



Performance Comparison between Design-Build vs.

Design-Bid-Build

in construction projects at UAE

**مقارنة الأداء بين مشاريع (التصميم والتنفيذ) مقابل مشاريع (التصميم-العطاء-
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في البناء بالإمارات العربية المتحدة

by

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ABSTRACT

Contracts are the main part of any construction industry and the construction is one of the main pillars of the economy in UAE. Moreover, the dynamic economy requires more development for the construction contracts to avoid ambiguity and uncertainty, which might lead to conflicts between contracts parties.

The majority of construction contracts are between two parties, which may refer as Client and Contractor or Employer and contractor. In the research paper, a study is conducted to make comparison between two major types of construction contracts related to the construction industry in UAE.

The first type is Design Bid Build (DBB) which is the traditional type for most of the construction contracts, in this type the client or the employer is preparing tender documents including full scope of design drawings, specifications, general conditions and bill of quantities. All those documents called the tender documents after that the contractors to prepare the commercial and the technical offers based on the full documents that they received from the procurement team, consequently the client or the employer awards the contractor the contract based on the best commercial and technical proposal.

The second type is Design and Build (DB), which is the client or the employer, is preparing scope of work and basic design requirements that describes his needs without detailed bill of quantities and without full design. All those documents shall called RFP (Request for Proposal) after that the contractor to prepare the commercial and technical offers and the bill of quantities and after awarding the contract to complete the design. Moreover, there are other ways for contracts between both parties depend on the time and value of the business and the scope of the project.

On the research paper, the comparison will discuss with professional project, contract & commercial managers to highlight the differences, positives and negatives for each type. The main objectives of this research to highlight the benefits of each type, the study shall take place using mixed methodology qualitative and quantitative. The literature review will show first the methodology of interviews with semi structure interview and present five questions with the possibility of adding any points in addition to the questions. The interviews conducted by online video conferences and the result recorded by sending emails and asking them to reply each question.

Most of construction projects in UAE are conducted by Design-Bid-Build contracts despite this type of contracts seems to be more time consuming, more costly and demand more resources, on the other hand Design and Build (DB) contracts are less used in UAE although it is more beneficial to be used in complex and major projects moreover it can reduce the project time and reduces the cost of the construction projects. In addition, it requires less resources and manpower.

ملخص البحث

العقود هي جزء وركيزة أساسية في صناعة البناء والتشييد، والبناء هو واحد من الدعائم الرئيسية للاقتصاد في دولة الإمارات العربية المتحدة علاوة على ذلك فإن الاقتصاد الحر يتطلب المزيد من التطوير لعقود البناء والتشييد لتجنب الغموض وعدم اليقين، مما قد يؤدي إلى تضارب بين الأطراف المتعاقدة. معظم عقود البناء هي بين طرفين، والتي قد يشار إليها باسم العميل والمقاول أو صاحب العمل والمقاول. في ورقة البحث، أجريت دراسة لإجراء مقارنة بين نوعين رئيسيين من عقود البناء في مجال الإنشاءات بدولة الإمارات.

النوع الأول هو التصميم ثم العطاء ثم بناء أو التنفيذ (عقد تنفيذ)، وفيه يقوم المالك أو صاحب العمل بإعداد وثائق المشروع بما في ذلك الرسومات التصميمية والتنفيذية المواصفات والشروط العامة وجداول الكميات. وتسمى جميع تلك المستندات بمستندات المناقصة بعد ذلك يقوم المقاولون بإعداد العروض التسعيرية والفنية بناء على المستندات الكاملة التي حصلوا عليها من المالك أو صاحب العمل.

النوع الثاني هو التصميم والبناء (عقد التصميم والتنفيذ)، وفيه يقوم المالك أو صاحب العمل بإعداد المتطلبات الأساسية التي تصف حاجته، والتصميم المبدئي من دون وجود جدول الكميات المفصل. ويتعين على المقاول التسعير مع الأخذ بعين الاعتبار تكملة التصميم جميع بعد ذلك يقوم المقاول بإعداد العروض التجارية والتقنية وتقديم عروض الأسعار ومقترحات التصميم المفصلة ثم يقوم فيما بعد بإكمال التصميمات التفصيلية للمشروع بالإضافة لذلك هناك طرق أخرى للعقود بين الطرفين تعتمد على الوقت وطبيعة الأعمال وقيمة المشروع.

ورقة البحث سوف تناقش مقارنة الأداء مع المهندسين ومدراء المشاريع والمختصين لتسليط الضوء على الاختلافات من إيجابيات وسلبيات لكل نوع من العقود ومن الأهداف الرئيسية لهذا البحث الوصول لفوائد وعيوب كل نوع من أنواع العقود، وقد تمت الدراسة باستخدام منهجية مختلطة نوعيا وكميا مع استعراض المناقشة الأكاديمية التي سوف تظهر أولا منهجية المقابلات مع مقابلة شبه هيكلية وتقديم خمسة أسئلة مع إمكانية إضافة أي نقاط بالإضافة إلى الأسئلة. المقابلات التي أجريت عن طريق مؤتمرات الفيديو على الانترنت والنتيجة تم توثيقها عن طريق إرسال رسائل البريد الإلكتروني وقد طلب من المهندسين الرد على كل سؤال.

معظم مشاريع البناء في دولة الإمارات العربية المتحدة تتم بموجب عقود التنفيذ المعتادة على الرغم من أن هذا النوع من العقود يبدو أكثر استهلاكاً للوقت وتكلفة ويتطلب المزيد من الموارد، ومن ناحية أخرى فإن عقود التصميم والتنفيذ أقل استخداماً في دولة الإمارات العربية المتحدة على الرغم من أنها أكثر فائدة لاستخدامها في المشاريع المعقدة والكبرى علاوة على ذلك يمكن أن تقلل من وقت المشروع وتخفض تكلفة مشاريع البناء بالإضافة إلى ذلك فهي تتطلب موارد أقل.

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List of Abbreviation

DBB: Design-Bid-Build or traditional contracts

DB: Design and Build

RFP: Request for Proposal

Vs.: Versus

GCC: Gulf Cooperation Council.

H: Hypothesis

CSM: Supply Chain Management

3D: Three dimensional

PMI: Project Management Institute.

GDP: Gross Domestic Product

SPSS: Statistical Package for Social Sciences.

UAE: United Arab Emirates.

AED: Arab Emirates Dirham

MEP: Mechanical, Electrical and Plumbing

BOQ: Bill of quantities

RsM: Requirements Management

UK: United Kingdom

Bch: Bachelor Degree

MSc: Master of Science

PhD: Doctor of Philosophy

1.0 INTRODUCTION

1.1 Background

Design Build (DB) and Design bid Build (DBB) are two types of methods or contracts widely used in construction projects in UAE.

Traditionally the (DBB) are used as standard practice for construction project, the owners know this type and wildly use it in construction contracts due to the nature of the complexity of the work and the need of hiring professional team to complete the design and understand the owner requirement then prepare the full scope including all technical specification prior to start any commercial detail, in some projects the owner hire independent design consultant to finish and complete the design then at later stage to supervise the work during construction activities.

The design build (DB) contracts which owner approaches contracting companies to submit price or commercial proposal for the project that include design and execution scope. In this type of contract, the owners give the entire package to one single firm which can reduce the time and the cost but it has significant impact in the quality of the works and it has great risk of giving all the scope of work to one company.

From the other hand the design bid build (DBB) contracts are different methodology, which the owner approaches independent design firm to complete the design scope which in the case of construction will be design engineering consultancy. Then the consultant starts preparing the design of the full scope of work after that the owner will ask the contractor to bid for the full scope of works which is prepared by the consultancy firm.

This may have additional time and more cost but it reduces the risk of giving the entire package to one firm and it also increases the quality of works.

Design-Bid-Build is process when the owner assigns the all the responsibility of the design to the consultant and prepare the tender documents which include the detailed design, the bill of quantities and full specifications although this procedure might take time but it reduces the risks on the owner and give the time to prepare the full scope of work prior to start the tendering process.

1.2 Construction industry in UAE

The construction sector in UAE one of the main pillars of the economy in the country, the UAE already implementing new methodology for new contracts and new technologies such as 3D printing, the research paper concentrate in the new areas of the construction contracts.

Looking ahead the industry leader adopted the new strategy of DB construction contracts rather than the traditional DBB but it is still the backbone of the industry. However, the traditional contracts for construction projects in both government and private sectors are widely using DBB methodology during procurement.

The GDP which refers to value of total goods and services produced within UAE is AED1.44 trillion as stated by Dr. El Hassan Jouaouine (Dec 2019) in UAE with 8.5 % related to the construction industry and 5.9% for Real Estate industry both consider the second sector in UAE economy after the oil and gas industry, total 14.4% of overall GDP in the UAE (UAE Ministry of Economy Dec 2019).

Whereas the traditional DBB is used in the majority of the construction contracts the studies show increased demanding for adopting new methodology to improve the performance and reduce the cost and time, although DB contracts are not used in construction projects in UAE much, we have seen rapidly increment of adopting in complex project and new coming contracts.

1.3 Statement of the problem

The research is to identify the benefits of each type of contracts and to provide comparison of each strength points to help understanding the best methodology for owners, moreover the comparison here emphasis the advantages and disadvantage of each type which allows in future to select the best methodology of contracts, it is the main issue for selecting the best approach to starting the construction contract to understand the practical and fasted way, the traditional procedure for projects normally implement the design-bid-build approach the question in this research why owners selecting design-build contracts instead of the traditional type of procurement which is design-bid-build?

What type and value of projects that implementing the traditional design-bid-built contracts and the design-build contracts?

Is the design & build construction contracts reduce the cost and save efforts and make it easier for coordination and resolve the site issues with the contractors?

The research also investigates the possibility of adopting both types of contracts by asking the experts, why they think the owner select design-build contracts?

If they recommend design-build contracts for future projects and why it would be the best option for future construction projects?

This finding and research analysis find the solution and the answers on the above questions and reduces the efforts for selecting the best options and adopting the most beneficial type of contracts it also put the ground base for knowing the advantages and disadvantages for each type and the future implementation for the construction projects in UAE considering the nature of the project moreover the reasons for adopting each type of contracts and the need of the owners and clients.

Since the owners are using traditional types of contracts in UAE, DBB method established a solid base for the construction industry and this may result difficulty in adopting other methods for future projects.

1.4 Aim of research

The main aim of the research is to provide comprehensive comparison between both types of contract DB and DBB this will eventually lead to project success and prevent the misunderstanding of the contract nature by all entity's owner, designer & contractor.

The great impose of the time, cost and quality factors for selecting the best procurement process during the selection of the design consultant and the contractor. The aim is achieved by adopting mixed methodology for the research qualitative and quantitative to reach for the reasons that drive experts and engineers for preferring the traditional way of contracts design-bid-build and the reasons that drive others to select and prefer the design-build construction contracts.

The research defines the elements of the advantages for each type and the disadvantages which urge the owners to adopt the design-build instead of the traditional way considering the risk element that might happened, although the research highlight and analyze the reasons and

conditions that prevent the owners from adopting design-build and choose the normal traditional design-bid-build contracts which take more time and cost.

1.5 Research objectives

Here in the research paper a comparison between the DB & DBB in construction projects especially in UAE, by exploring the reasons why owners should choose each type of contracts and the correlation of the project type with the project success factors such as finishing the project on time within the accepted quality and as per the planned time or schedule. The main factors that encourage adopting design-build construction contracts in UAE, defining the advantages and disadvantages for both types, recommendation by the engineers and experts for design-build and design-bid-build contracts from their previous experiences and the varies construction projects that they have completed, what are the reasons for owners that not adopting design-build contracts and preferring the traditional construction contracts design-bid-build considering the additional cost and time it take and the long procurement process.

1.6 Outline methodology

The limited numbers of researches related to this topic in UAE reinforce me to adopt more studies and research on both types on contracts weather the clients prepare Design-Build (DB) or Design-Bid-Build (DBB) contracts.

“We can expect the structures of the agreement forms/contracts to come through. Based on the arguments above, we draw the following propositions:

- 1: Design-build offers incentives that result in better constructability than design-bid-build contracts.
- 2: Design-build results in lower production costs and faster construction than design-bid-build contracts.
- 3: Quality and customer value come under pressure in design-build contracts.”

As presented by Kalsaas, B.T., Hannås, G., Frislie, G..and Skaar, J. (2018).

1.7 Justification for the research

Firstly, design and build contracts require from the client to arrange request for proposal (RFP) this clearly include all the necessary requirement in order to arrange technical and price

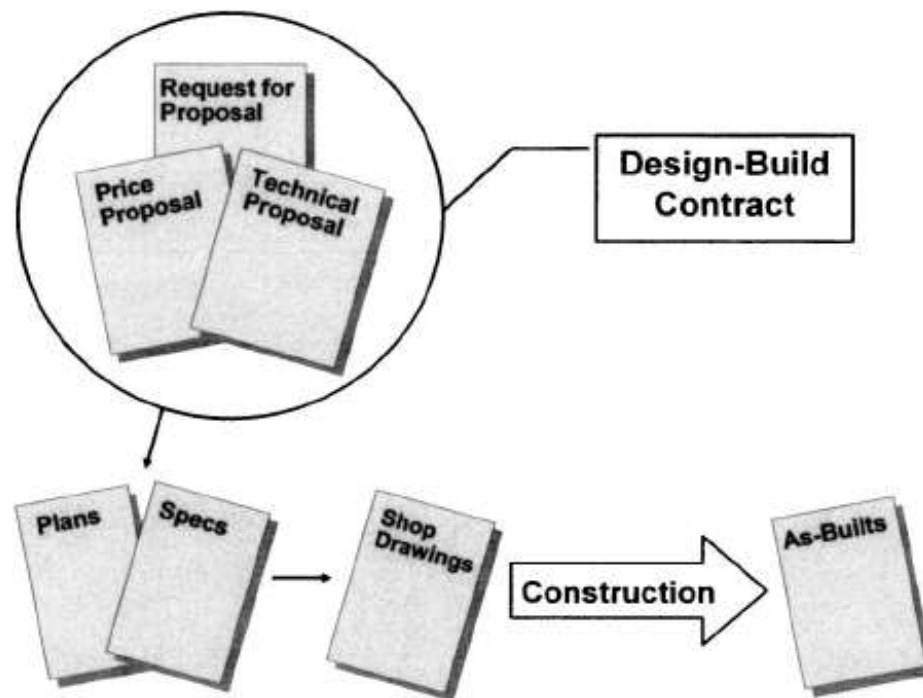
proposals, after that the contractor will prepare plans, specification and all the necessary shop drawings in order to start contraction works, moreover the need of the current market in rapid rising market to finish the projects in shorter time the owner aim to adopt this solution to reduce the time and cost, it also take the owner attention to implement design and build (DB) solution if the project require special contractors incase if the scope is complex or require special design and the owner cannot find specialized design consultant to complete the design and prepare the full scope of the work.

Bennett et al. (1996) published research to benchmark the comparison between DB and DBB project that was done in 1996 using multivariate analysis to prepare comparison in UK and the founding was recorded to highlight the types which performed better. In this research the problem was presented to the expert to highlight their opinion and the question was brought during the interviews why the owner adopting design and build contracts in construction projects in UAE. The experts have shown their interest in the subject matter and this encourages them to give their opinions clearly for the reasons of adopting this type of contracts.

Secondly, design-bid-build (DBB) which is the normal type of contracts when the owner select design consultant to complete the design and then arrange the project detailed drawings, specification and bill of quantities the question brought up during the interview why the owners select the traditional type of contracts and prefer to complete the scope and design before tendering stage and selection the contractor, the issue of taking more time and additional cost to hire specialized design consultant although this might delay starting of the construction in both private and public section the experts have shown their acceptance and encouragement of the design-bid-build contracts this might be due to the absence of regulations or procedures that allow them to use alternative easy and faster solution or due to technical or commercial reasons, this also discussed in the research analysis and the quantitative research.

Figure 1 Design-build contract model (DB)

As adopted by Gransberg and Molenaar-(2001)



Walker and Hampson (2003) argued the traditional procurement which is referred in this research as DBB is strategy of the owner approaches design entity to complete the design and prepare the full scope with all the client requirements by briefing the architect and develop the architectural drawings and concept design, after preparing the scope the client with the help of the engineers in related mechanical and electrical scope then after finishing the full scope the client invites the contractor via bidding process and selecting the best commercial offer.

It is apparent that the majority of engineers are familiar with both type of contracts and it is the research aim to investigate the reasons for adopting either design-build or design-bid-build construction contracts to release the previous researches in the same subject with concentration in the UAE market.

Aki and S Söderström (2013) argued that. “The feasibility study is the beginning of the project,

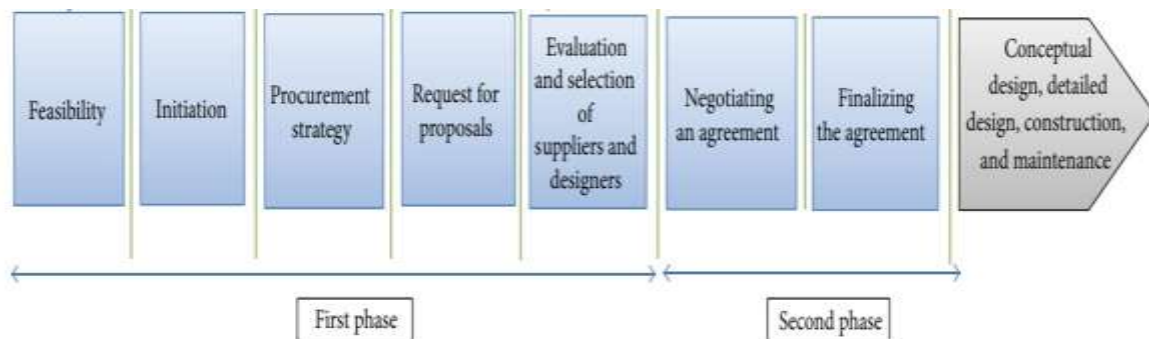


Figure 2 Overview of the project definition process.

and it examines if the project is applicable and feasible for the customers.” The construction project includes two phases, the first phase is project initiation which start with feasibility study then initiation of the project then procurement and preparation of the request for proposal (RFP) then selection designer and suppliers and finalizing the agreement.

The owners’ traditional previous preferences in the DBB contracts to verify and complete the design in the first phase by appointing the design consultancy firm or select the design team and complete the design before the procurement stage, from the other hand the DB contracts the owners skip the detailed design phase and proceed with the procurement strategy after completing basic design and the RFP documents.

On the request for proposal (RFP) documents which prepare by the owner prior to start the procurement process it includes all the necessary contract documents in details and the design is completed and finished by the design constancy.

2.0 LITERATURE REVIEW

The comparison section identifies the factors and the analysis of the positives and negatives during the contracts and construction phases by investigating the factors that affect the selection of contracts, the research conducts semi-structure interviews with selected experts project, construction managers and architects with previous experience on Design-Build and Design-Bid-Build projects.

The choice of the best procurement of the construction projects is the most important part in the project success and delivering the scope on time with the minimum cost and efforts, the decision of adopting design-build contract is the most challenging part during the initiation of any project however the research has been contacted to compare both types of contracts , the best method is preferred by the owners which analysis the differences between design-build (DB) and design-bid-build (DBB), although the research study and compare the future favorably by adopting the design-build contracts and comparing the performance of each type with the engineers and expert.

Key attribute for successful project is to be able to create the best and practical solution and the best process of procurement procedure, moreover the proper selection and adopting the best process between design-build and design-bid-build strategy will allow the owner easily to improve the quality of the construction at later stage and reduces the time and cost of the overall contract.

The behavior of the owners tend to select the traditional design-bid-build is normally coming from absence of clear understanding of the alternative procurement strategy and lack of procedure allowing design-build procurement.

The engineer and experts has shown great positive expectation for adopting design-build procurement contract in future construction projects in UAE.

2.1 The definition of the Design-build and Design-Bid-Build contracts

(DB) Design-build or Design and Build is type of contract in construction when the client decides to have basic documents such as concept design, scarifications basic scope of work and budgetary price and start selecting contractor by which normally based on the technical and commercial proposals via tendering or normal bidding process then the contractor will

complete the design and finalize the shop drawings. In this type the contractor is responsible for the design and the construction of the works.

(DBB) Design-Bid-build, traditional type of contract or design then bidding then build is type of contract in construction when the client awards the design consultant to finish the complete design and prepare bidding documents which normally include the full design drawings (Architectural, structural and MEP) beside preparing the BOQ after that the bidding process will start to select the contractor.

Edmond (2008) described the “Design-build (D&B) integrates design and construction to overcome some of the hurdles inherent in the traditional design-bid-build method” The DB contracts has advantages to overcome the traditional types of contracts and reduce the time and cost required to finish the projects.

2.2 Advantages of adopting design-build (DB) construction contracts

The advantages of DB as discussed in the literature review explore the early involvement of the contractor at earlier stage and the relation with reducing the overall cost and saving time in the construction industry moreover the selection of the specialized contractor at early stage to develop the design and arrange the detailed shop drawings and specification with this the owners can reach for the best solutions for the design, beside reduce the effort during the development of the design.

Design and execution are combined with one entity which allow the owner to have one contact point and make it easier for better communications, by adopting the DB methodology the construction team can start work at the mobilization and other activities related to site preparation until the design is finalized, this will help in achieving the planned date for the handing over and finish the project on time

Chang, Shen and Ibbs (2010) argued that DB contracts is selected to reduce the issues related to coordination, the study investigated the solution of adopting DB contracts and the major problems influencing the construction team during design and construction.

2.3 Disadvantages of adopting design-build (DB) construction contracts

The major disadvantages of adopting DB is the early involvement of the contractor and the early selection of the contractor team will push the client to approve the design and finalize it without proper review or understanding of the scope and if there is any changes on the design or the scope after selection of the contractor will be extremely hard and the owner cannot control the overall budget of the project

Ibrahim Al Saudi (2011) Argued that “Proper planning and understanding the suitability of D&B option for specific projects are the key factors for the success of D&B option. If properly managed, D&B procurement strategy will cut wasted time, energy and costs from the entire building process.” The choice of procurement can affect the quality of the work and the owner must be aware the durability of the project and consider the long-life cycle for the building, if the owner manages to select the professional contractor by adopting the best strategy of selecting the specialized contractors.

2.4 Advantages of adopting design-bid-build (DBB) construction contracts

The advantages of the traditional construction contracts DBB is to have fair competition between bidders to ensure the best and efficient price proposals and to ensure that every bidder contractor treated fair and everyone has equal opportunity to bid, moreover the liability of the design including the structural liability will be distributed among all parties. From the other hand the risk will be minimized due to the two stages of tendering and the commercial scope is well defined between the owner and the contractor.

Moruf a. Jimoh (2014) explained that the performance of DBB contracts in construction projects shows more successful progress and higher speed when adopting more proper interaction between the stakeholders however the research result decrease in performance and delay in the overall progress in case if the project in complex or has mega value.

2.5 Disadvantages of adopting design-bid-build (DBB) construction contracts

The disadvantages of the traditional construction contracts DBB that the owner liability and vision will be conflicted with the consultant and contractor, moreover the owner must arrange supervision consultant team after completing the design to monitor the performance of the

contractor this will be an additional cost on the total value of the project. The owner based on the selection of the design team and start the project with different team this may result a conflict in case of there is ant discrepancy on the scope and the tender documents. The design errors and mistakes will cost the owner additional time and cost.

J.L. Fernández-Solís and K. Chugh (2015) discussed in the research finding that DBB contracts performed better in the term of time and cost beside that the owner overall satisfaction although the it has disadvantages depend on the nature of the project and the complexity of the specification, the public sector normally prefer the DBB contracts in governmental construction projects.

2.6 Implementing Design-build (DB) project for construction project in UAE

UAE has witnessed increasing of the projects that adopting DB contracts specialty in construction industry for various reasons related to budget and complexity of the projects, notwithstanding the clear scope and detailed contracts procedure and conditions may decrease the issues related to coordination between design and construction team.

Most of the issues related to the lack of coordination between the design and the construction team due to weak contract and poor understanding of the contract terms and conditions, M. AL Mousli and S. M. El-Sayegh (2016) analyzed the problem of lacking coordination in construction projects in UAE, by resolving this issue the implementation of the project can be enhanced among the contract parties.

2.7 Organizational behaviour and preferences for future construction projects

The purpose of the research is to create comparative analysis between the design-build (DB) and design-bid-build (DBB) although the owners prefer the traditional contracts DBB some of them widely using the DB contracts specialty incase lack of the funding or lake of the resources or to reduce the cost and time moreover it is mandatory for the projects to have the full scope and full design, in case of absence of clear scope the owners tend to select design-build procedure to start selecting specialized contractor to complete the scope and finish the design, the paper present questions to the expert and try to understand the behavior of the owners while selecting and adopting new procedure such as design-build, deeper analyses to identify the advantages and

disadvantage such as design errors or mistakes and how it is affecting the cost and creating conflicts between parties, the research analysis the affection of design-build procurement process on many other issued such as the absence of supervision team and how the contractor select material and suppliers which might affect the overall quality of the works, this research also examine operational behavior of the selected contractor during the design-bid-build and design-build contracts.

H. Albaloushi and M. Skitmore (2014) argued about supply chain management (SCM), the majority of the researches an studies support the importance of the SCM tool in achieving the planned performance of the project and meeting the targeted dates of supplying the materials specially in countries like UAE importing a lot of materials from outside, the procurement strategy influencing the future behavior for construction projects by adopting DB or DBB contracts. The correspondence and coordination plays main role in selecting suppliers and enrolment of the procurement team at construction site.

M. Alinezhad, E. Sforoush, Z. Kahvandi and C. Preece (2020) demonstrated that traditional DBB contracts normally selected by the owners cause it is understandable process, both government and private sectors, it is easier since the design and construction phases are separated, however the behavior of the organization in private sector biggest issue to do rework on the design consequently the repeated revisions increases the possibility for future delays and claims can be raised from the contractors, the greatest challenges which may accrued due to DB approaches are the time and cost issues.

3.0 RESEARCH METHODOLOGY

The research methodology adapts mixed methodology qualitative and quantitative. The starting by interviewing professional project, commercial and contract managers that involve in both types of contracts, then the development of questionnaire survey by using online website and mobile applications. Pilot survey was conducted with contract manager with more than 20 years of experience and was followed by interviewing 5 professional civil engineers and architects to identify the different aspects and the comparison between design-build and the design-bid-build.

Prior to the interviews the respondents were giving some time to preset their expertise and then they were briefed about the nature of the research topic and the methodology of the study

3.1 Qualitative and quantitative methodology

Five questions were presented to the respondents about their opinions of best methodology for contracts, the effect of the cost, quality and time on different types of the contracts, the challenges of each type of contracts that they have faced and finally the benefits of adopting each type of contracts.

The interviews have been done by online meeting and the questions were recorded and everyone was given the same time and questions with freedom to answer and their views and based on their personal experience.

The research adopted Semi-structured interviews to conclude the dependent and independent variables

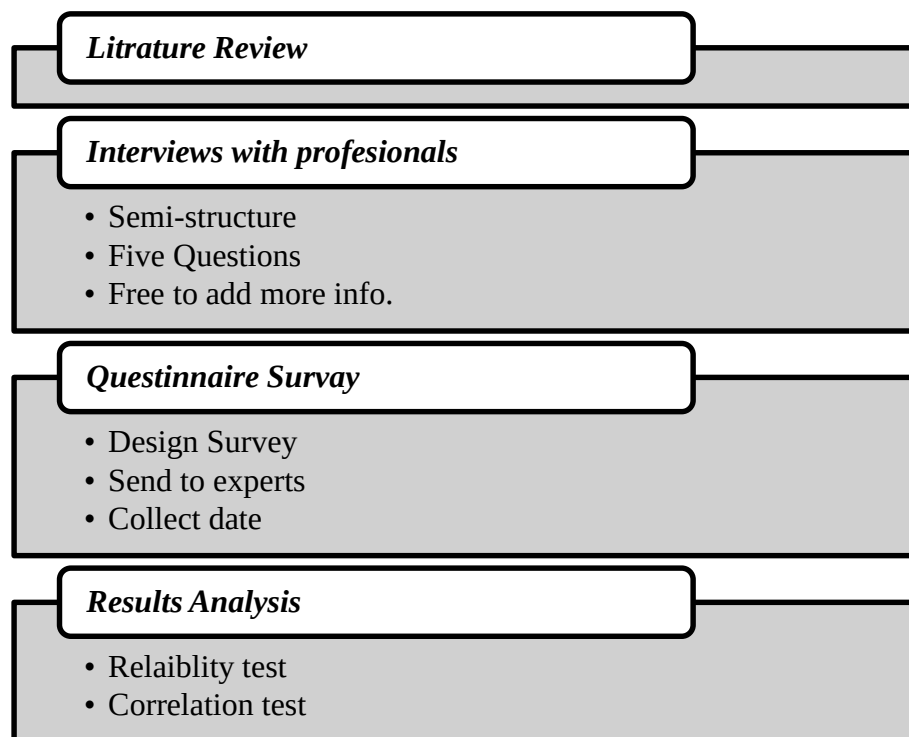


Figure 3 literature review

3.2 Qualitative research

The research started by interviewing five experts with total experience between five to twenty years on both types of contracts DB & DBB, the conversation was recorded by Microsoft team online interview and it takes approximately 30 minutes each as shown in Table 1

SN	Field	Position	Experience	Education	Sector
1	Client	Project Manager	16	Bch. Civil Engineering	Private
2	Consultancy	MEP project manager	10	Bch. Mechanical Engineering	Government
3	Client	Project Construction Manager	25	Bch. Civil Engineering	Government
4	Client	Development Management Engineer	25	MSc. Development and construction Engineering	Private
5	Consultancy	Space Management Engineer	12	Bch. Arch. Engineering	Private

Table 1: Interview experts list

The interviews started with brief about the research and the necessary feedback for the research study and presented to each expert five questions were raised during the interviews.

Q1: Design-build has better result in construction than design-bid-build contracts, what is your opinion?

Q2: Design-build has lower cost and may result of reducing the time of the construction than design-bid-build contracts, what is your opinion?

Q3: Quality of the final product maybe questioned in design-build contracts, what is your opinion?

Q4: Describe the most challenge in the design-build construction contracts.

Q5: Describe the benefit of adapting design-bid-build construction contracts.

To identify the advantages and disadvantages of each type of contracts, every expert was asked the same five questions and same time was given, although each of them was given the space to talk about other issues related to the subject, by adopting semi-structured interviews.

3.3 Dependent and independent variables

After the five questions which presented to the respondents about their opinion of best methodology of contracts, the effect of the cost, quality and time on different types of the contracts, the challenges of each type of contracts that they have faced and finally the benefits of adopting each type of contracts.

The interviews have been done by online meeting and the questions were recorded and everyone was given the same time and questions with freedom to answer and their views and based on their personal experience.

The research adopted Semi-structured interviews to conclude the dependent and independent variables

According to (Florence, Benjamin 2007) design–build (DB) contracts have several advantages, the clients and the owners are not implementing those types of contracts due to some issues happened during the executions of the projects

- A. Design & build reduce the time and save efforts during the design stage
- B. Implementing design& build make it easier for coordination and resolve site issues with the contractor
- C. Design and build contracts have less chance for future claims and additional variations
- D. Approval of materials and approval of works are easier in case of implementing design & build contract
- E. The most challenging in the design and build contracts is the quality, hiring design consultant and adapt design-bid-build will increase the quality of the project
- F. The most benefit of adapting the design-bid-build type of contract is the ability for the client to select from sub-contractor and suppliers

3.4 Design-bid-build construction contract methodology

The actual design process starts when the owner appoints design team including the project architect to create concept design, bill of quantities and specifications then the process of tendering or bidding starts after completing the full tender documents the other name for this phase is called the tender phase which utilizes either the select or open the bidding. Moreover, select bidding is only for specific pre-selected contractors while open bidding is for all contractors. Hence, general contractors and architects are the ones who analyze the bidding.

There are plenty subcontractors for every field in the workplace and by having an experience general contractor would be more beneficial at the beginning of the project because the relationships you make would develop discounted rates, after that the construction process starts. This phase is when the project is finally implemented and the multiple subcontractors that we have are assigned to their specific tasks in the project. Subcontractors are an important element in the workplace as they are the ones who give life to the project. General or main contractor's acts as a median between the subcontractors and the owners to ensure the projects are on track and in budget along every step of the way, they are responsible of resolving any built issues that arise and ensuring the project owner is always up to date with pictures, progress report.

According to Ola Laedre 2017, the traditional contract Design-bid-build the quality of the design is granted by the design consultant and the owner insured that the design is accurate and according to the best quality and well defined in the contract documents

3.5 Advantages of Design-Bid-Build

The fair competitions at the bidding stage are to ensure the best and efficient price for the subcontractors, ensures every bidding contractor are treated fair and everyone has equal opportunity to bid. The main contractor is the only one who takes your instructions to make your ideas and plans at site.

General or main contractor oversees assessing and preparing bid documents which would remove the stress from you and ensure every document are accurate and complete, design-bid-build provides a variety of options to choose from by the owner as they will have a lot of bid

to pick from direct approach between the owner and the design consultant which allow more involvement and guidance in all the design details, the liability of the design including the structure will be on the design consultant and the construction liability will be on the contract, the liability is fairly distributed among all parties. The owner has the possibility to change the design and verify any additional scope of work. In case of delays the contractor is obligated to submit the justification of the extension of time otherwise the owner can implement the delay damages clause. Less risk on the owner and all parties in case of any force majeure, two stages of tender and preparation of contract documents which reduce the risk on the owner. The commercial scope is well defined between parties and reduces the conflict between the owner and the contractor.

J. C. Lampe (2015) represented performance study between traditional DBB design-bid-build and DB design-build contracted in the delivery of the high way project, the study concentrated in factors related to start date of the project, awarding the contracts, inspection cost. The comparison showed that DBB overall cost for larger project is lower and more efficient in cost DB contracts, DBB and DB contracts were matched in respect to the overall cost in 15% of the project related to the study in highway construction contracts.

3.6 Disadvantages to Design-Bid-Build

Design errors or mistakes will cost the owner additional time and money, the owner liability will be conflicting with the consultant and the contractor. Since there will be many competitions, it can be a weakness and can create a system referred to as “Cheaper is better” and hire the cheapest subcontractors and suppliers to reduce cost.

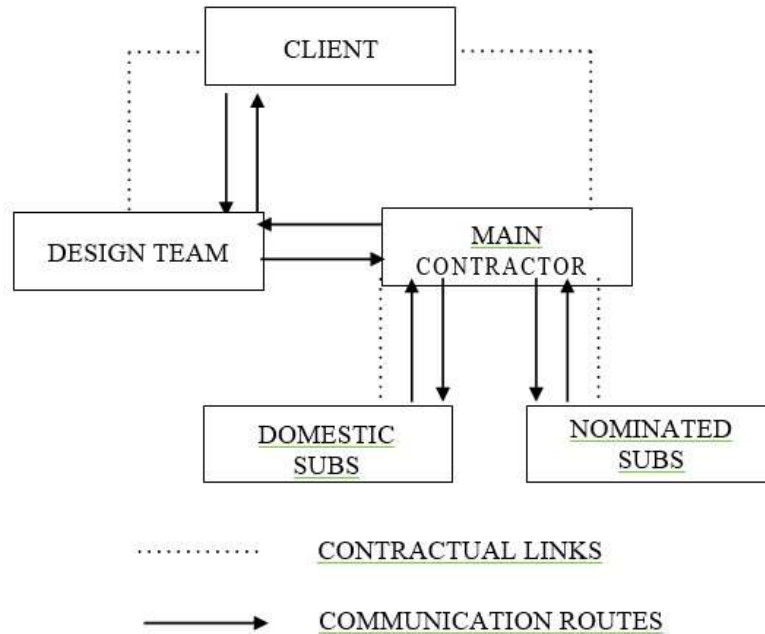
Bidding process cannot be started until the design is completed and approved by the owner which sometimes delays the start of the construction.

The owner must have supervision consultant which may add additional cost on the contract, The owner based on his selection of the design team and starts the project with different supervision team this may lead to conflict in case if there are any discrepancies on the tender documents

The Design-Bid-Build contract according to Ibrahim Al Saudi (2011) the procurement strategy that client is arranging design team to prepare the full scope of work before tender the contract, the client is having contractual agreement with the design team and the main contractor, however the main contractor has also contract agreement with the nominated contractors and domestic subcontractors as shown in Figure 04.

Figure 4

Typical
project's



organization for Design Bid build procurement strategy

By Ibrahim Al Saudi (2011)

3.7 Design-Build (DB) construction contract methodology

A crucial element that enhances the development of design-build project is briefing as it greatly depends on the owner's experience to create a detailed and comprehensive brief. When experienced clients create a detailed brief, it tends to reduce the time a project needs to be completed ensuring the project is always on time and never delayed. However, other such clients referred to as green clients tend to ignore the brief unfortunately and mainly clients have dichotomous attitude when creating a construction project brief. Ignoring a project brief can be very critical as conflict can occur at a later stage with the stakeholders of the project when the client decides to suggest improvement in the middle of the project.

The client's brief ranges from a statement, project brief then finally a detailed performance specification from various elements in every possible direction to detailed requirements of the materials being used. Moreover, it is the platform for the design, planning and technical work for various stages in the facility and when repetitive refinements of the requirements are being made, it adds value to the construction project

According to Chan, (2004), the research has discussed the relation between adopting the design-build contracts and the success of the project the demand on the design-build contracts has been increases on construction projects. The Importance of client contribution to the project is an essential necessity to a Design-Build project as they correlate groups of interest in a proposed facility and it is important and crucial to find the existing problems and finding solutions to them within the construction industry with the client's requirements

There have been several studies regarding the potential problems of the Requirements Management (RsM) practice limitations. Therefore, the introduction of a project brief is believed to play an important role of developing the requirements given by the client (Shen et al., 2004). The initial brief has errors that needs to be taken into consideration by (Arayici et al., 2006; Kamara and Anumba, 2001; Yu et al., 2005; Shen and Chung, 2006).

The initial brief tends to cover a certain view of the facility which is proposed. Nonetheless, stakeholders overlook the most crucial elements of the building which affects the project during the development phase. The Clients as well as the other professionals looks at the construction project as one entity during the inception stage (Leite et al., 2005) and by doing so they underestimate the most crucial necessities of the construction project and at a later stage change would need to be done to the brief.

It is rather common for clients to believe that creating a design brief does not add value to the project and prevents putting time and resources to the briefing (Othman et al., 2005). Hence, the time spend on briefing could be spend in commencing the design as early as possible and this creates a negative approach to the requirements as they are not able to identify them properly and at a later stage the client becomes unsatisfied with the results.

When preparing the brief, the only people who are allowed to be involved are a handful of stakeholders in order to be time efficient on the brief. Many key stakeholders and clients prefer to have a small number of people inside a group who are similar to each other in terms of agenda, objectives and interests.

The correspondences between the engineering, procurement and the site team which can be formal or informal communications involve a lot of parties and personal, the more parties involve in construction project the more communications and correspondences, moreover the communication may include the (mails, letters, fax, memos, drawings and submittals), beside that the verbal communications such as (face to face meeting, phone calls or any electronic communications) The more parties involve in the contracts the more communications which require more resources and records to avoid misunderstanding or loss of any information.

Stephen Emmitt and A. Gorse (2006) argued about the importance of construction meeting and records at site however “there are no regulations or rules on the number of parties or organizations that should be contacted to design and manager construction project/ Equally there are few construction publication that give real guidance on which and how many professionals should be present in the meeting” the DB contracts reduce the number of parties and reduced he communication or the coordination required in the construction projects.

Tran, Nguyen (2017) summarize in their findings that “the communication issues vary along with each phase of the DB process”, the communication protocol and procedure has direct influence in the success of DB contracts. The parties must provide clear communication during the design and during construction, the factors that can affect the proper information include the time and schedule.

Shohet and Frydman (2003) explained that the communication between the project construction team and procurement is necessary and vital to ensure that the project reach objectives and meet the planned progress. The targeted program of work is mandatory to be recorded in formal written communication, the study concluded that 50 % of communication between parties is verbal communications. It became a challenging in complex building and mass construction projects to maintain proper channel of communication and coordination

between stakeholders and the design team, DB contracts which has design and build contractor reduces the channels of communications between the owner and the contractor.

Additionally, the direct communication between the owner and the project manager from the contractor side in DB contracts is effective and the design and build contractor is capable to insure a smooth and productive communication channel.

NG Weng and Aminah (2006) stated that “Getting success in Design and Build projects enables an assurance of getting the project completed at the right time and within allocated budget. The Design and Build procurement system have better time performance and cost benefits, which are essentially what the end-users are concerned about”, the study has emphasized that all the parties in DB contracts should ensure clear communication and higher understanding in the commutation protocol to ensure the success of the project. All kind of communications with single point of contracts rather than communication in two parties the design and construction team will help in project execution and facilitate the flow of the information during design and construction phases.

3.8 Advantages of Design-Build

Gordon Culp (2011) argued that “The DB contracting method enables the owner to transfer risks associated with design liability and disputes between design subcontractors and construction subcontractors to the design–builder”

- a) The involvement of the contractor at earlier stage will defiantly reduce the time and cost
- b) At the complex type of projects, the specialized contractors are much expert and can propose the best solutions for the design
- c) Design and execution cost are combined with one party and this will reduce the effort and time
- d) Direct contact point to the owner of the project which is easier and faster to resolve issues that may happened
- e) The construction work preparation can be started during finalizing the design
- f) The engagement of the construction team at earlier stage will help on finishing the project on time

3.9 Disadvantages of Design-Build

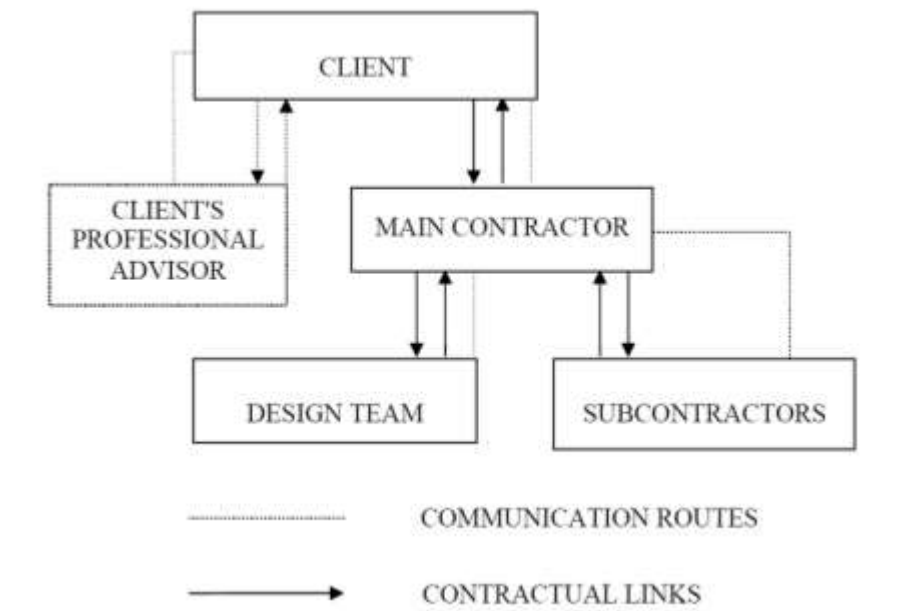
- g) The early involvement of the contractor will push the owner to approved the design and finalize it
- h) Any changes on the scope will be very hard and the owner cannot control the overall budget of the project
- i) Any changes on the design will be definitely a change order and will lead to additional cost and time
- j) In case of any issues happen to the contractor it is very hard to change it by the owner
- k) The contractor selection of the material and subcontractor will be based on the commercial view and normally the contractor will look to maximize the profit and reduce the cost
- l) The quality of the project will be totally at risk and depend of the contractor selection of the material

The Design -Build contract according to Ibrahim Saudi (2011), the client is considering both scope design and construction in one package as shown in Figure 05.

According to Peony W.L. Tang, (2010), the Design-build construction contracts is providing valuable into eliminating the difficulties and challenges on both private and government sectors and the construction industry has witnessed rapid increasing of this type of projects due to the unnecessary of preparing comprehensive design documents, no need to involve design team

Figure 5: typical project organization for Design-Bid-Build procurement strategy

By Ibrahim Saudi (2011)



3.10 Quantitative research

The research is emphasizing and establishing via the individual opinions and investigation the hypothesis by the results which received from the survey, although the 70 respondents replied the majority of the questions, the result has been checked by SPSS software to measure and test the reliability and accuracy.

The research aims from the quantitative methodology to complete the quantitative analysis and reach towards better understanding, by compiling the qualitative and quantitative research method the data analysis will help future research and studies to highlight the advantages and disadvantages for DB and DBB contracts in construction projects at UAE.

Many recommendations by other researches in adopting mixed methodology and the best answer for any practical research and better accurate results comes from the quantitative research.

The below table 2 showing the thirty questions which reflect the dependent and independent variable and its relation with the factors and the type of the contracts (DB) & (DBB).

The quantitative research provides the chance to test the theoretical qualitative research by using the statistical tools and software (SPSS) to analysis the result and the theory, the validation of the numerical values helps the industry expert for better understanding of each type and the statistics and values overcome the theoretical constrains.

Therefore, the research adopted mixed methodology and relay on the statistics analysis to prove the theory and hypothesis.

Table 2: quantitative research questions

No	Question	Factor
1.	What is your current location?	Location
2.	How many total years of Experience?	Age
3.	How many years you are working in your current organization?	Experience
4.	Which of the following best describes the principal industry of your organization?	Organization
5.	What is the highest level of education you have completed?	Education
6.	What type of field of is your Employer?	Employer field

7.	What is your nationality?	Employer field
8.	What is the average number of employees in your company?	Employer field
9.	What is the yearly turnover of your company?	Employer field
10.	How much is the value of the projects in your organization?	Employer field
11.	Are you familiar in Design & build construction contracts?	DB
12.	Does your company provide Design & Build solution to implement construction projects?	DB
13.	What is the value of the design & build projects that your company does per annum?	DB
14.	What types of projects your company implements design & build solution?	DB
15.	Are you familiar in Design Bid Build construction contracts?	DBB
16.	Does your company provide Design Bid Build solution to implement construction projects?	DBB
17.	What is the value of the design & build projects that your company does per annum?	DBB
18.	What types of projects your company implements design & build solution?	DBB
19.	Design & build reduce the time and save efforts during the design stage	DB
20.	Implementing design & build make it easier for coordination and resolve site issues with the contractor	DB
21.	Design and build contracts has less chance for future claims and additional variations	DB
22.	The most challenging in the design and build contracts is the quality, hiring design consultant and adapt Design-Bid-Build will increase the quality of the project	DBB
23.	The most benefit of adapting the design-bid-build type of contract is the ability for the client to select from sub-contractor and suppliers	DBB
24.	<u>Advantages of Design- Build construction contracts</u> a) The early involvement of the contractor at earlier stage will defiantly reduce the time and cost b) At the complex type of projects the specialized contractors are much expert and can propose the best solutions for the design c) Design and execution cost are combined with one party and this will reduce the effort and time	DB

	d) Direct contact point to the owner of the project which is easier and faster to resolve issues that may happened e) The construction work preparation can be started during finalizing the design f) The engagement of the construction team at earlier stage will help on finishing the project on time	
25.	<u>Disadvantages of Design-Build construction contracts</u> a) The early involvement of the contractor will push the owner to approved the design and finalize it b) Any changes on the scope will be extremely hard and the owner cannot control the overall budget of the project c) Any changes on the design will be definitely a change order and will lead to additional cost and time d) In case of any issues happen to the contractor it is very hard to change it by the owner e) The contractor selection of the material and subcontractor will be based on the commercial view and normally the contractor will look to maximize the profit and reduce the cost f) The quality of the project will be totally at risk and depend of the contractor selection of the material	DB
26.	<u>Advantages of Design-Bid-Build</u> a) The fair competitions to ensure the best and efficient price for the subcontractors b) Ensures every bidding contractor is treated fair and everyone has equal opportunity to bid. c) The liability of the design including the structure will be on the design consultant and the construction liability will be on the contract, the liability is fairly distributed among all parties d) In case of delays the contractor is obligated to submit the justification of the extension of time otherwise the owner can implement the delay damages clause. e) Less risk on the owner and all parties in case of any force majeure. f) Two stages of tender and preparation of contract documents which reduce the risk on the owner. g) The commercial scope is well defined between parties and reduces the conflict between the owner and the contractor.	DBB

27.	<u>Disadvantages to Design-Bid-Build</u> a) Design errors or mistakes will cost the owner additional time and money b) The owner liability will be conflicting with the consultant and the contractor c) Since there will be many competitions, it can be a weakness and can create a system referred to as “Cheaper is better” and hire the cheapest subcontractors and suppliers to save cost. d) Bidding process cannot be started until the design is completed and approved by the owner which sometimes delays the start of the construction. e) The owner must have supervision consultant which may add additional cost on the contract f) The owner based on his selection of the design team and start the project with different supervision team this may lead to conflict in case if there are any discrepancies on the tender documents	DBB
28.	Why do you think owners select design & build contracts?	DB
29.	Do you recommend using Design & build in construction projects?	DB
30.	Do you think that design & build contract would be the best option for future construction projects?	DB

4.0 CONCEPTUAL FRAMEWORK & HYPOTHESIS

The literature review analysis which was concluded from interviews and the qualitative research, with 5 experts, the finding approached the project delivery stage and identified them in 10 phases

- 1 Concept design (schematic design) and planning phase
- 2 Detailed design including architectural, civil and MEP
- 3 Preparation of the bidding
- 4 Mobilization and construction phase
- 5 Handing over and testing/commissioning phase
- 6 Planning or conceptual design phase
- 7 Engineering and design phase
- 8 Procurement or bid phase
- 9 Execution Phase (Construction & Commissioning)
- 10 Operations & Maintenance Phase

This section define factors in the DB and DBB in Figure 4 and 5 in the literature review that affect the client selection for both types of the contracts and following the influencer factors

The research aim to investigate the hypothesis related to the DB and DBB contracts to verify the factors affecting the owners and clients in adopting each type of contract in construction and the qualitative research conclude the result from the questionnaire

4.1 Hypothesis

H1: The owners' selection of the Design-build (DB) construction contracts encourages by the need of reducing the time and cost

H2: Design-build (DB) construction contracts resolve the issues and conflicts between parties

H3: Design-build (DB) construction contracts have less chance for future claims and variations

H4: Lack of funding and resources lead to the selection of the design-build (DB) contracts by the owners to start the construction works at early stage

H5: The owners tend to select design-build (DB) construction contracts in complex projects and select the specialized professional contractor.

H6: implementing design-build (DB) contracts make is easier for coordination and resolve issues between owners and contractors.

H7: Design-bid-build (DBB) construction contracts are easier to select among the contractors and the bidding procedure is fairly treated for the bidders and everyone has equal opportunity to bid.

H8: Two stages of tendering process and preparation of the contract reduce the risk on the owners which engorged them to adopt design-bid-build (DBB)

H9: If the commercial scope well defined at the beginning of the project the owners tend to adopt design-bid-build (DBB) construction contracts

H10: The values of the project and the nature of the scope will affect the selection of the owners by adopting either (DB) or (DBB)

4.2 Dependant and independent variables

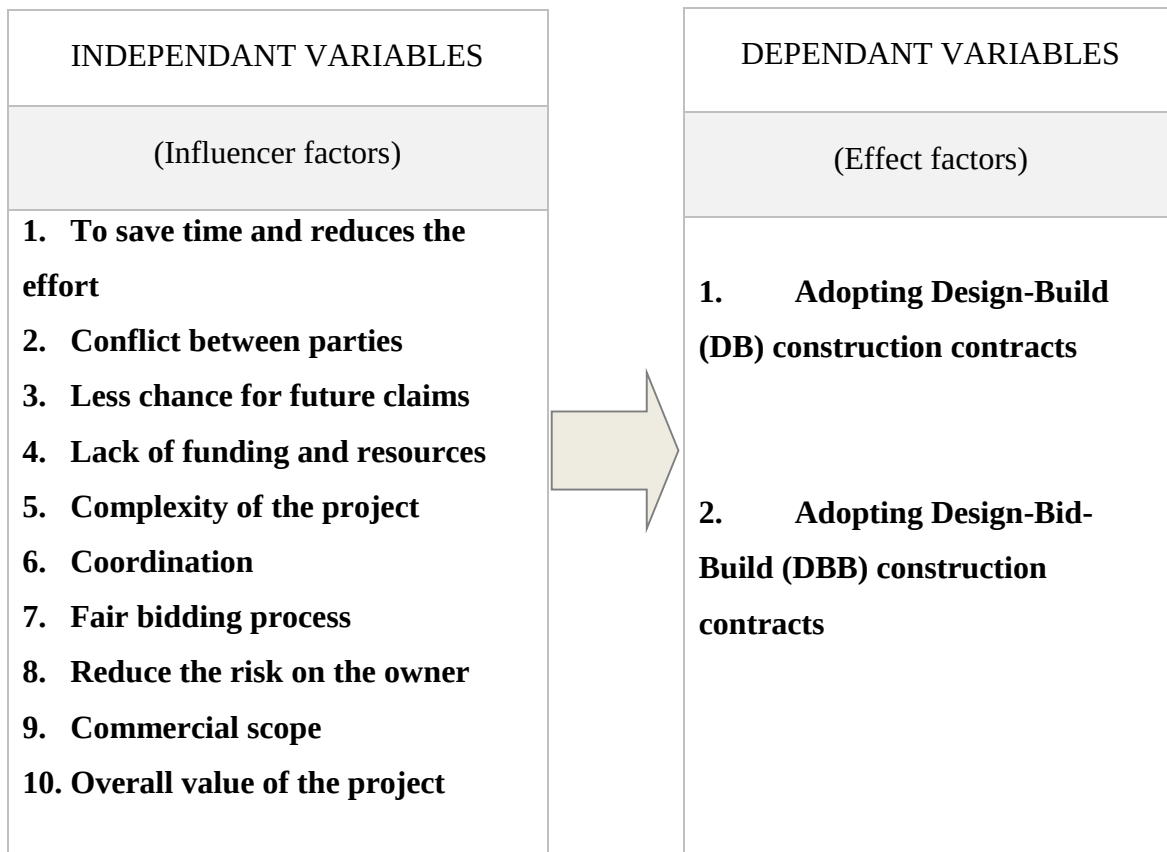


Figure 6: Independent and Dependents Variables

5.0 DATA ANALYSIS AND INTERPRETATION

After conduction 5 interviews with engineers working in construction projects in UAE, total 30 questions were concluded after the interviews. The interviews were conducted using Microsoft teams online. The engineers were asked about their previous experience working in Design-Build and design-Bid-Build especially in UAE.

Targeted respondents consisted of professional experts working in the construction industry in project related to design-bid-build (DBB) and design-build (DB) the research included engineers working in site and procurement, these also targeted clients, developers, owners, project

management, cost consultant, design consultants, supervision consultants, main contracts, subcontractors and suppliers.

5.1 Statistical Analysis

The survey summarized 30 questions and prepared online questionnaire via (www.surveymonkey.com), the online survey was addressed to experts and engineers working in the construction projects inside UAE.

The initial survey was sent to more than 350 experts and the initial reply was 35 conducted the survey, after follow up and reminders the response reached to 70 results was conducted and completed.

5.2 Sampling selection

Wilson (2014) discussed the selection of the sampling size and targeted number of experts in defined population “A clearly defined group of research subjects that is being sampled”, the sample selection targeted professional expert working in construction projects and has previous experience in design-build and design-bid-build contracts

5.3 Description of statistics

To record the research results after preparation of the questionnaire the research used excel to segregate the results and prepare the descriptive percentage of each question, the questionnaire was segregated into five major sections

5.3.1 Section I General information

5.3.2 Section II Work information

5.3.3 Section III awareness of the design-build and design bid build

5.3.4 Section IV the advantages and disadvantages

5.3.5 Section V recommendation from the respondents

5.4 Inferential statistics analysis

5.4.1 Reliability Test

By using SPSS software, the liability test conducted (clicking on Analyze/Scale/Reliability Analysis) For dependent and independent variables, each variable as checked by using SPSS for the scale of mean and scale of variance if item deleted followed by the Cronbach's Alpha if the item is deleted.

The table 3 and 4 below showing the run of liability test and Chronbach's Alpha

Table 3: Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.830	.835	12

The result of the Chronbcach's Alpha is 0.835 which is considered if equal of greater than 0.70 is acceptable this has reference to (Field 2006), the result is 0.80 and 0.89 which is considered good reliability

Table 4 Item- Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
The early involvement of the contractor at earlier stage will defiantly reduce the time and cost in DB contracts	42.13	56.145	.510	.683	.831

At the complex type of projects, the specialized contractors are much expert for DB contracts	42.13	56.661	.435	.593	.836
Design and execution cost are combined with one party and this will reduce the effort and time	42.16	56.071	.540	.492	.830
The contractor selection of the material and subcontractor will be based on the commercial selection only	42.54	53.317	.536	.457	.830
The fair competitions to ensure the best and efficient price for the contractors	42.29	53.788	.668	.644	.821
Ensure every bidding contractor are treated fair and everyone has equal opportunity to bid	42.10	53.668	.706	.643	.819
The liability of the design including the structure will be on the design consultant and the contractor	42.05	53.272	.640	.521	.822
Less risk on the owner and all parties in case of any force majeure.	42.49	55.544	.492	.434	.832
Two stages of tender and preparation of contract documents which reduce the risk on the owner	42.10	53.765	.745	.708	.817
The commercial scope is well defined between parties and reduces the conflict between the owner	42.00	54.032	.626	.564	.823
Do you recommend using Design & build in construction projects?	43.92	61.236	.129	.613	.857
Do you think that design & build contract would be the best option for future construction projects?	43.76	61.281	.150	.580	.853

The run of the liability test on the selected variables showed reliable data for the early involvement of the contractor reduces time and cost $\alpha=0.831$, complex type of projects the specialized contractors are much expert for DB contracts $\alpha=0.836$, Design and execution cost are

combined with one party and this will reduce the effort and time $\alpha=0.830$, the commercial selection $\alpha=0.830$, the fair competitions $\alpha=0.821$, every bidding contractor are treated fair and everyone has equal opportunity $\alpha=0.819$, the liability of the design including the structure $\alpha=0.822$, less risk on the owner $\alpha=0.832$, two stages of tender and preparation of contract documents which reduce the risk $\alpha=0.817$, reduces the conflict between parties $\alpha=0.823$, design & build in construction projects recommendation $\alpha=0.857$, design & build contract would be the best option for future construction $\alpha=0.853$.

5.4.2 Pearson's Correlation Test

Pearson correlation test to identify the relationships into two times, the first test related to the DB contracts and the second test related to the DBB contracts.

Based on Wilson (2014) about the definition of Pearson correlation test as it is the measurement tool to assign the relation between variables "A Parametric technique that measures the strength of association between two variables, the measurement will be represented between -1 and 1 where the value of 1 represents a perfect positive correlation and -1 presents a perfect negative correlation and where 0 means that there is no relationship between the two variables and they are independent" , The research has identified the 10 independent variables and run the correlation test to verify the hypothesis in the below tables 5 & 6 which showing the correlations between dependent and independent variables.

5.4.3 Design & build (DB) correlation test

The below table showed that there are significant negative relationship between independent and dependent variables.

Table 5 Correlation test DB

The variable identified in the literature review and the research selected 7 variables by using SPSS software and clicking (Analyze / Correlate / Bivariate), to select Bivariate coloration and move 5 variables to the (variable box), the test result the below information.

Correlations

		IV 01	IV 02	IV 03	IV 04	IV 05	DV 01 (DB)	DV 02 (DB)
The early involvement of the contractor at earlier stage reduce the time and cost	Pearson	1	.571**	.557**	.591**	.304*	-.287*	-.160
	Correlation		.000	.000	.000	.013	.018	.192
	Sig. (2-tailed)		.68	.68	.68	.66	.68	.68
At the complex type of projects the specialized contractors are much expert	Pearson	.571**	1	.613**	.450**	.330**	-.086	.594**
	Correlation	.000		.000	.000	.007	.486	.447
	Sig. (2-tailed)	.68	.68	.68	.68	.66	.68	.68
Direct one contact point to the owner of the project which is easier and faster	Pearson	.557**	.613**	1	.610**	.391**	-.137	-.070
	Correlation	.000	.000		.000	.001	.266	.568
	Sig. (2-tailed)	.68	.68	.68	.68	.66	.68	.68
Design and execution cost are combined with one party and this will reduce the effort	Pearson	.591**	.450**	.610**	1	.167	.002	.170**
	Correlation	.000	.000	.000		.181	.987	.893
	Sig. (2-tailed)	.68	.68	.68	.68	.66	.68	.68
The early involvement of the contractor will urge the owner to approved the design	Pearson	.304*	.330**	.391**	.167	1	-.167	-.259*
	Correlation	.013	.007	.001	.181		.181	.036
	Sig. (2-tailed)	.66	.66	.66	.66	.66	.66	.66
Do you recommend using Design & build in construction projects?	Pearson	-.287*	-.086	-.137	.002	-.167	1	.701**
	Correlation	.018	.486	.266	.987	.181		.000
	Sig. (2-tailed)	.68	.68	.68	.68	.66	.70	.69
Do you think that design & build contract would be the best option for future construction projects?	Pearson	-.160	.594**	.170**	-.017	-.259*	.701**	1
	Correlation	.192	.447	.568	.893	.036	.000	
	Sig. (2-tailed)	.68	.68	.68	.68	.66	.69	.69

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The early involvement of the contractor at earlier stage reduces the time and cost has moderate significant negative relationship with the recommendation of adopting DB contracts in construction projects correlation is (-.287*) which record that the assumed hypothesis related to the adopting DB contracts to reduce time and save resources , The complexity type of projects and the specialized contractors selection has recorded (.594**) which is a strong significant

relationship with the dependent variable about selection of the DB projects in future construction contracts

Design and execution cost are combined with one party and this will reduce the effort has strong significant relation with the dependent variable related to the DB future contracts with value of (.170**)

The early involvement of the contractor will urge the owner to approved the design has negative moderate relationship with adopting DB contracts in future construction projects the correlation factor is (-.259).

5.4.4 Design-Bid-Build (DBB) correlation test

Table 6 Correlation test DBB

The variable identified in the literature review and the research selected 6 variables by using SPSS software and clicking (Analyze / Correlate / Bivariate), to select Bivariate coloration and move 5 variables to the (variable box), the test result the below information.

Correlations

	IV 01 Liability	IV 02 Ext of time	IV 03 Risk	IV 04 Two stages of bidding	IV 05 Commer cial scope	DV 01 (DB B)
The liability of the design including the structure will be on the design consultant and the contractor Pearson Correlation (2-tailed) Sig. N	1 68	.496** .000 68	.258* .033 68	.515** .000 68	.344** .005 66	.419* .000 68
In case of delays the contractor is obligated to submit the justification of the extension of time Pearson Correlation (2-tailed) Sig. N	.496** .000 68	1 68	.293* .015 68	.578** .000 68	.610** .000 66	.703* .000 68
Less risk on the owner and all parties in case of any force majeure. Pearson Correlation (2-tailed) Sig. N	.258* .033 68	.293* .015 68	1 68	.421** .000 68	.426** .000 66	.270* .026 68
Two stages of tender and preparation of contract Pearson Correlation	.515**	.578**	.421**	1	.677**	.419* 68

documents which reduce the risk on the owner	Sig. (2-tailed) N	.000 68	.000 68	.000 68		.000 66	.000 68
The commercial scope is well defined between parties and reduces the conflict between the owner	Pearson Correlation Sig. (2-tailed) N	.344** .005 66	.610** .000 66	.426** .000 66	.677** .000 66	1 66	.590* .000 66
Bidding process cannot be started until the design is completed and approved by the owner which sometimes delays the start of the construction.	Pearson Correlation Sig. (2-tailed) N	.419** .000 68	.703** .000 68	.270* .026 68	.419** .000 68	.590** .000 66	1 69

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The correlation test has considered 5 independent variables related to the liability of the design, justification for extension of time, risk in all parties, two stages of tendering and the commercial scope is well defined, from the other side the dependent variable of bidding process in the DBB contracts.

The liability of the design including the structure will be on the design consultant and the contractor has significant positive relationship with the dependent variable bidding process cannot start before the design is completed the correlation is (.419**), Delays the contractor is obligated to submit the justification of the extension of time has significant positive relationship with the dependent variable value of (.703**)

Two stages of tender and preparation of contract documents which reduce the risk on the owner has moderate relationship with the dependent variable the correlation is (.270).

The last independent variable related to the commercial scope and its effect on the parties involve on the project has positive relationship with the dependent variable value of (.590).

5.4.5 Regression & Hypothesis tests

Linear regression test to predict the hypotheses, the research has assumed 10 hypotheses, 10 independent variables and 2 dependent variables.

The owners' selection of the Design-build (DB) construction contracts encourages by the need of reducing the time and cost. The research implemented SPSS software to do the analysis by

running (Analyse / Regression / Linear) by checking the first 5 hypothesis with the dependant variable related to DB construction contract

Table 7 Correlation Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.140 ^a	.020	.004	.983
2	.245 ^b	.060	.030	.970
3	.269 ^c	.072	.027	.972
4	.323 ^d	.104	.046	.962
5	.323 ^e	.105	.030	.970

a. Predictors: (Constant), H 01

b. Predictors: (Constant), H 02

c. Predictors: (Constant), H 03

d. Predictors: (Constant), H 04

e. Predictors: (Constant), H 05

H1: The owners' selection of the Design-build (DB) construction contracts encourage by the need of reducing the time and cost

H2: Design-build (DB) construction contracts resolve the issues and conflicts between parties

H3: Design-build (DB) construction contracts have less chance for future claims and variations

H4: Lack of funding and resources lead to the selection of the Design-build (DB) contracts by the owners to start the construction works at early stage

H5: The owners tend to select Design-build (DB) construction contracts in complex projects and select the specialized professional contractor.

Table 8 Correlation Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.215 ^a	.046	.031	1.081
2	.371 ^b	.138	.110	1.036
3	.408 ^c	.166	.126	1.027
4	.530 ^d	.281	.234	.962
5	.545 ^e	.297	.238	.959

a. Predictors: (Constant), H 06

b. Predictors: (Constant), H 07

c. Predictors: (Constant), H 08

d. Predictors: (Constant), H 09

e. Predictors: (Constant), H10

H6: implementing Design-build (DB) contracts make is easier for coordination and resolve issues between owners and contractors.

H7: Design-bid-build (DBB) construction contracts are easier to select among the contractors and the bidding procedure is fairly treated for the bidders and everyone has equal opportunity to bid.

H8: Two stages of tendering process and preparation of the contract reduce the risk on the owners which engorged them to adopt Design-bid-build (DBB)

H9: If the commercial scope well defined at the beginning of the project the owners tend to adopt Design-bid-build (DBB) construction contracts

H10: The values of the project and the nature of the scope will affect the selection of the owners by adopting either (DB) or (DBB)

5.5 Section I related to the general information about the respondents

Table 9: The current location of the respondents

The final survey result of resonances completed the majority of the questions from UAE and one from GCC and the 3 outside GCC, the responses rate recorded (20%)

What is your current location?		
Answer Choices	Responses	
UAE	94.29%	66
Other GCC	1.43%	1
Outside GCC	4.29%	3
	Answered	70
	Skipped	0

70

66

was

The questions about the

current location of the respondents are from UAE with percentage of (94.29%) from the total respondents

With regard to the experience (15.71%) of the respondents between 0 to 5 years of experience, 10% between 0 to 9 years of experience, (52.86%) of the respondents between 10 to 19 years of experience and (12.86%) between 20 to 29 years of experience and 8.57% is more than 30 years of experience.

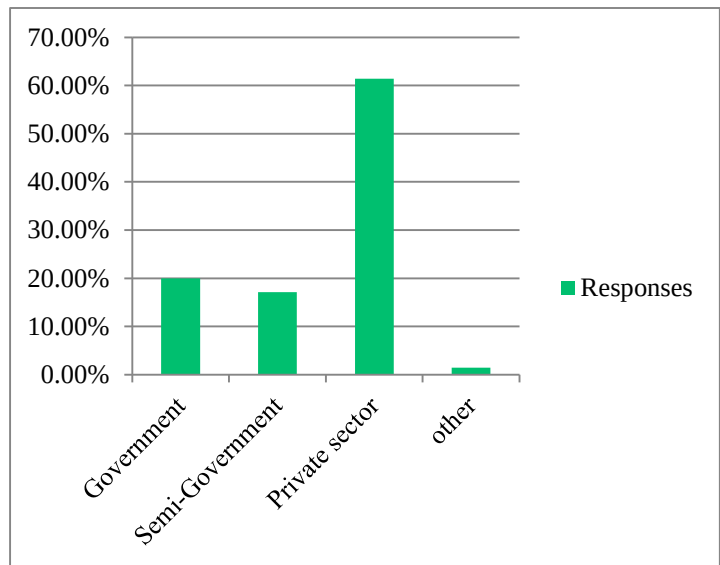
With regard to the question (3) How many years you are working in your current organization? Total 70 respondents have been responded to these questions, 44 respondents stayed less than 4 years in their existing organization with (76.86%), 14 respondents stayed between 5 to 9 years in their existing organization percentage of (14%) and only 1 respondent stayed above 20 years with percentage of (1.73%).

5.6 Section II related to the general information about the work information

In the question related to the type of organization (20%) are currently working in Government organization, (17.14%) are working in Semi-government organization and (61.73%) are working

in the private sector. In the question number 5 related to the education level of the respondents, once respondents have high school level or less with percentage of (1.45%)

Chart 1: General information about work information



In the question five (72.46%) of the total respondents answer that they have bachelor degree qualification and (23.19%) answered that they have master degree

Table (10) showing the percentage of the educational background of the respondents

ANSWER CHOICES	RESPONSES	
High-school or less	1.45%	1
Bachelor degree	72.46%	50
MSc. Degree	23.19%	16
PhD	0.00%	0
Other	2.90%	2
	Answered	69
	Skipped	1

Table 10 : Respondent's education background

5.7 Section III related to the awareness of the design-build and design bid build

The Question number 6 related to the type of the employer “what type of field of is your Employer?” all the respondents answered this question with (17.14%) working in the client or developer field, (25.71%) working in the project management / cost management filed, (20%) working in the design/ supervision consultant companies, (27.14%) working in main contract, subcontracting and supplier field and (10%) working in other fields.

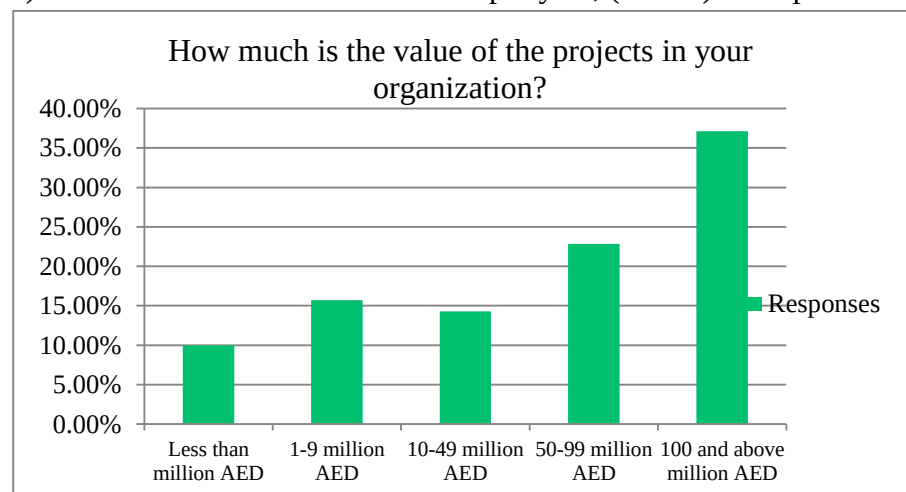
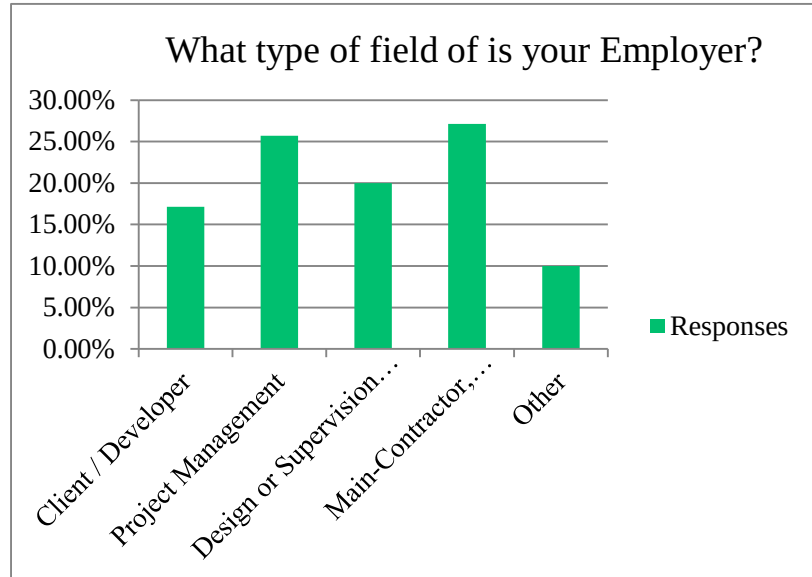
In regard to the nationality question the respondents has percentage of (5.71%) from Emiratis and GCC, (64%) Arabs, (4.29%) are European, (18.57%) Asian and 7.14% African and other counties

The question related to the number of the employees in the organization of the respondents, (10%) of the respondents working in small organization has 1 to 9 employees , (15.71%) of the respondents working in small medium organization between

10 to 49 employees, (11.43%) of the respondents working in medium organization between 50 to 90 employees, (14.29%) form the respondents working in large organization between 100 to 499 employees, (48.57%) from the respondents working in mega organization with more than 500 employee.

In the question number 9 related to the yearly turnover of the organization, (8.70%) respondents answered they have less than one million turnover per year, (21.74%) between 1 to 9 million turnover per year, (19.84%) between 10 to 49 million turnover per year, (8.70%) of respondents with turnover between 50 to 99 million and (42.03%) with more than 100 million turnover per years.

Chart 3: The value of the project in the organization



In the question related to the total value of the projects, (10%) of the answers from the respondents has less than one million projects value, (15.71%) with project value between one to nine million, (14.29%) has 10 to 49 million, (22.86%) with value of 50 to 99 million and (37%) has value of project more than 100 million.

5.8 Section IV related to the advantages and disadvantages of each type this section

5.8.1 Advantages and disadvantages of both types of contracts

The Results has been measured in scale 1 to 5 (1 is not agree and 5 is totally agree) to indicate the opinions of the respondents about the advantages and disadvantages of both types of contracts design-build (DB) and design-bid build (DBB)

5.8.2 Advantages of Design-Build construction contracts

The first question was how you would rate your opinion about the Advantages of Design-Build construction contracts. Followed by 6 factors See table (11)

Table 11: The Advantages of DB contracts

Factors	1		2		3		4		5		Total
The early involvement of the contractor will urge the owner to approved the design at early stage without completing the design	9.	6	16.9	1	36.9	2	23.0	15	13.8	9	65
	2		2%	1	2%	4	8%		5%		
	3										
	%										
Any changes on the scope will be extremely hard and the owner cannot control the overall budget of the project	7.	5	18.4	1	24.6	1	29.2	19	20.0	1	65
	6		6%	2	2%	6	3%		0%	3	
	9										
	%										
Any changes on the design will be definitely a change order and will lead to additional cost and time	7.	5	7.69	5	20.0	1	35.3	23	29.2	1	65
	6		%		0%	3	8%		3%	9	
	9										
	%										

In case of any issues happen to the contractor it is very hard to change it by the owner	10.7 7 7 %	7	10.7 7%	7	35.3 8%	2 3	23.0 8%	15	20.0 0%	1 3	65
The contractor selection of the material and subcontractor will be based on the commercial selection only	9.3 8 %	6	10.9 4%	7	23.4 4%	1 5	32.8 1%	21	23.4 4%	1 5	64
The quality of the project will be totally at risk and depend of the contractor selection of the material	9.2 3 %	6	15.3 8%	1 0	21.5 4%	1 4	33.8 5%	22	20.0 0%	1 3	65
									Answered		65
									Skipped		5

from survey Total 67 respondents has answered the questionnaire, with regard to the early involvement of the contractor is one of the advantages in design-build contracts, the result of the survey indicate that (49.25% has agreed and 26.87% has totally agreed) which considered that the majority of the respondents considered that, with regard to the complexity of the project and finding the specialized contractor to complete the design is tend to be the best solution (43.28% has agreed and 29.85% has totally agreed), with regard to reducing the cost of the design and execution selecting the contractor at early stage will reduce the time and cost (50.75% has agreed and 23.88% has totally agreed) With regard to the point of one contact between the owner and the contractor the respondents has shown less percentage on this point as an advantage for design-build contracts (38.81% agreed and 23.88% has totally agreed). The construction can be started early and the site preparation has shown the greatest results on the survey (50.75% has agreed and 25.73% has totally agreed), the last point related to the engagement of the construction team

at early stage will help in finishing the project on time the respondents' rates has shown high percentage of agreement (43.28% agreed and 29.85% has totally agreed)

5.8.3 Disadvantages of Design-Build construction contracts?

The second question was how you would rate your opinion about the Disadvantages of Design-Build construction contracts? See table 12 below

Factors	1		2		3		4		5		Total
The early involvement of the contractor at earlier stage will defiantly reduce the time and cost	4.48 %	3	2.99 %	2	16.42 %	11	49.25 %	33	26.87 %	18	67
At the complex type of projects the specialized contractors are much expert and can propose the best solutions for the design	5.97 %	4	4.48 %	3	16.42 %	11	43.28 %	29	29.85 %	20	67
Design and execution cost are combined with one party and this will reduce the effort and time	4.48 %	3	2.99 %	2	17.91 %	12	50.75 %	34	23.88 %	16	67

Direct one contact point to the owner of the project which is easier and faster to resolve issues that may happened	5.97 %	4	8.96 %	6	22.39 %	15	38.81 %	26	23.88 %	16	67
The construction work preparation can be started during finalizing the design	8.96 %	6	7.46 %	5	7.46%	5	50.75 %	34	25.37 %	17	67
The engagement of the construction team at earlier stage will help on finishing the project on time	7.46 %	5	1.49 %	1	17.91 %	12	43.28 %	29	29.85 %	20	67
										Answered	67
										Skipped	3

Table 12: the Disadvantages of DB contracts

Following the design-build disadvantages total 65 respondents has answer the questionnaire, with regard to the involvement of the contractor at early stage will urge the owner to approve the design without completing all the details the answers from the respondents was moderate (36.92% neither agree or disagreed, 9.23% and 16.92 disagreed, 23.08% and 13.85 agreed), with regard to the second point related to the changes on the scope will be very hard and the owner cannot control the budget ((29.23 % agreed , 20% totally agreed and 24.62% has given moderate answer) The question related to the change of the contractor in case of any issue happen, the respondents has agreed that this will be disadvantage on the design-build contracts the results (35.38% has given moderate answer, 23.81% agreed and 20% totally agreed) The last two question regarding the contractor selection of the material and the overall quality of the work

will be disadvantage on the design-build contracts the respondents has agreed in approximate percentage (20 % has given moderate agreement 30% agreed and 20% totally agreed)

5.8.4 Advantages of Design-bid--Build construction contracts

The third question , how you would rate your opinion about the Advantages of Design-bid-Build construction contracts? Followed by 7 factors as per the below table 13

Table 13: Advantages of DBB contracts

Factors	1		2		3		4		5		Total
The fair competitions to ensure the best and efficient price for the contractors	4.55 %	3	4.55 %	3	18.18 %	1 2	51.52 %	3 4	21.21 %	1 4	66
Ensure every bidding contractor are treated fair and everyone has equal opportunity to bid	3.03 %	2	4.55 %	3	15.15 %	1 0	48.48 %	3 2	28.79 %	1 9	66
The liability of the design including the structure will be on the design consultant and the contractor	4.55 %	3	4.55 %	3	13.64 %	9	39.39 %	2 6	37.88 %	2 5	66
In case of delays the contractor is obligated to submit the justification of the extension of time	3.03 %	2	6.06 %	4	22.73 %	1 5	36.36 %	2 4	31.82 %	2 1	66
Less risk on the owner and all parties in case of any force majeure.	6.06 %	4	9.09 %	6	31.82 %	2 1	31.82 %	2 1	21.21 %	1 4	66
Two stages of tender and preparation of contract documents which reduce the risk on the owner	1.52 %	1	6.06 %	4	19.70 %	1 3	45.45 %	3 0	27.27 %	1 8	66

The commercial scope is well defined between parties and reduces the conflict between the owner and contractor	3.17 %	2	7.94 %	5	17.46 %	1 1	30.16 %	1 9	41.27 %	2 6	63
									Answered		66
									Skipped		4

Following the design-bid-build advantages section the total number of respondents that answered the questionnaire is 66, with regard to the factor related to fair competitions among the contractors and to insure the fair and efficient price bidding, the majority of the respondents agreed on the factor (51.52% has agreed and 21.21% totally agreed) which is the most percentage compare to other factors which means this is the most factor that can be considered as an advantage of the design-bid-build contracts. The factor related to the fairness and giving all the bidders equal opportunity to bid the respondents has also agree with clear majority (48.48% has agreed and 28.79% totally agreed) , with regard to the factor related to the liability of the design including structure the respondents has agreed (39.39% agreed and 37.88% totally agreed) , in case of delay happen from the contractor and the respondent has also agreed with major percentage (31.82% agreed and 22.21% totally agreed), with regard to the point related to the two stages tender preparation the respondents has majority agreed (45.45% agreed and 27.27% totally agreed, the last point related to the commercial scope well defined in this type of contract the respondents has agreed with percentage (30.16% agreed and 41.27% totally agreed)

5.8.5 Disadvantages of Design-bid--Build construction contracts

The forth the question, how you would rate your opinion about the Disadvantages of Design-bid--Build construction contracts? See table 14 below

Table 14: Disadvantages of DBB contracts

Factors	1	2	3	4	5	Total
						1

Design errors or mistakes will cost the owner additional time and money	7.58 %	5	12.1 2%	8	21.21 %	14	31.82 %	21	27.27 %	18	66
The owner liability will be conflicting with the consultant and the contractor	1.52 %	1	15.1 5%	10	24.24 %	16	37.88 %	25	21.21 %	14	66
Since there will be many competitions, it can be a weakness and can create a system referred to as “Cheaper is better” and hire the cheapest subcontractors and suppliers to save cost.	12.3 1%	8	15.3 8%	10	20.00 %	13	40.00 %	26	12.31 %	8	66
Bidding process cannot be started until the design is completed and approved by the owners which sometimes delay the start of the construction.	4.55 %	3	9.09 %	6	10.61 %	7	39.39 %	26	36.36 %	24	66
The owner must have supervision consultant which may add additional cost on the contract	6.06 %	4	6.06 %	4	15.15 %	10	45.45 %	30	27.27 %	18	66
The owner based on his selection of the design team and start the project with different supervision team this may lead to conflict in case if there is any discrepancies on the tender documents	4.55 %	3	7.58 %	5	22.73 %	15	45.45 %	30	19.70 %	13	66
									Answered		66
									Skipped		4

Finally the design-bid-build disadvantages the total number of respondents that answered the questionnaire is 66, with regard to the first factor related to the design errors or mistakes that will be additional cost to the owner the respondents percentage (31.82% agreed and 27% totally

agreed), the owner liability will be conflicted with the consultant and the contractor the result of respondents percentage (37.88% agreed and 21.21% totally agreed), the next factor related to the weakness of the system and selecting the cheapest subcontractor and suppliers the respondents shown mutual opinion (12.31% totally disagree , 15.38% disagree, 20% uncertain, 40% agree and 12.31% total agreed), with regard to the factor point related to the bidding process that cannot be started until the design is completed the majority of respondents agreed with percentage (39.39% agreed and 36.36% totally agreed). With regard to the point related to the owner must appoint supervision consultant to monitor the work and this might add additional cost to the project the respondents agreed with majority that this one of the disadvantages on the design-bid-build (45.45% agreed and 27.27% totally agreed). Finally, the last factor related to the owner may find conflict if the design teams that started the project is different from the team the doing the supervision with majority agreement (45% agreed and 19.70% totally agreed)

5.9 Section (V) questions about the opinion of adopting design-build contracts in future construction projects

In addition to the advantages and disadvantages of both type of contract the research taken into consideration to record the reasons why owner tend to use design-build contracts three question raised on the survey about the opinion of the respondents, the first question about (why the owners select design-build contract?) and the respondents were given 5 choices with option to select multiple answers

In Chart 04: the result of the respondents showed that the majority of the answers with (50.75%) the reason to selecting the design-build contract related reducing the cost and the second choice with (46.27%) related to the complexity of the project, the third answer was related to the lack of clear scope by the owner with (35.82%), the fourth

Which of the following best describes the principal industry of your organization?

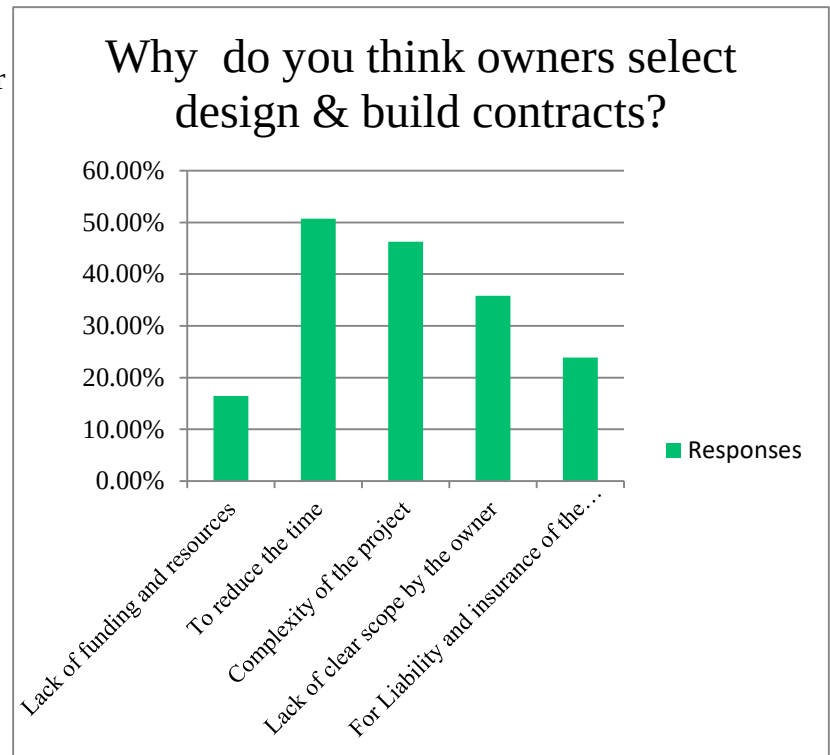
Answer Choices	Responses	
Government	20.00%	14
Semi-Government	17.14%	12
Private sector	61.43%	43
other	1.43%	1

Answered 70

Skipped 0

answer related to the liability and insurance of the work and the last and smallest percentage was related to the lack of funding and resources with (16.42%).

Chart 4: Survey results for DB contracts selection



5.10 Respondents' opinion for future project if the owners selected to use design-build contracts

Table 15: Recommendation for DB contracts survey

	Answer Choices	Responses	
50.75 % of the respondents, which is the highest percentage, recommended adopting DB contracts to reduce time, 16.42% of the respondents recommended adopting DB contracts if there is lack of funding and lack of resources.	Lack of funding and resources	16.42%	11
	To reduce the time	50.75%	34
	Complexity of the project	46.27%	31
	Lack of clear scope by the owner	35.82%	24
	For Liability and insurance of the work	23.88%	16
46.27% recommend to adopt DB contracts on future construction projects in case of the project is complex and the contractor is specialized in the type of work		Answered	67
		Skipped	3

35.82 % of the respondents recommend to adopt DB contracts in the owner does not have clear scope of the design is not completed.

23.88% of the respondents, which is the lowest percentage, recommended adopting DB contracts if the owner does not have the liability neither the insurances for the project.

6.0 Recommendation and Conclusions

6.1 Conclusions

The construction industry has been moving forward for adopting new methodology to facilitate the work and reduce the cost, the traditional method of procurement process DBB has been used for long time in construction contracts. Recently the owner and client rapidly looking for alternative solutions and started adopting the new methodology of contracts DB, the owner tend to use normal traditional contracts DBB to avoid the risk of conflict and liability on one entity they prefer to have design team and complete the scope prior tendering process, the fair and balance procedure encourage owners to adopt the traditional method of contracts meanwhile the new methodology DB is tend to be used recently to reduce the time and cost of the construction process and allow the bidding process to start early.

The research investigated and distinguished in the literature review the advantages and disadvantages of both types of contracts by adopting semi-structure methodology, interview was conducted with professional engineers and experts work in construction contracts the research highlight the comparison between the traditional way of contracts design-bid-build (DBB) and the new design-build (DB) contracts and concentrate in construction industry in UAE, data was collected by quantitative and qualitative research and the questionnaire prepared to answer 30 questions, the questionnaire was send to more than 300 and 70 respondents answer the majority of the questions.

6.2 Recommendation for adopting DB contracts

The research limited to the comparison between DBB and DB only in construction projects there has been a lot of different methodologies for contracts, moreover the owners adopting traditional DBB contracts although there are many advantages of DB contracts for more efficient and less cost, the research was commissioned and targeted the experts and engineers from different backgrounds such as project management, design / supervision consultants, developers / clients, main contractors, subcontractors and suppliers however the research recommendation for adopting DB contracts based on the criteria and under special types of complex construction constricts reduced the cost and time beside on the owners selection to facilitate the issues that

may rise during the construction stage the simplicity of the DB contracts has been the driven factors for owners to adopt new methodology for construction contracts.

Selecting the contract must consider the nature of the project, the available resources, the complexity of the scope, and time availability for the design phase and construction phase. The owners have to select and investigate the best options of contracts considering all the factors related to the project.

- Lack of funding and available resources, the owner shall sign DB contract with the capable contractor which having the available resources to complete the design and start the construction
- Reduced the time and cost, adopting DB contract will definitely reduce the time of preparing the full scope and complete the design
- Complexity of the project scope, if the owner does not have the technical knowledge to complete the design and the scope of the work DB contract shall be the best choice. The complex project requires specialized contractor that has the expertise and capabilities to complete the projects
- Lack of clear scope from the owner, the owner adopts the DB contracts if there is no clear scope and the project require more details and specifications to be completed
- Liability and insurance for the project, the owner shift the liability

The DB contracts establish fair liability and reduces the conflict moreover the early start of the construction activity which may accrue during completing the design by the selected contractor. The selection of the material would be the greatest challenge and may affect the overall quality of the projects either this might be the greatest risk it can be overcome by selecting specialized contractor and suppliers with relevant experience and select professional team that work in completing the design and starting the construction at early stage. The DB contracts allow the owners to transfer the design liability risk to the contractor and this can reduce the conflicts between parties.

6.3 Comparison in other economies between DB & DBB construction projects

Although the research study has been taken in UAE for the construction projects, other researches taken into consideration the comparison between DB & DBB in similar work environment, Y Ling, S Lok & E Tan (2001) has concluded that the DB projects if we look at the time and cost factors is better than DBB despite that if we looked at other factors such as quality and architectural value the DB projects is worth than DBB the research has been taken in Australian and Singaporean Architects and Engineering, moreover if we concluded the results with the research study analysis from the survey from UAE Expert and Engineers we concluded similar results from the questionnaire.

In regard to the type and nature of the projects, the DB type of contract is more compatible for complex or the small projects the research highlighted the variance in the results specially on the complexity of the project and the value of the scope, UAE engineers in the research results tend to adopt DB contracts in the complex projects despite that the Australian architects which the study made in 2001 by Y Ling, S Lok & E Tan tend to adopt DB contracts in small and simple contracts, moreover the renovation work, extension or retrofitting the preference is for the DBB not for the DB contracts as mention in the Australian studies.

DB procurement methodology in Australia and Singapore are the preferred in reference to the cost and time factors which is considered in parallel with the study results in UAE.

Florence Yean Yng Ling & Shu Hui Kerh (2004) discussed the two-procurement method DB and DBB systems in many countries and data was collected in Singapore for 107 construction projects, the research has concluded that some of the DB projects have more delivery speed than the traditional DBB projects which is in line with the research study in UAE, the majority of the engineers and expert in UAE has agreed that DB contracts reduces the time and cost. In the same study the DB projects has performed easier during the testing and commissioning stage at the end of the project and reduces the conflict between parties which is also in line with the research results in UAE. The finding and conclusion of the researches that the real need to improve the studies around the procurement practice especially with the values of the scope and the complexity of the projects.

H Park, D Lee, S Kim & J-L Kim (Oct 2018) argued that procurement method selection is affecting the project delivery, the cost of construction project in DB type includes the design cost, moreover the study which indicate that housing project in Korea which adopt DB contracts are tend to be less cost and time efficient which is more compatible with the research results in UAE base on the questionnaire results. The collective method of DB contract is greatly reducing the time and cost and consequently affecting the final handing over dates, it also helps in eliminating conflicts between parties during the testing and commissioning stage. Since the contract is part of the design team in the DB contracts it may be difficult to reach for the best artistic architectural design, looking at something in an alternative manner when adopting DBB contracts it segregate the design team from the contractor which improve the quality of the artistic architectural design, while the contractor involvement in DB contracts may reduce the opportunity for innovative design ideas since the contractor will be looking for reducing the cost and maximizing the profit.

On the other hand, public sector tend to hire separate teams for design and cost control moreover during the construction period in major government construction project it is mandatory to hire project cost management consultant to monitor the performance of the contractor and the performance of the consultant.

The numerous researches related to the DB and DBB contracts has been concentrated in the performance and the success factor of each type which make more easy in future for the client to select the best and more efficient practice in UAE however on the research we have found different results and opinion specially when the answers on the questionnaire came from the expert based on their recent experience on each type of construction contracts , the research concluded the comparative analysis based on the results of the questionnaire and the survey results by focusing in the construction sectors in UAE and compare it with the similar countries and similar economies in large and small scale economies.

James Ogechi Kereri (2017) argues that the previous relation between parties has a great impact on the success of the project and the selection of the best methodology of the procurement process.

The case study was conducted between the year of 2011 to 2017, In Ohio state for construction project related to education, infrastructure, oil & gas. Two great findings on the relation between the owner and the contract base on the previous experience and the level of the engagement of the teams during the design and during the construction, consequently the researched proved the DB has more strong and stable relationship between parties in case of the owner and contractor has previous history of projects if we compare it with the DBB contracts, this situation is not only limited to the procurement or supply chain teams.

The efficiency of DB and DBB contracts has many techniques to measure the performance and success of each type and methodology, on the research paper the points investigated the parties and the behavior of the owners on both private and government projects which also has direct relation with the procurement and supply chain teams. The research finds that adopting the DB contracts may have cost and time impact but the DBB contracts have better quality and more artistic value of the projects.

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8.0 Appendices

8.1 Appendix (I) Survey Questionnaire

Table 16: Questionnaire paper

No	Question	Factor	Item
Section 1: General information			
10.	What is your current location?		• UAE • Other GCC • Outside GCC
11.	How many total years of Experience?	Age	• 0-4 years • 5-9 years • 10-19 years • 20-29 years • More than 30 years
12.	How many years you are working in your current organization?		• 0-4 years • 5-9 years • 10-19 years • 20-29 years • More than 30 years
13.	Which of the following best describes the principal industry of your organization?	Organization	• Government • Semi-Government • Private sector
14.	What is the highest level of education you have completed?	Education	• High-school or less • Bachelor degree • MSc. degree • PhD • Other
15.	What type of field of is your Employer?	Employer field	• Client / Developer • Project Management • Design or Supervision Consultant • Main-Contractor, Subcontractor, Supplier • other
Section 2: Work information			
16.	What is your nationality?	Employer field	• Emirati • GCC • Arab • European • Asian

			• African • Other
17.	What is the average number of employees in your company?	Employer field	• 1-9 • 10-49 • 50-99 • 100-499 • 500 and above
18.	What is the yearly turnover of your company?	Employer field	• Less than one million AED • 1-9 million AED • 10-49 million AED • 50-99 million AED • 100 and above million AED
10 .	How much is the value of the projects in your organization?	Employer field	Less than million AED 1-9 million AED 10-49 million AED 50-99 million AED 100 and above million AED
Section 3: Previous experience of Design & build contracts and awareness of design-build and design-bid-build contracts			
11 .	Are you familiar in Design & build construction contracts?	DB	• Extremely familiar • Very familiar • Somewhat familiar • Not so familiar • Not at all familiar
12	Does your company provide Design & Build solution to implement construction projects?	DB	• Very likely • Likely • Neither likely nor unlikely • Unlikely • Very unlikely
13 .	What is the value of the design & build projects that your company does per annum?	DB	• Zero project (N/A) • Small projects less than million AED • Medium projects 1-9 million AED • Large projects 10-99 million AED • Mega projects 100 million and above AED
14 .	What types of projects your company implements design & build solution?	DB	• Residential • Commercial and offices • Educational • Medical • Industrial, leisure, religious or others

• Section 4: Previous experience of Design Bid Build contracts			
15 .	Are you familiar in Design Bid Build construction contracts?	DBB	- Extremely familiar - Very familiar - Somewhat familiar - Not so familiar - Not at all familiar
16 .	Does your company provide Design Bid Build solution to implement construction projects?	DBB	- Very likely - Likely - Neither likely nor unlikely - Unlikely - Very unlikely
17 .	What is the value of the design & build projects that your company does per annum?	DBB	- Zero project (N/A) - Small projects less than million AED - Medium projects 1-9 million AED - Large projects 10-99 million AED - Mega projects 100 million and above AED
18 .	What types of projects your company implements design & build solution?	DBB	- Residential - Commercial and offices - Educational - Medical - Industrial, leisure, religious or others
19 .	Design & build reduce the time and save efforts during the design stage		- Strongly Agree - Agree - Neither agree nor disagree - Disagree - Strongly Disagree
20 .	Implementing design & build make it easier for coordination and resolve site issues with the contractor		- Strongly Agree - Agree - Neither agree nor disagree - Disagree - Strongly Disagree
21 .	Design and build contracts has less chance for future claims and additional variations		- Strongly Agree - Agree - Neither agree nor disagree - Disagree - Strongly Disagree
22 .	The most challenging in the design and build contracts is the quality, hiring design consultant and adapt		- Strongly Agree - Agree - Neither agree nor disagree - Disagree

	Design-Bid-build will increase the quality of the project		Strongly Disagree
23	The most benefit of adapting the design-bid-build type of contract is the ability for the client to select from sub-contractor and suppliers		- Strongly Agree - Agree - Neither agree nor disagree - Disagree - Strongly Disagree

Section 3: Advantages and Disadvantages for each type of contracts

24	<u>Advantages of Design- Build construction contracts</u> g) The early involvement of the contractor at earlier stage will defiantly reduce the time and cost h) At the complex type of projects the specialized contractors are much expert and can propose the best solutions for the design i) Design and execution cost are combined with one party and this will reduce the effort and time j) Direct contact point to the owner of the project which is easier and faster to resolve issues that may happened k) The construction work preparation can be started during finalizing the design l) The engagement of the construction team at earlier stage will help on finishing the project on time		<i>1 is not agree and 5 is totally agree</i> 1 2 3 4 5
25	<u>Disadvantages of Design-Build construction contracts</u> g) The early involvement of the contractor will push the owner to approved the design and finalize it h) Any changes on the scope will be extremely hard and the owner cannot control the overall budget of the project i) Any changes on the design will be definitely a change order and will lead to additional cost and time		<i>1 is not agree and 5 is totally agree</i> 1 2 3 4 5

	j) In case of any issues happen to the contractor it is very hard to change it by the owner k) The contractor selection of the material and subcontractor will be based on the commercial view and normally the contractor will look to maximize the profit and reduce the cost l) The quality of the project will be totally at risk and depend of the contractor selection of the material		
26	Advantages of Design-Bid-Build h) The fair competitions to ensure the best and efficient price for the subcontractors i) Ensures every bidding contractor is treated fair and everyone has equal opportunity to bid. j) The liability of the design including the structure will be on the design consultant and the construction liability will be on the contract, the liability is fairly distributed among all parties k) In case of delays the contractor is obligated to submit the justification of the extension of time otherwise the owner can implement the delay damages clause. l) Less risk on the owner and all parties in case of any force majeure. m) Two stages of tender and preparation of contract documents which reduce the risk on the owner. n) The commercial scope is well defined between parties and reduces the conflict between the owner and the contractor.		<i>1 is not agree and 5 is totally agree</i> • 1 • 2 • 3 • 4 • 5
27	<u>Disadvantages to Design-Bid-Build</u> g) Design errors or mistakes will cost the owner additional time and money h) The owner liability will be conflicting with the consultant and the contractor		<i>1 is not agree and 5 is totally agree</i> • 1 • 2 • 3 • 4 • 5

	i) Since there will be many competitions, it can be a weakness and can create a system referred to as “Cheaper is better” and hire the cheapest subcontractors and suppliers to save cost. j) Bidding process cannot be started until the design is completed and approved by the owner which sometimes delays the start of the construction. k) The owner must have supervision consultant which may add additional cost on the contract l) The owner based on his selection of the design team and start the project with different supervision team this may lead to conflict in case if there is any discrepancies on the tender documents		
Section 4: Recommendation for future construction contracts			
28 .	Why do you think owners select design & build contracts?		• Lack of funding and resources • To reduce the time • Complexity of the project • Lack of clear scope by the owner • For Liability and insurance of the work
29 .	Do you recommend using Design & build in construction projects?		• Very likely • Likely • Neither likely nor unlikely • Unlikely • Very unlikely
30 .	Do you think that design & build contract would be the best option for future construction projects?		• Strongly Agree • Agree • Neither agree nor disagree • Disagree • Strongly Disagree

8.3 Appendix (II) Analysis Tests Results

8.2.1 Descriptive Statistics

8.2.2 Cronbach`s Alpha Reliability Test

Table 17: Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.875	.873	49

Table 18 Summary Item Statistics (Mean)

Summary Item Statistics							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.082	1.085	3.983	2.898	3.672	.640	49
Item Variances	1.131	.148	2.073	1.925	14.020	.147	49
Inter-Item Covariances	.141	-.757	1.261	2.017	-1.666	.054	49
Inter-Item Correlations	.123	-.483	.714	1.197	-1.476	.042	49

Table 19: Total Statistics

Item-Total Statistics					
	Scale Mean if Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
What is your current location?	149.95	388.532	-.127	.	.876
How many years of Experience?	148.03	368.826	.396	.	.871
How many years you are working in your current organization?	149.44	380.596	.154	.	.875

Which of the following best describes the principal industry of your organization	148.71	384.312	.053	.	.876
What is the highest level of education you have completed?	148.68	387.084	-.030	.	.876
What type of field of is your Employer?	148.24	378.770	.129	.	.876
What is your nationality?	148.46	381.632	.093	.	.876
What is the average number of employees in your company?	147.24	383.288	.028	.	.879
What is the yearly turnover of your company?	147.44	364.458	.368	.	.872
How much is the value of the projects in your organization?	147.41	367.970	.327	.	.873
Are you familiar in Design & Build construction contracts?	148.97	379.861	.181	.	.874
Does your company provide Design & Build solution to implement construction projects?	148.88	384.244	.031	.	.877
What is the value of the Design & Build projects that your company does per annum?	147.88	378.382	.144	.	.876
Are you familiar in Design Bid Build construction contracts?	148.93	383.271	.066	.	.876
Does your company provide Design Bid Build solution to implement construction projects?	148.73	385.167	.006	.	.878
What is the value of the Design Bid Build projects that your company does per annum?	147.76	375.977	.169	.	.876
Design & build reduces the time and save efforts during the design stage	149.15	387.132	-.032	.	.877
Implementing design & build make it easier for coordination and resolve site issues with the contractor	149.24	380.598	.257	.	.873
Design and build contracts has less chance for future claims and additional variations	148.85	375.718	.251	.	.873
The most challenging in the design and build contracts is the quality, hiring design consultant and adapt Design-Bid-build will increase the quality of the project	148.95	384.497	.035	.	.877
The most benefit of adapting the design-bid-build type of contract is the ability for the client to select from sub-contractor and suppliers	148.98	388.569	-.074	.	.878
The early involvement of the contractor at earlier stage will defiantly reduce the time and cost	147.08	365.113	.593	.	.869

At the complex type of projects the specialized contractors are much expert and can propose the best solutions for the design	147.10	365.645	.538	.	.869
Design and execution cost are combined with one party and this will reduce the effort and time	147.19	364.051	.606	.	.868
Direct one contact point to the owner of the project which is easier and faster to resolve issues that may happened	147.31	364.181	.528	.	.869
The construction work preparation can be started during finalizing the design	147.20	370.234	.350	.	.872
The engagement of the construction team at earlier stage will help on finishing the project on time	147.05	361.394	.635	.	.868
The early involvement of the contractor will urge the owner to approved the design at early stage without completing the design	147.76	364.357	.515	.	.869
Any changes on the scope will be extremely hard and the owner cannot control the overall budget of the project	147.71	368.760	.361	.	.872
Any changes on the design will be definitely a change order and will lead to additional cost and time	147.34	360.435	.565	.	.868
In case of any issues happen to the contractor it is very hard to change it by the owner	147.73	363.373	.483	.	.870
The contractor selection of the material and subcontractor will be based on the commercial selection only	147.63	365.065	.428	.	.870
The quality of the project will be totally at risk and depend of the contractor selection of the material	147.64	366.578	.396	.	.871
The fair competitions to ensure the best and efficient price for the contractors	147.36	361.716	.639	.	.868
Ensure every bidding contractor are treated fair and everyone has equal opportunity to bid	147.14	361.223	.662	.	.867
The liability of the design including the structure will be on the design consultant and the contractor	147.05	359.428	.676	.	.867
In case of delays the contractor is obligated to submit the justification of the extension of	147.20	359.786	.670	.	.867
Less risk on the owner and all parties in case of any force majeure.	147.47	366.012	.495	.	.870

Two stages of tender and preparation of contract documents which reduce the risk on the owner	147.14	362.361	.685	.	.867
The commercial scope is well defined between parties and reduces the conflict between the owner	147.07	360.306	.647	.	.867
Design errors or mistakes will cost the owner additional time and money	147.51	363.634	.476	.	.870
The owner liability will be conflicting with the consultant and the contractor	147.42	368.869	.402	.	.871
Since there will be many competitions, it can be a weakness and can create a system referred to as “Cheaper is better” and hire the cheapest subcontractors and suppliers to save cost.	147.75	370.917	.315	.	.873
Bidding process cannot be started until the design is completed and approved by the owner which sometimes delays the start of the construction.	147.17	362.764	.541	.	.869
The owner must have supervision consultant which may add additional cost on the contract	147.25	366.745	.461	.	.870
The owner based on his selection of the design team and start the project with different supervision team this may lead to conflict in case if there is any discrepancies on the tender documents	147.36	366.785	.511	.	.870
Why do you think owners select design and build contracts?	148.25	374.055	.257	.	.874
Do you recommend using Design & build in construction projects?	148.98	378.879	.168	.	.875
Do you think that design & build contract would be the best option for future construction projects?	148.85	381.476	.124	.	.875

Table 20: Scale statistics

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
151.03	386.757	19.666	49