

**INFLUENCE OF SELECTED PROCUREMENT METHODS ON DELIVERY
OF COMMERCIAL BUILDING PROJECTS IN ABUJA, NIGERIA**

BY

IBRAHIM, Abdulqadir

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ABSTRACT

Project construction in Nigeria is faced with time and cost overrun as a result of the use of wrong procurement methods. The last decade has exposed the declining level of clients' satisfaction in construction projects. This is as a result of perennial problems of time and cost overruns in addition to the poor quality performance in the Nigerian construction industry. Procurement methods differ from each other in term of allocation of responsibilities, activities sequencing, process and procedure and organizational approach in project delivery. It is therefore imperative to evaluate the influence of procurement methods on the delivery of projects in Abuja, Nigeria. This research assessed the factors influencing the various procurement methods in the delivery of commercial building projects in Abuja with a view to choosing the appropriate procurement method hence improving delivery quality of commercial building projects. Data was collected using well-structured questionnaire. Analysis of data was carried out using Relative Importance Index (RII), Mean Item Score (MIS) and One-way ANOVA. Findings revealed that of the five (5) methods of procurement are frequently used in commercial building construction in Abuja, the design & build system is the most used (RII = 0.79); followed by the Traditional Procurement system (RII = 0.77); then the Public Private Partnership (RII = 0.75) and Management Contracting (0.74); and Direct Labour system is the least frequently used (RII = 0.70). The study also revealed that the strategies for improving the cost (MIS = 3.95), quality (MIS = 3.75) and time (3.67) delivery of commercial building projects in Abuja are effective. It was therefore concluded that the Traditional, Management Contracting and Design & Build procurement systems have significant impact on the delivery of construction projects in Abuja. The study recommended that professionals should properly advise clients to use the appropriate procurement method for the execution of commercial building projects in order to avoid problem with time, cost and quality associated with the project.

TABLE OF CONTENTS

Contents	Page
Title Page	i
Declaration	ii
Certification	iii
Dedication	iv
Acknowledgements	v
Abstract	vi
Table of Contents	vii
List of Tables	x
List of Figures	xi
 CHAPTER ONE	
1.0 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of Research Problem	2
1.3 Research Questions	3
1.4 Aim and Objectives	4
1.5 Need for the Study	4
1.6 Scope of the Study	5
 CHAPTER TWO	
2.0 LITERATURE REVIEW	6
2.1 The Significance of the Construction Industry	6
2.2 The Federal Capital Development Agency (FCDA)	7
2.2.1 Responsibilities of the Federal Capital Development Administration (FCDA)	8

2.2.2	Organizational structure	9
2.2.3	Department of procurement	9
2.3	Types of Construction Project Procurement Methods	10
<u>2.3.1</u>	Traditional procurement system	11
2.3.1.1	Features of traditional procurement	12
2.3.2	Design and build	13
2.3.3	Management contracting	15
2.3.4	Direct labour system	16
2.3.5	Public private partnership (PPP)	17
2.3.6	The models of Public Private Partnership	18
2.4	Factors Influencing the Selection of Procurement Methods	22
2.5	Strategies for the Improvement of Project Delivery	26
2.5.1	Integrated project delivery (IPD)	29

CHAPTER THREE

3.0	RESEARCH METHODOLOGY	31
3.1	Research Design	31
3.2	Research Population	31
3.3	Sampling Frame	32
3.4	Sampling Techniques	32
3.5	Sample Size	32
3.6	Method of Data Collection	33
3.7	Method of Data Analysis	33

CHAPTER FOUR

4.0	RESULTS AND DISCUSSION	37
4.1	Response Rate	37
4.2	Data Analysis and Discussion of Results	37
4.2.1	Most frequently used procurement methods for the delivery of construction projects in Abuja	38
4.2.2	Factors influencing the various procurement methods in the delivery of commercial building projects in Abuja	39
4.2.3	Impact of the procurement methods on the cost, time and quality delivery of commercial building projects in Abuja	41
4.2.4	The best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness	43
4.2.5	Strategies for improving the cost, time and quality delivery of commercial building projects in Abuja	46
4.3	Summary of Findings	50

CHAPTER FIVE

5.0	CONCLUSION AND RECOMMENDATIONS	52
5.1	Conclusion	52
5.2	Recommendations	52
5.3	Contribution to Knowledge	53
5.4	Areas for Further Studies	53
	REFERENCES	55
	APPENDICES	59

LIST OF TABLES

Table	Page
2.1 Procurement Methods in the Construction Industry	11
3.1 Methods of Data Analysis	34
3.2 Decision Rule for Data Analysis	35
4.1 Respondents Profile	37
4.2 Most Frequently Used Procurement Methods for the Delivery of Construction Projects in Abuja commercial building projects in Abuja	38
4.3 Factors Influencing the Various Procurement Methods in the Delivery of Commercial Building Projects in Abuja	40
4.4 Results on the best possible procurement method for improving Commercial building projects delivery in terms of cost, time and quality effectiveness.	44
4.5 ANOVA Results on the variation in level of effectiveness among Procurement methods in the delivery of Commercial Building Projects Delivery in Terms of Cost, Time and Quality	45
4.6 Strategies for Improving the Cost, Time and Quality Delivery of Commercial Building Projects	47

LIST OF FIGURES

Figure		Page
4.1	Cost Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja	41
4.2	Time Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja.	42
4.3	Quality Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja	43

CHAPTER ONE

1.0

INTRODUCTION

1.1 Background of the Study

The construction industry contributes to the socio-economic growth of any nation by improving the quality of life, generating employments, providing the infrastructure and other basic facilities. Hence, it is imperative that construction projects are completed within the scheduled period of time, within the budgeted cost, and meet the anticipated quality (Saidu & Shakantu, 2016).

Project procurement has been described as an organised method or process and procedure for clients to obtain or acquire construction products (Ashworth & Hogg, 2007). The procurement of construction projects is vast in scope because it involves the gathering and organizing of myriads of separate individuals, firms and companies to design, manage and build construction products such as houses, office buildings, shopping complex, roads and bridges for specific clients. Different procurement methods are used for different construction projects and the correct choice may be the key to the attainment of project specific goals (Okunlola & Olugbenga, 2013). Procurement methods also define the management of functional and contractual arrangement and relationship amongst project team.

Procurement systems differ from each other in term of allocation of responsibilities, activities sequencing, process and procedure and organizational approach in project delivery. Deciding what method to use for a given project is a difficult and challenging task as a client's objective and priorities need to marry with the selected method so as to improve the likelihood of the project being procured successfully. The decision as to what procurement method to use should be made as early as possible and underpinned

by the client's business case for the project (Olufisayo *et al.*, 2018). These differences invariably affect the project performance and delivery. The selection of procurement system therefore becomes imperative because the client is faced with various options to procure his project (Okunlola & Olugbenga, 2013). Variants of procurement are available for meeting different clients' needs and projects specifics. In the Nigerian construction industry, project procurement seems to be one of the key areas which have to be developed to a great extent; this is because wrong procurement method often leads to project failure or client's dissatisfaction (Olufisayo *et al.*, 2018).

In view of the above, it is clear that every client at the beginning of any project aims at having value for the money spent via a quality structure delivered on time and within budget by the contractor. However, researches have shown that in most cases this aim is not met. Therefore, this study examined the influence of procurement methods on the delivery of commercial building projects in Nigeria, with a view to improving the cost, time and quality delivery of commercial building projects.

1.2 Statement of Research Problem

Procurement of infrastructure project is facing a global challenge. However, the case of developing nations is of unique interest (Ogunsanya *et al.*, 2016). Ogunsanya *et al.* (2019) also stated that there is sufficient evidence in literature that procurement of public works in developing nations has failed to deliver necessary infrastructure required for economic development in these nations particularly in Nigeria. Delay in project execution and cost overrun has been major problems plaguing the Nigerian construction industry. Ibrahim (2019) stated that a research carried out in Nigeria in 2015 revealed that project does suffer delay in project efficacy and efficiency due to defects in procurement method selection. Research undertaken to assess the Nigerian

Procurement sector has shown weak correlation between procurement methods and project performance (Muhammad *et al.*, 2015). Hence, it is imperative to improve the procurement methods by focusing and optimizing all the variables involved which are cost, time and quality.

In view of the above, it is observed that construction projects in Nigeria are faced with time and cost overrun as a result of the use of wrong procurement methods. The resultant effect is usually poor project delivery in terms of cost, time and quality. All these bring about low level satisfaction to the clients and occupants. It is therefore imperative to assess the influence of procurement methods on the delivery of commercial building projects in Abuja, Nigeria in terms of cost, time and quality.

1.3 Research Questions

In order to address the problem of the research, the following questions were answered by the study:

- i. What are the most frequently used procurement methods for the delivery of construction projects in Abuja, Nigeria?
- ii. What are the factors influencing the various procurement methods in the delivery of commercial building projects in in Abuja, Nigeria?
- iii. What is the impact of the procurement methods on the cost, time and quality delivery of commercial building projects in Abuja, Nigeria?
- iv. What is the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness?
- v. What are the strategies for improving the cost, time and quality delivery of commercial building projects in Abuja, Nigeria?

1.4 Aim and Objectives of the Study

The aim of the study is to evaluate the influence of selected procurement methods on the delivery of commercial building projects in Abuja, Nigeria with a view to improving the cost, time and quality delivery of commercial building projects.

In order to achieve the aim of the study, the following objectives were pursued:

- i. To identify the most frequently used procurement methods for the delivery of construction projects in Abuja, Nigeria.
- ii. To examine the factors influencing the various procurement methods in the delivery of commercial building projects in Abuja, Nigeria.
- iii. To determine the impact of the procurement methods on the cost, time and quality delivery of commercial building projects in Abuja, Nigeria.
- iv. To determine the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness.
- v. To propose the strategies for improving the cost, time and quality delivery of commercial building projects in Abuja, Nigeria.

1.5 Need for the Study

Every client at the beginning of any project aims at having value for the money spent via a quality structure delivered on time and within budget by the contractor. But this aim can very rarely or not be achieved due to the problems of time and cost overrun in majority of construction projects in Nigeria (Olugbenga *et al.*, 2013). Therefore, this study examined the effect of procurement methods on commercial building projects delivery in Abuja, Nigeria with a view to assess their effect on cost and time.

1.6 Scope of the Study

This study covers various commercial construction projects in Abuja as it has a high population of professionals in the built environment and it has a significantly high level of commercial projects on going in that location. The study focused mainly on the cost, time and quality frame of such projects.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Significance of the Construction Industry

It is said that the construction industry holds an integral position in the development of any country and no country can experience any significant development without an efficient and effective construction industry. The Nigerian construction industry continues to occupy an important position in the nation's economy even though it contributes less than the manufacturing or other service industries (Anaman & Osei, 2011). This industry plays an important role in the economy, and the products of its activities are so vital to the achievement of national socio-economic development goals of creating job opportunities and social amenities and infrastructures (Doloi *et al.*, 2012).

Construction projects evolve through the stages of conception, design and construction. A potential owner initiates the conception process by making clear his needs and requirements in a form of a brief to a professional. At the design stage, the relevant professionals translate the primary concept into an expression of a spatial form to satisfy the owner's requirements in an optimum and economic manner. At the construction phase, the conception and design are actualized in a practical term to satisfy the brief. The various combinations of the design and construction phases to achieve forms of organization to implement the project is regarded as the procurement method. Procurement methods define the management, functional and contractual arrangement and relationship amongst project team.

2.2 The Federal Capital Development Agency (FCDA)

The Federal Capital Development Agency (FCDA) was created by Decree No. 6 of 1976 (CAP 128 Laws of the Federation). This Decree charged the FCDA with the responsibilities of planning, development and administration of the Federal Capital City (FCC) and the Federal Capital Territory (FCT) as a whole. The Federal Government subsequently created the Ministry for Federal Capital Territory (MFCT) through Gazette No. 55 Vol. 66 of 26th October 1979, with the functions and responsibilities for administration of the FCT, control of Development within FCT, arrangement for the provision of Social Services and allocation of Urban and Rural Lands in FCT. Under this arrangement, the FCT Minister has dual responsibility as the Minister and the Chairman of FCDA Board. In another development, in 1980, the Federal Government created the then Federal Capital Territory Administration (FCTA), charged with basic responsibility of providing local Administration and provision of rural infrastructure. From 1983 the MFCT and the FCDA existed in that order with overlap of functions and responsibilities.

In December, 2004, as part of the general reforms by Government in restructuring the FCT Administrative machinery as contained in the Federal Capital Territory (Establishment of Functionaries and Departments) and Federal Capital Territory (Dissolution) **Order No.1, 2004**, approval was granted to create Mandate Secretariats for the provision of services namely: Social Services, Education, Agriculture, Transport and Health.

The dissolution order resulted into the creation of Mandate Secretariats to handle provision of Social Services, Education, Agriculture, Transport and Health as well as the Satellite Town Development Agency (STDA). Similarly, in August, 2008 the FCT

Administration approved the transfer of the defunct Satellite Towns Development Agency (STDA) back to FCDA as a Department named Satellite Towns Infrastructure (STI). These were done with a mission.

to oversee the infrastructural and physical development (planning, design and construction) of the new Federal Capital and build a first class Capital City and Territory comparable to the best Capital City and Territory in the World and should be in compliance with the Abuja master plan, taking into consideration all the reasons that necessitated the movement of the Federal Capital from Lagos and to establish a result oriented administration with constant focus on service delivery. This development will require a plethora of construction works to be executed over a long period of time and the engagement of various professionals from the construction industry through the use of their expertise to achieve this goal.

2.2.1 Responsibilities of the Federal Capital Development Administration (FCDA)

Decree 6 of 1976 (CAP 128 Laws of the Federation) establishing both the FCT and FCDA charged the FCDA with the following responsibilities:

- a) The choice of site for the location of the Capital City within the Capital Territory;
- b) The preparation of a Master Plan for the Capital City and the land use with respect to town and country planning within the rest of the Capital Territory;
- c) The provision of municipal services within the Federal Capital Territory;
- d) The provision of infrastructural services in accordance with the Master Plan;
- e) The Co-ordination of activities of all Ministries, Departments and Agencies of Government within the FCT.

2.2.2 Organizational structure

The Organizational Structure of the Federal Capital Development Authority (FCDA), is made up of nine (9) line Departments and four (4) Specialized Units under the office of the Executive Secretary. Each Department is headed by a Director with the Divisions headed by Deputy Directors.

The Departments and the Specialized Units are:

Departments:

- a) Engineering Services,
- b) Public Building,
- c) Survey & Mapping,
- d) Urban & Regional Planning,
- e) Mass Housing/PPP,
- f) Resettlement & Compensation,
- g) Procurement,
- h) Engineering Design & Evaluation
- i) Finance & Administration,

Units:

- a) Internal Audit,
- b) Information & Public Relations,
- c) Special Duties, and;
- d) Admin, Protocol & Accounts

2.2.3 Department of procurement

In line with the government directive that all MDAs and Parastatals should establish Procurement Departments in line with the Public Procurement Act of 2007, the Department of Procurement was created for the Federal Capital Development Authority

(FCDA) in 2008 to handle Public Procurement responsibilities for the Authority. This include:

- a) Preparation of procurement plans, advertisement and vetting of bidding documents.
- b) Preparation of submissions to BPP for issuance of due process certificate.
- c) Regular monitoring of all on-going projects
- d) Vetting of Contract Agreements and Payment Certificates
- e) Act as Secretariat for the Tender Board's meetings

The Department as presently structured, has three (3) divisions each headed by a Deputy Director as follows:

- a) Capital Procurement
- b) Recurrent Procurement
- c) Logistics

2.3 Types of Construction Project Procurement Methods

Different procurement methods are used for different construction projects and the correct choice may help to avoid problems and be the key to the attainment of project specific goals (Eyitope *et al* 2012). The traditional design-bid-build system of procurement is still dominant in the Nigerian construction sector and this may likely continue to be the trend. However, research has shown that Nigerian construction industry adopts all procurement methods in one form or another (Idoro, 2012).

Apart from the traditional approach, there are now other “fast-tracking” or innovative procurement systems used by the construction industry worldwide. The variants of procurement methods available today came about from the need to improve construction project delivery, that is, project completion within budget time and acceptable quality.

The different procurement systems differ from each other in term of allocation of responsibilities, activities sequencing, process and procedure and organizational approach in project delivery. These differences have invariably affected the project performance. Project performance has been defined as “the degree of achievement of certain effort or undertaking” (Project Management Institute (PMI), 2004). Project performance remains a prominent issue in project delivery because projects involve defined objectives which must be achieved and numerous resources which need to be efficiently utilized (Olugbenga *et al.*, 2013).

Below are the different procurements method commonly in use for the delivery of construction projects as seen in table 2.1:

Table 2.1: Procurement Methods in the Construction Industry

S/N	Procurement Methods	Functions of construction				
		<i>Design</i>	<i>Build</i>	<i>Management</i>	<i>Financ e</i>	<i>Operation</i>
1	Traditional Method	Consultant	Contractor	Consultant	Client	Client
2	Design & Build Method	Contractor	Contractor	Consultant	Client	Client
3	Management Contracting	Consultant	Specialized Contractors	Contractor	Client	Client
4	Public Private Partnership/Joint Venture	All the functions shall be shared with parties in mutually understanding environment				
5	Private Financing Initiative	All the functions shall be carried out by contractor and ownership of project shall be transferred to client				
6	Direct Labour System	All the functions shall be carried out by the Client engaging and creating a direct link with professionals and tradesmen dispensing the contractor				

Source: <https://www.basiccivilengineering.com>

2.3.1 Traditional procurement system

This method is as old as the construction industry the major feature in this method is that the design process is separate from the construction, it also requires full documents before the contractor can be invited to tender for the work. According to Kadiri and Odusami (2003), the main variants of traditional procurement method are: bills of firm

quantities; bills of approximate quantities; drawings and specification; schedule of rates; cost reimbursement; and labor only. The traditional method as the name implies, is a project procurement method where the three sequential phases of design, bid and build are identified as separate tasks. It is traditionally referred to as the competitively bid contract. This method allows for all contractors that are competent to bid for projects in a free and competitive atmosphere similar to a competitive market environment. In a typical traditional approach, the client initiates the project and produces a written scope statement, identifying the project's objectives and verifying the scope definition by the architect. The architect is responsible for defining the project scope in order to facilitate a clear assignment of responsibilities and to monitor the scope change control with the project team. The design team produces complete design documents before engaging the contractor, often affecting the quality by not taking into consideration build-ability, constructability and life-cycle costing. The features of the traditional procurement method are highlighted thus:

2.3.1.1 Features of traditional procurement

- a) The contractor is appointed by competitive tendering
- b) Design should be fully prepared ahead of time before tendering procedure and actual construction can begin
- c) The client has control over design, there is no design responsibility on the contractor
- d) The duration of the project tends to be very long because of the sequential process of design and construction
- e) The construction cost is well known ahead of time and there may be need for adjustment as provided in the contract

- f) The client appoints a consultant to administer the contract on his behalf and to advise on aspects associated with design, progress and stage payments which must be paid by clients.

Although the traditional method of procurement is very simple to understand by all classes of clients, the major problem it has is that its contract period tends to be more prolonged due to the fact that the design process is separate and determines the commencement of the actual construction. The early and vital inputs of the builder is usually not tapped hence the product is likely to be deficient in buildability and maintainability aspect.

2.3.2 Design and build

This approach gives the client a single point of contact. However, the client commits to the cost of construction, as well as the cost of design, much earlier than with the traditional approach. In this method, the contracting organization is responsible for design and construction for a lump sum price. In this system of procurement, all phases of a project, from conception through design and construction are handled by the same organization. To arrive at a choice of contractor, all contractors are required to develop a design to a certain level, prepare a tender figure and submit the whole package which is termed a proposal to be evaluated to meet client satisfaction. A team of consultants may be needed to assess each contractor's proposal. Evaluation of tenders in this case is usually very difficult because the contractors are not working with one design tenderer. Tenderers are to be informed of the criteria to be used and if price is likely to be a prime factor. This form of procurement has been used for the majority of process-oriented heavy industrial projects. Projects using a design-build approach are designed and constructed by a single company or a partnership of companies. Several varieties of Design-Build

have evolved including Design-Build-Maintain, Design-Build-Operate-Maintain, and Design-Build-Operate-Maintain-Warrant. Each version of Design-Build provides the government or owner with one source of responsibility for the project. Design-build can be specified in many different ways based on the magnitude of the project. The features of design and build procurement method are stated below:

features of design and build procurement method.

- a) The contractor is often appointed by two stage tendering i.e. the competitive element and quality is preserved.
- b) The client can introduce changes to the design at the design stage, but once contract has been awarded to the contractor, he has no direct control over the development of the design detail by the contractor.
- c) A major feature of this procurement method is that design and construction may proceed in parallel and so the project duration will be shortened.
- d) This procurement method makes no room for the appointment of an independent contract administrator, the client works directly with the contractor or he may appoint an agent to advise him or act on his behalf.
- e) Valuation and payment matters are solely in the hands of the contractor.
- f) It is an obligation to complete the project within contract period. However, client may accept a later date to account for delays resulting from reasons listed in the contract.

The design build approach gives the client a single point of contact. However, the client commits to the cost of construction as well as cost of design much earlier than with the traditional approach. While risk is shifted to the contractor, it is important that design liability insurance is maintained to cover the risk. Changes made by the client during the

design stage is expensive because they will affect the whole design and build contract rather than just the design team cost.

2.3.3 Management contracting

Management contracting is a system whereby a main contractor is appointed, either by negotiation or in competition, and works closely with the team of professionals. Also, Oyegoke (2001) opined that “in a management contract, the permanent works are constructed under a series of construction contracts placed by the management contractor after approval by the client.” All physical construction is undertaken by sub-contractors selected in competitive bidding. This system usually has the main contractor called the management contractor who provides the management expertise in the construction of the project for a fee. This Manager is appointed at the inception or better still feasibility stage to join the client’s team of consultants, to help work out the design programme and site operations. He manages and co-ordinates the work packages to individual sub-contractors and equally provides on the site service, plant and equipment, amenities for the work. The fee paid to the management contractor depends on the nature and extent of the work done and not on the cost of the work. However, management contracting system is most appropriate for large and complex projects which exhibit particular problems that militate against the employment of fixed price contract procedures. Typical examples of which are: Projects for which complicated machinery and / heavy equipment are to be installed concurrently with the building works; Projects for which the design process will of necessity continue throughout most of the construction periods; Projects on which construction problems are such that it is necessary or desirable that the design and management team includes a suitably experienced building contractor appointed on such a basis that his interests are largely synonymous with those of the employer’s professional consultants. Though, there is a

wide range of views as to the best procedures to be adapted in management contracting, but they usually incorporate the following activities and requirements: The management contractor is precluded from carrying out any of the physical works using directly employed labor; His role is primarily that of a planner, manager and organizer; The works are divided into packages agreed by the professional team and the management contractor as being most appropriate for the particular projects. The success of this approach depends on the contractor's team, unless the team is drawn from companies experienced in this kind of team working, the benefits are not always realized. The management contractor provides from his own resources the following: Site supervisor, technical and administrative staff to run the contract. This method is characterized by a high level of skill input since the subcontractors engaged are experts in their various fields. The result is that the construction process is characterized by some level of precision synonymous with the manufacturing industry. There is usually minimal supervision and the whole arrangement seems to favor each party. The major challenge in this method is the organization. Unless teams of contractors are pulled from companies who are used to team working, the whole system may be frustrating.

2.3.5 Direct labour system

In the direct labour system, the client engages tradesmen directly to execute projects by either using in-house personnel to design and construct or directly employ operatives to construct. By this method, the services of a contractor are dispensed with and this elimination makes the direct labour system distinct from other procurement methods. It is believed that the system is simpler; cost-effective (the contractor's profit is eliminated), prudent, corruption free and provides jobs for the populace).

2.3.5 Public private partnership (PPP)

This procurement method refers to the collaboration between public and private sector in order to achieve financing, management or maintenance of a project or provision of a service. According to Obozuwa (2011), Public Private Partnership describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. Public private partnership is regarded as a tool for infrastructural development. The responsibility of each of the sector in the realization of a project are as follows:

Private sector:

- a. Is responsible to finance the whole or part of the project financing
- b. Is responsible for the risk that are related to the construction or operation of the project.
- c. Has long term benefits from the project
- d. Designs the project (or part of the design)
- e. Manages and operates or maintains the facility.
- f. Returns the project to the public after the completion of the contract period

Public Sector

- a. Determines the drawing, technical, operational and financial requirements of the project
- b. Assess the proposal of the private sector
- c. Supports the construction of the projects
- d. Monitors the projects and makes sure the private sector conforms with the contract
- e. Proceeds with payment to the private sector

The public private partnership is an attempt by government to tap from the enormous private resources by way of diversification and letting private hands partake in the

provision of fundamental government responsibility of providing basic social and infrastructural amenities several models of PPP has evolved overtime as a form of improvement and modification to it, also depending on the magnitude and nature of work to be executed. The models of PPP are the following:

2.3.6 The models of public private partnership

Design and build or ‘turnkey’ contract: In this case, the private sector designs and build infrastructure according to public sector performance for a fixed price, thereby transferring risks of cost overrun to the private sector.

Management contract: Here the private sector contracts to manage a government owned project and manages the marketing and provision of the service.

Lease and operate contract: A private operator contracts to lease and assume all management and operation of a government owned facility and associated services, and may invest further in developing the service and providing the service for a fixed term.

Design build finance and operate (DBFO): The private sector designs finances and constructs a new facility, it is then required to operate the facility within a lease period. The private partner then transfers the new facility to the public sector.

Build-Operate-Transfer: A private entity receives the license to finance, design, build and operate a facility for a specified period after which ownership is transferred back to the public sector. This has been used in telecommunication service contracts.

Buy-Build-Operate (BBO): if there is need to revive a public asset, the government can transfer it to a private or quasi-public entity usually under contract that the assets are to be upgraded for a specified period of time. Public control is exercised through the contract at the time of transfer.

Build-Own Operate (BOO): in this case, the private sector finances builds, owns and operates a facility or service in perpetuity. The public constraints are stated in the original agreements and through on going regulatory obligations.

Build-Own-Operate and Transfer (BOOT): the private sector builds own and operates a facility for a specified period as agreed in the contract then transfers to the public.

Operating license: a private operator receives a license or rights to build and operate a public service, usually for a specified period. This is similar to buy build and operate arrangement and is often used in telecommunications and IT projects.

Finance Only: A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as long-term lease or bond issue.

The PPP procurement system has so many advantages among which are the following:

- a. The public sector gains the advantages the private sector offers such as the ability to design, construct, manage and finance a project.
- b. Public money is better used and at difficult economic periods for a government, this method is good.
- c. They promote and help the innovation in the public sectors with the transfer of knowledge and new techniques.
- d. Better quality infrastructure and better operations throughout the life of the project (maintenance of the project by the private sector) is assured.
- e. There is more efficient and more economical maintenance of the project.
- f. Reduction of the construction cost and maintenance of the project.
- g. Use of private sector in areas where there are 'weakness' in the public sector such as lack of expertise or qualified employees, no ability to promote new techno economical solutions, lack of efficient and effective use of human resource, lack of sensitivity and knowledge and expertise in the use of available energy sources.

On the other hand, the disadvantages of the PPP procurement system are:

- a. The use of projects by the private sector may be difficult for low income people. However, it has the advantage that only users pay not the taxpayers.
- b. In some cases, there may be in the contract sum clauses or provisions which do not favor the public interests but aim at increasing the profit of the private investor, allow monopoly or even allow the private sector to increase prices of a service or a product after completion of a project.
- c. Since much of the project funding is done by the private investor, there is every tendency to aim at reducing the cost of the project which might lead to the use of substandard materials and works.
- d. Generally, the public sector can get cheaper loans than the private sector.

The PPP procurement system has been applauded as an important tool for improving economic effectiveness, and a mechanism to fill infrastructural deficit (Shwarka & Anigbogu, 2012). The system equally lends itself to the intervention of private entity whose sole aim in development participation is more profit oriented than of social growth. For this reason, it is necessary that government should balance its profit motive with social growth. This can be achieved through government monitoring and imposition of compliance with performance standards as a pre-requisite in development participation.

There is no single method for procuring a project, the different methods are available to provide a wide range of options for any developer to realize his dream. The choice of any method is dependent on the prime concerns of the client which are cost time quality and the type of project. Whatever choice made or option selected must not fail in any of

these factors. Hence, the client needs guidance and direction so that he has a cause to attain full project satisfaction.

Majority of clients are quick to embrace the traditional method of procurement due to its simplicity, age and familiarity with the construction process. This results in wrong procurement options being applied to wrong projects which may lead to problems ranging from waste of resources to dissatisfaction with the final product. The need for professional advice is therefore necessary to help the client make the right procurement choice.

In Nigeria, the method of organizing and managing project processes are essentially by the traditional method of design-bid-construct (Doloi *et al.*, 2012). This method has however, been widely criticized for its separation of the design phase from the construction phase. It is believed that it is not effective for all categories of building projects (Ojo *et al.*, 2006). This has led to lack of effective communication and coordination between both stages and therefore creating uncertainty. Since then, there has been a proliferation of procurement options to organize and manage both the design and construction phases (Ojo, 2009). These alternative procurement options came about due to the fact that traditional contracting method had become inadequate in meeting all organizational challenges in the construction industry. However, the alternatives seem to address only few shortcomings of the traditional contracting method. Hence any of these alternatives is most effective under certain specific conditions. This being the case, there is need to evaluate the performance of the procurement methods on project delivery and the factors that influence their choices with particular reference to the Nigerian settings.

2.4 Factors Influencing the Selection of Procurement Methods

Procurement method is a flow of activities starting right from identification of the client need to completion of the project. There are many project procurement systems that have been introduced for effective, efficient and better performance and outcome of the system. It has been observed that major stakeholders need the desire to execute their project on fast track aiming to get fast delivery with the early start of work and ensuring better performance in term of cost and time, value for money invested the minimum possibility of risk, early confirmed design and prices.

There are many procurement methods but the most commonly used methods of procurement are: traditional method also known as Design-Bid-Build method and non-traditional method also known as Design-Build method. Besides this, Management oriented and Public-Private Partnership (PPP) is also accessible and used to some extent. The use of procurement methods varies from country to country (Love *et al.*, 2008). The procurement difference is based on cultural differentiation and reflects the relationship between procurement system and clients' interest (Bukarica & Tomsic 2016). Project effectiveness and efficiency are greatly affected by the type of procurement method and it helps to handle the project. It has been felt that the research so far is lacking some aspects with the special reference that how and up to what extent the procurement methods actually impact on project delivery. The use of procurement method helps to avoid problems and it is the key to the attainment of project-specific goals. An approach for procurement selection is essential to achieve the project success and ensure value for the client's interest (Ratnasabapathy & Rameezdeen 2007). Mostly construction projects use local procurement methods but research had been studied in Nigeria in 2015 has revealed that project does suffer delays in project efficacy &

efficiency due to defects in procurement methods. Hence, it is imperative to improve the procurement methods by focusing and optimizing all the variables involved in project performance viz. cost and time. Also, the same research study has revealed that project delivery is hampered due to defects in procurement methods. It also concludes that the delivery of the design-build method is better than the traditional method (design-bid-build) in terms of cost, time and quality of construction works (Idiako *et al.*, 2015). Different researchers have suggested different procurement selection factors that can help the client to choose and adopt the best procurement method. For better delivery and maintain the conducive environment in a construction project, it is essential to have effective, efficient and transparent procurement method.

To evaluate the efficacy of procurement variables on project delivery revealed that procurement selection criteria of cost, time, quality, quantity, and environmental aspects have a great influence on project delivery (Abdul-Aziz, 2014). Research study conducted in Nigeria in 2013 manifested that the traditional procurement system has been commonly employed in project execution (Arogundade, 2013). This indicates that the selection of procurement method mostly affects the project performance due to difference in level of importance of different factors in the selection of procurement methods. Many selection criteria have effect on choosing the appropriate procurement method among conventional and non-conventional method. For finding and selection of appropriate method understanding level of importance of different factors will provide a helping hand to public sector clients.

A study was conducted on factors affecting the performance of public procurement in Kenya. The study focused on three major aspects of public procurement. These aspects were information technology, competency of staff and ethical issues. From the study, it

has been adduced that the use of information technology, deployment of competent staff and using the fair transparent mechanism in procurement has enhanced the delivery of all procurement organizations (Muturi, 2019). Research focused on factors affecting the implementation of procurement policies in Kenya, in which study reveals about delay in procurement is due to lack of competence in staff, different procurement policies, estimated cost, size of economic projects, responsibilities of client (Kimote & Kinoti, 2018). Manthonsi and Thwala (2012) conducted study on factors influencing the selection of procurement method in construction industry of South Africa in which the identified factors were: knowledge and influence of client in life cycle of project, nature of client, political consideration, corruption and self-enrichment, size and technical complexity of project, delivery time and time related constraints, funding arrangement, familiarity of procurement method, government policies and competition, risk allocation, client requirement and cash flow, lack of sources, market condition, unskilled labour, technology globalization. A research conducted on an appraisal of project procurement method conducted in Nigerian construction industry in which identified factors having an effect on selection of procurement were reported as: estimated cost and time at project completion, minimum time of design and construction, quality assurance, financial management and control, complexity and flexibility of design and techniques to entertain the client requirement, consultancy offered, risk avoidance, available information at project inception, nature of project and client (Babatunde *et al.*, 2010).

A research work conducted by Nabil and Osama (2017) in Gaza on the selection of accurate procurement strategy for construction of projects. In this study, it is indicated that the most affected six factors involved in the adoption of accurate procurement methods in the construction of projects are cost competition, degree level of complexity

project, time criteria of the project, size of a project, financial capability of client and experienced client in procurement system. Furthermore, studies conducted by Nabil & Osama (2017), Arogundade (2013), and Doloi *et al.* (2012) also addressed the selection of procurement. Based on literature cited above and unstructured interview with industry experts, this study considered various factors which relating with the Nigerian environment and construction industry which mainly affect the selection of procurement and for further investigation in context of set objective. Therefore, Factors influencing the selection of procurement methods where considered and categorized as thus:

A. Category-1: Client characteristic related factors

- a. Financial capability of client
- b. Client experience in procurement method
- c. Availability of qualified personnel
- d. Integrated Design and Construction

B. Category-2: Time related factors

- a. Project completion at estimated time
- b. Construction time
- c. Delivery time Schedule

C. Category-3: Cost related factors:

- a. Project completion at estimated cost
- b. Cash flow and Funding Arrangement
- c. Price certainty

D. Category-4: Quality related factors

- a. Quality Certification
- b. Experience of project contractor
- c. Required level of quality control

d. Expected performance of project

E. Category-5: Risk related factors:

a. Complexity in project construction

b. Allocation of responsibility to project stakeholder

c. Economic condition

d. Market Conditions

F. Category-6: Project characteristics related factors

a. Nature of Project

b. Size of project

c. Available resources

G. Category-7: External Environment related factors

a. Procurement policy

b. Material availability

c. Environment impact

d. Political Consideration

e. Level of Technology

2.5 Strategies for the Improvement of Project Delivery

In delivering construction projects, diverse methods of procurement have and continue to evolve. Aside the traditional method of procurement, other innovative methods is now being used by the construction industry worldwide. The procurement methods differ from each other in terms of allocation of responsibilities, sequencing activities, process and procedure, and organizational approach in project delivery (Arogundade., 2013). Mathonsi and Thwala (2012) stated that over the years, the construction industry has undergone tremendous changes which has led to the development of alternative procurement systems other than the famous traditional system to improve project

delivery. Furthermore, it has been observed that different procurement methods have their distinct characteristics in terms of tender activities and processes, division of risks between client and contractors, the effectiveness of project monitoring and control, advantages, and constraints, which will all have an effect on the project performance (Construction Industry Development Board, 2007; Arogundade, 2013). With the availability of diverse procurement methods, no single system best satisfies the needs of a client in all situations, or that of different clients in the same situation (Jin Lin *et al.*, 2015). Furthermore, not all forms of procurement method are appropriate for particular project types, as client objectives and priorities consistently differs (Love *et al.*, 2002). Al-Hazmi and McCaffer (2000) therefore stated that for a project to be successful, the procurement method must address the technicality of the project alongside the client's needs and also suggested that it is essential that the characteristics of various procurement systems and selection methods available are understood by clients and their advisors before a procurement method is selected.

Improvement methods in project delivery are necessary actions to minimize losses. Proper planning and proper payment from the client are the basic improving measures to avoid time overrun (Memon *et al.*, 2014). Besides that, Gunduz and Ozdemir (2013) suggested that the time and cost overrun can be avoided or minimized when their causes are clearly identified. Also, those contractors should not be rewarded any project which lacked sufficient expertise. Further, the contractors should pay more attention to prepare effective planning and scheduling. Al- Ahababi (2014) identified the improvement methods to mitigate and also recover the time overrun. The authors mentioned that the improvement methods depend on the type of the problem/s that causes the delay of the project. It is also recommended that the productivity can be increased by working overtime hours or work by shifts. Besides that, regular site meetings between all

functional groups are helpful in understanding the construction problems at early stage and the management can suggest a change in construction method or use different technology to improve the time performance. In identifying common improvement methods, a total of 13 methods were identified through literature review which were considered for further investigation to find the effectiveness of these improvement method towards Malaysian construction industry. The identified improvement method as presented below:

- a. Proper planning work
- b. Committed leadership and management
- c. Close monitoring
- d. Send clear and complete message to worker to ensure effective communication
- e. Hire skilled workers to achieve good progress, avoid poor quality of work, more rectification and double handling
- f. Focus on the quality, cost and delivery of the project
- g. Training and development of all participant to support delivery process
- h. Fully utilize the construction team
- i. Use new construction technologies (IBS-Industrialize Building System)
- j. Focus on client's need
- k. Provide knowledge/training to unskilled workers based on their scope of work
- l. Adoption of tools and techniques like Value Management, Lean Thinking, Total Quality Management
- . Measure performance against other projects.

2.5.1 Integrated project delivery

In recent years, the improvement of traditional project delivery method was done in several countries through development of new project delivery methods such as Integrated Project Delivery (IPD) (Kahvandi *et al.*, 2017). Anderson *et al.* (2010) defined integrated project delivery as a business model for design, execution, and delivery of buildings by collaborative, integrated and productive teams composed of key project participants.

The traditional delivery method had many flaws which became more obvious as the level of project complexity increased (Doloi *et al.*, 2012) and isolation of professionals and process were fragmentation problems that associated with this method (Nawi *et al.*, 2014). The IPD was developed to overcome the problems in common procurement methods such as failure in aligning schedule and budget (Jayasena and Seevirathna 2012), that led to reworks (Nawi *et al.*, 2014) and time and cost overrun, inadequate details in construction drawings, materials wastage, lack of communication and coordination, increased errors and disagreement, competitive bidding strategy and fixed price contracts. Successful project outcomes could be achieved by utilizing IPD as it reduced the overall project cost and time delivery, increased the workmanship quality and succeed in satisfying sustainability and project life cycle goals (Cleves & Gallo, 2012). IPD employed contracting approach that based on relational and value by forming a virtual organization where the interests of the main project participants were in line with specified project objectives (Cleves & Dal Gallo, 2012). Throughout the process of design and construction, both collaboration and development are fostered between the numerous team members through a shared budgetary investment in the project outcome (Cleves & Dal Gallo, 2012). IPD emerged in current years as a method with capability to reform the project delivery and by focusing on the comprehensive

improvement and integration of processes, tools and people in a system this method was like no other (Al Ahbabi, 2014).

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

This research was carried out through the review of past literature and related works which include journals, seminar papers, textbooks and materials from the internet among other sources. This helped to identify the various inputs of previous authors and researchers in relation to the topic and as a guide to the proposed research. It also involved collection and analysis of data in the hope to satisfy the aim and objectives of the research. The study adopted the quantitative survey research approach. For the purpose of this study, data were collected with the use of well-structured questionnaire. The questionnaire was self-administered to construction professionals involved in the usage of various procurement methods in Abuja.

3.2 Research Population

A research population is generally a large collection of individuals or objects that is the main focus of a scientific query (Mohamed, 2017). Population can be defined as all people or items (unit of analysis) with the characteristics that one wishes to study. The unit of analysis may be a person, group, organization, country, object, or any other entity that you wish to draw scientific inferences about (Bhattacharjee, 2012).

The targeted population for this research constitutes building industry professionals (Architects, Quantity Surveyors, Builders and Engineers) in Federal Capital Development Authority (FCDA) in Abuja. This selection was made because FCDA has a unit responsible for procurement. The criteria for selecting the professionals was their involvement in the procurement and construction process of commercial buildings. There are a total of 286 professionals in the Procurement Department of FCDA and 194

of them are registered under professional bodies as seen from organization records. The population size is therefore 194.

3.3 Sampling Frame

A sampling frame is the source material or device from which a sample is drawn. It was further stated that it is a list of all those within a population who can be sampled, and may include individuals, households or institutions. This is an accessible section of the target population (usually a list with contact information) from where a sample can be drawn (Bhattacharjee, 2012). For the purpose of this study, the respondents were selected from FCDA in Abuja as they are highly staffed and are involved in majority of the commercial buildings in Abuja. It was discovered that the staff capacity of the FCDA is 20,000 with professionals distributed among various Departments. The sampling frame for the study constitutes professionals stationed at the procurement Department of the agency on the criteria that they must be registered under their various professional bodies with not less than 5yrs experience in the built environment.

3.4 Sampling Techniques

This study employed simple random sampling technique to select the respondents that were used for the research. The criteria for selection of the respondents here is the respondents must be registered under their various professional bodies with not less than 5yrs experience in the built environment and should be involved in the procurement and construction process of commercial buildings.

3.5 Sample Size

Sample size is the number of observations used from a given population. The sampling size is drawn from the sampling frame. This is a small subjects or event or objects taken from a large group called population or universe. The use of formula was adopted for

this study as the population is fairly large. The sample size in respect to both categories of respondents was determined using the Yamane (1967) formula:

$$S = \frac{N}{1 + N(e)^2} \quad \text{----- (3.1)}$$

Where, N= Number of respondent, e=5% level of precision which is $\pm 5\%$.

Based on Yamane's formula (equation 3.1), the sample size for the total population size (194) is 130. The use of systematic random sampling technique was employed to select 130 professionals from the total of 194.

3.6 Method of Data Collection

This study employed the use of primary data which were collected use of questionnaire. A well-structured questionnaire with the opened and closed ended response questions was used. The questionnaire was self-administered to selected construction participants in Abuja who make up the sampling frame for the study. The questionnaire was divided into six sections. The first section contains information on the profile of respondents while the other sections addressed the research objectives.

3.7 Method of Data Analysis

Analysis of data was carried out using statistical software (SPSS) 2018 and statistical tools such as Relative Importance Index (RII), Mean Item Score (MIS) and One-way Analysis of Variance (ANOVA). The use of RII was employed to rank the frequency of usage of procurement methods for the delivery of construction projects in Abuja to achieve Objective 1 of the study. The use of RII was also employed to examine the factors influencing the various procurement methods in the delivery of commercial building projects in Abuja in order of importance to achieve Objective 2 of the study. In order to achieve the third objective of the research, the use of RII was employed to determine the influence of the procurement methods on the cost, time and quality

delivery of commercial building projects in Abuja in order of significance. The use of MIS and One-way Analysis of Variance (ANOVA) were employed to determine the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness. MIS was used to rank the level of significance of the procurement methods in terms of cost, time and quality effectiveness of commercial building projects while ANOVA was used to compare the level of cost effectiveness of the procurement methods so as to identify the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness. These were used achieve the fourth Objective of the study. The use of MIS was employed to examine the strategies for improving the cost, time and quality delivery of commercial building projects in order of effectiveness to achieve the fifth objective of the study. Table 3.1 gives a summary of the methods of analysis adopted for this study.

Table 3.1: Methods of Data Analysis

S/No	Objectives	Methods of data analysis
1	To identify the most frequently used procurement methods for the delivery of construction projects in Abuja, Nigeria.	RII
2	To examine the factors influencing the various procurement methods in the delivery of commercial building projects in Abuja, Nigeria.	RII
3	To determine the impact of the procurement methods on the cost, time and quality delivery of commercial building projects in Abuja, Nigeria.	RII
4	To determine the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness.	MIS and ANOVA
5	To propose the strategies for improving the cost, time and quality delivery of commercial building projects in Abuja, Nigeria.	MIS

Source: Field Survey (2020)

The formula for calculating RII and MIS for data analysis is expressed in equation 1 and 2 as follows:

i. Relative Importance Index

Relative Importance Index is being ranked from 0.00 to 1.00 and they all have their decision rule as shown in Table 2. The formula for Relative Importance Index (RII) is as follows:

$$RII = \frac{\Sigma W}{A \times N} \text{-----} (3.2)$$

Where: Σ = Summation, W = the weights of every one of the factors given by respondents and it was in the range of (1 - 5), (A=5) the largest value of weight (i.e. Highest factor) and finally N refers to the Total number of respondents.

ii. Mean Item Score

Mean Item Score is being ranked from 1.00 to 5.00 and they all have their decision rule as shown in Table 3.2. The formula for Mean item score (MIS) is as follows:

$$MIS = \frac{\Sigma W}{N} \text{-----} (3.3)$$

Where: Σ = Summation, W = Weight, and N = Total

The decision rule adopted for the RII and MIS are summarized in Table 3.2.

Table 3.2: Decision Rule for Data Analysis

SCALE	Cut-Off Point		Interpretation		
	RII	MIS	Level of Importance	Level of Significance	Level of Effectiveness
5	0.81 - 1.00	4.51 - 5.00	Very Important	Very Significant	Very Effective
4	0.61 - 0.80	3.51 - 4.50	Important	Significant	Effective
3	0.41 - 0.60	2.51 - 3.50	Fairly Important	Fairly Significant	Fairly Effective
2	0.21 - 0.40	1.51 - 2.50	Less Important	Less Significant	Less Effective
1	0.00 - 0.20	1.00 - 1.50	Least Important	Least Significant	Least Effective

Source: Adapted and Modified from Shittu *et al.* (2015)

iii. ANOVA (Analysis of Variance)

The decision rule used for the ANOVA in this study is given below:

F value:

The decision rule here states that:

- If $F_{\text{calculated}} > F_{\text{tabulated}}$ then there is significant is Variation.
- If $F_{\text{calculated}} < F_{\text{tabulated}}$ then there is no significant Variation.

Below are the decision rules for each of the tools of the regression analysis employed in this study:

P test:

The decision rule here states that:

- If P value < significance level then variation is significant.
- If P value > significance level then variation is not significant.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Response Rate

This section gives the response rate to questionnaire. A total of 130 copies of questionnaire was distributed to the respondents out of which 95 copies were returned and used for analysis. This gives a response rate 73%. The Table 4.1 below shows the profile of respondents and their level of involvement in procurement practices.

Table 4.1: Respondents Profile

CATEGORY	CLASSIFICATION	FREQUENCY	PERCENTAGE
Profession	- ARCHITECT	22	23.16%
	-BUILDER	27	28.40%
	-QUANTITY SURVEYOR	35	36.84%
	-ENGINEER	11	11.58%
	TOTAL	95	100%
Years of Experience	1-5	9	9.47%
	6-10	38	40.00%
	11-15	26	27.37%
	15-20	15	15.79%
	ABOVE 20	7	7.39%
	TOTAL	95	100%
Academic Qualification	H.N.D	15	15.79%
	B.Tech./BSc	37	38.94%
	PGD	18	18.94%
	MTech/MSc	19	20.00%
	PhD	16	6.32%
	TOTAL	95	100%
Professional qualification	MNIA	22	23.16%
	MNIOB	27	28.42%
	MNIQS	35	36.84%
	MNSE	11	11.58%
	TOTAL	95	100%
Level of Involvement in Procurement Practice	VERY HIGH	17	17.89%
	HIGH	43	45.30%
	INTERMIDATE	30	31.57%
	LOW	5	5.30%
	VERY LOW	0	0%
	TOTAL	95	100%

Source: Field Survey (2020)

4.2 Data Analysis and Discussion of Results

This section presents the results of the analysis carried out to achieve each of the objectives of the study. This is presented and discussed under five sub sections.

4.2.1 Most frequently used procurement methods for the delivery of construction projects in Abuja

The Relative Importance Index (RII) results used to determine the most frequently used procurement methods for the delivery of construction projects in Abuja is presented in Table 4.2.

Table 4.2: Most Frequently Used Procurement Methods for the Delivery of Construction Projects in Abuja

S/No.	Procurement Methods for the Delivery of Construction Projects	RII	Rank	Decision
1	Design and Build System	0.79	1st	Often
2	Traditional Procurement System	0.77	2nd	Often
3	Public Private Partnership System	0.75	3rd	Often
4	Management Contracting System	0.74	4th	Often
5	Direct Labour System	0.70	5th	Often
	Average RII	0.75		Often

Source: Researcher's Analysis of Data (2020).

It is shown in Table 4.2 that all the five (5) procurement methods considered for the study are often used in commercial building projects. The most often used is Design and Build System (RII = 0.79), followed by Traditional Procurement System (RII = 0.77). Public Private Partnership and Management Contracting Systems are the next often used methods with RII of 0.75 and 0.74 respectively. The least ranked method of procurement often used is the Direct Labour System (RII = 0.70). The average RII of the frequency of usage of all the procurement method considered for the study is 0.75. This implies that the procurement methods are often used for commercial building projects in Abuja. This supports the statement that the delivery of design build method is better than the traditional design method in terms of cost, time and quality of construction works (Idiako *et al.*, 2015). It also tends to agree with Olufisayo *et al.* (2018) that the traditional procurement method and the design and build method are the most used procurement methods for building projects. This is said to be so due to their ease of use and high level of satisfaction of project goals. The findings also agree that

the traditional method of procurement has however been widely criticized for its separation of its design phase from the construction phase. It is believed that it is not effective for all categories of building projects (Ojo *et al.*, 2006). Hence the design and build system being most used for commercial projects followed by other forms of procurement methods.

4.2.2 Factors influencing the various procurement methods in the delivery of commercial building projects in Abuja

The use of RII was employed to determine the level of importance of the factors influencing the various procurement methods in the delivery of commercial building projects in Abuja. The results of the analysis are presented in Table 4.3.

Table 4.3: Factors Influencing the Various Procurement Methods in the Delivery of Commercial Building Projects in Abuja

S/No.	Factors Influencing the Various Procurement Methods	RII	Rank	Decision
1	Project Completion at Estimated Cost	0.91	1st	Very Important
2	Cash flow and Funding Arrangement	0.90	2nd	Very Important
3	Financial Capability of Client	0.89	3rd	Very Important
4	Expected Performance of Project	0.80	4th	Very Important
5	Size of Project	0.79	5th	Important
6	Procurement Policy	0.79	5th	Important
7	Client Experience in Procurement Methods	0.77	7th	Important
8	Economic Condition	0.77	7th	Important
9	Market Condition	0.77	7th	Important
10	Required Level of Quality Control	0.76	10th	Important
11	Construction Time	0.75	11th	Important
12	Experience of Project Contractor	0.75	11th	Important
13	Complexity in Project Construction	0.75	11th	Important
14	Nature of Project	0.75	11th	Important
15	Availability of Resources	0.73	15th	Important
16	Price Certainty	0.72	16th	Important
17	Availability of Qualified Personnel	0.70	17th	Important
18	Estimated Time of Project Completion	0.70	17th	Important
19	Integrated Design and Construction	0.67	19th	Important
20	Level of Technology	0.66	20th	Important
21	Environmental Impact	0.63	21st	Important
22	Political Consideration	0.63	21st	Important
23	Allocation of Responsibility to project Stakeholders	0.62	23rd	Important
24	Quality Certification	0.61	24th	Important
Average RII		0.74		Important

Source: Researcher's Analysis of Data (2020).

From Table 4.3, shows that out of the 24 factors influencing the various procurement methods in the delivery of commercial building projects in Abuja identified from review of literature, four (4) factors are very important. These are Project Completion at Estimated Cost, Cash flow and Funding Arrangement, Financial Capability of Client and Expected Performance of Project with RII of 0.91, 0.90, 0.89 and 0.80 respectively. The remaining twenty (20) factors are important with RII ranging from 0.79 (Size of Project) to 0.61(Quality Certification). On the average, the factors influencing the

various procurement methods in the delivery of commercial building projects in Abuja are important (average RII = 0.74). This is in line with the finding of El Agha and El-Sawalhi (2018) who stated that project completion at estimated cost, cash flow, cash flow and funding arrangement, expected performance of project in relation to project characteristics and financial capability of client in relation to client's characteristics are highly important factors in influencing the selection of procurement methods. It is also in line with the findings of Babatunde *et al.* (2010) and Nabil and Osama (2017) where they listed estimated cost at project completion, financial management and control and financial capability of client as key factors influencing accurate procurement strategy.

4.2.3 Impact of the procurement methods on the cost, time and quality delivery of commercial building projects in Abuja

The MIS results of the impact of the procurement methods on the cost, time and quality delivery of commercial building projects are presented in Figures 4.1 – 4.3.

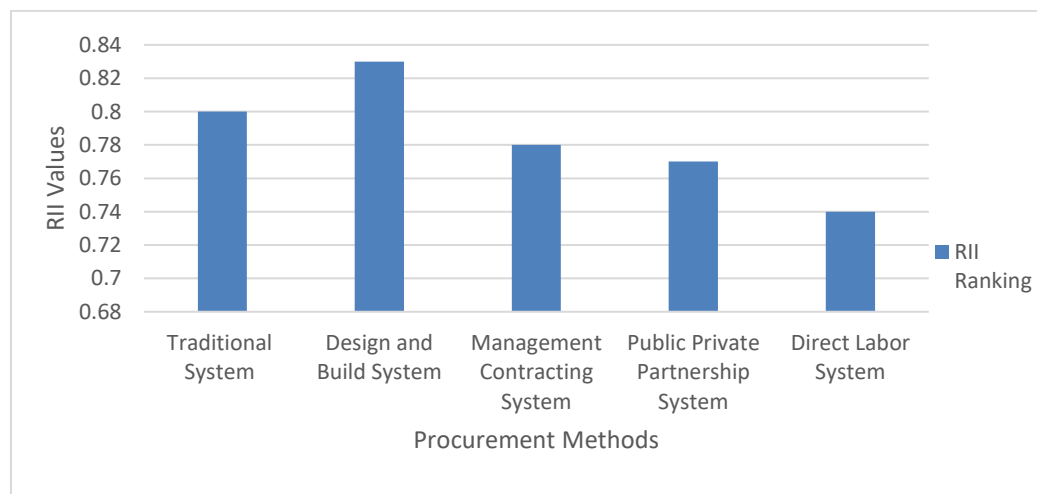


Fig. 4.1: Cost Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja

It was shown in Figure 4.1 that the impact of Design and Build System on the cost delivery of commercial building projects in Abuja is very significant with RII of 0.83. On the other hand, the impact of the Traditional, Management Contracting, Public Private Partnership and Direct Labour Systems on the cost delivery of commercial

building projects in Abuja is significant with RII of 0.80, 0.78, 0.77 and 0.74 respectively. This signifies that the Design and Build System has the most significant impact on the cost delivery of commercial building projects in Abuja.

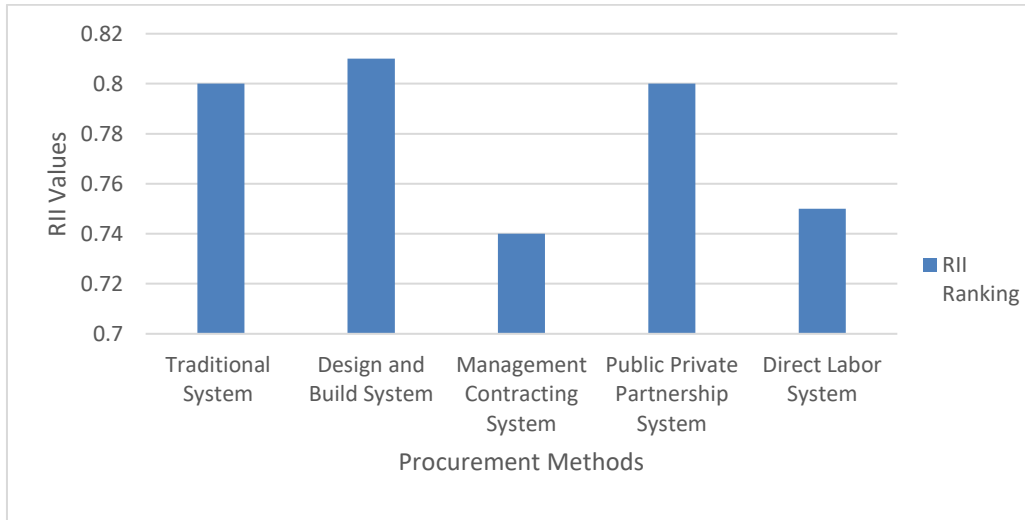


Fig. 4.2: Time Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja

It was shown in Figure 4.2 that impact of Design and Build System on the time delivery of commercial building projects in Abuja is very significant with RII of 0.81. On the other hand, the impact of the Traditional, Public Private Partnership, Direct Labour and Management Contracting Systems on the time delivery of commercial building projects in Abuja is significant with RII of 0.80, 0.80, 0.75 and 0.74 respectively. This signifies that the Design and Build System has the most significant impact on the time delivery of commercial building projects in Abuja.

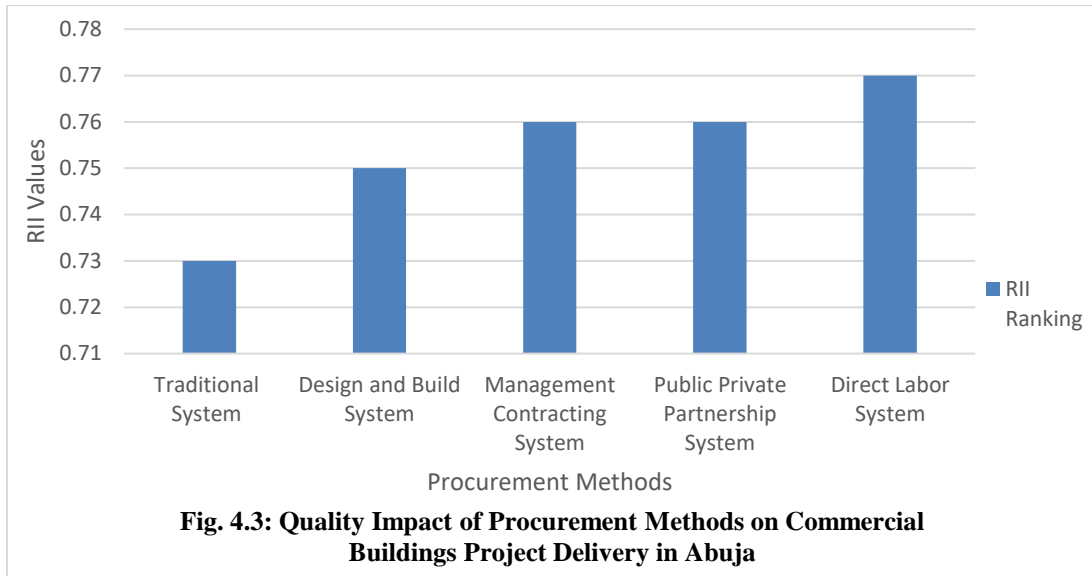


Fig. 4.3: Quality Impact of Procurement Methods on Commercial Buildings Project Delivery in Abuja

It was shown in Figure 4.3 that impact of Traditional, Design and Build, Management Contracting, Public Private Partnership and Direct Labour Systems on the quality delivery of commercial building projects in Abuja is significant with RII of 0.73, 0.75, 0.76, 0.76 and 0.77 respectively. This signifies that the Direct Labour System has the most significant impact on the quality delivery of commercial building projects in Abuja.

4.2.4 The best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness

In order to determine best procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness, the use of MIS was employed to rate the level of cost, time and quality effectiveness based on respondents experience and perception. ANOVA was thereafter used to determine the level of variation in the level of effectiveness among the five (5) procurement methods considered for the study. The results of the MIS analysis are presented in Table 4.4 while the ANOVA results are presented in Table 4.5.

Table 4.4: Results on the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness.

S/No	Procurement Methods	MIS	Rank	Decision
<i>Cost Effectiveness</i>				
1	Traditional System	4.03	1 st	Effective
2	Design and Build System	3.99	2 nd	Effective
3	Management Contracting System	3.79	3 rd	Effective
4	Public Private Partnership	3.75	4 th	Effective
5	Direct labour System	3.74	5 th	Effective
<i>Time Effectiveness</i>				
1	Management Contracting System	4.03	1 st	Effective
2	Design and Build System	4.01	2 nd	Effective
3	Traditional System	3.83	3 rd	Effective
4	Public Private Partnership	3.73	4 th	Effective
5	Direct labour System	3.38	5 th	Effective
<i>Quality Effectiveness</i>				
1	Design and Build System	3.74	1 st	Effective
2	Public Private Partnership	3.66	2 nd	Effective
3	Traditional System	3.56	3 rd	Effective
4	Management Contracting System	3.54	4 th	Effective
5	Direct labour System	3.31	5 th	Fairly Effective

It was revealed from Table 4.4 that in terms of cost effectiveness, the Traditional System is the most effective method of procurement with MIS of 4.03. All other procurement methods here are effective with MIS ranging from 3.74 – 3.99. Based on time effectiveness, it was shown that Management Contracting System is the most effective procurement method for the delivery of commercial building projects with MIS of 4.03. All the other procurement methods in this case are also effective with MIS ranging from 3.38 – 4.01. On the basis of quality effectiveness, the Design & Build System is the most effective procurement method for the delivery of commercial building projects with MIS of 3.74. The Public Private Partnership, Traditional System and Management Contracting System in this case are also effective with MIS of 3.66, 3.56 and 3.54 respectively. However, the Direct labour System appears to be fairly effective here with MIS of 3.31.

In view of the fact that all the procurement methods appear to be effective based on cost, time and quality effectiveness of the delivery of commercial building projects, the use of ANOVA was used to determine the statistical variation which occurs in the level of effectiveness among these procurement methods in terms of cost, time and quality. The result is summarised in Table 4.5.

Table 4.5: ANOVA Results on the variation in level of effectiveness among procurement methods in the delivery of Commercial Building Projects Delivery in Terms of Cost, Time and Quality

ANOVA	Variables			Observations			Inferences		
	X ₁	X ₂	X ₃	X ₄	X ₅	F _{cal}		F _{tab}	P _{value}
1 (Cost)	Traditional (4.0316)	Design & Build (3.9895)	Management Contracting (3.7895)	Public Private Partnership (3.7474)	Direct Labour (3.7368)	2.070	2.370	0.840	No Significant Variation
2 (Time)	Traditional (3.8316)	Design & Build (4.0105)	Management Contracting (4.0316)	Public Private Partnership (3.7263)	Direct Labour (3.3789)	7.658	2.370	0.000	Significant Variation
3 (Quality)	Traditional (3.5579)	Design & Build (3.7368)	Management Contracting (3.5368)	Public Private Partnership (3.6632)	Direct Labour (3.3053)	2.370	2.370	0.051	No Significant Variation

Source: Researcher's Analysis of Data (2020).

The first analysis in Table 4.5 shows the probability value observed was 0.840 which is greater than the level of significance for the analysis (0.050). The F calculated value observed was 2.070 and is less than the F statistics value (F_{tabulated}) of 2.370. This shows that there is no significant variation in the level of effectiveness of the procurement methods. Although the MIS values indicates that the Traditional method which has the highest MIS is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of cost.

The second analysis from Table 4.5 shows the probability value observed was 0.000 which is less than the level of significance for the analysis (0.050). The F calculated

value observed was 7.658 and is less than the F-tabulated of 2.370. This shows that there is significant variation in the level of effectiveness of the procurement methods. The MIS values also indicates that the Management Contracting System which has the highest MIS is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of time.

The third analysis from Table 4.5 revealed that the probability value observed was 0.051 which is greater than the level of significance for the analysis (0.050). The F calculated value observed was 2.370 and is same as the F-tabulated. This shows that there is no significant variation in the level of effectiveness of the procurement methods. Although, the MIS values indicates that the Design & Build System which has the highest MIS is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of quality.

4.2.5 Strategies for improving the cost, time and quality delivery of commercial building projects in Abuja

The use of MIS was also adopted to rank the strategies for improving the cost, time and quality delivery of commercial building projects in order of effectiveness. The summary of the results of the MIS ranking is given in Table 4.6.

Table 4.6: Strategies for Improving the Cost, Time and Quality Delivery of Commercial Building Projects

S/No.	Strategies for Improving Project Delivery	MIS	Level of Effectiveness	Rank	MIS	Level of Effectiveness	Rank	MIS	Level of Effectiveness	Rank
		Cost			Time			Quality		
1	Committed Leadership and Management	4.24	E	2nd	3.84	E	6th	3.81	E	6th
2	Proper Planning Work	4.35	E	1st	4.24	E	1st	3.82	E	5th
3	Placing Focus on Quality, Cost and Time Delivery.	4.02	E	6th	3.81	E	7th	3.96	E	3rd
4	Full Utilization of Construction Team	3.65	E	15th	4.21	E	2nd	3.59	E	10 th
5	Proper and Effective Communication through clear messages	4.06	E	5th	3.89	E	4th	3.36	F-E	14 th
6	Increased use of Prefabricated Material	3.87	E	10th	3.89	E	4th	3.46	F-E	11 th
7	Increased level of Productivity	3.91	E	9th	3.74	E	9th	3.40	F-E	12 th
8	Placing Focus on Clients needs	3.66	E	14th	3.32	F-E	15th	3.39	F-E	13 th
9	Close monitoring of workers	4.15	E	4th	3.93	E	3rd	3.74	E	8 th
10	Training and development of participants to support delivery project	4.00	E	7th	3.65	E	11th	3.97	E	1 st
11	Provision of knowledge and training to unskilled workers based on their scope of work	3.67	E	13th	3.66	E	10th	3.73	E	9 th
12	Use of Technology and Modern Construction Processes	3.97	E	8th	3.75	E	8th	3.97	E	1 st
13	Hiring of highly skilled workers to achieve good project performance	3.71	E	12th	3.41	F-E	14th	3.80	E	7 th

14	The Adoption of Integrated Delivery process (IPD)	3.75	E	11th	3.46	F-E	12th	3.86	E	4 th
15	Material Management and Planning	4.19	E	3rd	3.42	F-E	13th	3.24	F-E	15 th
<i>Average MIS</i>		<i>3.95</i>			<i>3.75</i>			<i>3.67</i>		

Source: Researcher's Analysis of Data (2020).

V-E= Very Effective

E = Effective

F-E= Fairly Effective

L-E=Less Effective

Table 4.6 revealed that all the fifteen strategies identified for improving the cost delivery of commercial building projects in Abuja are effective. The highest ranked strategy is “Proper Planning Work” (4.35) while the least ranked strategy is “Full Utilization of Construction Team” (MIS = 3.65). The average MIS observed is 3.95. It was also shown in Table 4.6 that 11 of the identified strategies for improving the time delivery of commercial building projects in Abuja are effective. The highest ranked in this group is Proper Planning Work (MIS = 4.24) while the least ranked is “Training and development of participants to support delivery project” (MIS = 3.65). The remaining 4 are fairly effective strategies with MIS ranging from 3.46 (The Adoption of Integrated Delivery process (IPD) to 3.32 (Placing Focus on Client’s needs). The average MIS observed is 3.75. This indicated that, on the average, the strategies for improving the time delivery of commercial building projects in Abuja are effective. Table 4.6 also revealed that ten of the strategies identified for improving the quality delivery of commercial building projects in Abuja are effective. The highest ranked strategy is “Training and development of participants to support delivery project” (3.97) while the least ranked strategy is “Full Utilization of Construction Team” (MIS = 3.59). Five other strategies in this group are fairly effective with MIS ranging between 3.46 (Increased use of Prefabricated Material) and 3.24 (Material Management and Planning). The average MIS observed is 3.67. This indicates that, averagely, the strategies identified for improving the quality delivery of commercial building projects in Abuja are effective.

4.3 Summary of Findings

The analysis of data carried out for this study reveals the following:

- i. All the five (5) procurement methods considered for the study are frequently used in commercial building projects. The most frequently used is Design and Build System (RII = 0.79).
- ii. The factors influencing the various procurement methods in the delivery of commercial building projects in Abuja are important (average RII = 0.74).
- iii. The Design and Build System has the most significant impact on the cost delivery of commercial building projects in Abuja (RII = 0.83). The Design and Build System has the most significant impact on the time delivery of commercial building projects in Abuja (RII = 0.81). The Direct Labour System has the most significant impact on the quality delivery of commercial building projects in Abuja (RII = 0.77).
- iv. The Traditional System which has the highest MIS (4.0316) is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of cost. The Management Contracting System which has the highest MIS (4.0316) is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of time. The Design & Build System which has the highest MIS (3.7368) is the most effective procurement methods and hence the best procurement method for improving commercial building projects delivery in terms of quality.
- v. All the fifteen strategies identified for improving the cost delivery of commercial building projects in Abuja are effective (MIS = 3.65 – 4.35). 11 of the identified strategies for improving the time delivery of commercial building projects in

Abuja are effective. The highest ranked in is Proper Planning Work (MIS = 4.24) while the least ranked is “Training and development of participants to support delivery project” (MIS = 3.65). Ten of the strategies identified for improving the quality delivery of commercial building projects in Abuja are effective. The highest ranked strategy is “Training and development of participants to support delivery project” (3.97) while the least ranked strategy is “Full Utilization of Construction Team” (MIS = 3.59).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The research reveals that the design and build procurement system is the most frequently used method in the procurement of commercial building projects in Abuja. It was also discovered that, in terms of impact of procurements methods on cost, time and quality delivery of projects, design and build procurement system has the most significant impact on the cost. It can therefore be concluded that the Traditional, Management Contracting and Design & Build procurement systems have significant impact on the delivery of construction projects in Abuja. However, the Traditional System is the most effective procurement method for improving the cost delivery of commercial building projects; the Management Contracting System is the most effective procurement method for improving the time delivery of commercial building projects; and the Design & Build System of procurement is the most effective procurement method for improving the quality delivery of commercial building projects in Abuja.

5.2 Recommendations

In view of the study's findings and conclusions, the following recommendations are made:

- i. Professionals should properly advise clients to use the appropriate procurement method for the execution of commercial building projects in order to avoid problem with time, cost and quality associated with the project.
- ii. In order to improve the cost, time and quality delivery of construction projects, professionals should properly ensure that the client sets up effective mechanism for the implementation of the strategies improving the cost, time and quality

delivery of commercial building projects. This is due to the fact that this study found these strategies to be effective.

- iii. The client should properly monitor the procurement process from inception to completion of a project is necessary to ensure and enforce the use of appropriate procurement method and avoid any discrepancies.

5.3 Contribution to Knowledge

The following contributions have been made to the body of knowledge by this study:

- i. The study has established that for a given project objective of a commercial building project, there is a best suited procurement system. Therefore, when cost delivery is the major objective, the Traditional system is the best (MIS = 4.03); when the major objective is time delivery, Management Contracting system is the best (MIS = 4.03); and when quality delivery is the major objective, the Design & Build system is the best suited (MIS = 3.74).
- ii. The study also indicates that the strategies for improving the cost (MIS = 3.95), quality (MIS = 3.75) and time (3.67) delivery of commercial building projects in Abuja are effective. That is these strategies are capable of improving the delivery of commercial building projects by 79%, 75% and 73% effectively.

5.4 Areas for Further Studies

The following areas are suggested for further studies in view of the findings of this study:

- i. Impact of procurement systems on the delivery of roads construction projects in Nigeria.

- ii. Comparative analysis of the traditional, management contracting and design & build procurement systems in the delivery of roads construction projects in Nigeria.

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APPENDIX

APPENDIX A: Research Questionnaire

COVERING LETTER ON QUESTIONNAIRE SURVEY

Dear Sir/Madam,

Research on: **“INFLUENCE OF SELECTED PROCUREMENT METHODS ON DELIVERY OF COMMERCIAL BUILDING PROJECTS IN ABUJA, NIGERIA”**

I am writing to request you to contribute to an MTech research, which aims at evaluating the influence of selected procurement methods on delivery of commercial building projects in Abuja, Nigeria in terms of cost, time and quality, with a view to improving the cost and time delivery of commercial building projects. The research is being carried out at the Department of Quantity Surveying, Federal University of Technology, Minna – Nigeria under the supervision of Dr. A. A. Shittu.

As part of this research, a survey is conducted to achieve the following objectives:

- i. To identify the most frequently used procurement methods for the delivery of construction projects in the Nigerian construction industry.
- ii. To examine the factors influencing the various procurement methods in the delivery of commercial building projects in the Nigerian construction industry.
- iii. To determine the level of importance of the procurement methods in the cost, time and quality delivery of commercial building projects.
- iv. To determine the best possible procurement method for improving commercial building projects delivery in terms of cost, time and quality effectiveness.
- v. To propose the strategies for improving the cost, time and quality delivery of commercial building projects.

It would be greatly appreciated if you would fill the questionnaire as soon as possible. I want you to also note that your responses will be treated confidentially.

Thanks.

Yours faithfully,

IBRAHIM, Abdulqadir
MTECH/SET/2018/8149
(Researcher)
Tel: (+234) 7063310747
Email: dulynx.ae@gmail.com

DEPARTMENT OF QUANTITY SURVEYING

FEDERAL UNIVERSITY OF TECHNOLOGY

MINNA – NIGERIA

QUESTIONNAIRE SURVEY

INFLUENCE OF SELECTED PROCUREMENT METHODS ON DELIVERY

OF COMMERCIAL BUILDING PROJECTS IN ABUJA, NIGERIA

SECTION A: Particulars and General Information

Please enter your name, position and other personal details.

All responses will be confidential and will not be connected in any way to yourself or your organisation.

Name (Optional): _____

Position: _____

Organisation: _____

Years of Experience: _____

Profession: Architect

Builder

Quantity Surveyor

Engineer

Telephone: _____

Postal Address: _____

Email: _____

SECTION B: Most Frequently Used Procurement Methods for the Delivery of Construction Projects in the Nigerian Construction Industry

Q1: The following are the identified procurement methods used in the delivery of construction projects in Nigeria. Please rank the level at which these procurement methods are used in the delivery of commercial building projects in Nigeria based on a five-point scale in the spaces provided in the table below.

/No.	Procurement Methods	5 Most Often	4 Often	3 Less Often	2 Least Often	1 Rarely
1	Traditional Procurement System					
2	Design and Build System					
3	Management Contracting System					
4	Public Private Partnership					
5	Private Financing Initiative					
6	Direct labor system					

SECTION C: Factors Influencing the Various Procurement Methods in the Delivery of Commercial Building Projects in the Nigerian Construction Industry

Q2: The following are the identified factors influencing the various procurement methods in the delivery of commercial building projects in the Nigerian construction industry. Please rank these factors in order of importance based on your experience on a five-point scale in the spaces provided in the table below.

S/No.	Factors Influencing Procurement Methods	5 Most Important	4 Very Important	3 Important	2 Less Important	1 Least Important
1.	Financial capability of client					
2.	Clients experience in procurement methods					
3.	Availability of qualified personnel					
4.	Integrated design and construction					
5.	Project Completion at estimated time					
6.	Construction time					
7.	Project completion at estimated cost					
8.	Cash flow and Funding arrangement					

9.	Price certainty					
10.	Quality Certification					
11.	Experience of project contractor					
12.	Required level of quality control					
13.	Expected performance of project					
14.	Complexity in project construction					
15.	Allocation of responsibility to project stakeholders					
16.	Economic conditions					
17.	Market conditions					
18.	Nature of Project					
19.	Size of project					
20.	Availability of resources					
21.	Procurement policy					
22.	Material Availability					
23.	Environmental Impact					
24.	Political Consideration					
25.	Level of Technology					

SECTION D: Level of Importance of the Procurement Methods in the Cost, Time and Quality Delivery of Commercial Building Projects

Q3. Kindly rank the level of importance of the following procurement methods in the cost, time and quality delivery of commercial building projects based on your experience on a five-point scale in the spaces provided in the table below.

5	4	3	2	1
Most Important	Very Important	Important	Less Important	Not Important

S/N	Procurement Methods	Cost Delivery					Time Delivery					Quality Delivery				
		5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1.	Traditional System															
2.	Design and Build System															
3.	Management Contracting System															
4.	Public Private Partnership System															
5.	Private Financing Initiative															
6.	Direct Labor System															

SECTION E: Best Procurement Method for Improving Commercial Building Projects Delivery in Terms of Cost, Time and Quality Effectiveness

Q4. Please rank the level at which each of the identified procurement methods can improve commercial building projects delivery in terms of cost, time and quality effectiveness based on your experience on a five-point scale in the spaces provided in the table below.

5	4	3	2	1
Most Significant	Very Significant	Significant	Less Significant	Not Significant

S/N	Procurement Methods	Cost Effectiveness					Time Effectiveness					Quality Effectiveness				
		5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1.	Traditional System															
2.	Design and Build System															
3.	Management Contracting System															
4.	Public Private Partnership System															
5.	Private Financing Initiative															
6.	Direct Labor System															

SECTION F: Strategies for Improving the Cost, Time and Quality Delivery of Commercial Building Projects

Q5. The following are the identified strategies for improving the cost, time and quality delivery of commercial building projects. Kindly rank these strategies in order of effectiveness based on your experience on a five-point scale in the spaces provided in the table below.

5	4	3	2	1
Most Effective	Very Effective	Effective	Less Effective	Not Effective

S/N	Strategies for Improving Delivery of Commercial Building Projects	Cost Delivery					Time Delivery					Quality Delivery				
		5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
1.	Committed Leadership and Management															
2.	Proper Planning Work															
3.	Placing Focus on Quality, Cost and Time Delivery															
4.	Full Utilization of Construction Team															
5.	Proper and Effective Communication through clear messages															
6.	Increased use of Prefabricated Material															
7..	Increased level of Productivity															
8.	Placing Focus on Clients needs															
9.	Close monitoring of workers															

10.	Training and development of participants to support delivery project																
11.	Provision of knowledge and training to unskilled workers based on their scope of work																
12.	Use of Technology and Modern Construction Processes																
13.	Hiring of highly skilled workers to achieve good project performance																
14.	The Adoption of Integrated Delivery process (IPD)																
15..	Material Management and Planning																

Thank you very much for your co-operation.

**IBRAHIM, Abdulqadir
MTECH/SET/2018/8149
(Researcher)
Tel: (+234) 7063310747
Email: dulynx.ae@gmail.com**

APPENIX B:

Raw Result of ANOVA

ONEWAY ANOVA1 BY Cost Comparison /STATISTICS DESCRIPTIVES
MISSING ANALYSIS.

Oneway

Notes

Output Created		08-Mar-2020 10:36:23
Comments		
Input	Active Dataset	DataSet0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	475
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on cases with no missing data for any variable in the analysis.
Syntax		ONEWAY ANOVA1 BY Cost Comparison /STATISTICS DESCRIPTIVES /MISSING ANALYSIS.
Resources	Processor Time	0:00:00.016
	Elapsed Time	0:00:00.095

[DataSet0]

Descriptive

ANOVA1

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
TraditionalCost	95	4.0316	1.04630	.10735	3.8184	4.2447	1.00	5.00
DBCcost	95	3.9895	.73651	.07556	3.8394	4.1395	3.00	5.00
MgtCtrCost	95	3.7895	.69794	.07161	3.6473	3.9317	2.00	5.00
PPPCost	95	3.7474	.96721	.09923	3.5503	3.9444	2.00	5.00
DLSCost	95	3.7368	1.21349	.12450	3.4896	3.9840	1.00	5.00
Total	475	3.8589	.95638	.04388	3.7727	3.9452	1.00	5.00

ANOVA

ANOVA1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.507	4	1.877	2.070	.084
Within Groups	426.042	470	.906		
Total	433.549	474			

ONEWAY ANOVA2 BY TimeComparison /STATISTICS DESCRIPTIVES
/MISSING ANALYSIS.

Oneway

Notes

Output Created	08-Mar-2020 10:37:04		
Comments			
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	Weight	<none>	
	Split File	<none>	
	N of Rows in Working Data File	475	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.	
	Cases Used	Statistics for each analysis are based on cases with no missing data for any variable in the analysis.	
Syntax	ONEWAY ANOVA2 BY TimeComparison /STATISTICS DESCRIPTIVES /MISSING ANALYSIS.		
Resources	Processor Time	0:00:00.015	
	Elapsed Time	0:00:00.031	

[DataSet0]

Descriptives

ANOVA2

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
TraditionalTime	95	3.8316	.99630	.10222	3.6286	4.0345	2.00	5.00
DBTime	95	4.0105	.81860	.08399	3.8438	4.1773	2.00	5.00
MgtCtrTime	95	4.0316	.75021	.07697	3.8788	4.1844	2.00	5.00
PPPTime	95	3.7263	.89255	.09157	3.5445	3.9081	2.00	5.00
DLSTime	95	3.3789	1.15941	.11895	3.1428	3.6151	1.00	5.00
Total	475	3.7958	.96039	.04407	3.7092	3.8824	1.00	5.00

ANOVA

ANOVA2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	26.749	4	6.687	7.658	.000
Within Groups	410.442	470	.873		
Total	437.192	474			

ONEWAY ANOVA3 BY Quality Comparison /STATISTICS DESCRIPTIVES

/MISSING ANALYSIS.

Oneway

Notes

Output Created		08-Mar-2020 11:12:12
Comments		
Input	Active Dataset	DataSet0
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	475
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on cases with no missing data for any variable in the analysis.
Syntax		ONEWAY ANOVA3 BY QualityComparison /STATISTICS DESCRIPTIVES /MISSING ANALYSIS.
Resources	Processor Time	0:00:00.016
	Elapsed Time	0:00:00.016

[DataSet0]

Descriptives

ANOVA3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
TraditionalQuality	95	3.5579	.98624	.10119	3.3570	3.7588	1.00	5.00
DBQuality	95	3.7368	.92496	.09490	3.5484	3.9253	2.00	5.00
MgtCtrQuality	95	3.5368	.96547	.09906	3.3402	3.7335	2.00	5.00
PPPQuality	95	3.6632	.78021	.08005	3.5042	3.8221	2.00	5.00
DLS	95	3.3053	1.41477	.14515	3.0171	3.5935	1.00	5.00
Total	475	3.5600	1.04239	.04783	3.4660	3.6540	1.00	5.00

ANOVA

ANOVA3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.198	4	2.549	2.374	.051
Within Groups	504.842	470	1.074		
Total	515.040	474			