ADOPTABILITY OF INTEGRATED PROJECT DELIVERY (IPD) CONCEPTS IN THE NIGERIAN CONSTRUCTION INDUSTRY

BY

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Declaration

I hereby declare that the work in this dissertation titled “Adoptability of Integrated Project Delivery IPD Concepts in the Nigerian Construction Industry” was performed by me in the Department of Building, Faculty of Environmental Design, Ahmadu Bello University Zaria, under the supervision of Dr. DahiruDaudaDanwata and Mal. MuawiyaAbubakar.

The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this work has been presented for another degree or diploma at any institution.

_____ _____

Salman SALAU Date

Certification

This Dissertation titled Adoptability of Integrated Project Delivery (IPD) Concepts in the Nigerian Construction Industry meets the regulations governing the award of the degree of Master of Science in Construction Management of the Ahmadu Bello Universityand is approved for its contribution to knowledge and literary presentation.

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Dedication

This dissertation is dedicated to the loving memory of my late mother and my Father who is an immeasurable pillar and role model, as well as everyone who has encouraged and supported me towards the completion of this work.

Acknowledgement

I wish to express my profound gratitude to my supervisors Dr. DahiruDauda and Mal MuawiyaAbubakar for the immeasurable contribution in the form of critics, advises and suggestions leadingto the successful completion of the work.

Similarly, I wish to express my appreciation to my lecturers for their uncommon encouragement in the pursuit of this research as well as my colleagues and course mates for the opportunity of friendship and comradeship during my study.

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Abstract

The dismal performance of the global construction industry has been a major source of worry for practitioners and construction stakeholders. The Nigerian Construction industry (NCI) has not been immune from these problems also as it is plagued with project abandonment, poor project analysis and management, poor quality of work, adversarial relationship, litigation amongst others. Integrated project delivery (IPD) is a relatively new project delivery approach which serves as a response to the poor performance of the construction industry as regards failure of projects achieving desired outcomes such as cost and time overrun. IPD is influenced by the extensive collaboration with emphasis on the exploitation of relevant technologies and lean construction for continuous improvement in project delivery. The study investigated the possibility of adopting IPD concepts and principles in the NCI with the view to addressing some of the pertinent problems of the industry such as wastes and adversarial relationships. 87 being a sum of the population were administered questionnaire of which 75 duly filled and returned questionnaires were used in the analysis. The analysis were presented in tables where they were ranked using relative importance index. Lack of awareness of the concept of IPD with a RII of 0.70 ranked as the major barrier to the adoption of the concept. Respondents indicated collaborative decision making with a RII of 0.71 and which is one of the characteristics of IPD was relevant in improving project delivery. The study concluded that awareness of the concept of IPD was relatively low and recommended the propagation of the concept by professional bodies through inter – professional workshop and symposia as a way of dissemination and diffusion of awareness of the concept which would assist to create and encourage further research to its adoption.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The global construction industry has been severally criticized for its under-performance, ever dwindling productivity and the failure of its delivery methods (Egan 1998). Emmit, Mossman and Smith (2011) stated that the fragmented nature as well its project delivery approach has beenthe major concerns as the different players in a project often do not consider themselves as a team but rather each trying to maximize its profit and protect its interest without considering its impact on other members of the project and the resultant backlash on the entire project. Govender, Nyagwaski, Smallwood and Allen (2018) argued that professionals of the CI have become accustomed to traditional methods of project delivery with its practices and systems which have not always produced best value for clients.

Latham (1994) corroborated that the construction industry in its current state is highly fragmented, with adversarial relationship between the various parties in projects coupled with its wastes, decreasing productivity and efficiency.Conklin (2005), stated thus "construction may best be described as a wicked problem, fragmented by the complexity of the subject, social interactions and latent technology, relating to losses on projects by owners, lack of appreciation of design quality by architect and engineers, with contractors bearing a great deal of financial risks in the process".

According to Emmitt, Sander andChristoffersen(2005) the reason for failure of current delivery methods is the rigidity in delineating responsibilities with much elaboration on the consequences of failure thereby reinforcing risk abating behaviour, lack of interest by team

members to engage in collaborative process and the promotion of adversarial construction cultures to the detriment of stakeholders.Alshawi, (2002) corroborated this by explaining that the construction industry promotes a stage-controlled process in which the life cycle of projects are divided into many isolated stages. This approach impedes transfer of information from one stage to another between participants.Traditional delivery methods seem to have failed due to the ever decreasing productivity, excess wastes and poor delivery of the construction industry. This calls for a paradigm shift in the approach of projects.

Similarly, the Nigerian construction industry is plagued with various problems hampering its efficiency and productivity, notably among them are project abandonment, poor project analysis and management, poor quality of work, adversarial relationship, litigation, arbitration, general feeling of apprehension between project participants (Aneikwu&Okpala, 1998; Ameh&Osegbo, 2011; Okuwoga 1998 and Aibinu&Jagboro, 2002). These problems clearly show the need for a change in the industry for more efficiency and productivity improvement. Thomsen (2010) attest that the construction industry requires an alternative approach to its delivery of projects, one which promotes collaboration among project teams, enabling multiple parties in a project to agree to a common set of terms and expectation, based on the principles of trust and mutual respect, mutual benefit and reward, collaborative decision – making and early involvement of key project participants, while leveraging new technologies such as BIM. This is the concept that drives integrated project delivery (IPD).

“Integrated Project Delivery (IPD) is a response to the extensive collaboration required for projects that must be influenced by tiers of people in multiple organizations with emphasis

on Lean Construction, Building Information Modeling(BIM), Project Management Information Systems(PMIS) and continuous improvement" (Thomsen, 2010).

American Institute of Architects, AIA (2007) defined IPD as a project delivery approach that integrates people, system, 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.

Mathew and Howell (2005) defined IPD as a relational contracting approach that employs both transactional and relational contracting approaches to align the interests of all the primary team members in such a way that the team members can be integrated for optimum project performance.

Oyewobi, Ibironke, Ganiyu and Ola - Awo (2011) asserts that there is a higher demand for improved services from the Nigerian construction industry, from increasing sophistication of client's requirement, increase in size, design complexity and construction difficulty. They stated further that traditional approach of projects no longer meets client needs. As such, there is the urgent need for a paradigm shift in approach, understanding and delivery of projects. IPD stands as a panacea to the current problems bedeviling the Nigerian construction industry.

1.2 Statement of the Research Problem

The global construction industry has severally been criticized for its under-performance, ever reducing productivity and failure of its delivery methods (Aouad, Cooper &Kagioglou 2001). The Nigerian construction industry has neither been spared from such criticism. As opined by AmehandOsegbo (2011), the Nigerian construction industry is plagued with

various problems affecting its efficiency and productivity resulting in a chain of resultant ripple effects on project outcomes. Abubakar, Ibrahim, KadoandBala (2014) asserted that the failure of the construction industry to its pursuance of individual interest in isolated silos on a project. Zhang, Cheng and Fan (2015) that this is as a result of the position of project members who view themselves as only responsible for their own tasks while maximizing their personal profit in their area of knowledge and expertise.

Al – Amar (2012) opined that IPD aligns different stakeholders' interests and objectives while collaboratively involving key participants early in the lifecycle of the project timeline. Mathew and Howell (2005) described IPD as a clever solution which sets to solve tough organizational and contractual problems by ensuring careful participant selection, transparency and continual dialogue. According to AIA (2012), IPD represents a comprehensive process which aligns all key project participants through the entire sequence of programming, design, construction and building operations to achieve successful project outcomes.

Moreover, the performance of theConstruction Industry CI in Nigeria has consistently been a source of concern to both the public and private sector, (Okuwoga, 1998). It has been characterized by repeated delays, cost overruns, building collapses, inefficiency, low productivity, litigation e.t.c. which lead to series of questions about the construction process (Oyedele&Tham 2005). In the view of Kent and Becerik – Gerber (2010) there is a need for the evolution of project delivery methods as IPD whichwould coordinate the various specialization in a project due to the increase in complexity of the CI which is fostered by the formation of multiple cultures by the various disciplines causing inefficiencies, high level of fragmentation and high costs of inadequate interoperability of tools.

These problems and even more can be addressed by the adoption of collaborative systems of project delivery such as the IPD. While acknowledging the challenges of the CI and the NCI in particular, as well as highlighting the potential benefits of IPD, implementation of any new system such as IPD for achieving productivity improvement in the Nigerian construction industry requires a careful investigation and analysis of the industry, to establish a ground for its adoption and identify the potential hitches to be encountered in order to make arrangements for a successful implementation. This research is therefore set out to fill this knowledge gap.

1.3 Justification for the Study

The fragmented nature of the construction industry as highlighted by Abubakar, *et al*. (2014) and other researchers (Ameh and Osegbo 2011, Okuwoga, 1998) wherein each discipline works independently in silos (specialization/expertise) often pursing their interest to the detriment of others within the project team, eventually to the detriment of the project has been the bane of the construction industry and a major cause of failures. Zhang and Qian (2016) opined that it is imperative to select project members who share common values, goals, trusts and effectively cooperate with one another to achieve implementation of integrated project delivery.Bryant and Colledge (2002) opined that there has been a paradigm shift towards collaboration and partnership (Integration) as models of success which emphasize more of trust – based approach to competition. The driver of this being the growth in globalization of market economies facilitated by technology.

Benefits of IPD has been acknowledged by several researchers (Becerik – Gerber &Ghasseni 2011; Cho & Ballard 2011; Hamzeh& Singleton 2011). Although it has been regarded as a relatively new approach of project delivery (Becerik – Gerber &Ghasseni

2011), it is thus necessary to investigate its adoptability within the context of the Nigerian construction industry. The benefits of IPD cannot be overemphasized due to its philosophy of "project first" approach, pulling all members of the project team as one, sharing risks and rewards, thereby greatly minimizing adversarial relationships, countless litigations and settlement, and decreasing productivity.

Adopting the concepts of IPD in the Nigerian construction industry may finally be the panacea to the ever-increasing criticism. As such findings from this study would be essential in determining which path the Nigerian construction industry intends to tread.

1.4 Aim and Objectives

1.4.1 Aim

The aim of the research is to examine the adoptability of integrated project delivery concepts and principles by professionals in the NCI with the view to introducing such practices and principles in addressing some of the pertinent problems of the NCI.

1.4.2 Objectives

The objectives through which the aim would be achieved are as follows, to;

i. Articulate the concept of integrated project delivery (IPD).
ii. Examine the level of awareness of the concept among practitioners in the Nigerian construction industry.
iii. Investigate the willingness of the NCI in adopting features of IPD.
iv. Identify factors affecting the adoption of the concepts of IPD.

1.5 Scope and De – limitation

The study sought responsesfrom consultancy firms inNigeria, focusing on Kaduna, Kano and Abuja, the Federal capital of Nigeria on their awareness of the concept of IPD, as well as their willingness in adopting its principles while acknowledging barriers which they seemed may be hindrances to its adoption by them. Client organizations were not included in this research.

The study was de – limited by the knowledge and exposure of respondents on the concept of IPD.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Review of Traditional Project Delivery Approaches

A study by the US Bureau of Labour and Statistics according to (AIA, 2007) revealed that the construction industry is the only industry that has had decreased productivity since 1964, while other have generally progressed over 200% during the same period. This is also exacerbated by (Sacks &Partouche, 2010) who stressed that the efficiency of construction has been on the decline.Becerik – Gerber and Ghassemi (2011) stated that traditional delivery methods of adopted by the construction industry include Design – Build, Design – Bid – Build and Construction Manager at Risk. Lichtig (2006) however added that over time, there has been growing dissatisfaction by professional in the construction industry over project outcomes, especially in the areas of project over – run, over – budget and low quality of project outcomes which are usually attributed to the fragmented nature of the industry.

2.1.1 Design – Build

This is the oldest delivery approach dating as far back as the Mesopotamian era where a master builder assumed responsibility for the design and construction of projects from inception to completion and was maintained till the turn of the nineteenth century (Ibbs, Kwak, Ng &Odabasi 2004). Sacks and Partouche (2010) opined that with advances in the fields of architecture and engineering, the industry has given room for distinct areas of responsibilities for the various professions in the industry. Design – Build according to (AIA 2007) is characterized by a single point of responsibility for both design and construction activities. The benefit of this arrangement as postulated by (Dal Gallo &

Wilson, 2017) is preferred by clients, as a means of reducing project – based risks by transferring risks and coordination efforts to a single contractual entity for coordination and construction. AIA (2007) adjudged that input from owner usually terminates on completion of design. By the characteristics and nature of this approach which clearly minimizes input and involvement of owner at this stage in order to make clear silos of responsibility and minimize risks, opportunities for improvement and innovation subsequently from the owner is greatly minimized or lost.

2.1.2 Design – Bid – Build

Ibbs*et al* (2004) opined is the most widely accepted traditional project delivery method especially for public project. The approach according to Dal Gallo and Wilson (2017) basically involves separating the project into two distinct regimented phases of Design and Construction by first entering into contract with a designer who develops a design based on owner's requirements. Subsequently the design is put out for bid for selection of a constructor of the project from bids received. AIA (2007) adds that this arrangement gives no room for inputs from the actual constructors of the project, hence significant amount of constructability and coordination issues are only revealed once construction have commenced.

2.1.3 Construction Manager at Risk

Thomsen (2006) described this delivery approach as one which basically entails the owner having two contracts with first a designer and another with the construction manager. Becerik – Gerber and Ghasseni (2011) state that typically in this arrangement, the designer is hired first while the Construction Manager is hired early in the design development to

carryout various preconstruction services as cost estimating, constructability analysis and value engineering studies. Upon completion of design, the construction manager becomes the general contractor and executes the project. Some projects according (O'Connor, 2009) however specify that the construction manager subcontract all specialized aspects of the work but may perform selected scopes of work.

2.2 Deficiencies of Traditional Delivery Methods

Bedrick and Rubel (2009) opined that the call for change has long been demanded in the construction industry. The earliest of such was the Banwell report of 1964 which adjudged that the existing contractual and professional practice provided no room for flexibility and was extremely rigid. More recent of such reports which have severely impacted the construction industry are the Latham and Egan reports of 1994 and 1998 respectively which have emphasized the need for change in the construction industry.

The fragmented nature of the industry has been a recurrent source of worry to stakeholders who stress that it promotes stage managed processes, increases the likelihoods of adversarial relationships in projects and has an overall negative impact on the performance and productivity of the industry (AIA, 2007; Thomsen, 2006; Abubakar *et al* 2014). By nature of projects in the construction industry, they involve several stakeholders including the owner, architect, engineers, contractors e.t.c. to form a project team. The coming of the various professional to form a team require tremendous coordination (AIA, 2009; Al – Ahbabi, 2014), as each caries in size, capability, skills e.t.c. and require to collaborate and share information which imposes challenges which require collaboration amongst the stakeholders. O'connor (2009) argued that traditional delivery approaches rigidly delineate

responsibilities with much elaboration on the consequences of failure thereby instilling self – protective behaviours and mistrust amongst the project team. The fragmented nature of the industry according to (O'cconnor, 2009) has been a major setback of the traditional approach to project delivery, coupled with its priced – based selection strategies which often have negative resultant effects on project outcomes.

Duke, Higgs and McMahon (2010) stressed that traditional project delivery processes have simply become outdated, as old ways of doing things quickly become obsolete and ineffective, which according to Zhang, Cheng and Fan (2015) that the traditional methods of project delivery which basically rely on lowest price and other similar criteria are are not suitable IPD and the CI in the wake of demands for latest technologies, environmental concerns, changes in reimbursements and transparency requirements and called for seeking alternatives to traditional delivery methods.

2.3 Transitioning from Traditional to Collaborative Delivery Approach

Glick and Guggenos (2009) opined that management of projects have evolved and matured over the decades from a stepped approach involving sequential completion of phases of construction to a highly specialized process with simultaneous work execution aimed at fast – tracking projects. Carbaso (2008) added that the evolution of management of projects was propelled with the idea of managing or controlling project outcomes in a manner that satisfies all expectations related to the project.

Lahpendera (2012) suggests that collaborative project arrangements have been the subject of many development efforts owing to the frustration towards inherent traditional approaches to project deliveryand added that collaborative forms of arrangements have

increasingly being developed as a backdrop to the Latham and Egan reports under various themes and titles in various parts of the globe. Lerringer and Brochner (2010) opined that there has been a push for servitization of the construction industry by means of integrating additional services, knowledge and support with a view to bringing firms face – to – face with the customer which in turn, increases the demand for relational mechanisms that support contracts. Three approaches have globally stood out in this pursuit according to (Lahpendera, 2012) in this pursuit, namely; Project Partnering (PP), Project Alliancing (PA) and Integrated Project Delivery (IPD), and are usually jointly referred to as Relational Project Delivery Approaches (RPDAs), due to the fact that their contracts are based upon relational trust between parties and are those in which responsibilities and benefits apportioned fairly and transparently. Gibbons and Henderson (2012) stated that relational contracts usually involve actions that cannot be fully specified in advance. Williamson (1979) adjudged that relational contracts resemble small nuclear societies with their own internal system of evolving norms. According to Lahpendera (2012) in the context of the construction process, relational contracts has been used and referred to in literature as Project Partnering (PP) by (Rahman & Kumaraswamy, 2002; Rowlinson& Cheung, 2004; Cheung et al 2006), Project Alliancing (PA) by (Rahman & Kumaraswamy, 2002; Rowlinson& Cheung, 2004; Sakal, 2005; National Association of State Facilities, 2010) and IPD by (Mathew & Howell, 2005, Lichtig, 2006; Cohen, 2010). Colledge (2005) opined that relational contract models in business and the construction industry has generally grown. These cooperative or relational approached she added was best exemplified by the use of partnering or supply chain management practices geared towards providing effective and efficient contracting mechanism for project with high demand for collaboration, especially complex construction projects. Carbaso (2008) added that these

has led to the creation, testing and modification of the various delivery approaches such as IPD which according to (Zhang, Cheng and Fan 2015) added that with the paradigm shift on – going in the CI towards integration of all parties on a project, there is a need for more attention in the party selection for construction.

2.3.1 Project Partnering (PP)

Rowlinson and Cheung (2004) opined that the earliest projects to adopt PP was launched by the US Army Corps in 1988 as a means of mitigating construction disputes and was based on joint workshop practice by the project team, while still maintaining low – bid selection of contractor, and was a voluntary arrangement between the contractor and owner. This arrangement has since evolved over time and developed to a contractual practice according to (Lahpendera, 2012). Mosey (2010) suggested that trust and commitment has always been the core philosophy of PP, while partnering charter and decision ladder were adopted as tools for improving cooperation and minimizing disagreements. The charter served as a document stating the principles of cooperation while the decision ladder served as the decision – making levels of the project, stating period allowed for resolution of unresolved issues and parties responsible for each.

2.3.2 Project Alliancing (PA)

Knott (1996) reckoned that the impetus for the conceptualization of PA was borne in the petroleum industry, specifically in the exploration of oil in the North sea by British Petroleum in 1992 and was adopted as a parallel, individual standard commercial contract with well-defined scopes of work, while the alliance agreement stood separate from the works contract. Thomsem (2006) asserts that the risks and gain sharing was later included

as a need to explore economic and efficient practices for risky projects which were novel at the time. Manely (2002) opined that with the positivity recorded in the petroleum industry and the resultant diffusion of awareness of the concept, it was rapidly adopted across Europe and eventually in the construction industry in the late 1990's. Lahpendera (2012) added that PA evolved as a response to the desire for improving the implementation for demand in projects with high risks and uncertainties usually encountered in traditional contract arrangements, and similarly reckoned that the risk sharing objectives and joint – decision making by parties in project alliancing were a necessity in project allaincing in the form of multi – party contract with the sole purpose of improving performance.

2.3.3 Integrated Project Delivery

Professionals of the construction have become accustomed to traditional methods of project delivery with its practices and systems which have not always produced best value for clients (Govender,Nyagwachi, Smallwood & Allen 2018). Glick andGuggenos (2009) argued that over time, project execution evolved from a stepped approach where project works are isolated in a silo approach to a more encompassing one which blends various members of theconstruction team.O'connor (2009) summarized the current state of the CI as egocentric and inefficient, which rigidly delineates responsibilities, reinforcing self-protectivebehaviour and instilling mistrust among team members. O'connor (2009) described risk assessment as a "dark art" in the form of economic Darwinism in which more often, risk flows down to the contracting tiers least able to bear or control.

Over the past decades, the CI has been on the quest for change. This has been amplified by Duke, Higgs andMcMahon (2010)that requests for proposals in IPD and BIM has risen to 19.7% and 33.5% respectively in the quest for integration in the CI. The CI is in dire need

of a change from the Traditional project delivery approach to one which promises increased and improved productivity, lean construction thinking, leveraging on innovative and integrative technologies such as BIM, and an approach devoid of endless and countless litigations and suits, this is where IPD shines as a revolution to the problems bedeviling the CI.O'Connor (2009), suggested a paradigm shift in the CI, to one of more collaboration among project team members in the form of collaborative delivery approaches fostered by more flexible and responsive contracts often identified by the term "Integrated Project Delivery" (IPD), covering a spectrum of from the familiar construction management infused with collaborative or team – based processes extending to alliance models with "no – dispute" clauses.Colledge (2005) asserts that relational contracting models in business and the construction industry has generally grown.

According to Sive (2009), recent advancements in project delivery such as Building Information Modeling (BIM), virtual design and construction, lean delivery are all among the century's new paradigm which promises true collaboration, integration of team, streamlined process and overall improvement are all stepping stones to the century's new paradigm – Integrated Project Delivery (IPD). Andre, (2011) described IPD as an evolving, bold innovation in construction delivery which basically involves binding the owner, architect or engineer and the contractor into one contract and as a cooperating and collaborative team to design and execute a project with shared risks and rewards in the ultimate cost, schedule and quality of the overall project.

IPD is a project delivery approach which requires extensive collaboration of tiers of people from multiple organizations.Abdirad and Pishdad – Bozorgi (2014) stressed that for IPD to perform as expected, collaboration is a requirement and not a choice. This is fueled by

some of its characteristics in its agreement which includes provision to share "risk of non – performance", which enhances team approach and collaborative project delivery. Thomsen,(2010) states that IPD emphasizes on lean construction, BIM and continuous improvement. From review of various literatures on the subject, it may be deduced that similar emphasis is placed on the agreement that binds the core team members of the project usually referred to as Integrated Form of Agreement (IFOA). This forms the foundation on which IPD projects are built, in which according to Thomsen (2010), project goals such as cost, time, quality and other requirements. In general, it comprises every legal, financial, project technological tools, project performance, punitive consequences, shared project goals and other responsibilities attached to the project.

2.4 Definition ofIPD

The most widely quoted and repeated definition of IPD is that of the American Institute of Architects (AIA, 2007). A Guide to Integrated Project Delivery. Therein, it defined Integrated Project Delivery (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 optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.* However, Mathew and Howell (2005) slightly differed from this generally repeated definition wherein they defined IPD as *a relational contract approach to align the interests of all the primary team members (PTM) in such a way that the team members can be integrated for optimum project performance.*

The evolution and adoption of IPD may be summarized as responses to a wide range of factors, most predominant amongst them are:

a. Lean construction and thinking: To tackle the menacing problem of wastes, lack of productivity and inefficiencies in the CI.
b. Technological evolution: Through the introduction of CAD and softwares, with specific reference to BIM.
c. Integrated Form of Agreement (IFOA): Aimed at mitigating the adversarial relationships usually encountered amongst team members and clearly define roles and responsibilities of the team members.

In similar light, Middlebrooks (2010) stressed that the catalysts of IPD include:

i. Multi Party Agreement
ii. Building Information Modeling
iii. Lean Design and Construction
iv. Performance Based Metrics

2.4.1 Lean Construction

Lean construction was propagated by the International Group for Lean Construction (IGLC) in 1993 which referred to a mode and practice of construction, inspired by the Toyota Production system which has over time diffuse and advanced in its implementation through research and development. Emmitt (2003) however expressed lean thinking as getting things right at the onset of a project and is crucial in helping to reduce waste and maximize value through all stages of construction. Ballard and Howell (2004) opined that lean construction may be understood as a revolution in project management and argued that lean construction conceives a construction project as a temporary production system dedicated to the three goals of delivering the product while maximizing value and

minimizing waste which differs from the traditional concept which has its only objective of product delivery as fulfilling contractual obligations (Koskela 2000).

Bertelsen (2004) stated that a major input of Lean construction is the improvement in the flow of construction process and focusing on value generation, which he envisaged would result in a reduction of time wasted on waiting and used on transport as well as reduction in cost of building materials which accounts for two thirds of the total construction time in Denmark.

Koskela (2004) explained that a process is lean in simple terms because it uses less of everything.Terms usually associated with Lean construction according to Ballard and Howel (2004), include;

i. Value: In production concept and not an economical one refers to projects/products accomplishing their intended purpose.
ii. Flow: This refers to the movement of materials and information through a network of independent specialists.
iii. Pull: Developed as a response to work flow variability, which relies on demand for product.

Liker (2004) stressed that “Lean is not about imitating the tools used by Toyota in a particular manufacturing process, but rather it is about developing principles that are right for one’s organization and diligently practicing them to achieve higher performance that continues to add value to customers.

2.4.2 Building Information Modeling (BIM)

Abubakar (2012) argued that BIM has now become the new international benchmark for efficiency in design, construction and maintenance of buildings with useful application covering the entire lifecycle of buildings from pre – design to post completion. Abubakar (2012) stated further that BIM was introduced in the early 80's and has over time shown optimism as a panacea for sanitizing the construction industry from its traditional fragmented approach to a more integrated system with improved efficiencies and collaborative capabilities.Eastman (1999) described BIM as a digital representation of the building process which facilitates exchange and interoperability of information in digital format.

As stated by Abubakar (2012), there is a strong argument amongst scholars as to whether BIM may be regarded as a tool which assists in achieving construction project team's goal or it (BIM) been thought of not just as a tool, but rather a technology and process having potentials of revolutionalizing construction project delivery.Dahlqust and Winberg (2010) expressed that BIM transforms modeling procedures from a basic geometric design to a multi – layered, data rich and intelligent representation of a structure with varying capabilities.

Roper (2012) however described BIM as composed of database of parametric objects that contain information about their geometry, relationship to other objects, data regarding their material and other properties. Computer Integrated Construction (2010) on the other hand thought of BIM as 'a digital representation of physical and functional characteristics of a facility and a shared knowledge resource for information about a facility forming a reliable basis for decision during the life cycle of a structure or building project.

Successful areas of implementing BIM according to Roper (2010) include:

Project Planning

i. Site selection and analysis
ii. Visualization
iii. Existing conditions modeling
iv. Cost estimating

Design

i. Design authoring and analysis
ii. Energy analysis
iii. Lighting analysis
iv. Structural analysis
v. 3D design coordination

Construction

i. Digital fabrication
ii. Construction planning (4D CAD)
iii. Construction analysis
iv. Clash analysis
v. Site utilization planning.

2.4.3 Integrated Form of Agreement (IFOA)

According to Litchig (2006), an Integrated Form of Agreement (IFOA) describes the relationships that are established among each of the members of the integrated project

delivery team, recognizing that different members may have design and construction responsibilities. Litchig (2006) explained further that from an onset, an IFOA aims to ensure coherence between the interests of a project and the participants and to align the interest of the project participants.

Selection of a team to an integrated agreement is subject to response to request for proposal and is based on quality, value – based selection and delivery. Furthermore, primary members are selected at the onset of the project and as expressed by Litchig (2006) as a signal to change, a general contractor/construction manager may be selected first as opposed to the traditional selection of the architect first to allow it sink into the minds of the team members an entirely "new game" of commitment.

The core group of an IPD team has the primary responsibility of selecting the rest of the IPD team, as well as management and operation of the project, with major project related decisions made on consensus of the group. However, in the event of an impasse, resolutions of issues are finally adjudged by the owner.

To achieve maximum participation and innovation, as well as facilitating integration and anticipated level of collaboration, major consultants and subcontractors are selected during the schematic design stage where their selection can be based on nomination by the core group but they would be expected to sign a joining agreement acknowledging the firm is familiar with the terms of an integrated agreement and agrees to participate based on the described level of responsibility and collaboration. These according to Zhang and Qian (2016) collaborative relationship between the parties in an IPD arrangement is a premise to successfully harness the advantages of IPD.

2.5 Forms of IPD Agreements

O'Connor (2009) provided a breakdown of review of current standards of IPD as follows:

A. **ConsensusDOCS 300:** This is a form of tri – party agreement published in 2008 for collaborative project delivery containing carefully crafted agreements which incorporates IPD principles as well as lean construction methodologies. The economic model of consensusDOCS 300 being target cost approach requiring parties to allocate responsibilities for costs over the target cost in a condition that does not permit adjustment to the target cost. consensusDOCS 300 contains articles such as project budget, cost modeling and project cost estimate, incentive and risk sharing, cost of work amongst others which according to O'Connor (2009) suggests a guaranteed maximum price (GMP) being the end goal, however, collaborative processes mandated under the agreement with emphasis of those regarding establishing, monitoring and maintaining of the target cost are consistent within cost reimbursement platform.

B. **AIA A295 (Transitional IPD):** This was published by AIA in 2008 and is considered as a transitional IPD form built on AIA's construction manager at risks platform (O' Connor 2009). Article 1 of the owner – contractor agreement addresses pre – construction and construction phase series and insurance by reference to general conditions and enumerates additional services which may be performed by the contractor before the owner and contractor establish a GMP. These additional services are similar to those which may be provided by the architect and the owner in the design phases of the project covered under the AIA B – series agreement.

Under the AIA A295 contract form, according to O'Connor (2009), it is envisaged that the owner and contractor would execute the "GMP amendment" (sic) after the owner, contractor and architect have completed the "detailed design phase". The GMP amendment follows the AIA document A102 – 2007 and A121 – 2003 (1) requiring itemized statement of trade categories, allowances, contingencies, alternatives and the contractors fees, incorporating definitions of cost or work and specific requirement about items that the contractor can and cannot include, as well as establishing standards for accounting and record keeping. In addition, the GMP amendment also establishes the anticipated date of substantial completion and the issuance date for the implementation document upon which the anticipated date of substantial completion relies upon.

C. **AIA C195 (Full Integration):** This according to O'Connor (2009) is a complete IPD form of agreement built upon target cost approach with risk sharing, claim suppression and incentive provision which encourage collaboration, while discouraging claim assertion. The C195 was designed and formulated in an attempt to create a contractual model containing many of the principles of IPD contained in the *IPD Guide.*

C195 known as the Single Purpose Entity IPD Agreement sets about by creating a limited liability company for the sole purpose of designing, financing and constructing the project. In traditional lump sum/GMP contracts according to O'Connor (2009), cost control by the owner rests primarily on the strength of the contractors word to complete the work for the stipulated sum or for an amount no greater than a specified sun (GMP) which is usually the initial source of conflict as

it places the owners interests in conflict with those of the contractor usually ending in litigations. This is however in variance with an IPD approach wherein the primary goal being a target cost, such that unlike in a GMP, where only one party bears all the economic consequences, it is evenly distributed among the entire primary team members in an IPD setting.

Parties are expected to engage in series of undertakings according to O'Connor (2009) these include:

1. Project Definition: This forms the basis of a mutually understood project scope.
2. Collaboration Standards Workshop: This entails establishing of protocols, standards and tolerances by parties.
3. Risk Matrix: Members are expected to jointly discuss and identify major risks to successful project completion and device means of addressing them when they arise.
4. Project Goals: This is a key concept in most IPD agreements, as the parties commit to make a priority, the achievement of mutually agreed – upon project goals even at the expense of personal gain, which would require project being developed in such a way that is agreeable by all parties.
5. Integrated Services Matrix: This involves allocating responsibilities amongst the parties, such that reasonable expectations can be developed as well as focusing on promises and commitments.
6. Project Schedule: Primary team members are expected to jointly develop project schedules as it directly influences project cost.

7. Funding Schedule: This is usually discussed and analyzed sequel to the establishment of a target cost and is of importance as funding schedule allows for proper project cash flow requirement and evaluation of target cost.

In summary, according to Maher, Millie and Raisbeck (2010) for IPD projects, contractors, sub – contractors, consultants and all parties agree to a guaranteed maximum price (GMP) at the beginning of the process. The IPD team is responsible for determining specific project cost targets in alignment with the owners' project goals. This takes place in early stage workshops before the multi – party agreement are signed where all team members are required to attend. The workshop facilitator prompts the building owner to disclose the budget for the project in addition to other goals such as quality, functionality or sustainability.

Litchig (2006) concluded that the parties of an IPD project recognize that opportunities to succeed on the project is directly tied to the performance of other project participants and should therefore work together in the spirit cooperation, collaboration and mutual respect for the benefit of the project and within the limits of their professional expertise with a mindset of expeditious and economic manner consistent with the interest of the project.

2.6 Principles of IPD

According to Integrated Project Delivery for Public and Private Owners (2010), a joint paper of professional groups in 2010, comprising of the National Association of State Facilities Administrators (NASFA), Construction Owners Association of America (COAA), Associated General Contractors of America (AGC) and the American Institute of

Architects (AIA), they expressed that principles of IPD may be categorized in two, namely; contractual principles and behavioural principles.

A. ***Contractual Principles:*** These are principles which may be written into agreements of a project and may consist of;

i. Key Participants Bound Together as Equals: A contractually defined relationship as equals supports collaboration and consensus – based decisions within a minimum of owner, architect and contractor or may include all project participants essential to project success.

ii. Shared Financial Risks and Rewards Based on Project Outcome: This involves clauses and agreements which tie fiscal risks and rewards to the overall outcome of the project and encourages project team members to "best for project" behaviour rather than everyone pursuing individual benefits usually at the expense of others and often the project eventually.

iii. Liability Waivers between Key Participants: This involves project participants agreeing not to sue one another, rather seek solutions to problems. However, this does not cover reckless decisions and behaviours from project participants.

iv. Fiscal Transparency between Key Participants: Due to the everincreasing complexity of projects, early involvement of essential participants promotes access to a pool of expertise and better understanding of probable implication of design decisions.

v. Intensified Design: It is expected that with project participants engaged in intensive design efforts would promote greater opportunities for cost control, as well as enhanced ability to achieve successful project results.

vi. Jointly Developed Target Criteria: This involves all participants carefully defining project performance criteria in relation to input, support and ensuring maximum attention to all aspects deemed important to overall outcome.

vii. Collaborative Decision Making: This involves core team members working together often co – locating in a "big room" scenario while leveraging on relevant tools and pools of expertise which help promote joint accountability.

B. ***Behavioural Principles:***

I. Mutual Respect and Trust: Project participants operating in an environment of mutual trust mitigates adversarial relationship among project members nurturing a positive environment and motivation of participants.

II. Willingness to Collaborate: Agreement to project participants on the onset to collaborate is primary in nurturing an environment of collaboration.

III. Open Communication: This involves project participants communicating in an open, honest manner, willing to share ideas, opinions and innovation to foster improvement.

2.7 Characteristics of IPD

Characteristics of IPD which stands it apart from other delivery approaches as stated by Autodesk (2007), Becerik – Gerber and Ghasseni (2011) as:

a. A highly collaborative process that spans project design, construction and project handing – over where decision making and control as well as risks are all shared.
b. A delivery approach which leverages the early contributions of individual expertise and key participants.
c. One which relies on open information sharing amongst project stakeholders.
d. A delivery approach where team success is tied to project success, with shared risks and rewards.
e. A value – based decision making process.
f. A delivery approach which allows for full utilization of enabling technological capabilities and support.

Duke *et al* (2010) juxtaposed characteristics of IPD in relation to traditional project delivery approaches (Table 2.1) with reference to the nature and processes in which teams are formed, processes of execution of flow, risks, compensations and types and descriptions of agreements.

Table 2.1 Comparison of the characteristics of IPD with Traditional Project Delivery

S/N	Traditional Project Delivery		Integrated Project Delivery
1.	Fragmented, Assembled on "Just – as – needed" or "minimum necessary" basis, strongly hierarchal.	***TEAMS***	An integrated team composed of key project stakeholders that are assembled early in the process, open, collaborative.
2.	Linear, distinct, segregated; knowledge gathered "Just – as – needed; information can be hoarded; silos of knowledge and expertise.	***PROCESS***	Concurrent and multi – level; early contributions of knowledge and expertise; information openly shared, stakeholder rust and respect.
3.	Individually managed, transferred to the greatest extent possible.	***RISK***	Collectively managed, appropriately shared.

S/N	Traditional Project Delivery		Integrated Project Delivery
4.	Individually pursued, minimum effort for maximum return.	***COMPENSATION/ REWARD***	Team success tied to project success, value based.
5.	Paper – based and usually only two – dimensional.	***COMMUNICATION/TECHNOLOGY***	Digitally based, virtual; BIM (3,4 & 5 Dimensional)
6.	Encourages unilateral effort, allocate and transfer risk, no sharing	***AGREEMENTS***	Encourages, foster, promote and support multi – lateral open sharing and collaboration

Source: Duke et al (2010)

Mathew and Howell (2005) stressed that fundamental difference between traditional delivery methods and IPD exists majorly in relation to contracts, project team relationships and compensation structure.

i. Contracts: IPD contracts are relational in nature which differ from traditional delivery methods which employ transactional contract approach wherein parties are engage based on the exchange of goods and services. This mindset according to Mathew and Howell (2005) restrains the exchange of good ideas, limit cooperation and innovation, inhibit coordination and encourages team members to optimize interests within their silos at the expense of others and the project. Similarly, Gibbons and Henderson (2012) state that relational contracts involve actions that cannot be fully specified in advance. Williamson (1979) added that relational contracts resemble small nuclear societies with their own internal system of evolving norms.

ii. Project Team Relationships: AIA (2007) suggests that IPD principles rely on encouraging transparency, open communication, honesty and collaboration among the main stakeholders with mutual respect and trust being fundamental and added that trust in such relationships among stakeholders is gained through relationships

and commitment wherein individuals accept risks knowing that the intention of others in the agreement is mutually positive. Lahpendera ((2012)opined that approach – oriented participant selection is usually adopted in IPD as it assists in understanding the approach and attitude of team members to projects.

iii. Compensation Structure: Compensation structure for IPD according to (Becerik – Gerber &Ghasseni, 2011) is modeled with the goal of stimulating efficiency and alignment of interests of the members for the benefit of the project as a whole. This model as described by (AIA, 2007) allows compensation for members on a cost - plus basis where the owner guarantees the direct cost, while a portion of the profit and participant's bonuses are dependent on project outcome. Risk management however varies with traditional projects which are dependent on project outcome. IPD maintains the same approach as expressed by (AIA, 2007) but adopts a more equitable approach by tying rewards to project result results. Cohen (2010) asserts that by aligning goals of the parties involved in the project to project success and making each party accountable for the behavior of others, project team gain more control of the overall process and mitigate overall risk.

Sive (2009) presented some differences between IPD, traditional approach and a partial adoption of IPD which he termed "IPDish" (Table 2.2), for those who intend to adopt some features of IPD which may easily be modified and adopted to traditional contract formats geared towards fostering greater team collaboration and efficiency.

Pure IPD however presents a completely overhauled project delivery method where the primary team of a project work in a contractually connected manner and leverage on

BIMand similar tools by legally and formally connecting the individual firms into a shared entity. This presentation forms a prequel for early adopters of IPD (Sive, 2009).

Table 2.2 Differences in the Progression from Tradition Delivery Approaches to Full IPD

	Traditional	*"IPDish"(Partial IPD Adoption)*	*"Pure" IPD*
Team Organisation	Hierarchical. Sequential addition "as needed:" architect, then engineer, then contractor, then fabricator, etc.	Hierarchical Sequential addition "as needed:" architect, then engineer, then contractor, then fabricator, etc. Collaborative. Earlier hiring/ participation of some areas of expertise. Stakeholder review after Design.	All key expertise on-board at earliest practical time. "Lifecycle" stakeholder participation in earliest programming. Designer/supplier/ tradesman collaboration in design and construction. Multi-Party Agreement (MPA) or Single Purpose Entity (SPE
Contracts	Establish liability protection. Separate (and not always consistent) contracts.	Encourage shared information and resources. Preconstruction agreements.	Legally direct and bind team activity. Mandate joint decision making. Eliminate or strictly limit ability to sue.
Risk/ Reward	Entities pursue and protect individually ("silo/bunker"). Separate risk/reward Pools.	Optional shared profit/bonus pool.	Optional shared profit/bonus pool. Pooled profit; distributed with team success. Based on project value.
Decision Control	Hierarchical.	Team, with final decision by owner.	Key project decisions by SPE.

	Traditional	*"IPDish"(Partial IPD Adoption)*	*"Pure" IPD*
Collaboration Tool	Meetings (core team, followed by sequential additional meetings with consultants and/or subcontractors)	Charrettes. Multidisciplinary coordination workshops.	Project charter. Detailed process design at start. Metric-based, informed Decisions.
Process	Linear information. Resides in "silos" controlled per discipline.	Concurrent information. BIM. Charrettes.	Shared models. Pull scheduling. Set based design.
Estimating	After design and publication of documents, per phase.	Contractor participation during preconstruction.	Budget first; then design to budget. Target Design Value (TDV). Real time estimating.

Source: Sive(2009.)

2.8 Drivers of IPD

As with any novel delivery method, there is bound to be resistance to its adoption both from within and outside the construction industry. Sive (2009) argued that at times the drive for change often comes from the industry and provided example examples of the Sutter Health in California as one of such market driven changes. AIA (2009) and Sive (2009) outlined some drivers to the adoption of IPD in the CI as follows:

i. Market Demand: As earlier stated the drive for IPD is often as a result of the client or client demanding a change in view of the presumed under performance and inefficiencies of existing processes such as negotiated Guaranteed Maximum Price (GMP), partnering and significant new technologies for design, in their drive for more reliable predictable outcomes.

ii. Construction Industry Desires: involves an inner push from within the industry's various disciplines whose frustration of existing situation in the form of lack of coordination, poor communication and misinformation, cost overruns e.t.c. this often creates a drive amongst the players of the CI to call for collaborations in producing a win – win outcome between themselves collaborators and their clients.

iii. Technology Drivers: This is mainly driven by the explosion in the use of BIM and other similar technologies in the CI which serves as a tool for seamless interaction between various disciplines. BIM's proven power as a collaborative tool according to (Abubakar, 2012) enhances the cooperation within members of the industry. The ability of such technology to create 3D environments assists in early clash detection as well as a basis for interdisciplinary constructability work sessions thereby enhancing integration.

iv. Sustainability Pressure: With global demand in the reduction of carbon footprints, as well as a reduction in the consumption of natural resources consumed, the CI is compelled to develop interdisciplinary robust options requiring analysis of trade – offs between disciplines, interpretation of data and choice. All these contribute in compelling the industry towards integration.

v. Collaborative Style: Collaboration models in the industry leave no option than integration. Such trends are touted by inefficiencies resulting in the desire for interdisciplinary collaboration. Examples of such include the Centre for Integrated Facility Engineering (CIFE) at Stanford University, the

Centre for Built Environment (CBE) at Berkeley which is aimed to building high performance building systems by improving the design and management of buildings while utilizing the lessons of collaboration.

vi. Increasing Complexity of Buildings: As buildings become increasingly complex and driven by more dramatic building forms, the resultant effect is one requiring complicated supply chain, new delivery standards, regulatory restrictions, project interaction amongst others, these can only be actualized through integration.

2.9 Potential Benefits of IPD

Mossman, Ballard &Pasquire (2010) and AIA (2012), stated situations where adoption of IPD may prove very valuable include:

i. Market Advantage: IPD may be most suited and prove to be a marketing advantage where the measurable results can easily be attained, thereby encouraging firms with valuable experience to market themselves as leaders in the industry.

ii. Cost and Schedule Predictability: IPD serves as a motivating factor by its argued potentials of meeting and surpassing project costs and schedule.

iii. Risk Management: For projects with high risks, such as cost and schedule, transactional risks, project type and site conditions, the potentials of IPD with regards its increased communication, gives it an edge over traditional delivery methods.

iv. Less rework minimizes iteration.Technical Complexity: Projects with high complexity usually require integration of expertise and coordination which is among the various aspects IPD leverages.

These can be further sub – divided among the various project participants viz;

A. For Clients:

i. Easily link design options to business objective.

ii. Improved value and a higher quality project.

iii. Greater potential for lower cost construction and operation.

iv. Faster delivery of product with high quality able to allow for early return on investment.

B. Designers:

i. Relationships, conversations and commitments are easily managed.

ii. Enables easy to attain target cost.

iii. Reduced design and documentation time.

iv. Better integration.

C. Constructors:

i. Easily buildable projects

ii. Logistics can be fully envisaged before commencement of project.

iii. Relationship and commitments are systematically managed.

iv. Greater construction process.

Duke *et al* (2010) similarly postulated benefits of IPD in relation to traditional project delivery (Table 2.3) See Appendix..Benefits of IPD were classified according to their characteristics.

2.10 IPD Overview

Duke *et al* (2010) argued that despite decades of attempts at improving the outcomes of projects executed with traditional delivery approach, the downward trend still continues

unabated, resulting in inefficiencies, over budget and late delivery and listed some of the problems plaguing the traditional project delivery as;

i. Perceived inefficiencies in current delivery model.
ii. Renewed scrutiny on costs and budgets.
iii. Desire for transparency.
iv. Lack of trust.
v. Adversarial relationships and conflicts.
vi. Frustrations with defensive behaviour and finger pointing.
vii. Desire to improve communication and collaboration.
viii. Increased publicity for alternatives.
ix. Need for improved quality of products.

Emmitt*et al* (2011) corroborated these by presenting other factors such as rigidity of the CI in delineating responsibilities with much elaboration on the consequences of failure thereby reinforcing risk abating behaviour, lack of interest by team members to engage in collaborative processes and the promotion of adversarial construction cultures to the detriment of stakeholders.Hamza and Singleton (2011) concluded that the standard practice in the CI has usually been "siloed" whereby every member in the construction team worries only about their interests, resulting in poor communication, wastes, low productivity and inefficiencies in the industry

A current state of majority of the problems associated with the construction industry can best be appreciated in Egan's and Latham's report of (1998 and 1994) respectively and this forms the backdrop for the underlying principles and concepts of the philosophy of IPD. As

earlier stated, the CI has been on a quest for change, in a typical traditional approach, projects are designed and then bided to several firms for execution usually with the lowest bidder being awarded the contract. However operational decisions are made throughout the design process whose impact often than most is not realized till much later in the process in contrast to an IPD approach, whereby the team is brought on board from the onset with cost and scope decisions being determined by the entire team.

Lichtig (2006) stressed that the parties of an IPD project recognize that opportunities to succeed on the project is directly tied to the performance of other project participants and should therefore work together in the spirit of cooperation, collaboration and mutual respect for the benefit of the project and within the limits of their professional expertise and abilities, with a mindset of executing the project in an expeditious and economic manner, consistent with the interest of the project.

Carbaso (2008) opined that IPD methodology evolved from the owner's desire to have all stakeholders involved in the project process to share an equal voice in the project with a view of eliminating waste, cut time, improve productivity and create a win – win outcome for the parties involved. Here the core stakeholders being the owner, design team and constructor while secondary stakeholders may include insurance companies, regulatory agencies, utility providers, suppliers bankers e.t.c and anyone who may have interest in the project.

Glick and Guggenos (2009) outlined some of the drivers of IPD such as; equitable risk allocation, increased collaboration, transparency across the board, maximum return on

investments, concerns about the environment, new government policies and regulations amongst others.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Approach

The research was exploratory in design as it sought to address the perception of respondents on the adoptability of Integrated Project Delivery (IPD) concepts in the Nigerian construction industry. According to Barbie (2010), such research is necessitated when a researcher seeks to familiarize on a relatively new area of interest and may be pursued through certain identified groups in this case being the respondents who are the major stakeholders of the Nigerian construction industry. The primary intention of this study was to identify those components of IPD which stakeholders in the construction industry would be willing to adopt being a novel method of project delivery in Nigeria as well as identifying such aspects which may serve as hindrances and barriers to its adoption. Barbie (2010) suggests that such is helpful in satisfying the researcher's curiosity and better understanding and may include testing the feasibility of taking a more extensive study and developing methods to be employed in any subsequent study.

The approach of the study was a quantitative,subsequently, questionnaires served as secondary data being obtained from literature on the subject, which was designed to answer the questions in relation to the perception of stakeholders in the construction industry.

3.2 Study Area

The study area was restricted to Kaduna, Kano and Abuja. These areas were specifically selected due to the high concentration of firms and construction activities in these locations.

The questionnaire was logically designed to assess the perception of stakeholders on the subject matter and was divided into two sections, section A and B. Section A was used to

obtain general information about the profile of the respondents while section B was on the perception of stakeholders on the adoptability of the concepts of IPD and was presented on a Likert scale of 1 – 5, where 1 represented strongly disagree and 5, strongly agree, from which respondents provided answers to the questions raised. Among the issues raised include:

i. Awareness of the concept.
ii. Appeal of the concept to professionals in the NCI
iii. Parameters and drivers as well as barriers to the adoption of the concept

3.3 Population, Sample Size and Sampling Technique

3.3.1 Population

A list of registered construction and consultancy firms based on Businesslist (2012) was extracted from its website which indicated there were 1,172 registered firms across the country.The target groups of this study, who form the units of analysis were construction and consultancy firms comprising in which a total of 87 firms were sampled for this study;

i. Architectural firms.
ii. Engineering firms (Electrical, Mechanical and Structural Engineering) firms.
iii. Quantity surveying firms.
iv. Multi- disciplinary design firms.

3.3.2 Sample Size

The listextracted from Businesslist (2012) revealed the number of firms in Abuja, Kano and Kaduna as 126, 12 and 60 respectively which either resided or had an office in the sampled locations. This was summed to give a total population of 198 firms, 87 firms were

conveniently sampled for the purpose of this study from the calculation using (Yamane 1967) formula and was approximated from the result i.e. 86.37 to 87.

Applying Yamane (1967) equation;

$$n = \frac{N}{1+N(e)2} \quad \text{…….. } \textit{eqn 3.1}$$

Where n = Sample Size

N = Population Size

e = Confidence Interval

i.e. $n= 198/1+198(0.1)^2= 66.44$

adding 10% for each of the three clusters

i.e. 30% of 66.44 = 86.37

3.3.3 Sampling Technique

The study employed a multi Stage sampling procedure. This involved purposive sampling in selecting the population i.e. the professional firms which according to Barbie (2010) is useful in situations where there is need to reach a target sample quickly.Convenience sampling was then used administering of the questionnaires to respondents based on nearness and availability of the respondents.

3.4 Method of Data Collection

3.4.1 Instrument of Data Collection

3.4.1 Questionnaire

The various characteristics, principles, concepts and other information having been extracted from literature were presented in the questionnaire with summated rating to be administered to respondents. Summatedrating scale was adopted to assist the respondents exclude questionable items into measurable attributes by means of administering of questionnaire. Chava and David (1996) suggested the following to be adopted when employing questionnaires in research.

i. Compiling possible scale items which involves a range of attributes which would require respondents to check from the options offered with such expressions as may be deemed fit by the researcher but should be one which can be easily understood by the respondents with relative weights for the items.
ii. Administering to respondents randomly from the population who would be required to indicate their perception on the items presented.
iii. Computing a total score for each item by summing the value of all items checked by respondents.
iv. Determining the discriminative power of items by summing the scored items for each respondent by correlating each item with the total score.

Based on the above, respondents were asked series of questions and given options 1 – 5 representing: 1 – Strongly disagree, 2 – Disagree, 3 – Somewhat agree, 4 – Agree and 5 – Strongly agree respectively to tick as appropriate as based on their perception.

Bhattacherjee (2012) opined that response values lower than (0.60) should be considered insignificant.

3.4.2 Data Collection Procedure

Copies of the questionnaires were self-administered to locations and premises of the firms in the three locations and distributed in the proportion of 10, 19 and 58 with respect to Kano, Kaduna and Abuja, totaling 87. Questionnaires were requested to be filled by Top level management staff of the firms administered, 75 questionnaires were dully filledand used in the analysis.

3.5 Data Analysis

Statistical Package for Social Sciences (SPSS) software was employed in the analysis of respondents in the study and presented by means of tables and statistical tools and eventually ranked using Relative Importance Index (RII). The data analysis employed the steps as in eqn 3.1:

i. Mean using weighted average formula i.e;

$$X = \frac{\sum fx}{\sum f} \quad \text{…….. } \textit{eqn 3.2}$$

Where:

x = points of the Likert's scale (1, 2, 3, 4 & 5).
f = frequency of choice of respondents on scale.

ii. Computation of Relative Importance Index (RII) with formula:

$$(RII) = \frac{\sum fx}{\sum f} \times \frac{1}{k} \text{……} \textit{eqn 3.3}$$

Where:

$\sum fx$ = Total weight given to each attribute by respondents.
$\sum f$ = Total number of respondents in the sample.
K = highest weight on Likert scale.

CHAPTER FOUR

4.0 DATA PRESENTATION, ANALYSIS AND DISCUSSIONOF RESULTS

This chapter presents the result, analyses discussion of the findings on the study Assessments were presented alongside each of the items and variables in the respective sections and are analyzed with mean scores. Decisions on each of the variables were based on agreement signified by the magnitude of the score. The study's discussions of findings from the analyzed data were presented in the last sections of the chapter.

4.1 Survey Response

Table 4.1: Distribution of Respondents

S/N	Variables	Frequency (No)	Percentage (%)
1.	Architectural firms	23	30.67
2.	Structural Engineering firms	7	9.33
3.	Mechanical & Electrical Engineering firms	12	16.00
4.	Quantity surveying firms	17	22.67
5.	Multi-disciplinary firms	16	21.33
	Total	75	100%

Source: Field survey *(2017)*

Table 4.1 shows the profession of respondents wherethe largest percentage of respondents was architectural firms with a percentage of 30.67%, others were quantity surveying firms 22.67%, multi-disciplinary firms 21.33%. the least respondents were structural engineering firms with a total of 9.33%

Table 4.2 Categorization of Firms

S/N	Size	Frequency (No)	Percentage (%)
1.	Small	8	10.7
2.	Medium	19	25.3
3.	Large	37	49.3
4.	Not Applicable	11	14.7
	Total	**75**	**100**

Source: Field Survey *(2017)*

Table 4.2indicates the distribution of firms of professionals in relation to their categorization with the Federal Ministry grouped as Small, Medium, Large and not Applicable (where respondents failed to indicate). Small firms accounted for 8 of the respondents, representing (10.7%), medium firms 19 with a percentage of 25.3%, large firms 37, representing 49.3% and Not Applicable 11 with a percentage of 14.7%. These (Not Applicable) being such respondents in client and other similar organizations

Table 4.3 Respondents Experience

S/N	Years of Experience	Frequency (No)	Percentage (%)
1.	0 – 5 years	30	40.0
2.	6 – 10 years	11	14.67
3.	11 – 15 years	10	13.33
4.	16 – 20 years	15	20.0
5.	Above 21 years	9	12.0
	Total	**75**	**100.0**

Source: Field Survey (2017)

Table 4.3 represents the work experience of respondents of the various firms surveyed which revealed that 30 of the respondents hadwork experience ranging from 0 - 5 years work experience (40.0%); 11 had 6 -10years experience(14.67%); 10 had 11 -15years work experience (13.33%), 15 had work experience of 16 -20years(20.0%) while 9 had above 21

years work experience representing (12.0%) of the total population. This implied majority of firms had relative experience in the field of construction and hence their views may be relied upon especially the range of 0 – 5 years as it is expected they have been recently exposed to the relatively new concept of IPD in the course of training.

Table 4.4 RespondentsAwareness of, and Involvement with IPD Concept in the NCI

S/N	Awareness/Involvement	Yes %	No %	Total
1.	Awareness of the concept of Integration/collaboration in project delivery	40 *53.3*	35 *46.7*	75 *100%*
2.	Engagement/Involvement in any project that entails some form of integration/collaboration	28 *37.3*	47 *62.7*	75 *100*
3.	Willingness to adopt highly integrative approaches in future project delivery	66 *88.0*	9 *12.0*	75 *100%*

Source: Field Survey (2017)

Table 4.4 shows the responses of the sampled population on their awareness of the concept of application of integration in project delivery. 40 of the respondents (53.3%) were aware of where such concepts where applied while 35 of the sampled respondents (46.7%) were unaware of the concept. This indicates that although 53.3% of the respondents were aware of the concepts 46.7% is still quite a high percentage as regards the lack of awareness of the concept. As such more enlightenment need to be undertaken by researchers and such conveyed and encouraged through professional bodies to help promote its awareness and subsequent adoption.

This can alsobe attributed to statement of Zahra, EhsanandFarimah(2017) who maintained that the USA had the most volume of articles in the field of IPD as well as the most in terms of implementation as at 2012, while other developing countries all had marginal research and implementation in the field.

As observed by Andre (2011) that IPD is still being evolved, the concept, as well as its characteristics and principles would need to be propagated by Professional bodies and academia. Likewise, joint collaboration similar to that organized by NASFA *et al* (2010) would need to be conducted wherein the various professional bodies may provide inputs geared to providing a more all – inclusive debate, understanding and approach to the IPD concept in the NCI.

Table 4.4 also sampled respondent's participation in projects involving some degree/level of integration/collaboration, 28 replied yes (37.3%), while 47 No(62.7%). This indicates a very low involvement of firms in integrative projects. According to Baiden and Price (2011),collaboration improves project performance and efficiency in the construction industry. As earlier postulated by Abubakar*et al* (2014), failure of the construction industry was due to its pursuance of individual interests. The deplorable response rate (Table 4.4) of the level of collaboration/integration by respondents in project buttresses the fact and should be a cause of worry in the NCI.

Table 4.4 finally shows respondents' willingness in adopting highly integrative projects as a follow up to previous presentations.88.0% of respondents showed their willingness to enter ahighly integrative contracts in future while 12.0% indicated their unwillingness to do so.

This indicates the high prospects of IPD projects in the NCI as regards its adoption among stakeholders.

Table 4.5 Consideration for entering an IPD project with other firms

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Technical competence of other firms	3	7	24	28	13	75	0.76	1st
2.	Commitment to integrated practices		4	28	34	9	75	0.73	3rd
3.	Experience and track record	1	4	26	40	4	75	0.71	4th
4.	Proven integrity		7	35	29	4	75	0.68	5th
5	Commitment to a collaborative process		5	23	31	16	75	0.75	2nd

Source: Survey (2017)
Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Somewhat Agree, 4 – Agree, 5 – Strongly Agree

Table 4.5 shows respondents' views on the parameters of Integrated Project Delivery they would consider when entering an IPD project with other firms. It showed that technical competence of other firm ranked highest with a mean score of 3.81 and RII of 0.76 while proven integrity of the other firms least with a mean of 3.40 and RII of 0.68. This indicates that technical competence of firms in an IPD project is a parameter which largely influences the willingness of firms to enter an IPD project in relation to the eventual outcome of either its success or failure.This is in line with the findings of Zhang*et al* (2015), where they establish the key issues in party selection for an IPD project to be specialization, credibility, commitment and clear coordination. These considerations according to them are the key ingredients for a success of an IPD project, and therefore, any organization willing to engage another in an IPD setting must give cognizance to them. Furthermore, Zhang and Qian (2016) have identified experience and track record of other firms as an important factor for a successful collaborative relationship in IPD projects. This

further confirms the validity of the findings of this research.In addition, Cleves and Dal Gallo argued that IPD on its own is not a sure recipe for success of a project but also necessary is the ability of the participants to collaborate and engage the various team members to achieve the intended outcome of IPD.

The results in Table 4.5 shows that the technical competence and commitment to a collaborative process as keen considerations when entering IPD projects with other firms. As such, firms and individuals considering this project delivery approach need to be well knowledgeable with the concept as well as have the requisite technical and managerial resources to drive teams to achieving the potentials and goals of IPD.

Table 4.6Barriers to the adoption of IPD in the NCI

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Lack of awareness of the concept	2	6	27	33	7	75	0.70	1st
2.	Lack of knowledgeable and experience partners.	6	13	19	29	8	75	0.65	4th
3.	Lack of enabling Environment (gov. policies and legislations) to guide implementation	1	9	27	26	12	75	0.70	1st
4.	Legal and contractual constraints	2	12	35	16	10	75	0.65	4th
5.	Social and Habitual Resistance to Change	5	15	22	27	6	75	0.64	6th
6.	No proof of financial benefits	5	19	19	21	11	75	0.64	6th
7.	Client not requesting the use of IPD projects.	1	13	25	23	13	75	0.69	3rd
8.	Absence of appropriate technology for integration	10	19	21	25		75	0.56	8th

Source: Field Survey (2017)

Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Somewhat Agree, 4 – Agree, 5 – Strongly Agree

Table 4.6 revealed the barriers which may be encountered in the adoption of IPD in the NCI by respondents with regards to 8 items which may serve as barriers as a checklist. The items were ranked with lack of awareness of the concept and Lack of Enabling Environment (government policies and legislations to guide implementation) tied at 1st having a mean of 3.49 and RII of 0.70 respectively as major barriers to adoption, while absence of appropriate technology placed as the least factor which may serve as barrier to implementation of IPD adoption by respondents. This explains that respondents are aware of appropriate technologies which may aid integration in one form or the order but are probably not fully utilized in the industry.

These findings also correspond to those of previous studies on similar subject matters. For instance, Abubakar*et al* (2014) found that lack of enabling environment and availability of trained professionals as the top barriers to the implementation of Building information modelling in the Nigerian construction industry. Further, Zhang andQian (2015) also emphasized the need for qualified people to handle IPD implementation issues as a necessary factor for the success of its implementation. This further highlights the challenges faced by new concepts like IPD are somewhat similar.

However, Middlebrook (2010) opined that barriers to IPD can be overcome and presents enormous benefits which include improved value and higher quality projects, faster delivery yielding early return on investment, potential for lower cost construction and operation, ease of linking design options to business objective. However as observed, respondents viewed that clients not requesting the use of IPD on their projects as one of the

barriers to IPD. This contradicts Carbaso (2008) opinion that IPD methodology evolved from owners' desire to eliminating waste, reducing time and increasing productivity. It may be argued that this may be a reflection of the sophistication of clients in the NCI or simply lack of awareness and cultural resistance to change by members of the NCI.

Table 4.7Relevance of IPD in Addressing Some Problems of the NCI

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Waste	8	13	23	24	7	75	0.64	3rd
2.	Inefficiencies	3	12	28	26	6	75	0.65	2nd
3.	Adversarial relationships	3	7	35	26	4	75	0.66	1st
4.	Owner demand for value	5	7	32	25	6	75	0.49	4th

Source:Field Survey (2017)
Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Somewhat Agree, 4 – Agree, 5 – Strongly Agree

The results in table 4.7 revealed the opinion of respondents on the issues that are addressed by IPD and its relevance to respondents as current issues in the construction industries. Adversarial relationship ranked 1st as the key area which IPD addresses with a mean of 3.28 and RII of 0.66. This implies that respondents generally viewed adversarial relationship as a major problem and were of the view that adoption of IPD would serve as a panacea toone of the major problems bedeviling the performance of the construction industry and the NCI in general.

These findings are in line with the views by Meng 2012; and Lloyd-walker *et al*. 2014 that considered trust-based collaboration among project parties as a critical factor that affects project performance. They also inferred that poor cooperation and limited trust leads to adversarial relationship among all project parties, causes project delays, difficulty in

resolving claims, cost overruns, and litigation, all of which drastically hamper the performance of construction projects.

These are all major factors usually highlighted in literature as causes of inefficiency and problems of the construction industry.

It can be safely assumed that if well implemented, IPD can successfully put the construction industry on track and bring about the radical change required to bring about overall improvement in the industry.

Table 4.8Relevance of some Characteristics of IPD in improving project delivery

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Key participant bound as equal	5	11	32	27		75	0.62	7th
2.	Shared financial risks and rewards based on project outcome	2	9	34	29	1	75	0.65	4th
3.	Liability waivers between participants	1	13	34	25	2	75	0.64	5th
4.	Early involvement of key participants	4	7	23	41		75	0.67	3rd
5.	Collaborative decision making	1	2	31	37	4	75	0.71	1st
6.	Jointly developed goals	4	4	26	40	1	75	0.68	2nd
7.	Agreeing to a multi- party contract	9	4	30	30	2	75	0.63	6th

Source: Field Survey (2017)

Table 4.8 represents respondents view on the characteristics of IPD which they suggested may be important in improving project delivery in Nigeria. Collaborative decision making ranked 1st with a RII of 0.71, as the most important factor in improving project delivery in the country by respondents. The findings corroborate those of Weiss and Molinaro (2010) who viewed that the reason for the transitioning of organizations to teamwork was due to the lack of potential to perform multifunctional tasks efficiently by few individuals.

Lencioni (2002) added that to promote performance in projects multi-disciplinary in nature, coordination and collaboration of teams from diverse teams must be built. Collaboration improves performance and efficiency in the CI (Abdirad&Pishdad -Bozorgi, 2014). The duo added that collaboration in IPD was a requirement and not a choice wherein participants in projects are obliged to coordinate and collaborate to enhance team approach among parties. This is in line with the concept of integration in which all aspects of work necessary to the successful of projects are discussed and agreed by the team members in an IPD project.

The high RII of respondents on the same issue portray positivity in the adoption of some of the concepts of IPD in the NCI.

Table 4.9 Drivers/facilitators for the adoption of IPD in the NCI

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Government support through legislation	7	12	21	30	5	75	0.64	8th
2.	Clients interest in the use of IPD in their projects	2	8	31	27	7	75	0.68	6th
3.	Availability of technology for seamless communication	3	3	27	39	3	75	0.70	4th
4.	Availability of well-trained professionals to coordinate its implementation	2	7	20	41	5	75	0.71	3rd
5.	Cooperation and commitment of professional bodies to its implementation	1	2	22	42	8	75	0.74	1st
6.	Highly collaborative processes that span project lifecycle	2	6	30	32	5	75	0.69	5th
7.	Value based decision-making	3	3	32	37		75	0.67	7th

S/N	Items	1	2	3	4	5	∑f	RII	Rank
	approach								
8.	Full utilization of enabling technological capabilities and support	2	2	23	44	4	75	0.72	2nd

Source: Field Survey (2017)

Table 4.9 showsrespondents' opinions on the drivers/facilitators to the adoption of Integrated Project Delivery. Response of respondents revealedCooperation and commitment of professional bodies ranking 1st in the drivers/facilitators of adoption of IPD in NCI with a mean of3.72 and RII of 0.74. Full utilization of enabling technological capabilities and support ranked 2nd which reveals it is more than mere acquisition of technological capabilities but its full utilization is required for optimization as revealed as the drivers/facilitators of IPD by respondents.These put the CI in the spotlight when judged by the statement of Glick and Guggenos (2009) who argued that the CI is siloed and the statement was expatiated by Sive (2009) who described the CI as one in which each discipline and firm speaking its own language, working its processes and data as such creating more confusion and inefficiencies.

Table 4.10 Role of Stakeholders in the Demand for IPD

S/N	Items	1	2	3	4	5	∑f	RII	Rank
1.	Owners/Client	3	5	20	36	11	75	0.73	1st
2.	Operator/End user	20	10	7	31	7	75	0.59	4th
3.	Designer	5	2	24	40	4	75	0.70	2nd
4.	Contractor	5	5	31	28	6	75	0.67	3rd
5.	Subcontractor	6	16	34	17	2	75	0.58	5th
6.	Suppliers	13	15	27	18	2	75	0.55	7th

7.	Financial organizations	4	6	20	35	10	75	0.58	5th

Source: Field Survey (2017)
Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Somewhat Agree, 4 – Agree, 5 – Strongly Agree

Table 4.10presents the opinion of respondents on the role played by the different participants in the construction industry in the demand for IPD executed projects. Respondents were unanimous in their opinion that Owner/client was most responsible in the demand for IPD in the execution of projects with a RII of 0.73. This corroborates Laiserin (2009), who claimed that smart clients were most likely to request the use of IPD in projects as he suggested could save construction costs of up to 30%. Laiserin (2009), however lamented that subcontractors were found to be the most resistant to adopting the delivery process as observed in projects in the USA as well as the construction of terminal five at Heathrow in the UK.

It can be deduced therefore that with positive case studies in the use of IPD in projects as witnessed in the terminal construction project in the UK as well as the Santa Rosa Memorial project in California, there is a future for the adoption of IPD in the global construction industry and the NCI eventually.

Table 4.11 Respondents' Perception of Factors Which Would Influence their Decision to Adopt IPD

S/N	Items	1	2	3	4	5	∑f	RII	Ranks
1.	Mutual Respect and Trust		8	21	42	4	75	0.71	6th
2.	Mutual Benefits and Rewards	2	1	33	35	4	75	0.70	9th

S/N	Items	1	2	3	4	5	∑f	RII	Ranks
3.	Collaborative Innovation and Decision Making		2	26	39	8	75	0.74	2nd
4.	Early Involvement of Key Participant		3	25	44	4	75	0.73	4th
5.	Early Goal Definition	3	5	19	41	7	75	0.71	6th
6.	Intensified Planning	1	3	32	29	10	75	0.71	6th
7.	Open Communication	2	6	19	40	11	75	0.76	1st
8.	Appropriate Tech		1	29	36	9	75	0.74	2nd
9.	Organization and leadership	5	4	15	41	10	75	0.72	5th

Source: Field Survey (2017)
Key: 1 – Strongly Disagree, 2 – Disagree, 3 – Somewhat Agree, 4 – Agree, 5 – Strongly Agree

Table 4.11 reveals factors which would influence decision of respondents when adopting IPD. Respondents were of the view that Open Communication was most likely to influence their decision to adopt IPD with a RII of 0.76. This was seconded by Collaborative Innovation and Decision Making which tied with Appropriate Technology with a RII of 0.74.

Harty and Laing (2009) reflects that ease of communication and visualization was a driving force in mobilizing project stakeholders to the adoption of IPD. They presented a case study of a 141,000m^2 office tower in Hong Kong where $13m was saved as well as over 2000 clashes avoided during the course of the project. Similarly, Ballard *et al* (2009) explained that "big room" scenario of IPD approach goes a long way in solving most of the procurement and delivery problems affecting the CI.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

The study was carried out to examine the adoptability of Integrated Project Delivery (IPD) concepts in the Nigerian Construction Industry. Below are the major findings of the research:

i. The study revealed that the level of awareness of the concept of IPD in the CI is relatively low with 46.7% of respondents indicating a lack of awareness of the concept as indicated in table 4.4.The level of engagement of practitioners in projects of varying degree/levels of collaboration is appalling. 62.7% of respondents revealed that they have never been involved in projects involving certain levels of integration/collaboration.However, on the positive, 88% of respondents indicated their willingness to participate in projects involving greater collaboration.

ii. Findings from the study revealed that practitioners and stakeholders in the CI were optimistic in the fact that IPD was capable of solving some of the pertinent problems of the CI especially the area of adversarial relationships with a RII of 0.66 ranking 1st (Table 4.7) and its effect on projects and participants, this they widely agreed could be addressed through collaborative decision making in the delivery process with a RII of 0.77 in table 4.8 and joint development of project goals and outcomes wherein early involvement of key players in the project lifecycle is adopted.

iii. Additionally, opinions of stakeholders revealed that cooperation and commitment of professional bodies with a RII of 0.74 ranking 1stwas paramount in the propagation

and implementation of IPD in the industry (Table 4.9). This may be achieved throughmaximumexploitation of enabling technologies (RII of 0.72) and tools available, managed by competent professionals who can manage and coordinate the various stages/levels of integration effectively and driven by clients/owners of projects as revealed in table 4.10 with a RII of 0.73 ranked as 1st in stakeholders role for the demand of IPD in projects execution.

iv. Lack of awareness of the concept of IPD with a RII of 0.70 revealed to be the greatest barrier to its adoption in the NCI tied with a lack of enabling environment in the manner of government policies and legislations which provides little or no room for its implementation (Table 4.6). Clients not demanding/pushing for IPD (RII 0.69) in their projects also were regarded as a factor inhibiting its adoption in the NCI.

5.2 Conclusion

From findings in the study, the following can be concluded:

i. Awareness of the IPD concept is relatively low with most members of the NCI having little or no knowledge of the concept.

ii. Collaborative decision making and open communication are key features which influence willingness of professionals in adopting the concept of IPD in the NCI.

iii. There is no enabling environment for the implementation in the form of government policies and legislations to guide its adoption, similarly legal and contractual constraints especially in public projects were factors considered as barriers.

5.3 Recommendations

Based on the major findings, these recommendations are made:

a. There should be further research and propagation of IPD amongst the professionals in the construction industry as regards the prospects and opportunities in the adoption of the concept.Professional bodies have been proven to be a major catalyst in the dissemination and encouragement of its members to adopt certain levels of integration and open communication amongst the various professionals of the construction industry as well as organizing inter – professional workshops and symposia of the concept inclusive of financial and legal bodies affiliated to the industry which would assist in preparing grounds for the dissemination and adoption of the concept.

b. The study recommends that firms and professionals equip themselves with the necessary technical knowledge and skills as well as avail themselves with available tools and software in order to remain competitive and abreast with trends in the industry.

c. Professionals should adopt more collaborative decision making and open communications while leveraging on visualization tools and software to mitigate adversarial relations, wastages in time and cost of reworks on projects which would ensure all projects players are aligned with the project objectives, process, procedures and outcome.

5.4 Contribution to Knowledge

i. The study has established that awareness and understanding of the concept of IPD amongst professionals in the NCI is relatively low.

ii. The research has established that the current environment in the NCI for the implementation of IPD is unsuitable with respect to the barriers to its adoption. in the form of policies and legislations as regards the concept.

iii. The study affirms the optimism of professionals of the potentials of IPD in solving pertinent problems of the CI especially through collaborative decision making and development of project goals by nature of its characteristics of leveraging on the early involvement of key players.

REFRENCES

Abdirad, H. and Pishdad – Bozorgi, P., (2014). *Developing a Framework of Metrics to Assess Collaboartion in Integrated Project Delivery*. 50th ASC Annual International Conference Proceedings.

Abubakar, M. (2012). *An Assessment of the Readiness of Nigerian Construction Industry to Adopt Building Information Modeling (BIM) Technologies.*(Unpublished master'sthesis). Ahmadu Bello University Zaria.

Abubakar, M., Ibrahim,, Y.M., Kado, D., and Bala, K. (2014). Contractors*perception of the factors affecting building information modelling (BIM) adoption in the Nigerian construction industry*. Paper presented at the ICCBE/CIB International Conference on Computing in Civil and Building Engineering. Orlando Florida, United States of America. ascelibrary.org/doi/abs/10.1061/9780784413616.022

AIA, (2012).*IPD Case Studies*. American Institute of Architects (March) 1 – 114

AIA (2009). *Experiences in Collaboration. On the Path to IPD*. AIA National and AIA California Council, Sacramento CA

AIA, (2007). *Integrated Project Delivery; A Guide*. California Council American Institute of Architects. https://info.aia.org 2007.

Aibinu, A. A., and Jabgoro, G. O. (2002). The Effect of Construction Delays on Project Deliveryin the Nigerian Construction Industry.*International Journal of Project Management*, 20, 593 – 599.

Al – Ahbabi, M. S. (2014).*Process Protocol for the Implementation of Integrated Project Delivery in the UAE: A Client Perspective.* An unpublished thesis submitted to the School of Built Environment, College of Science and Technology, University of Salford, Salford UK.

Alshawi, M. (2002).Integrated Construction Environment.*Technology and ImplementationConstruction Innovation*(2002). 2: 33 – 51.

Ameh, O. J., and Osegbo, E. E. (2011). Study of Relationship between Time Overrun and Productivity on Construction Sites.*International Journal of Construction Supply Chain Management 1* (1), pp 56 – 57.

Andre, G. R. (2011). *Integrated Project Delivery: A Teamwork Approach to Design and Design and Construction*. K & L Gates. http://www.klgates.com

Aniekwu, A. N., and Okpala, D. C. (1998). Causes of high costs of construction in Nigeria *Journal of Engineering and Management 114*(2) June (1998).223 – 244.

Aouad, G., Cooper, R. and Kagioulou, M., (2001). Performance management in construction: A conceptual framework.*Construction Management and Economics 19*(1) 2001.*https://doi.org.10.1080/01446190010003425*

Autodesk, (2008).*Autodesk Whitepaper: Improving Building Industry Results through IntegratedProject Delivery and Building Information Modelling* Autodesk Whitepaper, 12

Baiden, B. K. and Price, A. D. F. (2011). The Effect of Integration on Project Delivery Team effectiveness.*International Journal of Project Management, 29*(2), 129 – 136

Ballard, G. and Howell, G. A. (2004): Competing Construction Management Paradigm. *Lean Construction Journal*. *1*(1) October 2004.

Barbie, E. R. (2010). *The Practice of Social Research*.Wadsworth Cengage. 12th ed. BelmontCalifornia. USA.

Becerik – Gerber, B., andGhasseni, R., (2011). Transitioning to Integrated Project Delivery:Potential Barriers and Lessons Learned. *Lean Construction Journal* 2011, 32 – 52.

Bedrick, J. and Rubel, Z. (2009). *IPD: Why IPD, What is IPD, and how does it differ from other project delivery methods.* Retrieved from*http://www.ipd-ca.net/IPD%20Seminars%20Results.html*

Bertelsen, S. (2004): Lean Construction: Where are we and how to proceed. *Lean Construction Journal 2004*.Vol 1(1) October 2004

Bhattacherjee, A. (2012). Social Science Research: Principles, Methods and Practices (2012).Textbooks Collection 3. Retrieved from http://scholarcommons.usf.edu/oa_textbooks/3

Bryant, A. and Colledge, B. (2002). "Trust in Electronic Commerce Business Relationships".*Journal of Electronic Commerce Research 3*(2).

Businesslist (2012). *Directory of Businesses in Nigeria.* Retrieved from http://www.businesslist.com.ng

Carbaso, T. (2008): Integrated project delivery improves efficiency streamlines construction. Retrieved from http://www.tradelineinc.com/reports/0A03D1C0%2D2B3B%2DB525%2D85702BCEDF900F61.

Cho, S. and Ballard, G. (2011): Last Planner and IPD. *Lean Construction Journal* 2011, 67 – 78. John Wiley and Sons Inc.

Cheung, S., Yiu, K. and Chin, P. (2006). How relational are construction contract? *Journal of Professional Issues in Engineering Education and Practice 132*(1) 45 – 56.

Cleves, J. A. and Dal Gallo, L. (2012). Integrated Project Delivery: the Game Changer. Paper Presented at the American Bar Association Meeting: *Advanced Project Delivery: Improving the Odds of Success.*

Computer Integrated Construction,(2010): BIM project execution planning guide. Version 2.0. retrieved from http://www.engr.psu/bim

Cohen, J. (2010): *Integrated Project Delivery*: Case Studies AIA, California Council in partnership with AIA.

Colledge, B. (2005). Relational Contracting Creating – Value beyond the project. *Lean Construction Journal* 2(1) 30 – 45.

Conklin, J. (2005). *Dialogue Mapping: Building Shared Understanding of Wicked Problems*.Wiley. October 2005. http://www.cognexus.org.

ConsensusDOCS (2007).*ConsensusDOCS 300: Standard Tri – Party Agreement for IntegratedProject Delivery (IPD.)* USA.

Dahlqvist, E. and Winberg, A. (2010). *BIM, the next step in the construction of structures* (DissertationKTH Architecture and Built Environment) Retrieved from http://web.byu.kth.Se/Shared/pdf/3228_BIM%20%The%20Next%20Step%20in%20the%20Construction%20of%20Civil%20Structures.PDF

Dal Gallo, L. and Wilson, O. (2017): Moving from Design – Build to Integrated Project Delivery. *Design Cost Data* May – June 2017. Retrieved from http://www.hansonbridgett.com/Media/Files/Publications/2017 - 06 - moving – from – design – build. Pdf.

Duke, P. Higgs, S. andMcmahon, W.R. (2010): White Paper Integrate Project Delivery: "*The Value Proposition". An Owners Guide for Launching a Health Care Capital Project via IPD.* KLMK Group.

Eastman, C. (1999). Building Product Models: computer Environments Supporting Design and Construction CRC ISBN – 10:0849302595 ISBN – 13:9780849302596

Egan, J. (1998). *Rethinking Construction* HMSO London.

Emmitt, S. (2003): Learning to think and detail for first (Learner) principles. *11th Inernational Group for Lean Construction Conference Proceeding* Virginia Tech Blackburg VA.

Emmitt, S., Sander D. and Christoffersen, K. (2005). The Value Universe: Defining a Value

Based approach to Lean Construction. Proceedings of the 13th Annual Conference, *International Group for Lean Construction*. (IGLC), Sydney Australia.

Emmitt S., Mossman, A., and Smith, R. E., (2011): Lean and Integrated Project Delivery. Editorial, Integrated Project Delivery Special Issue.*Lean Construction Journal* 2011, 01 – 16.

Gibbons, R. and Henderson, R. (2012): Relational Contracts and Organisational Capabilities.
Organizational Science 35(5) pp 1350 – 1364. Retrieved from http://www.ijournals.informs.org.

Glick, S. and Guggenos, A. (2009). IPD and BIM: Benefits and opportunities for regulatory agencies. Proceedings 45th*Associated Schools of Construction*. National Conference Gainsville FL April 2 – 4.

Govender, K., Nyagwachi, J., Smallwood, J.J. and Allen, C.J. (2018): The Awareness of Integrated Project Delivery and Building Information Modelling in Facilitating Construction Project. *International Journal of Sustainable Development and Planning* 13(1) 2018 doi:10.2495/SDP-VIZ-NI-121-129.

Hamzeh, F. R. and Singleton, M. S. (2011): Implementing Integrated Project Delivery on Department of Navy Construction Projects.*Lean Construction Journal 2011*, 17 – 31.

Harty, J. and Laing, R. (2009). Drivers for change in construction procurement and its impact on management. Proceedings 2009 2nd*International Conference in Visualization VIZ 2009*, 138 – 143 https://doi.org/10.1109/viz. 2009.53.

Ibbs, W. Kwak, Y..H., Ng, T. andOdabasi, M. (2004). Project Delivery Systems and Project Change: QunatitativeAnalysis. *Journal of Construction Engineering and Management.* 20003 129: pp 382 – 387 doi:10.1061/ASCE)07 33-9364(2003) 129:4(382).

Koskela, L. (2000): An exploration towards a production theory and its application to construction. Espoo VTT Building Technologies. Retrieved from http://www.inf.vtt.f./pdf/publications/2000/p408pdf

Knott, T. (1996). *No Business as Usual: An Extraordinary North Sea Result*. The British Petroleum Company, London.

Lahpendera (2012): Making Sense of Muti – Part Contractual Arrangements of Project Partnering, Project Alliancing and Integrated Project Delivery. *Construction Management and Economics*. January 2012, 30 pp 57 – 79.

Laiserin, J. (2009). NEXT-GEN BIM: Graphisoft Teamwork 2.0 will revolutionalize

BIM/IPD workflow and collaboration.*TheLaiserin Letter No. 25* special edition July 2009.http://www.laiserin.co/features/issue_25/feature_01._pdf_19.Accessed July 2017.

Latham, M. (1994).*Construction Team*. The Final report on Joint Review of Procurement and Contractual Agreements in the UK Construction Industry. HMSO, London.

Liker, J. (2004): *The Toyota way: 14 management principles from the worlds greatest manufacturer*. McGraw Hill New York.

Lencioni, P. (2002). *The five dysfunctions of a team: A leadership fable*. San Francisco USA. Jossey – Bass.

Lerringer, R. &Brochner, J. (2010). Ed: Service – Led Construction Projects. *Construction Management and Economics.* 28(11) pp 123 – 129.

Lichtig, W. (2006).The Integrated Agreement for Lean Project Delivery.*Construction Law* 26,25

Lloyd-Walker, B. M., Mills, A. J., and Walker, D. H. (2014). "Enabling construction innovation:The role of a no-blame culture as a collaboration behavioural driver in project alliances." *Construction Management Economics*, 32(3), 229–245.

Maher, A. Millie, R. and Raisbeck, P. (2010). Assessing Integrated Project Delivery: A Comparative Analysis of IPD and Alliance Contracting Procurement Routes. Paper presented at the 26th*Annual ARCOM conference UK.*

Manley, K. (2002). Partnering and Alliancing on Road Projects in Australia and Internationally. *Road and Transport Research*, 11(3) 46 – 60.

Mathew, O. and Howell, G.A. (2005): Integrated Project Delivery, An Example of Relational Contracting. *Lean Construction Journal* 2005, 2(1), April 2005, pp 46 - 61.

Meng, X. (2012). "The effect of relationship management on project performance in construction." *International Journal of Project Management*, 30(2), 188–198.

Middlebrooks, B. (2010): Introduction to Integrated Project Delivery. Retrieved from https://www.aci-na.org.

Mosey, D. (2010). Ed: 10 years of partnering Contracts; PPC2000/TPC2005, the Association of Consultant Architects (ACA), Bromley.

Mossman, A. Ballard, G. and Pasquire, C. (2010): Lean project delivery. Innovation in integrated design and delivery. Retrieved from www.leanconstruction.dlc>media.

NASFA, COAA, APPA, AGC and AIA (2010). Integrated Project Delivery for public and

private owners. Retrieved from http://www.agc.org/galleries/projectd/IPD%20for%20%Public%20and%20Private%20Owners.pdf

O'Connor,P. J. (2009). *Integrated Project Delivery: Collaboration Through New Contract Forms.* Retrieved from http://www.faegrebd.com

Okuwoga, A. A. (1998). Cost-Time Performance of Public Sector Housing Projects in Nigeria. *Habitat International* 22 389 – 395.

Oyedele, L. O. and Tham, K. W. (2005): Examining architects' performance in Nigerian private and public sectors building project. *Engineering Construction and Architectural Management.*Vol.12(1) pp 52–68.Retrieved from https://doi.org/10.1108/096999.

Oyewobi, L. O., Ibironke, O. T., Ganiyu, B. O. and Ola – Awo, A. W. (2011): Evaluating Rework Cost; A Study of Selected Building Projects in Niger State, Nigeria. *Journal of Geography and Regional Planning 4*(3), 147 – 151, March 2011.

Rahman and Kumaraswamy, M. (2002). Joint risk management through transactional efficient relational contracting. *Construction Management and Economics 20*(1). 45-
54.

Roper, K.O. (2012): IFMA & BIM for lifecycle management. IFMA Facility Fusion Conference & Expo 2012.Chicago. April 11 – 13

Rowlinson. S, and Cheung, F. (2004). *A review of concepts and definitions of various forms of relational contracts*. Paper presented at the International symposium of CIB W92 on Procurement Systems. "Project Procurement for Infrastructure Construction"Chennai, India, 7 – 10 January.

Sacks, R. andPartouche, R. (2010). Empire State Building Project: Archetype of "Mass Construction". *Journal of Construction Engineering and Management*. 136(6), 702 – 710. Doi:10.1061/(ASCE)co.1943-7862.0000162.

Sakal, M. (2005). Project Alliancing: A Relational Contracting Mechanism for Dynamic Projects. *Lean Construction Journal*. 2(1), pp67 – 79.

Sive, T. (2009).White Paper.Integrated Project Delivery: Reality and Promise. A Strategist Guide to Understanding and Marketing IPD. *Society for Marketing Professional ServicesFoundation*.Retrieved from.
www.tedsive.com/docs/sive_White_Paper_IPD.pdf

Thomsen, C. (2006). *Project Delivery Process,* 3D/I, Houston.

Thomsen, C. (2010): *Managing Integrated Project Delivery*. Retrieved from https://www.leanconstruction.org>uploads

Williamson, O.E. (1979): Transactional Cost Economics: The Governance of Contractual Relations. *Journal of Law and Economics* 22 pp 223 – 261.

Weiss, D. S. and Molinaro, V. (2010).*The leadership Gap. Building leadership capacity for competitive advantage*. Wiley.

Yamane, T. (1976). Statistics: An introduction analysis 2nd ed. New York. Harper and Row.

Zahra, K., Ehsan, S., Mahdi, A. and Farimah, N. (2017). Integrated Project Delivery (IPD) Research Trends.*Journal of Engineering, Project and Production Management 2017 7*(2), 99 – 114.

Zhang, L, Cheng, J.andFan, W. (2015).Party Selection for Integrated Project Delivery Based onInterorganizationalTransactive Memory System.*Journal of Construction Engineering and Management*. DOI: 10.1061/(ASCE)CO.1943-7862.0001068.

Zhang, L.and Qian, Q. (2016). Exploring the Factors for Collaborative Relationships in IPD Projects. A paper presented at the *Construction Research Congress*. May 31–June 2, 2016 held at San Juan, Puerto Rico

APPENDIX

Table 2.3 Comparative Benefits of IPD in Relation to Traditional Project Delivery Approaches

S/N	Delivery Approach	Characteristics	Advantage	
1.	Design/Bid/Award	a. Two main contracts (Design Team/Contractor. b. Best Understood. c. Linear sequence of work (Longest delivery)	Low first cost	i. Pr ii. St re iii. Er or
2.	Design – Build	a. Single contractor/Responsibility. b. Faster delivery. c. Changes traditional role and relationship between owner, contractor and designer.	A. Sole source of accountability. B. Increases potential for early completion. C. Less adversarial. D. Earlier knowledge of firm practice.	i. M de ii. O de iii. O de iv. N pr qu

S/N	Delivery Approach	Characteristics	Advantage	
3.	Construction Manager	a. Two main contractors (design team & Contractor). b. Linear sequence of work but accommodates fast track delivery. c. CM is selected on qualification not price. d. CM selected early in the delivery process.	A. Fosters more collaborative environment. B. Allows for a tight control of pricing and schedule. C. Allow for phased construction. D. Full disclosure of cost and schedule throughout delivery process. E. Reduces owner risk.	i. Pe co ii. D ta du iii. St po
4.	Integrated Project Delivery (IPD)	a. One integrated form of agreement. b. Mutual respect and trust. c. Mutual benefit and reward. d. Early key involvement of all key delivery members. e. Early goal definition.	A. Owner, Architect and Contractor act as one. B. Owner can tailor the best aspects of design – build and CM – at – risk. C. Shared risks and rewards. D. Allows for distribution of costs by eliminating redundant efforts. E. Delivery relationships changes from adversarial to collaborative. F. Increases ability to deliver project within budget and schedule. G. Increases ability to deliver a more operationally efficient facility.	i. ii. iii.

Source: Duke *et al (2010)*