

Assessing the Extent of Deployment of Integrated Project Delivery (IPD) on Construction Project.

Engr. W.C. Nwoko-Omere^{1*}, Dr. B. Amade², Dr. I. I. Echeme³, Prof. G. E. Nworuh⁴

¹Michael Okpara University of Agriculture, Umudike Abia State.

^{2,3,4}Federal University of Technology, Owerri, Imo State.

***Corresponding Author**

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ABSTRACT

The study aimed to assess the extent of deployment of integrated project delivery (IPD) on construction project. Presently, the execution of sustainable development projects in Nigeria such as road, bridge, residential and commercial building, hospital, hostel, school etc. are significantly dominated with delays, leading to time and cost overrun, poor performance, conflicts among stakeholders, leading to building collapse and abandonment of developmental projects. Infrastructural projects involve the utilization of resources, engineering, labour, materials, equipment, capital, and market exchange available within the national economy. To maximize these resources demand the transition from traditional delivery method like the Design-Build (BD) and Design-Bid-Build (DBB) to more collaborative technological techniques such as Building Information Modeling (BIM) and Integrated Project Delivery (IPD), which is achieved by assessing the extent of deployment of IPD in the delivery of infrastructure construction projects in Nigeria.

The study adopted a combination of two research designs viz; exploratory and descriptive research design which moves towards the use of qualitative and quantitative (mixed method) approaches in answering the research question accurately. Data were collected from 161 professionals in the Physical Planning Units of the Federal Universities in the South-East geo-political zone of Nigeria through self-administered questionnaires. The data analysis technique used was descriptive in nature; Frequency, Mean Item Score (MIS), charts and figures, and Ranking Techniques were among them. The demographic data of the respondents were analyzed using frequency and percentile. The findings present the state of familiarity in using IPD, the likelihood of practitioners to apply IPD management systems on their infrastructure construction projects without delay. More so, emphasis on the importance of IPD principles in handling infrastructure construction projects and having a good IPD skills to ascertain effective and efficient infrastructure construction project delivery. The study concludes with a practical recommendations for stakeholders to embrace “IPD” philosophy for sustainable infrastructure construction project delivery as well suggest for future research the need of stakeholders at all levels to brace up to the paradigm change in delivery of infrastructure construction project.

Keywords: Construction, Infrastructure, Collaboration, Integrated Project Delivery, Building Information Modeling, Time and Cost Overrun.

INTRODUCTION

Assessment of the extent of deployment of integrated project delivery (IPD) on infrastructure construction project is of utmost important to building and construction industry. Building and construction industry is the body through which infrastructural development project is been achieved such as road, bridge, residential and commercial building, hospital, hotel, school etc. (Barret, Treves, Shmis & Ambasz, 2019).

This industry operates more effective when resources, engineering, labour, materials, equipment, capital,

and market exchange are available within the national economy (UNCTAD, 2020).

Nigerian construction industries are facing several challenges in the delivery of infrastructural development projects. They are significantly dominated with delay in term of project execution, leading to time and cost overrun, poor performance, conflicts among stakeholders, building collapse and abandonment of developmental projects. These challenges for decades today have been a great issue and a concern to stakeholders (Clients, Contractors, Financiers, and Consultants etc). Nedozi, Obasanmi and Ighata (2014) opined that delivery of infrastructural development projects in the construction industries in Nigeria within the estimated cost and time is becoming unrealistic. This is due to the inability of the stakeholders to apply efficient and effective project management tools and techniques. Most of the construction projects in Nigeria experiences delay (behind schedule) in term of execution; some are delivered with rework and high cost beyond the appropriation (Daniel, Garcia, Marasini, Kolo & Oshodi, 2019).

Problem Statement

The increasing complexity of infrastructure projects and the environment within which they are constructed place greater demand on construction managers to deliver projects on time, within the planned budget and with high quality (Enshassi et al., 2007).

The investment in infrastructural development project is of capital-intensive, mostly sponsored by government and non-governmental agencies attracting the regulation of professional bodies to achieve the goal. In addition, infrastructural development project as the backbone of economic activity supporting production and distribution system is meant to enhance the well-being of the nation (Waziri, Bukar, & Mu'azu, 2014). This development programmed to improve the quality of life through the provision of social amenities and support to macro-economic stability is encumbered with delay in delivery and its associated challenges.

Hence, despite the allocations, the process and method of delivery infrastructural development projects is poor and annoying, even in the higher institution of learning where excellent performance is required in all aspects of their operation is still battling with poor project delivery. Thus, assessing the extent of deployment of IPD model for infrastructure construction project becomes the driving key to accelerate economic growth which this research seeks to address.

Objectives of the Study

The aim of this study is to ascertain the extent of deployment of integrated project delivery (IPD) model on infrastructure construction project. The study specific objective is to assess the extent of deployment of IPD on infrastructure construction projects in South-East Region of Nigeria.

Research Questions

Based on the above information, this study will tend to answer the research question: to what extent can the deployment of IPD on infrastructure construction projects in South-East Region of Nigeria be assessed?

Justification of the Study

Given that it is necessary, a study assessing the extent of deployment of integrated project delivery (IPD) on infrastructure construction project in the entire South-East geopolitical zone of Nigeria to the best of our knowledge is nonexistent. Therefore, the findings of the study along with the enhanced IPD model developed for successful infrastructure construction project delivery have significant theoretical, practical, managerial, and policy implications for the adoption of an enhanced IPD model in construction project delivery. This study will offer practitioners and project teams the much-needed specific delivery strategies, technical know-how, and guidelines to successfully implement the enhanced IPD model on infrastructure construction projects delivery within the study area with a view to achieving their desired outcomes. Thus,

the study findings will help to improve the success and adoption of IPD as the desired model in the Nigerian construction project industry as a whole.

Scope of the Study

The scope of this study covers Federal Universities within the five states of South-East geopolitical zone of Nigeria: Abia, Imo, Enugu, Ebonyi and Anambra States as the case study areas.

LITERATURE REVIEW

Conceptual Review

Similar to the context that led the software industry develop Agile Project Management methodologies, from these trends arose the need for a new contractual model to deliver construction projects: the Integrated Project Delivery (IPD) (De Marco & Karzouna, 2018). The model was introduced by the American Institute of Architecture (Buk'hail & Al-Sabah, 2022; De Marco & Karzouna, 2018; Liu, Liu, Zhou, Kou, Ji & Li, 2021) to upend the often adversarial relationship between the project parties that often happen in most contract models (such as design-bid-build or integrated design-build). IPD calls incentives to all participants to work in a collaborative way to maximize value and minimize waste for the project, and ultimately all participants are called open to directly share data and eliminate the communication barriers.

The IPD method is one of the latest project delivery systems introduced to the construction industry (Buk'hail & Al-Sabah, 2022).

The American Institute of Architects, AIA California Council (2007), has defined IPD as a “project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication, and construction.” AIA has also provided many educational content on the IPD system, including a handful of guides and case studies published in this regard.

As a new project delivery mode (Liu et al., 2021), IPD mode effectively solves the problems of participants' responsibility and risk transfer under traditional delivery mode. The core idea of IPD mode is multidisciplinary collaboration and collaborative team. The effective communication, collaboration and decision-making can quickly maximize the value of a project.

As defined by AIA (Zhang & Hu, 2018), there are a number of levels of collaboration in the IPD; among these, the highest collaborative level is referred to as “IPD as a Delivery Method” and also by numerous other terms including “Pure” IPD and “True” IPD. “IPD as a Delivery Method” is characterized by a multi-party contract between the owner, prime designer, contractor, and/or other key members of the project team, incentivizing collaborative behavior, team risk-sharing, and other IPD principles and practices. On the other hand, the lower collaborative level in IPD occurs when integrated practices or philosophies are applied to certain traditional delivery approaches, it is referred to as “IPD as a Philosophy” and also by numerous other terms including IPD-ish. IPD-ish is characterized by traditional contracts with some limited risk-sharing and some application of IPD principles (Zhang & Hu, 2018).

The AIA goes further to elaborate its definition: “IPD leverages early contributions of knowledge and expertise through utilization of new technologies, allowing all team members to better realize their highest potentials while expanding the value they provide throughout the project lifecycle. Building upon early contributions of individual expertise, these teams are guided by principles of trust, transparent processes, effective collaboration, open information sharing, team success tied to project success, shared risk and reward, value-based decision making, and utilization of full technological capabilities and support. The outcome is the opportunity to design, build, and operate as efficiently as possible.” (AIA, 2007). However, despite the effort of the AIA and the Associated General Contractors of America (AGC) to establish standards for IPD (Buk'hail & Al-Sabah, 2022; Mihic, Sertic & Zavrski, 2014) there does not exist a standard definition that has been accepted by the whole industry, therefore IPD is still used to describe

significantly different contract arrangements and processes. Differences between the traditional delivery methods and IPD are more than just in the collaboration between the parties (Buk'hail & Al-Sabah, 2022; Mihic, Sertic & Zavrski, 2014). The main characteristics that differentiate IPD from the traditional delivery methods are: a multi-party contract; early involvement of key participants; collaborative decision making and control; shared risks and rewards; liability waivers among key participants; jointly developed project goals. Table 2.1 show that the American Institute of Architects has designed in order to list the said differences more clearly.

Table: 2.1: Comparison between traditional project delivery and IPD

Traditional Project Delivery	teams	Integrated Project Delivery
Fragmented assembled on “just-as-needed” or “minimum-necessary” basis, strongly hierarchical, controlled		An integrated team entity composed key project stakeholders, assembled early in the process, open, collaborative
Linear, distinct, Segregated; knowledge gathered “just-as-needed”; information hoarded; silos of knowledge and expertise	process	Concurrent and multi-level; early contributions of knowledge and expertise; Information openly shared; stakeholder trust and respect
Individually managed, transferred to the greatest extent possible	risk	Collectively managed, appropriately shared
Individually pursued; minimum effort for maximum return; (usually) first-cost based	compensations/ reward	Team success tied to project success; value-based
Paper-based, 2 dimensional; analog	communications/technology	Digitally based, virtual; Building Modelling (3, 4 and 5 dimensional)
Encourage unilateral effort; allocate and transfer risk; no sharing	agreement	Encourage, foster, promote and support multi-lateral open sharing and collaboration; risk sharing

Source: (AIA, 2007)

IPD Conceptions and Principles

IPD conceptions and similar integrated delivery methods have enjoyed wide recognition by means of publication of several project and owner success stories, such as the Autodesk Headquarters (Zhang & Hu, 2018). Several organizations such as AIA and Associated General Contractors (AGC) have also developed and promoted a few standardized contractual documents.

Deployment of IPD in the Delivery of Construction Infrastructure Projects in Nigeria

In the US, the construction industry’s use of IPD necessitates benefiting from advanced techniques including BIM and lean practices (Nguyen & Akhavian, 2019). In IPD projects, members meet regularly in early stages of the project initiation where they deliberately discuss relevant issues and practically streamline critical tasks related to the design and construction stages. Not only do such methodologies guarantee lower number of changes and higher levels of confidence in adhering to the original project budget and duration estimate, they also tend to result in more sustainable and resilient outcomes. While Mesa, Molenaar and Alarcón (2019) are of the view that IPD is an approach that is rapidly gaining popularity in the design and construction industry in the United States (U.S.), and the industry has started to use IPD in an attempt to achieve more collaboration and, hopefully, better performance.

THEORETICAL REVIEW

Agency theory explains what is sometimes referred to as the “principal-agent problem” and involves one person, the agent, who “acts for, on behalf of, or as the representative” of another person, the principal (Paolillo et al., 2016). Two types of problems arise in principal-agent situations: first, when the goals or desires of the agent and principal differ and second, when the agent and principal have different levels of risk tolerance. Contracts are central when analyzing the relationship between a principal and an agent. This is because structuring incentives or increasing transparency are the primary means to align the interests of the principal and agent. Agency theory assumes that individuals are rational actors and will pursue their own self-interest. This assumption frames much of the way in which agency theory is applied. The legacy of this paradigm with principal-agent problems can be seen across the world as the traditional and dominant means of construction project delivery.

It is important to understand what IPD is in order to help distinguish it from traditional project delivery (Paolillo et al., 2016). IPD is a relational contract between the owner, contractor, and architect to construct a building. The premise is that the three entities become stakeholders in the outcome. As the project progresses from initial design through completion, the team leverages early, concurrent efforts of the core team and associated sub-consultants. With input and agreement from all three stakeholder groups and sub-consultants, a fully coordinated solution and project plan is devised that meets program requirements within the available schedule and budget.

EMPIRICAL REVIEW

Buk'hail and Al-Sabah (2022) did a study on exploring the barriers to implementing the integrated project delivery method in the Kuwait's construction industry. The research aims to provide the specific barriers to IPD by evaluating the willingness of non-IPD teams in implementing the principles of IPD. Data was collected from members engaged in multiple construction projects located in Kuwait. Statistical analyses were performed on the collected data to examine differences and similarities in their responses. A Delay Index variable revealed that ongoing Design-Bid-Build (DBB) projects are suffering a delay that amounts to half their original construction duration and that is almost double the delay incurred on Design-Build (DB) projects, which suffered a lesser delay. The results indicated that the majority of the respondents working in Kuwait were willing to implement most of IPD's principles. Astonishingly, respondents working on DBB projects were more willing to implement the principles of IPD than those working on DB projects. The respondents from both public and private sectors were equally willing. The main contractors were found to be less willing to implement IPD than all other project parties. Moreover, the most prominent barriers prohibiting most respondents from implementing IPD was their unwillingness to sign a contract that includes liability waivers and one that includes IPD's organizational hierarchical structure. The study findings did not strictly show how each of the barriers impeding IPD implementation were either identified from the literature or analyzed using any rigorous analytical tool.

Nevertheless, Kahvandi et al. (2019) did a study on the analysis of the barriers to the implementation of integrated project delivery (IPD): a meta-synthesis approach. The study identified the barriers to IPD basically extracted from existing case studies. In the research, the meta-synthesis qualitative method was used in identifying and classifying the IPD barriers. The meta-synthesis method did not involve the use of quantitative tools which will bring out the rigours in arriving at a tentative result.

Hence, Durdyev et al. (2019) did a study on barriers to the use of integrated project delivery (IPD), a quantified model for Malaysia. The purpose of the paper is to quantify the barriers, and to use the IPD, as assessed by 115 construction professionals in Malaysia. The model was validated via a partial least squares structural equation modelling (PLS-SEM) technique. The findings indicate that the advance body of knowledge on IPD provided original insights into the nature of key barriers, quantifying the relative

importance of each barrier. The work did not arrive at any tangible approach for enhancing IPD adoption and implementation in Malaysia.

Research Gap

An examination of the existing body of literature reveals various patterns in research pertaining to the subject matter. A significant portion of the research has been dedicated to investigating the possibilities of various tools and approaches, such as IPD. The majority of these research primarily focus on presenting an overview of how different methodologies and techniques contribute to enhancing the deployment of IPD in the construction industry. The integration of BIM with IPD practices has been the subject of discussion in various research publications. The difficulties associated with these integration are examined in a separate body of research. Common obstacles to the adoption of IPD include technological challenges such as difficulty in connecting digital technologies with IPD, as well as the presence of underdeveloped environment that hinder efficient infrastructure construction projects delivery. However, there is a lack of a practical technique to effectively show the correlation between BIM tools/dimensions and IPD stages. The challenges associated with IPD and the absence of adequate support systems to assist the utilisation of IPD continue to pose significant obstacles. The relevance of delivering web-based solutions as intermediaries between BIM and IPD support systems has been established. However, there are currently no research exists specifically designed for a developing clime like Nigeria in the area of IPD. As previously said, an ideal system should possess the ability to periodically share information with respect to construction infrastructural project delivery via IPD. It is advised and justified to utilise such a project delivery method. Upon conducting a comprehensive evaluation of prior research conducted on this particular subject matter, it has come to light that there exists a notable gap in the existing body of knowledge. Thus, the empirical review reveal the following gaps:

1. The study findings did not strictly show how each of the barriers impeding IPD implementation were either identified from the literature or analyzed using any rigorous analytical tool.
2. The meta-synthesis method did not involve the use of quantitative tools which will bring out the rigours in arriving at a tentative result.
3. The work did not arrive at any tangible approach for enhancing IPD adoption and its implementation in Malaysia.

Hence, these deficiencies will be further elaborated upon in the subsequent discussion. Certain academics have made deliberate efforts to develop an enhanced IPD schemes and frameworks that are deemed beneficial. There is currently a lack of a viable and theoretically-grounded approach that encompasses such integration via IPD and infrastructure construction projects. This discrepancy underscores the importance of undertaking the current investigation.

METHODOLOGY

Research Design

This study adopted a combination of two research designs viz; exploratory and descriptive research design which moves towards the use of qualitative and quantitative (mixed method) approaches in answering the research questions accurately. The most important factor to consider when developing a research plan is its applicability and fit to the study questions and objectives. Berg (2007), on the other hand, defines research design as a process that illustrates how all the components of a research project fit together: what data are needed, how data will be collected and analyzed, and the structure that will allow a researcher to deliver answers to their research questions.

Population

According to Kothari (2004), the target population is the complete group of respondents who the researcher believes fit the specified set of characteristics. The authors go on to say that a target population is any group of people or items from which the researcher wishes to draw conclusions. To be targeted and effective, a study must explicitly define its target group and establish a referral mechanism to ensure that it obtains the right data. This study's target demographic consists of practitioners who operate in Universities within the five (5) South-East states of Nigeria who are familiar with issues bordering on IPD and infrastructure construction projects within the area of study. Participants were chosen based on their prior experiences and participation in IPD project selection and decision-making procedures.

Sample size

According to Burns and Bush (2010), as researchers organize their research projects, one critical feature that must be given proper consideration in the research process is the sample size. In research initiatives, sample size considers how well the findings from the sample chosen correctly represent the population. Information from several examples was obtained in order to increase the likelihood that the outcome of this study reflects either comparable or opposing perspective patterns on the same topic. Multiple cases, according to Yin (1994), Miles and Huberman (1994), and Vohra (2014), not only provide a deeper understanding of the processes and outcomes of cases but also strengthen the results by replicating the patterns, increasing the robustness of the findings. The primary purpose of this research project was the basis on which the researcher considered the number of cases needed to provide confident analytical results. Some writers, such as Hair (2006) and Pallant (2007), show that a sample size greater than 100 is required for factor analysis as a general rule of thumb. Hence, Purposive sampling were adopted to allow researchers to learn about a community without having to investigate its entire population (National Audit Office, 1999).

Method of Data Collection

The questionnaire designed for this study included closed-ended questions as well as a collection of responses from which the respondent had to choose. Sections A and B of the questionnaires was created. Section A requests respondents' general information. Section B addressed concerns about the research's primary goals. The quantitative research method is consistent with the positivist viewpoint. It is quantitative since the researcher produced and gave a structured questionnaire, including a list of literature-based information, to the respondents. This aids in the validation of material from the literature by determining the frequency and level of agreement with the criteria. The questionnaire findings were the only research data used in the study. Primary sources were used to compile the data for this analysis. A secondary data (performance data) source for ongoing construction projects within the Tertiary Institutions in the South East geopolitical zone of Nigeria was also used to collate data, which means that the data was gathered directly by the researcher for a specific research goal or project.

Method of Data Analysis

Data analysis is the act of analyzing, cleansing, manipulating, and modeling data with the goal of presenting valuable features, generating conclusions, and supporting decision-making. In statistical applications, some researchers separate data analysis into descriptive statistics, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) (Candela, 2019). Because this is a quantitative study, the data analysis technique used was descriptive in nature. Frequency, Mean Item Score (MIS), charts and figures, and Ranking Techniques were among them. The demographic data of the respondents were analyzed using frequency and percentile.

Specifically, to achieve the objective, which is to assess the extent of deployment of IPD in the delivery of construction infrastructure projects in Nigeria, this was achieved using mean item score (MIS), and frequency etc. The arithmetic mean is a descriptive statistic and measures the central tendency of a probability distribution along median and mode (Norusis, 2008; Ott & Longnecker, 2016, Wuni, 2022). It provided a quantitative indicator of the average responses of the assessors, computed as a ratio of the sum of

all the given responses to the total number of respondents. The mean scores and frequency played complementary roles in delineating the extent of IPD deployment in the study.

The mean scores are computed using this formula below (Osei-Kyei, 2017);

$$\frac{N_{i1} \times 1 + N_{i2} \times 2 + N_{i3} \times 3 + N_{i4} \times 4 + N_{i5} \times 5}{N_{i1} + N_{i2} + N_{i3} + N_{i4} + N_{i5}}$$

$$S_1 = 3.1$$

Where S_1 = mean score for i th factor,

N_{i1} = number of responses 1 for i th factor;

N_{i2} = number of responses 2 for i th factor;

N_{i3} = number of responses 3 for i th factor;

N_{i4} = number of responses 4 for i th factor;

N_{i5} = number of responses 5 for i th factor.

RESULTS AND DISCUSSION

Results

The study population comprises 161 professionals in the Physical Planning Units of the Federal Universities in the South-East geopolitical zone of Nigeria. The professionals working in these institutions were given the self-administered questionnaires. The number of questionnaires distributed was determined using the census sampling technique for sample size determination, thus resulting in a sample size of 161. The table 4.1 displays the number of questionnaires retrieved and deemed suitable for analysis from the institutions.

Table 4.1 Details of response from the Federal Universities within the study area

S/N	Institutions / State	Population Size	Sample Size	Sample Returned	Number Used
1	FUTO - Imo	28	28	25	23
2	MOU AU - Abia	29	29	26	25
3	UNN - Enugu	44	44	38	36
4	NAU - Anambra	38	38	34	34
5	FUNAI - Ebonyi	22	22	17	15
	Total	161	161	140	133

Demographic Characteristics of Respondents

The initial section of the questionnaire provides an overview of the respondent's attributes, such as their field of expertise, years of professional experience, qualifications, and sector of operation amongst others.

Respondents Academic Qualifications

Figure 4.1 presents the academic qualifications of the study's respondents. The group with the highest number of responses consist of B.Eng/B.Tech/B.Sc/HND holders accounting for 65.4% (87), while Ph.D

holders consisted of 8.3% (11), while respondents with M.Eng/M.Sc/MBA degrees had a response rate of 26.3% totaling 37 responses.

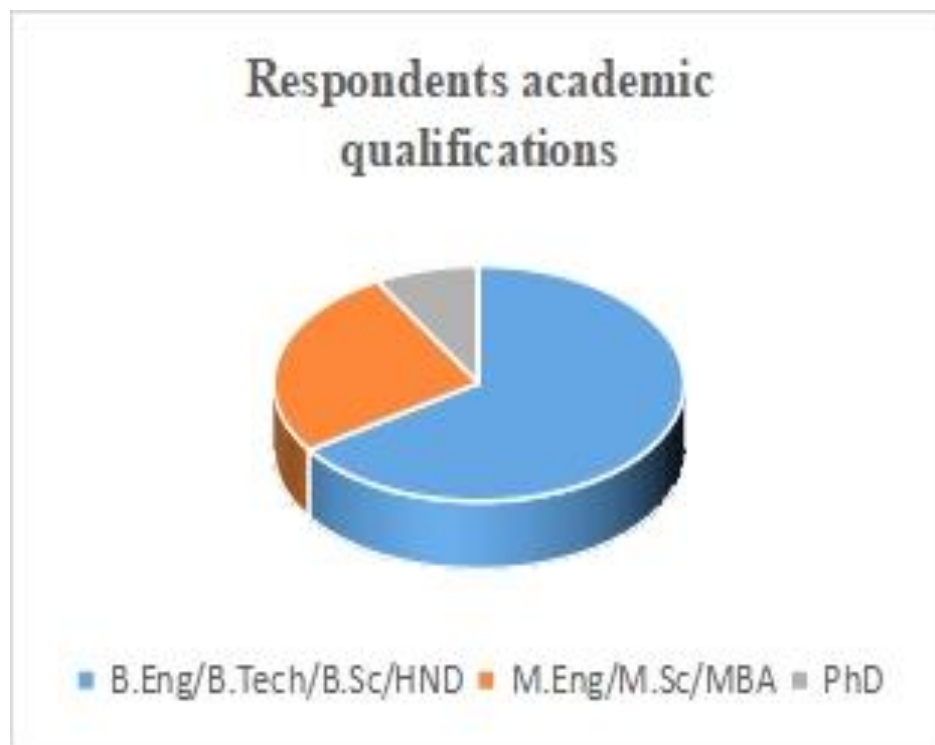


Figure 4.1: Respondents academic qualifications Years of experience of respondents in the industry

Table 4.2 Years of experience of respondents in the industry

Years of Experience of respondents in the industry					
		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	0 to 5 Years	4	1.9	3.0	3.0
	6 – 10 Years	9	4.3	6.8	9.8
	11- 15 Years	20	9.6	15.0	24.8
	16 to 20 Years	26	12.5	19.5	44.3
	21 Years and more	74	35.6	55.6	100.0
	Total	133	63.9	100.0	
Missing	System	75	36.1		
Total		208	100.0		

Table 4.2 displays the number of years of experience of all the respondents who took part in the study. It is worth mentioning that 74 respondents accounting for 55.6% of the total respondents who have accumulated 21 years and more in the infrastructure construction industry. 26 (19.5%) have spent between 16 to 20 years of experience in the construction industry. Additionally, 20 practitioners representing 15% of the total, have accumulated between 11 and 15 years of experience. Additional 9, which is 6.8% of respondents have also dedicated a period of 6 to 10 years to the industry. The age group with the lowest response rate was less than 5 years, with 4 responses making 3% of the total respondents. It is interesting to know that the practitioners are well experienced in business of delivering infrastructure construction projects.

Discipline of respondents

Table 4.3 Discipline of respondents

Discipline of respondents					
		Fre-quency	Percen-tage	Valid Percentage	Cumula-tive Percentage
Valid	Quantity Surveyor	32	17.5	24.1	24.1
	Project Manager	14	6.7	10.5	34.6
	Builder	10	4.8	7.5	42.1
	Architect	29	13.9	21.8	63.9
	Engineer	22	10.6	16.5	80.4
	Others	26	11.6	19.5	100.0
	Total	133	63.9	100.0	
Missing	System	75	36.1		
Total		208	100.0		

Table 4.3 displays the distribution of disciplines among the participants in the study. It is worth mentioning that the majority of respondents, specifically 22 individuals (16.5%), are engineers, while 14 individuals (10.5%) are project managers. Additionally, other professionals such as builders and quantity surveyors have also contributed, with 10 (7.5%) and 32 (24.1%) participants respectively. Furthermore, others consisting of different practitioners had 26 individuals (19.5%).

Extent of deployment of IPD in the delivery of construction infrastructure projects

The figure 4.2 presents the state of familiarity in using IPD by the respondent's. 51.1% (68) are very unfamiliar with the use of IPD, 10.5% (14) are familiar, 12.8% (17) are unfamiliar, 18.8% (25) are very familiar, while 6.8% (9) were somewhat familiar with the use of IPD in infrastructure construction projects in the study area.

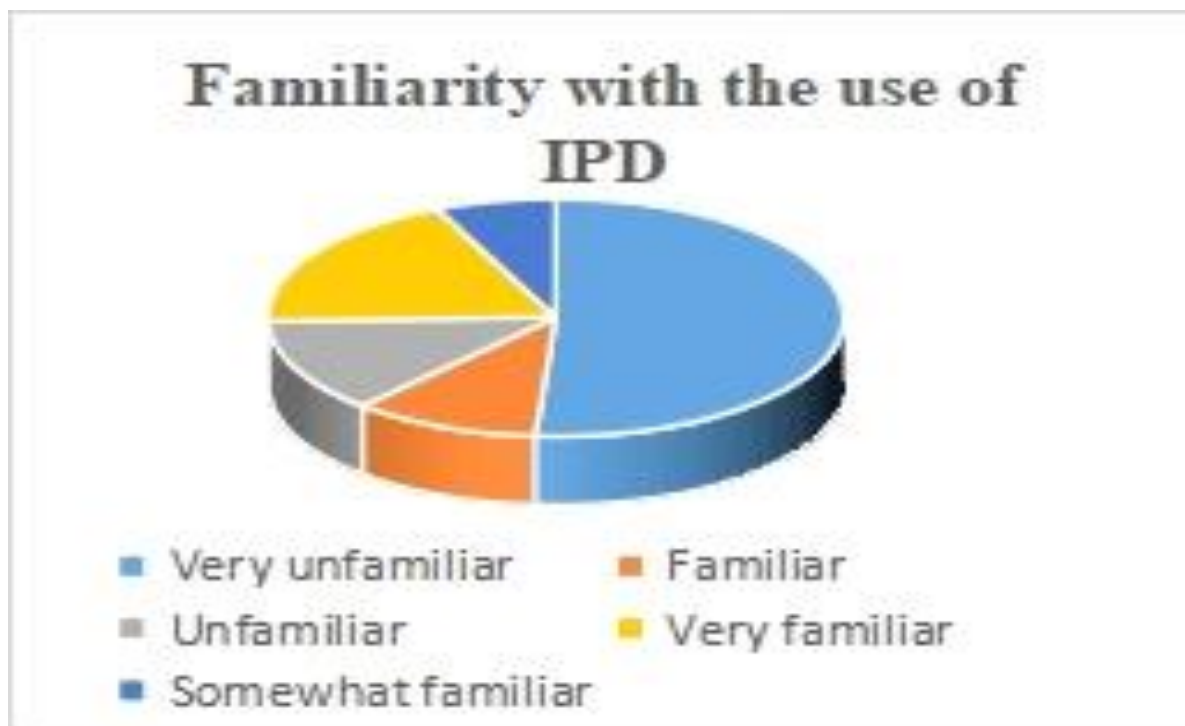


Figure 4.2 Familiarity with the use of IPD

Figure 4.3 displays the likelihood of applying IPD system on infrastructure construction projects in the institutions. It is worth mentioning that 12 practitioners (9%) are very unlikely going to apply the IPD system. 8 (6%) are unlikely, 6 (4.5%) are neutral about it, 37 (27.8%) are likely, while a whopping 70 (52.6%) are very likely to apply IPD management systems on their infrastructure construction projects any

time soon. This is a clear indication that the practitioners have seen the importance of the IPD system and are ever willing to deploy it.

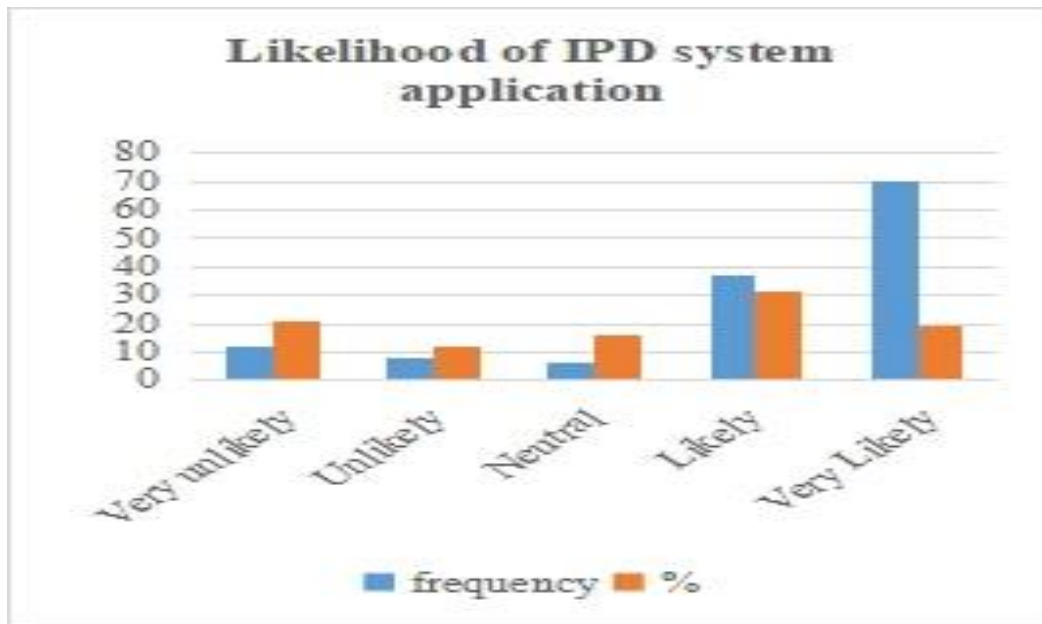


Figure 4.3: Likelihood of the application of IPD management system

Table 4.4: Emphasis on the importance of IPD

Emphasis on importance of IPD					
		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Never	70	33.7	52.6	52.6
	Rarely	18	8.7	13.5	66.2
	Sometimes	17	8.2	12.8	78.9
	Often	12	5.8	9.0	88.0
	Always	16	7.7	12.0	100.0
	Total	133	63.9	100.0	
Missing	System	75	36.1		
Total		208	100.0		

Table 4.4 displays the institutions emphasis on the importance of IPD principles in handling infrastructure construction projects. It is worth mentioning that 70 (52.6%) of the practitioners agreed that the institution never emphasizes on the importance of IPD when delivering their infrastructure construction projects, 18 (13.5%) rarely, 17 (12.8%) sometimes do, 12 (9%) often, while 16 (12%) agreed that their institution always emphasizes on IPD's importance. This is a clear indication that the institutions need to start as soon as possible in emphasizing on the importance of the use of IPD in modern day construction project delivery.

Table 4.5 Important to have IPD skill

Important to have IPD skills					
		Frequency	Percent-age	Valid Percen-tage	Cumula-tive Percen-tage
Valid	Not Important	8	3.8	6.0	6.0
	Least Important	13	6.3	9.8	15.8
	Important	19	9.1	14.3	30.1
	Very Important	24	11.5	18.0	48.1
	Extremely Important	69	33.2	51.9	100.0
	Total	133	63.9	100.0	

Missing	System	75	36.1		
Total		208	100.0		

Table 4.5 displays the institutions emphasis on the importance of having good IPD skills in assisting their infrastructure construction activities. It is worth mentioning that 8 (6 %) of the practitioners agreed that the importance of a good IPD skill is not important in the institution when delivering their infrastructure construction projects, 13 (9.8%) agreed that it is least important, 19 (14.3%) important, 24 (18 %) very important, and 69 (51.9 %) agreed that it is extremely important. This is also a clear indication that the institutions have come to terms with the benefits and importance of IPD skills in infrastructure construction project delivery.

DISCUSSION

The figure 4.2 presents the state of familiarity in using IPD by the respondent's. 51.1% (68) are very unfamiliar with the use of IPD, 10.5% (14) are familiar, 12.8% (17) are unfamiliar, 18.8% (25) are very familiar, while 6.8% (9) were somewhat familiar with the use of IPD in infrastructure construction projects in the study area.

Figure 4.3 displays the likelihood of applying IPD system on infrastructure construction projects in the institutions. It is worth mentioning that 12 practitioners (9%) are very unlikely going to apply the IPD system. 8 (6%) are unlikely, 6 (4.5%) are neutral about it, 37 (27.8%) are likely, while a whopping 70 (52.6%) are very likely to apply IPD management systems on their infrastructure construction projects any time soon. This is a clear indication that the practitioners have seen of the importance of the IPD system and are ever willing to deploy it.

Table 4.4 displays the institutions emphasis on the importance of IPD principles in handling infrastructure construction projects. It is worth mentioning that 70 (52.6%) of the practitioners agreed that the institution never emphasizes on the importance of IPD when delivering their infrastructure construction projects, 18 (13.5%) rarely, 17 (12.8%) sometimes do, 12 (9%) often, while 16 (12%) agreed that their institution always emphasizes on IPD's importance. This is a clear indication that the institutions need to start as soon as possible in emphasizing on the importance of the use of IPD in modern day construction project delivery.

Table 4.5 displays the institutions emphasis on the importance of having good IPD skills in assisting their infrastructure construction activities. It is worth mentioning that 8 (6 %) of the practitioners agreed that the importance of a good IPD skill is not important in the institution when delivering their infrastructure construction projects. 13 (9.8%) agreed that it is least important, 19 (14.3%) important, 24 (18 %) very important, and 69 (51.9 %) agreed that it is extremely important. This is also a clear indication that the institutions have come to terms with the benefits and importance of IPD skills in infrastructure construction project delivery.

CONCLUSION AND RECOMMENDATION

Conclusion

There is a moderate level in the extent of deployment of IPD in the delivery of construction infrastructure projects in the tertiary institutions in the South-East geopolitical region of Nigeria. Given that 18.8% (25) are very familiar in using IPD in the delivery of construction infrastructure projects in the tertiary institutions. On the likelihood of applying IPD system on infrastructure construction projects in the institutions, 12 practitioners (9%) were very unlikely going to apply the IPD system. 8 (6%) were unlikely, 6 (4.5%) were neutral about it, 37 (27.8%) were likely, while a whopping 70 (52.6%) were very likely to apply IPD management systems on their infrastructure construction projects any time soon. On the institutions emphasis on the importance of IPD principles in handling infrastructure construction projects, that 70 (52.6%) of the practitioners agreed that the institution never emphasizes on the importance of IPD when delivering their infrastructure construction projects. Whereas, on the institutions emphasis on the

importance of having good IPD skills in assisting their infrastructure construction activities, it is worth mentioning that 69 (51.9 %) agreed that it is extremely important.

Recommendation

Given the outcomes of the results emanating from this study, we now conclude that; given the moderate level in the extent of deployment of IPD in the delivery of infrastructure construction projects in the tertiary institutions in the South-East geopolitical region of Nigeria, there's need for industry players, professionals and government at all levels to brace up to the paradigm change and embrace the "IPD" philosophy in their infrastructure construction project delivery in particular. IPD principles and philosophy has proven to be a cost cutting and saving mechanism that would help curb waste in the entire infrastructure construction project delivery system. Some of the notable problems bedeviling the infrastructure construction project delivery such as not deploying the construction consortium and application of modern emerging tools like the BIM etc can be nipped in the bud by the application of an IPD philosophy.

Contribution to knowledge

This research paper contributed and advances knowledge by assessing the extent of deployment of IPD in the delivery of infrastructure construction project in Federal Universities in the South-East geopolitical region of Nigeria. The study was able to create an in-road into the aspect of IPD and construction project management in ameliorating issues and problems bedeviling the successful delivery of infrastructure construction projects in public-based tertiary institutions in South-East Nigeria in particular, and the entire Nigeria in general.

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