Challenges and Barriers to the Implementation of Integrated Project Delivery IPD in Public Building Projects in Anambra State, Nigeria.

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Abstract

The Integrated Project Delivery (IPD) method was developed as a new construction approach to improve current delivery methods and increase project performance through a highly collaborative process. Despite the advantages of IPD over conventional methods, its implementation in Anambra State remains limited. Key challenges include a lack of understanding of IPD concepts among construction professionals, resistance to change from traditional processes, and insufficient regulatory support for collaborative contracting models. This study aimed to assess the challenges and barriers to implementing Integrated Project Delivery (IPD) in public building projects in Anambra State, Nigeria. To achieve this aim, the hypothesis was formulated that no significant barriers impede the implementation of IPD for public building project delivery in Anambra State. This study employed a quantitative research approach, collecting data through structured questionnaires administered to 92 registered professionals in the Ministry of Housing, Anambra State. Of these, 64 valid responses were received and analysed. The data were analysed using a descriptive method. The study categorises barriers as contractual (mean = 4.43), organisational (mean = 4.05), technological (mean = 3.39), managerial (mean = 3.35), and legal (mean = 3.09). Within each category, the top-ranking barriers are resistance to new contractual models, resistance to change, insufficient IT infrastructure, a fragmented decision-making process, and a lack of effective dispute-resolution mechanisms. The study recommends that the government strengthen its procurement policy to facilitate the implementation of collaborative delivery approaches, such as IPD.

Keywords: Integrated project delivery; Anambra State, construction professional; public building project; procurement.

1.0 Introduction.

The construction industry is a complex, dynamic, and challenging sector, and projects often fail to meet the owner's performance requirements (Lichtig, 2006). Mitropoulos and Taum (as cited in Villanueva, 2018) suggest that the degree of project integration and a lack of cooperation directly affect project performance outcomes. This is also cited in the Construction Users Roundtable (2014) report as the root cause of most cost and schedule overruns. There are different ways to deliver a construction project, and the elements of any construction project delivery include design, planning, construction, and financing. For the past two decades, public project owners have demanded that the design and construction industry enhance quality, reduce cost, and compress the delivery period for public projects, and as a result, both owners and the industry have experimented with various forms of project delivery methods (Gransberg and Shane, 2010). According to the Construction Management Association of America (CMAA, 2012), in their report, it was noted that every owner responsible for implementing a construction project must make an important decision regarding the method of project delivery by which the project would be designed.

Accordingly, Lichtig (2006), Hall and Scott (2016), Alves and Shah (2018), and Perlberg (2019) observe that project delivery methods such as design-build, design-bid-build, and construction management have been used in the construction industry for decades and remain the standard delivery methods, yet professionals remain dissatisfied with the outcomes. These delivery methods are considered inappropriate because they cannot keep pace with modern trends, thereby causing projects to suffer from low quality, time and cost overruns, and dissatisfaction (Hamzeh, Racheal, Hraoni, Karam, Maleb, Asmar, and Abbas, 2019; Viana, Hadikusumo, Mohammed, and Kahvandi, 2020) As a result, in recent years, effective delivery methods have been considered crucial for a project's overall success (Kent and Becerik-Gerber, 2010). Given this, the Integrated Project Delivery (IPD) method was developed as a new construction approach to improve current delivery methods and increase project performance through a highly collaborative process (DeBernard, 2008; El Asmar, Hanna, and Loh, 2013). 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 aims to change the behaviour of project participants and the means and methods they use, and to improve collaboration, communication, and alignment between stakeholders in a project (Villanueva, 2018). Integration in project delivery is even more necessary now because of the complexity of infrastructure projects.

Despite the advantages of IPD over conventional methods, its implementation in Anambra State remains limited. Key challenges include a lack of understanding of IPD concepts among construction professionals, resistance to change from traditional processes, and insufficient regulatory support for collaborative contracting models. Furthermore, the existing legal framework and procurement restrictions prioritise traditional procedures over innovative practices such as IPD. As a result, public building construction practice in Anambra State faces significant inefficiencies, leading to delays and cost overruns. The foregoing underscores the need to assess the challenges and barriers to implementing integrated project delivery (IPD) in public building projects in Anambra State, Nigeria. Based on the study purpose, this hypothesis was formulated:

H_0: *There are no significant barriers that impede the implementation of IPD for public building project delivery in Anambra State.*

2.0 Literature Review

2.1 Concept of IPD

The Associated General Contractors (AGC) of America (2024) defines IPD as a delivery method that fully integrates project teams to take advantage of the knowledge of all team members and maximise the project outcome. Integrated Project Delivery is the highest form of collaboration because all three parties (Owner, Architect, and Constructor) are aligned by a single contract. In addition, IPD as a philosophy is the application of integrated practices or philosophies to more conventional delivery methods like Design-Build, Design-Bid-Build, or CM at-Risk (when the owner is not a party to a multi-party contract). According to Thomsen, cited in Salau (2019), Integrated Project Delivery (IPD) is a response to the extensive collaboration required for projects that must be influenced by tiers of people in multiple organisations, with emphasis on Lean construction, Building Information Modelling (BIM), Project Management Information Systems (PMIS) and continuous improvement. Sive (2009) identifies recent advancements in project delivery, such as Building Information Modelling (BIM), virtual design and construction, and lean delivery, as stepping stones to the new paradigm of integrated project delivery (IPD). This paradigm promotes collaboration, team integration, streamlined processes, and overall improvement. According to Andre (2011), IPD is a new approach to construction delivery that involves a

collaborative team of the owner, architect, and contractor to design and execute a project with shared risks and rewards in terms of cost, schedule and overall quality.

Yee, Saar, Yusof, Chuing, and Cheng (2017) stated that the IPD approach is introduced to transform the project delivery and management, resulting in better project performances. However, it depends on whether the integration principles are applied within the current project delivery methodologies or with a new delivery system; both are thought to produce better modifications and higher investment returns. In IPD, trust is essential; its lack can obstruct cooperation and open communication. IPD implementation may put established corporate cultures to the test, requiring a major cultural change (Olabode, Mohammed and Ahmad, 2024).

2.2 Challenges of Implementing Integrated Project Delivery in the Construction Industry in Nigeria.

Zahra et al. (2019) have examined the challenges of implementing IPD, considering the diverse situations and regulations in various parts of the world related to the construction industry. Zahra et al. (2019) state that IPD implementation challenges were divided into four main categories: cultural, financial, technological, and legal issues. Zahra *et al.* (2019), in their research, presented three macro factors as the major issues implementing IPD, the factors include organizational factors, which include managerial, contractual, educational, communication and technological barriers; environmental factors, which include cultural, legal and political barriers; and capital factors, which deal with financial barriers. Ey, Zuo and Han (2014) added managerial factors/barriers as a major challenge facing the implementation of IPD in the construction industry.

The following constraints were identified by MCDonnelly (2016) in a qualitative research carried out in Ireland: government policy, existing contractual arrangements, culture, trust, education, client awareness, and the industry's conservation nature. In Australia, community mentality, government incentives and regulations, building and planning laws, unionisation and corporate politics, finance and supply chain management were the obstacles (Langston and Zheng, 2021). According to this study conducted in 2019, on the adoptability of Integrated Project delivery concepts in the Nigerian Construction Industry, the study, using a quantitative approach, was delimited to Kaduna, Kano and Abuja. It focused on Nigeria's construction industry stakeholders and further asserted that the lack of an enabling environment in the form of government policies and legislations, legal and contractual constraints, especially in public projects, are also major barriers to IPD adoption in Nigeria's Public Construction Sector. Bhonde, Zadeh, Staub-French and Goodland (2020) in their study explored the obstacles to IPD implementation in Canada from the owner's perspective and divided them into six groups: reluctance to change, Cultural misalignment, unclear IPD contract model, opposition to increased project management engagement, lack of trust and familiarity with the new process and, and structural misalignment at owner organisations.

3.0 Methodology

This study employs a quantitative research approach to examine the challenges and barriers of the implementation of IPD in Anambra State public building projects. A descriptive survey was utilised to gather quantitative data from the population. 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. Purposive 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.

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
Total	92

Source: Ministry of Housing, Anambra State (2025)

A total of 92 copies of the questionnaire were distributed both electronically and in person across the various target populations, with 64 valid responses received and analysed (70% response rate). The questionnaire, adapted from validated instruments, employed a five-point Likert scale to examine the challenges and barriers of the implementation of IPD in Anambra State public building projects.

4.0 Results

The results of the demographic profile of the respondents, out of 64 respondents, 36% of the respondents are architects, 22% are Quantity Surveyors, 19% builders, 19% are Civil Engineers, and the least majority of 4% respondents are from other fields. Most respondents (70%) had over 5 years of experience, indicating that the data reflects competent professionals in the construction sector of Anambra State.

Table 4.1: Barriers to implementing IPD in public building projects in Anambra State.

	SA	A	N	D	SD		Mean	SD	Rank	G. Mean	G. mean rank
Contractual barriers											
Lack of mutual trust and respect among key stakeholders	42	12	4	6	2	64	4.41	0.9638	4th	4.43	1st
Lack of appropriate policies that support IPD principles	48	10	4	2	0	64	4.63	0.7394	2nd		
Absence of a proper definition of the responsibilities of each party to the contract.	38	70	7	1	0	64	4.45	0.7490	3rd		
Resistance to new contractual models.	52	8	4	0	0	64	4.75	0.5590	1st		
Complexity of multiparty agreements	31	10	9	18	1	64	3.89	1.251	5th		
Organisation and Cultural Barriers											
Lack of familiarity with IPD processes	38	12	10	4	0	64	4.31	0.9499	4th	4.05	2nd
Resistance to change.	52	8	4	0	0	64	4.75	0.5590	1st		

Inadequate communication channels	31	10	9	13	1	64	3.89	1.251	5th		
Fear of financial transparency	11	15	10	24	4	64	3.08	1.241	7th		
Corruption	15	10	18	12	9	64	3.16	1.3488	6th		
Absence of collaboration and teamwork	48	10	4	2	0	64	4.63	0.7394	2nd		
Lack of awareness and willingness about IPD among owners.	44	13	5	2	0	64	4.55	0.7730	3rd		
Managerial Barriers											
Insufficient training and expertise.	31	10	8	12	3	64	3.84	1.325	2nd		4th
Inadequate leadership support	15	12	10	20	7	64	3.13	1.364	3rd	3.35	
Lack of a proper definition of teamwork culture among the project key stakeholders	9	10	8	21	16	64	2.61	1.377	5th		
Poor information sharing among different phases of the project	11	13	8	26	6	64	2.95	1.292	4th		
Fragmented decision-making process	38	12	8	3	3	64	4.23	1.128	1st		
Technological Barriers											
Lack of familiarity with technology.	21	10	18	12	3	64	3.53	1.250	2nd	3.39	3rd
Absence of BIM as an appropriate tool to implement the IPD approach	13	13	13	18	7	64	3.11	1.311	3rd		
Insufficient IT infrastructure.	31	10	8	12	3	64	3.84	1.325	1st		
Lack of integrated collaboration among key stakeholders because of insufficient technology.	11	15	10	24	4	64	3.08	1.241	4th		
Financial Barriers											
Inadequate fair distribution of gains and losses among stakeholders.	18	7	10	12	17	64	2.95	1.576	4th	3.08	6th
Lack of financial incentive schemes/structures	15	12	10	20	7	64	3.13	1.364	2nd		

Poor compensation system	15	10	18	12	9	64	3.16	1.349	1st		
Risk-reward sharing mechanism among key stakeholders	10	15	18	12	9	64	3.08	1.266	3rd		
Legal Barriers											
Regulatory constraints	18	12	8	16	10	64	3.19	1.468	2nd		5th
Lack of effective dispute resolution mechanisms	19	18	2	19	6	64	3.39	1.409	1st	3.09	
Insufficient support from the current legal system	8	18	8	25	5	64	2.98	1.217	3rd		
Insurance and liability issues	5	12	18	22	7	64	2.78	1.111	4th		

Source: field survey (2025)

Table 4.1 presents a detailed analysis of the perceived barriers affecting the implementation of Integrated Project Delivery (IPD) in public building projects across six broad thematic categories: contractual, organisational and cultural, managerial, technological, financial, and legal. Contractual barriers recorded the highest group mean of 4.43, indicating they are perceived as the most significant hindrance to IPD adoption. Within this group, resistance to new contractual models ranked first with a mean score of 4.75, suggesting that stakeholders are hesitant to shift from traditional procurement systems to IPD's collaborative structures. This is closely followed by the absence of appropriate policies (mean = 4.63), undefined party responsibilities (mean = 4.45), and lack of trust among stakeholders (mean = 4.41), all of which underscore the critical role of governance and trust-building in enabling IPD. The complexity of multiparty agreements was the least rated within this category, but still had a moderately high score (mean = 3.89), reflecting the perceived challenge of managing multiple interconnected roles in a single contractual framework.

The second most prominent barrier group is organisational and cultural (group mean = 4.05). Within this group, resistance to change again topped the list with a mean of 4.75, matching the highest across all variables in the entire table. This reflects a strong institutional inertia in the public construction sector, where entrenched practices are difficult to modify. Lack of collaboration (mean = 4.63) and inadequate awareness among owners (mean = 4.55) also scored highly, showing that cultural alignment and education are key to IPD success. On the other hand, corruption (mean = 3.16) and fear of financial transparency (mean = 3.08) were ranked lower, though they remain significant. Managerial, technological, legal, and financial barriers followed with group means of 3.35, 3.39, 3.09, and 3.08, respectively.

Within managerial barriers, fragmented decision-making was the most severe (mean = 4.23), while lack of teamwork culture ranked lowest (mean = 2.61), indicating potential deficiencies in shared leadership. In terms of technology, insufficient IT infrastructure was the biggest concern (mean = 3.84), while the absence of BIM was perceived as less impactful (mean = 3.11). Financial barriers were mostly rated lower, with poor compensation systems topping the group (mean = 3.16), suggesting that monetary factors, while relevant, may not be the most critical challenge. Legal barriers such as a lack of dispute resolution mechanisms (mean = 3.39) and regulatory constraints (mean = 3.19) further highlight structural challenges in the policy environment. Altogether, the data suggest that successful implementation of IPD in Anambra State will require addressing a complex mix of technical, contractual, cultural, and institutional barriers, with particular attention to shifting stakeholder mindsets and reforming procurement and legal frameworks.

4.1 Exploratory factor analysis (EFA) of barriers to implementing IPD in public building projects in Anambra State.

The study employed factor analysis to empirically reduce the observed barriers to the most latent and underlying components affecting the implementation of Integrated Project Delivery (IPD) in public building projects within the study area. A total of 29 variables representing various contractual, organisational, managerial, technological, financial, and legal barriers were subjected to Principal Component Analysis (PCA) using the Varimax rotation method in SPSS. The aim was to determine the key latent dimensions that significantly influence the failure or success of IPD integration in the Nigerian public construction sector.

Table 4.2: KMO and Bartlett's test results for sampling adequacy

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.724
Bartlett's Test of Sphericity	Approx. Chi-Square	1608.226
	Df	36
	Sig.	.000

The results of the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test, as presented in Table 4.2, confirmed the appropriateness of the dataset for factor analysis. The KMO value exceeded the minimum threshold of 0.6, and Bartlett's Test of Sphericity was significant ($p < 0.001$), confirming that correlations among the variables were sufficiently large for PCA.

Table 4.3: Communalities of Variables

	Initial	Extraction
Lack of Mutual Trust & Respect	1.000	.937
Inadequate IPD Policies	1.000	.942
Undefined Party Responsibilities	1.000	.772
Resistance to New Contracts	1.000	.908
Multiparty Agreement Complexity	1.000	.909
Lack of Familiarity with IPD	1.000	.946
Resistance to Change	1.000	.908
Inadequate Communication	1.000	.920
Fear of Financial Transparency	1.000	.956
Corruption	1.000	.945
Absence of Collaboration & Teamwork	1.000	.942
Lack of Awareness of IPD (Owners)	1.000	.922
Insufficient Training & Expertise	1.000	.937
Inadequate Leadership Support	1.000	.971
Lack of Teamwork Culture Definition	1.000	.918
Poor Info Sharing Across Phases	1.000	.937
Fragmented Decision-Making	1.000	.969
Lack of Familiarity with Technology	1.000	.936
Absence of BIM Tool	1.000	.965

Insufficient IT Infrastructure	1.000	.937
Lack of Integrated Collaboration (Due to Insufficient Tech)	1.000	.956
Inadequate Fair Distribution of Gains and Losses	1.000	.961
Lack of Financial Incentive Scheme/Structures	1.000	.971
Poor Compensation System	1.000	.945
Risk-Reward Sharing Mechanism Among Key Stakeholders	1.000	.937
Regulatory Constraints	1.000	.962
Lack of Effective Dispute Resolution Mechanisms	1.000	.938
Insufficient Support from the Current Legal System	1.000	.936
Insurance and Liability Issues	1.000	.902

Extraction Method: Principal Component Analysis.

Table 4.3 presents the communalities of 29 variables used to examine the barriers to implementing Integrated Project Delivery (IPD) in public building projects. Communality represents the proportion of each variable's variance that can be explained by the extracted components. High communalities (generally values above 0.5) suggest that the variables are well-represented by the factor solution. As shown in the table, all variables had communalities above 0.7, with the lowest being 0.772 and the highest at 0.971. This indicates that a substantial portion of each variable's variance was captured by the extracted components, confirming the suitability of the dataset for Principal Component Analysis (PCA). Notably, variables such as inadequate leadership support, lack of financial incentive schemes, regulatory constraints, absence of BIM, and risk-reward sharing mechanisms all recorded very high communalities (≥0.96), suggesting these variables are particularly strong contributors to the underlying structure of IPD implementation barriers.

Table 4.4: Total Variance Explained by Extracted Factors

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.425	84.223	84.223	24.425	84.223	84.223	16.611	57.278	57.278
2	2.660	9.173	93.396	2.660	9.173	93.396	10.474	36.118	93.396
3	.649	2.236	95.632						
4	.253	.872	96.505						
5	.228	.787	97.292						
6	.190	.656	97.948						
7	.116	.400	98.348						
8	.088	.303	98.651						
9	.072	.249	98.901						
10	.057	.197	99.097						

11	.046	.158	99.255
12	.036	.122	99.378
13	.034	.116	99.493
14	.030	.104	99.597
15	.024	.084	99.681
16	.023	.078	99.759
17	.019	.067	99.825
18	.017	.060	99.885
19	.011	.040	99.925
20	.008	.027	99.951
21	.008	.026	99.978
22	.004	.014	99.992
23	.002	.008	100.000
24	2.305E-16	7.949E-16	100.000
25	2.229E-16	7.686E-16	100.000
26	-7.507E-20	-2.589E-19	100.000
27	-1.862E-17	-6.419E-17	100.000
28	-2.323E-16	-8.010E-16	100.000
29	-2.366E-16	-8.160E-16	100.000

Extraction Method: Principal Component Analysis.

Table 4.4 provides details on the total variance explained by the extracted factors. The PCA output reveals that two principal components were retained based on the Eigenvalue >1 rule. These two components together explain a cumulative variance of 93.40%, which is exceptionally high and implies that the extracted components capture the majority of the information contained in the original variables. The first component alone accounts for 84.22% of the total variance, while the second contributes an additional 9.17%. After rotation, the variance is more evenly distributed, with the first rotated component explaining 57.28% and the second 36.12%, suggesting a clearer separation of thematic groupings among the variables. The sharp drop in Eigenvalues after the second factor (the third component accounting for only 2.24%) further supports the appropriateness of the two-factor solution. This dimensional reduction simplifies the complex set of 29 variables into two major factors, which could represent underlying themes such as institutional-contractual challenges and technological-organisational constraints. This outcome enhances interpretability and provides a practical foundation for further analysis and framework development.

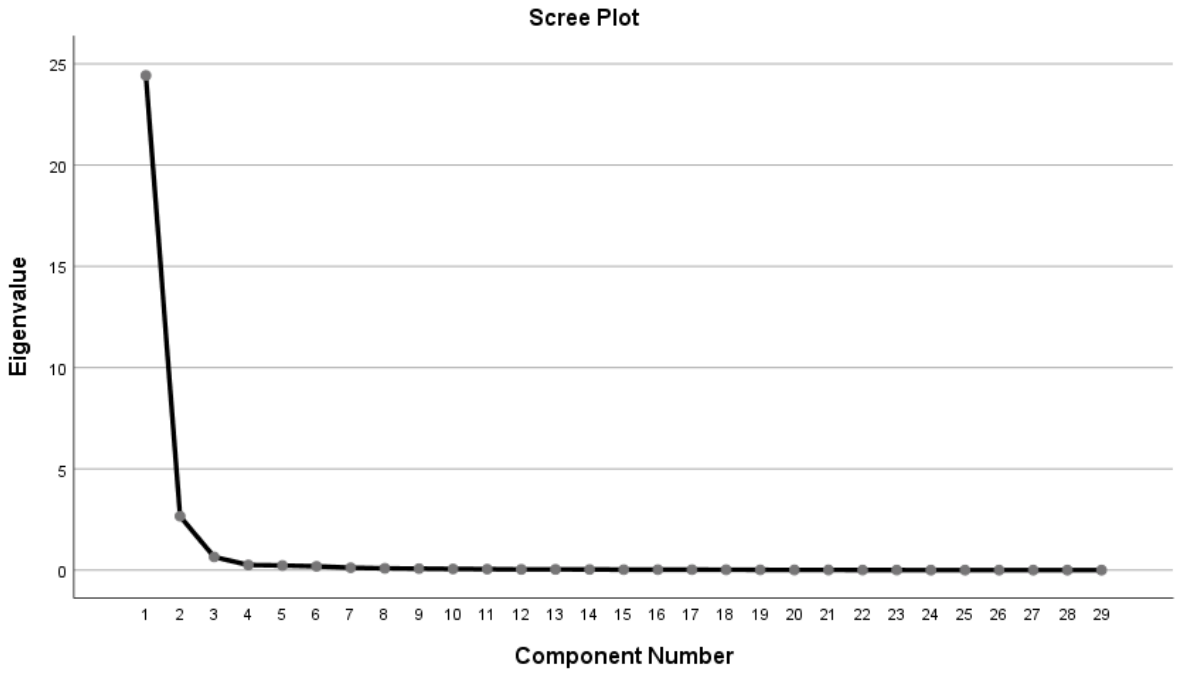

Figure 4.1: Scree Plot Showing Number of Significant Barrier Components to IPD Implementation

The Scree Plot in Figure 4.1 revealed a sharp inflexion point at the second component, indicating that two components should be retained for interpretation. These two components cumulatively explained 93.4% of the total variance, signifying that the latent factors captured the underlying structure of the dataset effectively.

a. Factor 1: Structural, Legal, and Financial Incompatibility

The first latent factor accounted for 84.22% of the total variance and represents deep-rooted structural and systemic deficiencies in the construction environment. This component was characterised by high loadings on variables related to the absence of enabling legal frameworks, inadequate financial structures, weak technological foundations, and poor leadership. Specifically, the strongest loadings under this factor included:

i. Lack of integrated collaboration due to insufficient technology (loading = .921)
ii. Poor information sharing across project phases (.919)
iii. Inadequate leadership support (.910)
iv. Lack of teamwork culture definition (.915)
v. Absence of financial incentive structures (.910)
vi. Inadequate fair distribution of gains and losses (.915)
vii. Insurance and liability issues (.875)
viii. Insufficient support from the current legal system (.908)

These findings highlight the fact that the implementation of IPD is severely constrained by institutional and operational weaknesses that transcend individual project teams.

b. Factor 2: Cultural, Policy, and Collaborative Deficits

The second component accounted for an additional 9.17% of the variance and revealed the underlying behavioural and cultural resistance that affects IPD implementation. Key barriers with strong loadings on this factor included:

i. Resistance to change (.916)
ii. Resistance to new contractual models (.916)
iii. Absence of collaboration and teamwork (.913)
iv. Inadequate IPD-supportive policies (.913)
v. Lack of awareness of IPD among project owners (.857)

vi. Fragmented decision-making processes (.835)
vii. Lack of mutual trust and respect among key stakeholders (.849)

This factor is reflective of deep-seated cultural norms and institutional inertia prevalent in the Nigerian construction industry. The lack of stakeholder alignment, mistrust among parties, and reluctance to deviate from traditional procurement methods were all found to significantly obstruct the successful adoption of IPD.

Table 4.5: Component Matrix of Barriers to IPD Implementation

	Component	
	1	2
Lack of Mutual Trust & Respect	.881	.402
Inadequate IPD Policies	.811	.533
Undefined Party Responsibilities	.875	
Resistance to New Contracts	.758	.577
Multiparty Agreement Complexity	.953	
Lack of Familiarity with IPD	.931	
Resistance to Change	.758	.577
Inadequate Communication	.957	
Fear of Financial Transparency	.934	
Corruption	.960	
Absence of Collaboration & Teamwork	.811	.533
Lack of Awareness of IPD (Owners)	.860	.426
Insufficient Training & Expertise	.963	
Inadequate Leadership Support	.955	
Lack of Teamwork Culture Definition	.903	
Poor Info Sharing Across Phases	.917	
Fragmented Decision-Making	.918	
Lack of Familiarity with Technology	.963	
Absence of BIM Tool	.959	
Insufficient IT Infrastructure	.963	
Lack of Integrated Collaboration (Due to Insufficient Tech)	.934	
Inadequate Fair Distribution of Gains and Losses	.943	
Lack of Financial Incentive Scheme/Structures	.955	
Poor Compensation System	.960	
Risk-Reward Sharing Mechanism Among Key Stakeholders	.960	
Regulatory Constraints	.964	
Lack of Effective Dispute Resolution Mechanisms	.962	
Insufficient Support from the Current Legal System	.927	
Insurance and Liability Issues	.922	

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Table 4.5, which displays the unrotated component matrix, illustrates the degree to which each barrier is loaded onto the two extracted components. Here, most variables have high loadings (above 0.9) on Component 1, such as inadequate leadership support (.955), lack of financial incentive schemes (.955), insufficient IT infrastructure (.963), and corruption (.960), implying a dominant underlying factor influencing the majority of the observed barriers. A few variables like lack of mutual trust and respect (.881 on Component 1 and .402 on Component 2) and resistance to new contracts (.758 and .577, respectively) show cross-loading, suggesting both components influence them. However, Component 1 generally accounts for broader structural and institutional challenges, while Component 2 captures softer, behavioural or relational constraints.

Table 4.6: Rotated Component Matrix of Barriers to IPD Implementation

	Component	
	1	2
Lack of Mutual Trust & Respect	.464	.849
Inadequate IPD Policies		.913
Undefined Party Responsibilities	.751	.456
Resistance to New Contracts		.916
Multiparty Agreement Complexity	.741	.599
Lack of Familiarity with IPD	.577	.783
Resistance to Change		.916
Inadequate Communication	.726	.626
Fear of Financial Transparency	.921	
Corruption	.860	.454
Absence of Collaboration & Teamwork		.913
Lack of Awareness of IPD (Owners)	.433	.857
Insufficient Training & Expertise	.708	.660
Inadequate Leadership Support	.910	
Lack of Teamwork Culture Definition	.915	
Poor Info Sharing Across Phases	.919	
Fragmented Decision-Making	.521	.835
Lack of Familiarity with Technology	.827	.502
Absence of BIM Tool	.895	.405
Insufficient IT Infrastructure	.708	.660
Lack of Integrated Collaboration (Due to Insufficient Tech)	.921	
Inadequate Fair Distribution of Gains and Losses	.915	
Lack of Financial Incentive Scheme/Structures	.910	
Poor Compensation System	.860	.454
Risk-Reward Sharing Mechanism Among Key Stakeholders	.843	.477
Regulatory Constraints	.879	.434
Lack of Effective Dispute Resolution Mechanisms	.837	.488
Insufficient Support from the Current Legal System	.908	
Insurance and Liability Issues	.875	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
a. Rotation converged in 3 iterations.

After varimax rotation, shown in Table 4.6, the factor structure becomes more interpretable as the rotated component matrix clarifies which barriers distinctly belong to which component. Component 1 is characterised by variables such as fear of financial transparency (.921), corruption (.860), lack of dispute resolution mechanisms (.837), insurance and liability issues (.875), and absence of BIM tools (.895), all of which point to institutional, technological, legal, and financial barriers. On the other hand, Component 2 includes barriers like resistance to change (.916), inadequate IPD policies (.913), absence of collaboration and teamwork (.913), and lack of trust and respect (.849), which are more reflective of organisational, behavioural, and cultural barriers. This clearer separation confirms that IPD implementation barriers can be broadly categorised under two latent dimensions: (1) structural-systemic/infrastructural challenges and (2) organisational-cultural readiness issues.

Table 4.7: Grouping of Barriers under Extracted Factors

Component	1	2
1	.801	.599
2	-.599	.801

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.

Table 4.7 further validates this grouping by confirming the correlation pattern between the two components. The first extracted component has a strong loading of .801 on its own dimension and a lower cross-loading of .599 on the second, while the second component reverses this relationship. This reinforces the orthogonal nature of the two components and shows that while the barriers are interrelated, they group distinctly into two main categories. Overall, the PCA results provide a strong empirical basis for developing a two-pronged intervention strategy: one focused on institutional, policy, and technical enablers, and the other aimed at improving stakeholder mindset, communication, and collaborative culture.

H_0: *There are no significant barriers that impede the implementation of IPD for public building project delivery in Anambra State.*

The study employed One-Sample t-Test to determine if there are no significant barriers that impede the implementation of IPD for public building project delivery in the study area. The data for this analysis were obtained from Table 4.1

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

Table 4.8: One-sample statistics summary of hypothesis two

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Contractual_barriers	15.794	63	.000	1.456	1.27	1.64
Organization_and_CulturalBarriers	15.794	63	.000	1.456	1.27	1.64
Managerial_Barriers	2.301	63	.025	.353	.05	.66
Technological_Barriers	2.501	63	.015	.391	.08	.70

Financial_Barriers	.455	63	.651	.078	-.27	.42
Legal_Barriers	.539	63	.592	.086	-.23	.40

The results in Table 4.8 reveal that among the six categories of barriers examined, contractual and organizational/cultural barriers were the most significant, both recording a very high t-value of 15.794 and a p-value of 0.000, with a mean difference of 1.456 and narrow confidence intervals (1.27–1.64), indicating strong agreement among respondents that these are major challenges to Integrated Project Delivery (IPD) implementation. Managerial and technological barriers also showed statistical significance, with p-values of 0.025 and 0.015, respectively, and positive mean differences (0.353 and 0.391), suggesting a moderate but relevant influence. However, financial and legal barriers were not statistically significant, as their p-values (0.651 and 0.592) were well above 0.05 and their confidence intervals included zero, implying that respondents did not perceive these as serious impediments to IPD in the study area.

Table 4.9: One-sample Test results of hypothesis two

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Contractual_barriers	15.794	63	.000	1.456	1.27	1.64
Organization_and_Cultural_Barriers	15.794	63	.000	1.456	1.27	1.64
Managerial_Barriers	2.301	63	.025	.353	.05	.66
Technological_Barriers	2.501	63	.015	.391	.08	.70
Financial_Barriers	.455	63	.651	.078	-.27	.42
Legal_Barriers	.539	63	.592	.086	-.23	.40

Table 4.9 presents the one-sample test results for hypothesis two, assessing the significance of various barriers to Integrated Project Delivery (IPD) using a test value of 3. The results show that contractual barriers and organisational/cultural barriers were the most statistically significant, both with a high t-value of 15.794 and p-value of 0.000, and a mean difference of 1.456, indicating a strong deviation from the test value and widespread agreement that these are major obstacles. Managerial barriers ($t = 2.301$, $p = 0.025$) and technological barriers ($t = 2.501$, $p = 0.015$) also showed statistically significant results, albeit with smaller mean differences of 0.353 and 0.391, respectively, suggesting moderate levels of concern. However, financial ($p = 0.651$) and legal barriers ($p = 0.592$) were not statistically significant, with very low t-values and confidence intervals that included zero, indicating that these were not seen as major barriers by the respondents in the study area.

Decision: *since 4 of the 6 observed barrier groups have p-values greater than 0.05, the null hypothesis is hereby rejected. This implies that there are significant barriers that impede the implementation of IPD for public building project delivery in the study area.*

The study revealed that contractual and cultural barriers are the most prominent impediments to the successful implementation of IPD in public building projects in Anambra State. The resistance to new forms of contractual arrangements and the absence of enabling policies point to a prevailing adherence to traditional procurement models. This supports previous research by Ling, Teo, Ma and Li (2022), who emphasised that in environments where traditional design–bid–build methods are institutionalised, the transition to IPD faces systemic opposition.

Similarly, the lack of trust among stakeholders aligns with the work of Ibem *et al.* (2011), who observed that trust deficits significantly undermine collaborative procurement strategies in the Nigerian construction industry. However, while Ghassemi and Becerik-Gerber (2011) emphasised policy and awareness issues in emerging economies, others, such as Mollaoglu-Korkmaz, Swarup, and Riley (2013), argue that IPD success is possible even in less mature systems, provided strong leadership and training are in place, suggesting some disagreement on the rigidity of context-specific challenges. The study also showed that organisational and behavioural issues, particularly resistance to change and inadequate awareness, represent major barriers to IPD adoption. Respondents confirmed that there is limited understanding of the collaborative nature of IPD, with many assuming it gives excessive control to contractors. This observation is consistent with the findings of Alufohai and Ibem (2020), who noted that a lack of knowledge about innovative procurement frameworks limits their application in public construction projects in Nigeria.

Lastly, the study identified managerial, legal, technological, and financial constraints as secondary barriers, but still relevant to IPD implementation. Fragmented decision-making, insufficient IT infrastructure, and outdated procurement laws were all seen as hindrances.

5.0 Conclusion

The successful implementation of IPD in Anambra State will require addressing a complex mix of technical, contractual, cultural, and institutional barriers, with particular attention to shifting stakeholder mindsets and reforming the procurement and legal frameworks. The study found that certain factors hampered the implementation of IPD. Organisational, contractual, technological, managerial, legal, and financial barriers are categories of challenges that hinder the effective adoption of IPD.

The study recommends that the government strengthen its procurement policy to facilitate the implementation of collaborative delivery approaches, such as IPD. The use of BIM as the main platform for project collaboration, transparency, and real-time coordination among stakeholders should be mandatory for public building projects. The study suggests that firms and professionals equip themselves with the necessary technical tools and knowledge, including available software, to stay competitive and keep up with industry trends. Establish project performance monitoring systems with KPIs aligned to IPD core principles. IPD-based projects should be institutionalised for ongoing improvement based on lessons learned.

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