EXAMINATION OF THE INFLUENCE OF PROCUREMENT MANAGEMENT STRATEGIES ON EFFECTIVE CONSTRUCTION PROJECT DELIVERY IN RIVERS STATE

BY

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CERTIFICATION

This is to certify that this work entitled "Examination of the Influence of Procurement Management Strategies on Effective Construction Project Delivery in Rivers State" was carried out by Fubara, Igoni Jacob with Registration No. 20174075833, in partial fulfilment of the requirements for the award of the degree Master of Science (M.Sc) in Project Management Technology, in the Department of Project Management Technology, Federal University of Technology, Owerri, Nigeria.

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DEDICATION

This research is dedicated to my lovely wife Mrs Gloria J. Fubara

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ABSTRACT

This research aims at examining the influence of procurement management strategies on effective construction project delivery in Rivers state, Nigeria**.** Additionally, this study seeks to identify and categorize the procurement management strategies currently in use in the effective delivery of construction projects, determine the influence of procurement management strategies on effective construction project delivery, analyses and correlate the difference between the traditional procurement management strategies and non-traditional procurement management strategies on construction project delivery in Rivers State**.** The study was guided by the transaction cost economics, principal-agent, resource-based view, stakeholder and institutional theories. The study used an exploratory and descriptive research design methods of investigation, and a census sampling technique was used to select a sample size from 84 population of the practitioners in Rivers state. The study employed a well-structured standardized questionnaire designed in Likert five-point scales, in addition to personal observations to elicit responses from construction firms and projects situated in Rivers State, Nigeria. The questionnaires underwent pre-testing and validation to ensure their reliability. The study utilized various statistical tools such as tables and descriptive statistics to present the demographic data. Additionally, the Factor Analysis technique, Multiple Regression and Correlation analysis were employed to analyses the major issues in the study. The statistical analysis was conducted using IBM SPSS Statistics version 19.0. The study's results show that out of the twelve (12) procurement management strategies (variables) tested for factor analysis, the findings revealed six clusters named in other of significance as DBPS, DLPS, DBBPS, LCPS, CMPS and CRCPS. The multiple regression analysis results revealed that Design and build procurement system, Design bid build procurement system, lump-sum contract procurement system, direct labour procurement strategy, and construction management procurement system influenced effective construction procurement management strategies in Rivers state. The study suggests that project executioners in Rivers State should adopt modern procurement strategies, such as the integrated project delivery (IPD) method, to improve the efficiency and reliability of construction projects. It also suggests separating design and construction teams to ensure due diligence in the handling of works. Non-traditional procurement methods, such as DBB, are expected to address industry challenges like project delays and cost overruns. The study suggests that more attention should be given to non-traditional procurement systems to change the narrative in the Nigerian construction industry, aiming to deliver projects on schedule, cost, quality, and value for money.

Keywords: construction projects, correlation analysis, factor analysis, Rivers State, multiple regression, Nigeria, procurement management strategies.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The Nigerian construction industry is critical to the country's economic development, creating jobs and expanding infrastructure. Procurement strategies in Nigeria's construction industry have a significant impact on project efficiency and cost effectiveness. The implementation of sustainable procurement practices has emerged as a key strategy in recent years. By incorporating environmental and social factors into the procurement process, the industry can reduce negative environmental impacts while also encouraging social responsibility. (Ibem, Aduwo, Afolabi, Oluwunmi, Tunji-Olayeni, Ayo-Vaughan, & Uwakonye, 2020).

Recently, a lot of emphasis has been placed on the need to improve project delivery, and thus the need for effective procurement management, which encompasses a large portion of project management. However, many authors have expressed concern that ineffective procurement is the first sign of project failure (Femi, 2015; Bailey, 2013; Ekpo, 2002). Procurement management is the process of acquiring goods and services from sources other than the performing organisation (Walker, 2007). Improvements in procurement services provide a unique opportunity to significantly increase project success rates at little or no cost. Companies' large expenditures on goods, works, and services have prompted their management to address this area as a means of not only lowering costs, but also gaining and maintaining a competitive advantage. Project procurement management is essential to the Nigerian economy. It is critical that project organisations obtain materials for their project implementation operations and that finished goods are delivered to clients/customers as scheduled. Such operations necessitate the use of the best materials at the right price, from the right vendor or supplier, in the right quantity, quality, and

timing (Bailey, 2013).

Procurement is the acquisition of goods, services, and works to meet a corporate business need or the various needs of private individuals (Acquah, 2024). Over the last few decades, annual reports from corporations have shown that business procurement expenses account for nearly 75% of total organizational expenditure. Thus, because significant financial resources are invested in procurement activities, due diligence should be a required skill for procurement professionals.

There is no doubt that the procurement concept covers a broader range of supply activities than the purchasing concept (Dobbler, 2010). It typically includes a broader view specification, value analysis, purchasing, contract administration, supply, market research, supplier management, negotiations, quality, and transportation of goods or materials to end users. Because the end products of procurement are materials supplied, it follows that material availability determines the level of project success. No project-oriented organization can function without effective procurement of materials required for timely project completion. As a result, they must be available at the appropriate time, in the appropriate quality and quantity, at the appropriate location, and at a reasonable cost.

Recently, the level of failure in the procurement of materials has increased project time, cost, and profitability, compromising output quality. It follows that materials management is critical. Materials management, as it is currently practiced, can be defined as a collection of various activities. Operations include the planning, acquisition, conversion, flow, and distribution of materials to end users for effective use in project implementation.

Until now, very little research has been conducted to investigate the effects of procurement systems on construction project completion in Rivers state. With various procurement systems such as design-bid-build (DBB), design and build, construction management, partnering,

integrated project delivery (IPD), etc. (Tang, Ng & Skitmore, 2019), each with its own set of features, clients find it difficult to determine which is the best procurement system to ensure long-term construction project success.

Although many authors have researched and recommended solutions to the problem of poor procurement practices, the issue persists. The study is thus motivated by a desire to investigate the factors that impede effective procurement management functions for project survival in Rivers State.

1.2 Problem Statement

While the construction sector in Rivers state, Nigeria, has made a significant contribution to the economy, it faces numerous challenges, particularly in terms of project execution and delivery. Common issues include project delays, budget overruns, and compromised construction quality. According to the literature, procurement management is an important factor influencing these issues. However, there is still a lack of understanding about the specific nature and impact of procurement management practices on the successful completion of construction projects in the Rivers state context. The complexities of procurement processes, the interactions of various stakeholders, and the alignment of procurement strategies with organizational goals in Rivers state's unique business environment have not been fully explored, limiting the development of targeted interventions for improvement. Recognizing the importance of developing novel and yet practical sustainable solutions, traditional mechanisms for procuring the design team and contractor may not be the best answer for sustainable building projects because project participants will primarily focus on their own interests rather than striving to maximize the success of sustainable buildings (Tang *et al.,* 2019). To achieve significant reductions in life cycle emissions and costs, an appropriate procurement system should be implemented to

encourage collaborative thinking and problem-solving spirit. It is clear that most project-oriented companies in Nigeria have encountered a slew of procurement issues in managing their project operations. However, the literature revealed that this problem could be external or internal. Some external forces include government interference, environmental forces, infrastructure development, technology type, foreign exchange, and customer influence, among others. Internal forces include the use of improper or abusive procurement methods, a lack of experienced manpower, poor supervision/due diligence, payment terms, changes in operating processes, management style, and so on. As a result, most procurement officers and project managers have struggled to manage projects in this dynamic environment, making Project Procurement prone to failure. The resulting effects include an inability to achieve operational efficiency, which affects project timeliness, client dissatisfaction, increased operating costs, and decreased profits.

1.3 Objectives of the Study

The aim of this study is to examine the influence of procurement management strategies on effective construction project delivery in Rivers State. To achieve this, the following specific objectives were set;

i. To identify and categorize the procurement management strategies currently in use in the effective delivery of construction projects in Rivers State.

ii. To determine the influence of procurement management strategies on effective construction project delivery in Rivers State.

iii. To analyze and correlate the difference between the traditional procurement management strategies and non-traditional procurement management strategies on construction project delivery in Rivers State.

1.4 Research Questions

To achieve the objectives, the following research questions were raised;

i. What are the categories of procurement management currently in use in the effective delivery of construction projects in Rivers State?

ii. What are the influence of procurement management strategies on effective construction project delivery in Rivers State?

iii. To what extent can the difference between the traditional procurement management strategies and non-traditional procurement management strategies on construction project delivery in Rivers State be analyzed and correlated?

1.5 Research Hypotheses

In order to realize the set objectives, the following hypotheses were formulated for testing;

H_{01}: Design and build procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{02}: Design bid build procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{03}: Cost reimbursement contract procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{04}: Management contracting procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{05}: Alliancing procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{06}: Partnering procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{07}: Lump-sum contract procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{08}: Procurement management system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{09}: Direct labour procurement strategy has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{010}: Integrated project delivery procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{011}: Public private partnership procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

H_{012}: Construction management procurement system has no considerable influence on the effective delivery of construction projects in Rivers state.

1.6 Justification of the Study

The justification for this study is multifaceted. To begin, there is a notable lack of empirical research on the relationship between procurement management and project delivery in the context of Rivers State, Nigeria. Addressing this gap is compelling theoretically, as it adds context-specific insights to the global body of knowledge. From a practical standpoint, such a study could bring tangible benefits to industry practitioners by providing evidence-based strategies for better procurement practices, which are likely to lead to better project outcomes. Furthermore, understanding and improving procurement management has potential economic benefits, such as reducing inefficiencies and fostering long-term development in the state's growing construction industry. Finally, the study's findings could help policymakers and

regulatory bodies implement regulatory frameworks and industry standards that encourage best practices in procurement management.

Above all, it will serve as an invaluable tool for academics seeking to advance learning and research at all levels.

1.7 Scope of the Study

The study will look at procurement management strategies and their relationship to construction project delivery in Rivers State, Nigeria. To ensure relevance and applicability, it will focus on evaluating procurement strategies, systems, and processes implemented in the Rivers State construction industry. The study's specific goal is to examine the effects of procurement management strategies on effective construction project delivery from the perspectives of various stakeholders, including project owners, contractors, and material suppliers, across a wide range of construction projects, from residential to commercial and public infrastructure. While the study may draw on global theories and insights, its primary goal will be to analyze data collected directly from the Rivers State construction sector to ensure specificity and contextual accuracy. This study was conducted to examine procurement activities in Rivers State, with a focus on some of the state's projects.

1.8 Limitations of the Study

This study is limited by:

Sample Size: The sample used in this study was within the procurement department and project operators. This sample size and the inability of the researcher to obtain across sectional data from other respondents within the organization and limiting it to Rivers state have limited the findings of the study. These limitations may render generalization difficult.

Respondent's response: Most target respondents were unwilling to respond to the questionnaire due to what they termed as organizational secrecy. Accordingly, this study focuses primarily on procurement management strategies and not on other project management knowledge areas that might relate to procurement functions. However, the researcher adopted high level of personal relationship in extracting the relevant data needed to make this study a success. Other limitations of the study include the potential variance in practices in other parts/states of Nigeria, and the focus on the current practices and outcomes, which may not account for rapidly changing market dynamics.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

This study is based on the idea that good procurement management leads to projects being completed on time and within budget. Stevens (2008) proposed that procurement management is measured based on the effectiveness of delivery at the right cost, time, and location for project success. Delays in procurement, without a doubt, lead to time and cost overruns as well as poor work quality. This is because effective procurement helps to complete projects on time, within budget, and according to specifications, as well as with user acceptance.

However, Kerzner (2003) added that a successful project implementation occurs when the project is completed on time and within budget, meets all of the original objectives, and is adopted and used by the clients for whom the project is intended. It denotes the successful achievement of time, cost, and quality objectives, as well as the quality of the project process, which is only possible if procurement management is effectively and efficiently managed (Erling, Anderson, & Svein, 2006).

Steinfort (2013) concludes that ineffective procurement management must be investigated from the perspective of the nature of the project contract, stakeholders, and client benefit, as well as a theoretical and empirical review of related procurement factors on any project." According to Steinfort (2013), it is necessary to conduct a theoretical and empirical review of procurement-related factors and the impact of ineffective procurement management on project delivery in Rivers State, Nigeria.

2.1.1 Procurement

Procurement is the process by which goods, works, and services are acquired (Arrowsmith, 2010). Lysons and Farrington (2012) defined procurement as the process of acquiring goods, works, and/or services by purchasing, borrowing, or leasing. It includes all activities involved in establishing essential requirements, sourcing practices such as market research and vendor evaluation, and contract negotiation to ensure the management of external resources to achieve the organization's strategic objectives.

Van Weele (2006) defines procurement as obtaining from external sources all goods, services, capabilities, and knowledge required to run, maintain, and manage the company's primary and supporting activities at the best possible conditions.

However, Lipson (2016) defined procurement as a term used to indicate that the product input obtained will be used for fabrication processing or other business purposes. This definition suggests that procurement is concerned with industrial products intended for final consumption. Procurement entails identifying and purchasing known new and desirable goods and services, determining material requirements, equipment, component parts, and material sources, managing material in flow through the organization's stores, and eventually delivering materials to production or end users.

2.1.2 Categories of Procurement

1. **Goods:** This category of procurement involves commodities, raw material, machinery, equipment, vehicles, Plant, and other related services like transportation, insurance, installation, commissioning, training, and initial maintenance (Procurement Guide, 2016).

2. **Works:** This category of procurement refers to construction, repair, rehabilitation, demolition, restoration, maintenance of civil work, structures, and other related services like transportation, insurance, installation, commissioning, and training of user's department.

3. **Services (Contractual):** Services are of two kinds, namely Non-Consulting services and Consulting Services.

   - **Non-consulting Services**:

     Non-consulting Services are normally bided and contracted based on performance of measurable outputs, and for which performance standards can clearly be identified and consistently applied. Examples of non-consulting services are: drilling, aerial photography, satellite imagery, mapping, and similar operations.

   - **Consulting Services**:

     This embraces a range of services that are of an advisory or professional in nature and are provided by Consultants. These Services typically involves providing expert or strategic advice e.g., management consultants, policy consultants or communications consultants. Advisory and project related Consulting Services include: feasibility studies, project management, engineering services, finance and accounting services, training and development. (World Bank, 2018)

2.1.3 Procurement Strategies

In the Nigerian construction industry, as in many other regions, procurement strategies play a crucial role in ensuring the timely and cost-efficient completion of projects. According to

Umuhoza and An (2023), there are several systems that can be used in the procurement of construction works, and they can be summarized under certain sections based on the relationship and interaction between design and construction responsibilities. The first is the traditional approach. This system separates the designing and construction responsibilities, whereby the works are carried by different firms of designers and contractors. Owner direct force (ODF) and general contractors mostly known as design-bid-build (DBB) belong to this category. The second is the integrated system, or non-traditional (Inuwa, Wanyona & Diang'a, 2014; Mathonsi & Thwala, 2012; Babatunde *et al.,* 2010) which can be divided into package deal, turnkey and develop and construct.

According to Ogunsanmi (2013), different studies have confirmed the use of various types of procurement methods for project delivery in Nigeria. Ogunsanmi, (2013), further confirms the use of traditional, design and build, project management, construction management, labour only, direct labour and other types such as alliancing, partnering and joint ventures procurements in the Nigerian construction industry. The use of these procurement methods can significantly affect the performance of most projects. Although different procurement systems have their own advantages and disadvantages, some procurement system features can be very similar (Tang *et al.,* 2019). For example, all five chosen procurement systems involve team cooperation of various extents with DBB having the lowest level of team cooperation while IPD's team cooperation is the highest. The features of procurement systems like team cooperation are regarded as the procurement system variables. The traditional system has remained a popular procurement method used to deliver Rwandan construction projects till now and it is expected that it would probably continue to be the most dominant (Umuhoza & An, 2023).

These strategies can be broadly grouped into traditional and non-traditional methods, each with its variations and approaches aimed at tackling the unique challenges of the industry, including the prevalent issues of project delays and cost overruns. Here's an overview of some procurement strategies used in Nigeria.

2.1.3.1 Design and build procurement system (DBPS)

In DBPS, the responsibility of the design and the construction is on single organization. The client signs only one contract, thus this form is the most straightforward from the perspective of responsibility and communication (Onosakponome, Yahya, Rani & Shaikh, 2011). The organization in charge of the project will likely deliver the greatest performance benefits to the client through innovation, standardization and integrated supply chain. Furthermore, many surveys have established that clients perceive the design and build system as providing better value for money and giving rise to less disputes than other procurement systems, and the surveys also suggest that, an experienced client with a clear brief can use it satisfactorily with projects of most sizes.

The DBPS which is the integrated system, can be divided into package deal, turnkey and develop and construct. This method is a parallel or single responsibility procurement system, which combines the responsibilities of designing and constructing the project, as its name implies (Umuhoza & An, 2023). The DB option according to Inuwa *et al.*, (2014), is one of the procurement systems that have gained prominence in the construction industry, however, its application in Nigeria records high time and cost overrun.

Under this system, the client together with his/her consultants will prepare a tender or bidding document that include the project brief and client’s requirements and invite a number of contractors to bid. For the purpose of submitting tenders, the invited contractors will produce their own design, construction and cost proposal. Very often the successful contractor will into a

contract based on lump sum price and a fixed duration (Rashid, Taib, Ahmad, Nasid, Ali & Zainordin, 2006).

This type of system performs well as contractors are on also on-board during design, but they are not independent which may affect the project quality (Azhar *et al.*, 2014)

2.1.3.2 Design bid build procurement system (DBBPS)

The DBB method, as described by Kenyatta (2023), is considered the earliest approach and is sometimes referred to as traditional. One notable characteristic of this approach is separation between the design and the construction phases. The system is separated, and it uses a traditional approach. This system separates the designing and construction responsibilities, whereby the works are carried by different firms of designers and contractors ((Umuhoza & An, 2023). Owner direct force and general contractors mostly known as design-bid-build (DBB) belong to this category. The oil boom in Nigeria and the need for reconstruction and rehabilitation works to mend the havoc resulting from a fratricidal war that ended in 1970, ushered in the use of the design-bid-build (DBB) procurement system which is traditional into the Nigerian construction industry (Inuwa *et al.*, 2014). This system was also used by the National Housing Policy (NHP); a policy enacted into law in 1991 by the Nigerian government to provide decent housing accommodation at affordable cost for the country, in adherence to the campaign launched by the United Nation (UN) tagged 'Housing for All by the year 2000'. Though, the DBB method was later discovered to bring long delays in project conception and delivery thus leading to high project cost. Despite the criticism of the performance of DBB system in Nigeria, the system is still used by government establishments and some uninformed private clients.

Consequently, this system necessitates the establishment of two distinct contracts between the project owner and the involved teams. As a result, the DBB approach is often linked to several indications of underperformance, such as cost and schedule overruns, quality nonconformance,

and disagreements, mostly due to the absence of distinct role separations during the realization process (Kenyatta, 2023). Given the prevalence of payment dispute risks, it is imperative to investigate the influence of DBB associated practices on the occurrence of contractor payment risks. In terms of quality of projects delivered, this system is usually good due to presence of independent advisors and the expanded design phase (Azhar *et al.,* 2014).

2.1.3.3 Construction management procurement system (CMPS)

This is the management-oriented system, which is comprised of management contracting and construction management. This method integrates management with the design and construction of the project, and accordingly, the management of both design and construction is contracted out to a contractor who acts as a management consultant on behalf of the client (Umuhoza & An, 2023). Construction management is where the management service is provided by a fee-based consultant, a specialist construction manager or a contractor and where all construction contracts are directly agreed between the client and the trade (package) contractors. The following are the characteristics of construction management (Onosakponome *et al.,* 2011). The construction manager is appointed as a consultant during the initial stages of the project and has equal status to the members of the design teams. Reimbursement is made by means of a lump sum or percentage fee for management services. The physical construction of the project is carried out by works, or package, contractors who are employed by the client and coordinated, supervised and administered by the construction manager.

In a construction management approach, the main contractor is hired to manage, prepare a construction programme and facilitate the process between (as shown in figure 2.1) design and construction. The main contractor is there to simplify the relationship between the design team and the construction team, thus enabling a better outcome in terms of the project objectives and communication (Windapo, Adediran & Rotimi, Umeokafor, 2021).

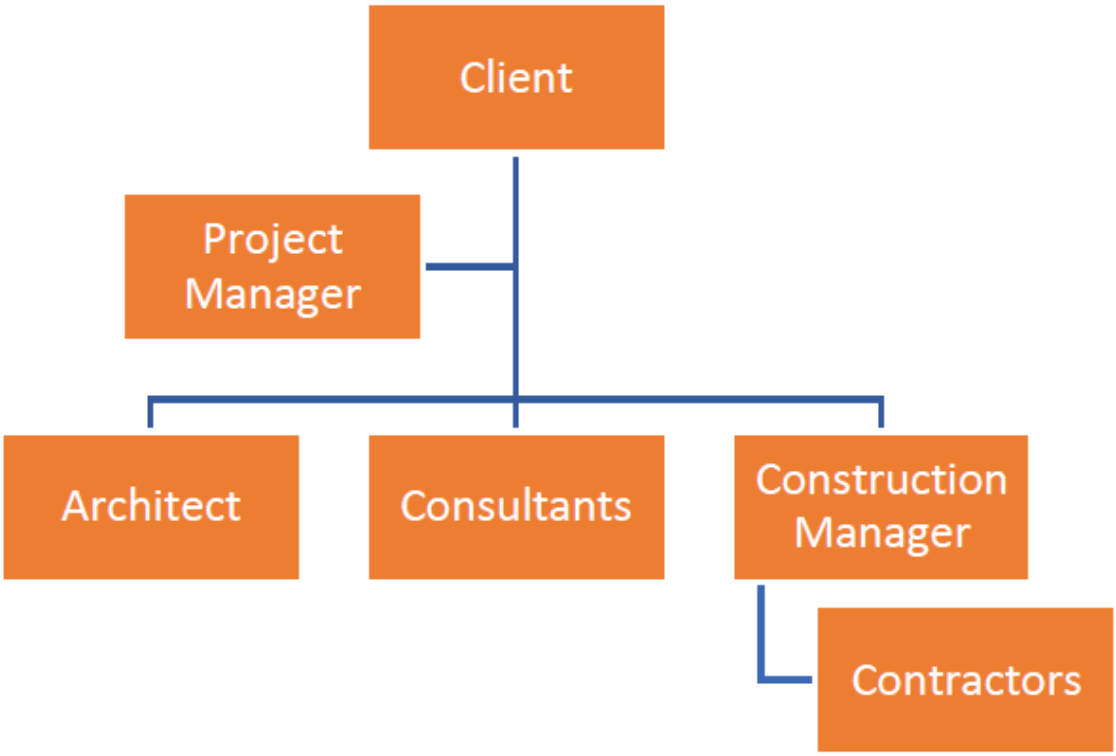

Figure 2.1: Construction Management Procurement

Source: Windapo *et al.*, (2021)

2.1.3.4 Construction Management

The construction industry makes a vital contribution to the social and economic development of every country and it is one of the backbones of the economy of many countries (Onosakponome *et al.,* 2011). Construction management is a discipline and management system specifically created to promote the successful execution of projects for project sponsors or clients. Moreover, construction project outcome may be measured in terms of time, cost and quality achieved and construction project owner decision impact these superlative value criteria, is that of selecting the appropriate procurement system and contractor.

At the same, the system also allows for early start of construction compared to the traditional approach. The preparation of simple or basic tender (bidding) document and the shift of the process of schematic and detail design to construction phase, allow for an early start of construction (Rashid *et al.,* 2006). As pointed earlier, under this system, the detail design (shop drawings) is carried out (either by the consultant or package contractors) during the construction stage. All these factors brought about a considerable reduction of the overall project time compared to the traditional or even design and build contracting systems. The cost of the project procured using this system tends to be lower than those using other procurement approach. This is because the cost of the project is actually the sum of prices quoted by the package contractors.

2.1.3.5 Management contracting procurement system (MCPS)

Management contracting is a process whereby an organization, normally construction based, is appointed to the professional team during the initial stages of a project to provide construction-management expertise under the direction of the contract administration. This procurement system is a fast track procurement option which overlaps the design and the construction stages and allows early elements of the construction process to be commenced before design has been completed. The management contractor employs and manages works contractors who carry out the actual construction of the project and he/she is reimbursed by means of a fee for his/her management services and payment of the actual prime cost of the construction (Onosakponome *et al.,* 2011). Moreover, the management contractor is engaged to manage the overall contract in return for a fee. The management contractor can therefore be appointed early in the design and can advise on buildability and programming. In addition to the contract with the management contractor, the contracts for the individual work packages are between the management contractor and the individual sub-contractors. The use of management contracting in Nigeria

(Inuwa *et al.,* 2014), spanned back to the era of the defunct Petroleum (Special) Trust Fund (PTF) mass rehabilitation of key public infrastructure across the country in 1994-1999.

As mentioned by Rashid *et al.,* (2006), earlier, the essence of this method of project procurement is that a contractor has the knowledge, experience and competency to better manage the design and construction of a project. It is a factor that allows for more efficient and effective coordination of works, materials, manpower and plants, thus making construction time shorter compared to other procurement systems. This is especially so, given the fact that the same management contractor is able to manage and contribute towards the development of the design. It allows the management contractor to improve buildability or constructability. With the management contractor being the consultant, no extra cost is being added up for main contractor's profit margin. The only additional cost is the consultant fee that the client has to pay to the management contractor or to the construction management consultant.

2.1.3.6 Procurement Management

Procurement management is a key component of project management. The procurement of construction project 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, airports, bridges, and stadiums etc for specific client. Onosakponome *et al.,* (2011) opined that "procurement management is the process to purchase or acquire the products, services or results needed from outside the project team to perform the work".

Akinradewo, Ojekunle and Ogunsemi (2020), stated that this method is used to describe procurement which involves a contractor providing management services. The two main variants of this are; management contracting and construction management, which are both very different approaches. In management contracting, the contractor provides management services to control

and coordinate all site activities, subletting works to suitable contractors on a competitive basis. In construction management, the client enters into separate contracts with the construction manager, designers, and trade contractors. They further stated that under a management-oriented procurement system, the management of the project is carried out by an organization working with the designer and other consultants to produce the designs and manage the physical operations which are carried out by contractors. When using systems within this category, the client will need to have greater involvement with the project than when employing any of the other methods.

2.1.3.7 Direct Labour Procurement Strategy

According to Inuwa *et al.,* (2014), direct labour, which is a traditional system, was mainly used during the colonial era all through the 1960s in the execution of construction projects in Nigeria and to date (Ibrahim, 2008), direct labour is still minimally used across the three tiers of government (Federal, States and Local government), primarily for maintenance and new works of minor nature. However, direct labour projects are said to be ineffectively managed resulting in cost and time overruns.

2.1.3.8 Alliancing procurement system (APS)

Project alliancing is a method of delivering major capital assets where the owner and nonowner participants work together as an integrated, collaborative team in good faith, acting with integrity and making unanimous, best-forproject decisions, managing all risks of project delivery jointly, and sharing the outcome of the project (Lahdenperä (2012). PA has its roots in industries other than construction. In 1992 British Petroleum launched a collaboration process for an oil project in the North Sea which is generally considered the start of the PA evolution. At the time, the arrangement was still based on parallel, individual, relatively standard commercial contracts with well-defined scopes of work and the alliance agreement was separate from the works contract.

Yet the risk and gain-share principle was involved in response to the need to discover an economically more efficient practice for the risky project which was then new. As a result of the positive experiences, the model was introduced in oil and gas projects in Australia in 1994 (KPMG, 1998; Australian Constructors Association, 1999; Sakal, 2005; Thomsen, 2006; Morwood *et al.*, 2008). The diffusion of awareness continued, and the model was widely adopted on the continent soon thereafter (see Manley, 2002; Ross, 2006) and the first PA construction project started in 1997 (KPMG, 1998; Ross, 2006; Morwood *et al.*, 2008). Naturally, the active use of PP (e.g. Manley, 2002) also contributed to the favorable attitude towards PA in Australia, where PP was introduced as a result of US influence (Stehbens *et al.*, 1999), before its launch in the UK (Tyler and Matthews, 1996; Hellard, 2002).

Project alliancing is typically used on larger and more complex projects, where there is a large amount of uncertainty so would be useful in an emergency situation. The size and duration of the project has to justify the investment in setting it up, both commercially and culturally (Masurier, Wilkinson & Shestakova, 2006). According to Raisbeck, Millie and Maher (2010), alliance contracting was developed in the early 1990s for high-risk Oil and Gas projects in the North Sea, in particular the Andrew Drilling Platform project, to create a more collaborative work environment, and share project risks more evenly among project teams.

According to Masurier *et al.,* (2006), trust in a strategic alliance also includes the concept of reciprocity, including a long-term focus, the acceptance that obligations are mutual, and room for adjustment if one partner is suddenly placed in a compromising position. The principles of successful strategic alliances include– trust, commitment, interdependence, cooperation, communication and joint problem solving – reflect a similar theme. Therefore, analysis of alliancing shows that there are core principles that are regarded as fundamental for alliance relationships which can be defined as:

Collective ownership of all risks associated with the delivery of the project.

Sharing of the ‘pain’ or ‘gain’ depending on how actual project outcomes compare with the pre-agreed targets which have been jointly committed to.

- All participants operate at same level and have an equal say.
- Decision making based on condition that is “best-for-project.
- Responsibilities are clearly defined and parties respect and support rather than blame each other.
- All parties have full access to the resources, skills and expertise of each other.
- All financial transactions are based on an ‘open-book’ concept.
- Innovative thinking is encouraged with a commitment to achieve outstanding outcomes.
- Visible and unconditional support from the top level of each participating organization.
- Open and honest communication with no hidden agendas.

2.1.3.9 Partnering procurement system (PPS)

Project partnering is not easy to define, since researchers have been unable to develop a widely accepted description of project partnering (Nevstad, Madsen, Eskerod, Aarseth, Karlsen & Andersen, 2021). While a definition of partnering that includes a list of success elements, such as collaboration, trust, openness, and mutual respect, other authors have emphasized that a partnering definition cannot be separated from the presented elements. Partnering in contracting is actually a commitment between the contracting organizations mainly (clients and contractors) to avoid adversarial and cooperate with each other in order to achieve their common business objectives (Khan, Gul & Shah, 2011). According to Inuwa *et al.*, (2014), partnering which is a discretionary procurement system has also evolved in Nigeria. All the studies reviewed elicited vital information on the application of procurement systems and their performances in the NCI, yet, none of the studies focused entirely on NICs’ involvement and performances in construction

procurement systems in the NCI. Concerning its benefits, partnering is often presented as an opportunity to increase productivity and quality, reduce transaction costs and project times, improve customer satisfaction and stability (Crespin-Mazet, Havenvid & Linné, 2015), facilitate joint risk management and allocation, reduce disputes and enhance learning. However, these benefits can only be achieved if partnering is applied in the "right situations for the right reasons".

Over years, partnering seems to have found an echo in managerial practice and is becoming widely applied within the construction industries of the United States, the United Kingdom, Australia, and Hong Kong. In contrast, it still remains in its infancy in other countries such as East-Asia, Africa and several European countries such as Sweden, Norway and France where partnering projects are frequently recorded but fail at being adopted on a larger scale (Crespin-Mazet & Portier, 2010).

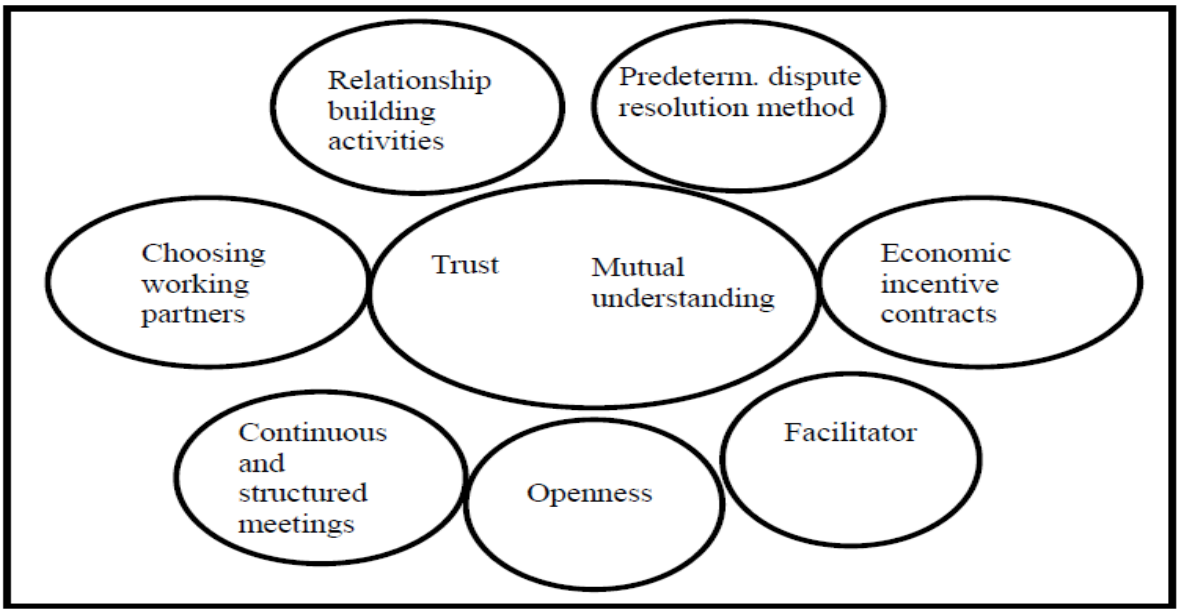

Figure 2.2: Partnering Flower

Source: Nyström (2005)

The resulting analysis of the partnering concept can be described as a "flower", (Nyström, 2005; figure 2.2) where the centre contains the two common components to all partnering designs. The rest of the components mentioned in the literature can be seen as petals. Something is then to be called partnering if it firstly contains the two centre components and secondly some of the petals, but there is no specific petals or set of petals that they must contain. Adding different sets leads to different variants of partnering. The flower as an entirety can be seen as the base for describing the whole "family" of all partnering variants.

2.1.3.10 Integrated project delivery procurement system (IPDPS)

The Integrated Project Delivery (IPD) method is one of the latest project delivery systems introduced to the construction industry (Buk'hail & Al-Sabah, 2022). The American Institute of Architects, AIA California Council (2007), has defined IPD as a ''project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication, and construction." AIA has also provided many educational contents on the IPD system, including a handful of guides and case studies published in this regard.

IPD differs from the existing project delivery systems in two critical aspects: the existence of a single multi-party contract that joins all key project stakeholders and the early involvement of key project stakeholders, where most parties join the project before the design even starts. Studies have shown that IPD projects have either met, exceeded, or significantly exceeded their owner's expectations. It has been concluded that IPD has better schedule predictability and cost and budget control, and its overall delivery provides a significantly higher value than other project delivery systems.

Aligned to Agile Project Management principles, IPD is mainly based on collaboration and trust, this trust-based collaboration enhances parties to be more focused on project outcomes rather than their own benefits (De Marco & Karzouna, 2018). Without it, IPD will fail and participants will be in an antagonist relationship, which is one of the main factors that ruins construction project value today. IPD has a promising outcome, if the participants understand their missions and perform it in a collaborative way.

In order for a project team to implement IPD efficiently, certain technologies and collaboration and automation capabilities are required. Azhar, Kang and Ahmad (2014) enlisted the essential capabilities as: modelling of design intent, multi-disciplinary performance analysis, building geometry data, merged with construction site data, and delivery of as-constructed facility model; 4D visualization; virtual prototyping; transparent interoperable and reliable data transfer with third party applications; automated propagation of changes and integrity checking, and computer aided manufacturing and assembly. This requires open system architectures, sharing, and coordination of data between the project team members. The utilization of appropriate technologies is not limited to integrate different parties but also fostering of sharing information and encourages effective communication such as Building Information Modelling (BIM) (Yee, Saar, Yusof, Chuing, & Chong, 2017). Although IPD can be achieved without the BIM applications, but it is positive that BIM is one of the key factors to accomplish the integration required by IPD effectively.

With the above in mind, IPD as a delivery method, is largely promoted for its potential in integration with BIM on construction projects (Elghaish, Abrishami, Hosseini, Abu-Samra & Gaterell, 2019). Coupling BIM with IPD is proven to improve efficiency, reduce errors, enable exploring alternative approaches, as well as expanding market opportunities on projects. In fact, “the full potential benefits of IPD and BIM are achieved only when they are used together”.

Therefore, control of construction on IPD projects can rely on data-rich BIM models, with a focus on exploiting BIM in integrating information flows. Such combined use of IPD and BIM makes sense from a theoretical perspective, but in reality, it faces substantial roadblocks. To date, however, BIM-based project control activities have largely relied on automated site data collection tools that use various methods, like spatial sensing technologies, linking between 3D BIM model and performed works, etc. Despite the undeniable advantages, these methods almost entirely measure physical items and components on construction sites, overlooking the value of activities. There are also problems with sharing of acquired control information across the entire project, given that project team members are still dominated by silo thinking, and information systems loosely coupled. An automated process that integrates information of physical components with managerial attributes (such as allocated resources and values), to facilitate controlling cost-time integrated progress can, therefore, provide a solution.

As such, the cost management system under IPD must be one of dynamically integrated, and capable of avoiding any waste of cost information throughout all project stages. The cost structure applied for IPD must ensure that there is no hidden profit in the estimated cost and achieve the purpose of fostering trust among project parties. Any inaccuracy in data handling and usage – influencing determining the individual trade package – will affect the value of the proportions of profit-at-risk percentage of each member in IPD team.

Another study by Nguyen and Akhavian (2019) showed that BIM utilization enables collaborative lean construction exercises extensively; in fact, BIM users experience leaner procedures by minimizing waste and maximizing value and are more able to deal with potentially complex conflicts and threats to project success. In a theoretical approach to analyze the collaboration between IPD and BIM, they opined that these two elements can lead to a comprehensive scheme that establishes meaningful and predictable relationships between the

time constraint, processes, and products. The aforementioned suggests that past efforts using qualitative analyses supports the mixed use of IPD, lean practices, and BIM in improving project performance.

The most essential principles of IPD includes; Multi-party Contract; Liability Waivers; Building Information Modeling; Shared Risk & Reward; Fiscal Transparency; Collaborative Team and No Hierarchical Structure (Buk'hail & Al-Sabah, 2022).

2.1.3.11 Public private partnership procurement system (PPPPS)

Akinradewo *et al.,* (2020) reiterated, the public-private partnership (PPP) procurement method involves two or more organizations working together to improve performance through agreeing on mutual objectives, devising a way for resolving any disputes, and committing themselves to continuous improvement, measuring progress, and sharing gains and pains. Examples include framework agreements and joint ventures. It is more commonly seen within large civil engineering projects, than individual building projects.

In the PPP procurement method, quantity surveyors play an integral role by providing a wide range of services, which include contractual issues; it also offers quantity surveyors an opportunity to act as independent advisors within the system.

The principles of this method include a decision-making process, mutual objectives, and an overall improvement in performance. Partnership forms are typically used for highly complex projects. A detailed description of their characteristics and the conditions for using such forms of collaborative arrangement can be found in Project Alliance Practitioners Guide (Larmour, 2011).

2.1.3.12 Lump-sum Contract procurement system (LCPS)

The fixed price, also known as the lump sum contract, emphasizes an approach in which the product price is assumed to be fully determined prior to construction (Kenyatta, 2023). In such circumstances, the fixed price mechanism is appropriate because it can effectively coordinate the

interactions between producers/sellers and their buyers. However, it contrasts with the interactions associated with the construction project procurement, particularly under the DBB option. Consequently, such conditions allow the owner to shift the responsibility for cost variations to the contractors. Thus, it is essential to identify and analyze how such vulnerabilities contribute to payment risks. Studies for instance, illustrate how the paths between risk causes and their triggers represent the channels for conveying a win or loss strategy. Winning in such strategies implies that the other player will lose. Since the fixed price is a central component of the DBB procurement system, its prevalence among owners and their agents indicates its capacity to generate benefits for one of the parties. In the DBB option, the formulation of procurement components excludes contractors. Consequently, their design is anticipated to provide benefits to owners rather than contractors. In fact, it was demonstrated that disputes over liability for cost variations were linked to payment defaults to contractors. Studies also demonstrated how some payment defaults by the owner reflect strategies for shifting liability for variations to contractors. The ability to transfer cost variation risks makes the fixed price mechanism a crucial component of the DBB option, which explains why it is the most preferred.

Akinradewo *et al.,* (2020) stated that contractor undertakes to carry out a defined amount of work in return for an agreed sum. This can be a fixed amount not subject to recalculation, in which case there would be no opportunity for the employer to make variations. They further stated that lump sum contracts with quantities are priced based on drawings and a firm bill of quantities. Items that cannot be accurately quantified can be recovered by an approximate quantity or a provisional sum, but these should be kept to a minimum. Lump-sum contracts, without quantities, are priced based on drawings and another document. This may simply be a specification of a descriptive kind, in which case the lump sum will not be itemized, or one that is detailed to the extent that the contract sum is the total of the price-able items.

2.1.3.13 Cost reimbursement contract procurement system (CRCPS)

Akinradewo *et al.,* (2020) demonstrated that this type of contract is sometimes referred to as "cost-plus" contracts. The contractor undertakes to carry out an indeterminate amount of work on the basis that they are paid the prime or actual cost of labour, plant, and materials. Besides, the contractor receives an agreed fee to cover management, overheads, and profit. Hybrids of the cost reimbursement contracts include Cost-plus percentage fee; Cost plus fixed fee; Cost-plus fluctuating fee.

2.1.4 Reasons for Delayed Procurement

Although not negating the fact that procurement is a veritable tool for successful project delivery, Jorge Lynch. 2015, did advance that public procurement process is often timely delayed for different reasons. Such delays may damage the integrity of the entity and the process leading to waste of public resources; additionally, contracts are not awarded on time and these results in poor delivery of public goods and services. Below are the commonly observed delays in the public procurement process;

1. Delay in Preparing Technical Specifications, Scope of Work or Terms of Reference
2. Failure to Start the Procurement Process on Time
3. Extension of Bid or Proposal Submission Date
4. Delay in Opening Bids or Proposals Received
5. Delay in Starting or Finishing the Evaluation Process
6. Delays during the Approval Process
7. Delay in Contract Negotiations
8. A Contractor, Supplier or Service Provider Challenges the Procurement Process.

2.1.4.1 Procurement Related Factors

A number of researchers identified the importance of successful procurement factors and their level of impact on prompt project delivery and have warned that the inability to consider them will have negative effect on the success level of project implementation (Pocock, Liu & Tang, 2017; Walker, 2007; Kumaraswamy & Chan, 2009; Walker, 2000). Kumaraswanmy and Chan (2009) therefore define the scope of procurement as the frame work within which production is brought about, acquired or obtained. Quality performance has been considered as a function of procurement method adopted during the production process. Those procedures comprise the concept of procurement projects and the method of tendering. The fact that no two procurement projects are identical results in the complex nature of the project organization which places a great dependence on the project team in setting up the procurement process and bringing the project to successful conclusion (Davenpord, 2015).

Previous studies of according to Ogunsanmi (2013), different procurement related factors that can affect project performance. The study considered preconstruction time, control of project design and cost and client's control of construction projects are procurement related factors whose influences were found on procurement methods of Traditional, Design and Build and Management Contracting, integrated project delivery (IPD).

To ensure success, the selection of the appropriate organization for the procurement functions require early and particular attention. Therefore, two attributes are used to measure this factor; according to Femi (2015), they are procurement method (selection of the organization for the implementation of the tasks) and tendering method (procedures adopted for the selection of the project team and in particular the main contractor).

In most literature, there seems to be consensus that the procurement method and contractual arrangements have a major impact on the success or failure of a project. Bennet and Grice, (2012) argued that the procurement method helps in selecting the leader of the project, as well as the rest of the professional team to be utilized on the project. The choice of an appropriate procurement method is crucial to the success of projects. The choice of a procurement method offers the following benefits:

a. Establishes the roles and relationships which make up the project organization.

b. Considers the amount of risk the client is prepared to accept

c. Establishes the overall management structure of the project

d. Helps shape the overall values and style of the project.

However, the following factors have been hindering the realization of effective procurement management that will guaranty successful project delivery according to various related authors:

2.1.4.2 Infrastructural Development

The movement of goods to points where they are actually needed is important to our economic system. The problems faced by suppliers to get materials from one place to another, during fuel crisis, bad road infrastructure, poor communication network, epileptic power supply, to mention but a few, have made procurement management uncertain thereby affecting effective project management. Okeke (2016) posited that the level of governance and their policies on infrastructural development has been a cog in the wheel of progress for most project managers in Nigeria. However, effective infrastructural development is critical for effective procurement management. This will enable project materials and personnel to be available at the right place

and at the right time for end users. It clearly shows the importance of the movement, storage and availability of products or services as a key part of procurement function.

2.1.4.3 Management Style

There is no doubt that the nature of management setup has significant effect on procurement management and projects success. Unfortunately, corruption and insincerity have always influence management decision for self-aggrandizement. The return to the management staff in charge of procurement negatively affect the award of contract to the wrong contractors at the detriment of project delivery. Meanwhile, Chizea (2002) averred that management should be made in such a manner that allows free flow of information to the personnel involved in procurement and project activities in order to select the appropriate vendor that will be effective in delivery materials for contract execution.

2.1.4.4 Skilled Personnel

Procurement requires skilled personnel to manage it for effectiveness and efficiency. However, most personnel saddled with procurement function lack the basic skills for effective management of procurement activities, hence projects suffer. Fubara (2015) is of the view that incompetent personnel contribute a lot to the problem of procurement in project implementation. Base on this, competent and skilled manpower are critical to effective procurement management since procurement involve a lot of activities that requires expertise. Unfortunately, this is not in most procurement organizations in Nigeria.

2.1.4.5 Changes in Government Regulations

Instability in Government policies has been an ill-wind that blows no one any good. Most government regulation are made to favor the ruling class at the detriment of the society. Essien

(2017) lamented that the nature of policies formulated by the government most times affects economic variables like interest rate, price of construction materials, transportation cost, etc. thereby making the procurement roles difficult. The resultant effect is a failure in project execution due to unpredictable occurrence in the economy which may affect procurement and successful project delivery.

2.1.4.6 Environmental Factors

Environmental related factors like heavy rainfall, hurricane, etc, create a lot of problem for prompt delivery of project materials. This no doubt does not go well with successful project delivery. Rivers State and its terrain have not really favored in effective procurement. This have also crippled the pace of project delivery in the area. Many authors like Obidan (2009) and Onyeulo (2013), have studied the environmental challenges faced by contractors and suppliers involved in procurement and project management and conclude that project managers should pay more attention on environmental forecast to assist them in their activities for economic development.

2.1.5 Procurement as a Key to Successful Project Implementation

Cherema (2016) also discussed how critical procurement is to the success of any project. He maintained that, as early as possible, after a project has been scoped, critical items of equipment or materials with long lead time must be identified and incorporated into the project schedule. When design has progressed appreciably and details of the critical items of equipment are known, they should be quantified, specified and acquired through vendors and suppliers. Cherema warned that, if any of the items considered to be very critical are extra – ordinarily expensive, for example, compressor, pump or crane, expenditure should be assigned to

specifically monitor their progress and report regularly to the project manager. This, he said, is because vendors tend to take on more procurement work than their scope can handle. Consequently, more attention is given to the purchaser who demonstrates that the equipment should be fabricated, inspected, tested, tagged, packaged and dispatched to arrive when and where scheduled.

Everything necessary should therefore, be done to ensure that this happens. If a critical equipment does not arrive on time, this may lead to uneconomic use of labour and construction equipment at the site which may translate into additional costs and schedule over – runs for the owner.

2.1.6 Process of Procurement Management

A guide to the Project Management Book of knowledge (2017) defines project procurement management to include the processes required to acquire goods and services to attain project scope from outside the performing organization. Dobbler (2010) sees procurement as a concept that encompasses a wider range of supply activities such as materials specification, value analysis, supply, market research, negotiation, buying activities or purchasing, contract administration, quality assurance and transfer of goods to end users. It implies that procurement management could be complex and interdependence, therefore requires skilled manpower capable of managing these activities and ensure prompt delivery.

Procurement is concerned with effective and efficient procurement of parts, materials and services from outside the organization. This means selecting, approving and dealing with the supplier, negotiating price and resolving quality problems and ensuring adequate capacity.

Femi (2015) posited that procurement management function is responsible for obtaining purchase, lease, or other legal means, equipment, materials and services required by an

organization for use in production of goods and services. He defined the supplier as one who is at all times honest and fair in his dealing with customers, his own employees and himself, who has adequate facilities and technical know-how to be able to provide materials that meet the purchaser's specifications in the quantities received and at the time promised, whose financial position is sound, whose price is reasonable both to the buyer and to himself, whose management policies are progressive, who is alert to the need for continued improvement in both his product and manufacturing processes and who realizes that his own interest are best served when he best serves his customers. Firms most times find out that relationship with suppliers will bring them resources, facilities investments and equipment, which would not otherwise, be available to a project utilizing its own limited company assets. This addition of suppliers to a project will often reduce the risk of a new or existing venture buy sharing the cost of the venture and enhancing the chances of success.

It is a known fact that one of the most judiciously guarded functions in any company is the ability to place orders (legal agreements) to buy something. According to Davenport (2015), this practice is called a procurement delegation of authority" to buy and such procurement delegation of authority comes straight from the top person i.e. managing director or general manager of any company and such delegations will topically go to someone carrying a title of procurement officer/manger, supply manager or vice president of procurement.

Project Management Institute (2000) breaks the project procurement management into a distinct process which begins at the start of new project and including the make or buy analysis, procurement management plan, solicitation documentation (Request for proposal), formal proposal from sellers, evaluating proposals, insurance of contract award to a seller, managing the

seller performance and changes to seller authorized scope and finally setting all open contractual issues and closing out each procurement.

2.1.7 Categories of Procurement Management

Not all project procurements are created equal, some purchases are big, others small. Some are complex, while others are routine, some procurement carry high risks while others have only minimal or perhaps no risk at all. Some procurements require a major long-term commitment from both the buyer and the seller while other commodities are immediately available for purchase in the open market, including online or e-commerce buys.

It is a good practice to place all procurement into categories to be able to manage project procurements differently according to their complexity, their risks and their unique characteristics. Many project purchases are routine and simply require that someone track the orders to make sure that the commodities arrive in time to support the project schedule and are inspected to make sure that they work and meet all quality standards (Femi, 2015). However, some procurements because of their characteristics require the management oversight because they are initial to the success of the project and no one individual can adequately manage them due to their complexity.

According to Femi (2015), such grouping of project procurement creates three categories, namely:

a. **Major (High risk) complexity procurements;** These procurements are the most challenging purchase for any project to manage by their nature. They typically represent high risks to the projects' technical quality cost and schedule. They often require the creation of something new by a seller, something that does not already exist. In order to

be managed properly, these items require that the project specify precisely what it needs typically taking the form of specifications, drawings and often includes a comprehensive statement of work.

As such, Lipson (2016) added that such procurements will often result in a long-term relationship being created between a company (project buyer) and a supplier (seller) where significant development and capital expenses may have to be incurred by the company or the supplier or both. Once the relationship is set between buyer and seller, further competition is often waved as long as the quality remains high and the seller's pricing seems reasonable to the participants. Then each identification of these procurements will be critical to any project in order to adequately plan and organize for them. These procurements must be managed well for the success of the project.

b. **Minor (low risk) complexity procurements**: These procurements are for items which exist in some form with a given seller and are defined by the seller's own product specification. They are commercially available from the seller either in the seller's inventory or sometimes assembled after an order is received. In terms of risk, these items will normally carry a lower risk as long as they arrive in time to support the project master schedule and of course the work.

However, comparable performance items may sometimes be substituted as long as they satisfy the same requirements of the project. Early identification of these purchase is important in order to properly schedule lead-times for each item and to budget the necessary funds for them.

c. **Routine buys of commercial off–the shelf (COTS) items or purchased services**. Some project may actually purchase substantial amount of materials, but such procurements are

often commercially available as “off-the shelf” articles or routine services. In these cases, the fundamental principle of basic purchasing will be more applicable than a requirement to manage complicated contracts or subcontracts as critical subprojects. The early identification of these procurements is typically not vital to the success of the project, that is, they can be identified in inter phase and generally not cause difficulties to the project. These commodities will often have interchangeable (substitute) components.

There are also two other special procurement relationships, based on the work of Pocock *et al*. (2017) worthy of mention as follows:

(i) **Special procurements done under corporate teaming arrangements;** Here the executives of the company and another company (or companies) agree to combine their assets, facilities, people shared risks, etc. and go after a new segment of hard, typically in the form of some new project.

(ii) **Special procurements to other segments of the projects company typically called interdivisional work**. The significance of interdivisional work sometimes also called intercompany work is that such procurements should be the easiest arrangement to manage.

At this point, it is imperative to review the objectives and policies of procurement management.

2.1.8 Project Procurement Objectives and Policies

There are many objectives of procurement both to a firm and project execution. However, Dobbler, (2010) outlines some of the basic objectives of procurement as follows:

a. To support project operations with an uninterrupted flow of materials and services.

b. To buy competitively, keeping abreast with demand that regulate prices and availability of materials in the market place.

c. To buy wisely which involves a continual search for better values at the right price, quality and quantity?

d. To develop reliable and effective source of supply.

e. To develop good relationships with the vendor community and good suppliers.

f. To administer the purchasing and materials management function in a professional cost-effective manner.

After the fundamental objectives of an activity are established, policies are developed to serve as general guidelines in making decision that channel actions towards achievement of objectives (Davenpord, 2015). These policies however, lie close to the heart of the procurement and material management function get their influence to permeates the entire project operations.

2.1.9 Role of Procurement

The role of procurement is broader than its traditional role of merely making routine purchase, procurement contributes to the long-term plans and policies of the organization. Goeff (2014) lectures that procurement has become more involved in strategic decision and procurement operations cuts across all departmental line within the organization.

According to him, the roles of procurement include the following:

i. **Consumerism Role**: This involves the protection of consumers or end users. It assists in the rectification of problems and return of faulty or poor-quality products if and when the need arises.

ii. **Safety Role**: The Procurement unit ensures that new products and materials purchased are in compliance with specification.

iii. **Organization and corporate image role:** Every organization is highly interested in protecting its image and reputation. Therefore, procurement activities are conducted upon a strong foundation of honesty, integrity and fairness to all its customers.

iv. **Socio-economic Role**: The socio-economic problems of any nation cannot be overlooked. Therefore, top management have in recent times urged procurement personnel to assume a new service role by contributing solutions to the social economic problems of the nation. Business advice and professional assistance should be given to disadvantaged groups and minority entrepreneurs in addition to awarding contracts.

v. **Advisory Role:** Skilled procurement personnel are of great assistance to any organization. Apart from the day to day purchasing activities, services such as obtaining technical information on specifications, prices, expediting orders as well as conducting vendor snookers and analysis contain useful procurement efforts and services, advising management on certain value issues that are not directly measurable in monetary terms.

2.1.10 Procurement Project Management and its Functional Relationship

The various departments in a project organization operate within as a system, all working towards a common goal and the achievement of organizational corporate goal and objectives. Procurement forms an integral part of this unified whole and is at the center of the business ‘activities (Bailey, 2013). Procurement project management operations cut across all departmental lines and its realm of relations include engineering sales, production supply, purchasing and distribution among others.

a. **Procurement and Engineering:** Procurement and engineering like production is greatly influenced by the amount of procurement time. Engineering is usually responsible for preparing the technical specifications for a company's product and therefore for a good and effective design, engineering sources for assistance from the procurement and production units.

However, procurement function may interfere with or alter the engineering requirement just as engineering is expected to be flexible in cognizance of the market conditions as well as forces of supply and demand (Bailey, 2013).

b. **Procurement and Sales**: According to Ekpo (2002), no company can stay in business for a long time unless its products can be sold at a profit, hence the procurement department assists the sales department to buy at low costs so that the company can maintain a competitive selling position. At the same time, the sales department can assist the procurement department to schedule its purchases effectively by appraising her sales quota and sales expectations. The sales department can be particularly helpful in giving the procurement department as much information as possible during negotiations with customers to avoid 'incidences of out of stock.

c. **Procurement and Finance:** The relationship of the procurement functions with finance functions differs from its relationship with engineering and sales. According to Stevens (2018), the relationship between procurement and finance department has to do with the fact that cost determinants cannot be hidden in the purchasing finance relationship as they can in other relationships. The importance of good financial planning is paramount for the success of the project. Proper planning of its working capital and cash flow positions need an accurate sales forecasts and accurate procurement schedules. It is just as

important for procurement to inform finance unit of charges in its schedule as it is to inform production and sales of these charges.

2.1.11 General Procurement Procedures

Dobbler (2010) defines the procurement procedure as that which outlines in detail the specific actions to be taken to accomplish a given task within the guidelines of any applicable policies i.e. it establishes the way of doing things. If procurement department buys various types of materials with varied procedures, this is not standardized and will typically affect the company in the long run. The following steps constitute the typical procurement cycle.

a. Recognize define and describe the need.

b. Transmit the need

c. Conduct a research and select the supplier

d. Prepare and issue the purchase order (PO)

e. Follow-up the order including expending and re-expediting

f. Inspect, certify and receive the materials

g. Close the orders.

Once a need has been identified and functionally described, procurement research and analysis is conducted. This research and analysis also provide the following information as appropriate;

i. the availability of required products

ii. The terms conditions and price

iii. Any applicable trade provisions or restrictions or controlling laws

iv. The performance characteristics and quality of available products including quality controls test procedures followed by the manufactures.

v. Cost Implication or other problems associated with integration of the item with those currently used

vi. Industry production practices, such as continuous periodic or batch production.

vii. The distribution and support capabilities of potential supplies. If a suitable commercial production is unavailable at a reasonable price, an alternative or substitute could be determined.

In addition, an organization must have a procurement business strategy which defines a unified, comprehensive and integrated plan that relates the activities of the firm to the challenges of the environment and that is defined to ensure that the basic objectives of the enterprise are achieved through proper execution by the organization. Thus, procurement business strategy moves a company into a changing era which focuses from design through acquisition and supply to monitoring the performance of materials and services.

2.1.12 Monitoring and Controlling Supplier Performance and Project Progress

Suppliers are responsible for the timely and satisfactory performance of their contracts. Unfortunately, a buyer cannot rely entirely on the supplier to ensure that work is progressing as scheduled and that delivery will be as specified. Poor performance or late deliveries disrupt project activities and result in project failure. According to Stevens (2018), project procurement management must monitor supplier progress closely to ensure that desired materials are delivered

on time. This method of monitoring depends on lead time or period of performance and urgency of the order. When evaluating a supplier's progress, the buyer is interested in actual progress towards project work completion. Data about progress may be obtained from a variety of sources such as procurement progress conferences, field visits to the suppliers' location and periodic progress reports by the supplies.

Many progressive project or buying organizations monitor their major supplier's performance to ensure satisfaction. After the supplier selection, subsequent development of buyer supplier relationship is important to monitor and assess the supplier's overall performance. The purpose, according to Lipson (2016), is to enhance relationship and performance. In his research "Evaluation of supplier performance" the national association of purchasing management investigated three types of evaluation plans which include;

a. **Categorical plan**: under this plan, personnel from various departments of the vendor's firm maintain informal evaluation records. These individuals are drawn from procurement, engineering, quality assurance, accounting, and warehouse units

b. **The weighted plant plan**: under this plan, the performance factors are evaluated such as quality, service and price are given "weights" the weights selected in any specific situation represent buyer judgment concerning the relative importance of the respective factions.

c. **Cost Ratio Plan**: This plan evaluates supplier's performance by using the tools of standard cost analysis that businessmen additionally use to evaluate a wide variety of business operation. When using this plan, the buying firm identifies the additional costs it

incurs when transacting business with a given supplier. These are separated as costs associated with the quality service and price elements or supplier performance.

2.1.13 Sources of Suppliers

To produce the best products, world-wide organization need more than ideas, designs and specifications. They need to choose the very best suppliers. Selection and management of the right supplier is the key to obtaining the desired level of quality, on time and at the right price and the necessary level of technical support. Buyers must take six important supplier-oriented actions in order to satisfy this responsibility according to Femi (2015). They must:

a. Develop and maintain a supplier base
b. Address the appropriate strategic and technical issues.
c. Ensure that potential suppliers are carefully evaluated.
d. Decide whether to use competitive bidding or negotiation as the basis of selection
e. Select the appropriate source responsible for this task who will be asked to sign a standard contract.
f. Manage the selected supplier to ensure timely delivery of the required quality at the right price.

After developing a comprehensive list of potential suppliers, the buyer's next step is to evaluate each prospective supplier individually. By a process of elimination, a selected list of potential suppliers is developed with whom the buying company may transact business. However, Chizea

(2002) posited that the supplier list should be comprehensive enough to bring to bearing every type of competition desired.

A goods supplier is therefore one who could be said to be honest and fair in his dealing with the customers, his own employees and himself. Someone who has adequate plant facilities and technical know-how, someone who can provide materials which meet the purchaser's specification in the quantities required and at the stipulated time. He has to be someone with sound financial position; whose price are reasonable both to the buyer and to himself, whose management policies are progressive. He is also alert to the need for continued improvement, and who realizes that in the final analysis his own interests are protected when he renders good services to his customers (Femi, 2015).

2.2 Theoretical Review

This study is based on institutional theories made by Meyer and Rowan, DiMaggio and Powell, the institutional theorists state that the theory is a socio-political and traditional approach where the institutional environment can strongly influence (often more than market pressures) the development of formal structures in an organization. (DiMaggio & Powell, 1983; Meyer & Rowan, 1977).

Meyer and Rowan further in their study maintained that institutions adopt prevalent structures or systems in their environment in order for the organization to attain or maintain acceptability in the institutional environment such as job specification, work method and process, and organizational structures and roles (Meyer & Rowan, 1977). Firms are always under the institutional pressure to adopt strategies that enhance and standardize their performance in a competitive environment and this coercive pressure may arise from legal requirements, influence

from other similar or interdependent firms or the need to attain operational excellence and competitive advantage in the market (DiMaggio & Powell, 1983).

However, Kezner (2003) added that a successful project implementation occurs if the project, comes on-time, on-budget, achieves all the goals originally set for it, and is adopted and used by the clients for whom the project is intended. It implies the successful achievement of time, cost and quality objectives, as well as the quality of the project process, and this can be achieved with the aid of effective procurement management in the institution.

2.2.1 Transaction Cost Economics Theory

Transaction Cost Economics (TCE) by Williamson (1975, 1985) classifies contracting into three types classical, neo-classical, and relational contracting (Khan *et al.,* 2011). Classical and relational contracting are two extremes. The classical contracting is one, which is used for discrete transactions and does not need special provisions in the contract as the contracts in here are standardized with predetermined penalties in case of non-conformance. Whereas, transactions that involve specific investments should recourse to relational contracting (RC) which helps in the development of trust among inter-organizations. Trust has a number of benefits for the contracting parties; it lowers the transactions costs through mutual risk sharing during the life of the project. The modern form of relational contracting is in the form of partnering, alliancing, joint ventures, etc.

TCE is usually traced back to Coase (1937), whose insights on transaction costs became relevant almost 40 years later thanks to Williamson's pioneering work (Williamson 1975). Williamson's work paved the way for a wide body of theories based on the concept of transaction costs, such as transaction cost economics (Williamson 1981). Transaction costs are simply the costs of conducting any exchange, such as those taking place between firms in a marketplace or a transfer

of resources between the stages of a vertically integrated firm. Transaction costs are usually divided into three main groups: information costs, negotiation costs, and monitoring costs. Williamson identified three groups of parameters or dimensions related to TCE: behavioural assumptions, governance mechanisms, and transaction dimensions (Carter & Hodgson 2006).

Transaction cost theory has been used to address many issues related to strategic alliances, including commitment (Young-Ybarra & Wiersema, 1999) and stability. Partners within strategic alliances are assumed to have the potential for opportunistic behavior. Transaction cost economists have recognized the proliferation of these intermediate governance structures and suggest that they are maintained by economic weapons such as hostages and other credible economic commitments. The effect of such economic commitments is to create a locked-in condition which in turn promotes behaviors that ensure the continuance and "mutual forbearance" of the partnership.

TCE offers a very rational view for evaluating make versus buy decisions, where the sourcing choice is made strictly based on the economic merits of market versus hierarchy costs associated with each individual sourcing transaction (Shook, Adams, Ketchen Jr, & Craighead, 2009). Beyond individual sourcing transactions, firms should consider and manage transactions from a holistic perspective. In such cases, the level of analysis implied by TCE moves from the individual transaction to the network of sourcing transactions at the organizational level, with firms making sourcing decisions that maximizes the economic value added from interactions with sourcing partners. The overall value of these sourcing interactions includes the minimization of economic costs incurred from managing a nexus of sourcing transactions, as well as maximizing the value of network connections and other knowledge gained from sourcing relationships and transactions.

The premise of transaction cost theory is that in a perfectly efficient world, all business would be conducted in the market, that is, external to the firm. Three variables determine the decision to produce internally or externally (Tate, Dooley & Ellram, 2011):

(1) specificity of assets to support the transaction, which increases dependence on the supplier and increases risk and the potential for opportunism;

(2) uncertainty in the requirements of the firm, and uncertainty in assessing whether delivered goods or services meet those requirements, which also both add to potential opportunism; and

(3) transaction frequency, which increases transaction costs associated with monitoring but may also lower the risk of opportunism. Failure to recognize such potential costs, whether due to information asymmetry or deficient due diligence, is considered an opportunity transaction cost.

TCE according to Derakhshan, Turner and Mancini (2019), focuses on the relationship between the buyer and seller and has been used in the project management context to describe the contractor and supplier selection process. Considering the costs involved in transacting services and goods to another organization, this theory argues how organizations make a decision about outsourcing in order to minimize the costs.

This theory posits that companies will organize themselves in the most economically efficient way, within the limits of information (bounded rationality) and the spectrum of opportunistic behavior. In the context of procurement management, Transaction Cost Theory can be used to analyze and determine the most appropriate procurement method for construction projects, considering factors such as complexity, uncertainty, and frequency of transactions.

2.2.2 Principal-Agent Theory (Agency Theory):

Principal-agency theory (PAT) was first proposed independently by Ross and Mitnick in 1973 (Kenyetta, 2023). Despite their fragmented contributions, they agree that because of the inherent

conflict of interest between principal and agent, the primary challenge is to separate ownership from control of resources. Separation occurs when the hiring party, known as the principal, relinquishes control to the hired party, known as the agent. As a result, the principal-agent relationship is structured around the concept of the contract.

Agency Theory explicitly addresses under which contractual arrangements the relationship between a Principal and an Agent operates most efficiently. It can be used to look at both the explicit (legal) and implicit (social) aspects of the contract (Tate, Ellram, Bals, Hartmann, & Valk, 2009).

Additionally, it is the contractual principles that bind the TCE and PAT together (Pryke, 2012). Indeed, PAT views organizational entities through the lens of a treaty of contracts (Winch, 2008), whereas TCE views them through the lens of "contractual men" (Williamson, 1985).

This connection emphasizes their complementarity, which is also relevant to In a D-B-B contracting system, the principal is typically the project owner, also known as the client or construction buyer, while the main contractor is one of the agents. There is also another principal-agency relationship as a result of the contract between the owner and the project integrator, who may be an engineer, project manager, or architect (Besaiso *et al.*, 2018). Likewise, when upper-tier entities delegate portions of their responsibilities to subcontractors, a new set of contracts is created. In this context, PAT assumes a problem of unequal information distribution and divergent interests (Steininger *et al.*, 2020). As a result, it is presumed that the agent is more informed than the principal (Schieg, 2008). However, Eriksson and Lind (2016) demonstrate that the converse is also true. However, the existing payment literature does not adequately address the relationship between an information-advantaged owner and the contractor's exposure to payment risks. Examples of practices that advantage the owner includes

right to choose the contract (Yao *et al.,* 2020) and contractor noninvolvement during pre-tender stages (Mehany *et al.,* 2018).

Agency theory broadly states, given that agents of an organization are responsible for conducting business in the interest of the organization, and given that an agent's own self-interests will never align completely with the interests of the organization, agents of an organization will sometimes experience conflicts of interest when conducting business on behalf of the organization (Bryant & Davis, 2014). Given also that people can be expected to act on behalf of their own self interests when those interests conflict with that of another entity and given that agents will sometimes experience conflicts of interests while conducting business on behalf of the organization, agents are more likely to act in the interests of the organization when their own interests are aligned with those of the organization or when their behavior is monitored or controlled against self-interested behavior.

However, it is obvious that there is a chain of agency where at any given node of agency relation, there are multiple principals for whom the agent has a fiducial responsibility (McCue & Prier, 2004). In turn, this suggests that purchasing decisions may be more complex than generally recognized. In the figure below, consider who and what comprise the group called citizens. If it is assumed that they are domestic providers, this group would also include the vendors and suppliers themselves with whom the purchasers at the bottom are contracting. Given that there are social goals beyond mere economics that are thought to be important when procuring public goods and services, the murkiness with which the public purchasing role can be viewed is considerable.

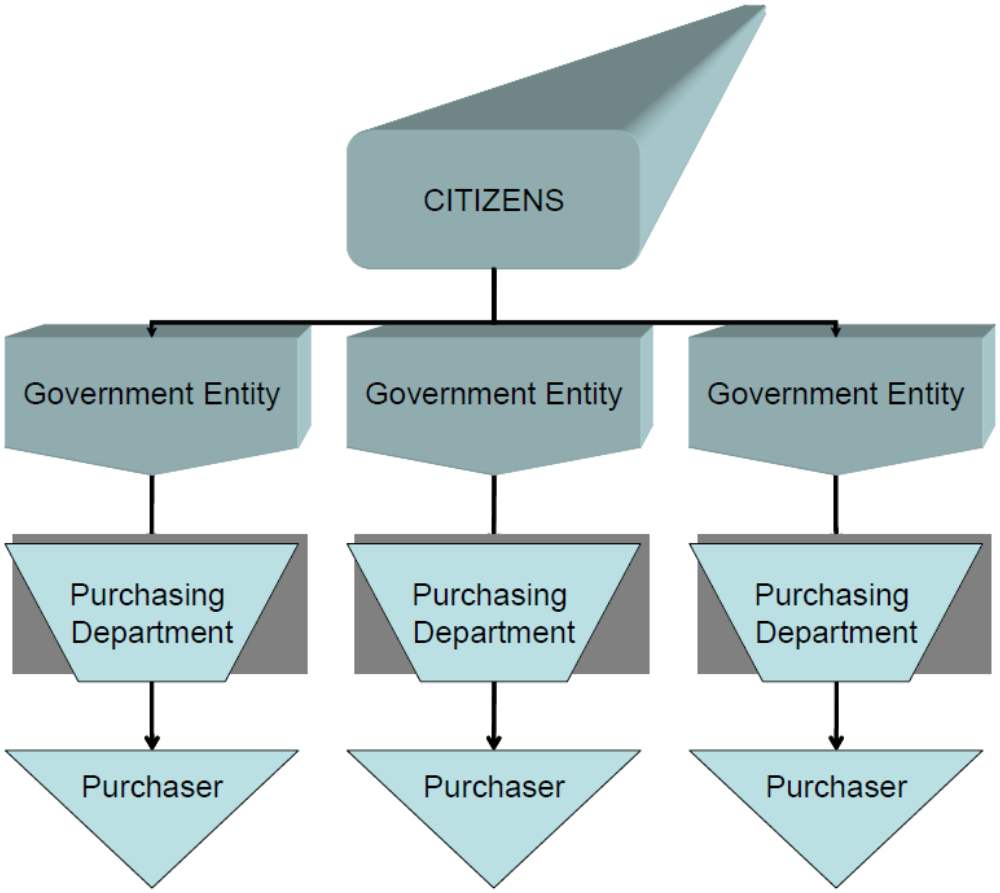

Figure 2.3: Conceptual Framework for Principal-Agent Model of Public Purchasing

Source: McCue and Prier (2004)

Agency Theory can be used to help design the most effective types of contracts and relationships to provide fair outcomes to all parties. The contractual question concerns the management of the Agent using behavioral-based contracts or outcome-based contracts while

balancing the Agency Triad (Tate *et al.*, 2009).

According to Derakhshan et al. (2019), in agency theory, project managers are responsible for decision making in the organization on behalf of the shareholders or project owners. Accordingly, this theory discusses how short-term goals of these principles (time and cost performance) can be achieved by development of controlling and monitoring mechanisms which

govern project managers' behavior. In project management literature, this theory gives a huge credit to the value of contracts as controlling tools for governing these relationships.

The Agency Theory examines the relationship between principals (clients in the construction project) and agents (contractors, sub-contractors, suppliers) and how contractual arrangements are managed to align objectives and minimize the risks of divergent interests. It is pertinent in examining how procurement processes can ensure accountability and performance.

2.2.3 Resource-Based View (RBV) Theory

The resource-based view of the firm (RBV) and is an internally based theory designed to explain differences in firm behaviors and performance (Shook *et al.,* 2009). The RBV holds that firm resources that are valuable, rare, and hard to substitute are a basis for competitive advantage (Zhang & Dhaliwal, 2009). In the context of IT, RBV can be used to understand the link between IT practices and competitive advantage, that is, how IT applications become one of a firm's resources and contribute to supply chain management excellence.

From a sourcing perspective, RBV theorists have traditionally maintained that firms should not outsource any business function or activity that contributes to building and maintaining competitive advantage. Firms that establish connections with external firms through mechanisms such as outsourcing run the risk of transferring vital knowledge and resources by engaging in sourcing partnerships (Shook *et al.,* 2009). Other potential negative sourcing outcomes include creating competitors via vertical integration of sourcing partners and losing vital internal knowledge and resources by engaging in sourcing relationships with external partners. As a result, RBV called for a protectionist stance regarding outsourcing, recommending that firms should only outsource support functions that do not directly contribute to the firm's value-adding and competitive advantage generating mechanisms.

RBV indicates that rare, indispensable, valuable and non-substitutable internal resources and capabilities will lead to sustainable competitive advantage (Çankaya & Sezen, 2019). Resources include both tangible assets and intangible assets such as leadership, market agility, positive social reputation and human resources. Tangible resources provide a temporary competitive advantage to the firm as they can easily be imitated by competitors. Intangible resources are more difficult to imitate because they are gained by experience.

The resource-based view (RBV) has become one of the most influential and cited theories in the history of management theorizing (Kraaijenbrink, Spender & Groen, 2009). It aspires to explain the internal sources of a firm's sustained competitive advantage. Its central proposition is that if a firm is to achieve a state of sustained competitive advantage it must acquire and control valuable, rare, inimitable, and non-substitutable resources and capabilities, plus have the organization in place that can absorb and apply them.

The RBV emphasizes that firms possess resources, a subset of which enables them to achieve competitive advantage. In the field of procurement, the theory reinforces the importance of the firm's procurement capabilities and resources as a critical factor for successful project delivery.

2.2.4 Stakeholder Theory

Stakeholder theory is an umbrella term for a genre of theories that help scholars and managers understand relationships between firms and their stakeholders, as well as some of the performance outcomes of these relationships. The theory is often characterized as being divided into three interrelated streams: descriptive, normative, and instrumental (Jones, Harrison & Felps, 2018). The main contender to value maximization as the corporate objective is called "stakeholder theory." Stakeholder theory says that managers should make decisions that take account of the interests of *all* the stakeholders in a firm (Jensen, 2001). Stakeholders include all

individuals or groups who can substantially affect, or be affected by, the welfare of the firm—a category that includes not only the financial claimholders, but also employees, customers, communities, and government officials.

Stakeholder theory has attracted considerable attention from scholars, politicians and managers. A stakeholder view of the company emerged, proposing that managers should design specific processes to manage stakeholders' expectations (Guerci, Longoni & Luzzini, 2016). To appreciate the concept of stakeholders, it is useful to understand the idea of a stake, that is, 'an interest or share in an undertaking'. This idea can range from simple interest in an undertaking to a legal claim of ownership. Even though the literature offers several definitions of 'stakeholder', the most cited definition states that a stakeholder is 'any individual or group who can affect or is affected by actions, decisions, policies, practices or goals of an organization'.

Stakeholder theory according to Eskerod and Huemann (2013) is a central part of the strategic management discourse. Despite of the intense research efforts concerning stakeholder theory within general management, the project management community has not sought much inspiration in these developments. As we see it, project management scholars and practitioners tend to create their own discourses which are either unrelated to other fields or building on non-updated concepts, models, and theories from other fields.

In contrast, shareholder theory argues that in addition to the shareholders, project organization is accountable to a broader range of stakeholders, and the structure of the organization should also be aligned with this inclusive approach (Derakhshan *et al.,* 2019). This in fact stems from the normative formulation of stakeholder theory that considers a moral right for all of the stakeholders of the organization, inside and outside.

Stakeholder Theory can apply to the study of procurement management by considering the needs and influences of various stakeholders involved in a construction project. It can guide the development of procurement strategies that seek to balance and address these diverse interests.

2.2.5 Institutional Theory

Institutional theory provides a rich and complex view of organizational behavior (Zhang & Dhaliwal, 2009). From an institutional perspective, organizations can be influenced by varied pressures arising from either the external environment or internal organizational factors. Under certain conditions, these pressures may lead organizations to be ‘‘legitimated’’ in order to survive in the market. Three important legitimization processes are often discussed in relation to innovation diffusion: coercive, imitative, and normative.

The relevance of institutional theory is particularly notable (Weerakkody, Dwivedi & Irani, 2009) in the context of understanding the impact of internal and external influences on organizations that are engaged in various change programmes.

Varying institutional pressures may cause organizations to source in different ways, which may have economic consequences and may lead to ethical dilemmas. Nonetheless, it is important for firms to be within the range of legitimate sourcing strategies because a legitimate firm obtains resources of higher quality at more favorable terms than does an illegitimate firm (Shook et al., 2009). On the other hand, if firms are too similar strategically, performance may suffer. Thus, it would appear that firms should select sourcing strategies that help legitimate them, but do not lead to “isomorphism” (i.e. close duplication). When making sourcing decisions, managers should be aware that whereas some strategies are rational for individual organizations, these same strategies are not rational when adopted by large numbers of firms.

According to Spiller (2008), the figure below reproduces Williamson's famous "simple contractual schema," whereby simple transactions (k=0) get implemented via simple contractual methods such as unassisted market transactions, while complex transactions (k>0) exposing the parties to transaction hazards require the design of complex governance structures. Figure 1 shows the existence of multiple governance structures – credible contracting at node (C) and hierarchy at node (D) – which counter entering into the transaction with unrelieved hazards (node B).

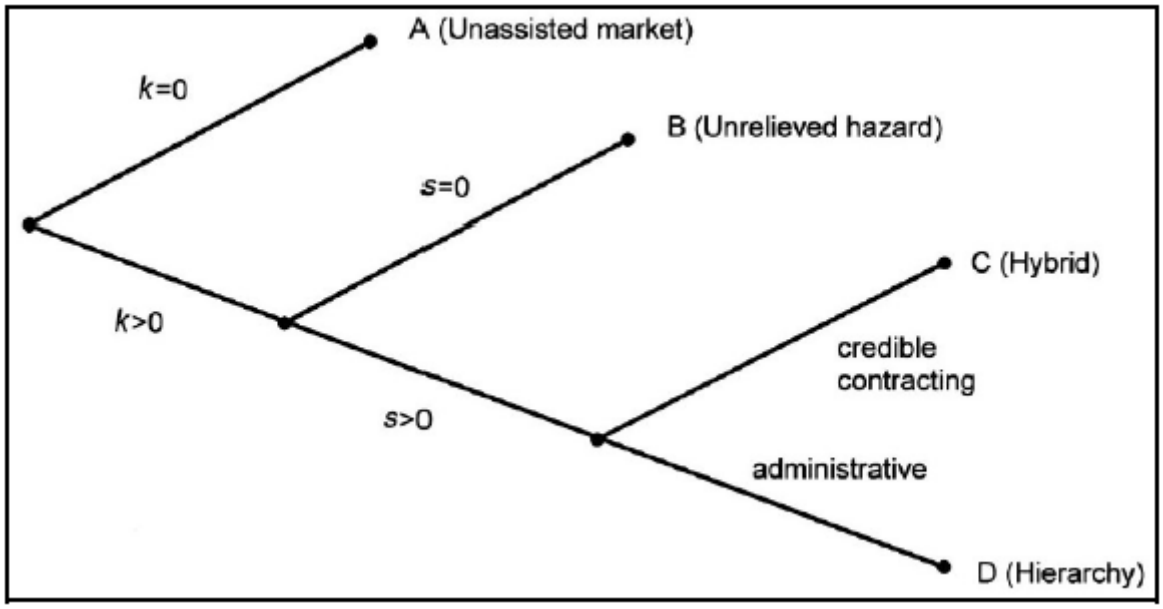

Figure 2.4: Williamson's Simple Contractual Schema

Source: Spiller (2008)

The institutional theory can guide the understanding of how procurement practices are shaped by the wider regulatory, normative and cognitive structures within the industry. It is

Institutional Theory can guide the understanding of how procurement practices are shaped by the wider regulatory, normative, and cognitive structures within the industry. It is useful for examining how such structures can influence the success or failure of construction projects.

2.3 Empirical Review

Several renowned authors have studied procurement management as it relates to project management of different projects. Some studies determined the main causes of procurement management problem in different countries, while some of them investigated the procurement and delay analysis methods in different types of oil and gas construction projects.

Alhazmi and McCaffer (2000) did a study on Procurement system selection model. The study conducted a survey on the performance of a project procurement system selection model in Saudi Arabia and it was revealed that Saudi public clients selected DB as the most appropriate procurement system for their project with an overall priority of 0.496. The model assisted in choosing the procurement system that would ideally fulfil their needs, and it consisted of various key criteria including cost, time and quality. Metrics used to measure cost were capital cost, maintenance cost, prequalification cost, cost overrun and reduction of financial risk. Metrics used to measure time were construction time, the early start of construction activity, planning and designing time, rapid response to new client needs, minimisation of activities interference, speed of construction, and time overruns. Metrics used to measure quality were design reliability and durability, design innovation, building systems guarantees, suitability of the intended uses, flexibility, and aesthetic appearance of the building.

Specifically, Bassioni (2013) studied several articles on examining the causes of poor procurement management in oil and gas projects. He identified that the problem of procurement management in oil and gas projects in Vietnam to include, administrative factors, level of skilled personnel, application of wrong method of procurement, insincerity and corruption, fluctuation in exchange rate, government policies and regulations, and activities of social groups.

Umuhoza and An (2023) did a study on the impact of project procurement systems on performance of Rwandan building construction projects. The study evaluated and compared the effects of the most-utilized project procurement systems on the key performance criteria in the Rwandan building construction projects such as time, cost, quality and scope. A questionnaire survey was conducted among contractors, consultants and clients, and a total of 73 questionnaires were used for the analysis. The survey results, analyzed by using statistic method, discovered that the traditional procurement system of design-bid-build (DBB) is the most-employed system in Rwanda. Also, it was revealed that in the Rwandan building construction industry, the construction management (CM) system was identified as a system that performs better for more objectives than others. Specifically, the results showed that owner direct force (ODF) is suitable for cost effectiveness, design and build (DB) system is better for time performance, and CM performs better for both scope and quality achievement. The study will facilitate Rwandan construction practitioners to be able to choose the appropriate option that suits the main objectives of their projects in order to reduce risks resulting from the use of unrelated procurement systems.

Ameyaw (2009) did a study on comparative performance evaluation of the traditional design-bid-build (DBB) and design-build (DB) procurement systems in Ghana. The study evaluated the performance of the traditional DBB and DB procurement methods in Ghana and the findings indicated that, while a sizeable portion of DB projects are completed within their respective estimated durations and budgets, a greater number of DBB projects do incur time and cost overruns due to variation and price fluctuations. On the other hand, there is significant difference between the qualities of completed projects executed under the two project delivery methods.

Meanwhile, Mezher and Tawilo (2005) discussed the causes of procurement delay by examining data relating to construction projects in Lebanon. They discovered that most times, project suffer

due to procurement related problem which include, poor supervision, lack of management clear direction, harsh government interference, bad road network, price fluctuation and climatic factors. They identified that government policies contributed most in the problem encountered in procurement functions. Another author, Kwame (2012) identified insincerity and bad governance as critical to procurement activities and hence attract cost and time overrun in gas projects in Legon, Ghana. The study therefore suggested improvement in policies and regulations that will encourage effective project supply function.

Oladinrin, Olatunji and Hamza (2013) did a study on the Effect of selected procurement systems on building project performance in Nigeria. The study assessed the effects of selected procurement systems – namely, CM, DB, management contracting and traditional procurement system – on the project's cost and quality in 76 building projects in Nigeria. The measurement indicators used for cost were delay costs, claims costs, contingencies costs, cost related to environmental issues, cost related to insurance, legal costs, managerial cost, variation between contract sum and final account, variation in design/change orders, retention and rework; and the indicators used for quality were adherence and compliance with specification, competence of contractor and his team, inconsistency of variation and change orders, insistence on specification, major variation between original design and the actual completed work, material test, number of rework, number of variation, and supervision of works. The results revealed that the traditional procurement system was the most-employed option in executing projects in Nigeria. Thus, the DB system performed better in terms of cost, while the CM system was identified as the most suitable system whenever quality was the most prioritized objective. Based on these results, it was discovered that none of the selected procurement systems is the best for all the performance assessment criteria; instead, one can be better than the other against a specific performance criterion. This is in agreement with Abdul Rashid *et al*. (2016), who stated that each procurement

system possesses its own peculiarity that will provide a different impact on the critical parameters of project performance, i.e. time, cost and quality.

Luis, Rodrigo and Alfredo (1999) did a study on the evaluation and improvement of the procurement process in construction projects. The study evaluated the improvement of the procurement process used in construction projects, where the potential performance indicators for the procurement process were identified as cycle times, event indicators, management indicators, cost indicators and referential values. For cost indicators, these were number of drops to ground and month, number of days in warehouse and in delivery, number of rules and of possible fiscal credits, number of repairs, number of special transport and time until release of container. The results indicated that the main problem of procurement is related to schedule delays and lack of specified quality for the project.

Al-Khalil, (2015) studied the main causes of procurement delay in large oil and gas projects in Saudi Arabia and their relative importance. In his study, the largest number of causes of procurement delay was listed and the respondents were asked to respond to their degree of importance. The author grouped the factors into nine major groups: financing, materials, application of wrong method of procurement, contractual relationships, project changes, government regulations, manpower, scheduling and control, equipment, and environmental factors. The financing group of procurement delay factors was selected as the most significant procurement factor by all parties and that environment group was selected as the least significant factors.

Ron (2012) did a study on Changing the construction procurement culture to improve project outcomes. He studied the changing of construction procurement culture to improve project outcomes and highlighted that construction projects need to be delivered on time, within the budget and in adherence with the applicable quality standard, but also need to meet the client

requirement or agreed scope of work. Project Management Institute (2013) revealed the key components of scope management as defined project scope, set manageable requirements, control scope related risks such as scope change and scope creep, and a detailed identification of the scope involved using the trifurcation of scope into flexible, fixed and interfered scope.

A study by Ling, Lok and Tan (2001) did a study on design-build projects: a comparison of views between South Australia and Singapore. They compared the performance of DB and DBB procurement systems in Singapore and Australia. The criteria to gauge the performance were: aesthetic quality, workmanship quality, physical construction time, total development time, timeliness of completion, and costs. The results of the Analysis of variance (ANOVA) showed that DB project time and cost performance in the two countries were not significantly different. Also, Singapore and Australian architects revealed the aesthetic quality and workmanship quality of DB projects to be lower than those of DBB projects. This is consistent with the studies of Hogg and Morledge (1995) and Smith et al. (1992), which revealed that the nature of DB projects resulted in a failure to achieve high quality. Therefore, the DB system is used to simultaneously meet the owner's requirements and reduce the contractor's cost. Under this system, since they are motivated to submit the lowest bid, the contractors are incentivized to lower quality, which would enable them to achieve more savings in costs together with completion of the defined scope of the work. Thus, financial pressure would take the precedence over the project's quality standards.

Alaeddin and Nuhu (2016) did a study on the impact of design-bid-build procurement methods on project performance in Libya. The study assessed the impact of DBB procurement methods on project performance in Libya and revealed that 11 out of its 12 common selection criteria exhibit a significant contribution to one or more project performance criteria, namely, time, cost and quality. The criteria highlighted as a best measure for one or more criteria were high price

completion, clarity of scope definition, complexity of design, high quality level, clear definition for project parties' responsibilities, client involvement, controllable project variations, cost certainty, organizing and reviewing, project planning and project functionality.

In another study, Battaineh (2014) carried out a study to determine the most significant causes of procurement management with traditional type of contracts with regard to contractors and clients. According to the results of the study, owner interference, application of wrong method of procurement, inadequate contractor experience, financing and payments, slow decision making, environmental factors, improper planning, and subcontractors are among the top ten most significant causes of poor procurement management in construction projects.

Through a survey research, Sanvido, Konchar and Moore (1997) did a study on comparison of project delivery systems and evaluated the cost, schedule and quality performance of US building projects that used CM at risk, DB and DBB project delivery systems. The metrics used for schedule performance were construction speed, delivery speed and schedule growth, while cost metrics were cost unit, cost growth and intensity; and quality metrics were start up; call backs; operation and maintenance; envelope, roof, structure and foundation; interior space and layout environment; and process equipment and layout. According to the results, the DB project delivery system achieved significantly improved cost and schedule advantages. Also, it was indicated that usage of this system yielded a better-quality performance than DBB projects and CM at risk.

Another related study was by Onoiga and Ogulana (2010) which aimed to determine the causes and effects of procurement cost escalation and schedule delays in road construction projects in Nigeria. The authors compile the main causes of procurement management problem in road construction projects which are determined according to their survey as the following: delayed payments, financial processes and 'difficulties on the part of contractors and clients, contract

modification, economic problems, materials price change, changes in project specifications, staffing problems, equipment unavailability, instability in foreign exchange, poor supervision, and instability in government policies and regulations. Government policies and regulations play a critical role in poor management of procurement functions.

Ghulam and Noel (2015) did a study on comparative performance evaluation of design-build and traditional procurement systems for highway projects in Afghanistan. The study compared the performance evaluations of DB and traditional procurement systems for highway projects in Afghanistan and ascertained that DB was a superior option in terms of time performance, while it performed poorly in cost saving compared to the traditional procurement system. However, both the systems were identified as suitable in terms of quality performance. The quality variables used were in conformity with the applicable standards and specifications, and using these, it was possible to ensure compliance with warranty provisions as well as expectations as to the aesthetic quality of the workmanship, and thereby achieve overall client satisfaction. Cost saving and cost overrun were used as the main measurement metrics for cost, while, similarly, time saving and time overrun were used as the key measurements for time.

2.3.1 Research Gap

Procurement management actually support project management, if properly handled. Based on the literatures reviewed, many authors have studied procurement management and identified factors which contributed to ineffective procurement management and as such negatively affected the delivery of projects. The authors did a lot of work on procurement management in production management and manufacturing organizations. Only few authors dwelled on procurement management in project delivery and did not specifically consider procurement related factors which constrain effective project delivery which is a major index for measuring

budget performance and national development. This study was done specifically to identify and evaluate the variables of procurement management that constrain project delivery in Rivers State, Nigeria.

In addition, based on the above literature review, we are able to ascertain that the respective various effects that the choice of procurement system have on the different criteria vary from country to country, probably due to the disparity in the environment of their construction projects. Therefore, a gap emerges in the literature dealing with construction projects in Rivers state, Nigeria. There's need to evaluate the influence of the various procurement systems on the mentioned key performance criteria. Given the fact that there is a paucity of studies dealing with the evaluation of procurement systems' effects on the measurement indicators associated with the mentioned key performance criteria, in formulating the list of the indicators corresponding to each criterion (for which an evaluation is proposed to be made), some indicators that are particularly compatible with the Nigerian construction industry were selected from several studies, adequately having the required type of content, that were identified based on a review of various literature. Table 2.1 below showed the details of the empirical review from the different authors.

Table 2.1: Research gap

Authors	Title	Objective	Methods	Main findings	Limitations
Ghulam and Noel (2015)	a study on comparative performance evaluation of design-build and traditional procurement systems for highway projects in Afghanistan.	The study compared the performance evaluations of DB and traditional procurement systems for highway projects in Afghanistan and ascertained that DB was a superior option in terms of time performance,	**Not mentioned**	Cost saving and cost overrun were used as the main measurement metrics for cost, while, similarly, time saving and time overrun were used as the key measurements for time.	• No method of analysis mentioned
Onoiga and Ogulana (2010)	Determine the causes and effects of procurement cost escalation and schedule delays	The study compiled the main causes of procurement	survey	delayed payments, financial processes and 'difficulties on the part of contractors and clients,	• Method of analysis not properly specified.

	in road construction projects in Nigeria.	management problem in road construction projects		contract modification, economic problems, materials price change, changes in project specifications, staffing problems, equipment unavailability, instability in foreign exchange, poor supervision, and instability in government policies and regulations.	• Geographical location not described
Sanvido, Konchar and Moore (1997)	A study on comparison of project delivery systems	The study evaluated the cost, schedule and quality performance of US building projects that used CM at risk, DB and DBB project delivery systems.	a survey research	DB project delivery system achieved significantly improved cost and schedule advantages. Also, it was indicated that usage of this system yielded a better-quality performance than DBB projects and CM at risk.	• Method of analysis not properly specified.

Battaineh (2014)	Determining the most significant causes of procurement management with traditional type of contracts with regard to contractors and clients.	-	-	owner interference, application of wrong method of procurement, inadequate contractor experience, financing and payments, slow decision making, environmental factors, improper planning, and subcontractors are among the top ten most significant causes of poor procurement management in construction projects.	• Method of analysis not properly specified • No method of data analysis specified
Alaeddin and Nuhu (2016)	The impact of design-bid-build procurement methods on project performance in Libya.	The study assessed the impact of DBB procurement methods on project performance in Libya	**Not stated**	The criteria highlighted as a best measure for one or more criteria were high price completion, clarity of scope definition, complexity of design, high quality level, clear definition for project parties' responsibilities, client	• No method of data analysis specified

				involvement, controllable project variations, cost certainty, organizing and reviewing, project planning and project functionality.	
Ling, Lok and Tan (2001)	Design-build projects: a comparison of views between South Australia and Singapore.	The study compared the performance of DB and DBB procurement systems in Singapore and Australia.	Analysis of variance (ANOVA)	DB project time and cost per-formance in the two countries were not significantly different. Also, Singapore and Australian architects revealed the aesthetic quality and workmanship quality of DB projects to be lower than those of DBB projects.	•
Alhazmi and McCaffer (2000)	Procurement system selection model.	The study investigated on the performance of a project procurement system selection	Survey method	That Saudi public clients selected DB as the most appropriate procurement system for their project with an overall priority	•

		model in Saudi Arabia			
Umuhoza and An (2023)	The impact of project procurement systems on performance of Rwandan building construction projects.	The study evaluated and compared the effects of the most-utilized project procurement systems on the key performance criteria in the Rwandan building construction projects such as time, cost, quality and scope.	A questionnaire survey using statistical method	The study discovered that the traditional procurement system of design-bid-build (DBB) is the most-employed system in Rwanda. Also, it was revealed that in the Rwandan building construction industry, the construction management (CM) system was identified as a system that performs better for more objec-tives than others.	•
Ameyaw (2009)	Comparative performance evaluation of the traditional design-bid-build(DBB) and design-build (DB) procurement	The study evaluated the performance of the traditional DBB and DB procurement	Not stated	Findings indicated that, while a sizeable portion of DB projects are completed within their respective estimated durations and budgets, a greater number of DBB projects do	• Method of analysis not stated

	systems in Ghana.	methods in Ghana		incur time and cost overruns due to variation and price fluctuations.	
Mezher and Tawilo (2005)	The causes of procurement delay by examining data relating to construction projects in Lebanon.	Not clearly stated	Not stated	They discovered that most times, project suffer due to procurement related problem which include, poor supervision, lack of management clear direction, harsh government interference, bad road network, price fluctuation and climatic factors.	• No clearly stated method.
Oladinrin, Olatunji and Hamza (2013)	The Effect of selected procurement systems on building project performance in Nigeria.	The study assessed the effects of selected procurement systems – namely, CM, DB, management contracting and traditional	Not stated	The results revealed that the traditional procurement system was the most-employed option in executing projects in Nigeria. Thus, the DB system performed better in terms of cost, while the CM system was identified as the	• Method not mentioned •

		procurement system – on the project's cost and quality		most suitable system whenever quality was the most prioritized objective.	
Luis, Rodrigo and Alfredo (1999)	The evaluation and improvement of the procurement process in construction projects.	The study evaluated the improvement of the procurement process used in construction projects	Not mentioned	The results indicated that the main problem of procurement is related to schedule delays and lack of specified quality for the project.	• No mention of method

Source: Author's Compilation (2024)

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The researcher adopted a descriptive and survey research design/technique in administration and retrieval of the instruments used for collection of the data using questionnaire and personal interview. The structure of this methodology is designed in a manner that will facilitate the gathering of information that will show the relationship between procurement management strategies on one hand and effective construction project delivery on the other hand.

3.2 Sources and Method of Data Collection

The study made use of mainly the primary sources of data collection. Here, the instruments used in collection of primary data were mainly structured questionnaires and semi-structured interview methods. The researcher had face to face interviews with some of the respondents, which permitted gathering of the necessary information while well-structured questionnaires were distributed to the participants, comprising of the following categories of individuals;

1. Project Managers
2. Procurement Officers
3. Project Accountants
4. Communication Officers
5. Monitoring & Evaluation Officers
6. Representative of School Based Management Committees
7. Administration Officers

3.3 Population and Sample Size

Being that this study was designed to bring out the effect of procurement management strategies on effective construction project delivery in Rivers State, focus was on projects in Rivers State technical/skills acquisition institutions for their peculiar nature in the State, and more so because the government insists on the employment of professionalism given the huge amount of funding involved. Available statistics showed that the projects have the following schedule and personnel with the spread as shown in table 3.1. The entire population was 82, hence, the census sampling method was adopted since the population is not large. According to Njeru (2015), the census approach is justified because it contributes to the collection of unbiased data representing all individuals' opinions in the study population on a specific problem. The census approach is also justified because census results are more likely to be representative, accurate, and reliable than population sample results, and thus census aids in generalization of research findings.

Table 3.1: Composition of the Study Population (Respondents)

S/No	Project Implementation unit	Number of respondents
1	Government Technical College, Ahoada	8
2	Government Technical College, Port Harcourt	8
3	Government Technical College, Ele/Ogu	8
4	Government Technical College, Tombia	7
5	Government Craft & Development Centre, Port Harcourt	10
6	Women Development Centre, Taabaa	7
7	School to Land Authority, Obio/Akpor	7
8	Contractors/Suppliers	27
	Total	82

Source: Field Survey (2018).

3.4 Questionnaire Design

In this section, we give a vivid description of the questionnaires employed to generate the data set for analysis. As already stated under sections 3.3 and 3.4 of this report, the population of interest comprised of officials and participants in the state -sponsored technical/skills acquisition projects in Rivers State. Therefore, the questionnaire was designed to enable us extract meaningful information necessary to test the hypotheses of the study and also address the issues of the relationship between procurement management strategies and effective construction project delivery as contained in the study.

While section **A** covers matters bothering on demographic issues, section **B**, however, focuses on the relationship between procurement management strategies and effective construction project

delivery, procurement management-induced infrastructural development, efficient project delivery, quality of project delivery and successful project delivery.

3.5 Validity of Research Instrument

The instrument used for this work was made valid and accurate. The questionnaire's validity was determined by the fact that the questions and items in the questionnaire were strictly on an empirical analysis of relationship between procurement management strategies and effective construction project delivery. Therefore, the questionnaire was subjected to supervisor's corrections as to achieve face and content validity. The supervisor and other senior academics in the department also contributed in validating the instrument. We also used a pilot study to determine the validity by selecting some respondents from the projects executed to which the instrument was administered, and corrections made wherever necessary.

3.6 Method of Data Analysis

Here frequency tables, percentage, graphs and charts were utilized where applicable.

To achieve objectives 1, of the study, factor analysis was utilized in achieving it. According to Dogbegah, Owusu-Manu and Omoteso (2011), factor analysis is useful for finding clusters of related variables and thus ideal for reducing a large number of variables into a more easily understood framework. The first attempt to the use of factor analysis was to address some pertinent issues relating to the appropriate sample size for undertaking and establishing the reliability of factors analysis.

In addressing the second objective, multiple regression was deployed. According to Pallant (2005), multiple regression is not just one technique but a family of techniques that can be used

to explore the relationship between one continuous dependent variable and a number of independent variables or predictors (usually continuous). Multiple regression is based on correlation but allows a more sophisticated exploration of the interrelationship among a set of variables. This makes it ideal for the investigation of more complex real-life, rather than laboratory-based, research questions. The mathematical notation of the concept of a multiple regression model is depicted below.

$$Y = a_o + a_1 x_1 + a_2 x_2 + \ldots . a_n x_n + e \quad - \quad - \quad - \quad - \quad 3.1$$

Where

a_o = constant

$x_1, x_2 \ldots xn$ = independent variables

Y = dependent variable and

E = margin of error

Given the postulation of the variables in question, the formulation of the model specifications can be articulated as follows:

$$Y = a_o + x_1 a_1 + x_2 a_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + a_6 x_6 + a_7 x_{7+} a_8 x_{8+} a_9 x_9 + a_{10} x_{10+} a_{11} x_{11+} a_{12} x_{12+} e \quad - \quad 3.2$$

In addressing the third objective, the spearman coefficient of rank correlation, a non-parametric test was adopted. The underlying premise behind non-parametric tests is that they do not rely on the estimation of parameters such as the means or the standard deviation describing the distribution of the variable of interest in the population. Such methods as the spearman test currently being utilized are therefore called parameter-free methods or distribution-free methods.

The spearman coefficient of rank correlation is calculated as follows:

$$\gamma S = 1 - \frac{6 \Sigma d^2}{}$$

$$N^3 - N$$

or

$$\gamma S = 1 - \frac{6 \Sigma d^2}{N(N^2-1)}$$

Where;

Σd^2 = sum of the squared differences

In the ranking of the subject on the two subjects

N = Number of subject being ranked or number of pairs

ranked observations.

To evaluate whether or not there is an association between two variables, we may use the Spearman rank correlation procedure thus;

1. Replace the n values of variable X by their ranks Rx, by giving the rank of 1 to the, smallest X and the rank of n to the 'largest' if two or more X values are tied, they are each assigned the average rank of the positions they otherwise would have been assigned individually had ties not occurred.

2. Replace the n valves of Y by their rank Ry as in step 1

3. For each of the n subjects, obtain a set rank differences score

$$di = Rx_2 - Ry_2$$

Where I = 1, 2……..n

4.Obtain the summation of squared rank differences scores;

$$\sum_{2=1}^{n} d^2_1$$

5.The Spearman coefficient of rank correlation γs is given by the formula above. However, when 'n' is relatively large (e.g. above 20 observations) as in the current study, the student T-test statistic may be used.

The student T-test is stated as;

$$t = \gamma s \frac{n-2}{1-\gamma^2 s}^{1/2}$$

Or

$$t = \gamma \frac{\sqrt{(n-2)}}{\sqrt{(1-\gamma^2)}}$$

Here, 'T' is distributed as students T, with n – 2 degrees of freedom. The test is carried out using the computer based statistical package for social sciences (SPSS 19.0).

A perfect correlation between the two variables would result in a value of + 1 if the variables are positively correlation and –1 if they are negatively correlated. However, when row, ρ = o, the time correlation between the two variables being compared is also zero.

Decision Rule

In order to prove the significance or otherwise of the relationship, the calculated t – test is compared with the tabulated t – statistic. The null hypothesis is rejected once the calculated t – statistic is greater than the tabulated t – statistic, otherwise the null is accepted.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Preamble

This chapter presents the data generated through the use of well-constructed questionnaires administered on the population of interest comprising of eighty-two (82) respondents involved in the state -sponsored technical/skills acquisition projects in Rivers State.

4.2 Questionnaire Analysis

Table 4.1 shows that all the eighty-two (82) questionnaires distributed were properly filled and returned, while seventy-four (74) were found useful for further analysis. This represent a ninety percent (90%) response rate.

Table 4.1: Response Rate

Total Distribution	No. Returned	% responses
82	74	90.2

Source: Field survey (2020)

Section A: Demographic Analysis

This section presents the analysis of the demographic variables of the study, bothering on age and educational qualification of the respondents. Other variables covered here include the work experience as well as other questions that elicited issues related to the study.

Table 4.2: Age Distribution

AGEDISTR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 20yrs	6	8.1	8.1	8.1
	20-25yrs	11	14.9	14.9	23.0
	26-35yrs	3	4.1	4.1	27.1
	36-45yrs	30	40.5	40.5	67.6
	Above 45yrs	24	32.4	32.4	100.0
	Total	74	100.0	100.0	

Source: SPSS 19.0

Table 4.2 shows the age distribution of the respondents. Whereas thirty (30) or about forty percent (40.5%) of the respondents fell under the thirty-six to forty-five-year age bracket, twenty-four (24) or about thirty-two percent (32.4%) of the respondents was within the forty-five-year age bracket. This was followed by eleven (11) or about fourteen percent (14.9%) of the respondents that fell within the twenty to twenty-five-year bracket. Others were six (6) or about eight percent (8.1%) for below twenty years (20) and finally, three respondents (3) representing about four percent (4.1%) of the respondents for the between 26-35 age bracket.

Overall, the cumulative age distribution for the not above forty-five years was fifty (50), representing about sixty-seven percent (67.6%) of the entire respondents. Thus, one can infer from this distribution that it represents a very productive workforce respondent group that can permit meaningful analysis of the subject matter necessary to pass the reliability test.

Table 4.3: Educational Qualification Distribution

EDUQUAL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below O'Level	0	0.0	0.0	0.0
	O'Level	12	16.2	16.2	16.2
	B.Sc	44	59.5	59.5	75.7
	M.Sc.	18	24.3	24.3	100.0
	Total	74	100.0	100.0	

Source: SPSS, 19.0

Table 4.3 shows the distribution of educational qualification of the respondents. One of the most interesting inferences is that all the respondents, at least had O'Level qualification and were by this adjudged educated. This table also showed that whereas twelve (12) or about sixteen percent (16.2%) attended secondary education, forty-four (44) respondents or about fifty-nine (59.5%) of the respondents, had a Bachelor's degree with 18 or about twenty-four percent (24.3%) having a Master's degree. Cumulatively for the university education, this represented about eighty-three

percent (83.8%) of the entire respondents. Thus, from this distribution, the conclusion is that one can also rely on the information supplied by the respondents for the analysis.

Table 4.4: Work Experience Distribution

WORKEXP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5yrs	3	4.1	4.1	4.1
	6-10yrs	7	9.5	9.4	13.5
	11-15yrs	11	14.9	14.9	28.4
	16-20yrs	27	36.5	36.5	64.9
	Above 20yrs	26	35.1	35.1	100.0
	Total	74	100.0	100.0	

Source: SPSS, 19.0

Table 4.4 reveals the experience of the workforce respondents. Here, whereas only three or about four percent (4.1%) of the respondents fell under the within one-five-year work experience and seven or about nine percent (9.5%) for between six and ten-year bracket, sixty-four (64) or about eighty-six percent (86.5%) of the respondents have experience spanning more than ten years. This again shows that this sample can be relied upon for meaningful analysis and information.

4.3 Factor analysis

Table 4.5: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.619
Bartlett's Test of Sphericity	Approx. Chi-Square	131.146
	Df	78
	Sig.	.000

Twelve (12) items of the procurement strategies were subjected to principal component analysis using IBM SPSS Statistics version 25.0. Before this, the suitability of data for analysis was assessed. Inspection of the correlation matrix showed many of the coefficients had values of 0.5 and above. The Kaiser-Meyer- Olkin (KMO) measure of sampling adequacy of 0.619 was obtained. This value is within the desirable value of 0.6. From the table above, Bartlett's test of sphericity was 131.146 with an associated significance of 0.000, also, suggesting an acceptable level of internal consistency and reliability in the measures and the scale in the use of factor analysis. The KMO statistic varies between 0 and 1 with a value of zero indicates that the sum of partial correlations is large relative to the sum of correlations, indicating diffusion of pattern of the correlations and hence factor analysis is likely to be inappropriate. A value close to 1.00 indicates that patterns of correlation are relatively compact and so factor analysis should yield distinct and reliable factors. However, literature recommends that the KMO value should be greater than 0.50 if the sample size is adequate. The Bartlett‟s test of sphericity was also significant suggesting that the population was not an identity matrix.

As indicated in table 4.6, the average communality of the variables after extraction was above 0.50. The conventional rule about communality values is that; extraction values (eigenvalues) of more than 0.50 at the initial iteration indicates that the variable is significant; and should be included in the data for further analysis or otherwise removed. The eigenvalue and factor loadings were set at conventional high values of 1.00 and 0.50 respectively. Applying the latent root criterion on the number of principal components to be extracted suggests that 6 components should be extracted as their respective eigenvalues are greater than one. From the table above, the average communality of the variables after extraction was 0.713. Hence, the communalities extracted support the use of fmactor analysis on the variables.

Table 4.6: Communalities

Communalities		
	Initial	Extraction
Design and Build Procurement System (DBPS)	1.000	.815
Design Bid Build Procurement System (DBBPS)	1.000	.700
Cost reimbursement Contract Procurement System (CRCPS)	1.000	.652
Management Contracting Procurement System (MCPS)	1.000	.614
Alliancing Procurement System (APS)	1.000	.725
Partnering Procurement System (PPS)	1.000	.776
Lump-sum Contract Procurement System (LCPS)	1.000	.700
Procurement Management System (PMS)	1.000	.664
Direct Labour Procurement System (DLPS)	1.000	.842
Integrated Project Delivery Procurement System (IPDPS)	1.000	.743
Public Private Partnership Procureent System (PPPPS)	1.000	.562
Construction Management Procurement System (CMPS)	1.000	.758
Extraction Method: Principal Component Analysis.		

Source: SPSS 19.0

Table 4.7: Total variance explained for factors influencing effective delivery of construction Projects

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.269	18.910	18.910	2.269	18.910	18.910	1.747	14.562	14.562
2	1.572	13.102	32.012	1.572	13.102	32.012	1.598	13.316	27.878
3	1.322	11.013	43.025	1.322	11.013	43.025	1.381	11.507	39.385
4	1.233	10.275	53.300	1.233	10.275	53.300	1.346	11.219	50.603
5	1.129	9.408	62.708	1.129	9.408	62.708	1.323	11.022	61.625
6	1.027	8.556	71.264	1.027	8.556	71.264	1.157	9.639	71.264
7	.726	6.052	77.316						
8	.713	5.945	83.261						
9	.636	5.303	88.564						
10	.607	5.056	93.621						
11	.463	3.859	97.480						
12	.302	2.520	100.000						
Extraction Method: Principal Component Analysis.									

As demonstrated in table 4.7 and supported by the scree plot in figure 4.1; six (6) components with eigenvalues greater than 1.0 were extracted using the factor loading of 0.50 as the cut-off point. The total variance explained by each component extracted is as follows: The first principal component (component 1) accounted for 18.910 % of the total variance whilst the second principal (component 2) component, explained 13.102 % of the remaining variation not explained by the first component. Component 3 accounted for 11.013%, component 4 accounted for 10.275%, component 5 accounted for 9.408% and component 6 accounted for 8.556%. The cumulative proportion of variance criterion, which says that the extracted components should together explain at least 50% of the variation, shows that the 6 extracted components cumulatively explained 71.264% of the variation in the data set. Scores are numbers that express the influence of an eigenvector on a specific sample.

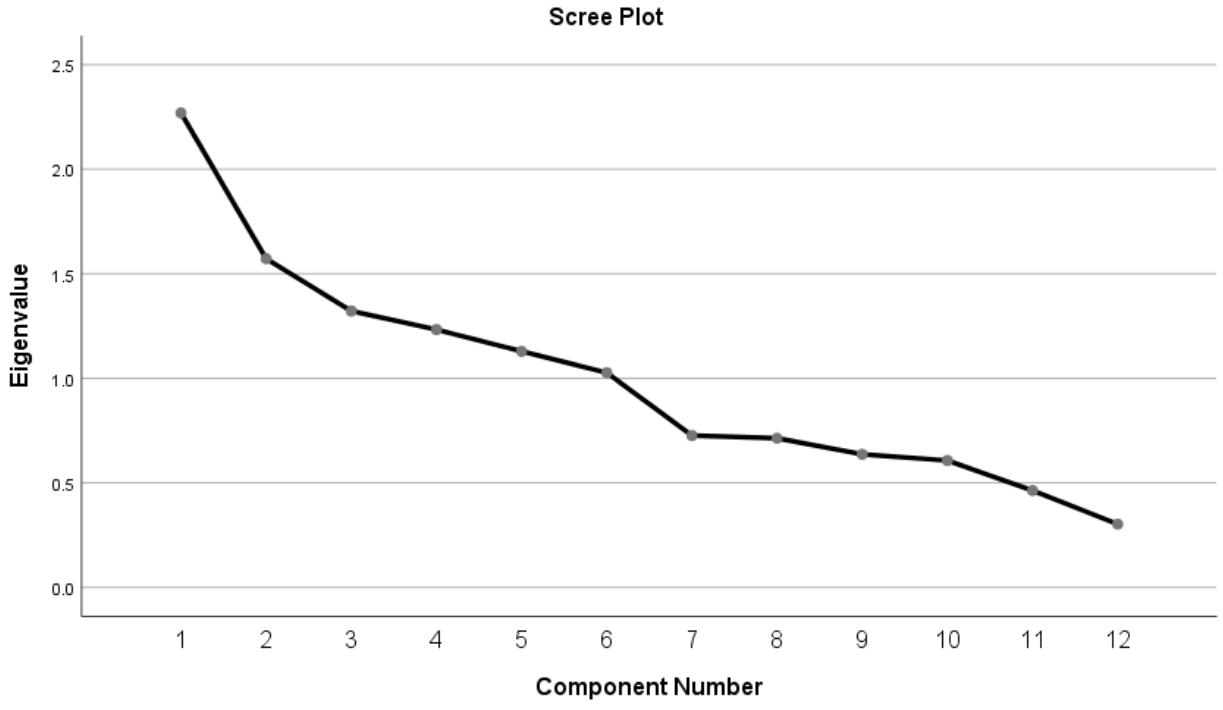

Figure 4.1: Scree plot

Figure 4.1 shows the scree plot derived from the EFA conducted. The report retains six factors based on Kaiser's rule which recommends maintaining elements with eigenvalues greater than unity and the fact that the scree plot showed a sharp curve after the sixth factor. The twelve factors account for over 50% of the total variance explained.

Table 4.8: Component matrix

Component Matrix[a]						
	Component					
	1	2	3	4	5	6
Design and Build Procurement System (DBPS)	**.627**	-.385	-.216	-.184	-.172	-.193
Design Bid Build Procurement System (DBBPS)	**.572**		**.555**		-.173	.265
Cost reimbursement Contract Procurement System (CRCPS)	**.542**	-.161		.424	-.226	**.514**
Management Contracting Procurement System (MCPS)	**.494**	-.392	.226	-.178	.197	-.403
Alliancing Procurement System (APS)	.405	-.368	-.383	.136	-.338	.331
Partnering Procurement System (PPS)	.416	**.504**	-.291	-.163		-.105
Lump-sum Contract Procurement System (LCPS)	**.468**	.428	-.331	**.566**		
Procurement Management System (PMS)	.400	.121	**.506**	-.306	.467	.128
Direct Labour Procurement System (DLPS)		**.525**	-.114		.148	
Integrated Project Delivery Procurement System (IPDPS)	.370	.283	-.337	-.446	.251	.307

Public Private Partnership Procurement System (PPPPS)		.405	.487		-.530	.353
Construction Management Procurement System (CMPS)	.220	-.237		.426	**.520**	.478
Extraction Method: Principal Component Analysis.						
a. 6 components extracted.						

The next stage involved the examination of the presence of any complex structure among the variables. A complex structure is said to be present when a variable has a factor or component loading greater than 0.50 on more than one component. Loadings express the influence of each original variable within the component. After checking for complex structure in the variables, the factor loadings are again examined, but this time to check for components that have only one variable loading on them. A check on table 4.8 shows that all 6 components had more than one variable loading on them, thus resulting in the keeping of all the 6 components. What remains is the interpretation of the 6 principal components extracted. It is instructive to note that the original 12 variables have been summarized into 6 new uncorrelated variables that explain 71.264% of the total variance in the variables included on the components. This often is the challenge posed by this analysis as the combinations of variables that load high on a component are difficult to interpret.

The findings from the results shown above indicate that 12-factors can be grouped into six (6) decision matrix (components) for procurement management strategies. However, six-principal components were later extracted for effectiveness. In the first component, 5 factors in that order loads positively maximally, 2 factors, loads positively maximally in the second component, while 2 factors load positively maximally in the third component. In the fourth component, 1 factor loads, positively maximally. While in the fifth and sixth components, 1 and 1 factor

respectively load positively maximally. From this result, the components that emerged could be the dominant underlining procurement management strategies.

4.4 Regression

Table 4.9: Model summary

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.602	.099	1.33382
a. Predictors: (Constant), Design and build procurement system (DBPS), Design bid build procurement system (DBBPS), Management contracting procurement system (MCPS), Construction Management procurement system(CMPS), Procurement Management system (PMS), Direct Labour Procurement Strategy (DLPS), Alliancing procurement system (APS), Partnering procurement system (PPS), Integrated project delivery procurement system (IPDPS), Public private partnership procurement system (PPPPS), Lump-sum Contract procurement system (LCPS), Cost reimbursement contract procurement system (CRCPS)				
b. Dependent Variable: Effective construction project delivery				

The regression model on the influence of procurement management strategies on effective construction project delivery is presented in the table above. The table displays the values of the coefficient of determination R squared and R, which are 0.61 and 0.509, respectively. The R-squared value denotes that 61.0% of the variance in the factors influence of procurement management strategies on effective construction project delivery can be accounted for by the fluctuations in effective construction project delivery. The coefficient of determination (R squared) indicates a suboptimal fit of the model. The coefficient of determination, adjusted for the number of predictors in the model, is 0.099, indicating a lower value than the unadjusted R square. This suggests that there may not be any further potential for enhancing the model's adequacy by incorporating an additional factor that affects the outcome variable. The inclusion of

an extra independent variable would result in a decrease in the R Square value to that of the adjusted R square.

The table below presents the outcomes of an Analysis of Variance (ANOVA) conducted on the factors influencing effective construction project delivery. The analysis of variance (ANOVA) outcomes pertaining to the regression coefficients reveal that the F value is 0.00, indicating statistical significance at a level below 0.05. This suggests that the predictor coefficient is not equivalent to zero, at minimum. This also suggests that the model is well-suited for the task.

Table 4.10: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.417	13	2.878	1.618	.000[b]
	Residual	106.745	60	1.779		
	Total	144.162	73			

a. Dependent Variable: Effective construction project delivery

b. Predictors: Design and build procurement system (DBPS), Design bid build procurement system (DBBPS), Management contracting procurement system (MCPS), Construction Management procurement system(CMPS), Procurement Management system (PMS), Direct Labour Procurement Strategy (DLPS), Alliancing procurement system (APS), Partnering procurement system (PPS), Integrated project delivery procurement system (IPDPS), Public private partnership procurement system (PPPPS), Lump-sum Contract procurement system (LCPS), Cost reimbursement contract procurement system (CRCPS)

The table below displays the beta coefficients of all the twelve (12) independent variables versus the effective construction project delivery. Design and build procurement system DBPS (X_1) had a coefficient of 0.232, which is more than zero, as shown in the table. The t statistic is 2.756, with a p-value of 0.008, implying that the coefficient of X_1 is significant at the 0.05 threshold of significance. This demonstrates that have a considerable positive influence on effective

construction project delivery. Design bid build procurement system (DBBPS) coefficient (X_2) was 0.201, which was greater than zero. This coefficient's t statistic is 0.125, with a p value of 0.019 that is less than 0.050. This means that the coefficient is significant. Because the X_2 coefficient is significant, design bid build procurement system has a significant effect on effective construction project delivery.

Table 4.11: Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.312	2.369		2.242	.029
	Design and Build Procurement System (DBPS)	.639	.232	.342	2.756	.008
	Design Bid Build Procurement System (DBBPS)	.125	.201	.015	.125	.019
	Cost reimbursement Contract Procurement System (CRCPS)	.017	.214	.010	.082	.935
	Management Contracting Procurement System (MCPS)	.101	.151	.081	.673	.503
	Alliancing Procurement System (APS)	.089	.192	.056	.462	.646
	Partnering Procurement System (PPS)	.152	.186	.109	.821	.415
	Lump-sum Contract Procurement System (LCPS)	.158	.166	.129	.953	.044

	Procurement Management System (PMS)	.164	.114	.177	1.431	.158
	Direct Labour Procurement System (DLPS)	.133	.113	.138	1.173	.045
	Integrated Project Delivery Procurement System (IPDPS)	.119	.191	.083	.622	.536
	Public Private Partnership Procurement System (PPPPS)	.045	.175	.031	.256	.799
	Construction Management Procurement System (CMPS)	.427	.162	.334	2.645	.010
a. Dependent Variable: Effective construction project delivery						

Cost reimbursement contract procurement system (CRCPS) (X_3) had a coefficient of 0.214, which is more than zero, as shown in the table. The t statistic is 0.082, with a p-value of 0.935, implying that the coefficient of X_3 is not significant at the 0.05 threshold of significance. This demonstrates that Cost reimbursement contract procurement system have a considerable negative influence on effective construction project delivery.

Management contracting procurement system (MCPS) (X_4) has a coefficient of 0.151, which is more than zero, according to the coefficient table. The t stats is 0.673, and the p-value is 0.503, which is greater than 0.05, implying that the coefficient of X_4 is not significant at the 0.05 level of significance. This demonstrates that the effective delivery of construction projects is not significantly influenced by management contracting procurement system. Alliancing procurement system (APS) (X_5) has a coefficient of 0.192, which is more than zero, according to the coefficient table. The t stats is 0.462, and the p-value is 0.646, which is greater than 0.05, implying that the coefficient of X_5 is not significant at the 0.05 level of significance. This demonstrates that the effective delivery of construction projects is not significantly influenced by alliancing procurement system.

Partnering procurement system (PPS) (X_6) has a coefficient of 0.186, which is more than zero, according to the coefficient table. The t stats is 0.821, and the p-value is 0.815, which is greater than 0.05, implying that the partnering procurement system (PPS) coefficient of X_6 is not significant at the 0.05 level of significance. This demonstrates that the effective delivery of construction projects is not significantly influenced by partnering procurement system.

The table further reveals that Lump-sum Contract procurement system (LCPS) (X_7) had a coefficient of 0.166 with a t static of 0.953 and a p-value of 0.044 (less than 0.05). This means that the X_7 coefficient is significant at the 0.05 threshold of significance. This demonstrates that lump-sum contract procurement system has a considerable positive impact on the effective delivery of construction projects. Procurement Management system (PMS) (X_8) has a coefficient

of 0.114, which is more than zero, according to the coefficient table. The t stats is 1.431, and the p-value is 0.158, which is greater than 0.05, implying that the coefficient of X_8 is not significant at the 0.05 level of significance. This demonstrates that the effective delivery of construction projects is not significantly influenced by procurement management system. The table further reveals that Direct Labour Procurement Strategy (DLPS) (X_9) had a coefficient of 0.113 with a t static of 1.173 and a p-value of 0.045 (less than 0.05). This means that the X_9 coefficient is significant at the 0.05 threshold of significance. This demonstrates that direct labour procurement strategy has a considerable positive impact on the effective delivery of construction projects.

Integrated project delivery procurement system (IPDPS) (X_{10}) had a coefficient of 0.191, which is more than zero, as shown in the table. The t statistic is 0.622, with a p-value of 0.536, implying that the coefficient of X_{10} is not significant at the 0.05 threshold of significance. This demonstrates that Integrated project delivery procurement system have a considerable negative influence on the effective delivery of construction projects. Public private partnership procurement system (PPPPS) (X_{11}) has a coefficient of 0.175, which is more than zero, according to the coefficient table. The t stats is 0.256, and the p-value is 0.799, which is greater than 0.05, implying that the coefficient of X_{11} is not significant at the 0.05 level of significance. This demonstrates that the effective delivery of construction projects is not significantly influenced by public private partnership procurement system.

The table further reveals that Construction Management procurement system (CMPS) (X_{12}) had a coefficient of 0.162 with a t static of 2.645 and a p-value of 0.010 (less than 0.05). This means that the X_{12} coefficient is significant at the 0.05 threshold of significance. This demonstrates that construction management procurement system has a considerable positive impact on the effective delivery of construction projects.

4.5 Correlation Testing

Data in tables 4.12 through to 4.23 were utilized to run a correlation analysis and to test whether a significant relationship existed between the type of procurement management strategy in use and the level of effective project delivery.

Table 4.12: Matrix of correlation coefficient between design build procurement system and level of effective project delivery

Correlations				
			DBPS	EPD
Spearman's rho	DBPS	Correlation Coefficient	1.000	.918*
		Sig. (2-tailed)	.	.028
		N	5	5
	EPD	Correlation Coefficient	.918*	1.000
		Sig. (2-tailed)	.028	.
		N	5	5

*. Correlation is significant at the 0.05 level (2-tailed). **Source: SPSS 19.0**

A scale of 1-5 was used to calibrate the opinions different categories of respondents as detailed below;

1 = Strongly Agree

2 = Agree

3 = Disagree

4 = Strongly Disagree

5 = Undecided

We therefore conclude that a significant relationship exists between the design build procurement system and the level of effective project delivery in Rivers State. One can infer from the result that this assertion agreed with our hypothesis earlier via regression.

Table 4.13: Matrix of correlation coefficient between the design bid build procurement system and the level of effective project delivery in Nigeria

Correlations				
			DBBPS	EPD
Spearman's rho	DBBPS	Correlation Coefficient	1.000	.821
		Sig. (2-tailed)	.	.089
		N	5	5
	EPD	Correlation Coefficient	.821	1.000
		Sig. (2-tailed)	.089	.
		N	5	5

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

Table 4.13 shows the computed correlation coefficient 'r' to be + 0.821

We therefore conclude that a significant relationship exists between design bid build procurement management system and the level of effective construction project delivery in Rivers State. One can infer from the result that this assertion agreed with our hypothesis earlier via regression.

Table 4.14: Matrix of correlation coefficient between management contracting procurement system adopted and effective project delivery in Rivers State.

Correlations

			MCPS	EPD
Spearman's rho	MCPS	Correlation Coefficient	1.000	.821
		Sig. (2-tailed)	.	.089
		N	5	5
	EPD	Correlation Coefficient	.821	1.000
		Sig. (2-tailed)	.089	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a significant relationship exists between management contracting procurement style adopted and the level of effective project delivery in Rivers State.

Table 4.15: Matrix of correlation coefficient between the use of procurement management system and the level of effective project delivery in Rivers State

Correlations

			PMS	EPD
Spearman's rho	PMS	Correlation Coefficient	1.000	-.75
		Sig. (2-tailed)	.	.055
		N	5	5
	EPD	Correlation Coefficient	-.75	1.000
		Sig. (2-tailed)	.055	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that there is no significant relationship existing between the use of procurement management system and the level of effective project delivery in Rivers State

Table 4.16: Matrix of correlation coefficient between the use of construction management procurement system and effective project delivery in Rivers State

Correlations

			CMPS	EPD
Spearman's rho	CMPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.037
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000
		Sig. (2-tailed)	.037	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a significant relationship exists between the use of construction management procurement system and level of effective project delivery in Rivers State.

Table 4.17: Matrix of correlation coefficient between the use of direct labour procurement system and effective project delivery in Rivers State

Correlations

			DLPS	EPD
Spearman's rho	DLPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.037
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000
		Sig. (2-tailed)	.037	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a significant relationship exists between the use of direct labour procurement system and level of effective project delivery in Rivers State.

Table 4.18: Matrix of correlation coefficient between the use of alliancing procurement system and effective project delivery in Rivers State

Correlations

			APS	EPD
Spearman's rho	APS	Correlation Coefficient	1.000	-.020
		Sig. (2-tailed)	.	.077
		N	5	5
	EPD	Correlation Coefficient	-.020	1.000
		Sig. (2-tailed)	.077	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a negative and insignificant relationship exists between the use of direct labour procurement system and level of effective project delivery in Rivers State.

Table 4.19: Matrix of correlation coefficient between the use of partnering procurement system and effective project delivery in Rivers State

Correlations

			PPS	EPD
Spearman's rho	PPS	Correlation Coefficient	1.000	-.109
		Sig. (2-tailed)	.	.087
		N	5	5
	EPD	Correlation Coefficient	-.109	1.000
		Sig. (2-tailed)	.087	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a negative and insignificant relationship exists between the use of partnering procurement system and level of effective project delivery in Rivers State.

Table 4.20: Matrix of correlation coefficient between the use of integrated project delivery procurement system and effective project delivery in Rivers State

Correlations

			IPDPS	EPD
Spearman's rho	IPDPS	Correlation Coefficient	1.000	-.201
		Sig. (2-tailed)	.	.096
		N	5	5
	EPD	Correlation Coefficient	-.201	1.000
		Sig. (2-tailed)	.096	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a negative and insignificant relationship exists between the use of integrated project delivery procurement system and level of effective construction project delivery in Rivers State.

Table 4.21: Matrix of correlation coefficient between the use of lump-sum contract procurement system and effective project delivery in Rivers State

Correlations

			LCPS	EPD
Spearman's rho	LCPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.027
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000
		Sig. (2-tailed)	.027	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a significant and positive relationship exists between the use of lump-sum contract procurement system and level of effective construction project delivery in Rivers State.

Table 4.22: Matrix of correlation coefficient between the use of public private partnership procurement system and effective project delivery in Rivers State

Correlations

			PPPPS	EPD
Spearman's rho	PPPPS	Correlation Coefficient	1.000	-.290
		Sig. (2-tailed)	.	.092
		N	5	5
	EPD	Correlation Coefficient	-.290	1.000
		Sig. (2-tailed)	.037	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a negative and insignificant relationship exists between the use of public private partnership procurement system and level of effective construction project delivery in Rivers State.

Table 4.23: Matrix of correlation coefficient between the use of cost reimbursement contract procurement system and effective project delivery in Rivers State

Correlations

			CRCPS	EPD
Spearman's rho	CRCPS	Correlation Coefficient	1.000	.700*
		Sig. (2-tailed)	.	.023
		N	5	5
	EPD	Correlation Coefficient	.700*	1.000
		Sig. (2-tailed)	.023	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

We therefore conclude that a significant and positive relationship exists between the use of cost reimbursement contract procurement system and level of effective construction project delivery in Rivers State.

4.6 Discussion of Findings

The majority of respondents agreed with the statement that utilizing various procurement management approaches is essential in enhancing construction project delivery. The outcome of this study agrees with that of Inuwa *et al.,* (2014), who were of the view that one of the procurement systems that have gained prominence in the Nigerian construction industry, is the design build procurement system, however, its application in Nigeria records high time and cost overrun. Their reports further provided evidence to support the claim that the choice of this type of procurement management system has a direct impact on the level of effective construction project delivery.

The assessment of the relationship between the utilization of direct labour procurement management system and the level of effective construction project delivery led to infrastructural development. The revelation is that the involvement of various procurement management strategies, in response to the requirements of the work, significantly contributes to the growth of infrastructure in the economy. Consequently, this leads to the expansion of infrastructural development. Furthermore, the outcomes of our study further corroborate with that of Umuhoza and An (2023) who categorized the various systems used in the procurement of construction works based on the relationship and interaction between design and construction responsibilities. The initial method is the conventional approach, and this system employs a division of labour between designers and contractors, with each firm responsible for specific tasks related to the design and construction process. Owner direct force (ODF) and general contractors, commonly referred to as design-bid-build (DBB), fall under this classification. The second type is the integrated system, also known as the non-traditional approach (Inuwa, Wanyona & Diang'a, 2014; Mathonsi & Thwala, 2012; Babatunde *et al.,* 2010). This approach can be further categorized into package deal, turnkey, and develop and construct methods. Ogunsanmi (2013) states that multiple studies have verified the utilization of diverse

procurement methods for project delivery in Nigeria. Ogunsanmi (2013) provides additional evidence of the utilizations of various procurement methods in the Nigerian construction industry, including traditional, design and build, project management, construction management, labour only, direct labour, as well as more specialized methods such as alliancing, partnering, and joint ventures. The utilization of these procurement methods can have a substantial impact on the performance of the majority of projects. While various procurement systems possess their own set of benefits and drawbacks, certain features of these systems can exhibit significant similarities (Tang *et al.,* 2019). Each of the five selected procurement systems requires different levels of team cooperation, with the Design-Bid-Build (DBB) system having the lowest level and the Integrated Project Delivery (IPD) system having the highest level. The attributes of procurement systems, such as team collaboration, are considered to be the variables of the procurement system. The traditional system has consistently been a favored procurement method for delivering construction projects in Rwanda, and it is anticipated that it will likely remain the predominant approach (Umuhoza & An, 2023).

These strategies can be categorized into conventional and unconventional methods, each with its own variations and approaches aimed at addressing the distinct challenges of the industry, such as project delays and cost overruns. Here is a summary of certain procurement activities.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

This chapter provides a summary of the study's objectives, findings, and outcomes resulting from the conducted research. Moreover, drawing upon the results and discourse, the investigation arrived at conclusions and proffered suggestions. The final section of the chapter provides an analysis of the research's findings with regards to the existing body of knowledge.

5.1 Summary of Findings

The broad objective of this research is to examine the influence of procurement management strategies on effective construction project delivery in Rivers state, Nigeria. The study specifically identified and categorized the procurement management strategies currently in use in the effective delivery of construction projects, determined the influence of procurement management strategies on effective construction project delivery, and analyzed and correlated the difference between the traditional procurement management strategies and non-traditional procurement management strategies on construction project delivery in Rivers State.

In the course of conducting the research out of the eighty-two (82) responses from the respondents sent out, 74 were found usable. Twelve (12) procurement management strategies currently in use in the effective delivery of construction projects in Rivers state were identified and evaluated. The key findings arising from the three (3) objectives set out *ab ini tio* in the course of this study are described below.

The study further sought to identify and categorize the procurement management strategies currently in use in the effective delivery of construction projects in Rivers state. The findings from the study shows that the 12-factors of procurement management strategies can be grouped into six (6) decision matrix (components) for procurement management strategies in use in

effective delivery of construction projects in Rivers state. However, 6-principal components were later extracted for effectiveness as the most significant factors; they include; DBPS, DLPS, DBBPS, LCPS, CMPS and CRCPS.

The study sought to determine the influence of procurement management strategies on effective construction project delivery in Rivers State. The study findings showed that factors notably; Design and build procurement system, Design bid build procurement system, lump-sum contract procurement system, direct-labour procurement strategy, and construction management procurement system to a large extent influenced effective construction project delivery in Rivers state. The overall Regression model on the strategies versus effective construction project delivery gave a coefficient of determination R square as 0.260 and R as 0.509 at 0.05 level of significance. This is since the p-values of their coefficients were all less than 0.05. The coefficient of determination thus indicated that 26.0% of the variation on procurement management strategies is influenced by effective construction project delivery. This indicates that there exists a strong positive relationship between effective construction project delivery and the five (5) factors procurement management strategies.

The study further sought to analyze and correlate the difference between the traditional procurement management strategies and non-traditional procurement management strategies on effective construction project delivery in Rivers State. The study findings showed that factors notably; Design and build procurement system, Design bid build procurement system, lump-sum contract procurement system, direct-labour procurement strategy, construction management procurement system and cost reimbursement contract procurement system had a positive and significant relationships with effective construction project delivery in Rivers state. The overall Spearman's rho value on the strategies versus effective construction project delivery gave a correlation coefficient of 1.000 and Sig. (2-tailed) value. This is so since the p-values of their coefficients were all less than 0.05.

5.2 Conclusion

From the outcomes of the results, the study now concludes that;

1. The most significant procurement management strategies in use in effective construction project delivery in Rivers State are; design build procurement system, direct labour procurement system, design bid-build procurement system, lump sum contract procurement system, construction management procurement system and cost reimbursement contract procurement system.

2. The study concludes that design and build procurement system (X_1) is the first important procurement strategy that influences effective construction project delivery in Rivers State. The optimal model of the study shows that design and build procurement system (X_1) has a significant influence on effective construction project delivery in Rivers State. This implies that increasing levels of design and build procurement system (X_1) by a unit would increase the levels of effective construction project delivery in Rivers State by a unit. This shows that design and build procurement system (X_1) has a positive influence on effective construction project delivery in Rivers State. Design bid build procurement system (X_2) is the second important procurement strategy that influences effective construction project delivery in Rivers State. The optimal model of the study shows that increasing levels of design bid build procurement system (X_2) by a unit would increase the levels of effective construction project delivery in Rivers State. Lump-sum contract procurement system (X_7) is the third important procurement strategy that influences effective construction project delivery in Rivers State. The optimal model of the study shows that increasing levels of lump-sum contract procurement system (X_7) by a unit would increase the levels of effective construction project delivery in Rivers State by a

unit. Direct-labour procurement strategy (X_9) is the fourth important procurement strategy that influences effective construction project delivery in Rivers State. The optimal model of the study shows that increasing levels of direct-labour procurement strategy (X_9) by a unit would increase the levels of effective construction project delivery in Rivers State by a unit. Finally, the study concludes that construction management procurement system (X_{12}) is the fifth important procurement strategy that influences effective construction project delivery in Rivers State. The optimal model of the study shows that construction management procurement system (X_{12}) have a significant influence on effective construction project delivery in Rivers State. Increasing construction management procurement system (X_{12}) by a unit would increase the levels of effective construction project delivery in Rivers State.

5.3 Recommendation

On the basis of the findings and conclusions, this study therefore calls for the following recommendations;

1. Having revealed that the different procurement management strategies being deployed in the delivery of construction projects in Rivers State, the study therefore recommends that project executioners must see to it that they change the tide by delving into the use modern day procurement strategies that have proven to be effective and reliable. Notable amongst them is the use of integrated project delivery (IPD) method and other variants of alliancing procurement methods/strategies which have all proven to be reliable in modern day procurement.

2. There are several systems that can be used in the procurement of construction works, and they can be summarized under certain sections based on the relationship and interaction between design and construction responsibilities. This study recommends further that a

system consisting of separating the designing and construction teams where responsibilities for works carried out by different firms of designers and contractors is done with due diligence is advocated. The use of non-traditional methods, each with its variations and approaches is aimed at tackling the unique challenges of the industry, including the prevalent issues of project delays and cost overruns that have bedeviled the Nigerian construction industry landscape. It is also expected that non-traditional procurement systems involve team cooperation to a greater extent, while the traditional-based ones such as DBB have the lowest level of team cooperation. The traditional system has remained a popular procurement method used to deliver construction projects in almost all African and sub-Saharan countries up till now and it is expected that it would probably continue to be the most dominant if we don't make amends.

3. Given that the traditional procurement systems portrayed a better level of significance with regards to their levels of correlation, it is recommended that more attention should be accorded to the non-traditional procurement system as a way of changing the narrative in the business of procurement in the Nigerian construction industry. More effort should be made by government and other public-spirited individuals to look on how to start embracing the modern and conventional modes of procurement with a view to delivering construction projects to schedule, cost, quality and ensuring value for money is achieved.

5.3.1 Contribution to Knowledge

This paper advances knowledge in the following ways:

1. The study conducted an examination of influence of procurement management strategies on effective construction project delivery in Rivers State. This was achieved via a thorough review of existing literature, which allowed for the categorization of these

procurement strategies as well as their influence of effective construction project delivery.

2. This study adds to the existing body of knowledge by being the first of kind of investigation to be conducted in Rivers state in recent time.

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APPENDIX I

QUESTIONNAIRE

LETTER TO RESPONDENTS

Dept. of Project Management Technology
School of Management Technology

FUTO.

20th July, 2018.

Dear Respondent,

REQUEST FOR RESPONSE TO QUESTIONNAIRE

I am a Master of Science (M.Sc.) research Student of the Department of Project Management Technology, School of Management Technology, Federal University of Technology, Owerri, Imo state.

*Currently, I am carrying out a research work titled "*An examination of the influence of procurement management strategies on effective construction project delivery in Rivers State" *As this study is purely undertaken as an academic exercise, I therefore request that you kindly fill the attached Questionnaire to the best of your knowledge. I promise absolute confidentially of any material/ information you may reveal to me.*

Thanks for your co-operation.

Yours faithfully,

FUBARA JACOB.

QUESTIONNAIRE

Instruction: Please, kindly indicate the options you consider appropriate by ticking" good" against such options and fill in the blank spaces as appropriate.

SECTION A: *PERSONAL DATA.*

1. *AGE*

Below 20years ☐

☐

20-25 years

☐

Above 25 years

2. *LEVEL OF EDUCATION*

A. Below B.Sc. ☐

B. B.Sc. ☐

C. Above B.Sc. ☐

3. *WORKING EXPERIENCE*

☐

A. Below 1-5yrs ☐

B. 6-10yrs ☐

☐

☐

C. *11-15yrs*

D. *16-20yrs*

E. *Above20yrs*

SECTION B: *PROCUREMENT MANAGEMENT AND SUCCESSFUL PROJECT DELIVERY*

4. *Procurement Management comes in different ways depending on job conditions.*

   a. *Strongly Agree* ☐
   b. *Agree* ☐
   c. *Disagree* ☐
   d. *Strongly Disagree* ☐
   e. *Undecided* ☐

5. *The type of Procurement Management adopted determines the level of effective Project Delivery to be accomplished.*

   a. *Strongly Agree* ☐
   b. *Agree* ☐
   c. *Disagree* ☐
   d. *Strongly Disagree* ☐
   e. *Undecided* ☐

6. *Procurement Management roles are remarkably necessary aids for infrastructural development in the economy.*

   a. *Strongly Agree* ☐
   b. *Agree* ☐
   c. *Disagree* ☐
   d. *Strongly Disagree* ☐
   e. *Undecided* ☐

7. *The level of Procurement Management functions in place during Project Implementation exerts significant influence on the size of infrastructural development.*

   a. *Strongly Agree* ☐
   b. *Agree* ☐
   c. *Disagree* ☐
   d. *Strongly Disagree* ☐
   e. *Undecided* ☐

8. *Project executioners employ different Procurement Management styles depending on the project type.*

☐
☐
☐
☐
☐

a. *Strongly Agree*

b. *Agree*

c. *Disagree*

d. *Strongly Disagree*

e. *Undecided*

9. *The type of Procurement Management style in place is determinant factor for efficient Project delivery.*

a. *Strongly Agree* ☐

b. *Agree* ☐

c. *Disagree* ☐

d. *Strongly Disagree* ☐

e. *Undecided* ☐

10. *Project Management Practitioners ensure and also insist on the adoption skilled personnel in Procurement Management.*

a. *Strongly Agree* ☐

b. ☐

c. ☐

d. ☐

e. ☐

b. Agree

c. Disagree

d. Strongly Disagree

e. Undecided

11. *The adoption of skilled procurement personnel in Procurement Management improves quality and timely project delivery.*

a. Strongly Agree ☐

b. Agree ☐

c. Disagree ☐

d. Strongly Disagree ☐

e. Undecided ☐

12. *Project executioners consider due diligence supervision necessary in every aspect of project implementation.*

a. Strongly Agree ☐

b. Agree ☐

c. Disagree ☐

d. Strongly Disagree ☐

e. Undecided ☐

13. *The adoption of the policy of due diligence supervision in project implementation guarantees quality project delivery.*

a.	*Strongly Agree*	☐
b.	*Agree*	☐
c.	*Disagree*	☐
d.	*Strongly Disagree*	☐
e.	*Undecided*	☐

S/N	Procurement Management Strategies	SA Strongly Agree	A Agree	N Neutral	D Disagree	SD Strongly Disagree
1	Design and Build Procurement System (DBPS)					
2	Design Bid Build Procurement System (DBBPS)					
3	Cost reimbursement Contract Procurement System (CRCPS)					
4	Management Contracting Procurement System (MCPS)					
5	Alliancing Procurement System (APS)					
6	Partnering Procurement System (PPS)					
7	Lump-sum Contract Procurement System (LCPS)					
8	Procurement Management System (PMS)					
9	Direct Labour Procurement System (DLPS)					

10	Integrated Project Delivery Procurement System (IPDPS)					
11	Public Private Partnership Procurement System (PPPPS)					
12	Construction Management Procurement System (CMPS)					

APPENDIX II

ANALYSIS OF RESULTS

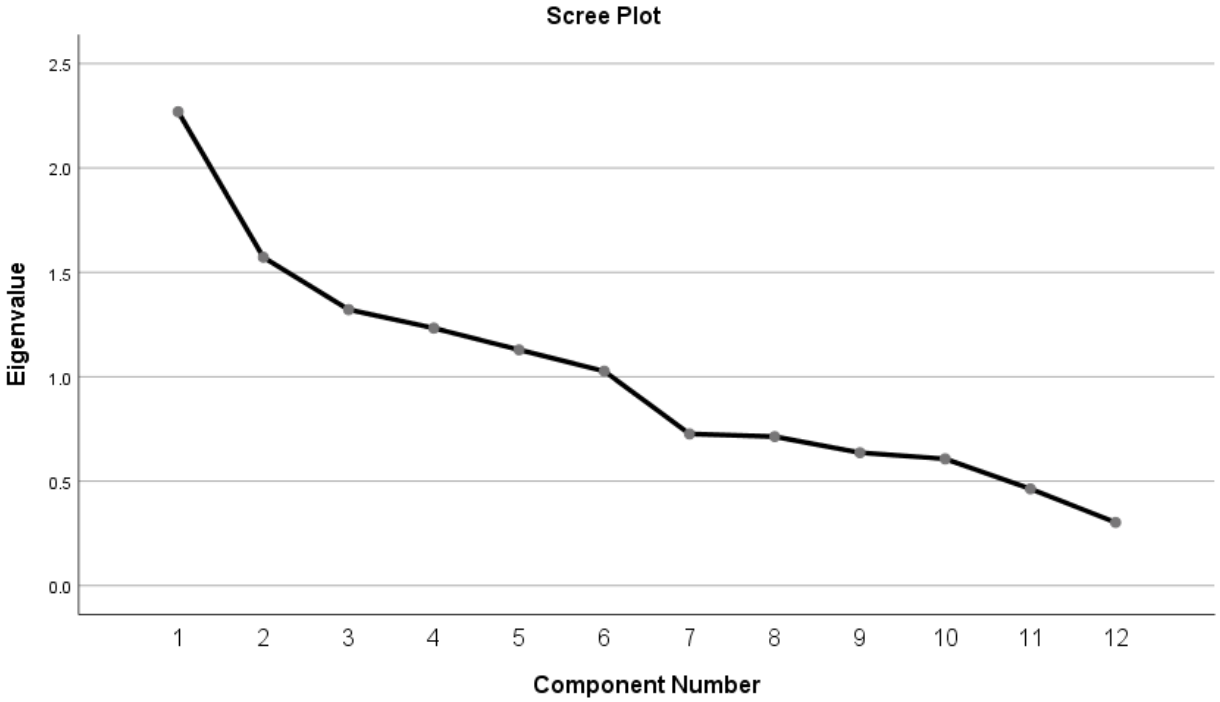
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.619
Bartlett's Test of Sphericity	Approx. Chi-Square	131.146
	Df	78
	Sig.	.000

Communalities		
	Initial	Extraction
Design and Build Procurement System (DBPS)	1.000	.815
Design Bid Build Procurement System (DBBPS)	1.000	.700
Cost reimbursement Contract Procurement System (CRCPS)	1.000	.652
Management Contracting Procurement System (MCPS)	1.000	.614
Alliancing Procurement System (APS)	1.000	.725
Partnering Procurement System (PPS)	1.000	.776

Lump-sum Contract Procurement System (LCPS)	1.000	.700
Procurement Management System (PMS)	1.000	.664
Direct Labour Procurement System (DLPS)	1.000	.842
Integrated Project Delivery Procurement System (IPDPS)	1.000	.743
Public Private Partnership Procurement System (PPPPS)	1.000	.562
Construction Management Procurement System (CMPS)	1.000	.758
Extraction Method: Principal Component Analysis.		

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.269	18.910	18.910	2.269	18.910	18.910	1.747	14.562	14.562
2	1.572	13.102	32.012	1.572	13.102	32.012	1.598	13.316	27.878
3	1.322	11.013	43.025	1.322	11.013	43.025	1.381	11.507	39.385
4	1.233	10.275	53.300	1.233	10.275	53.300	1.346	11.219	50.603
5	1.129	9.408	62.708	1.129	9.408	62.708	1.323	11.022	61.625
6	1.027	8.556	71.264	1.027	8.556	71.264	1.157	9.639	71.264
7	.726	6.052	77.316						
8	.713	5.945	83.261						
9	.636	5.303	88.564						
10	.607	5.056	93.621						
11	.463	3.859	97.480						
12	.302	2.520	100.000						

Extraction Method: Principal Component Analysis.



Component Matrix[a]						
	Component					
	1	2	3	4	5	6
Design and Build Procurement System (DBPS)	**.627**	-.385	-.216	-.184	-.172	-.193
Design Bid Build Procurement System (DBBPS)	**.572**		**.555**		-.173	.265
Cost reimbursement Contract Procurement System (CRCPS)	**.542**	-.161		.424	-.226	**.514**

Management Contracting Procurement System (MCPS)	**.494**	-.392	.226	-.178	.197	-.403
Alliancing Procurement System (APS)	.405	-.368	-.383	.136	-.338	.331
Partnering Procurement System (PPS)	.416	**.504**	-.291	-.163		-.105
Lump-sum Contract Procurement System (LCPS)	**.468**	.428	-.331	**.566**		
Procurement Management System (PMS)	.400	.121	**.506**	-.306	.467	.128
Direct Labour Procurement System (DLPS)		**.525**	-.114		.148	
Integrated Project Delivery Procurement System (IPDPS)	.370	.283	-.337	-.446	.251	.307
Public Private Partnership Procurement System (PPPPS)		.405	.487		-.530	.353
Construction Management Procurement System (CMPS)	.220	-.237		.426	**.520**	.478
Extraction Method: Principal Component Analysis.						
a. 6 components extracted.						

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.602	.099	1.33382

a. Predictors: (Constant), Design and build procurement system (DBPS), Design bid build procurement system (DBBPS), Management contracting procurement system (MCPS), Construction Management procurement system(CMPS), Procurement Management system (PMS), Direct Labour Procurement Strategy (DLPS), Alliancing procurement system (APS), Partnering procurement system (PPS), Integrated project delivery procurement system (IPDPS), Public private partnership procurement system (PPPPS), Lump-sum Contract procurement system (LCPS), Cost reimbursement contract procurement system (CRCPS)

b. Dependent Variable: Effective construction project delivery

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.417	13	2.878	1.618	.000[b]
	Residual	106.745	60	1.779		
	Total	144.162	73			

a. Dependent Variable: Effective construction project delivery

b. Predictors: Design and build procurement system (DBPS), Design bid build procurement system (DBBPS), Management contracting procurement system (MCPS), Construction Management procurement system(CMPS), Procurement Management system (PMS), Direct Labour Procurement Strategy (DLPS), Alliancing procurement system (APS), Partnering procurement system (PPS), Integrated project delivery procurement system (IPDPS), Public private partnership procurement system (PPPPS), Lump-sum Contract procurement system (LCPS), Cost reimbursement contract procurement system (CRCPS)

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.312	2.369		2.242	.029
	Design and Build Procurement System (DBPS)	.639	.232	.342	2.756	.008
	Design Bid Build Procurement System (DBBPS)	.125	.201	.015	.125	.019
	Cost reimbursement Contract Procurement System (CRCPS)	.017	.214	.010	.082	.935
	Management Contracting Procurement System (MCPS)	.101	.151	.081	.673	.503
	Alliancing Procurement System (APS)	.089	.192	.056	.462	.646
	Partnering Procurement System (PPS)	.152	.186	.109	.821	.415
	Lump-sum Contract Procurement System (LCPS)	.158	.166	.129	.953	.044

	Procurement Management System (PMS)	.164	.114	.177	1.431	.158
	Direct Labour Procurement System (DLPS)	.133	.113	.138	1.173	.045
	Integrated Project Delivery Procurement System (IPDPS)	.119	.191	.083	.622	.536
	Public Private Partnership Procurement System (PPPPS)	.045	.175	.031	.256	.799
	Construction Management Procurement System (CMPS)	.427	.162	.334	2.645	.010
a. Dependent Variable: Effective construction project delivery						

Correlations				
			DBPS	EPD
Spearman's rho	DBPS	Correlation Coefficient	1.000	.918*
		Sig. (2-tailed)	.	.028
		N	5	5
	EPD	Correlation Coefficient	.918*	1.000
		Sig. (2-tailed)	.028	.
		N	5	5

*. Correlation is significant at the 0.05 level (2-tailed). **Source: SPSS 19.0**

Correlations				
			DBBPS	EPD
Spearman's rho	DBBPS	Correlation Coefficient	1.000	.821
		Sig. (2-tailed)	.	.089
		N	5	5
	EPD	Correlation Coefficient	.821	1.000
		Sig. (2-tailed)	.089	.
		N	5	5

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

Correlations

			MCPS	EPD
Spearman's rho	MCPS	Correlation Coefficient	1.000	.821
		Sig. (2-tailed)	.	.089
		N	5	5
	EPD	Correlation Coefficient	.821	1.000
		Sig. (2-tailed)	.089	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			PMS	EPD
Spearman's rho	PMS	Correlation Coefficient	1.000	-.75

		Sig. (2-tailed)	.	.055
		N	5	5
	EPD	Correlation Coefficient	-.75	1.000
		Sig. (2-tailed)	.055	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			CMPS	EPD
Spearman's rho	CMPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.037
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000

	Sig. (2-tailed)	.037	.
	N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			DLPS	EPD
Spearman's rho	DLPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.037
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000
		Sig. (2-tailed)	.037	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			APS	EPD
Spearman's rho	APS	Correlation Coefficient	1.000	-.020
		Sig. (2-tailed)	.	.077
		N	5	5
	EPD	Correlation Coefficient	-.020	1.000
		Sig. (2-tailed)	.077	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			PPS	EPD
Spearman's rho	PPS	Correlation Coefficient	1.000	-.109
		Sig. (2-tailed)	.	.087
		N	5	5
	EPD	Correlation Coefficient	-.109	1.000
		Sig. (2-tailed)	.087	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Table 4.20: Matrix of correlation coefficient between the use of integrated project delivery procurement system and effective project delivery in Rivers State

Correlations

			IPDPS	EPD
Spearman's rho	IPDPS	Correlation Coefficient	1.000	-.201
		Sig. (2-tailed)	.	.096
		N	5	5
	EPD	Correlation Coefficient	-.201	1.000
		Sig. (2-tailed)	.096	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			LCPS	EPD
Spearman's rho	LCPS	Correlation Coefficient	1.000	.900*
		Sig. (2-tailed)	.	.027
		N	5	5
	EPD	Correlation Coefficient	.900*	1.000
		Sig. (2-tailed)	.027	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			PPPPS	EPD
Spearman's rho	PPPPS	Correlation Coefficient	1.000	-.290

		Sig. (2-tailed)	.	.092
		N	5	5
	EPD	Correlation Coefficient	-.290	1.000
		Sig. (2-tailed)	.037	.
		N	5	5

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

Source: SPSS 19.0; Sample size 74

Correlations

			CRCPS	EPD
Spearman's rho	CRCPS	Correlation Coefficient	1.000	.700*
		Sig. (2-tailed)	.	.023
		N	5	5
	EPD	Correlation Coefficient	.700*	1.000

	Sig. (2-tailed)	.023	.
	N	5	5

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

Source: SPSS 19.0; Sample size 74

APPENDIX III

RAW RESULT PRINTOUT

Raw input data from SPSS Statistics Version 19.0

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12
1	5.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	2.00
2	5.00	5.00	4.00	5.00	5.00	2.00	5.00	4.00	2.00	4.00	4.00	5.00	4.00
3	5.00	4.00	5.00	4.00	5.00	3.00	4.00	3.00	3.00	5.00	4.00	4.00	4.00
4	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	3.00	3.00	5.00	3.00
5	4.00	4.00	4.00	5.00	4.00	4.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00
6	5.00	3.00	5.00	4.00	5.00	3.00	5.00	4.00	4.00	4.00	2.00	4.00	3.00
7	3.00	4.00	5.00	4.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00	5.00
8	5.00	4.00	5.00	1.00	5.00	4.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00
9	5.00	4.00	5.00	4.00	5.00	3.00	5.00	4.00	4.00	5.00	5.00	4.00	5.00
10	4.00	3.00	4.00	5.00	4.00	3.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00
11	3.00	4.00	5.00	4.00	3.00	4.00	5.00	3.00	2.00	5.00	4.00	5.00	4.00
12	5.00	4.00	4.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00

13	4.00	5.00	5.00	4.00	4.00	3.00	4.00	4.00	3.00	5.00	3.00	5.00	4.00
14	5.00	4.00	5.00	4.00	5.00	5.00	4.00	5.00	4.00	3.00	4.00	5.00	4.00
15	5.00	5.00	4.00	5.00	5.00	4.00	4.00	4.00	4.00	5.00	4.00	5.00	1.00
16	5.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	3.00	5.00	4.00	5.00	4.00
17	5.00	4.00	5.00	4.00	5.00	2.00	4.00	3.00	4.00	4.00	3.00	4.00	5.00
18	4.00	4.00	4.00	5.00	4.00	4.00	5.00	5.00	4.00	3.00	4.00	5.00	4.00
19	5.00	3.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	5.00	4.00	4.00	5.00
20	4.00	4.00	5.00	4.00	5.00	5.00	4.00	5.00	4.00	4.00	5.00	5.00	4.00
21	5.00	4.00	4.00	4.00	4.00	2.00	4.00	2.00	4.00	5.00	4.00	5.00	4.00
22	3.00	3.00	5.00	3.00	5.00	4.00	5.00	4.00	3.00	5.00	4.00	4.00	5.00
23	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00
24	4.00	2.00	4.00	3.00	5.00	3.00	5.00	3.00	2.00	5.00	2.00	5.00	4.00
25	4.00	4.00	5.00	5.00	5.00	4.00	5.00	4.00	4.00	5.00	3.00	4.00	3.00
26	5.00	4.00	5.00	4.00	4.00	3.00	4.00	3.00	4.00	3.00	4.00	5.00	4.00
27	5.00	5.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	5.00	4.00
28	5.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00

29	5.00	4.00	5.00	4.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	5.00	5.00
30	4.00	4.00	4.00	3.00	3.00	4.00	4.00	3.00	4.00	5.00	4.00	5.00	3.00
31	5.00	3.00	5.00	4.00	5.00	5.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00
32	3.00	4.00	5.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00
33	5.00	4.00	5.00	5.00	4.00	4.00	5.00	5.00	4.00	5.00	5.00	5.00	4.00
34	5.00	4.00	5.00	5.00	4.00	5.00	4.00	5.00	3.00	4.00	3.00	5.00	4.00
35	4.00	3.00	4.00	5.00	2.00	5.00	4.00	3.00	4.00	5.00	4.00	4.00	4.00
36	4.00	4.00	3.00	5.00	3.00	4.00	3.00	5.00	3.00	5.00	4.00	4.00	3.00
37	4.00	4.00	4.00	3.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
38	3.00	4.00	4.00	3.00	3.00	4.00	4.00	3.00	4.00	5.00	4.00	4.00	4.00
39	5.00	5.00	4.00	4.00	5.00	5.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00
40	4.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	5.00	4.00
41	4.00	4.00	5.00	5.00	4.00	4.00	5.00	5.00	4.00	5.00	5.00	4.00	5.00
42	4.00	5.00	4.00	4.00	5.00	4.00	5.00	4.00	5.00	5.00	4.00	5.00	4.00
43	2.00	5.00	4.00	2.00	5.00	4.00	5.00	4.00	4.00	5.00	2.00	5.00	4.00
44	3.00	4.00	3.00	3.00	4.00	5.00	4.00	4.00	5.00	5.00	3.00	4.00	3.00

45	4.00	5.00	4.00	4.00	5.00	4.00	5.00	4.00	4.00	3.00	4.00	5.00	4.00
46	3.00	5.00	4.00	3.00	5.00	5.00	4.00	3.00	3.00	5.00	3.00	5.00	4.00
47	4.00	4.00	2.00	4.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	2.00
48	4.00	4.00	3.00	4.00	4.00	4.00	5.00	3.00	4.00	4.00	4.00	5.00	4.00
49	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00	4.00	4.00	4.00
50	3.00	4.00	4.00	3.00	4.00	4.00	3.00	5.00	4.00	3.00	3.00	5.00	3.00
51	5.00	3.00	5.00	4.00	4.00	4.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00
52	4.00	4.00	5.00	4.00	3.00	3.00	3.00	4.00	4.00	4.00	2.00	4.00	3.00
53	5.00	3.00	4.00	5.00	4.00	4.00	2.00	4.00	3.00	4.00	4.00	5.00	5.00
54	4.00	3.00	4.00	4.00	5.00	2.00	3.00	4.00	3.00	5.00	4.00	5.00	4.00
55	4.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00	4.00	5.00	2.00	4.00	5.00
56	5.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00	4.00	5.00	3.00	5.00	4.00
57	3.00	3.00	4.00	4.00	4.00	2.00	4.00	3.00	3.00	3.00	4.00	5.00	4.00
58	5.00	4.00	5.00	3.00	4.00	4.00	5.00	5.00	4.00	5.00	3.00	4.00	5.00
59	4.00	3.00	4.00	4.00	5.00	2.00	3.00	4.00	3.00	5.00	4.00	5.00	4.00
60	3.00	4.00	5.00	4.00	3.00	5.00	4.00	3.00	4.00	3.00	4.00	5.00	4.00

61	5.00	3.00	5.00	4.00	4.00	5.00	4.00	4.00	3.00	5.00	4.00	5.00	1.00
62	4.00	4.00	4.00	4.00	3.00	4.00	5.00	3.00	4.00	5.00	4.00	5.00	4.00
63	5.00	4.00	4.00	5.00	3.00	3.00	4.00	4.00	4.00	4.00	3.00	4.00	5.00
64	4.00	3.00	5.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	4.00	5.00	4.00
65	5.00	4.00	5.00	4.00	4.00	5.00	4.00	4.00	4.00	5.00	4.00	4.00	5.00
66	3.00	4.00	4.00	3.00	4.00	4.00	3.00	4.00	4.00	4.00	5.00	5.00	4.00
67	5.00	2.00	3.00	4.00	5.00	4.00	5.00	4.00	2.00	5.00	4.00	5.00	4.00
68	5.00	4.00	5.00	4.00	3.00	4.00	4.00	3.00	4.00	5.00	4.00	4.00	5.00
69	4.00	3.00	4.00	4.00	5.00	2.00	3.00	4.00	3.00	5.00	4.00	5.00	4.00
70	4.00	4.00	5.00	3.00	5.00	4.00	5.00	4.00	4.00	5.00	2.00	5.00	4.00
71	5.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00	4.00	5.00	3.00	4.00	3.00
72	3.00	3.00	4.00	4.00	4.00	2.00	4.00	3.00	3.00	3.00	4.00	5.00	4.00
73	5.00	4.00	5.00	3.00	4.00	4.00	5.00	5.00	4.00	5.00	3.00	5.00	4.00
74	5.00	4.00	5.00	4.00	3.00	3.00	5.00	3.00	4.00	4.00	4.00	4.00	4.00