

## **Exploring the Opportunities of Design and Build Contracts for the Construction Projects in Pakistan.**

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### **Abstract**

Design and Build is one of the latest procurement techniques and philosophies for the construction projects in the developing world. The main objective of this approach is to transfer the risk and achieve the Total Quality Management in the construction projects. There is very little application of this approach in the developing world including Pakistan due to lack of policy and institutional support. The traditional approach of Design Bid Build is thus leading to delays and cost over runs of the construction projects. In this paper, the application of Design and Build approach has been explored for the construction industry in Pakistan, and particularly the public sector. If suitable environment is developed, the Design and Build approach can be successfully applied to boost the construction industry of Pakistan.

### **Keywords**

Design and Build, procurement, techniques, Total Quality Management

### **1. Introduction**

Procurement is defined as acquisition of products and services. Procurement Management is one of the nine knowledge areas of Project Management as defined by the Project Management Body of Knowledge (PMBOK, 2007). Today a number of procurement methods are used in the construction industry. The major types of procurements, covered under Cost plus contracts include fixed price or lump sum contracts, Cost price with re-determination, fixed price plus incentive fee, Fixed price plus economic price adjustment, fixed price with successive targets incentives and Fixed price for service material and labor at cost method etc.

In addition to the fixed price contracts, many other procurement modes and options have been tried in the world. The success of any particular mode of procurement depends on the following factors:

- Government Rules and Regulations.
- Knowledge of the basic stakeholders about the proposed procurement method.
- Availability of core technical teams and their levels of competency.
- History of the organization dealing with the particular types of contracts.

- Availability of human and non human resources for implementation of the particular mode for procurement.

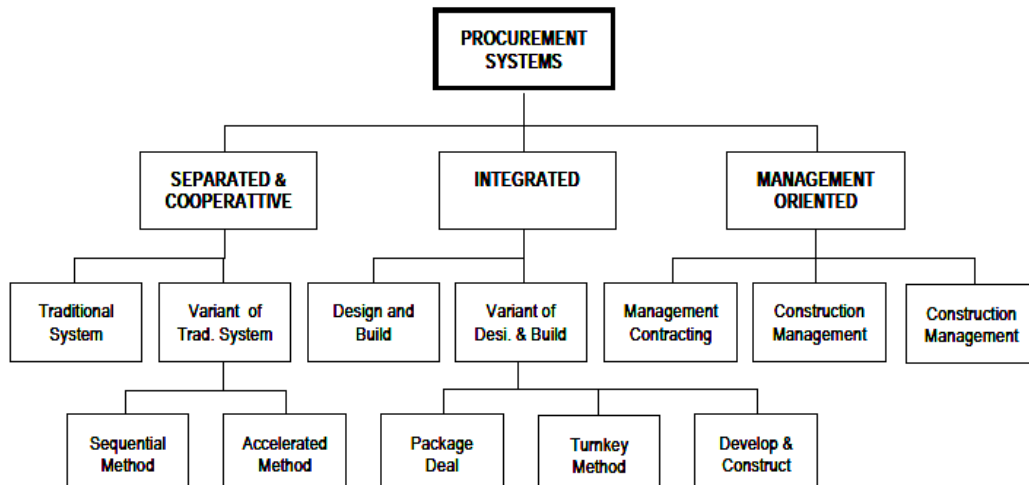
Some of the alternative options to fixed price contracts are given below:

- Turnkey
- Bonus - Penalty
- Joint venture
- Combination of the above
- BOOT ( Build Operate Own and Transfer
- BOT ( Build Operate and Transfer)
- Build Lease and Transfer (BLT) .

Selecting of a contractor is crucial to the successful completion of a construction project (Chan, 1996). For Construction projects procurement systems according to Mastermann (1996), have been divided into three major groups. In a traditional system of Design Bid Build, the design of the projects are done separately by the Engineering and Consultancy firms, whereas the construction is arranged through civil work contractors. The main advantage of this system of procurement is creating better control of the client during various phases of the construction projects. Historically, the traditional procurement system of Design-Bid-Build has been extensively used in developing countries like Pakistan. In such systems of procurements, most of the risk is taken by the client for any default on the part of contractor(s). Some changes in traditional systems have been proposed in Pakistan and other developing countries like Malaysia, India, Indonesia and Bangladesh.

The second system of procurement, namely Design and Build transfers the risk from the client to the contractors; as both the design and construction is arranged by the same firm or group of firms. The present by-laws of Pakistan Engineering Council do not encourage such kinds of procurements. Hence, there is a need to review and revise the existing by-laws to develop the Design and Build Contracting with in the public works as well.

The third system of procurement is management oriented. This system relies on a professional construction firm or consultant, which is appointed to manage the various phases of construction projects. The extensive use of Project Management tools and techniques by such firms can lead to a timely completion of the projects. The roles of construction management firms are increasing in the construction industry with time. The various options available for procurement of construction projects are given by Mastermann (1996) in Fig.1.



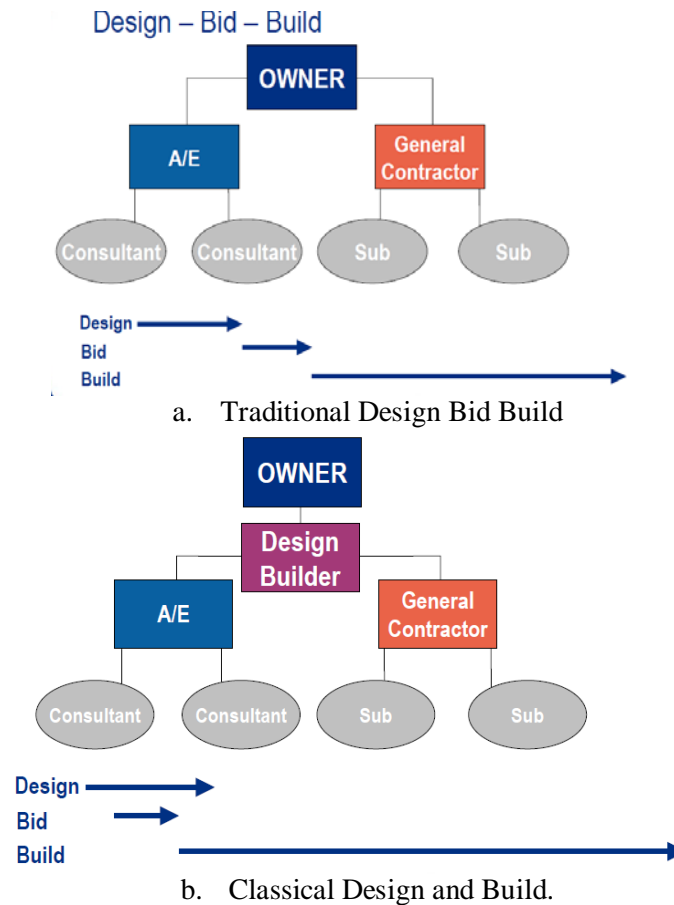
**Figure 1 various methods of construction project procurement (Mastermann,1996).**

There is no single generally agreed procurement method for all types of construction projects, as the selection of any appropriate procurement method depends on a number of factors (Chan,1995)

Under the design and build contracts, there is only one contractor – the design and build contractor. The main advantage is that the employer does not have a claim against different parties if there is a problem. Design and Build has been proved to be a relatively effective delivery method for construction projects in last few decades. In this paper the strengths and weaknesses of Design and Build delivery methods have been discussed in comparison with the traditional Bid Build Method and various opportunities have been explored for its application to the construction industry of Pakistan on the basis of surveys and discussions with the contractors, project related public sector managers, consultants and sponsoring agencies. It has been observed that Design and Build can provide relatively fast track mechanism for project delivery provided that various legislative, policy and institutional issues are addressed.

## 2. Strengths and weaknesses of Design and Build Contracts

According to the Design-Build Institute of America (DBIA), about 40-percent of all nonresidential construction projects in both public and private sectors in U.S now use this approach, in contrast to less than 10-percent two decades ago. They further estimated that by the year 2011-12, the Design & Build contracting methods will surpass the traditional Design Bid Build constructions methods (Anumba and Evbuomwan, 1997). The comparison of activities involved in the Design Bid Build and Design & Build methods has been given in the Fig. 2.



**Fig2. Comparison of two major construction delivery methods (Chan, 1995).**

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.

There are a number of advantages of the “Design and Build” method of construction. Some of the advantages are discussed as follows:

i. **Single point of Responsibility:**

In “Design and Build” method, the contractor is responsible for the design and the construction both. The employer’s responsibility has been defined at single point, as compared to the traditional form of “Design Bid build”, where the employer has entered into separate construction and design agreements with two different firms.

ii. **Price certainty:**

In most of the “Design and Build” contracts, the maximum price is guaranteed by the contractor. The professional fee for design and consultancy is normally built into the final contract price and tends to be lower in many cases.

iii. **Speed and high progress:**

In most of the cases the design and construction of the projects are maintained in parallel rather than in incremental way. Due to single point of responsibility, the contractors are not relying on many other parties for design and supply of information, which leads to an accelerated progress of the projects.

iv. **Effective Cost control:**

Due to quicker completion of the projects, the costs over runs are avoided and the projects are completed within the allocated budgets and costs.

v. **Build ability/Constructability:**

In the traditional “Design and Build” delivery of projects, the problems encountered are due to design issues, sites related difficulties and other structural issues that are usually referred to employers or consultants, which can often leads to a delay of the project completion. In “Design and Build” projects, the contractor has to design build-able projects for its timely completion.

vi. **Less claims:**

In “Design and Build”, the frequency of claims is reduced as the liability of the employer is defined at a single point, thus reducing the frequency of claims.

On the other hand, there are a number of issues and threats in using the “Design and Build” contracts. Some of these threats are given as follows:

i. **Poor quality of design:**

Here the traditional role of architects and consultants is eliminated in the design of the facilities, which creates doubts about the suitability of the design proposed by the contractor. This apprehension is even more relevant to the architects. However strong in-house design review capacity is essential for eliminating the chances of poor quality of design.

ii. **Additional fee for design revision and improvements:**

In case improvements and revisions are required due to changes in the facilities and scope of the project, the contractor may demand additional compensation for revised design of the facility.

iii. **Lack of flexibility in the contract:**

“Design and Build” are more suitable for repetitive type of medium and small projects, where the tendency of subsequent changes in the scope of work is minimal after commencement of projects. The large projects may however involve changes in the scope of work at later stages, which may not be guaranteed by the Terms of References (ToR) of the contracts. This inherent weakness in the “Design and Build” method of procurement makes it less flexible and non adoptive to the large construction projects, which limits its wider application.

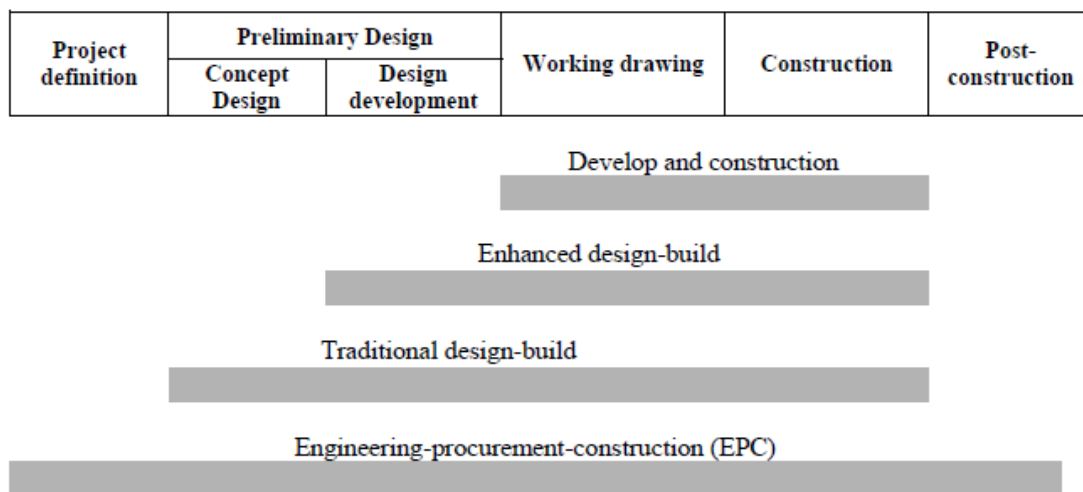
### 3. Application of Design and build contracting in the construction projects

“Design and Build” method has been used extensively in the developing world. Lim, Wang and Tiong (2002), studied the success of the “Design and Build” construction methods and related critical issues in the pre-cast industry of Singapore, through questionnaire surveys and interviews. They reported that due to typical design of pre-cast structures having fewer complications, D&B can provide more cost effective solutions. The respondents agreed that “Design and Build”, when applied to pre-cast structures would reduce the construction costs. They also recommended wide application of “Design and Build” to other construction projects with certain amendments.

Chan (2010) studied the application of enhanced “Design and Build” procurement method to hospital buildings in Hong Kong. In the enhanced “Design and Build” procurement, the basic design parameters were developed by the in-house team of the employer wherein the responsibilities and roles of the contractors were specified. The work of detailed designing and construction of the hospital facility conforming to the basic design parameters, was however left to the contractors. This shifted both the liabilities relating to design and construction to the potential contractors. Thus through enhanced “Design and Build” procurement for the construction of hospitals, the following advantages were achieved:

- i. Conformance to the basic design,
- ii. Time saving,
- iii. Less demanding documentation,
- iv. Opportunity to benefit from the contractor’s expertise in constructability and
- v. Reduction of cost overrun.

Bo and Chan (2008) explored the opportunities to use D&B contracting for the construction industry of China. The various projects executed in Mainland China and the associated tasks have been divided into four major groups by them as shown in Fig.3.



**Fig 3. The classification of design-build projects in Mainland China**

On the basis of Case studies of the projects executed in mainland China under various “Design and Build” variants , they concluded that in the Design and Develop mode, the employer develops the preliminary designs and engage the contractors for detailed design and construction, which will lead to more control of the client. This mode is mostly applicable in the housing sector. The gap between the traditional “Design Bid Build method” and “Design and Build method” is bridged by the “Develop and Construction method”. In the pure “Design and Build” and enhanced design and build modes, the preliminary design is also done by the contractor as well but this mode is not favored by the clients as it leaves them at a relatively disadvantaged position. However these modes are successful for typical projects, where there are not a lot of complexities. The Engineering Procurement Construction mode engages the contractor from the early project definition to commissioning and construction. However this mode is not applicable to the construction industry but can be applied to industrial sector. They recommended that for selection of suitable “Design and Build” variants, sufficient information may be provided.

Reshaid and Kartram (2005) proposed a pre-qualification and tendering procedure for the Design and Build contractors for public sector projects and highlighted the main issues like: technical and financial evaluations, terms of reference for “Design and Build” contractors, role of supervision consultants and other related issues.

#### **4. Legal issues in the Design and Build delivery methods for construction.**

In most of the developing countries, the construction projects are executed through traditional procurement methods of Design Bid Build as there are number of legal issues faced in the implementation of the “Design and Build” option. The legal issues have been broken into following categories as highlighted by Mark C. Friedlander (2010).

- i. The relationships and loyalties among the parties.
- ii. The design professional’s standard of care.
- iii. Performance warranties.
- iv. Entitlement to change orders.
- v. Licensing problems.
- vi. Insurance/Bonding problems.
- vii. Conflicts with competitive bidding laws.

##### **i. The relationships and loyalties among the parties**

The existence of a “team” comprised of a contractor and designer raises unique legal issues regarding their relationship between them. In case the designer and builders are different parties, then their teaming for the projects can take the form of joint venture, Limited Liability Company or corporation. This can lead to many legal issues related to authority and conflict resolutions.

##### **ii. The design professional’s standard of care.**

In most of the courts, the design build contractor is more nearly akin to a contractor than to a design professional. Generally the D&B contractors engage the services of designer or consultants at their own and interact with the client in all issues relating to design and build. Hence the liabilities of the Design Build Contractors are usually considered the same as traditional contractor in the legal perspective. To elaborate the role of “Design and Build” contractor in the design related issues may need to include additional provisions in the contract documents.

##### **iii. The design professional’s standard of care.**

In “Design and Build” contracts, the contractor is responsible for the project performance including all phases and aspects. However in actual practice, the “Design and Build” contractor may request to limiting some of the liabilities. Hence the performance warranties must be carefully drafted.

#### **IV Entitlement to change orders.**

The change orders normally come into play due to impacts caused by the owner, changes due to ground situation and design changed in traditional projects. The third category arising from design changes and errors usually are not faced in the “Design and Build” contracts and must be covered under the terms and conditions of the contracts.

#### **vi. Licensing problems.**

“Design and Build” contractors usually provide engineering and architectural services by partnering with a design professional or subcontracting these services to the design consultants. But in most countries the contractors and design consultants are exclusive entities which cannot undertake the agreements for joint venture. The rules are sometimes more stringent and the contractors is altogether not allowed as design firm to contest for “Design and Build” projects, however with time, the rules are being changed.

#### **vii. Insurance/Bonding problems.**

The insurance and warranties provided by the contractors normally do not cover the defects arising from the design. The unique bond or warranty to cover both the design and contractor performance will require further legal deliberations. Gaffar and Perry (1998) discussed the design liability in the “Design and Build” projects with the recommendation to include the design liability spectrum.

#### **viii. Conflicts with competitive bidding laws.**

In most of the public works, the competitive bidding is usually the base for selection of the contractor. The “Design and Build” often becomes in conflict with the traditional bidding methods and sufficient rules and regulations are not available for “Design and Build” contracts.

### **5. Objectives of Research study and Methodology**

The main aim of this research study was to explore the opportunities for “Design and Build” based construction projects in Pakistan, in view of the strengths and weaknesses of the method. The objectives of the research are given as follows:

- i. To identify the projects in the construction industry of Pakistan, where the “Design and Build” methods of constructions can be applied.
- ii. To identify the major factors of the construction industry which can facilitate the adoption of “Design and Build” methods.
- iii. Explore the benefits of the D&B construction methods in these sectors of construction.
- iv. Make recommendations for the implementation of the D&B construction methods for the construction industry of Pakistan.

A questionnaire survey was conducted amongst a group of 130 respondents as per following details:

- Contractors : 40
- Design Consultants: 30
- Project Execution firms: 30

- Project Management firms: 30

A total of 67 responses were received, making the response rate of about 50%.

The questionnaire was comprised of 30 questions. Each response was measured on 5 point scale having the following band:

- 1- “ Never”
- 2- “ rarely”
- 3- “ Sometimes”
- 4- “ Often”
- 5- “ Most often”

The questionnaire was divided into two major parts. Part-A was related to the background information about the respondent, his experience with the projects etc. In Part-B, five sections of 6 responses each was developed and the respondents were requested to weigh, their responses at the scale of 1 to 5, showing its severity. The following aspects were covered in the survey.

- i. Problems of traditional Design Bid Build method of procurement.
- ii. Advantages of Design and Build methods for construction industry as conceived by the respondents.
- iii. Issues likely to be faced by the “Design and Build” construction methods in Pakistan.
- iv. Potential sectors for application of “Design and Build” construction.
- v. Recommendation for implementation of “Design and Build” contracts.

## **6. Trends of modern Project delivery methods in Pakistan.**

In public sector in Pakistan the traditional Design Bid Build a method has been mainly used for construction projects over the past ten years. The 2004 Public Procurement Rules though provided some alternative project procurement methods but the main underlying assumption of the rules was separating design from the construction. There has been some efforts to apply the Build Operate and Transfer Mode (BOT) for some of the major public sector projects, but very little success rate was observed. Khan *et al* (2008) highlighted some of the major projects offered in Pakistan under BOT. The basic BOT model has been given in Fig. 3. They reported that the concept of BOT is still new in Pakistan and recommended that visible changes may be made in the requirements of guarantees and other formalities to attract more foreign funding for BOT projects in Pakistan.



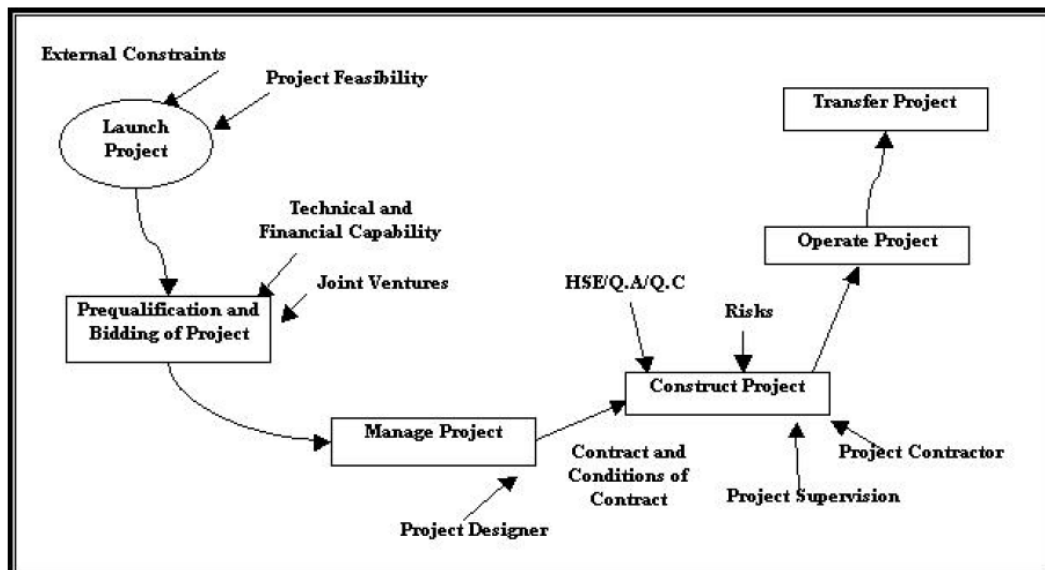


Figure 3 BOT Project Model (Khan *et al*, 2008)

The foreign donor organizations like World Bank and Asian Development Bank have been using the “Design and Build” for the delivery of the projects in the last few years, but its implementation in the public sector requires changes at the policy and institutional levels.

## 7. Analysis and findings

On the basis of responses from the four groups of respondents, it has been revealed that only 25% of the respondents knew about the “Design and Build” terminology. The majority of the respondents confused it with other types of procurements like Turnkey, BOOT and BOT etc. Based on of numerical values assigned to each response, the responses under various sections were ordered from highest to the lowest cumulative value.

### 7.1 Five major problems under traditional Design Bid Build procurement Methods:

Based on the frequency index, the following five major problems with the traditional procurement were identified as:

- i. **Cost overruns**
- ii. **Project delays ( Time overruns)**
- iii. **Changes in the scope.**
- iv. **Poor quality of projects.**
- v. **Low bidder dilemma.**

### 7.2 Perspective Advantages of the Design and Build Procurement methods:

The respondents highlighted the following five major advantages of the “Design and Build”, if applied in the public sector projects in Pakistan.

- i. **Risk transfer to the contractor.**
- ii. **Compression of time and Cost reduction**
- iii. **Resolution of disputes between contractor and designers.**
- iv. **Few design changes and fewer change orders.**
- v. **Better control of client on the entire project.**

### ***7.3 Five major issues likely to be faced by the D&B contractors:***

The following major impediments were identified by the respondents for implementation of D&B method of procurement.

- i. Lack of rules and regulations.
- ii. Prevailing public procurement rules and Pakistan Engineering Council regulations.
- iii. Lack of capacity of the firms and their awareness and knowledge about D&B.
- iv. Disputes over authority and responsibilities regarding construction.
- v. Licensing issues due to different regulatory bodies.

### ***7.4 Potential sectors for “Design and Build” procurement methods:***

- i. Industrial sector
- ii. Housing sector
- iii. Education Sector
- iv. Infrastructure development and Highways sector
- v. Commercial buildings.

### ***7.5 Recommendations for implementation of “Design and Build” procurement Methods.***

- i. Change in the regularity bye-laws and rules & regulations.
- ii. Revision of Standard bidding and tendering documents and related procurement rules for various forms of “Design and Build” procurements.
- iii. Development of pre-qualification documents for rigorous pre-qualification of “Design and Build” contractors.
- iv. In-house capacity building and training of the professionals associated with the construction public sector organizations for dealing with the problems relating to the “Design and Build” contracts.
- v. Establishment of Design and Build section under Pakistan Engineering Council to deal with the problems and issues related to “Design and Build” procurement in the public sector. For this purpose a “Task Force” comprising of academia and industry representatives may be constituted to resolve the issues of “Design and Build” contracts in Pakistan Engineering Council.

## **8. Conclusion**

The “Design and Build” method of contracting offers a wide range of opportunities for the procurement of construction projects in Pakistan. The existing by-laws of Pakistan Engineering Council, however restrict the involvement of the construction firms in the design consultancy services at the same time. This is a major impediment to the implementation of “Design and Build method”. In this research, a questionnaire survey was held amongst the professionals related to the construction industry of Pakistan to identify the opportunities and problems for the “Design and Build” methods for procurement of construction projects. The study has explored the possible sectors, where this method of procurement can be applied. However policy and institutional changes are required for the implementation of the “Design and Build” for the success of such projects. Further research is required for resolving the legal, institutional and policy issues in this direction.

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