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STRATEGIC IT INTEGRATION FOR IMPROVED PROJECT DELIVERY IN NIGERIA'S CONSTRUCTION INDUSTRY

By E.B. Ogunbode, M.D. Walbe, I.S. Mohoro, B. Adamu and K.I. Adenuga

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ABSTRACT

The integration of Information Technology (IT) into construction project delivery systems is widely recognized as a key driver of improved performance. However, in many emerging markets, such integration remains limited and inconsistent. This study explores how IT tools—such as Building Information Modeling (BIM), scheduling software, mobile applications, and cloud systems—are being used in Nigeria's construction industry. Guided by the Technology-Organization-Environment (TOE) framework and Strategic Alignment Theory, a survey of 287 professionals was analyzed using factor analysis and regression techniques. Three distinct IT integration approaches were identified: Operational, Tactical, and Transformative—each representing a different level of digital maturity. Firms classified under the Transformative group achieved significantly better results in technical performance ($F(2, 284) = 5.62$, $p < 0.01$), team collaboration ($F(2, 284) = 4.14$, $p < 0.05$), and quality outcomes ($F(2, 284) = 4.09$, $p < 0.05$), though no notable differences were found in cost or time performance. Strategic alignment between IT use and project goals was the strongest predictor of success ($\beta = 0.42$, $p < 0.001$), followed by the ability to integrate tools across functions ($\beta = 0.28$, $p < 0.01$). Despite moderate levels of IT adoption, integration often lacks coordination, policy support, and institutional guidance. To address this, a Staged Integration Framework is proposed to help construction firms transition toward more strategic and impactful use of digital technologies. This study offers practical recommendations for policymakers, industry professionals, and clients aiming to improve construction outcomes through digital transformation, contributing valuable insights for similar emerging economies.

KEY WORDS BIM, Digital transformation, Emerging markets, Nigeria, Project delivery, Strategic IT integration.

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1. INTRODUCTION

As digital technologies continue to reshape industries globally, the construction sector is undergoing a significant transformation. Tools such as Building Information Modeling (BIM), cloud-based platforms, mobile project management apps, and advanced scheduling software are redefining how projects are designed, executed, and managed (Volk et al., 2014). In advanced economies, the strategic integration of these tools has yielded measurable gains in efficiency, collaboration, and informed decision-making, supported by strong regulatory frameworks and industry-wide digital mandates (Succar & Kassem, 2015; Khosrowshahi & Arayici, 2012). However, this progress is not mirrored evenly across regions. In emerging markets like Nigeria, the adoption and integration of IT tools in construction remain inconsistent and largely driven by individual initiatives or client demands rather than coordinated industry strategies or policy support (Aghimien et al., 2021). As a result, the potential benefits—such as improved coordination, quality control, and lifecycle cost savings—are often underrealized. Although awareness of IT's advantages is growing, its use tends to be fragmented and ad hoc, reflecting a lack of structured digital frameworks.

Nigeria's construction industry presents a particularly important case due to its size, rapid growth, and persistent challenges such as cost overruns, delays, and coordination gaps (Olugboyega et al., 2020). While digital technologies hold promises for addressing these issues, empirical research on their strategic integration—beyond mere adoption—remains limited. Much of the existing literature in developing countries focuses on barriers to adoption (Abubakar et al., 2014; Aibinu & Papadakis, 2006) or the application of specific tools like BIM or mobile apps, without exploring their broader, strategic alignment with project performance and organizational goals. By contrast, studies in more developed contexts have emphasized structured frameworks and maturity models to guide IT deployment. For example, Succar and Kassem (2015) proposed the BIM Framework to evaluate readiness and implementation strategies, while Marzouk et al. (2022) explored BIM's role in driving digital transformation through integrated workflows. These models underscore the importance of institutional enablers and strategic alignment, though they often require adaptation for emerging markets, where resource, policy, and organizational constraints are more pronounced.

This study aims to address these gaps by investigating how IT tools are strategically integrated into Nigeria's construction project delivery systems. It explores the extent to which this integration aligns with project performance metrics and organizational goals, drawing on data from industry professionals and guided by the Technology-Organization-Environment (TOE) framework and Strategic Alignment Theory. The study contributes in three key ways: it shifts focus from simple adoption to the purpose and depth of IT use; it identifies distinct integration typologies (Operational, Tactical, and Transformative); and it introduces a Staged Integration Framework designed for construction firms in emerging markets.

To guide the investigation, the study addresses the following questions:

- How are IT tools currently integrated into project delivery systems in Nigeria's construction industry?
- What strategic patterns or typologies of IT integration can be identified across firms?
- What is the relationship between the level of IT integration and project performance outcomes?

By answering these questions, this research offers evidence-based insights into current practices and proposes a strategic roadmap for digital transformation. It aligns with broader goals such as the African Union's Agenda 2063 and Nigeria's National Digital Economy Policy, both of which emphasize the critical role of digital infrastructure in economic development. The study provides a context-sensitive theoretical and practical contribution, with implications for policy, industry, and research communities working to modernize construction delivery systems in Nigeria and similar emerging economies.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Theoretical Framework

The strategic integration of Information Technology (IT) in construction project delivery is grounded in established models that explain how organizations adopt and benefit from digital innovation. This study adopts two key theoretical lenses: the Technology-Organization-Environment (TOE) framework and Strategic Alignment Theory. The TOE framework, introduced by Tornatzky and Fleischer (1990), provides a structured approach to understanding technology adoption, highlighting three interrelated contexts:

- Technological context: Availability, maturity, and compatibility of digital tools.
- Organizational context: Internal capabilities, leadership support, and absorptive capacity.
- Environmental context: External pressures such as regulations, competition, and socio-political dynamics.

This framework is particularly relevant in emerging markets like Nigeria, where institutional readiness and infrastructure can vary widely (Pan & Jang, 2008). Complementing this is Strategic Alignment Theory, which emphasizes that IT delivers value when aligned with an organization's goals and operations (Henderson & Venkatraman, 1993). In construction, this means using IT not just for operational convenience but for achieving strategic objectives such as better cost control, higher quality, and improved stakeholder collaboration (Marnewick & Labuschagne, 2011). These theories enable a deeper understanding of both the drivers and barriers to IT integration. They also form the foundation for this study's conceptual model and the proposed Staged Integration Framework presented in later sections.

2.2. Literature Review

The integration of IT into construction workflows has become a focal point of global research, especially around tools like BIM, digital scheduling platforms, and cloud-based collaboration systems (Volk et al., 2014; Miettinen & Paavola, 2014). In high-income countries, these tools are often embedded within regulatory frameworks and standardized processes. Countries like the UK and Singapore have made BIM adoption mandatory for public infrastructure projects, significantly accelerating digital maturity (Khosrowshahi & Arayici, 2012; Succar & Kassem, 2015). By contrast, emerging economies face challenges such as fragmented policies, high implementation costs, and limited digital literacy (Liu et al., 2020). In Nigeria, while IT tools like BIM are becoming more familiar, usage remains limited and often informal—focused on basic functions like scheduling or document management (Aghimien et al., 2021). Barriers such as poor interoperability, limited client demand, and the cost of implementation persist (Abubakar et al., 2014).

Various scholars have attempted to measure digital readiness or maturity. For instance, Alreshidi et al. (2018) proposed a BIM maturity model emphasizing interoperability, stakeholder coordination, and process standardization. Similarly, Deloitte (2020) and Marnewick & Labuschagne (2011) stress the importance of aligning IT with business strategy and building continuous capability. However, most of these models originate from developed contexts and may not fully capture the unique constraints faced by firms in low- and middle-income countries. This study builds on the existing literature by moving beyond adoption rates and tool familiarity. It empirically identifies IT integration typologies—Operational, Tactical, and Transformative—and investigates how these influence project outcomes in a Nigerian context. This typological approach allows for a more nuanced understanding of digital maturity and supports the development of a Staged Integration Framework tailored to emerging construction markets.

Figure 1 presents the conceptual framework guiding this study, synthesizing the TOE framework and Strategic Alignment Theory within the context of IT integration in construction.

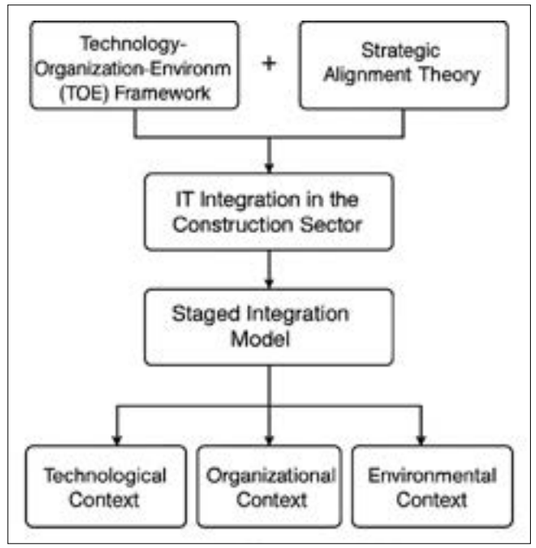

Figure 1. Conceptual Framework for IT Integration in the Construction Sector

3. METHODOLOGY

This study employed a quantitative, cross-sectional survey design to examine how Information Technology (IT) tools are strategically integrated into construction project delivery systems in Nigeria. The aim was to explore patterns of IT use, their alignment with organizational goals, and their impact on project performance.

3.1. Sampling and Data Collection

A purposive sampling technique was adopted to target professionals actively involved in IT-supported construction project delivery. This approach ensured that respondents possessed relevant experience with digital tools such as BIM, scheduling platforms, and mobile collaboration apps. The survey was distributed both online and in person across key Nigerian cities with robust construction activity, including Lagos, Abuja, Port Harcourt, and Kano. A total of 287 valid responses were received, yielding a 72% response rate. Participants were required to have a minimum of three years of industry experience and demonstrated familiarity with commonly used IT tools in construction (Table 1).

The structured questionnaire consisted of five sections:

- Respondent demographics,
- Types and frequency of IT tool usage,
- Depth of IT integration,
- Strategic alignment of IT with project delivery,
- Perceived project performance outcomes.

All items were measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). A pre-test involving 25 professionals was conducted to refine the instrument, improving clarity and relevance. Based on feedback, minor wording adjustments were made. To ensure internal consistency, Cronbach's alpha values were calculated for all multi-item constructs. As shown in Table 2, all values exceeded the acceptable threshold of 0.70 (Nunnally & Bernstein, 1994), indicating strong reliability. Although purposive sampling was appropriate for targeting specific expertise, it limits the generalizability of the findings to the broader industry. This limitation is acknowledged and discussed further in Section 5.4.

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n = 287)	Percentage (%)
Profession	Architect	78	27.2
	Civil Engineer	91	31.7
	Quantity Surveyor	63	22.0
	Project Manager	55	19.1
Years of Experience	3–5 years	89	31.0
	6–10 years	103	35.9
	11–15 years	56	19.5
	16 years and above	39	13.6
Firm Size (Employees)	< 20	96	33.4
	20–50	112	39.0
	> 50	79	27.5
Location	Lagos	123	42.8
	Abuja	77	26.8
	Port Harcourt	49	17.1
	Kano	38	13.2

Table 2: Reliability Statistics of Constructs (Cronbach's Alpha)

Construct	Number of Items	Cronbach's Alpha
IT Tool Usage	6	0.87
IT Integration Depth	5	0.85
Strategic Alignment with Objectives	4	0.82
Perceived Project Performance	5	0.88

3.2. Data Analysis

Data were analyzed using IBM SPSS (v26) and AMOS (v24). The analytical process involved several steps:

- Descriptive statistics were computed to summarize demographic information and usage patterns of IT tools.
- Exploratory Factor Analysis (EFA) using principal component extraction and varimax rotation was conducted to identify latent constructs underpinning IT integration. Items with factor loadings below 0.50 were excluded.
- Cluster analysis was performed using standardized factor scores to classify firms into integration typologies—Operational, Tactical, and Transformative. Both hierarchical and k-means clustering techniques were applied to validate the classifications.
- ANOVA and multiple regression analyses were then used to examine the relationship between integration types and project performance metrics, including technical outcomes, team collaboration, quality, cost, and time. Significance was assessed at p-values of <0.05 and <0.01.

This mixed statistical approach enabled a detailed understanding of not only IT tool usage patterns but also the strategic alignment and performance implications of IT integration across different firms.

4. RESULTS AND ANALYSIS

This section presents the findings of the quantitative analysis, structured in three main subsections: IT tool utilization patterns, strategic integration typologies, and the relationship between integration levels and project performance outcomes.

4.1. IT Tool Utilization and Purpose

Descriptive statistics revealed moderate to high levels of usage of several IT tools among respondents. Specifically, BIM tools (such as Revit or ArchiCAD) were primarily used for design visualization, while mobile collaboration tools (e.g., WhatsApp, Trello) were employed for progress tracking. Scheduling tools like Microsoft Project and Primavera were widely adopted, though largely for basic task sequencing rather than risk analysis or resource optimization. To explore the latent constructs underpinning IT integration, Exploratory Factor Analysis (EFA) was conducted. The Kaiser-Meyer-Olkin (KMO) measure was 0.81, and Bartlett's Test of Sphericity was significant ($\chi^2 = 1527.6$, $p < 0.001$), validating the adequacy of the dataset. The EFA results, shown in Table 3, revealed three factors with eigenvalues above 1.0, interpreted as:

- Strategic Alignment (e.g., alignment of IT tools with performance objectives),
- Tool Usage Depth (e.g., multi-functional use of BIM and scheduling tools), and
- Integration Capability (e.g., interoperability and staff cross-training).

Table 3 shows the rotated factor loadings obtained through Exploratory Factor Analysis, identifying three distinct constructs that represent patterns of IT integration.

Table 3: Factor Loadings from Exploratory Factor Analysis (EFA)

Item Description	Factor 1: Strategic Alignment	Factor 2: Tool Usage Depth	Factor 3: Integration Capability
Our IT tools are aligned with key performance indicators	0.84	—	—
Digital tools are used during all project phases	0.81	—	—
Our organization has a digital integration roadmap	0.78	—	—
We use BIM for clash detection and coordination	—	0.80	—
We use mobile platforms for real-time progress tracking	—	0.76	—
Microsoft Project/Primavera is used for forecasting risks	—	0.73	—
Our tools are interoperable with other systems	—	—	0.82
Staff are cross-trained on multiple IT platforms	—	—	0.78
Cloud systems support file sharing and collaborative editing	—	—	0.75

Note: Only loadings ≥ 0.70 are shown for brevity. Extraction method: Principal Component Analysis. Rotation method: Varimax with Kaiser Normalization.

These constructs informed the next phase of the analysis: cluster formation.

4.2. Strategic Integration Typologies

To further explore patterns of IT integration within construction firms, a k-means cluster analysis was conducted using the standardized factor scores derived from the exploratory factor analysis (EFA). The analysis revealed three distinct IT integration profiles, each reflecting a unique level of digital maturity and strategic orientation. These clusters; Operational, Tactical, and Transformative are summarized in Table 4 and represent progressively sophisticated approaches to IT deployment and alignment.

The Operational cluster, comprising 36.2 percent of the sample, includes firms characterized by low levels of IT sophistication. Organizations in this group primarily relied on basic tools such as email and rudimentary scheduling software. Their use of IT was functional but fragmented, lacking both integration across project phases and alignment with broader performance goals. Collaboration was largely informal, with limited use of digital platforms to support communication or coordination. In contrast, the Tactical cluster, representing 34.1 percent of respondents, demonstrated a more structured approach to IT adoption. Firms in this category showed moderate usage of digital tools, including mobile applications and planning software, and engaged in periodic staff training. While not fully integrated, their IT usage often responded to project-specific demands, such as client requirements or tight deadlines. Strategic alignment was present but partial, with some tools used in targeted phases of project delivery. The Transformative cluster, which accounted for 29.6 percent of the sample, represented the most digitally mature firms. These organizations integrated a suite of interoperable digital tools across all project phases—from design and planning to execution and closeout. They exhibited a high degree of alignment between IT usage and key performance indicators, using technology not only to support but to drive project outcomes. Furthermore,

firms in this group demonstrated cross-functional collaboration, often facilitated by cloud platforms, BIM coordination tools, and centralized data environments, indicating an advanced level of digital strategy implementation. The comparative characteristics of these clusters across key integration dimensions are visually summarized in Figure 2. Together, these clusters illustrate the diverse stages of IT integration across the Nigerian construction industry and provide a typology for assessing organizational digital maturity within emerging market contexts.

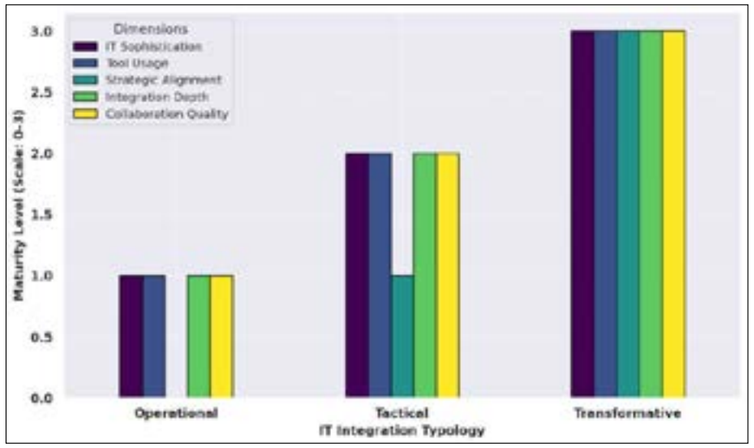

Figure 2: Comparative Characteristics of IT Integration Typologies Across Key Dimensions

Table 4 summarizes the characteristics of the three IT integration clusters derived from k-means clustering.

Table 4: Cluster Profiling Based on IT Integration Typologies

Variable	Cluster 1: Operational	Cluster 2: Tactical	Cluster 3: Transformative
No. of Firms (%)	104 (36.2%)	98 (34.1%)	85 (29.6%)
Average IT Tool Usage Score	2.1	3.3	4.4
Integration Across Phases	Low	Medium	High
Strategic Alignment with KPIs	None	Partial	Strong
Use of BIM	Minimal	Visualization only	Coordination + Costing
Training Frequency	Rare	Periodic	Regular
Collaboration Platform Usage	Email only	Mobile tools	Cloud-integrated systems
Perceived Technical Performance	Low	Moderate	High
Average Team Collaboration Rating	2.5	3.2	4.5

To visually compare performance (technical, collaboration, quality, cost, and time) across clusters (IT integration typologies - Operational, Tactical, and Transformative), a radar chart (Figure 3) was developed, plotting average scores across five outcome indicators: technical performance, team collaboration, quality, cost, and time. The chart shows the Transformative cluster outperforming others in all areas except cost and time, where no statistically significant differences were observed.

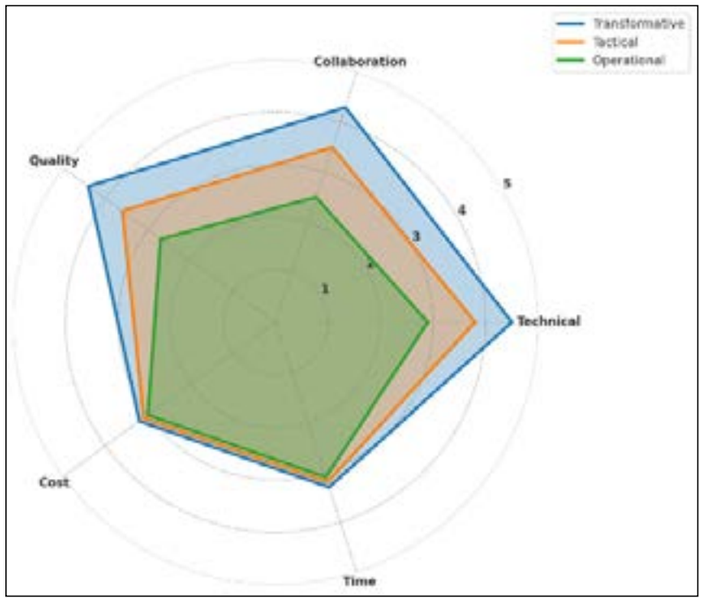

Figure 3. Comparative radar chart illustrating performance outcomes (technical, collaboration, quality, cost, and time) across IT integration typologies (Operational, Tactical, and Transformative)

Figure 4 presents Heatmap illustrating frequency and intensity of IT tool usage across the three identified integration typologies; Operational, Tactical, and Transformative. As presented in Section 4, the figure illustrates that Transformative clusters consistently utilize advanced tools (e.g., BIM, cloud systems, cross-training) more intensively, highlighting key differences in integration depth and digital maturity across firms.

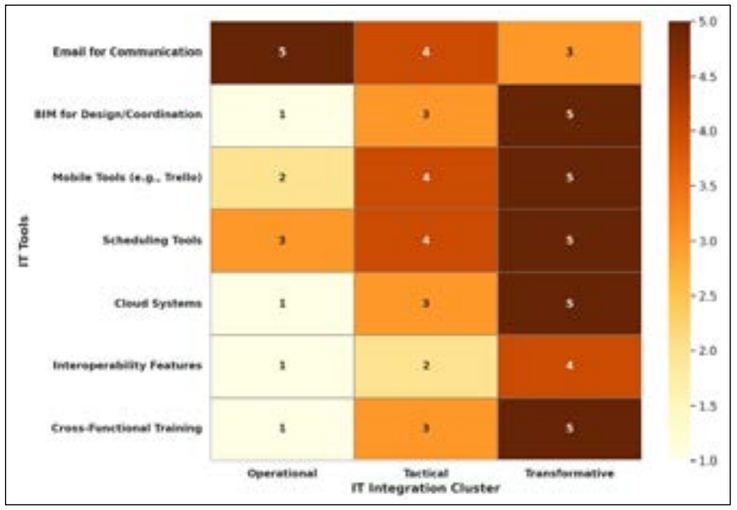

Figure 4. Heatmap showing the relative frequency of IT tool usage across the identified integration clusters (Operational, Tactical, and Transformative)

4.3. Integration and Its Impact on Project Performance

The results of the ANOVA and regression analysis are presented in Table 5, showing statistically significant relationships between IT integration typologies and project performance indicators. To assess the extent to which IT integration influences project outcomes, a one-way analysis of variance (ANOVA) was conducted using the identified IT integration typologies—Operational, Tactical, and Transformative—as the independent variable. The analysis revealed statistically significant differences in technical performance, team collaboration, and quality outcomes across the three clusters. Specifically, technical performance yielded $F(2, 284) = 5.62$, $p < 0.01$; team collaboration showed $F(2, 284) = 4.14$, $p < 0.05$; and quality outcomes were significant at $F(2, 284) = 4.09$, $p < 0.05$. These results suggest that higher levels of IT integration are positively associated with enhanced project performance, particularly in aspects related to internal efficiency and team effectiveness. Post-hoc Tukey's HSD tests further established that firms classified under the Transformative cluster reported significantly higher performance scores in these dimensions when compared to their Operational and Tactical counterparts. This supports the framework presented earlier in Table 4 and visualized in Figure 1, where firms demonstrating deeper integration, marked by strategic alignment, cross-functional tool usage, and digital interoperability outperformed those with more fragmented or tool-limited approaches.

However, no statistically significant differences were observed in cost and time performance across the three integration types. This finding indicates that, while IT integration can drive improvements in technical efficiency and coordination, its impact on project budget and schedule adherence may be moderated by broader systemic and external factors. Variables such as inflation, procurement delays, and supply chain disruptions, which are common in

many emerging economies, likely play a more dominant role in influencing these aspects. This observation is consistent with findings by Osunsanmi et al. (2022), who similarly noted that external macroeconomic conditions can diminish the benefits of internal IT improvements in developing contexts. To further explore the predictive strength of specific integration dimensions, a multiple regression analysis was conducted using the three latent factors derived from the Exploratory Factor Analysis (EFA)—namely Strategic Alignment, Integration Capability, and Tool Usage Depth. The results indicate that Strategic Alignment emerged as the most influential predictor of overall project performance (β = 0.42, $p < 0.001$), followed by Integration Capability (β = 0.28, $p < 0.01$). Tool Usage Depth demonstrated a weaker and only marginally significant effect (β = 0.19, $p = 0.07$). These results underscore that the mere presence or frequency of tool usage is insufficient; rather, it is the strategic embedding of digital systems into organizational goals and processes that delivers the most tangible performance benefits.

In sum, the analysis confirms that firms with Transformative IT integration are more likely to achieve superior technical outcomes, enhanced team collaboration, and improved quality control. The findings reinforce the centrality of strategic alignment as a critical mechanism through which IT integration translates into project success, while also highlighting the limitations of digital transformation in overcoming structural or economic barriers related to cost and time efficiency.

Table 5. Summary of ANOVA and Multiple Regression Results Linking IT Integration with Project Performance

Performance Indicator	ANOVA F (df = 2, 284)	p-value	Regression Predictor	β	p-value
Technical Performance	5.62	< 0.01	Strategic Alignment	0.42	< 0.001
Team Collaboration	4.14	< 0.05	Integration Capability	0.28	< 0.01
Quality Outcomes	4.09	< 0.05	Tool Usage Depth	0.19	0.07
Cost Performance	1.47	0.23	—	—	—
Time Performance	1.62	0.20	—	—	—

Note: Regression predictors were derived from EFA-based integration dimensions. Only significant predictors of overall performance are shown.

5. DISCUSSION

This study provides key insights into the evolving digital landscape of Nigeria's construction sector by empirically identifying three IT integration typologies—Operational, Tactical, and Transformative. As shown in Section 4, these typologies differ significantly in terms of tool usage, integration depth, and alignment with performance goals. Transformative integration was associated with higher levels of technical performance, collaboration, and quality outcomes (Figure 1; Table 4), affirming that digital maturity is not linear but staged and context-sensitive, particularly in emerging economies.

5.1. Emerging Market Comparisons

The results revealed that the majority of firms are positioned between Operational and Tactical levels, indicating a transitional digital phase. This aligns with Liu et al. (2020), who found that construction sectors in Vietnam and India face similar integration barriers—organizational inertia, policy fragmentation, and limited stakeholder alignment—even when technology is available. Likewise, Marzouk et al. (2022) highlighted a disconnect between high BIM awareness and practical implementation in Egypt, which parallels our finding that Nigerian firms often use BIM for visualization rather than full lifecycle coordination (Section 4.1). Importantly, while Transformative users reported higher satisfaction with technical and quality performance, no significant improvement was observed in cost and time outcomes (Section 4.3). This finding mirrors Antunes and Gonzalez (2015), who argued that external economic factors such as inflation, procurement delays, and unstable supply chains—can offset the internal efficiency gains from IT integration in Brazil. It suggests that technology alone is insufficient to overcome systemic delivery challenges in underregulated or volatile economies.

5.2. Theoretical Implications

The identified clusters support the theoretical foundations of the Technology-Organization-Environment (TOE) framework and Strategic Alignment Theory. Transformative firms marked by integrated tools, cross-functional collaboration, and performance-oriented IT usage illustrate the synergy between technological capacity and organizational readiness (Tornatzky & Fleischer, 1990; Henderson & Venkatraman, 1993). Operational firms, despite having access to some tools, lack this alignment, demonstrating that technology must be embedded into strategic structures to be effective. These findings also call for a shift in how digital maturity is measured. The Results section showed that higher IT adoption does not always equate to improved outcomes unless integration is strategic (Table 3, Table 4). This supports the argument made by Succar and Kassem (2015) for multi-dimensional maturity models that account for depth of use, interoperability, and alignment not just adoption levels.

5.3. Practical and Policy Implications

The proposed Staged Integration Framework offers a structured roadmap for construction firms to progress from ad hoc tool use to strategic integration. Firms in the Transformative cluster demonstrated higher tool interoperability, cross-training, and performance alignment, validating the framework's applicability. To accelerate digital maturity, public sector clients should embed digital requirements such as BIM use and cloud collaboration platforms into procurement protocols. Professional bodies must revise certification systems to include digital competencies and strategic IT management. Firms should prioritize workforce training, digital leadership, and structured implementation plans. These recommendations echo successful policy directions from India's Smart Cities initiative, South Africa's digital licensure reforms (Marnewick & Labuschagne, 2011), and recent BIM-led transformation models in developing countries (Marzouk et al., 2022).

5.4. Limitations

This study acknowledges several limitations. First, reliance on self-reported survey data may introduce bias, especially in performance assessment. Second, although the sample was professionally diverse, it was limited to Nigeria, which may affect the generalizability of the findings. Third, the cross-sectional design captures a single time frame and does not account for evolving IT strategies or longitudinal impacts. Moreover, the performance metrics used were perceptual rather than based on audited project data, which may overstate the observed benefits of strategic IT integration.

5.5. Future Research

Future work should adopt longitudinal designs to trace firms' progression through the Staged Integration Framework and to assess how changes in IT practices correlate with long-term project outcomes. Comparative studies across African or other Global South countries can further illuminate how national policy, infrastructure, and education systems shape integration trajectories. There is also scope for qualitative investigations into leadership behavior, cultural readiness, and change resistance, which this study could not capture. Mixed-methods research combining perception-based data with project audits would provide a more comprehensive view of how IT integration drives value. Finally, future studies should validate and refine the Staged Integration Framework through broader applications across regions and firm types.

6. CONCLUSION AND RECOMMENDATIONS

This study examined the strategic integration of Information Technology (IT) in Nigeria's construction sector, identifying three typologies—Operational, Tactical, and Transformative. The Transformative approach, marked by cross-functional usage and alignment with project goals, showed the strongest link to improved technical performance, collaboration, and quality outcomes. The findings advance theory by shifting focus from basic adoption to strategic alignment, applying the Technology-Organization-Environment (TOE) framework and Strategic Alignment Theory within an emerging market. The proposed Staged Integration Framework offers a practical roadmap for progressing toward digital maturity. While grounded in Nigeria, the insights are transferable to similar economies like Egypt, India, and Brazil, though local variations in policy and infrastructure may affect applicability. Policymakers should mandate digital protocols in procurement and develop national IT competency frameworks. Industry actors must adopt integration strategies, invest in workforce training, and prioritize system interoperability. Clients should require digital plans in tenders and promote collaborative technologies, while academic institutions should modernize curricula and encourage applied digital research. Future studies should explore longitudinal trends, cross-country comparisons, and qualitative organizational factors to deepen understanding. True digital transformation lies not in tool adoption alone but in embedding IT into the strategic fabric of construction delivery systems.

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