

Critical Success Factors for IPD Implementation in Public Building Projects in Anambra State, Nigeria

ARINZE UCHENNA OKEKE¹, KEVIN CHUKS OKOLIE², CHUKWUNWIKI CHARLES EGOLUM³, GODWIN OBUMNEME OKOLI⁴, CHRISTIAN OBINNA MGBEAHURU⁵

¹*Dept of Building, Nnamdi Azikiwe University, Awka Anambra State.*

²*Dept of Building, Nnamdi Azikiwe University, Awka.*

³*Dept of Estate management, Nnamdi Azikiwe University, Awka.*

⁴*Dept of Building, Nnamdi Azikiwe University, Awka*

⁵*Dept of Architecture, Alex Ekwueme University, Ebonyi State, Nigeria*

Abstract—Over the years, construction projects in Nigeria have been delivered using conventional methods. These methods have long been challenged by cost overruns, delays, poor project outcomes, and stakeholder conflict, particularly in public building projects. Integrated Project Delivery (IPD) has emerged globally as an innovative delivery approach to improve current methods and increase project performance by integrating collaboration, shared risk and reward, and the people, systems, and practices throughout the project lifecycle. This study aims to assess the key critical success factors for implementing IPD in public building projects in Anambra State, Nigeria. To achieve this, the hypothesis was formulated that no significant correlation exists between stakeholder collaboration and the success of IPD implementation in public building projects. The study adopted a descriptive research design. Ninety-two (92) copies of the questionnaire were administered to professionals in the Ministry of Housing in Anambra State. From the analysed data, the key critical success factors for IPD implementation were early stakeholder involvement (4.75), collaboration mindset (4.66), sharing risk and reward (4.59), mutual respect and trust (4.56), and multi-party contract (4.41). The study recommended that the government should strengthen its procurement policy to allow the implementation of collaborative delivery approaches such as IPD. Regular workshops, seminars, and training programmes on BIM, Lean practices, and IPD should be provided for public building construction stakeholders. Finally, the study contributed to the knowledge on IPD by highlighting the importance of stakeholder collaboration and other key success factors in the successful implementation of Integrated Project Delivery in public building projects in Anambra State.

Keywords—Construction Projects, Anambra State, Integrated Project Delivery, Stakeholder Collaboration, Public Buildings.

I. INTRODUCTION

The construction industry has been characterised as a highly fragmented sector, frequently suffering from adversarial relationships, poor project performance in terms of productivity, gross inefficiency, rework, frequent disputes, and limited innovation (Lee, 2013; Villanueva, 2018). As a result, too many construction projects experience cost, schedule overruns and clients' dissatisfaction with the quality of the end product. (Thomsen, Darrington, Dunne, and Lichtig, 2009). Construction projects in Nigeria have been delivered over the years using traditional methods, including design-bid-build (DBB) and design-build (DB). The increasing complexity of the construction market, which is becoming more competitive by the day, is driving a need for faster completion of construction projects (Kent and Becerik-Gerber, 2010). This also results in the creation of new delivery methods with quicker design and construction phases and optimal control of cost, improved product quality, and operational safety (Tsanyawa and Ali-Gombe 2021).

Given this, the Integrated Project Delivery (IPD) method was developed as a new construction approach to improve the current delivery methods and increase the project performance through a highly collaborative process (El Asmar, Hanna, and Loh, 2013; DeBernard, 2008). The American Institute of Architects (AIA) defines the method 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 project participants to optimise project results, increase value to the owner, reduce waste and maximise efficiency through all the project phases (AIA, 2007). The primary concept behind IPD is that the entire team is on board from day one of the

project. The owner, designer, construction, and other major participants (often including subcontractors with substantial scopes of work) all sign a single agreement under which participants share risk and reward (David, Ben, Edelmiro, and Christa, 2015).

IPD is considered by many scholars as an effective method to overcome the fragmentation in traditional construction methods (Jin, Gao, Cheshmehzangi, and Aboagge-Nimo, 2018). The traditional delivery method frequently lacks the collaboration and integration necessary for addressing the complexities of modern construction projects, thus causing the project to suffer from low quality, time and cost overruns, waste and delay, abandonment, and dissatisfaction (Viana, Hadikusumo, Mohammed and Kahvandi, 2020). Given the fragmented nature and high development speed of the construction industry, there is an increasing need for the direct introduction of IPD as a project delivery approach. The integrated project delivery (IPD) method has the potential to improve project efficiency and sustainability by integrating the design, construction, and operations of a project and collaborating and enhancing better communication among all stakeholders and the overall delivery of value to clients (Ebekozien, Aigbavboa, Ogbaini, and Aginah, 2022).

Nigeria is one of the countries that can effectively enhance the use of IPD, and Anambra State can apply this approach to the delivery of public building projects. The foregoing underscores the need to assess the key critical success factors for implementing IPD in public building projects in Anambra State, Nigeria. Based on the study purpose, this hypothesis was formulated:

Ho: There is no significant correlation between stakeholder collaboration and the success of integrated project delivery implementation concerning public building projects in Anambra State.

II. LITERATURE REVIEW

2.1. Integrated Project Delivery

The application of project implementation systems has advanced significantly in the construction industry in recent years. (Zahra, Ehsan, Ahad and Christopher 2019). The adoption of the IPD strategy has resulted in these advancements and has the potential to address several persistent issues. Several factors underline the need for implementing

Integrated Project Delivery (IPD) in the construction industry. These include the need to boost productivity, market demands, stakeholder demands, growing technological complexity and stability requirements for building (Sive, 2009; Autodesk 2008; Zahra *et al.* 2019).

According to Jackson (2011), he stated that the Integrated Project Delivery (IPD) system was designed to counter the limitations associated with low productivity in previous project delivery methods. IPD tends to contractually collaborate with all team members, and the integration of all is the main factor in this project delivery method. Definition by America Institute of Architects (AIA) California Council (2007) on Integrated Project Delivery, as a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harness the talents and insights of all participants to optimize project results, increase value to the owner; reduces waste and maximize efficiency through all phases of design, fabrication and construction. The goal of Integrated Project Delivery (IPD) is to accurately capture in a contract the collaborative relationships and efforts that result from a team working together to finish design and construction projects. IPD is also a method that attempts to spread the risks, responsibility and liability for project delivery equally among the primary parties-the owner, the designer and the builder, whether through partnership agreements or multiparty contracts (Construction Management Association of America, CMAA, 2012).

IPD is a project delivery approach that demands collaboration across multiple companies. According to Pishdad-Bozorgi (2017), teamwork is essential for effective IPD performance. The agreement includes a clause to share “risk of non-performance”, which promotes teamwork and collaborative project delivery. Kent and Becerik-Gerber (2010) emphasised that the following are the IPD catalysts:

- i. Multi-party agreements
- ii. Building Information Modelling
- iii. Lean Design and Construction
- iv. Performance-Based Metrics.

2.2. Critical Success Factors of Integrated Project Delivery

Lessing (2023) states that Integrated Project Delivery is a collaborative construction approach that aims to

maximise efficiency, teamwork, and shared responsibility among all project stakeholders and also promotes close collaboration and risk-sharing. Fischer, Ashcraft, Reed and Khanzode (2017) asserted that the IPD method requires specific principles for a proper application. Fish (2011) states that nine basic principles are needed to make IPD more effective. The nine IPD principles were adopted by the American Institute of Architects AIA (2007), including Mutual respect and trust; sharing of risks and rewards; Collaborative decision-making and innovation, early key participant involvement; Goal-setting; comprehensive planning; open lines of communication; Leadership and organization and multi-party agreement. Bertino (2023) states seven key features of IPD that differentiate it from other project delivery methods, which include: collaboration; Risk sharing; Integrated team; Early stakeholder involvement; Lean Design and construction; Technology and Continuous improvement.

Yee, Xiao, Peng and Xiangyu (2017), from numerous researchers and literature, identified four (4) categories that IPD principles are based on contractual/legal factors, behavioural factors, structural factors and technological factors. This re-categorisation aligns with Sive's (2009) assertion, as cited in Yee et al. (2017), that IPD involves three key components: true collaboration (Contractual and Technological), team integration (Behavioural), and a streamlined process (structural). The subsection below summarizes the IPD principles based on the findings of numerous researchers, including Mossman, Ballard and Pasquire (2011); Kenig, Allison, Black, Burdi, Colella, Davis and Williams (2010); Ballard, Dilsworth, Do, Low, Mobley, Phillips, Reed, Sargent, Tillman and Wood (2015), Yee et al (2017). These factors include a collaborative decision-making process, shared governance, which involves sharing risk and rewards, and early involvement of all key participants, which means bringing the right people together at the right time to deliver greater value. The application of these principles could potentially reduce the risk of project failure and deliver what the owner really needs. To

achieve this, suppliers and customers should collaborate, designers and contractors should define the scope of work, and at some point, the workers who will build the project will be engaged (Ballard et al., 2015; Yee et al., 2017).

III. METHODOLOGY

This research work adopted a descriptive research design approach. These approaches helped gather data and facts from professionals. The study population for the research is professionals in the Ministry of Housing in Anambra state (Architects, Builders, and Quantity Surveyors) and consultants and project managers of all the active construction companies registered under the Ministry and the government of Anambra state. The choice of this target population was made because they handled and supervised all the public building projects in the state, and they were validated to have the requisite knowledge on the subject matter under consideration. Table 3.1 presents statistics on the population. Random sampling techniques were used for the study, which allows generalising the findings from the entire population. Since the population for this study was not that large, an effort was made to administer the questions to the whole population on the sampling frame.

Anambra State (Figure 3.1) is a state in Nigeria located in the South-Eastern region of the country. The state was created on 27th August 1999. The state has land boundaries with Delta State to the west, Imo State and Rivers State to the South, Enugu State to the East, and Kogi State to the North. It has a land area of 4,887sq km with an estimated population of over 5 million in 2019. It has 21 local government areas (LGAs) consisting of 177 autonomous communities.

Anambra state has 4 major urban centres: Onitsha, Nnewi, Awka, and Ekwulobia. Anambra State is the eighth-most populated state in the Federal Republic of Nigeria and the second-most densely populated state in Nigeria after Lagos State (Ezeokoli Onyia and Bert-Okonkwo, 2019).

Table 3.1: Study Population

Targeted stakeholder	Population
Professionals in the Ministry of Housing	55
Active registered Contractors (valid up to date)	25
Consultants	12

Source: Ministry of Housing, Anambra State (2025)

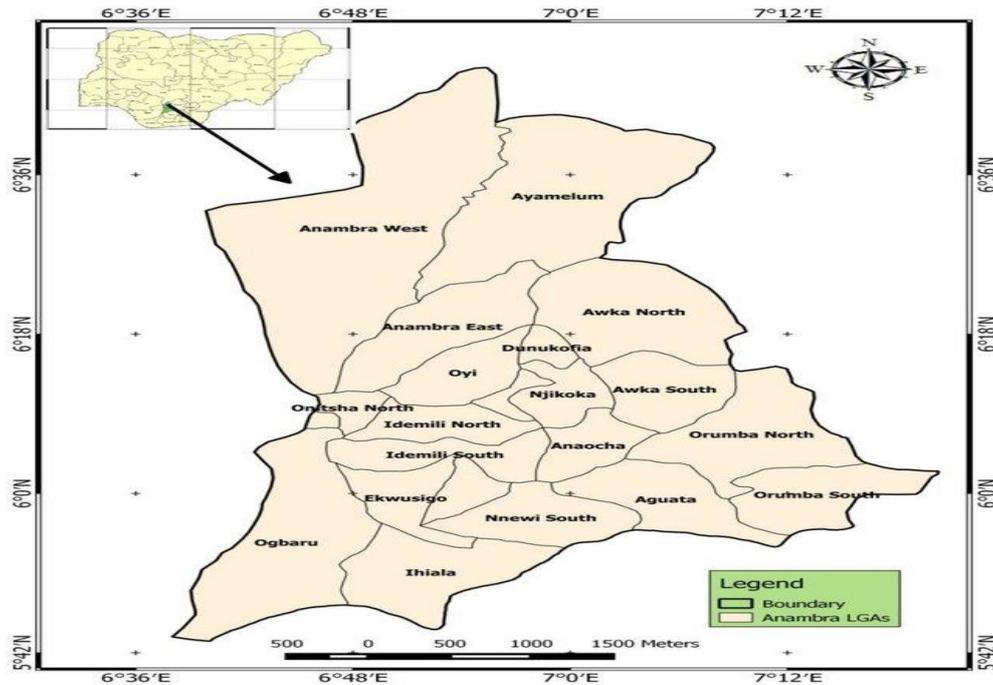


Figure 3.2: Map of Anambra State showing all the local government areas.

Source: Department of Environment Management, COOU (2021)

IV. RESULTS

A total of 92 questionnaires were distributed to the population. A total of 64 questionnaires were completed and returned, representing a response rate of approximately 70%. Okolie (2011) suggests that an acceptable response rate for organisational research is 30-94 per cent; the response rate of this

study falls within this acceptable range and is therefore adequate. The remaining questions were either incomplete or uncompleted. The ones not properly completed were discarded as unusable. Respondents gave no rationale for the incomplete questionnaires. Table 4.1 presents the population distribution of respondents and their corresponding percentage responses to the questions.

Table 4.1. Distribution of Questionnaire.

Respondent	Number of Questionnaires Administered	Number of Questionnaires Retrieved	Percentage Contribution to total response
Professionals in the Ministry of Housing	55	40	62.5
Registered active contractors	25	16	25
Registered Consultants	12	8	12.5
Total	92	64	100
Percentage	100%	70%	

Source: field survey (2025)

Table 4.1 shows that 70% of the questionnaires were retrieved, while 30% were uncompleted or incomplete. This is a very high representation and adequate, as it falls within the acceptable range.

Table 4.2. Critical Success Factors of Integrated Project Delivery

Drivers	5	4	3	2	1	Mean	RII	Ranking
Mutual respect and trust	44	16	0	4	0	4.56	0.9125	4 th
Sharing risk and reward in a no-blame culture	48	12	0	2	2	4.59	0.9188	3 rd
Collaboration Mindset	48	13	0	3	0	4.66	0.9313	2 nd
Early Stakeholder involvement	52	10	0	2	0	4.75	0.95	1 st
Co-location of Team	38	16	4	6	0	4.34	0.8688	6 th
Lean Design and Construction	29	17	4	11	3	3.91	0.7813	7 th
Fiscal Transparency between Key Participants	18	15	8	22	1	3.42	0.6844	11 th
Building Information Modelling	23	17	0	15	9	3.47	0.6938	10 th
Multi-Party agreement/Contract	40	D	0	4	2	4.41	0.8813	5 th
Liability waivers for key participation	22	10	10	10	12	3.31	0.6625	13 th
Open communication	17	19	7	15	6	3.40	0.6813	12 th
Early Goal Definition	18	19	5	22	0	3.51	0.7031	9 th
Creating a safe environment	18	27	5	12	2	3.73	0.7469	8 th

Source: field survey (2025)

Table 4.2 presents the analysis of respondents' ratings on the critical success factors (CSFs) of Integrated Project Delivery (IPD) in the context of public building projects in Anambra state. Using a five-point Likert scale, the study identifies the most highly rated drivers that contribute to the success of IPD implementation. Among the 13 critical factors assessed, early stakeholder involvement emerged as the most important driver with a mean score of 4.75 (0.95), indicating widespread agreement among respondents on its significance in driving successful IPD. The next most highly rated factors were collaboration mindset (Mean = 4.66, Rank = 2nd) and sharing risk and reward in a no-blame culture (Mean = 4.59, Rank = 3rd), both of which show the relational and trust-based ethos central to IPD.

Conversely, factors such as liability waivers for key participants (Mean = 3.31, Rank = 13th), open communication (Mean = 3.40, Rank = 12th), and fiscal transparency between key participants (Mean = 3.42, Rank = 11th) were ranked lowest among the respondents. This outcome may suggest a lack of familiarity or confidence in legal and financial integration mechanisms among stakeholders in Anambra State. Interestingly, Building Information Modelling (BIM) also ranked relatively low (Mean = 3.47, Rank = 10th), possibly reflecting the slow pace of digital adoption and training gaps in Anambra State.

Table 4.3. Distribution of responses on stakeholders' collaboration

Option	Frequency	Percentage
Yes	54	84%
No	10	16%
Total	64	100

Source: field survey (2025)

Table 4.3 presents stakeholders' views on their willingness to collaborate in the implementation of Integrated Project Delivery (IPD) in public building projects. Out of the 64 respondents surveyed, 54, representing 84%, indicated a positive response, affirming their readiness to work collaboratively with other project stakeholders. This strong majority suggests that there is a growing recognition among professionals of the benefits that come with collaboration, such as improved communication, shared goals, and better project outcomes. It also reflects a favourable disposition toward adopting procurement methods that promote integration and teamwork, which are essential elements in the success of IPD.

However, a smaller group (10) of respondents, making up 16%, expressed unwillingness to collaborate. This indicates that despite the general enthusiasm for stakeholder collaboration, there are still lingering concerns or reservations among a few

professionals. These concerns may be tied to issues like lack of trust, fear of unequal responsibilities, or limited awareness of the collaborative model. The presence of this minority highlights the need for more awareness and capacity-building efforts to bridge the knowledge gap and encourage broader stakeholder participation.

H₀: There is no significant correlation between stakeholder collaboration and the success of integrated project delivery implementation in Anambra State public building projects.

The study employed the point-biserial correlation analysis to determine if there is any significant correlation between stakeholder collaboration and the success of integrated project delivery implementation in Anambra State public building projects. The data for this analysis were obtained from Tables 4.2 and 4.3

Decision rule: Reject the null hypothesis if the p-value is less than 0.05 (i.e., $p < 0.05$). Otherwise, accept.

Table 4.4: Correlation output of hypothesis one

		Critical_success_factors_of_IPD	Stakeholders' collaboration
Critical_success_factors_of_IPD	Pearson Correlation	1	.757**
	Sig. (2-tailed)		.000
	N	64	64
Stakeholders' collaboration	Pearson Correlation	-.757**	1
	Sig. (2-tailed)	.000	
	N	64	64

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

The outcome of the point-biserial correlation analysis between stakeholders' collaboration (a dichotomous variable) and the critical success factors of Integrated Project Delivery (IPD) implementation (a continuous composite variable) reveals a statistically significant and strong positive relationship. Specifically, the correlation coefficient was found to be $r = 0.757$, with a p-value of 0.000 ($p < 0.01$), based on a total sample of 64 respondents. This result implies that higher levels of stakeholders' collaboration are associated with higher success of integrated project delivery implementation. These findings align with the assertions of Mathews and Howell (2005), who argued that early stakeholder alignment is essential for achieving mutual accountability and successful delivery under IPD. The findings revealed a statistically significant and strong positive correlation, confirming that effective stakeholder collaboration is central to the success of IPD. This

supports existing scholarship, which emphasises the collaborative ethos of IPD as critical to achieving improved project outcomes (Kent and Becerik-Gerber, 2010).

Decision: Since the p-value is less than 0.05, the null hypothesis is hereby rejected. This indicates that there is a significant correlation between stakeholder collaboration and the success of integrated project delivery in Anambra State public building projects.

The rejection of the null hypothesis aligns with qualitative insights gathered from the study, particularly from participants such as CB1, who noted that when stakeholders work together transparently and are mutually accountable, adversarial relationships diminish, and performance improves. These findings also mirror the assertions of Lahdenperä (2012), who highlighted that strong

stakeholder synergy fosters trust, minimises conflict, and improves delivery efficiency.

V. CONCLUSION

The study identified critical factors that will determine the success of IPD in the study area. Some of these factors, including shared risk and reward, collaboration mindset, early stakeholder involvement, establishing a culture of trust and respect, transparency, co-location of team and IPD enablers such as Lean construction and design, BIM, multi-party agreement, and target value design, are core principles that should be considered when implementing IPD.

The study recommends that regular workshops, seminars, and training programs on BIM, Lean practices, and IPD be offered to public sector stakeholders, including architects, builders, quantity surveyors, engineers, contractors, project managers, and consultants, to enhance their collaborative delivery skills. The Anambra state government and relevant agencies should review and improve their procurement policies to enable multiparty contracts that foster shared risk and reward, along with collaborative delivery methods crucial for IPD success. Stakeholders in public building projects should develop trust-building measures, promote collaborative decision-making, facilitate information sharing, and foster a culture of no blame that encourages transparency and joint problem-solving.

The study adds to the body of knowledge on IPD by highlighting the importance of stakeholder collaboration and other key success factors in the successful implementation of Integrated Project Delivery in public building projects in Anambra State. Based on the current study and the existing literature, future research should focus on developing the legal and contractual framework necessary to support IPD within the Anambra State Public Procurement Act.

REFERENCES

[1] American Institute of Architects (AIA) (2007). Integrated Project Delivery – A Working Definition. AIA California Council Sacramento, C.A

- [2] Autodesk, I. (2008). *Improving Building Industry results through integrated project delivery and building information modelling*.
- [3] Fischer, M., Ashcraft, H., Reed, D. and Khanzode, A. (2017). *Integrating Project Delivery*. John Wiley and Sons Inc., Hoboken, New Jersey.
- [4] Ashcraft, H. (2014). *Integrated Project Delivery: Optimising Project Performance*. Ownersperspective.org, 16-21
- [5] Allison, M., Ashcraft, H., Cheng, R., Khanzode, S., and Pease, J. (2017). *Integrated Project Delivery: An Action Guide for Leaders*, Integrated Project Delivery Alliance (IPDA), Centre for Innovation in the Design and Construction Industry (CIDCI).
- [6] Ballard, G., Dilsworth, B., Dob, Lew W., Mobley, J., Phillips, P., Reed, P., Sargent, Z., Tillnan, P., and Wood, N. (2015). *How to make shared Risk and Reward Sustainable*, Proceeding of the 23rd Annual Conference of the International Group for Lean Construction. Perth, Australia, 257-266.
- [7] Becerik-Gerber, B, DDes, and Kent D. C. (2010). *Implementation of Integrated Project Delivery and Building Information Modelling on a Small Commercial Project*. International Journal of Project Management (1-6).
- [8] Bertino, L. (2023). *Integrated Project Delivery (IPD): What, Why and Benefits*. HOYLU.
- [9] Construction Management Association of America (CMAA) (2012). *An Owner's Guide to Project Delivery Methods*.
- [10] David, B., Ben. B., Edelmiro, E. and Christa, L. (2015). *Comparison of Construction Manager at Risk and Integrated Project Delivery Performance on Healthcare Projects: A Comparative Case Study*.
- [11] DeBernard (2008). *Beyond Collaboration: The Benefits of Integrated Project Delivery*. Retrieve from <http://info.aia.org/on2023>.
- [12] Ezeokoli, F. O., Onyia, C. I., and Bert Okonkwo C.B.N (2019). *State of Readiness of Nigerian Construction Industry towards Digital Transformation*. The Construction Professionals Perception, Journal of Engineering Research and Report 4(2): 1-11
- [13] El Asmar, M., Hanna, A. S. y Loh, W. (2013). *Quantifying Performance for the Integrated Project Delivery System as Compared to Established Delivery Systems*. *Journal of*

- Construction Engineering and Management*, 139(11), 04013012.
- [14] Ebekozien, A, Aigbavboa, C., Aigbedion, M. S, Ogbaini, I. F. and Aginah, I. L (2022). *Integrated Project Delivery in the Nigerian Construction Sector: and unexplored approach from the Stakeholders' Perspective*. *Engineering Construction and Architectural Management*. Doi:10.1108/ECAM-09-2021-0823. *Journal of Construction. Education and Research*, 15(4) 291-314 <https://doi.org/10.1080/15578771.2018.1525446>
- [15] Fish, A. (2011). *Integrated Project Delivery – The obstacles of Implementation*. 60.
- [16] Jackson, B. J (2011). *Design-Build Essentials: Pelanar* (Engage Learning, New York, USA).
- [17] Jin, R., Gao, S., Cheshmehzangi, A. and Aboagge-Nimo, E. (2018). A holistic review of off-site construction literature published between 2008 and 2018, *J. Clean Prod.* 202, 1202-1219.
- [18] Kent, D.C., and Becerik-Gerber, B. (2010). *Understanding Construction Industry Experience and Attitudes towards Integrated Project Delivery*. *Journal of Construction Engineering and Management*. 136 (8), 815-825. <https://doi.org/10.1061/CO.1943-7862.0000188/> (ASCE)
- [19] Kenig, M., Allison, M., Black, B., Burdi, L., Colella, C., Davis, H., and Williams, M. (2010). *Integrated Project Delivery for public and private owners*. National Association of State Facilities Administration (NASPA), Construction Owners Association of America (COAA), The Association of Higher Education Facilities Officers (APPA), Associated General Contractors of America (AGC) and American Institute of Architects (AIA).
- [20] Lahdenpera, P. (2012). *Making Sense of the Multi-Party Contractual Arrangements of Project Partnering, Project Alliancing and Integrated Project Delivery*. *Construction Management and Economics*, 30(1)57-79. <https://doi.org/10.1080/01446193.2011.648947>
- [21] Lessing, D. (2023). *Advantages of Integrated Project Delivery (IPD) Contracting and How Three-Party Agreements Work*. White Paper BHP.
- [22] Lee, C. S. (2013). Implementation of Integrated Project Delivery on Department of the Navy Military Construction Projects. *UNLV Theses, Dissertations; Professional papers and cepstones* 1940 <http://dx.doi.org/10.34917/4798013>
- [23] Mossman, A., Ballard, G. and Pasquire, C. (2011). The growing case for Lean Construction. *Construction Research and Innovation*, 2(4) 30-34.
- [24] Matthews, O., and Howell, G. A. (2005). *Integrated Project Delivery: An Example of Relational Contracting*. *Lean Construction Journal*, 2 (1) 46-61
- [25] Okolie, K.C., (2011). Performance Evaluation of Buildings in Educational Institutions: A Case of Universities in South-East Nigeria. PhD Dissertation, Nelson Mandela Metropolitan University, Gqeberha.
- [26] Pishdad-Bozorgi, P. (2017). *Case Studies on the Role of Integrated Project Delivery (IPD) Approach on the Establishment and Promotion of Trust*. *International Journal of Construction Education and Research*, 13(2), 102-124.
- [27] Sive, T. (2009). *Integrated Project Delivery: "Relating and Promise, a strategist's guide to understanding and marketing IPD"* Society for Marketing Professional Services Foundation.
- [28] Thomson, C., Darrington, J., Dunne, D. and Lichtig, W. (2009). "Managing Integrated Project Delivery" Construction Management Association of America, McLean, V. A
- [29] Tsanyawa, N. I. and Ali-Gombe, B. (2021). Comparative Analysis on the Performance of Integrated Project Delivery and Design, Bid and Build System on Road Projects. *International Journal of Advances in Engineering and Management (IJAEM)*. 3(8). 1584-1590.
- [30] Viana, M. L., Hadikusumo, H.B.W., Mohammad, M. Z., and Kahvandi, Z (2020). Integrated Project Delivery (IPD): An Updated Review and Analysis Case Study, *Journal of Engineering Project and Production Management* 10(2), 147-161.
- [31] Villanueva, S. C. G. (2018). Conceptual Framework for Implementing Integrated Project Delivery for Infrastructure Projects in Peru. Open Access Theses. 1534 <https://docs.lib.purdue.edu/open-access-theses/1534>
- [32] Yee, T., Xiao, L., Peng, W., and Xiangyu (2017). Using Cooperative game theory to determine profit distribution in IPD projects.

International Journal of Construction
Management.

<https://doi.org/10.1080/15623599.2017.13580>

75

- [33] Zahra, K., Ehsan, S., Ahad, Z., and Christopher, P. (2019). *Integrated Project Delivery Implementation Challenges in the Construction Industry*. Civil Engineering Journal 5(8) www.civilejournal.org