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The Impediments to the Adoption of the Design and Build Project Procurement Strategy in the Saudi Construction Industry

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Abstract: In the fast moving world, the timely completion of construction projects within a stipulated budget will be of the highest priority. The Saudi construction industry is being increasingly challenged to provide for faster, more economical projects and better construction results. Whilst the benefits of procuring projects along the Design and Build (D&B) contracting have been realized in many industries and in many parts of the world, the Saudi construction industry has been slow to accept the D&B project delivery option. This option has not been adopted on a grand scale and its application is still limited. The traditional design, bid, build (D.B.B) project delivery option still dominates the local construction industry. On a close examination, there appear to be impediments preventing the adoption of D&B contracting within the Saudi construction industry. To investigate this problem, a mixed methodology approach is employed and direct interviews with key industry stakeholders were conducted. The questionnaire survey involved 63 key participants representing consulting and contracting firms. This paper defines the impediments to the adoption of D&B option and proposes practical recommendations to overcome them. The nature of these impediments, which include cultural factors, lack of knowledge about D&B option, a scarcity of medium-size D&B firms, and the nature of current government contracts, are defined. Recommendations to improve the performance and productivity utilizing D&B are presented, including a practical six phases guiding model to be consulted by D&B clients. This paper is inspired by the PhD work of one of the authors.

Keywords: Impediments, Design and Build (D&B), Stakeholders, Phenomenon, Efficiency, Design-Bid-Build.

Introduction

The construction industry considers projects successful if they are delivered on time or sooner, on budget and achieve a specified quality standard, while meeting or exceeding the client's expectations. All clients wish to have a project that is efficient, and unburdened by unnecessary cost overruns. Experience however, tells us that in reality this is unattainable. Clients have to trade off time, cost and quality objectives when considering a wide array of project related contractual and commercial matters. Time based performance improvement, building faster, controlling delays are considered as the ways to solve the industry's problems (Solis 2009, Tulacz 2006).

The Kingdom of Saudi Arabia's economy which is growing rapidly has led to a massive demand for significant investments in every sector of the construction industry. For almost a decade now the Saudi construction industry is going through a major construction boom. According to a study by (Almohawis et al. 2005) about the significance of Saudi construction industry to the national GDP showed that this industry has contributed about SR40 billions between 2002 and 2004 to the national GDP, and employed about 14.4% of the total work force in the Kingdom. Oxford Business Group Saudi Arabia report (June. 2012), estimated that the total spending on construction and infrastructure projects during 2012 to 2015 will exceed 451 billion US Dollars (Figure 1).

However, the dominance of the traditional Design-Bid-Build (D-B-B) procurement system is a major factor that several Saudi researchers have argued is an impediment to improving performance and productivity within the Saudi construction industry (Assaf et al. 1995, Assaf and Al Hejji 2006, Amjad 2003). In their study about reasons for delays in public projects in the Kingdom of Saudi Arabia Al Kharashi and Skitmore (2009) found that such delays are largely attributed to shortages of engineers, contractors, consultants, manpower, equipment, skilled labor and problematic contractual terms between consulting and contracting firms.

Recently, more attention in the Kingdom has been directed towards earlier start of construction activities through the implementation of Design and Build (D&B) project procurement strategy. However, (D&B) option is still not widely accepted as a credible method for procuring projects (Jaweed 2004, Al Kharashi and Skitmore 2009). As the Saudi construction industry remains committed to the D-B-B delivery option, it is secluded from other options that are commonplace in the rest of the world.

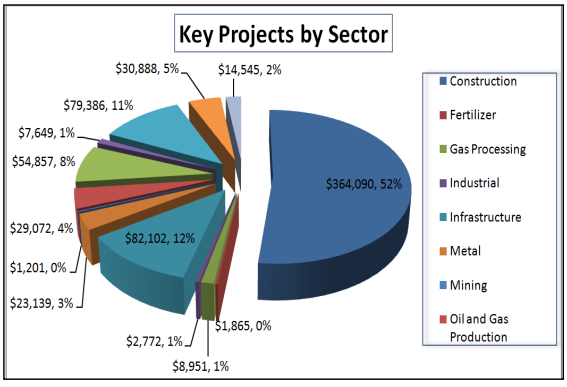


Figure 1. Source: Oxford Business Group Saudi Arabia Report 2012.

There is an obvious void of unexplored information that should be reviewed in order to understand this phenomenon and ascertain why the D&B delivery option is unpopular in the Kingdom of Saudi Arabia.

The purpose of this paper is to explore why the D&B delivery method is not widely adopted for the Saudi construction industry. It investigates some of the consulting and contracting firms' perception, views and opinions in order to define the impediments to adopting this project delivery option. Key questions that this paper will answer include:

1. Why the traditional project procurement option is still dominant in the local construction industry?
2. What are the impediments to the adoption of D&B project delivery option? Are they cultural, contractual, lack of knowledge, insurance, or regulatory factors? What are the improvements missed out?
3. What is the common level of knowledge regarding D&B contracting amongst the consulting and contracting firms in particular?
4. Would the local construction industry be prepared to consider adopting the D&B option if certain changes to the contracting regulations were introduced?

Literature Review

The D&B concept has its roots in ancient civilizations. According to (Beard, et al. 2001), the earliest form of infrastructure delivery involved a Master Builder serving as both project designer and builder. Throughout recorded history, this project delivery system has developed major projects including the Pyramids, Temples, Aqueducts, Cathedrals and major public buildings, (DBIA 2005, Tianji et al. 2005, Tulacz 2006). Master Builder procured materials and was the chief architect, engineer and builder molded together, with complete accountability for delivering a project, (Beard, et al. 2001). It is a reality carved in stone. The Seven Wonders of the World stand as stunning testimony to the D&B process.

Within the construction industry there is a wide variety of ways in which projects can be procured and delivered. Some, including D-B-B, segregate the roles and responsibilities for the different phases of the project. The final design is completed by one party and the subsequent construction is awarded to a separate contractor, usually on either a low bid or best value basis. Others integrate the design and construction activities under a single contract, as with D&B contracting. Still others extend contract roles and responsibilities to include operation, and maintenance, (Tianji, et al 2005).

The proper use of the D&B concept has been widely debated. There seems to be a unanimous interpretation of D&B as the process of providing design, construction and contract administration services under a single contract. These services are performed by one company, or a group of individual firms who form an association that is recognized as a

legal entity. This entity may be led by a contracting firm, as commonly the case (Murdoch and Hughes 2002), or a designer. This is in marked contrast to the traditional D-B-B approach in which two separate efforts are undertaken in sequence (Tulacz 2006, Knight et al. 2002).

In the UK Sir Eagan (1998) asked the construction industry stakeholders to consider off-site production, and to benchmark its performance against other industries. The recommendations included a change in the current contractual relationships making the project procurement process concurrent and more efficient. The various stages in the D&B contracting approach as defined by (AIA, 2003) are illustrated in Figure 2.

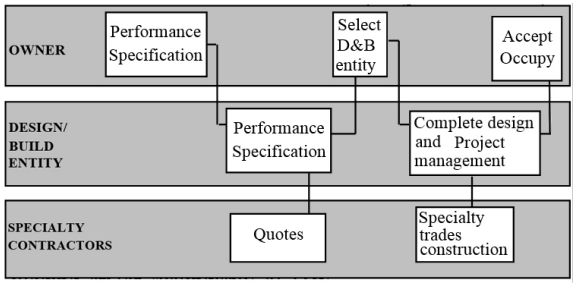


Figure 2. Design and Build Approaches, Source: (AIA, 2003).

Types of Design and Build and the Contract Award Selection Process

Several writers and government agencies including (AIA, 2003, DBIA, 2005) have described some configurations of D&B contracting which include:

- Direct D&B with complete responsibility for design and construction.
- Comprehensive Turnkey contracts with D&B contractor taking full charge of financing and constructing the project.
- Design and Manage. Where the contractor is compensated for managing the design and construction activities while retaining the design responsibilities.
- Design, Manage and Construct. Which is similar to the design and manage variant with the contractor involved in the construction activities.
- D&B with innovation of client appointed architect to manage the detailed design.
- Develop and Construct. The contractor develops the scheme design prepared by the client's architect to the construction stage.

The Perception of Construction Stakeholders about D&B Project Delivery Option.

Considerable research and debate have demonstrated the advantages and disadvantages of D&B delivery system (Solis, 2009), (Tianji, et, al. 2005). Many writers described the current state of the construction industry as a high–risk business, and delays are frequent and recurring (Loudoun and Allan 2008, Chan et al. 2005).

Citing (Koskela, 2000), (Solis, 2009) stated that a crises or pre-crises exists in the construction industry which requires a new approach, and a structural change from the current way that projects are procured and delivered.

On the other hand, critics of the D&B project delivery argue that D&B contracting, in many cases, is proposed as the answer to failure of the original plan and scheduling of projects, (Oztas and Okmen 2004, Kerzner, 2003). Others believe that all project delivery systems must focus on achieving the optimum time, cost and quality targets irrespective of the choice of delivery strategy (Ling, and Poh, 2008).

The Views of Proponents and Critics of the D&B Delivery Option.

Literature review showed that both the proponents and opponents of D&B delivery option use the same judging criteria for evaluating the validity of D&B option. These nine (9) judging criteria are:

1. Impact on project cost, certainty of cost from the outset.
2. Time saving and less time to project delivery.
3. Impact on quality, innovation.
4. Suitability for specific projects.
5. Impact on work environment, and efficiency.
6. Risk management.
7. Impact on disputes. Change orders, litigations.
8. Subjectivity and Favoritism.
9. Influence on strategic alliances and small businesses.

1. Impact on Project Cost, Certainty of Cost from the Outset

According to the (AIA, 2003) combining the design and construction into a single procurement effort eliminates the administrative burdens and cost,

shortens the project time and encourages innovation by having the designer and contractor working together.

Consistent with these studies (Song, et al, 2009) reported that D&B projects have a higher chance of being delivered within budget. (Tianji, et al, 2005) reported that D&B offers contractors the opportunity to bring their construction economics into the project and providing value for money. A questionnaire survey to 150 construction firms in the UK conducted by (Gidado, and Arshi, 2004) showed that 94% of the respondents claimed that using D&B contracting has resulted in 20% saving in time. In terms of cost, 75% of these respondents reported that up to 20% saving was achieved.

However, opposing views from (Tighe,1991) advocates that the benefits of D&B with their promise of speed and cost saving are a myth. Tighe argues:

"Everything will be designed to meet the worst scenario; the services engineers will over-size their systems to ensure adequate capacity. The architect, fearing the unexpected risks will allow more space than required. The result is giving the owner less than optimal design and greater construction cost" (Tighe, 1991, 50).

D&B is also seen by (Tenah, 2001) to have a negative impact on the overall cost and design quality of the project due to the high level of uncertainties inherent in the process.

2. Time Saving and Less Time to Project Delivery

According to (Beard, et al, 2001) D&B option is ideal for the application of fast-track construction to reduce the overall project delivery time. Construction activities start before construction documents are fully completed, (AIA, 2003). The overlapping of design and construction realizes the total shortening of schedule and cost as shown in Figure 3. (Song, et al, 2009), (Edwin, et al, 2005), (Beard, et al, 2001) reported that benefits from early contractor involvement in the design include improved schedule, cost, and quality performance. According to (Konchar, and Sanvido,1998) D&B projects in USA are found to be 12% faster than the traditional projects without schedule overrun. Total delivery speed is 30% faster.

In neighboring Kuwait, (Al Reshaid and Kartam, 2005), found that the private sector is using D&B with great success and meeting schedule:

"D&B will soon be the dominant method for project delivery with growing acceptance by the public and private sectors" (Al Reshaid ,and Kartam, 2005, 319).

Research shows that this is an area of substantial debate. According to (Gidado, and Arshi, 2004; Tenah, 2001), if D&B is not implemented efficiently, it may cause clients to spend more money and time. (Knight, et al. 2002); believe that preparing the full requirements of the project brief and the performance specifications can be time consuming and in some instances, offsets the potential time saving that is being sought.

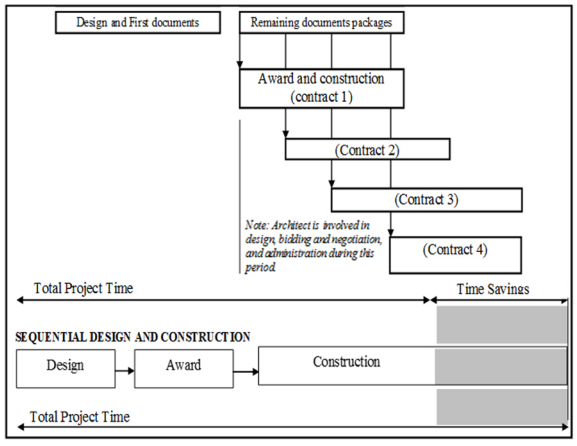


Figure 3. Design and Build Fast Track in Comparison with D.B.B. Source: (AIA, 2003).

3. Impact on Quality and Innovation

Proponents of D&B argued that this option is ideal, for design innovation, meeting quality targets and responding to the client's expressed and implied requirements, (Tianji, et al. 2005).

In Singapore, (Ling, and Leong, 2002), conducted a study to empirically compare the performance of projects which used the traditional D-B-B and the D&B system. It is based on 14 performance measures and uses quantitative project data. The results indicated that D&B performed well in terms of functional, architectural and technical quality. (Chan, et al. 2005), argues that the D&B entity will focus on the project performance rather than conformance with prescriptive specifications that can be outdated.

Critics of the D&B approach criticize this option for failure to produce creative design solutions and not meeting the quality standards of

the client. Because of the time pressure to design and build faster, there is a danger that simplicity of the design becomes more important (Gidado, and Arshi, 2004). A study of 351 design and construct firms was organized by the (AIA, 2003), and conducted by Penn State University. The study found that D&B projects resulting from forced marriage between architect and contractors ranked last in quality among all project types. Clients receive a compromised building.

4. Suitability for Specific Projects

Although size, complexity, risk and nature of the projects warrant the choice of D&B contracting, (Tulacz, 2006) argued that the technology required may dictate the suitability of specific project delivery options. D&B contracting according to (Beard et al. 2001) is ideal for procuring complex projects that involve specific technologies and high level of specialization such as power plants, process factories, and refurbishment of large historical buildings.

Opposing views from (Murdoch, and Hughes, 2002) suggest that D&B delivery approach is suited for clients who are experienced with the option, are familiar with the D&B inherent procedures, and are skilled in managing and administering the procurement of D&B stages. (DBIA, 2005) described the process as a complex one. Many mistakes can be made that may be irreversible, (Hashem, 2005).

5. Impact on Work Environment and Efficiency

Several researchers studied the D&B process work environment and described it as a dynamic one. It fosters high team morale and promotes efficient communication (Koskela, 2003). This contracting strategy represents a collaborative effort (Jaweed, 2004). The team spirit encourages economical solutions and unites the various organizations together under a shared mission and purpose (Gidado, and Arshi, 2004).

On the other hand, many writers argued that D&B contracting requires a new organizational structure, work culture, and increased coordination efforts (Knight, et al. 2002; Murdoch, and Hughes , 2002). These factors are critical for D&B projects to ensure prompt and effective communication amongst all project stakeholders. (Chan, et al. 2005) reported that since D&B focuses on construction activities, the designers may feel that their traditional leadership is threatened and undermined. This feeling may lead to a confrontational relationship within the D&B team.

6. Risk Management

Under D&B, contract risks that could significantly impact the project are identified and assigned to the party most suitable to manage those (Song, et al. 2009). While the D&B entity takes full charge of the design and construction, the client is responsible to defining the scope precisely in terms of performance specifications and making rapid decisions. Other D&B subcontractors and suppliers with long term partnering agreements with each other have the opportunity to share risks and rewards, (Blacket, al. 2000).

Risk identification and risk allocation were heavily debated by critics of D&B project delivery system. D&B approach has inherent litigation risks because incomplete documents are used. Due to the lack of design certainty, (Oztas , and Okmen, 2004) warned that conflicts increase under D&B contracting project delivery:

"D&B turns to be a risky contract system for both the owner and contractor unless the risks are identified in advance and managed throughout the project". (Oztas, and Okmen, 2004, 231).

7. Impact on Disputes, Change Orders and litigations

The single point of responsibility for the design and construction in the hands of the D&B entity shifts to them all responsibilities to comply with cost, schedule, and quality control (Tianji, et al. 2005). (Sells, 2003) argues that with the traditional D-B-B path the owner's best interests are not protected. The architects and contractors strive to protect themselves from change orders, whereas the D&B entity is responsible to interpret the entire client's requirements that are stated in the performance specifications without submitting any change orders. This translates, according to (Song, et al. 2009), to less adversarial relationships, and to avoid claims.

Opposing views from (Tenah 2001), (Murdoch, and Hughes, 2002) argue that misinterpreting the facility program or brief by the D&B entity was a source of disputes between clients and D&B firms. (Friedlander, 1998) reported that D&B related litigation tend to take longer time due to the reasons

that much of the existing industry insurance and laws have to a great extent developed around the traditional D-B-B model. As a result, judges and lawyers appoint special committees to clarify responsibilities and obligations in D&B contract.

8. Subjectivity and Favoritism

While low bidding continues to be a significant factor in contract award, especially in the sequential D-B-B delivery system, best-value approaches using multiple criteria (including cost) are gaining momentum, (DBIA 2005, Gidado and Arshi 2004). However, some D&B clients favor large contracting firms that have substantial experience and resources to procure projects using the D&B option. This biased approach is criticized by (Tenah, 2001), for preventing small size contracting and design firms from bidding for D&B projects. (Knight et al. 2002). added that because of the high costs associated with preparing D&B proposals, fewer medium and small size firms respond to D&B projects invitations.

9. Influence on Strategic Alliances and Small Businesses

(Jaweed, 2004) argued that D&B fosters partnering relationships conducive to strategic alliances and partnering relationships. Clients, designers and contractors are looking for long term business relationships founded on trust. They keep the flow of work and realize mutual benefits. D&B contracting strategy promotes 'win-win' partnering relationships where the supply chain's emphasis is on cost rather than price, continuous improvements, prevention rather than quality checks, (Black, et al. 2000).

Research did not reveal negative impacts resulting from strategic alliances collaborating in D&B contracting. However, there is evidence that many clients prefer to select large firms to procure D&B projects. Small businesses suffer as a result of this trend, (Beard, et al. 2001).

Design and Build in other Industries

The separation of design and construction is not the standard process in other industries. The aviation, manufacturing, process, digital, and automobile manufacturers plan, design, and produce complex, expensive and safe products, and in a very reasonable time frame (Eagan, 1998). In their study of refabricating architecture, (Kieran, and Timberlake, 2004) described the automotive industry as dynamic, competitive and efficient. It is regularly defining and building new capabilities, setting new standards. It moved into the realms where quality and scope can increase out of all proportion to cost and time.

The Local Perception and Operating Environment with D&B Option

Critics of the D&B delivery option from the Saudi construction industry date back to more than two decades. Literature review reveals that for decades, the traditional D-B-B path dominated the Saudi construction industry. (Al Mansouri, 1988) compared the salient features of the Saudi industry with the choice of procurement system in the United States and the UK. He studied the various perceptions of clients, contractors and consultants regarding the traditional D-B-B, Construction Management CM, and D&B delivery options. He identified twenty one common contributory factors shown in Table 1. that are shared between the consulting firms and the contractors. His findings revealed that the traditional D-B-B was dominating the industry.

Table 1. Factors that Affect Efficiency in the Saudi construction Industry. Source: (Al Mansouri, 1988).

1	Contractor's involvement in design.	2	Need for fast track process.
3	Selecting the appropriate project delivery system.	4	Work packaging.
5	Responsibility for design and buildability.	6	Repetition of design activity (simplicity).
7	Awareness of available resources and materials.	8	Work place conditions.
9	Type of supervising firms and the nationalities of their staff.	10	Proper planning and scheduling.
11	Reduction of change orders.	12	Using known construction skills.
13	Having information about the site conditions.	14	Prefabrication off site.
15	Using rapid means to excavate.	16	Overtime payment to staff.
17	Rapid client decision making.	18	Having tried CM or PM.
19	Making regular progress payments.	20	Having effective communication between contractor and PM.
21	Having effective communication between all sub-contractors.		

Al Mansouri concluded that the Saudi construction industry is inefficient for many reasons which include:

- The separation of the design from the construction process.
- Inefficient project management structure.
- Lack of trust between contractors and consultants.
- Design and Build contracting is only favored by contractors who want to take short cuts by reducing the design work and effort.

(Ubaid, 1991) studied the performance of contractors in the Saudi construction industry. He claimed that delays are expected irrespective of prior planning due to:

- Lack of trust between clients and contractors.
- Lack of proper project management tools.
- Presence of unrealistic contractual clauses that shift all risks to the contractors.

(Assaf, et al. 1995), studied the causes of delay in large building construction projects in Saudi Arabia. They revealed that D&B was never accepted as an alternative to the traditional approach. Also Saudi clients were not prepared to accept dealing with contractors as designers.

(Jannadi, 1997) investigated the reasons for construction business failure in Saudi Arabia and reported that both contractors and clients are not carefully interpreting the scope and contractual arrangements of the project. Notably, only twenty four percent (24%) of the design firms surveyed were willing to procure projects utilizing the D&B option. These firms were unclear about the liabilities of the architect under D&B contracts. D&B option presents a venue with risk. Importantly, his findings reveal that forty six percent (46%), of the directors interviewed agreed that D&B is the preferable future procurement strategy. (Amjad, 2003) noted that the Saudi industry is well familiar with the D-B-B but lacks commonly accepted standard form of D&B contract.

(Al Khalil, and Al Ghafly, 1999) studied the delay in a public utility project in Saudi Arabia. They claimed that delays are an acceptable phenomenon within the industry. The industry needs to rethink many of these accepted terms, including the use of the traditional D-B-B system. (Jannadia, et al. 2000) conducted a study regarding the contractual method for dispute avoidance and resolution (DAR) in Saudi Arabia. They studied the drafting of dispute resolution clauses in the Saudi construction contracts for D-B-B and the D&B contracts. They reported that many clients draft their construction contracts so that the submission of a valid claim is nearly impossible.

(Alhazmi, and McCaffer, 2000) developed a Project Procurement System Selection Model (PPSSM) Figure 4. They conducted a survey in Saudi Arabia aimed at testing this PPSSM for effectiveness and efficiency. The model is intended to assist the Saudi governmental agencies in selecting the most appropriate procurement system for implementing their projects. It is structured to examine the relationship between different procurement systems with reference to six criteria: 1) Project characteristics, 2) Market attributes, 3) Contractor and architect/engineer (A/E) needs, 4) Categories of clients, 5) Client design organization, 6) Local design and construction regulations.

In this framework, clients' needs are grouped into four categories: Cost, Time, Quality, and General Needs. Procurement systems are classified according to the integration of the design and construction management. The PPSSM creates a comprehensive methodology for the selection of the most appropriate procurement system. It comprises four screening levels. The first three screens are part of Parker's technique and the final screen uses Saaty's Analytical Hierarchy Process (AHP) evaluation method. The first screen is concerned with feasibility ranking. It develops a set of evaluation criteria to judge the competing procurement systems for the feasibility.

The second screen performs an evaluation by comparison. Here the comparison of feasible procurement systems is made by listing the advantages and disadvantages of each. (Alhazmi, and McCaffer, 2000) reported that the government utilized D&B project delivery option for completing major public amenities including defense projects and the expansion projects of the Two Holy Mosques in (Makkah), at the time, when the D-B-B option proved to be inadequate in meeting time requirements.

(Jaweed, 2004) developed another D&B procurement selection model which comprises a software tool model with guidelines for the selection and implementation of D&B method. This model identifies factors affecting the selection of D&B contracting as shown in Figure 5. Jaweed's model is based on seven distinct phases that would guide concerned industry participants to decide if D&B is the appropriate procurement method.

Phase One is concerned with establishing a number of criteria related to the nature of the facility being proposed for D&B which includes:

- Project characteristics
- Owner Requirements.
- Applicable market sector

● Previous constructed design facilities

At this very early stage of the project life cycle clients can decide whether the D&B project delivery option is the appropriate contracting strategy. Details of each component of these factors are shown in Figure 6.

By comparing past studies, it is apparent that these researchers acknowledge the existence of the problem within the industry. The review of the literature revealed that several groups of Saudi researchers have studied this problem from different perspectives.

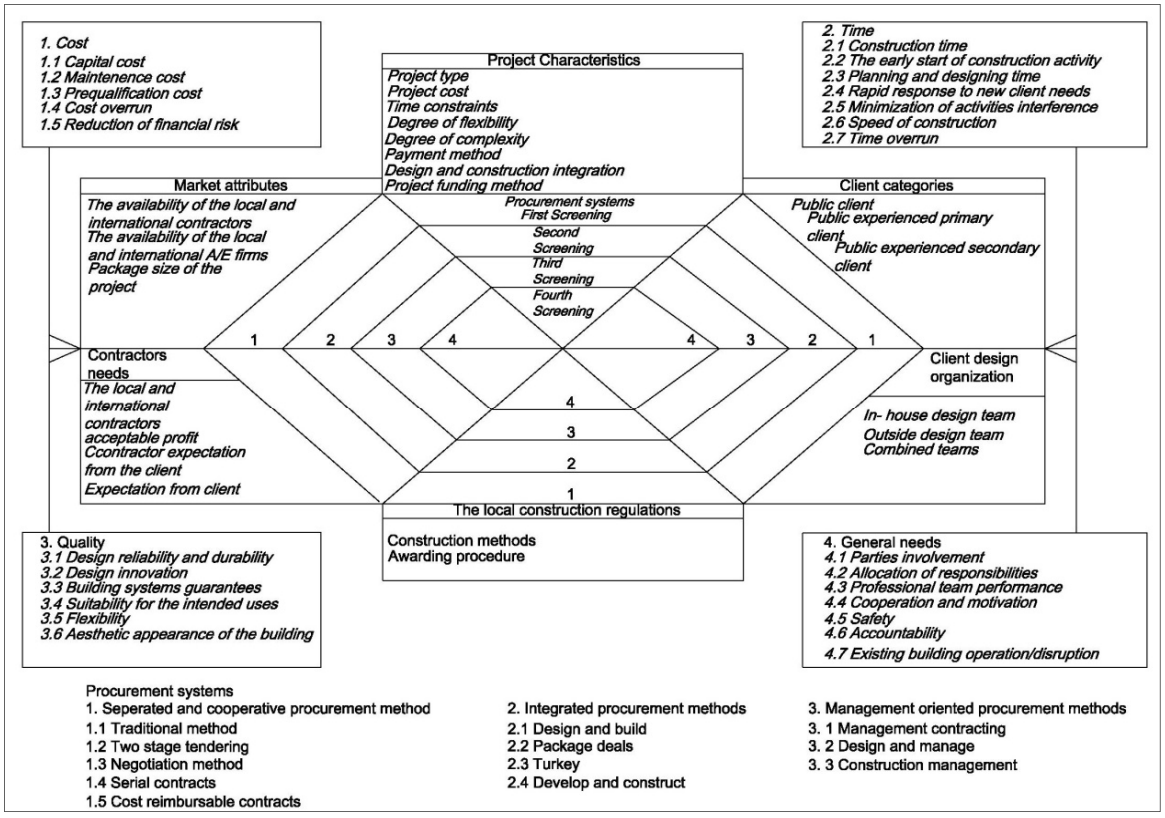


Figure 4. Project Procurement System and Selection Model Source: (Al Hazmi, and McCaffer, 2000).

Table 2. The Value of D&B Projects from Four Leading Contracting Firms in Saudi Arabia.

		No.	1	2	3	4
	Year					
Firm			SOL	SC	SBG	ELS
Value of D&B Projects in SR Bn	2006		5.3	1.0	12.4	1.6
	2007		6.1	2.1	15	1.9
	2008		9.0	4.3	22	2.8
	2009		11.2	3.1	27	7.1
Remarks	% of Total Construction Value in SR Billion		20 to 30 %	15 to 25 %	35 to 50%	20 to 35%

The successful examples in the Gulf areas set the yardstick for the speed of accomplishing large scale projects. In August 2009 and the Public Pension Agency (PPA) awarded forty three (43) high rise towers within King Abdullah Financial District to six firms on D&B option. The completion of these towers is within thirty six months (PPA Annual Report, 2009). A quick project delivery was a necessity, not a choice.

The authors collected the following data shown in Table 2. that shows the magnitude of D&B projects awarded to four local contracting firms.

The figures clearly show an increase in demand for D&B project option. The review of pertinent literature indicates that the local perception and operation mode about D&B project procurement

process appears to fall into two categories:

1) Unfamiliarity with D&B option,

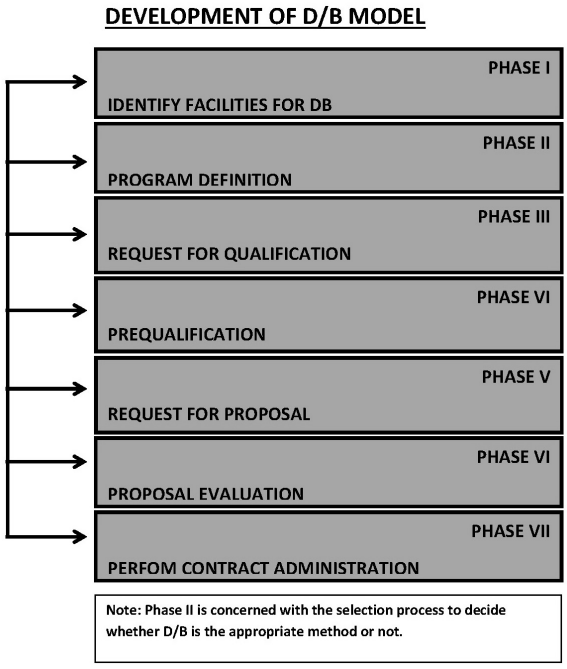


Figure 5. Design and Build Selection Model. Source: (Jaweed, 2004).

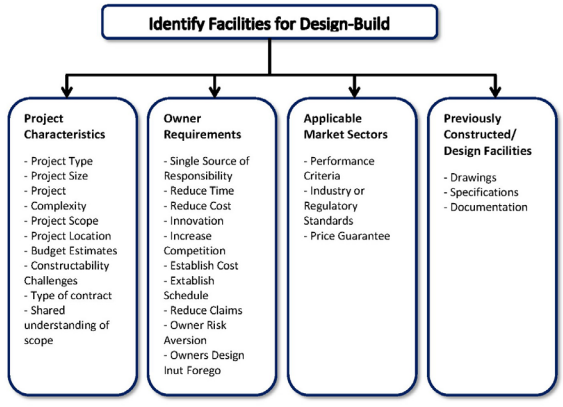


Figure 6.0. Phase I Selection Process for D&B Option. Source: (Jaweed, 2004).

2) Lack of procedures and tools to manage D&B procurement option.

Therefore, the proposed improvements to the adoption of D&B contracting must address areas of common concern to the industry stakeholders with respect to:

1. The industry clients' concern for certainty of delivery, on time, on budget, and meeting the quality standards.
2. The consulting firms' concern for scope definition, setting realistic schedules, establising appropriate insurances coverage.
3. Contractors' concerns with respect to scope definition and being allowed to participate in the dsign process.
4. Government authorities' concern for objectivity and accountability in delivering quality projects.
5. Absence of cultural barriers separating consultants, contractors and clients.
6. Clear legal and contractual arrangements.

Research Methodology

In the literature review, little statistical and descriptive information was found on why D&B strategy is not widely accepted in the Saudi construction industry. To address the objectives of this study and given the exploratory approach for this study, the authors designed this study to enable the collection of both statistical and descriptive data using a mixed method approach. The mixed method strategy will enrich an exploratory study since it allows both the qualitative inductive grounded theory method and the deductive quantitative method to be combined into a single study (Teddlie, and Tashakkori, 2009).

Collecting Data by Means of Conducting Personal Interviews

The data was gathered by means of conducting direct interviews with selected consulting and contracting firms that represent a wide spectrum of the Saudi construction industry. The grounded theory methodology inductive approach referred to by (Goulding, 2002), was adopted for its inherent ability to encourage emergence of new issues from the data.

The investigation is therefore, based on survey information utilizing structured, semi-structured and open-ended questionnaires. Two questionnaires were prepared and aimed at the selected consulting and contracting firms.

The twenty two (22) questions in Appendix (A) were organized into five broad categories. These categories were to a large extent common to the consultants and contracting firms with specific

modifications to suit the nature of the distinct business, choice of clients, and their perception towards impediments and solutions to D&B contracting. The semi-structured survey provided data regarding their views and opinion in a generic and open sense about the future of D&B contracting in the Saudi construction industry.

The method of documenting the interviews included taking hand written notes and tape recording.

Selecting the Research Sampling Method

Given the nature of this study it was decided to select purposive sample of representative members of each sector of the construction industry stakeholder. This approach, according to (Silverman, 2005), relies on conducting a thorough investigation to define those members who are believed to accurately represent the population.

Administering the Data Collecting Method

Collecting primary data through self-administrated direct interviews (by researcher) offered the following advantages:

1. Direct interviews avoided the problems associated with unsolicited postal questionnaires.
2. Direct self-administrated interviews also provided the opportunity to avoid unclear answers.

After several rounds of testing and assessing the clarity of the questionnaires the pilot format was retested before it was finally adopted for the survey. An informational cover letter was addressed to all representatives of the sample.

Selecting the Research Population and Sample

The criteria for selecting the consulting firms was based on selecting firms with common features and characteristics related to their size, broad experience in D&B contracting, turnover, and capabilities. The authors consulted the bulletin for the licensed and practicing consulting and contracting firms issued by (The Riyadh Chamber of Commerce and Industry, (COCI, 2006). Nine (9) consulting f irms were identified. Only four (4) of them participated in this research study. The respective managers of these firms were issued the questionnaires forms and were asked to distribute them randomly to the relevant individuals covering seven disciplines that are [Architecture, Structure, Mechanical and Electrical Engineering, Estimation, Planning and Project Management]. Direct contact with each respondent was made. Similar approach for selecting consulting firms was taken for identifying the contracting firms. Out of twelve (12) contracting firm identified and approached only five (5) firms agreed to participate in this study.

A total of 63 completed interview questionnaires were received as shown in Table 3.0 which yielded a response rate of over 57%. Data collection began in September 2008 and continued till early 2011. A few of the semi-structured interviews were made over the telephone at the request of the interviewees.

Table 3. The Distribution of the Targeted and Actual Sample Size

No.	Sample Type	No. of firms/ category identified	No. of firms/ category selected	No. of Inter-views agreed	No. of inter-views made. Sample Nos.	Inter-views %
1	Consulting Firms	8	4	48	28	26.4
2	Contracting Firms	9	5	62	35	33.0
TOTAL		17	9	110	63	100

Data Analysis, Forming Preliminary Categories, Concepts, Codes, Themes, Through Analysis

Quantitative and qualitative data were arriving constantly for analysis. The returned and completed (63) interviews were edited, checked for accuracy and submitted to Prince Naif University in Riyadh for analysis using the SPSS software. Employing the conceptual ordering, categories from the open-ended interviews were transcribed, and analyzed. The authors developed a form (Figure 7) adopted from (Strauss, and Corbin, 1998) for coding each the field open-ended interview. The open-ended parts of the questionnaire and descriptive responses were analyzed using Content Analysis techniques by coding the data for main categories and themes. Conceptual ordering was implemented identifying and classifying data into discrete categories.

Data analysis and interpretation was performed by conversion technique using "quantitizing and qualitizing of data" as recommended by (Teddlie and Tashakkori, 2009). This technique allows transforming quantitative data that can be analyzed qualitatively and the process of converting narrative qualitative data into numeric quantitative data that can be statistically analyzed as illustrated in Figure 8. The data were rated according to properties and dimensions and

using descriptions to elucidate these categories.

Internal and external validity and reliability were applied to assure sensible, accurate and easily verifiable results. The main concepts were tested for bias, objectivity, accuracy and reliability.

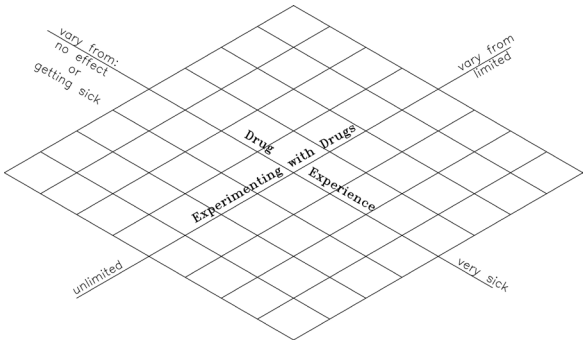


Figure 7. Framework Showing Cross Cut between Two Major Concepts. The Heavy Lines Represent the Intersection of Major Categories. Light Lines Represent the Intersection of Lesser Important Categories. Source: (Strauss, and Corbin, 1998) With Modifications.

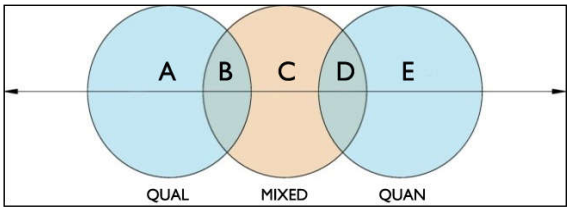


Figure 8. The Qualitative, Mixed Method, Quantitative Continuum. Source (Teddlie, and Tashakkori, 2009).

Ethical Issues Anticipated

Ethical considerations and understandings of the informants' rights were respected. The following safeguards measures were implemented:

1. Written permission to proceed with the study was received from the informants.
2. The final decision regarding informant anonymity was left with the informant.

The Approach to Processing and Analyzing the Raw Data

Prior to the analysis, the structured questions were subjected to editing. Pre-coding of the questions was done for ease of processing by computer.

The structured questionnaires were analyzed using the SPSS software. The analysis provided statistical results defining Mean values, Percentages and Tendencies, as applicable. A ranking format is used to analyze the attitudinal questions. A numerical rating is used to analyze scores of the respondents.

The key results are presented in a graphical format either in tables, charts or percentages of the Mean values. Descriptive frequency distribution, ranking and ratings techniques are employed to analyze the data. The analysis provides the following results:

1. Descriptive Statistics Table. Giving number of participants, (N) or (List wise), values of minimum and maximum scores (highest and lowest) that any participants had on that variable, the Mean value, or average scores for each variable, and the standard deviation.
2. Frequencies and Percentages Tables. These tables provide the scores for the answers from each participant for each variable.
3. Group Statistics. Shows descriptive statistics for the two groups.
4. T-Tests Table. This output provides an adjustment to deal with the problem of unequal variances and it is customary to use t-test to compare two groups.
5. Independent Sample Test. This test referred to as (Levene test) is for the assumption that the variances of the two groups are equal.

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 and most important answer. Descending values indicate answers of lower significance.

The next step taken was to collect the cumulative answers from all respondents for each variable. The highest scoring point is ranked on the top of the scale. Lower scoring criteria descend down the scale. Mean values are used consistently to represent the frequencies of the answers and the level of significance and voting level.

The Analysis of the Data Collected

Sample of the completed structured questionnaires targeted at both the consulting and contracting firms are presented herein.

Because of the similarity in the questionnaires for each group, one question is presented. In few incidences, two sets of questions were presented to suit the sample. One question is given to the consulting group and a modified question is issued to the contracting group.

Summary of the Main Results of the Direct Open-Ended and Semi-Structured Interviews with Consulting, Contracting Firms

The analysis of all the interviews led to establishing prime categories. The analysis of these categories was conducted by computing the frequency of answers that belonged to each sub-category. A total of eight (8) subcategories where established as shown below:

1. Sub-Category 1. Local knowledge with D&B option and market acceptability / condition.
2. Sub-Category 2. D&B option saves time achieves early start and early completion.
3. Sub-Category 3. D&B option is cost effectiveness. Can save cost.
4. Sub-Category 4. D&B option ensures continuity of work, profitable and better risk management.
5. Sub-Category 5. D&B option delivers quality work with innovation.
6. Sub-Category 6. D&B option fosters participative work environment. Win-Win for all parties. Establishes long term relationships.
7. Sub-Category 7. D&B option is essential for certain rush and complex projects.
8. Sub-Category 8. D&B project approach can validate the business case and feasibility of critical projects.

The respondents proposed several improvements to make D&B project delivery option more attractive. These included:

- Having a dedicated internal organizational team for procuring D&B projects.
- Develop better understanding of the scope of work.
- The contract award must be based on best practice and best value for the project.
- Revise contract terms to have shared risk distribution.
- Agree fair contractual terms.
- The involvement of the D&B party from the project outset.

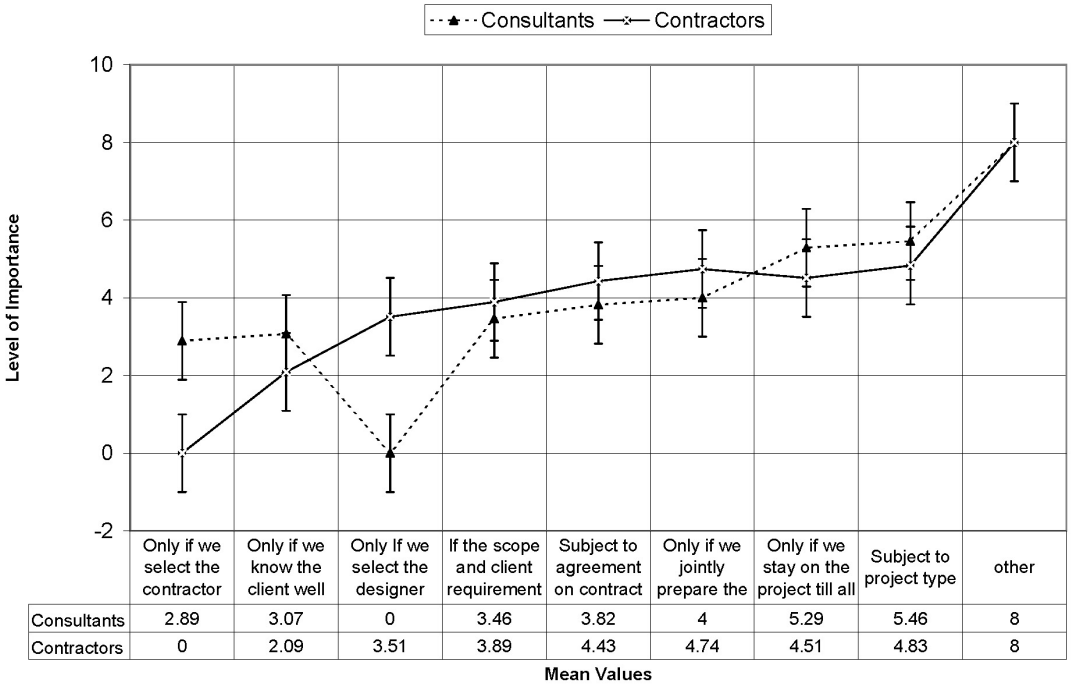
The Declared Impediments to the Adoption of D&B Project Delivery Strategy

After analyzing and computing the frequencies of the responses, ten categories of impediments were identified as shown in Table 4.0.

Tables 5 to 14 summarize the current impediments related to this category and the proposed recommendations for improvements.

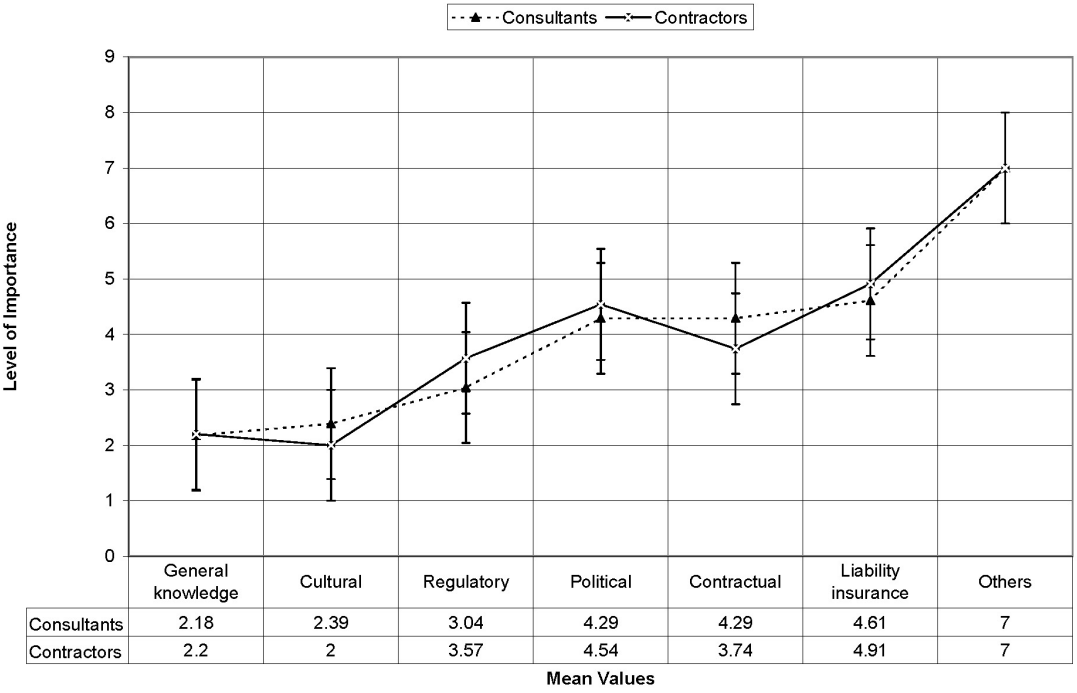
Table 4. Summary of declared impediments.

No.	Impediment
1	Lack of knowledge and understanding of the D&B principles and procedures.
2	Cultural impediments, mainly due to mistrust between clients and contractors.
3	Slow regulatory procedures and the absence of phased permits.
4	Organizational and contractual impediments.
5	Fear of inferior and unsatisfactory quality of works.
6	The current inappropriate process of selecting and awarding the D&B projects.
7	Lack of available medium and small size D&B contracting firms.
8	The perceived risk of no cost certainty, delays, litigious attitude that often leads to adversarial relationships.
9	Government contract documents are based on the procuring D.B.B option.
10	The missing role of the government in taking the lead for exploring the benefits of the D&B project procurement strategy.



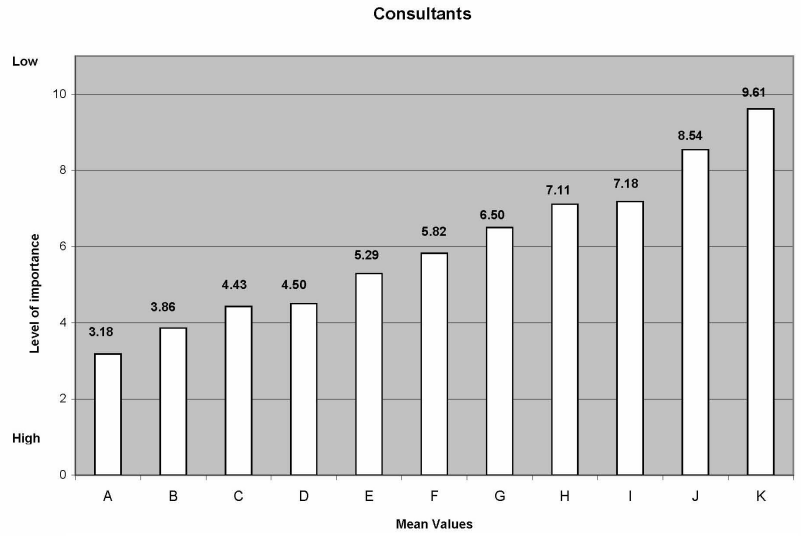
	Only if we select the contractor	Only if we know the client well	Only If we select the designer	If the scope and client requirement	Subject to agreement on contract	Only if we jointly prepare the	Only if we stay on the project till all	Subject to project type	other
Consultants	2.89	3.07	0	3.46	3.82	4	5.29	5.46	8
Contractors	0	2.09	3.51	3.89	4.43	4.74	4.51	4.83	8

Q5.0 The Results of the Nature of Impediments to the Appliction of D & B Option.

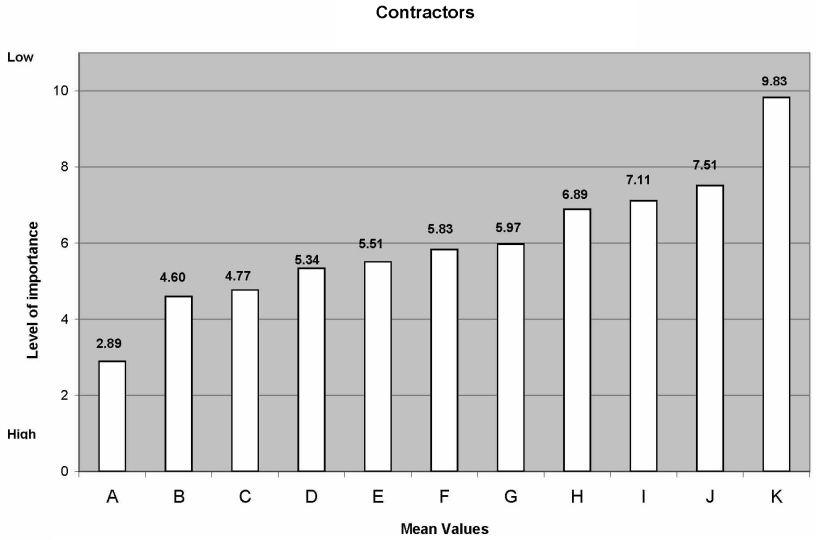


	General knowledge	Cultural	Regulatory	Political	Contractual	Liability insurance	Others
Consultants	2.18	2.39	3.04	4.29	4.29	4.61	7
Contractors	2.2	2	3.57	4.54	3.74	4.91	7

Q5.1 The Results Showing at What Stage the Sample Firms Accept to be Part of the Design and Build Delivery Team.



A. Lack of trained professional resources
B. Lack of financial compensation
C. Maintaining the acceptable standard of design work.
D. Lack of clear client requirements
E. Always avoiding rework, time, and cost overrun.
F. Continuous planning to cope with site activities
G. Unable to discuss with the client the design brief.
H. Insurance liabilities, contractual responsibilities, risks distribution are not clear.
I. Having to allow over estimated space requirements.
J. Having to shield the continuous contractor's queries.
K. Staying too long in the project.



A. Lack of trained professional resources
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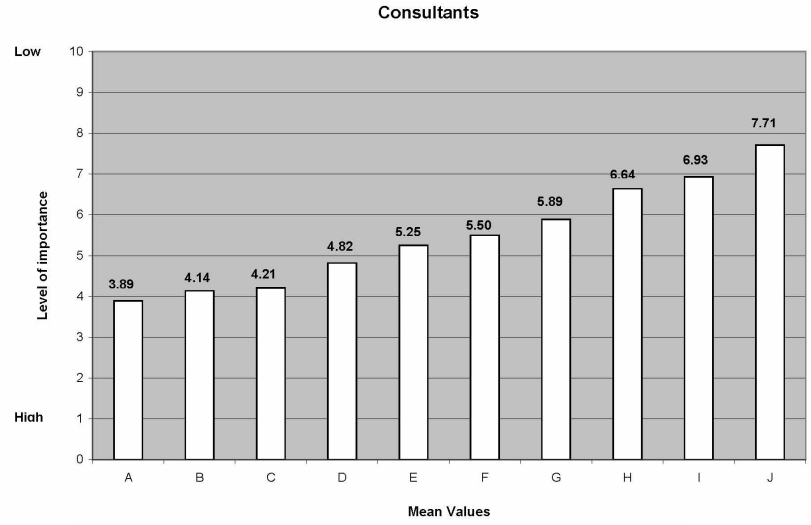
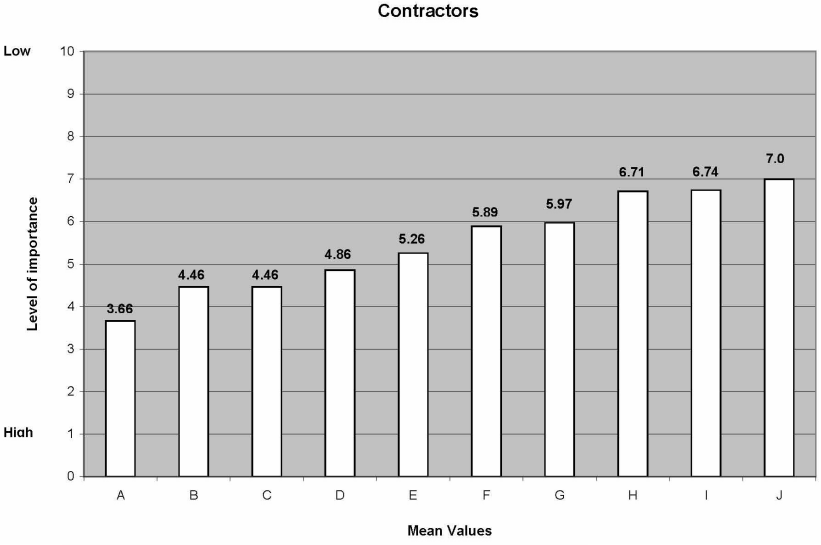
C. Always avoiding rework, time, and cost overrun.
D. Having to shield the continuous designer's changes.
E. Lack of financial compensation
F. Continuous planning to cope with site activities
G. Maintaining the acceptable standard of design work.
H. Lack of clear client requirements
I. Having to allow over estimated space requirements.
J. Staying too long in the project.
K. Insurance liabilities, contractual responsibilities, risks distribution are not clear.

Q5.2 The Results of the Main Impediments to the Adoption of D/B Project Delivery Option Reported by each group.

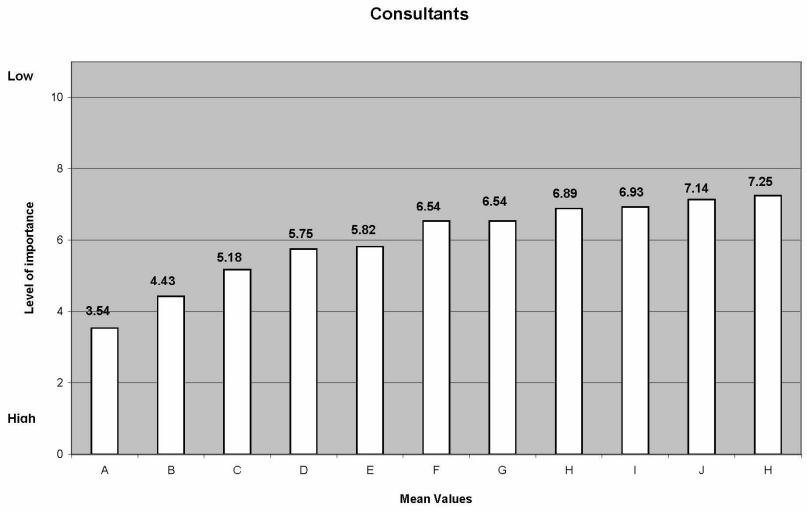


A. Contractual Responsibilities /duties /Obligation / risk distribution are clear.
B. Familiarity with the traditional system compared with D/B option.
C. Clear comprehensive client brief.
D. 48 Design document checked systematically for coordination, errors and compliance to specifications.
E. Less coordination problems compared to other project delivery systems.
F. Lack of many qualified Design and Build firms.
G. Many consultants prefer not to work for contractors.
H. Insurance, liability, and contractual clauses and regulations are clear.
I. Some clients do not feel comfortable dealing directly with contractors and prefer dealing with consultant.
J. No pressure from contractors, to design differently to meet site demands.

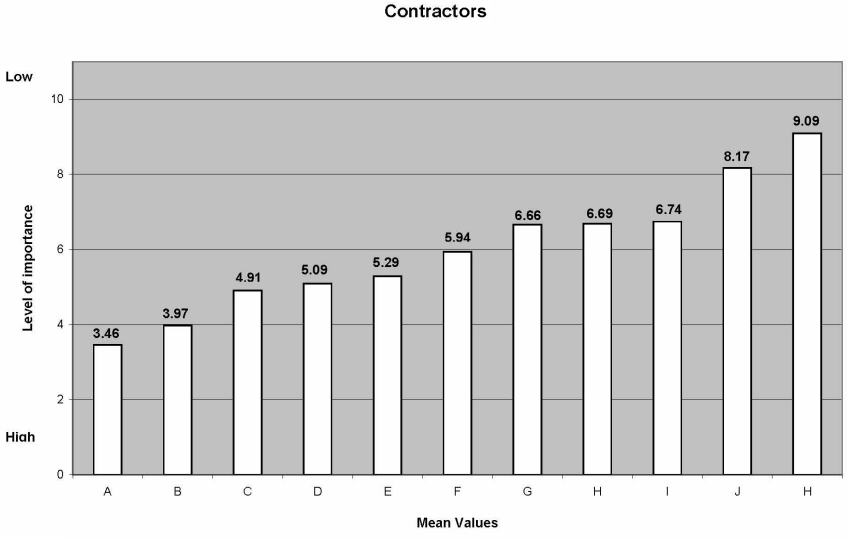


A. Many consultants prefer not to work for contractors.
B. Less coordination problems compared to other project delivery systems.
C. Lack of many qualified Design and Build firms.
D. Some clients do not feel comfortable dealing directly with contractors and prefer dealing with consultant.
E. Design document checked systematically for coordination, errors and compliance to specifications.
F. Familiarity with the traditional system compared with D/B option.
G. Contractual Responsibilities /duties /Obligation / risk distribution are clear.
H. Clear comprehensive client brief.
I. No pressure from contractors, to design differently to meet site demands.
J. Insurance, liability, and contractual clauses and regulations are clear.

Q5.3 The Results Reported by the Groups on the Factors that Make the Traditional Project Delivery Option an Attractive Option.



A. Having in house experience in procuring Design and Build projects.
B. Having shared understanding of the scope of works.
C. Agree contractual clauses, for all parties to the contract.
D. Be involved on the project from initiation to hand over.
E. Having an experienced client representative and an experienced independent cost engineer on the project.
F. Agree contractual compensation changes formula.
G. Availability of qualified D/B contractors.
H. Set through planning the priorities of the work sequences and work quantities with agreement on site needs.
I. Having an acceptable completion date with achievable milestone.
J. Introduction of revised building regulations and increase public awareness about Design and Build Option.
K.Involved the client in regular decision making meeting.



A. Availability of qualified D/B contractors.
B. Having shared understanding of the scope of works.
C. Having an acceptable completion date with achievable milestone.
D. Having an experienced client representative and an experienced independent cost engineer on the project.
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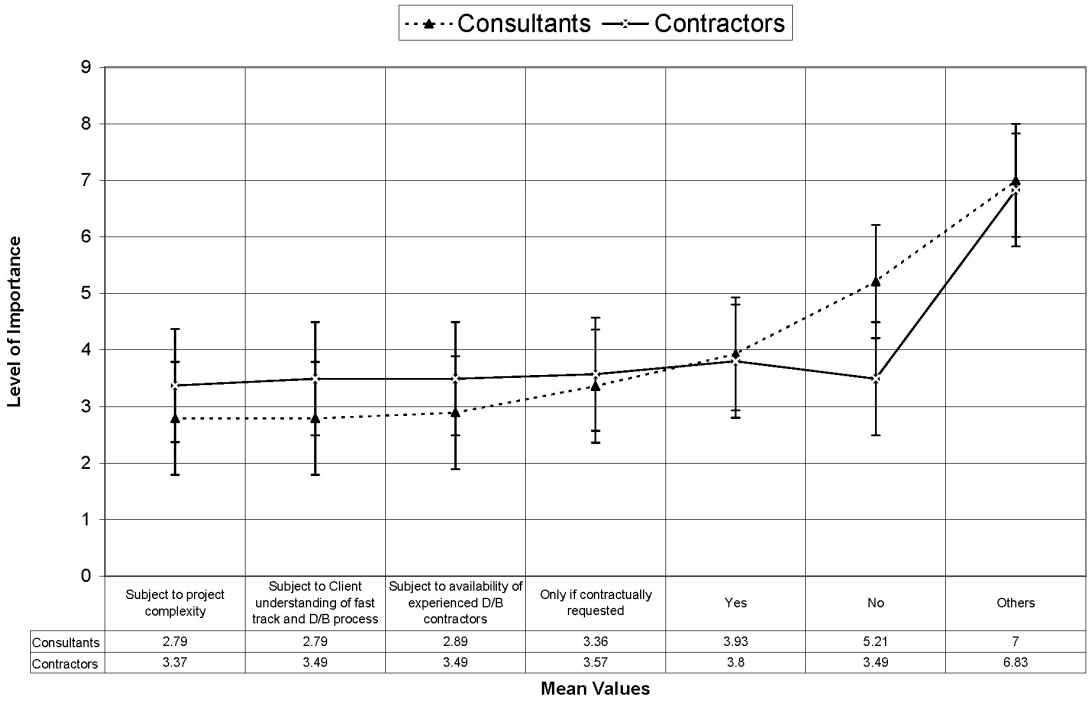
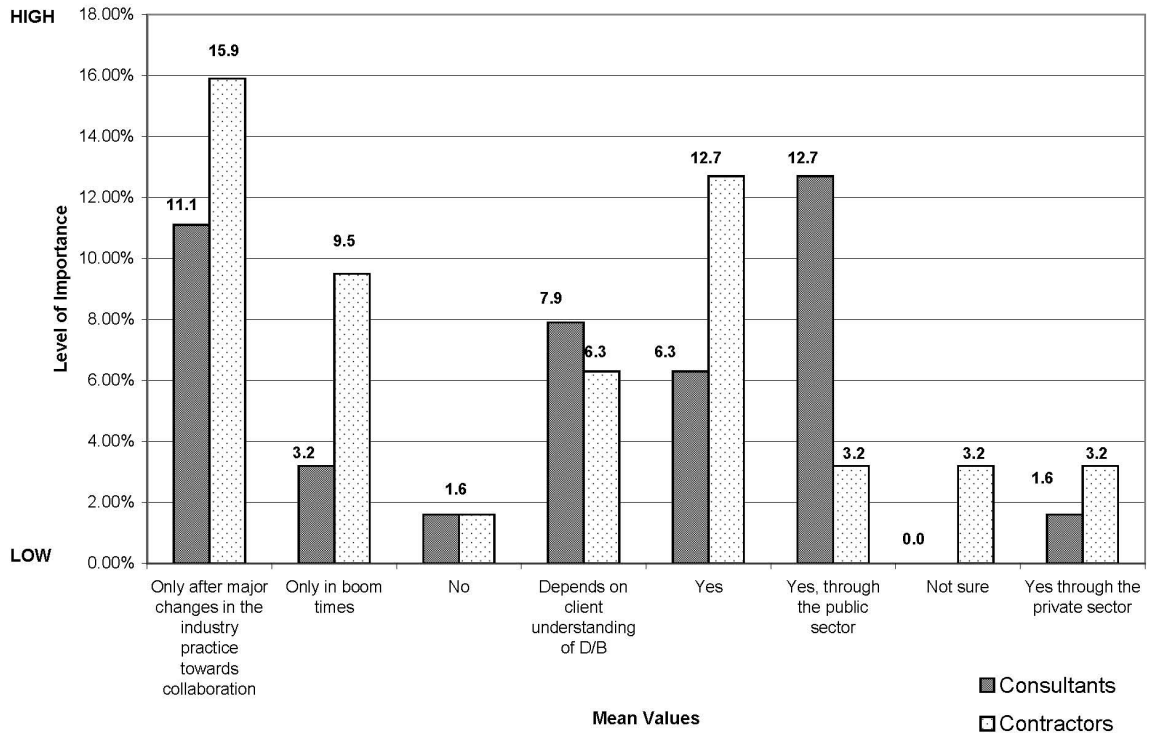
H. Introduction of revised building regulations and increase public awareness about Design and Build Option.
I. Agree contractual clauses, for all parties to the contract.
J. Involved the client in regular decision making meeting.
K. Be involved on the project from initiation to hand over.

Q5.4 The Measures Reported in a Priority Order that will Help Design Firms Resolve Some of D&B Issues and Make D&B Opion More Attractive.



	Subject to project complexity	Subject to Client understanding of fast track and D/B process	Subject to availability of experienced D/B contractors	Only if contractually requested	Yes	No	Others
Consultants	2.79	2.79	2.89	3.36	3.93	5.21	7
Contractors	3.37	3.49	3.49	3.57	3.8	3.49	6.83

Q5.5 The Results Reported from Each Group on When to Recommented the D&B Project Delivery Option to Their Current and New Clients.



Q5.6 The Main Findings and the Views of Both Groups Regarding the Future of D&B Project Delivery Option.

Table 5. Lack of Knowledge and Understanding of D&B project Procurement Strategy and the Proposed Recommendations.

I – Lack of Knowledge and Understanding of the D&B Project Procurement Strategy		
Current Impediments		**Proposed Recommended Improvements**
1. There is an obvious lack of understanding regarding the principles and application of D&B project strategy.		There is a need for a joint effort led by the local order of engineering committee, local universities and professional institutes to increase the level of awareness with this project delivery option.
2. No clear framework for the local construction industry stakeholders to follow.		More publication, conferences and focused research is needed to raise the level of understanding regarding the D&B project procurement option.
3. There is a lack of trained and experienced D&B professional and medium sized D&B contracting firms capable to manage D&B projects.		Continuous and focused training in project management and construction management is the key to having more staff experienced in procuring D&B projects.
4. Not many clients know how to prepare accurate D&B bidding documents, decide on the level of the design drawings to be issued to the D&B entity, how to approve the progress payments, how to define the work packages and agree on the division of liabilities.		Employing an independent consulting firm to prepare and manage the RFP scope of works is a step towards resolving this problem. This firm can also define the boundaries of the D&B work packages.

Table 6. Cultural Impediments and the Proposed Recommendations

II – Cultural Impediments		
Current Impediments		**Proposed Recommended Improvements**
1. Consulting firms do not prefer to work with contracting firms. They lose their status and become subcontractors.		Establishing long term relationships or partnering arrangement between consulting and contracting firms will help remove these barriers.
2. Contracting firms prefer to lead the D&B contract and be the prime owner of the D&B contract. They control budget and schedule.		Contracting firms must treat the consulting firms as partners and engage them in all major decisions (commercial and technical) throughout the project. Consultants must feel that their opinion is respected.
3. Many industry clients believe that D&B contracting yields corruption and unjustified cost increases. Consulting and contracting firms must be separated for the interest of the project.		This area requires collaborative efforts from clients, contracting and consulting firms. Some transparency is required while preparing the project cost. One solution is to encourage clients to nominate their D&B consultants.
4. The lack of trust between clients and D&B contracting firms is translated into shifting most of the design and construction risk to the D&B entity.		The D&B contracts must be fair and based on good industry practice. Risks shall be given to the party best capable to handle them. Contract clauses must eliminate adversarial clauses and encourage fair and balanced share of risks.

Table 7. Regulatory Procedures and the Absence of Phased Permits Impediments and the Proposed Recommendations.

III – Regulatory Procedures and Absence of Phased Permits.		
Current Impediments		**Proposed Recommended Improvements**
1. There are no clear guidelines that define and govern the technical requirements needed for the local authorities review and approval of D&B projects.		The local approving authorities are invited to address this problem and publish detailed guidelines that define all technical and supporting documents required to grant a planning and building
2. Local authorities request the full preliminary design documents be presented for them to review in order to grand preliminary planning approval. This request is not always possible in D&B projects since it delays the construction process.		Adequate time must be given to the D&B entity to complete and submit the essential design documents at the early stage of the PLC. This is important to ensure that the submitted D&B project design documents comply with the established building regulations.
3. There is no mechanism proposed by the local authorities to facilitate phased approvals. The absence of this mechanism is delaying the D&B projects.		This is where the local authorities must in collaboration with the consulting and contracting firms define a workable mechanism and set the procedures for the parties engaged in D&B projects to follow.

Table 8. Organizational and Contractual Impediments and the Proposed Recommendations.

IV – Organizational and Contractual Impediments		
Current Impediments		**Proposed Recommended Improvements**
1. Many D&B firms do not have the internal project organizational and project management structure to procure D&B projects.		Project management is the key to monitor the performance, and timely delivery of the D&B projects. Building a dedicated and integrated project team to procure D&B projects becomes a must for the project to succeed.
2. Inadequate scheduling, reactive planning, absence of clear and realistic priorities of work packages are reasons for unpopularity of D&B contracting.		Adequate time must be given to the D&B firms to complete each scheduled activity. Time should not be compromised if there is no true justification for doing so.
3. There is a lack of trained and experienced project managers capable to procure D&B projects.		Continuous training and educating the staff on how to procure project on D&B path is key to the success of D&B projects. The PM will control and monitor progress of work against project objectives, and measure actual performance and propose remedy plans.
4. There are contractual problems associated with D&B projects. The D&B contracts contain many bespoke clauses. Penalty clauses are unfair and almost all risks are shifted to the D&B entity.		D&B contracts must be fair to all parties to the contract, clear responsibilities, financial compensation terms and fair dispute resolution procedures must be mutually agreed to.

Table 9. Fear of Inferior and Unsatisfactory Quality Impediments and the Proposed Recommendations.

V – Fear of Inferior and Unsatisfactory Quality of Work.		
Current Impediments		**Proposed Recommended Improvements**
1. D&B projects are considered monotonous and have many unnecessary repetitions. This undesirable image deters many clients from considering D&B project procurement option.		Publishing completed D&B projects will improve the perception of D&B option. D&B promotes innovation. Starting the D&B process with a design competition stage would encourage D&B firms to innovate.
2. The D&B project design brief and performance specification documents are not always clear. This leads to the misinterpretation of the project requirements and quality standards.		Preliminary design time must not be compromised, since this is where fundamental design decisions are made.
3. The D&B strategy and process does not allow the proper sequence of QA/QC reviews at various design phases. Many drawings reach the site unchecked and errors are inevitable. Some mistakes are irreversible.		Although a level of assumptions is made, nevertheless, design and construction work can proceed with a degree of certainty if work packages are accurately defined. QA/QC reviews of the work package can occur as they are being developed.
4. Technical decisions are made ahead of time, in the dark, and without full knowledge of the entire project's objectives. Thus, wrong assumptions are discovered later.		The PM must continually measure the compliance of work against the established project targets. The PM must have an information tracking system to identify the reasons for the deviations and take any necessary measures to cope with any deviations.

Table 10. The Impediments Related to The Process of Selecting and Awarding D&B Projects and Proposed Recommendations.

VI – The Process of Selecting and Awarding the D&B Projects.		
Current Impediments		**Proposed Recommended Improvements**
1. There are not many experienced contractors available and those available are either busy or charge high rates. It is difficult to find experienced ones from those who are not.		Setting realistic deadlines by clients and offering equitable share of risks and benefits will help resolve this problem. It will encourage contractors to consider D&B projects.
2. Many clients are not aware of the availability of an industry project procurement selection system.		Through education, research and organizing joint conferences attended by the industry stakeholders, these project selection models will become known to all stakeholders.
3. The local construction market is dominated by the low price culture. Two stage prequalification process requires a change in the government contracting documents.		The selection criteria should not be based solely on lower cost. Rather, it should be based on experience, reputation, knowledge, track record and quality of work performed. By using technical and commercial prequalification process, this problem can be resolved.
4. It was common practice that many contractors entered into D&B agreement to win the job. Once successful they make substantial profit from claims and overhead.		This problem can be solved by establishing a pre-qualifying procedure for choosing the contractors. Partnering with the supply chain is a concept that can also be applied for choosing the contractors and suppliers who meet the quality standards.

Table 11. Impediments Related to the Lack of Medium and Small Size D&B Firms and the Proposed Recommendations.

VII - The lack of Available Medium and Small Size D&B Contracting Firms.		
Current Impediments		**Proposed Recommended Improvements**
1. Lack of understanding of the principles of D&B project procurement option is causing confusion and many medium and small size firms avoid this procurement option.		More education is needed about the advantages and disadvantages of this project procurement system. This process should be led by the government and the private sector. Providing actual successful examples will encourage medium size firms to partner to procure D&B projects.
2. Because many D&B clients are not allocating sufficient contingencies for unforeseen risks/uncertainties. They shift all types of risk to the D&B firm. This is a major impediment to D&B contracting.		Some projects are fast tracked for other motives and not always economical. Clients must be made aware of the cost of D&B projects and risks associated. Risk sharing will encourage more contracting firms to consider D&B option.

Table 12. The Impediments Related to the Risk of No Cost Certainty, Delays, Litigious and Adversarial Relationships and the Proposed Recommendations.

VIII- The Risk of No Cost Certainty, Delays, Litigious and Adversarial Relationships.		
Current Impediments		**Proposed Recommended Improvements**
1. Many D&B clients introduce design modifications and changes during the construction stage and refuse to provide additional costs and time. This leads to adversarial relationships.		Clients must modify and/or change the contractual clauses to accommodate new terms within the original contract. Additional costs must be agreed and the delays, penalties and liquidated damages, clauses must be altered. Delay clauses must be matched with incentives for earlier completion.
2. Cost of rework increases due to wrong or inaccurate design assumptions. Because of the speed and time pressure, D&B firms make hasty decisions which can be wrong and irreversible.		An independent QA/QC team must be employed to audit the design and contract documents before they go out to site. Errors must be detected at source. This team must continually question, and update the design assumptions to avoid having un-optimized building.
3. Overestimating structural sizes, electro-mechanical space requirements leads to higher unnecessary costs.		With D&B procurement option, certain design decisions must be made based on educated estimates and past experience. This is part of the D&B process.
4. More materials are ordered at the beginning of the project to off-set the cost of delays. Waste of unused material is imminent. This translates into claims and change orders.		The extra material problem can be resolved by partnering the supply chain. Additional materials can be returned and/or changed when dealing with suppliers on long term basis.

Table 13. Impediments related to Governments Contracts that are based on the Procurement of the D-B-B Project Delivery Option and the Proposed Recommendations.

IX –The Government's Contracts are Based on the Procurement of the D.B.B Project delivery Option.		
Current Impediments		**Proposed Recommended Improvements**
1. The current public sector contract documents are based on the D-B-B option.		The government is invited to properly define the principles and procedures of this delivery option, regulate its application, and set an example by procuring projects along this path. More examples need to be published with the advantages and disadvantages of this option.
2. Local authorities are not issuing partial building approvals. This is delaying the early construction and issuance of permits on time.		The government is invited to facilitate the issuance of permits in a timely manner whilst setting conditions and rules for how to approach this procurement path.
3. Insurance companies are demanding high premiums for liabilities, risks, and errors for projects running along fast track. This is preventing many clients and design firms from choosing this delivery technique.		Once the level of awareness increases in the industry, clients, investors, consulting firms and suppliers will become more knowledgeable with this technique. Uncertainties, risks, and fear levels will reduce and so will the insurance coverage.

Table 14. The Government's Role in Leading the Industry, The Impediments and the Proposed Recommendations.

X – The Government's Role in Leading the Industry.		
Current Impediments		**Proposed Recommended Improvements**
1. Local authorities are not issuing partial building permit approvals. This is delaying the early construction and issuance of permits on time.		This problem can be resolved once the government fulfills the needs of regulating and controlling the contracting procedures. The government is invited to facilitate the issuance of permits on a timely manner whilst setting rules for how to approach D&B procurement path.
2. Public sector contracts are based on D-B-B contracting. This limits the use of D&B contracting.		The government is invited to adopt contracts that are based on the adoption of D&B option. Standardized contract language for D&B procurement, including general and project specific requirements will encourage the adoption of this option.

The Proposed Guiding Framework for the Clients who are Interested in Procuring D&B projects. Steps to Consider

In order to assist the local construction industry clients, the authors have developed a step- by- step systematic procedure to approach and apply the D&B project procurement strategy. This procedure guides clients through the stages involved in implementing the D&B option. The framework is illustrated in Figure 9. It is comprised of six main phases of decision making and the steps to be followed.

Phase II. Prepare the D&B Scope of Work

The client must accurately define the scope of work for the D&B project. A specialist consultant may be appointed to develop criteria requirement.

1. The space program for the project.
2. The performance specifications.
3. The contract documents.
4. The design brief for the project and site information. (The client may develop the concept design or invite the D&B contractors to assist in preparing the concept design for the facility).
5. Instructions to the bidders.
6. Schedule.
7. Other implied requirements.

The D&B contractors will use this scope of work document as the basis for submitting their proposals.

Phase III. The Prequalification Phase.

Potential D&B firms are pre-qualified using the best value, two stage processes. A technical appraisal must be followed by a commercial prequalification. The client prequalifies potential D&B firms based on:

- Experience and capabilities of the D&B Firm.
- Track Record / Reputation of the Firm.
- Staff Qualifications.
- Financial Strength.
- Method Statement.
- Management Structure.

A weighted evaluation follows to score points for the firms that meet the technical criteria. Those D&B contractors that pass the technical appraisal are invited to submit a commercial offer to either develop the design prepared by the client or develop the design from the criteria document issued by the client. For the commercial proposal, the clients must evaluate the following:

- Priced proposal based on BOQ details, & Performance Specifications.
- Submitted Design Proposal.
- Price to Develop the Client's Concept Design to Construction Documents.

Phase IV. The Contract Award

The contract award is based on a negotiated offer with the D&B entity. All commercial, specifications targets, schedule, contractual and insurance terms are discussed and mutually agreed upon. All risk matters and payment terms must be resolved at this phase. This is in advance of all contractual matters being resolved. Tender queries and all negotiated terms shall form part of the contract documents.

Phase V. Project Organization Structure

This phase looks inside the client's firm and describes the basic restructuring and organizing of the project team in a flow chart. Definition of the tasks that will be taken to advance the design activities, and establishment of a responsibility matrix of the team members will greatly contribute to the success of the D&B process. The D&B contracting demands specific requirements from the client such as:

- Design Review Team.
- Technical and Legal Advisors.
- Independent Cost Consultant.

This phase is essential for the proper running of the project. The client shall have a qualified technical and estimating team to review design drawings, approve samples and respond to D&B queries. An independent cost engineer should review monthly progress payments and review the variations and modifications. This is one major aspect that would comfort D&B contractor and create an unbiased work environment.

Phase VI. Integrated Design and Construction Activities

This phase illustrates the method for integrating and overlapping design and construction activities. Significant time is needed to efficiently and concurrently coordinate the flow of informa-

tion between the design team and the site. Regular feedback and continuous assessment of the project progress are essential. Design work packages are jointly identified. Priorities are set for the construction activities to commence. Inevitable problems and conflicts are handled by a defined process.

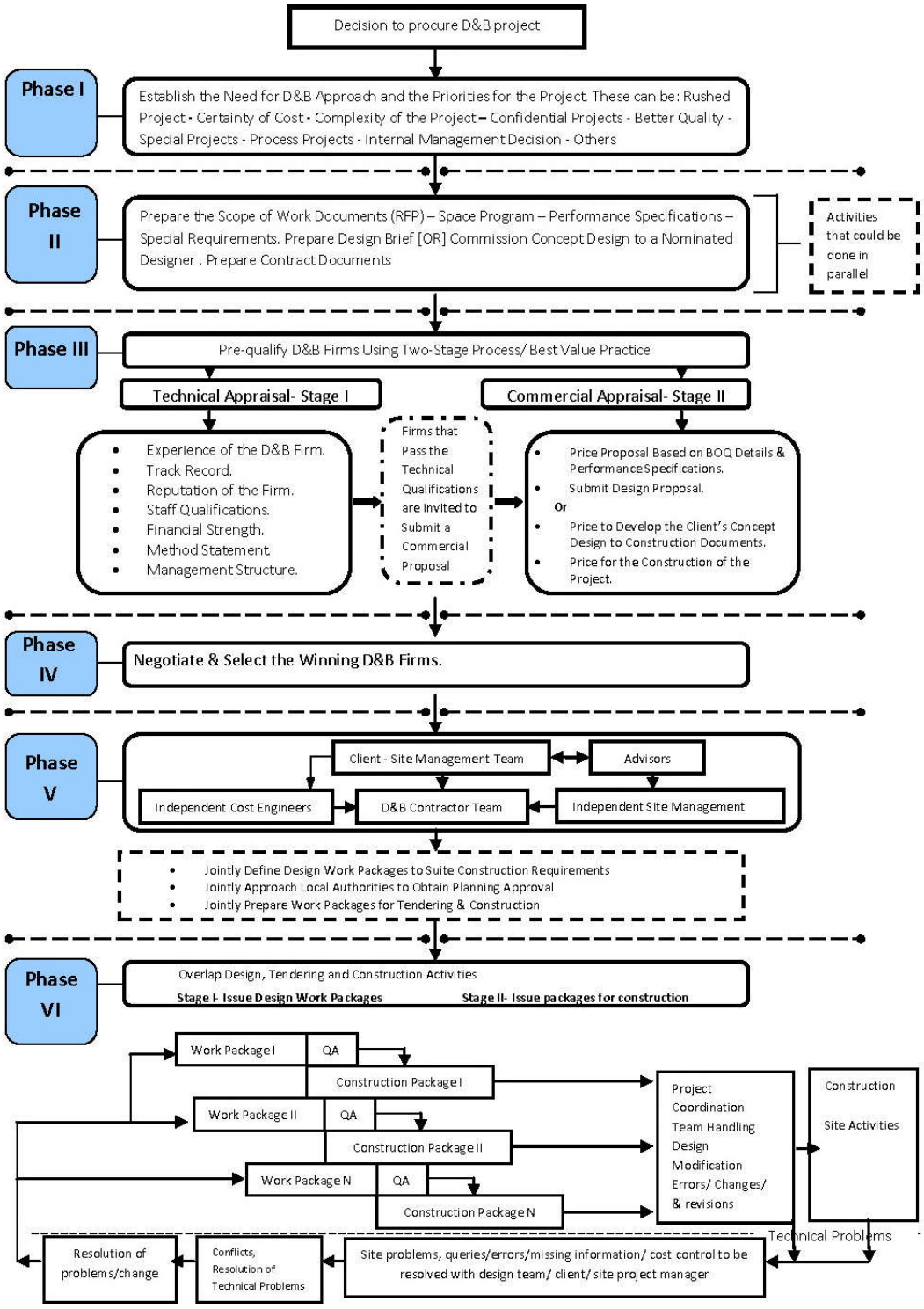


Figure 9. D&B Guiding Model to follow by D&B Clients

The Answers to the Research Questions

First Question

"Why is the traditional project procurement option still dominant in the local construction industry?"

The results show that consulting and contracting firms were found to be more familiar with the D-B-B option. The contractual arrangements are clear. Today, the contract terms and method of payment are clearer in the D-B-B compared to any other project procurement option. Liabilities and responsibilities for the client, consultant and contractor are understood. It has an established local legal and contractual procedures and application. Many public and private clients are in favor of the D-B-B option for reasons of risk allocation and accountability.

Second Question

"What are the impediments to the adoption of D&B? Are they cultural, political, contractual, lack of knowledge, insurance and liability related system, or regulatory factors?"

Ten impediments were identified as stated in Table 4. The solutions to these impediments and areas of improvements are as shown in Tables 5 to 14.

Third Question

"What is the common level of knowledge regarding D&B contracting amongst the consulting and contracting firms in particular?

There is a consistency of the general level of knowledge of the D&B project procurement option. Compared to contracting firms, consulting firms appear to be more aware of this project procurement option. Survey results indicated that consulting firms are noticing a higher level, scale and number of D&B projects on yearly basis. However, the majority of the sample respondents are not aware of the existence of an industry project procurement selection model.

Suggested improvements are summarized in Table 15.

Fourth Question

"Would the local construction industry be prepared to consider adopting another delivery option such as D&B if certain changes to the contracting contracts and regulations were introduced?"

The findings revealed that many clients and consulting firms avoid using D&B option because the current government contracts are tailored around the traditional D-B-B option. In addition, the design and construction approval and the permit issuance process are also developed around the traditional D-B-B option. Consequently, D&B projects face delays in securing approvals and permits. This deters many clients away from D&B option.

The suggested improvements focus on developing guidelines by the local authorities that would establish and define the requirements for submitting D&B documents to obtain phased approvals.

In addition, the government is invited to expand the current design and construction contract documents to allow for the inclusion of the D&B option.

The Proposed Improvements

The proposed improvements focused on the following topics as shown on Table 15.

Table 15. Topics of Solutions

No	Topic
1	Increasing the knowledge and understanding of the D&B principles.
2	Removing cultural impediments.
3	Addressing the slow regulatory procedures and the absence of phased permits.
4	Addressing organizational and contractual impediments.
5	Removing fear of inferior and unsatisfactory quality of works.
6	Changing the current inappropriate process of selecting and awarding the D&B projects.
7	Encouraging medium and small size contracting firms to bid for D&B projects.
8	Addressing the perceived risk of no cost certainty, delays, litigious attitude that often Leads to adversarial relationships.
9	Government contract documents shall include procuring D-B-B and D&B options.
10	Resolving the missing role of the government in taking the lead for exploring the benefits of the D&B project procurement strategy.

Conclusions and Recommendations

The Saudi construction industry is undecided about the implementation of the D&B project procurement strategy. The results of the surveys show that the industry is divided with almost 60% of the consulting firms unwilling to enter into a D&B contract unless certain reforms are made. The consulting firms' managers blame clients for not accepting the D&B option. Clients want to see tangible examples and expect to be informed with example of successfully built projects before

they change their attitude. Local industry clients, consultants, and contractors are not aware of the principles of this delivery method. They apply their own interpretation and amendments to their D&B contract clauses. The government, on the other hand, is doing little to keep pace with the required development and improvements to the current contracting climate. The government is invited to set an example by providing educational opportunities, and to showcase real life examples to the public and demonstrate the successful implementation of D&B projects.

More educational programs are required to educate the industry stakeholders about the true benefits of D&B project procurement option. There is a need to define and analyze the drawbacks of the D&B option. The practice of setting unrealistic deadlines and imposing all types of risks on the D&B contractors must cease. The above findings show that, contrary to what many concerned professionals may think, D&B option must be planned for from the outset. Lack of planning causes a chain reaction that affects all work packages.

In an age of multiple project delivery approaches, professionals must be knowledgeable of all the delivery options and must become "project delivery system impartial". The quality performance of the project can be attributed to the right and effective procurement choice at the start of the project.

The Saudi perception of D&B project procurement option can only be described as going through a state of confusion and experimentation. The findings also suggest that the long term future of D&B option is assured, simply because of its beneficial economic implications. Consultants and contractors have to learn how to cope with D&B delivery option. The local legislative authorities must define and control the proper application of this project delivery option. Once these goals have achieved the desired results, true and lasting benefits will occur.

Limitations and Difficulties Encountered

The authors encountered a number of difficulties while researching this topic. First, the subject of D&B project procurement strategy has not been studied in detail by many Saudi and non-Saudi scholars.

Benchmarking and comparing several studies to triangulate findings and measuring performance were difficult.

Second, there are few locally accepted scientific journals that can be used as a source for secondary data. The local construction industry does not publish sufficient information regarding the projects that are awarded and the basis of their contractual terms. Most of the data used in this study was sourced from abroad. Finally, certain financial data related to the details of the variation orders, turnover and profit margins was not provided by some managers due to reasons of confidentiality.

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Appendix A. Summary of Questionnaire Survey and the recorded responses.

Section	No.	QUESTION	ANSWER CATEGORIES
I. General Information.	**1.0**	What is your Nationality?	Asians, Arabs, Saudis, Africans, Europeans, North Americans
II. Consultant's Work Information.	**2.0**	What is the average number of professional staff that is present at your firm?	120 – 180, >250
	2.1	What is the yearly average turnover that your firm normally generates in $ US Dollar (optional)?	40 million, > 50 million
	2.2	What is the number of medium to large size projects that your firm is awarded per annum; along the traditional project delivery system?	Medium (20-50 million), Large (100-200 million), Very Large (210-500 million), Mega (>500 million)
III. Knowledge and Awareness of Design and Build Option.	**3.0**	Are you aware about Design and Build (D&B) contracting?	Well Aware, Aware, Vaguely Aware
	3.1	Does your firm provide D&B project delivery options to your Client?	Yes, No, Only if the fees are sufficient, Only if required by repeated Clients, For attractive projects
	3.2	What is the number of medium to large size D&B projects that your firm is generally awarded per annum?	Medium ($20 - 50 million), Large ($ 100 - 200 million), Very Large ($ 210 - 500 million), Mega project > $ 500 million
	3.3	Please specify since when has your firm been involved and working with D&B project delivery option?	Less than 5 years, 5 - 10 years, 10 - 15 years, Over 15 years
	3.4	What are the types of projects that you know are being procured along D&B option? Please rank the frequency of each, in a priority order on a scale of 1 (High) to 9 (Low). - Mean Value.	Commercial, Residential, Office, Education, Medical, Leisure, Religious, Industrial, Other, , Institutional, Military, Aviation
	3.5	What are the backgrounds of your clients that request projects be procured along the D&B option? Please rank in priority order which client asks for D&B project on a scale of 1 (High) to 7 (Low)- Mean Value.	Investors, Private client, Government, Semi Government, Developers, Consultants /Contractors, Others
IV. The Local Operating Environment and Objectives of Design and Build Projects.	**4.0**	At what stage of the project life cycle process do your clients generally invite you to Design and Build projects? Please rank in a priority order on a scale of 1 (High) to 6 (Low) - Mean Value.	Following the preparation of (RFP), After the marketing / feasibility, After the prequalification, After the preliminary design, After design development, Other
	4.1	Have you encountered any problem when working on Design and Build project that discourage you from accepting new D&B contracts? Please rank in a priority order on a scale of 1 (High) to 5 (Low). (Mean Value)	Yes, Occasionally, No, In specific circumstances, Other
	4.2	Do you think that your clients are aware of the Design and Build accelerated design programs?	Fully aware, Fairly aware, Neutral, Vaguely aware, Unaware
	4.3	Do you think that your clients are aware of, and in agreement with the expected number of design changes associated with D&B projects and the impact of this on the project cost and time?	Fully aware, Fairly aware, Neutral, Vaguely aware, Unaware
	4.4	Why do your clients choose D&B option? Please indicate in a priority order the objectives of the clients for choosing D&B option on a scale of 1 (High) to 9 (Low). (Mean Value).	Market place advantage, Earlier revenue, For renovation project, Rushed project, Complexity of the project, Reduced Cost, Better product, Dealing with one entity, Other

Completion of Appendix A. Summary of Questionnaire Survey and the recorded responses.

V. Observations and Recommendations for the Future Projects.	**5.0**	What are the nature of impediments to the application of Design and Build contracting? Please rank in a priority order on a scale of 1 (High) to 7 (Low)- Mean Value.	General Knowledge, Cultural, Political, Contractual, Regulatory, Liability insurance, Others
	5.1	Whether you have in the past or not, at what stage would your firm accept to be part of the Design and Build project delivery team? Please rank in a priority order on a scale of 1 (High) to 7 (Low)- Mean Value.	Only if we know the client well, Only if we select the contractor, Subject to agreement on contract conditions and schedule and budget, Only if we select the designer, Only if we jointly prepare the contract with the contractor, Only if we jointly prepare the contract with the designer, Subject to project type, Only if there is an experienced client representative on site, If the scope and client requirements are clear, Other
	5.2	What are the main problems that your firm encounters when asked to deliver projects along the D&B option? Please indicate in a priority order which of the following variables present more problems on a scale of 1 (High) to 11 (Low) - Mean Value.	Lack of financial compensation, Continuous planning to cope with site activities, Maintaining the acceptable standard of design, Unable to discuss with client the design brief, Staying too long in the project, Always avoiding rework, time and cost overrun, Having to shield the continuous contractor's queries, Having to shield the continuous consultant's changes, Having to allow the overestimated space requirements, Lack of clear clients requirements, Lack of trained professional resources, Insurance liabilities are not clear.
	5.3	What makes the traditional project delivery system an attractive choice for you? Please indicate in a priority order on a scale of 1 (High) to 10 (Low) - Mean Value.	Clear comprehensive client brief, Lack of many qualified D&B firms, Many consultants prefer not to work for contractors, Contractual Responsibilities /duties/ Obligation / risk distribution are clear, Familiarity with the traditional system, Insurance and liabilities clauses are clear, Some clients do not feel comfortable dealing directly with contractors and prefer dealing with consultant, Design document checked systematically for coordination and errors and compliance to specs, Less coordination problems compared to other project delivery systems, No pressure from contractors to design differently to meet site demands.
	5.4	Please rank the following measures in order of priority that in your opinion will help D&B firms resolve some of D&B issues and make D&B project delivery system more attractive on a scale of 1 (High) to 11 (Low) - Mean Value.	Introduction of revised building regulations and increase public awareness about D&B option, Set through planning the priorities of the work sequences and work quantities with agreement on site needs, Having shared understanding of scope of work, Having an acceptable completion date with achievable milestone, Having an experienced client representative and an experienced independent cost engineer on the project, Agree contractual compensation changes formula, Agree contractual clauses, for all parties to the contract, Having in house experience in procuring Design and Build projects, Involve the client in regular decision making meeting, Be involved in the project from initiation to hand over, Availability of qualified D&B contractors.
	5.5	Would you recommend the D&B project delivery option to your current and new clients? Please indicate answers in a priority order on a scale of 1 (High) to 7 (Low)- Mean Value.	Yes, No, Subject to project complexity, Subject to client understanding of fast track and Design and Build process, Only if contractually requested, Subject to availability of experienced Design and Build Contractors, Others
	5.6	Do you think the D&B project delivery option may become a choice for the Saudi construction industry in the future?	Yes through the public sector, Only after major changes in the industry practice towards collaboration, Depends on clients understanding of D/B, Yes, Only in boom times, Yes through the private sector, No, Not sure

المعوقات لاعتماد استراتيجية التصميم والتنفيذ المتزامن للمشاريع في سوق صناعة البناء في المملكة العربية السعودية

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ملخص البحث.: في هذا العالم المتسارع، إنهاء مشاريع البناء في الوقت المناسب ضمن الميزانية المنصوص عليها يشكل أولوية قصوى. ويجري التحدي بشكل متزايد في سوق البناء السعودي لتوفير نتائج بشكل أسرع، وبشكل اقتصادي وأفضل من حيث الجودة. في حين أن أنحاء كثيرة في العالم قد عرفت الفوائد المصاحبة لمشاريع التصميم والتنفيذ المتزامن (D&B) ، الا أن سوق البناء السعودي يتجاوب بشكل بطيء في اعتماد خيارات التنفيذ لمشاريع التصميم والتنفيذ المتزامن(D&B) . لم يعتمد هذا الخيار على نطاق واسع، ولا يزال تطبيقه محدودا. الخيار التقليدي (تصميم، تسعير، بناء) لا يزال يهيمن على سوق البناء المحلية. بعد الفحص المعمق، يبدو أن هناك عوائق تحول دون اعتماد منهجية (D&B) في سوق البناء السعودية. وللتحقق من هذه المشكلة، تم توظيف منهجية بحث علمي متعددة وأجريت مقابلات مباشرة مع الجهات المعنية ذات الشأن في سوق البناء. وشمل الاستبيان ٣٦ مشاركا رئيسيا يمثلون شركات الاستشارات الهندسية والمقاولات. هذا البحث يعرِّف المعوقات في اعتماد (D&B) كخيار ويقترح توصيات عملية للتغلب عليها. طبيعة هذه المعوقات تشمل الثقافة، نقص المعرفة عن خيار ال (D&B) ، ندرة في وجود شركات مقاولات متوسطة الحجم تعتمد ال(D&B) كمنهجية أساسية، والعقود الحكومية الحالية. كما تم عرض توصيات لتحسين الأداء والإنتاجية باستخدام (D&B)، بما في ذلك إعداد نموذج توجيه عملي يتكون من ستة مراحل يمكن الاستعانة به من قبل كل المعنيين وأصحاب العمل في صناعة البناء في المملكة العربية السعودية. هذا البحث مستوحى من رسالة دكتوراه لأحد من المؤلفين.

الكلمات المفتاحية: المعوقات، التصميم والتنفيذ المتزامن، الجهات المعنية ذات الشأن، ظاهرة، كفاءة، الخيار التقليدي، تصميم- تسعير- تنفيذ.