

THE STUDY ON THE IMPLEMENTATION OF DESIGN AND BUILD  
PROJECTS IN DID

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*To my beloved mother,  
late father  
& family*

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## ABSTRACT

Procurement selection is crucial for the project success. Recently, design and build procurement method is used as alternative to the traditional procurement method (design-tender-build). The scenario is due to design and build procurement method gives advantages to the employer in term of time and cost. However, when this method was implemented, it did not fully fulfil what it claim to be. The project still suffer cost overrun, time overrun and the quality does not meet the standard. The objectives of the study are to identify the shortcomings or problems of using the design and build procurement method. It is also to establish the causes that give rise to these problems. Problems of design and build procurement method are identify through literature review in which these problems give impact to the project success in term of time, cost and quality. Multiple-case studies are conducted in which seven design and build projects are selected from the Department of Irrigation and Drainage, Malaysia (DID). The case studies using approaches of semi-structure interviews, observations and documentary sources. This study shows that the projects that use design and build procurement method no different from the traditional method in term of time and cost. Many of them suffer cost and time overrun and poor quality workmanship. The causes of these problems include unclear Needs Statement, inexperience design and build contractor, unfamiliar of design and build concepts, insufficient time during the tender stage, greater project cost, employer loss control over design, conflict of interest as well as design and build procurement method is discourage competition. These problems may be eliminated if the design and build project is let out through pre-qualification exercise. This is to ensure fairness and only the eligible contractor could be employed. Course or workshop on design and build procurement method should regular be conducted to increased the understanding amongst the construction players. Employer may adopt 'novation' agreement in which design consultants do the designs on the employer behalf and afterwards the design consultants are novated to the design and build contractor. Finally, the employer must allocate sufficient time for planning, design as well as negotiation.

## ABSTRAK

Pemilihan kaedah perolehan yang tepat adalah penting bagi menentukan kejayaan sesuatu projek pembinaan. Kebelakangan ini, kaedah perolehan secara reka dan bina telah digunakan sebagai kaedah perolehan alternatif kepada kaedah tradisional (reka-tender-bina). Perkembangan ini adalah disebabkan oleh kelebihan kaedah reka dan bina dari sudut masa dan kos. Walau bagaimanapun, projek yang menggunakan kaedah ini masih menghadapi lebih kos, kelewatan dan kualiti yang tidak mencapai standard. Objektif kajian ini adalah untuk mengenalpasti masalah-masalah yang timbul akibat menggunakan kaedah reka dan bina serta menyediakan sebab-sebab yang menyumbang kepada masalah tersebut. Masalah-masalah kaedah perolehan secara reka dan bina ini dikenalpasti melalui kajian literatur yang mana masalah-masalah ini memberi kesan terhadap faktor kejayaan projek pembinaan dari sudut masa, kos dan kualiti. Kajian kes telah dijalankan terhadap tujuh projek pembinaan di Jabatan Pengairan dan Saliran, Malaysia (JPS). Kajian kes ini telah menggunakan pendekatan wawancara secara semi-struktur, pemerhatian dan sumber dokumentasi. Kajian ini menunjukkan bahawa projek reka dan bina tiada berbezaan dengan kaedah tradisional dari sudut masa dan kos. Masalah utama yang dihadapi oleh pihak majikan adalah Penyata Kehendak yang tidak jelas, kontraktor reka bina yang tidak berpengalaman dalam menguruskan projek secara reka dan bina, pasukan projek yang tidak memahami konsep perolehan secara reka dan bina, masa yang tidak mencukupi semasa proses tender, kos projek yang tinggi, pihak majikan kehilangan kawalan terhadap rekabentuk, konflik kepentingan dan kaedah perolehan secara rundingan terus yang menyebabkan kurangnya persaingan. Didapati masalah-masalah tersebut boleh diatasi sekiranya projek-projek awam yang dilaksanakan secara reka dan bina diperolehi melalui tender pra-kelayakan iaitu kontraktor yang berkelayakan sahaja yang dipanggil untuk memasuki tender disamping memastikan ketelusan. Latihan juga perlu dijalankan bagi meningkatkan kefahaman pemain industri pembinaan tentang pengurusan kontrak reka dan bina. Bagi memastikan pihak majikan terlibat dalam proses reka bentuk, adalah dicadangkan perjanjian 'novation' dilaksanakan dimana perunding rekabentuk dilantik oleh majikan untuk kerja rekabentuk dan kemudiannya setelah projek tersebut ditender perunding rekabentuk bekerja di bawah kontraktor reka dan bina. Akhir sekali, pihak majikan hendaklah memperuntukan masa yang mencukupi untuk peringkat perancangan, rekabentuk dan rundingan harga.

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**LIST OF ABBREVIATIONS**

CIDB	-	Construction Industry Development Board
DID	-	Department of Irrigation and Drainage, Malaysia
MOF	-	Ministry of Finance, Malaysia
PKK	-	<i>Pusat Khidmat Kontraktor</i>
PMC	-	Project Management Consultant
PMD	-	Project Management Division
PWD	-	Public Work Department, Malaysia
PWD DB/T 2002	-	Standard Form of Design and Build/Turnkey Contract Edition 2002
SMART	-	Storm Management and Road Tunnel Project
SMATRAK	-	<i>Sistem Maklumat Kontrak</i>
SD	-	Specialist Division
SPP	-	<i>Surat Pekeliling Perbendaharaan</i>

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background of the Study**

Construction project is unique as it has distinctive characteristics such as type of a project, employer, contractor, project team, size of a project, location, budget, completion duration as well as complexity of a project. The characteristics of the project will allow the risks during construction. Therefore, procurement method will be a tool that allocating the project's risks between the employer and contractor (Fellow, 1993).

Procurement method is a project delivery system commonly used by the employer to get a construction project. Masterman, (1992) describes procurement method as the organisational structure adopted by the employer for the management of the design and construction of a construction project. Procurement method defines the contractual relationship, roles and responsibilities among the parties as well as the procedures used to complete a construction project. The selection and use of an appropriate procurement method is crucial to a project success (Ng, Luu & Chen, 2002). The success of a construction project may be determined by the degree to which it meets the employer's requirement specifications and project's requirements in term of time, cost and quality. Chan and Kumaraswamy (1997) emphasized that

timely delivery of projects within budget and to the standard of quality specified by the employer is an index of successful of project delivery. Failure to achieve the targeted time, budgeted cost and specified quality will result to various unexpected negative effects on the construction project (Sambasivan & Yau, 2007).

Traditionally, the public and private sectors used conventional method to procure their construction project by which the management of design stage and construction stage are separated. Employer employed the design team that comprises of the architect, engineer and quantity surveyor to give the design input and do the detailed design. Afterwards, employer employ the contractor to carry out the construction project based on the complete detailed drawings. Using this procurement method, employer takes the risks by which warrants the drawings and specifications are free from mistake. Meanwhile, the contractor has the liability to the 'buildability' of the facility.

However, the traditional procurement method has been identified as the slowest project delivery approach (Rosli Abd. Rashid *et al.*, 2006). This procurement method requires lengthy time to complete the design. Inadequate drawings and specifications will cause variation of works in which will ultimately lead to increased cost. In addition, the contractor will have no opportunity to contribute their expertise in the design process. Lack of communication between designers and contractor is also identified as one of the disadvantages of this procurement method.

The disadvantages of traditional procurement method and the escalating requirements of the employer on project time, cost, quality and risk have given rise to the development and use of alternative construction procurement methods such as design and build, management contracting, construction management, partnering as well as alliance. Theoretically these alternative methods may reduce employer's risks or risks sharing between the employer and contractor.

In Malaysia, design and build method of procurement has become more popular procurement method especially in the public sector. The design and build procurement method was first launched in Public Works Department (PWD) by the Malaysian Prime Minister in year 1983. The first project handled using this

procurement method was the Kuala Terengganu Hospital, which was completed in 1985 (Mokhtar, 1993). The main reasons for adopting this procurement method is the urgency to expedite construction projects as well as to weigh down PWD's scope of works mainly in design and site supervision. The selection of this type of procurement is due to its lead to saving in time, fixed lump sum price and improved project performance.

The extensive use of design and build procurement method in Malaysia includes complex and large-scale project such as the government's offices, commercial buildings, hospitals, schools, residential building as well as civil engineering works. Civil engineering works or infrastructure works usually link with the public sector as it involves large-scale, complex construction method and high cost which need investment from the large organisation. Civil engineering works are comprised of flood mitigation works, drainage and irrigation system, dams, roads, bridges, ports, airports, train railways and etc.. All these works typically require input from the experts such as specialist contractors and designers.

The design and build procurement method is known as the 'fast-track' delivery system where the design and construction stage are integrated as well as single-point of responsibility contract. Findings from the survey conducted by The Centre for Construction Management and Information (CCMI) in year 1986 identify three main benefits resulting from the use of design and build procurement method; speed, single-point of responsibility and saving in cost. Moreover, the survey conducted by the National Science Foundation, University of Colorado in year 1995 found that the main reason the public sector chooses design and build procurement method is to shorten the contract duration (Molenaar, 1995).

The design and build procurement method requires the employer to enter into a contract with the contractor who acts as single entity who is liable to both design and construction works. The contractor is normally appointed by the employer based on its vast experience, knowledge and competency in construction (Rosli Abd. Rashid *et al.*, 2006). Legally, the contractor will be responsible for the design, construction, quality, structural soundness, durability, suitability and satisfactory performance to complete the works (Shapiro, B.). Under this procurement method,

the design is prepared by the contractor's design team by which contractor warrant the drawings and specifications are free from mistake and the 'buildability' of the facility.

Therefore, single-point of responsibility, speed, saving in cost and quality are the main factors why the employer chooses design and build procurement method for delivering their construction projects as an alternative to the traditional procurement method.

## **1.2 Problem Statement**

Theoretically, design and build procurement method has advantages over the traditional procurement method in term of single-point of responsibility, speed in the project completion, saving in cost and improved project performances.

The decision to use design and build procurement method among the employers is contributed by the fact that it results to a single-point of responsibility for both construction and design defects as well as its potential to fulfil the project's requirements. This procurement method also reduces claims as the contractor will bear any of the additional costs that may occur as the result of using defective or inadequate plans prepared by their designers. The contractor will also take the design risk by warrant the design is free from mistake, functionality, 'buildability' and agrees to meet the employer's performance specifications. The project can be completed within a shorter time since works at site can start earlier as the design and construction stage may overlaps. The experienced contractor will be able to control the work programme and budget by which lead to lower overall cost.

The design and build procurement method gains its popularity in recent years (Haque *et al.*, 2001) and appears to be the most accepted alternative to traditional procurement (Akintoye, 1994), but it happened to be only in large-complex projects



(Tam, 2000) or in the public sector projects (Lam *et al.*, 2003; Lam *et al.*, 2004; Chan *et al.*, 2002). Despite its growing popularity amongst construction players, and acclaimed to be beneficial to all parties such as employer, architect, engineer and contractor (Flora *et al.*, 1998), design and build procurement method is not without its disadvantages.

A study by Hamimah Adnan (2008) suggested that time overrun and cost overrun, employer's delays, lack of information from the employer, difficulty of following instruction, conflict of interest and variation to changes were ranked as highest risk in design and build procurement method. According to Public Account Committee Chairman, projects that implemented using the design and build method incurred higher cost compared to conventional projects (The Sun, 19 October 2009) and market prices (*Surat Arahan Perbendaharaan*, 26 March 2008).

These problems can be vouched by recent cases such as the design and build projects of Malaysian External Trade Development Corporation (MATRADE) building. This project failed to fulfil the project's requirements by which it took 9 years to be completed from the original completion date in February 1997, the cost has ballooned from RM167 million to RM287.5 million plus another RM64.8 million spent on repair works (The Star, 26 February 2006).

Similar problem cropped up again in 2004, where Malaysian was shocked against the cracks on 31 pillars of Middle Ring Road 2 (MRR2). The cracks led to the closure of the 1.7km section of MRR2 from Kepong Indah to Damansara-Puchong Highway. The original cost of project is RM120 million increased to RM238.8 million and RM70 million spent for repair works. This project was completed in 34 months instead of 36 months. The investigation consultant announced the failure of this project is due to its design deficiencies (News Strait Time, 30 September 2004).

Recently, the design and build procurement method adopted in the construction of Stadium Sultan Mizan Zainal Abidin (SSMZA) also experienced the same problem. The roof structure collapsed in June 2009 after a year opened to the public. The original cost of project is RM191 million increased to RM292 million

and completed on time. The investigation committee announced the roof structure collapsed as the material and quality are not according to specifications, design deficiencies, inferior quality of construction, lack of quality control and site inspection, inexperienced project team as well as negligence (Berita Harian, 15 March 2010).

These are some of the examples of the problems and issues of the implementation of design and build projects by the public sector. These construction failures have tainted the image of Malaysian construction industry as well as to bring bad reputation to the public sector efficiency, accountability and integrity. Moreover, Chan *et al.*, (2002) assert that in the case of public sector, the design and build project can be accountable to the general public in term of time and cost.

Consequently, it is true that the design and build procurement method will assist employer to gain theoretical benefits of design and build procurement method in term of project's requirements or vice versa?. Does the change from traditional procurement method to design and build procurement method help the employer gain 'best value for money' as the project completed on time, within budget as well as meet employer's requirements.

The foregoing discussion highlighted several pertinent issues, which are;

1. Why there problems arises when it was claimed that design and build procurement method is better than traditional procurement method.
2. What went wrong – which aspect is the actually problematic.
3. Is it the fault of the contractor or employer.

One of the government departments that use design and build for the procurement of its projects is Department of Irrigation and Drainage, Malaysia (DID). Preliminary discussion with DID's officers suggested that there are a lot of problems and issues that have crop up in project using design and build procurement method. DID has for the last 10 years spent RM5.05 billion to develop its design and build projects. The projects that are carried out by DID is civil engineering works involving large-scale and high cost projects, specialist works and urgency works that contribute to the infrastructure development of this country.

Therefore, this research intent to study the design and build projects that executed by DID in which to investigate the shortcoming of the design and build procurement method against the project's requirements in term of time and cost as well as to ascertain the significant factors contribute to the problems.

### **1.3 Objective of the Research**

The main objective of this research is to study the implementation of design and build projects by the Department of Irrigation and Drainage, Malaysia by which;

1. To identify the shortcomings or problems of using the design and build procurement method.
2. To establish the causes that give rise to these problems.

### **1.4 Scope of the Research**

This research focuses on the civil engineering projects at Department of Irrigation and Drainage, Malaysia. The construction projects involved are flood mitigation works as well as drainage and irrigation system.

This research concentrates on the parameter of project success in term of time and cost. In addition, this research will also study the problems in implementing design and build projects that faced by the public sector.

## **1.5 Importance of the Research**

This research is to scrutinise the shortcoming of the design and build project that executed by the public sector. The intention is to investigate whether the design and build procurement method is competent to ensure the project completed on time, within cost as well as meet employer's requirement specifications. The research findings may assist in increase the efficiency of parties who involve in implementing design and build procurement method in order to achieve the benefits of design and build concept as well give better implication to construction industry in Malaysia.

## **1.6 Research Methodology**

Research methodology is a main aspect to scrutinise the research. In order to achieve the objective, the primary data collection methods for this research are based on reading as well as case studies.

The data or proof for literature review collected through reading the published books, journals, articles, conference papers, news papers and design and build standard form of contract (PWD DB/T Edition 2002). This method will assist the researcher to understand the background of the research as well as to get the ideas and opinions on the research.

The case studies afterward carried out to obtain data regarding to the implementing design and build projects (civil engineering project) by the Department of Irrigation and Drainage, Malaysia. The approaches employed are semi-structured interviews, observations and documentary sources.

The primary data therefore analysed and transformed into tables as well as bar charts in order to ascertain the actual circumstances faced by the employer when implementing design and build procurement method in their construction projects.

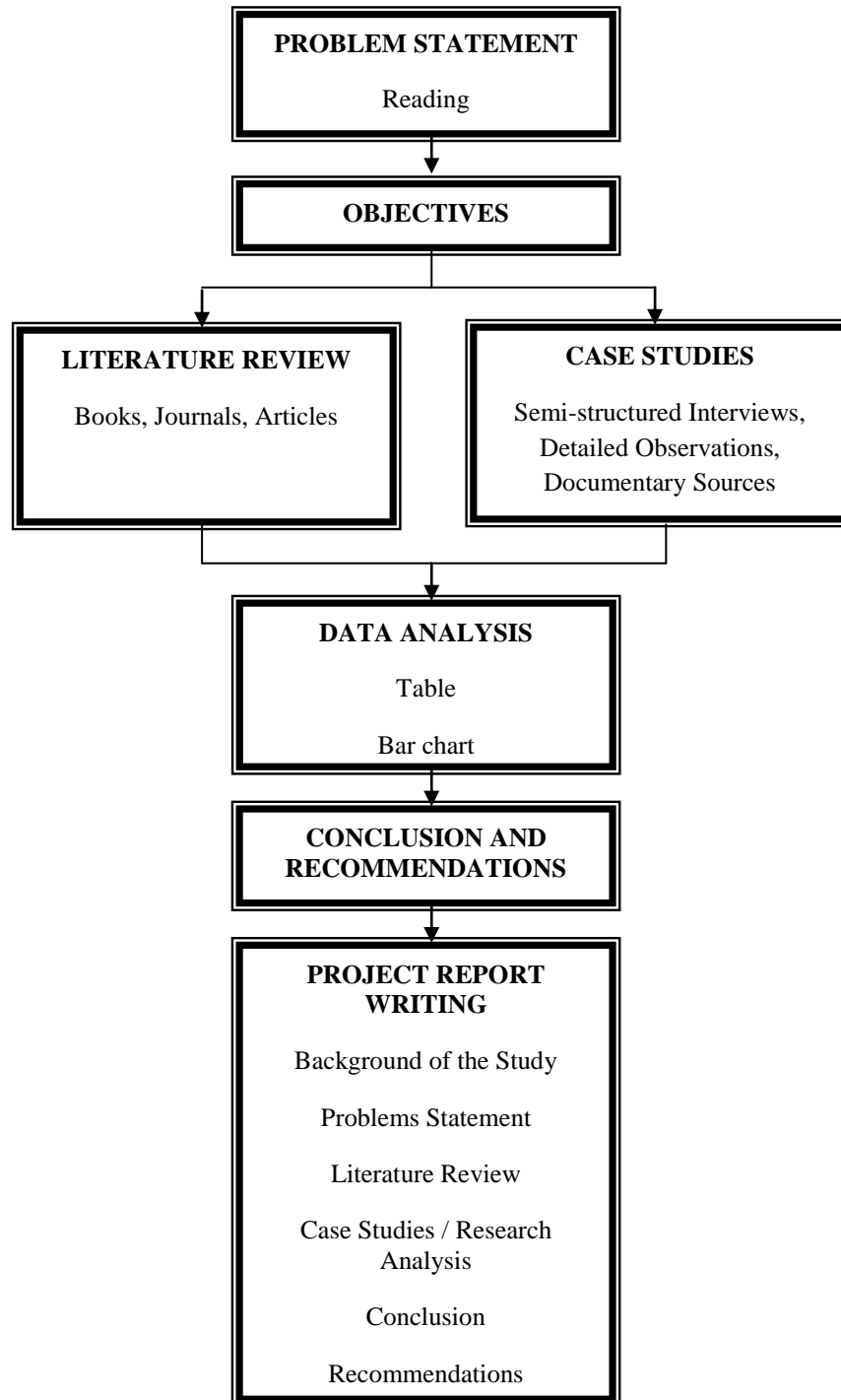


Figure 1.1 : Research Methodology

## **1.7 Structure of Dissertation**

This dissertation writing is divided into five chapters. Chapter 2 and Chapter 3 are literature review on research by which based on reading the published materials. Chapter 4 is analysis of projects in term of project's requirements and problems faced in implement design and build projects. Finally, the researcher will conclude the research findings and make the recommendations in Chapter 5. The synopsis of this dissertation is as follow;

### **Chapter 1: Introduction**

This chapter consists of background of the study, problem statement, objectives of the research, scope of the research, importance of the research as well as research methodology.

### **Chapter 2 : Literature Review on Design and Build Procurement Method**

This chapter is a literature review on the design and build procurement method. The chapter explain the design and build concept, the roles and responsibilities of the employer and contractor under design and build procurement method, the theoretical advantages and disadvantages as well as the success and failure factors of the design and build procurement method.

### **Chapter 3 : Literature Review on the Implementation of Design and Build Procurement Method by Department of Irrigation and Drainage, Malaysia**

This chapter describes the procedure and process for implementation of the design and build procurement method at Department of Irrigation and Drainage, Malaysia.

### **Chapter 4 : Case Studies**

The case studies for the civil engineering projects at Department of Irrigation and Drainage, Malaysia by identify the shortcoming of design and build procurement method against the project's requirements in term of time and cost; and the problems that faced by the public sector when adopted this method.

### **Chapter 5 : Conclusion and Recommendations**

The researcher is therefore concludes the research findings and make some recommendations in order to improvise design and build implementation in the public sector.

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