging from 0.2 to 1. The value 0.2 represents the lowest strength and the value 1 represents the maximum strength.

3.3 Summary

Research methodology is essential in providing the valuable results of the study. Methodology used in this study was literature review, data collection, data analysis and conclusion and recommendation of the study. The literature review is used to identify the issues; the questionnaire is used to collect data while interviews are conducted to collect data related to the case study. Statistical and analysis method were used to analyze data. Finally, the conclusion and recommendation with reference to the objectives are created, subsequent to the analysis from the interviews and questionnaires.


CHAPTER 4

ANALYSIS AND DISCUSSION

4.1 The Results of the Questionnaire

As the statistics show, the use of Design-and-Build procurement in projects has increased steeply. The reason for using the Design-and-Build procurement method should be investigated by using the questionnaire.

The 50 questionnaires were delivered to the respondents who work in construction firms and Consultant firms and the Employers. They were given 3 weeks to complete the questionnaire and return the questionnaires within 2 week. Of them, 46 questionnaires were returned. They were divided into 3 groups, Employer, Consultant and Contractor.

 There were 24 questionnaires from Consultants, 18 from the Contractors and 4 from Employers. According to these 46 questionnaires, the result is illustrated as follows: Results of the **question 1** shows all the respondents of questioner have been involved at least one D &B project.

Question 2 - Are you aware about Design-and-Build (D&B) contract method?

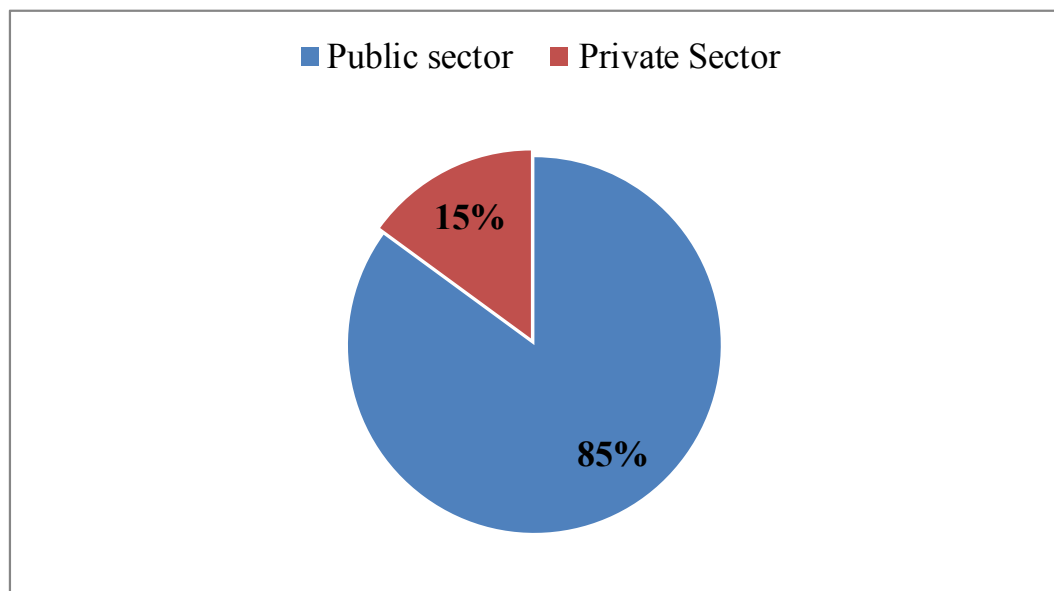
This attitudinal question is related to defining the actual understanding, awareness and knowledge of the respondents towards D& B project delivery method.

		Consultants		Contractors		Employers		Total	
		No of respondents	% of total no.	No of respondents	% of total no.	No of respondents	% of total no.	No of respondents	% of Total no
1	Well Aware	20	83%	18	100%	1	25%	39	85%
2	Aware	4	17%			2	50%	6	13%
3	Vaguely Aware					1	25%	1	2%
4	Not Aware							0	0%
	Total	24	100%	18	100%	4	100%	46	100%

The responses clearly show that these selected employers, consultants and contractors are generally aware of the D & B project delivery method with a combined majority of (98%) Compared with (2%) for those who are vaguely aware of the D&B procurement method.

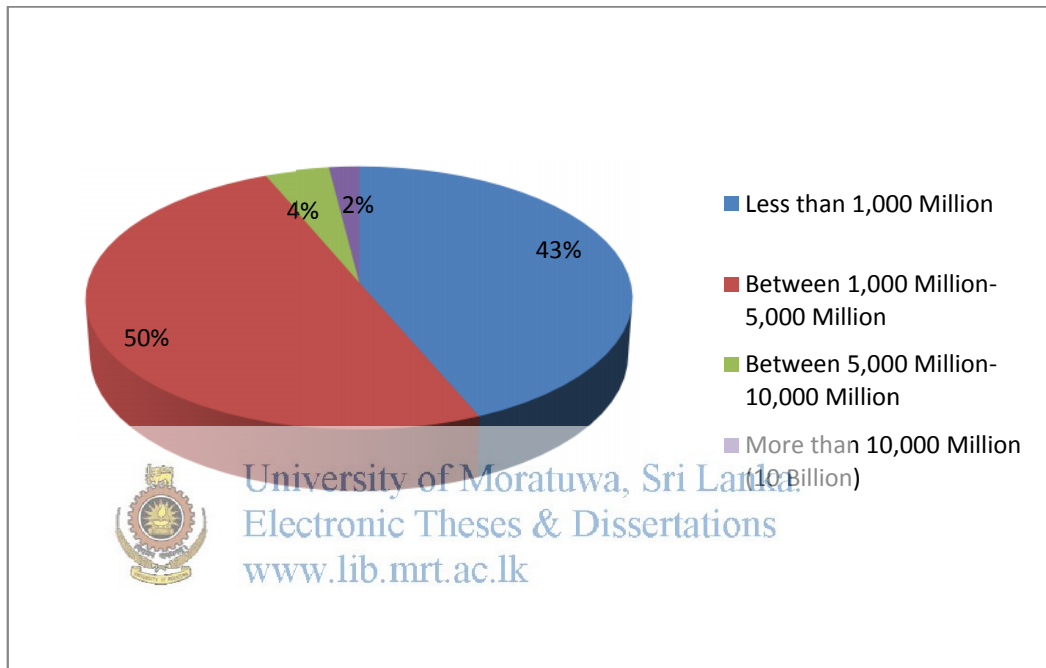
Question 3 – In which sector is mostly involved in Design-and-Build projects?

This question is to support the classifications of the Employers/ sector. It intended to provide answers with respect to the types of Employers who are interested in D&B procurement method. Respondents' results show that 85% of the Design-and-Build project is initiated by the public sector.



Question 4 - What is the number of medium to large size D & B projects that you/ your firm is generally awarded per annum?

The reason of this question was to inquire about the size and number of the D&B projects that the sample respondents are awarded or involved with per year. The answers will highlight the importance of the D&B project size. Project size is the one of the factor affecting of the selection of D& B procurement method.



It was found that the only 2% of the respondents in Mega projects range had opted for D&B. In the medium (43%) and large size projects (50%), both groups are involved with almost the same number of projects along the various scales of project values. Also noted was that 4% of respondents were between 5,000 Million – 10,000 Million range.

Question 5: When have your firm been involved and working with Design-and-Build projects delivery method?

This question is directed at the respondents to establish their knowledge and experience with the D&B project procurement method. The objective here is to define the level of accumulated experience of respondents groups in procuring D&B method and examine their practical experience with this option over the past two to three decades.

		Consultants		Contractors		Employers		Total	
		No of respondents	% of total no.	No of respondents	% of total no.	No of respondents	% of total no.		% of Total cost
1	Less than 5 years	2	8%	1	6%	0	0%	3	7%
2	5 – 10 years	4	17%	2	8%	2	8%	8	17%
3	10 – 15 years	10	42%	8	33%	1	4%	19	41%
4	Over 15 years	8	33%	7	29%	1	4%	16	35%
	Total	24	100%	18	76%	4	17%	46	100%

Taken as a one group, the answers clearly show that the sample is well knowledgeable with the D&B method. Over forty one percent (41%) combined majority states that they have been working with the D&B option for more than 10 years. Whereas, Thirty Five percent (35%) of the total sample population is practicing D&B procurement method for more than 15 years. The results show that the D&B procurement method is being practiced in the Sri Lankan construction industry by all three respondents for a period over two decades. These results are consistent with the literature review indicating when the Design-and-Build procurement system had a usage rate of 20% to 35% 2003 in the Sri Lankan construction industry during the late 1977 to during and from the beginning of 2003 until now.

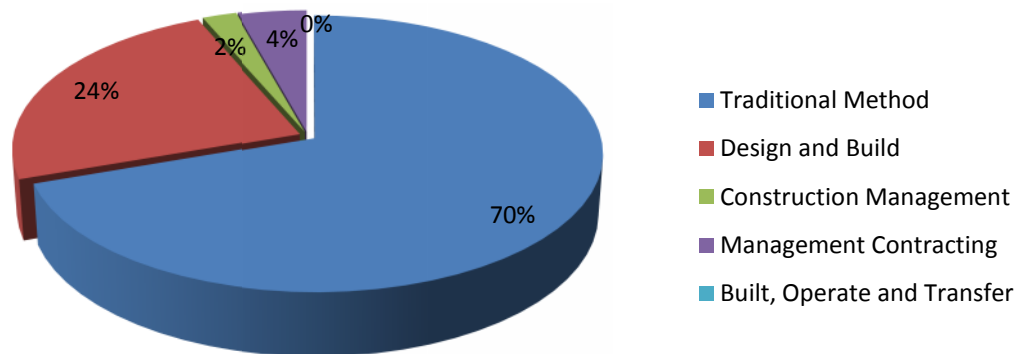
Question 6 – What is the most common procurement method used in the projects involved?

Through questionnaires that have been gathered, the result of the most frequent used or dominant procurement method in Sri Lanka is shown in the table below.

Rank	Procurement Method	Ranking (1-5)					Total	%
		1	2	3	4	5		
		Frequency (no. of respondent)						
1	Traditional Method	32	14	0	0	0	46	70%
2	Design-and-Build	11	17	12	3	3	46	24%
3	Construction Management	0	0	0	1	45	46	2%
4	Management Contracting	0	0	0	2	44	46	4%
5	Built, Operate and Transfer	0	0	0	0	0	0	0%



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Question 7 – What factors would you consider for the selection of Design-and-Build projects involved?

Selection Factor	Priority					
	High	←	→	Low		
1 Cost certainty	1	2	3	4	5	6
2 Quality	1	2	3	4	5	6
3 Time (Decrease the overall project completion time as compared to other procurement methods)	1	2	3	4	5	6
4 Constructability/Innovations (Introduce buildability knowledge into design early in the process.)	1	2	3	4	5	6
5 Large Project Size/Complexity (Single point of responsibility)	1	2	3	4	5	6
6 Reduce Claims/Less Disputes (Decrease litigation as compared to other procurement methods)	1	2	3	4	5	6



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The purpose of these questions is to find out why the respondents selected the D&B method and the reasons behind this selection. This question will unveil the motives and reasons that lead Employers to select D&B procurement method and their justification for this.

Through the questionnaire, it was found Consultants/ employers procure D&B procurement method for reasons of Time/ Speed as the first choice with Mean value of (3.00). Reasons of Single point of responsibility is rated as a second choice with a Mean of (3.39) followed by reasons of Cost certainty with a Mean of (3.57) and for Better quality with a Mean of (3.86), Reduce Claims / Less Disputes, with a mean value of 4.82 and Constructability/ Innovations with a mean of 5.04.

Contractors, however, answered with different priorities to this question. They have stated that the Employers approach them for procuring D&B projects for reasons of (Reduced cost) as the first choice with Mean of (2.60). The second choice was time/

speed with Mean value of 3.51, Single point of responsibility came third with Mean value of (3.71). Quality came in the fourth place with a Mean value of (3.80). However, the T-Test results show that five categories are statistically significant ($\text{sig} \leq 0.05$).

1. Time / Speed
2. Cost certainty
3. Quality
4. Complexity
5. Less disputes

Further, it was found that interviewees from consultants stated that time is the critical factor for the projects while the interviewees from contractors stated that the cost is the major factor for the project.

Question 8 – What factors would you consider for the success of Design-and-Build projects involved?

The purpose of these questions is to find out what are the factors affecting to success of the D&B method.



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According to the questionnaire, the top three factors that employers consider for Design-and-Build success is Time, Cost and the Employer's requirements. They are rated 1, 2, or 3 more frequently than the bottom four criteria of quality, Project characteristic, Contractual arrangement, and Project-related participants.

Further, it is noted that, the majority of the (74%) of interviewees stated time is saved when employing Design-and-Build procurement method.

Among the respondents, 74% of them stated that cost-saving when using D&B method and 26% of the respondents stated cost would increase when employing the Design-and-Build procurement method.

85% of the interviewees believe that the details of the employer's requirement would determine the success of the Design-and-Build project.

It is noteworthy that 61% of the respondents stated that projects gave the same quality standard, and 39% said the use of D & B results in a loss of quality standard.

Question 09–Who should take the risk when using the Design-and-Build procurement method?

It was found that the 61% interviewees think that majority of risk is transferred to contractor when employing the Design-and-Build procurement method. 39% interviewees think the risk is not totally transferred to the Contractor.

Question 10 – Do you think the Design-and-Build delivery option may become a choice for the Sri Lankan industry in the future?

This question surveys provide the participants the opportunity to express their generic views about the future of D&B method.



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The above attitudinal answers summarized, the majority of the combined respondents, forty one percent (41%) answered that D&B option will survive following major changes in the industry towards more collaboration between the key industry stakeholders. The higher ratio of the votes came from the contracting firms.

Question 11 – Do you think that the flexibility would be enhanced when using Design-and-Build procurement method?

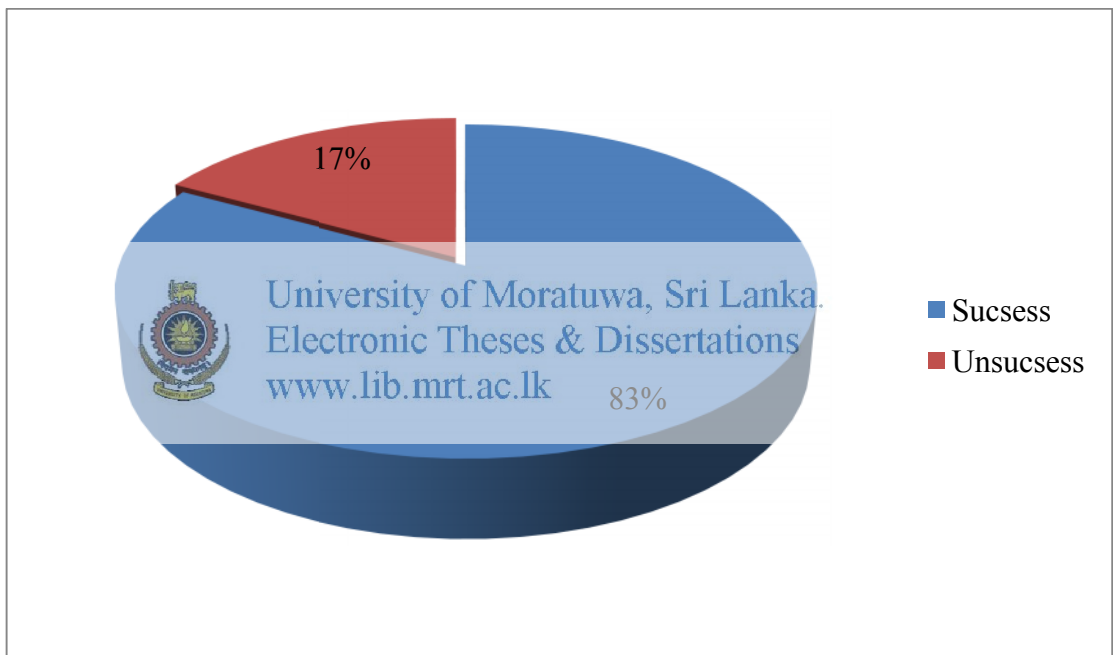
All interviewees from consultant and the employers believe that the use of D&B neither increase nor decrease in the flexibility of the project. All interviewees from contractor side stated that, the flexibility would be increased when using Design-and-Build procurement method in the projects.

Question 12 – Do you think that number of disputes would be reduced when using Design-and-Build procurement method?

All interviewees shared the view that the disputes are reduced when using Design-and-Build procurement method.

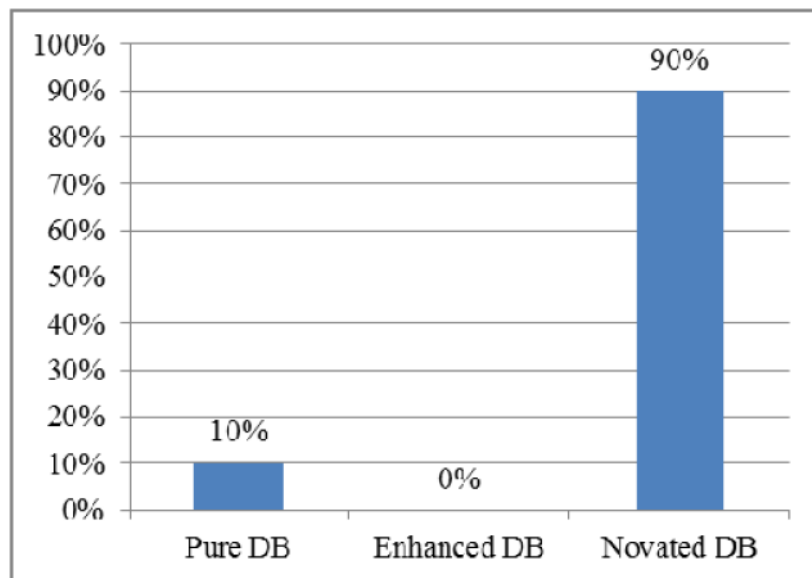
Question 13 – Do you think that the Design-and-Build procurement method is successful in Sri Lanka?

83% of respondents believe that the Design-and-Build method is successful in Sri Lanka and 17% think it is unsuccessful in Sri Lanka.



Question 14 – Under the following routes which one you recommend for future D&B Projects?

It was found that 90% of the respondents believe that Novated Design-and-Build procurement method should be used in future development project and 10% recommended pure Design-and-Build system.



4.2 Summary of Findings of Questionnaire

From the responses to the questionnaire, it was found that the traditional method is the main procurement system in Sri Lanka since this procurement has been used from the early of the construction industry. It is indicated that all of the interviewees have been involved in the Design-and-Build project which is initiated by the public sector.

From the questionnaire, it was found that the Design-and-Build can improve the cost saving or within the budget and the time reduction for the project. The interviewees think that the quality standard basis has no improvement or decreased. Most of the interviewees think that risk was transferred to the contractors in the Design-and-Build procurement method.

Majority of the interviewees think that the Design-and-Build procurement method is successful in Sri Lanka and recommend the novated Design-and-Build procurement method in future projects.

4.3 Analysis and Discussion of the Questionnaire

4.3.1 The reason for selecting the design-and-build procurement method

4.3.1.1 Time

According to the questionnaire (question nos. 7 and 8), most of the interviewees regard time is the most important advantage of using the Design-and-Build procurement method. As time is money, every Employer is concerned about money returned for investment. For the time basis, the single point of responsibility enables the contractor produce the both Design-and-Build for the project. In the Design-and-Build procurement method, the contractor should provide a 'package' to the employer which is the design and the construction stated in the employer's requirement. The overlapping of the design stage and the construction stage would reduce the time to meet the target completion date. It is because the preparation for tendering is shortened by producing the design detail at the later stage. The early start the construction on the site would shorten the time required for the construction. The total construction time would be shortened by carrying out the Design-and-Build as a parallel process. The early completion of the project would give an advantage to the Employer to release the pressure on the interest of the capital borrowed from bank. Due to the both designing and building functions are carried out by one organization, the communication between the designer and the contractor would improve. The better communication between the designer and the contractor would improve the project performance and the efficiency. The contractor is responsible to produce the Design-and-Build in the Design-and-Build procurement method. They employ the in-house designer to produce the design which can communicate with the contractor to improve the detail design with their familiar construction way. The designer can fully understand the needs and the difficult of the contractor which would avoid the unnecessary mistake in contraction method by use the most suitable construction method.

The contractors can make use of their resource and specialist skill to construct the building in their own way in accordance with the detailed design they have developed produced. It would shorten the time to find out the suitable construction

method. As the detailed design is produced by the contractor, they can make a better decision on the construction arrangement such as the sequence of the construction works. It would reduce the total construction time resulting from the better arrangement of the construction works.

The completion date is fixed because of the fewer claims the extension of time. As stated before, the contractor is responsible for producing the detailed design, the extension of time always claimed for the design changes. The less extension of time would be claimed in Design-and-Build procurement method which could meet the target completion date.

4.3.1.2 Quality

As revealed in the questionnaire, (Question no 7 & 8), majority of the interviewees think that the quality is decreased and more than the half of the interviewees think that the quality is as same as the requirement sated in the specification.

As the quality of work depends on the specification stated in the employer's requirement, the description has to be as broad as possible to make sure that the quality if the work is not compromised during the construction. A miscommunication of an idea between the Employer and the contractor would cause poor quality of the project. The specification stated in the employer's requirement should be stated clearly for the workmanship requirement. The contractor has the responsibility to fulfil the requirement stated in the employer's requirement. The contractor should produce the best design for the success tendering; therefore, the quality would be guaranteed.

From the questionnaire, the interviewees recommend the novated Design-and-Build procurement method will be used more in the future development. The novated Design-and-Build allows better communication between designers and the contractors as the design team would be transferred to the contractor for the detailed design development.

4.3.1.3 Cost

From the questionnaire (Question no 7 & 8) 74% of the interviewees reported that the cost for the project is as same as the budget of the projects. It means the cost for the Design-and-Build procurement method can release the pressure on over-budget. As the cost of time related items is affected by the duration of the construction, the longer the construction period is, the higher the cost for the construction. As the Employer would borrow money for the project via the bank, interest charges would be higher when the completion date is delayed. As the contractor is responsible for both design and build, the delay of the completion date beyond the control of the employer would be the risk of the contractor. Moreover, the Design-and-Build project ensures the completion date is met as the Employer would keep monitoring their progress by submitting the bills for work completed by the contractor.

The Employer will choose the optimum project design, which is the most suited for him and the most economical. Moreover, the cost saving can be achieved by better use of the material and specialist skill as the design is produced by the contractor. They can make good use of their skills to lower the cost of the construction. Therefore, the contractor can bid a lower price for the tender in D & B method.



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The claim of extension of time and variation are reduced as the drawing is provided by the contractor side. Fewer claims of extension of time would result in fewer claims on loss and expense. Therefore, the cost for the building will certainly lower the chance for the project to go over-budget.. As the Employer is concerned about the budget of the project, the final contract sum would not exceed the amount stated before by using the Design-and-Build procurement method.

4.3.1.4 Risk

In response to the question no. 9, 61% interviewees think that the risk is transferred to the contractor and 39% interviewees think that the risk is not transferred to the contractor.

The Risk cannot be completely avoided in any procurement method. The potential risk should be identified early, so that it could be minimised. In the Design-and-Build procurement method, the Employer should ensure his idea is understood by his design team as the draft design is the fundamental document for the contractor to create the detailed design. The final drawing and the idea should meet the requirements of the Employer. The risk occurred in Design-and-Build projects is usually the building not met with the Employer's objective. The appointment for the experienced architect on the contractor's proposal can eliminate the risk of the misunderstanding between the Employer and the Contractor.

In the Design-and-Build procurement method, the risk is almost transferred to the contractor as the responsibility rests solely with the contractor. The contractor should take risk on both Design-and-Build processes. The contractor should guarantee the design fulfils the requirement of the employer and the workmanship complies with the specification stated in the employer's requirement. Moreover, the contractor should take the risk of the performance of their sub-contractor. The performance of the sub-contractor or supplier is the responsibility of the contractor.



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The contractor should take care to assure meet the requirement of the specification stated in the employer's requirement. The over-budget risk would not occur in the Design-and-Build procurement method as the Design-and-Build contract is the lump sum fixed price contract. The price of the project would be fixed after the award of the tender. An over-budget situation may only occur when the Employer needs to change the design of the works. An excessive claim on variation may cause an over-budget of the project. The only risk for the contractor is a possible misunderstanding or a miscommunication of requirements between the Employer and the contractor. The risk would be transferred to the Employer when their idea do not fully describe in the employer's requirement.

The risk for delay of the date of completion would not occur in this method since the contractor may be able to the project complete on time, as he is also the designer of

the project. The delay of the project would be the fault of the contractor, as the contractor has the control of the whole project under him.

4.3.1.5 Flexibility

From the responses to the question no: 11, it was observed that majority of the interviewees from among the consultants think that the flexibility does improve significantly, but all the interviewees who were contractors believe that the flexibility for the project is increased.

As the contractor develops the detailed design, the Employer has only the choice to choose the suitable design in the pre-contract stage. In the pre-contract stage, the design of the building may be the concern for the Employer. The Employer has the choice for a different design produced by the contractor in the pre-contract stage. The Employer may find the most suitable design among various designs submitted by the contractor. The Employer can adopt the optimum design, which is best suited to what he wants and what is most economical. It is an advantage when the Employer does not have much of a design capacity himself.



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From the side of the contractor, the detailed design provided by them would be the most suitable way to construct. Therefore, it would maximize the resource and take an advantage on their skill which can reduce the cost for the construction and speed up the time for the construction.

Moreover, the contractor has the choice for selecting a suitable construction method and the material using. It would enhance the quality of the building and allows using better material in the project.

Furthermore, the co-ordination of the construction works can be arranged in more effective way. As the Design-and-Build procurement method allows the contractor arrange the construction work in his own way, the better co-ordination of the works would facilitate the construction flexibility to achieve the most effective way for the construction.

4.3.1.6 Dispute

From the responses to the question no; 12 it is apparent that the majority of the interviewees reported that the number of disputes has decreased when they used D&B system for projects. The contractor is responsible for both Design and Build processes. It would reduce the chance for the disputing of the design detail. The Design-and-Build is the lump sum fixed contract; the budget dispute could be avoided. The variation orders would be issued a lesser number of times, because of the detailed drawing is produced by the contractor. This will reduce the requests for time extensions requested for time. This harmony between design and building will also increase the speed of the project, and target achievement.

Disputes over performance decreases as the requirement for the project is stated initially in the employer's specifications. The contractor must fulfil the requirement in the specification to achieve the standard of the project.

Negligence disputes become lesser in the Design-and-Build procurement method as the contractor is responsible for both Design and Build phases. As they act as professionals, they have the expertise, skill and plants to complete the building as per the construction design and methods chosen by themselves.

4.3.1.7 Contractual arrangement

The contractual arrangement exists between the Employer and the contractor only. Therefore, it becomes the responsibility of the contractor if there is any default on design or construction because of the single point of responsibility of the contractor. The Employer does not involve in any contractual relationship with sub-contractors. Therefore, the contractor becomes responsible for employing sub-contractors to meet the requirement of the project. The default of the sub-contractor or supplier would be the responsibility of the contractor solely. This model relieves the Employer from the burden of dealing with sub-contractor and the supplier.

As it was observed in the analysis of the responses to the questionnaire, Design-and-Build system is more commonly applied in the public sector than in the private

sector. It is because the design is the highest concern factor in the private sector employers, who are willing to bare the cost of employing a professional design team to design the building. Therefore, Design-and-Build project opportunities become less in the private sector.

4.3.1.8 The project size

The results to the questionnaire indicate that most of the Design-and-Build projects show the characteristic to be of medium project size with shorter construction period. The standard repetitive works with less specification can guarantee the time saving and better quality performance. It is because most of the Design-and-Build projects are initiated by Government, which mainly initiated housing schemes that have a standard plan, without much complicated specifications.

4.4 The Advantages and Disadvantages of Design-and-Build Procurement Method

Based on the responses to the questionnaire, the following advantages and disadvantages can be illustrated.



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4.4.1 The advantage of using design-and-build procurement method

When the Employer does not have much experience in the construction industry, they need to appoint skilled and experienced consultants and architects to handle the problem. Due to their inexperienced in the construction field, they are not willing to move into the construction process. The Design-and-Build procurement method provides a single point of responsibility of the contractor. The Employer does not involve himself in the construction process as the contractor is responsible for both the design and the building.

On the other hand, the contractor can appoint in-house designers for designing the project rather than unknown designers who have never worked with them. This opportunity to use known and in-house designers can enhance better communication

between the contractor and the designer to achieve efficient construction. The overlapping of the Design-and-Build would lead to shorten the total construction time. Although the pre-contract stage is longer, the construction time would be reduced by the overlapping of the Design-and-Build stage. It will avoid delays of date of completion of the project.

Somers (1993) stated that the cost certainty is one of the greatest benefits of using the Design-and-Build procurement method despite the tender price is higher or lower than the traditional method. The fewer claims on extension of time or loss and/or expense claim due to less variation order. Since the detailed design is developed by the contractor, chance for claims may be reduces due to less variance. The cost for the construction process would be reflected on the tender price bided by the contractor.

The fast return on the capital would be another benefit of the Employer as he can avoid some of the bank interest charge that could otherwise have a negative impact on profit of the project. The completion on time would release the pressure on paying further interest charge.



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On the contractor's side, what is most important in assuring the success of the project is its buildability. As the contractor produces the detailed design, the best construction method would be provided. It ensures the building built in the appropriate way. They can utilize their resources and plant to co-operate with the construction method. The best method applied in the construction is not only the time saving, but also cost saving so that no material would be wasted.

When the contractor enters the design stage, he may assist the design development for the project as the contractor is act as a builder who fully understand the difficulty of the construction process. The early involvement in the design stage would reduce the disputes between the Employer and the contractor at the later stage.

4.4.2 The disadvantage of using design-and-build procurement method

The main concern factor of the Employer is the cost basis in the construction process. In the Design-and-Build procurement method, the Employer cannot have design changes once the award of the tender. The flexibility of the Employer would be limit since the design changes would cause huge amount of variation. The budget would exceed the lump sum fixed price of the project. Therefore, the flexibility for the Design-and-Build procurement project would not favour to the Employer. The Employer cannot change the design without paying any additional charges. Pain (1993) stated that the design cannot change in the post-contract period and the most suitable design should be found at the pre-contract stage.

The quality of work is another problem in the Design-and-Build procurement method. The poor quality of works would be resulted from the brief specification stated in the employer's requirement. It is the fault of the Employer if he does not provide a clear and detailed specifications in the employer's requirement to the contractor. The responsibility of the contractor is to comply with the specifications stated in the employer's requirement. Therefore, the poor quality of works may cause additional money for repairing. It will increase the cost of the project when the employer's requirement does not fully explain the standard of the works.

Employer and the Contractor may have different ideas about the design. The contractor will develop the detailed design after the approval of the design drawing by the Employer. Once the Employer approves the design, it becomes final. Even if the Employer discovers some problems on the drawing later, he cannot change the design anymore. The variation would be claimed by the contractor for the change of the design. The variation in Design-and-Build contracts make it is difficult to access the changes in exiting construction works. Therefore, it becomes difficult to identify the responsibility of any cost implication. As such, the Employer does not advise to issue a variation order after the drawing has been approved by the Employer.

Poor quality performance may occur when no information is provided for the scope of work and the site condition. Delays of the completion date may be occur when insufficient data and information to the contractor is given for tendering. The tender price does not include the cost for uncertainty. Therefore, their construction progress would delay and may affect the completion date. However, the contractor is willing to give up the quality performance to catch up with the completion date.

From the responses to the questionnaire, it is clearly observed that time is the highest benefit of using this method of procurement of design and build. In addition, it helps the Employer to save time and cost of the project. These factors are the main concern of the Employer and meet their needs. This means that the Design-and-Build procurement system is successful in Sri Lanka. Even though the method of procurement of Design-and-Build is successful there are still drawbacks. These disadvantages can be avoided by identifying the risk before.

4.5 Conclusion

Research methodology is essential in reaching objective results of the study. Methodology used in this study was literature review, data collection, data analysis and the conclusion and recommendation of the study. The literature review is used to identify the issues and a questionnaire was administered to collect data while interviews were conducted to collect data related to the case study. Statistical analysis and qualitative interviewing methods were used to analyze data. Finally, the conclusions and recommendation with reference to the objectives are created, subsequent to the analysis from the interviews and questionnaires.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The choice of a procurement method is critical for the success of a construction project. Understanding of the method of supply is very important. Different procurement methods have different advantages and disadvantages. Clear understanding of the method of procurement is not only lead to success of the project, but also optimizes the benefits to the employer. The procurement method should be paired with the objective of the employer. Subject of the employer should fully understand and according to their needs.

The disadvantages of the traditional method are longer construction times and uncertainly and variability of costs. However, both are the determining factors for Employers. The procurement of the Design-and-Build method is an alternative way to mitigate these challenges associated with the traditional method. The main advantages of Design-and-Build procurement method are the efficient use of time and larger cost savings. These two advantages are the main criteria for the customer to choose the appropriate procurement method. In this research, the success of the method of supply is considered the employer requirement.

In Sri Lanka, the employers are willing to pay according to the budget and to complete the construction on time. As time is a valuable resource, delays in the project completion would lead to reduced benefits to employers. As a result, employing the method of procurement of Design-and-Build is better.

In Chapter 2, the principles of the method of Design-and-Build supply are discussed through a literature review. The literature review identified the criteria that are used for choosing the method of current construction industry.

The objective of the employer in terms of time, cost, quality, and risk and the factor that will determine the success of the method of procurement are also identified. They are the features of the project, the selection of the contractor and the employer.

The Government is the largest Design-and-Build the employer in Sri Lanka. According to the Construction industry statistics, the use for the Design-and-Build construction project has increased this year.

The analysis of the success in the public sector could improve the understanding of the success in the procurement of the Design-and-Build method.

As discussed in chapter 3, in the second phase of this research a questionnaire had been sent to consultants and individual contractors. The selected candidates were well known in the construction industry in Sri Lanka. They are the participants who have been involved in different projects and had implemented many projects. The questionnaire was about their knowledge and experience to complete. The obtained results represented a reflection of the current situation of the construction.



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Responses to the questionnaire clearly indicate that use of the Design-and-Build procurement method leads to time and cost savings. These savings are a major benefit to the employer. This means that the Design-and-Build is successful in Sri Lanka as a procurement method. Although the procurement of the Design-and-Build method is successful, there are still drawbacks. Most of these disadvantages can be avoided by identifying the risks before.

The performance of quality can be checked and balanced if the Employer visits the site often. The employer can check if the project progresses according to the agreed upon specifications. Monitoring measures such as these can assure higher performance consistency.

The time and the cost savings are achieved when the obligation of the employer fully explains the requirement of the employer. The idea of the Employer must be well

presented to the contractor, who will be informed by this requirement to their design and their manufacturing performance details. As a result, it is very important to identify the needs and the idea of the Employer and the state in the employer's obligation.

Level of adaptation of Design-and-Build procurement method in the private sector is currently low. This is because the project Design-and-Build is more suited to simple buildings with plans of standard design specification and repetitions. The limitation of the Design-and-Build should be further studies in order to solve these problems.

5.2 Recommendations

The interviewees and the author recommended the novation Design-and-Build procurement system. It can improve the Design-and-Build method of supply for customised construction in the Sri Lankan situation. In this method, the contractor is responsible for the design, details of work and the construction of the project against an initial design provided by the Employer following the transfer of the design of the employer's team to the contractor. The design team develops the design based on the idea of the employer. It ensures the design to fulfil the obligation of the employer to reduce disputes between the employer and the contractor.

To meet Sri Lanka's competitive construction industry, employers have been searching for methods of supply such as the traditional method, in order to make the project more effectively and also be suitable for rapid change. Therefore, it is necessary to conduct this kind of research periodically to request feedback by different companies to study and understand the real situation of the industry. Whereas the present result will represent the development of projects and the procurement method, future changes may need to be taken into account.

Finally, success means different things to different customers. Some are more concerned about saving on time or money while others want high quality performance. No method of supply is perfect. It is advisable, therefore, to use their

advantages to optimize the needs of the employer. The method of procurement of the Design-and-Build provides opportunities to meet the Employer's requirement. This is why Design-and-Build project is successful in Sri Lanka.


5.3 Further Research

A more in-depth study should be carried out to find out reasons for smaller incident of use of method of procurement of Design-and-Build. The effect of such application in large project must also be studied. . Other case studies for the Sri Lankan construction industry procurement systems should be studied in further research. The deep study would strengthen the development of the Design-and-Build method of supply that can be applied to various projects. The cultural issues regarding D & B should be researched in the future.



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APPENDIX I - QUESTIONNAIRE

A STUDY OF THE SUCCESS OF DESIGN-AND-BUILD PROCUREMENT METHOD FOR BUILDING PROJECTS IN SRI LANKA

SECTION –A

RESPONDENT'S INFORMATION

1. Name : _____
2. Organization : _____
3. Designation : _____
4. e-mail address : _____
5. Phone Number : _____
6. Profession : _____
7. Professional experience : _____
8. What type of organisation do you work for : _____
Consulting / Contracting /Employer

SECTION - B

KNOWLEDGE AND AWARENESS OF DESIGN AND BUILD

Please read through the following questions carefully and give where possible, answers that represent your views

- **Please tick the appropriate box**

Question 1 – Have you involved in Design-and-Build projects.

1	Involved	
2	Not Involved	

Question 2 - Are you aware about Design-and-Build contracting

1	Well Aware	
2	Aware	
3	Vaguely Aware	
4	Not Aware	

Question 3 – In which sector is mostly involved in Design-and-Build projects

1	Private Sector	
2	Public Sector	

Question 4 - What is the number of medium to large size D &B projects that you / your firm is generally awarded per annum?

			0	1	2	3	4	or more
1	Medium size project Less than 1,000 Million							
2	Large size project Between 1,000 Million- 5,000 Million							
3	Very Large size project Between 5,000 Million- 10,000 Million							
4	Mega project More than 10,000 Million (10 Billion)							

Question 5 : When have your firm been involved and working with Design-and-Build projects delivery method?

1	Less than 5 years	
2	5 – 10 years	
3	10 – 15 years	
4	Over 15 years	

Question 6 – What is the most common procurement method used in the projects involved Please rank the frequency of each, in a priority order

		Priority				
		High	←————→			Low
1	Traditional Method	1	2	3	4	5
2	Design-and-Build	1	2	3	4	5
3	Construction Management	1	2	3	4	5
4	Management Contracting	1	2	3	4	5
5	Built, Operate and Transfer	1	2	3	4	5

Question 7 – What factors would you consider for the selection of Design-and-Build projects involved. Please rank the frequency of each, in a priority order

		Priority					
Selection Factor		High	←————→				Low
1	Cost certainty	1	2	3	4	5	6
2	Quality	1	2	3	4	5	6
3	Time (Decrease the overall project completion time as compared to other procurement methods)	1	2	3	4	5	6
4	Constructability/Innovations (Introduce buildability knowledge into design early in the process.)	1	2	3	4	5	6
5	Large Project Size/Complexity (Single point of responsibility)	1	2	3	4	5	6
6	Reduce Claims/Less Disputes (Decrease litigation as compared to other procurement methods)	1	2	3	4	5	6

Question 8 – What factors would you consider for the success of Design-and-Build projects involved. Please rank the frequency of each, in a priority order

Success Factor	Priority						
	High	←————→					Low
1 Time	1	2	3	4	5	6	7
2 Cost	1	2	3	4	5	6	7
3 Quality (Completed project meets or exceeds all technical performance specifications provided by the Employer and the accepted standards of workmanship in all areas.)	1	2	3	4	5	6	7
4 Employer's requirement	1	2	3	4	5	6	7
5 Project characteristic	1	2	3	4	5	6	7
6 Contractual arrangement	1	2	3	4	5	6	7
7 Project-related participants	1	2	3	4	5	6	7



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Question 09 – Who should take the risk when using the Design-and-Build procurement method. Please rank the frequency of each, in a priority order

Risk factor	Priority		
	High	←————→	Low
1 Employer	1	2	3
2 Contractor	1	2	3
3 Both	1	2	3

- **Please tick the appropriate box**

Question 10 – Do you think the Design-and-Build delivery option may become a choice for the Sri Lankan industry in the future?

1	Yes	
2	No	
3	Not sure	
4	Depends on the Employers understanding of D/B	
5	Only in the boom times	
6	Yes, through the public sector	
7	Yes, through the private sector	
8	Other (please specify)	



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Question 11 – Do you think that the flexibility would be enhanced when using Design-and-Build procurement method.

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1	Yes	
2	No	

Question 12 – Do you think that number of disputes would be reduced when using Design-and-Build procurement method.

1	Yes	
2	No	

Question 13 – Do you think that the Design-and-Build procurement method is successful in Sri Lanka.

1	Yes	
2	No	

Question 14 – Under the following routes which one you recommend for future D&B Projects.

1	Pure D&B procurement method	
2	Enhanced D&B procurement method	
3	Novated D& Build procurement method	



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