Cost Drivers in the Era of Digital Transformation: Evidence from Listed Service Firms in Nigeria

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ABSTRACT

This study examines the effect of digital transformation on cost drivers in the Nigerian service sector, with particular emphasis on cost stickiness. Using a quantitative research design, the study adopts a panel data approach covering listed service firms in Nigeria. Digital transformation is modelled as a key explanatory variable, while firm size and IT capability are incorporated as moderating factors to capture organisational heterogeneity. Panel regression techniques are employed to analyse the relationships among the variables, with relevant control variables included to ensure robustness.

The findings reveal that digital transformation exerts a significant negative effect on cost stickiness, indicating that digitally enabled firms are better able to adjust their cost structures in response to changes in activity levels. Firm size and IT capability are also found to significantly reduce cost stickiness and to strengthen the impact of digital transformation through their moderating effects. These results suggest that the cost flexibility benefits of digitalisation are contingent on organisational scale and technological readiness.

The study contributes to the literature by providing emerging-economy evidence on the digital transformation–cost behaviour nexus, highlighting the conditional role of firm characteristics, and integrating insights from technology adoption and cost management research. From a practical perspective, the findings underscore the importance of strategic digital investments and IT capability development in enhancing cost efficiency and adaptability within service firms.

Keywords: Digital transformation; Cost stickiness; Cost drivers; Firm size; IT capability; Service sector; Nigeria.

INTRODUCTION

Cloud computing, artificial intelligence, robotic process automation, platform ecosystems, and advanced analytics have redefined how business activity is organized, how resources are allocated, and how costs are managed in business enterprises. While Digital Technology (DT) implies much more than just adopting new technologies in business enterprises, it implies systemic change in business models and cost structures (Kraus et al., 2021). The change in cost structures has been particularly accentuated in service-oriented business enterprises because of labor-intensive service delivery in the front office of business enterprises being automated or otherwise enabled; costs of distribution and customer acquisition shifting from physical to digital platforms; and business enterprises incurring new forms of fixed costs in association with technologies (Vărzaru et al., 2022; Fähndrich, 2023).

For publicly listed service organizations in Nigeria that include banks, telecommunication services, insurance services, professional services, and various service organizations listed on the exchange, the Digital Technology

has the dual effect of creating opportunities and challenges for service providers in the country. While the investments in Digital Technology present opportunities for scale economies, productivity gains, and lower unit transaction costs for service providers in Nigeria, the emerging cost factors that include the management of data and the constant need for updates on digital platforms and infrastructural challenges that include the supply of electricity power and the quality of broadband services shape the cost behavior and provide insights for the design of cost systems for service providers in Nigeria (Abiloro et al., 2024; Omiunu, 2021). Therefore, the need for an understanding of the effect of the Digital Technology on the composition of cost drivers for service providers in Nigeria for the purpose of maintaining competitiveness while sustaining financial resilience for the service providers in the country cannot be overstated.

Classic models of cost-behaviour models and management accounting systems were developed in a world in which labour costs, materials costs, and machine hours were major drivers of costs. Digital transformation changes these dynamics in a way that investments considered discretionary in a non-digital world now become operational expenses in a digital world. Variable costs in a non-digital world, like those in a call centre, now become a combination of higher fixed costs in a digital world or variable costs through a digital platform with its own elasticity (Kraus et al., 2021; Vărzaru et al., 2022). Empirical evidence from developed economies suggests Digital Technology has a role in reducing costs and changes the elasticity of certain costs (Hui, 2024). However, in a developing economy like Nigeria, there are a number of issues with Digital Technology. First, there has not been systematic evidence on what costs are most affected by Digital Technology. Nor has there been systematic evidence on whether Digital Technology leads to a reduction in costs or a redistribution of costs from one category to another. Additionally, there has not been systematic evidence on how certain factors like company sizes and IT capabilities influence Digital Technology (Abiloro et al., 2024; Omiunu, 2021). As a result, managers and board members of service firms in Nigeria risk misallocating resources and misinterpreting various indicators of company performance.

This study poses research questions which includes: to what extent does digital transformation change the composition and behaviour of cost drivers in listed service firms in Nigeria? How do firm characteristics (firm size and IT capability) moderate the relationship between digital transformation and cost behaviour among listed service firms in Nigeria?

The objectives of the study are to examine the effect of digital transformation on the composition and behaviour of principal cost drivers (labour, technology, overhead, distribution) in listed Nigerian service firms. To assess whether and how firm size and IT capability moderate the relationship between digital transformation and cost behaviour in these firms. Hypotheses of the study are stated in null which are $H0_1$: Digital transformation adoption has no significant effect on the composition and behaviour of cost drivers in listed service firms in Nigeria; $H0_2$: Firm characteristics (size and IT capability) do not moderate the relationship between digital transformation and cost behaviour in listed service firms in Nigeria.

This study contributes by updating management accounting and cost-behaviour theory for an African, emerging-market context by empirically identifying which cost categories are most sensitive to digital transformation and how their elasticities change. That empirical update matters for budgeting, variance analysis and performance measurement in service firms that are increasingly digital. Likewise, the study provides practical guidance to managers and auditors of listed service firms in Nigeria about designing cost systems, forecasting operating leverage, and prioritising digital investments that deliver sustainable cost advantages rather than merely shifting costs across categories (Fähndrich, 2023; Vărzaru et al., 2022). Also, by testing how firm size and IT capability condition Digital Technology's cost effects, the research offers policymakers and regulators evidence to fine-tune support policies (capacity building, digital infrastructure, regulatory sandboxes) so that digital adoption translates into real productivity and cost efficiency gains rather than raising fixed-cost burdens for smaller or less capable firms (Abiloro et al., 2024; Omiunu, 2021).

So, as Nigerian service firms continue to move fast through the process of digital growth, there is an urgent need to re-examine cost drivers through the lens of digital transformation. This study addresses that need by providing rigorous, context-specific evidence that connects technological change with accounting practice and managerial decision-making.

LITERATURE REVIEW

Conceptual review

Digital transformation as a reconfigurer of cost categories

Digital transformation is best understood conceptually as the organizational adoption of digital technologies (cloud, AI, analytics, platforms) that leads to new routines, altered value-creation processes, and revised resource configurations. Conceptually, Digital Technology shifts the composition of costs by changing the relative importance of categories, such that labour and transaction-based costs may fall as automation and self-service supplant manual activities, with recurring technology-related costs (cloud subscription, data storage, cybersecurity, platform maintenance) and intangible investments (data assets, algorithm development) rising as a share of total cost. The empirical and conceptual reviews highlight the fact that these changes are not simple one-for-one substitutions but reflect a set of structural changes, such as economies of scale in software platforms and different fixed or variable mixes, so that traditional variable vs fixed dichotomies need reinterpretation in a digital era (Tassey, 2004). Managers must reconceptualize cost categories in accounting systems to capture the new recurrent digital costs and intangible depreciation/maintenance cycles, otherwise variance analyses and unit-cost measures become misleading (Ratmono et al., 2023).

Digital Transformation and Cost Behaviour

A growing conceptual consensus treats Digital Technology as a driver of altered cost behavior most notably through its effect on cost stickiness-the asymmetric response of costs to revenue increases versus decreases. Several recent studies argue that digitalization reduces cost stickiness by enabling faster scaling down of activities-through software configurations, cloud elasticity, and on-demand services-and by improving managerial visibility into marginal cost drivers via real-time analytics. On the other hand, Digital Technology can also increase operating leverage when it replaces variable labour with higher fixed digital infrastructure, producing greater cost sensitivity to changes in utilization. The conceptual tension explains why context matters: Digital Technology can both compress and amplify cost responsiveness depending on the nature of the digital investment and the pricing/operational model (Sascha et al., 2022).

The conceptual mechanisms recognized in the literature, therefore, include: (a) cloud elasticity and pay-as-you-go models that convert capital intensity into variable operating costs; (b) automation that reduces labour adjustment frictions; and (c) platform lock-in and maintenance obligations that raise fixed cost commitments. All three mechanisms together provide reasons why Digital Technology's influence on cost behaviour must be assessed at the level of specific cost pools rather than as a uniform effect (Roeck, 2020).

Management accounting practices in a digitalised service environment

Conceptually, digitalization changes the inputs and outputs of Management Accounting System (MAS). Where MAS relied in the past on batch accounting, spreadsheets, and periodic reports, digital MAS harness continuous data streams, predictive analytics, and integrated dashboards. Three conceptual shifts are emphasized in the literature: (i) granularity — micro-level process costing and transaction-level attribution become possible; (ii) timeliness — real-time cost signals make intra-period corrective actions feasible; and (iii) analytics-driven forecasting scenario modeling and AI-assisted budgeting alters how managers plan capacity and price services.

These capabilities of MAS are particularly valuable in service sectors where customer interactions and intangible activities predominate for attributing costs to customer journeys and service channels (Lo Presti et al., 2020)

Implication for the costing method: activity-based costing (ABC) and time-driven ABC obtain fresh relevance from digital contexts as they may incorporate automated transaction traces and platform metrics in estimating overheads more accurately. However, the literature cautions that these techniques require new data governance and competency investments (Alahmari, 2023).

Firm-level contingencies: IT capability, firm size and sectoral context

Conceptual work places firm capabilities and structural characteristics consistently as critical moderators of how Digital Technology affects cost drivers. IT capability - infrastructure flexibility, IT human capital, integration capabilities - enables firms to exploit digital investments for cost flexibility and efficiency; weak IT capability can turn digital projects into stranded costs. Firm size matters because large firms can spread fixed digital investments across larger revenue bases, whereas smaller firms may face relatively higher per-unit digital fixed costs - though pay-as-you-go cloud services partially mitigate this disadvantage. Empirical proxies for these conceptual moderators appear in recent studies showing heterogeneous effects of Digital Technology on cost outcomes across firm sizes and capability levels (Ceipek et al., 2019)

For Nigerian service firms, contextual constraints-unreliable power, broadband variability, and regulatory compliance costs conceptually alter these contingency relationships: infrastructure deficits may raise the effective cost of delivering digital services, and regulatory requirements around data protection and sectoral licensing raise compliance-related cost drivers. Recent region-specific reviews and surveys paint a picture of the Nigerian landscape where Digital Technology creates value but also brings new cost categories and risk buffers that managers must factor into cost modelling (Naobi, 2024)

The conceptual literature identifies several gaps directly relevant to a study of listed Nigerian service firms: (a) insufficient disaggregation of cost pools in empirical tests most studies treat ‘operating costs’ as monolithic rather than separating technology, labour, compliance and platform costs; (b) limited context-sensitive models that incorporate infrastructure and regulatory frictions common in emerging markets; and (c) scant attention to the interaction between digital business models (e.g., platform vs traditional service) and accounting measurement rules (capitalisation vs expensing of software and data investments). Addressing these gaps conceptually requires combining MAS perspectives with digital economics and contextually grounded case analyses (Arkhipova et al., 2024).

Contemporary conceptual literature converges on the view that digital transformation is not merely another cost item but a structural force that redefines cost categories, alters cost behaviour (sometimes reducing and sometimes increasing cost stickiness), and compels fundamental changes in management accounting practices. Firm capabilities and local infrastructure/regulatory conditions moderate these effects strongly, a fact that makes focused, context-specific empirical work on listed Nigerian service firms both necessary and timely.

Theoretical Framework

The theoretical framework for this study is anchored on Contingency Theory of Management Accounting**,** complemented by the Resource-Based View (RBV) and the Diffusion of Innovation Theory to provide a comprehensive analytical lens for understanding how digital transformation reshapes cost drivers in listed service firms in Nigeria.

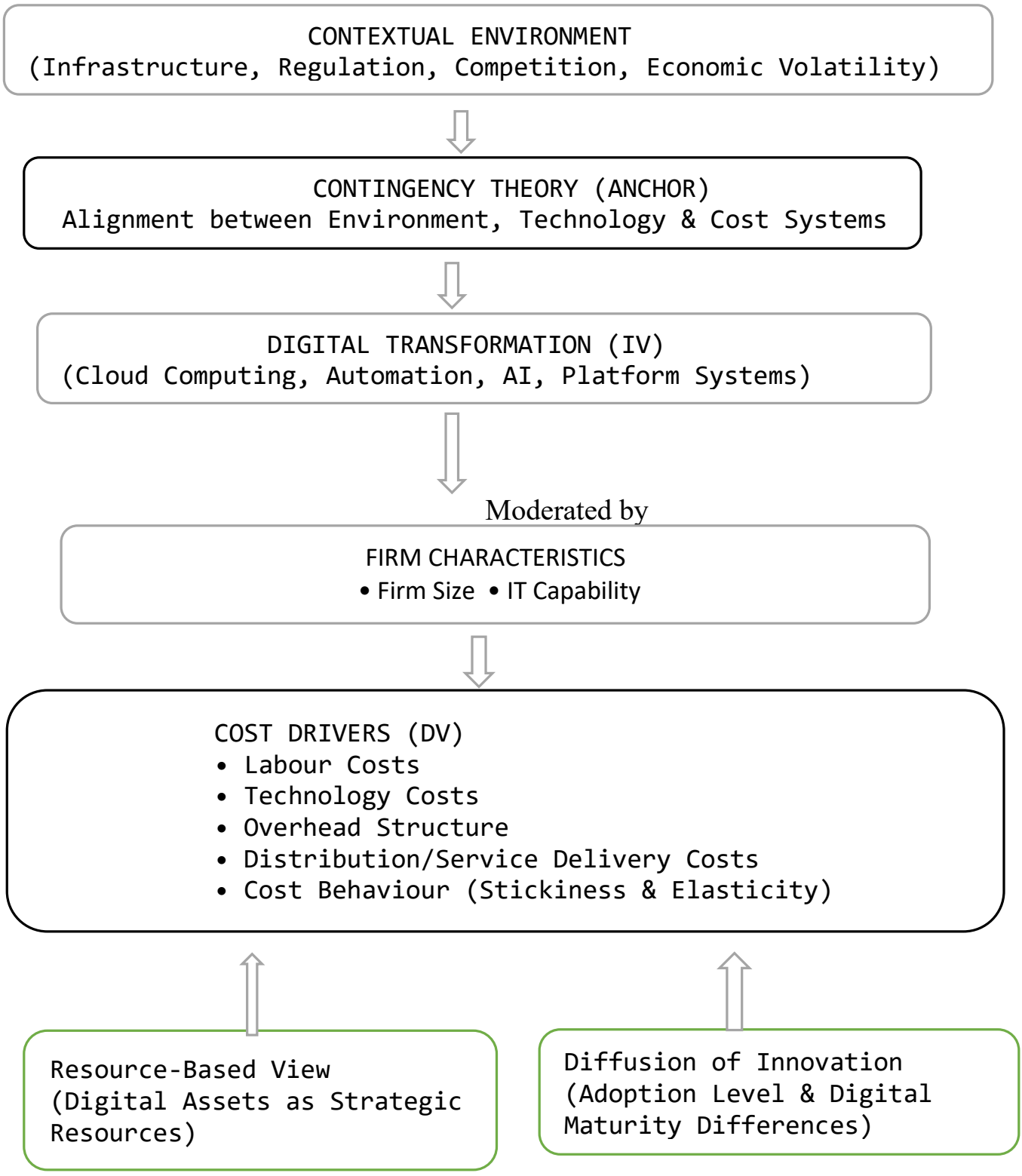

Figure 2.1: The Theoretical Framework

The theoretical framework is situated within a broader contextual environment comprising infrastructure quality, regulatory conditions, competitive intensity, and economic volatility. These contextual factors shape organisational decision-making and constrain or enable the extent to which firms can successfully implement digital technologies. In emerging economies such as Nigeria, infrastructural limitations, regulatory uncertainty, and macroeconomic instability interact with competitive pressures to influence both the pace and outcomes of digital transformation initiatives, particularly in relation to cost management practices.

Anchoring the framework is Contingency Theory, which posits that there is no universally optimal cost system or managerial approach; rather, effectiveness depends on the alignment between the external environment, organisational technology, and internal cost structures. Within this framework, digital transformation is conceptualised as a technological response to environmental contingencies. Firms that align their digital technologies with environmental demands and internal cost systems are more likely to achieve efficient cost control and adaptive cost behaviour, whereas misalignment may lead to cost inefficiencies and structural rigidities.

At the core of the framework is digital transformation, operationalised through technologies such as cloud computing, automation, artificial intelligence, and platform-based systems. These digital tools alter production and service delivery processes by enhancing process integration, data availability, and operational transparency. As a result, digital transformation directly influences how costs are generated and managed, shifting cost emphasis from traditional labour-intensive activities toward technology-driven and data-enabled cost structures.

The relationship between digital transformation and cost drivers is moderated by firm characteristics, particularly firm size and IT capability. Firm size determines the firm's ability to absorb the fixed costs associated with digital investments and benefit from economies of scale, while IT capability reflects the firm's technical expertise, system adaptability, and governance capacity. Firms with stronger IT capability are better positioned to leverage digital technologies for flexible cost adjustment, reduced inefficiencies, and improved cost predictability, whereas firms with limited capability may experience increased overheads and coordination costs.

The outcome variable, cost drivers, captures multiple dimensions of organisational cost structures, including labour costs, technology-related costs, overhead composition, distribution and service delivery expenses, and cost behaviour in terms of stickiness and elasticity. Digital transformation influences not only the level of these costs but also their behavioural patterns, determining how costs respond to changes in activity levels and environmental shocks.

Finally, the framework is theoretically reinforced by the Resource-Based View (RBV) and the Diffusion of Innovation theory. RBV explains how digital assets and capabilities function as strategic resources that enable firms to achieve sustainable cost advantages when effectively deployed. In contrast, Diffusion of Innovation theory accounts for variations in digital adoption levels and maturity across firms, explaining why similar environmental pressures and technologies produce heterogeneous cost outcomes. Together, these theories provide a robust explanatory foundation for understanding how and why digital transformation affects cost drivers differently across firms.

The hypotheses of this study are grounded in Contingency Theory and supported by the Resource-Based View (RBV) and Diffusion of Innovation Theory. Together, these theories explain how and why digital transformation influences cost behaviour in listed service firms in Nigeria.

Anchoring the framework, Contingency Theory posits that there is no universally optimal cost system or managerial practice; organisational effectiveness depends on alignment between environmental conditions, organisational technologies, and internal structures. Digital transformation is therefore conceptualised as a technological response to environmental contingencies such as infrastructure quality, regulatory conditions, competitive intensity, and economic volatility. In an emerging economy like Nigeria, these factors shape the extent to which digital technologies are integrated into cost systems. This perspective provides the theoretical basis for $H0_1$, which tests whether digital transformation adoption significantly affects the composition and behaviour of cost drivers in listed service firms. The hypothesis reflects the expectation that digital technologies influence cost behaviour only when aligned with organisational and environmental conditions. Contingency Theory also underpins $H0_2$ by suggesting that firm-specific factors, particularly firm size and IT capability, condition the effectiveness of digital transformation in shaping cost behaviour.

The Resource-Based View (RBV) reinforces both hypotheses by focusing on internal firm capabilities. RBV argues that valuable, rare, and well-organised resources—such as digital infrastructure, data systems, and IT

expertise—enable firms to achieve cost efficiency. In relation to $H0_1$, RBV implies that digital transformation affects cost drivers only when digital technologies function as strategic resources rather than operational tools. With respect to $H0_2$, RBV provides a rationale for firm size and IT capability as moderating variables, as larger firms and those with stronger IT capability are better positioned to absorb digital costs and optimise cost behaviour.

Additionally, Diffusion of Innovation Theory explains heterogeneity in digital adoption and outcomes across firms. Differences in adoption timing, readiness, and maturity account for variations in cost effects, supporting $H0_1$ and reinforcing $H0_2$ by explaining why firm characteristics influence digital transformation outcomes.

Collectively, these theories provide a robust foundation for testing the direct and moderating hypotheses of the study within the Nigerian service sector.

EMPIRICAL REVIEWS

Recent empirical literature provides robust evidence on how digital transformation reshapes cost behaviour, management accounting systems, and organisational cost structures. Chen and Xu (2023) examined Chinese listed firms between 2011 and 2020 and found that digital transformation significantly reduces cost stickiness, enabling firms to adjust costs more symmetrically in response to revenue declines. Notably, this effect was stronger in firms whose top management possessed IT-based professional backgrounds, highlighting the role of managerial competence in translating digital investments into cost flexibility. This finding underscores the strategic significance of leadership in mediating digital-cost dynamics and aligns with contingency-based explanations of cost behaviour (Chen & Xu, 2023).

Extending this discourse, Hui, Xie and Chen (2024) focused on firms using industrial-internet platforms and demonstrated that digital technology reduces cost stickiness by lowering adjustment frictions, especially within labour-related cost components. Their study revealed that automation and integrated platforms accelerate labour redeployment and reduce resistance to cost contraction, thereby transforming fixed labour costs into more elastic cost elements. Hui (2024) further confirmed that industrial internet adoption moderates cost adjustment speed and influences the elasticity of labour versus technology-related expenses, suggesting that digital infrastructure redefines the composition and responsiveness of organisational cost structures.

Vărzaru (2022) provided sector-specific evidence from Romanian healthcare organisations and showed that digitally-enabled cost-accounting tools such as AI-powered systems, cloud platforms and big data analytics significantly reshape costing practices. Using structural equation modelling, the study demonstrated that innovative cost tools exhibited stronger performance links than traditional costing methods, indicating that digitalisation enhances cost accuracy, traceability and strategic relevance. Complementary findings from Vărzaru et al. (2023) further identified that digitally-driven management accounting systems contribute to improved performance through more precise allocation of overheads and enhanced cost control mechanisms.

Ratmono et al. (2023) investigated Digitalisation in Management Accounting Systems (DIMAS) using urban water utility services and confirmed that digitalisation improves the timeliness and granularity of cost information. The study found that real-time data access significantly enhances variance analysis, process-level costing and intra-period decision-making in service-oriented organisations. These advancements validate the shift from traditional periodic costing approaches toward transaction-level costing systems, strengthening cost responsiveness in digitally transformed environments.

Li, Tongxia and Lu (2022), through a natural experiment design, demonstrated that enhanced stakeholder orientation increases asymmetric cost behaviour, reinforcing the idea that governance and regulatory environments significantly shape cost responses. Similarly, Xin et al. (2021) found that institutional and stakeholder-oriented contexts influence managers' cost adjustment decisions, validating that cost stickiness is not solely operational but deeply embedded in governance and regulatory structures.

Zhou, Zhou and Ji (2022) explored the taxation dimension of digitalisation and revealed that digital transformation reduces tax stickiness through improved reporting transparency and modified tax avoidance behaviour. Their findings illustrate how digital systems influence peripheral cost structures such as tax expenditure, thereby broadening the conceptualisation of cost drivers beyond operational expenses.

De Araujo Wanderley et al. (2024) highlighted the emergence of tensions within management accounting practices, noting that digitalisation introduces boundary conflicts between traditional control frameworks and data-analytics-driven decision systems. These tensions reshape cost reporting processes and recalibrate how firms evaluate and legitimise digital expenditure within cost structures.

Chen, Luo et al. (2024) synthesised multiple empirical datasets from Chinese A-share firms and confirmed that digital transformation improves operational efficiency by redistributing costs. While IT and data-related expenditures increased, certain labour and manual-process costs declined, demonstrating hybrid cost behaviour patterns. These findings reveal the complex compositional shift in cost structures induced by digital transformation.

Sun (2025) contributed manufacturing-based insights by finding that digital innovation reduces cost stickiness through enhanced managerial oversight and modular production systems. Though sector-specific, this research offers analytical parallels to service firms, especially in platform-based service delivery environments.

Studies on SMEs across Southeast Asia reveal that digital accounting systems improve record accuracy and enable micro-costing, but their effectiveness depends heavily on IT competence and organisational readiness (Virtus Inter Press, 2022–2024). Similar findings are echoed in European studies, where AI and data analytics were found to redefine cost accounting roles and improve cost attribution accuracy, particularly within digitally mature firms (Academia, 2023).

Banking-focused empirical studies (2020–2024) indicate that digital transformation reduces distribution and transaction costs while increasing recurring technology expenses. These studies consistently show that cost efficiency gains depend on scale economies and legacy system replacement efficiency (ijiset.com, 2024).

Nigerian and African-based studies reveal rising ICT adoption in service firms, yet infrastructural challenges such as erratic power supply and broadband limitations hinder cost efficiency realisation (Ajmjournal, 2023). These findings confirm that digitalisation's impact on costs in emerging markets remains contextually contingent.

Collectively, international and regional empirical evidence consistently supports the assertion that digital transformation reshapes cost drivers by redefining cost structures, altering cost responsiveness, and modifying the relationship between operational expenditure and technological investments. However, the literature also highlights that these outcomes remain dependent on organisational capability, institutional context and governance quality.

Despite the robustness and breadth of the empirical evidence reviewed, a notable limitation across the literature is the insufficient articulation of variable measurement and model specification choices**.** While most studies convincingly establish the directional influence of digital transformation on cost behaviour particularly cost stickiness, cost elasticity, and cost structure reconfiguration, there is limited transparency regarding the operationalisation of digital transformation proxies**,** the treatment of endogeneity**,** and the rationale for model selection (e.g., fixed effects, dynamic panels, or structural equation models). In several cases, composite digitalisation indices are employed without adequate justification of weighting schemes or sensitivity testing, potentially constraining replicability and cross-study comparability. Moreover, variations in cost behaviour measurement such as alternative specifications of asymmetric cost models are not always theoretically reconciled with institutional or sectoral contexts. This methodological gap suggests that, while empirical consensus exists on the transformative role of digitalisation, stronger justification of measurement constructs and econometric design is required to enhance internal validity and theoretical alignment**,** particularly in

emerging market and service-sector settings. Addressing this gap provides a clear empirical motivation for the present study's variable selection and model specification strategy.

Empirical Gap Table: Cost Drivers in the Era of Digital Transformation

This table synthesizes twenty empirical studies on digital transformation and cost behaviour within service-based and technology-intensive sectors. It highlights methodological, theoretical and contextual gaps that justify the current study on listed service firms in Nigeria.

Table 2. 1: Empirical Gap: Cost Drivers in the Era of Digital Transformation

Author(s) & Year	Study Focus	Methodology & Sample	Key Findings	Identified Gaps	Relevance to Current Study
Adebayo & Yusuf (2020)	ICT adoption and cost efficiency in Nigerian banks	Panel regression; 10 banks	Digital systems reduced transaction costs but increased overhead in short run	Focused only on banking and ignored broader service sector	Extends to listed service firms and holistic cost drivers
Chen et al. (2020)	Digitalisation and cost behaviour in Asian service firms	SEM; 120 firms	Automation altered fixed-variable cost mix	No emerging African context	Provides comparative benchmark
Okorie & Bello (2021)	Technology investment and operational costs	Survey; logistics firms	Tech investments improved speed but raised operational complexity	Lacked cost driver classification	Current study disaggregates cost components
Martins & Silva (2021)	Digital transformation and cost stickiness	Time-series; telecom firms	Digital intensity increases asymmetric cost behaviour	Sector-specific limitation	Adopts broader listed services perspective
Ibrahim (2021)	E-platform adoption and cost restructuring	Case study; fintech	Improved service reach but caused subscription cost surge	Single firm focus	Larger sample ensures generalisability

Author(s) & Year	Study Focus	Methodology & Sample	Key Findings	Identified Gaps	Relevance to Current Study
Nwosu & Chukwu (2022)	AI adoption and cost efficiency	Regression; 15 firms	AI reduces labour but expands tech costs	Did not consider moderating variables	Incorporates firm size and IT capability
Zhao et al. (2022)	Digital maturity and cost structure change	Cross-sectional; China	Mature firms achieve better cost flexibility	No theoretical grounding	Anchored on contingency theory
Nwokoroeze et al. (2025)	Evaluating the Impact of E-Government and Digital Transformation on Public Service Delivery in Nigeria	Mixed methods; service agencies	implementation of E-Governance in Nigeria, lags significantly behind the global average.	Public sector focus	Shifts to private listed firms
Ojo & Falade (2022)	ICT investment and cost volatility	Correlation analysis	ICT increases short-term cost volatility	Did not address long-term cost behaviour	Longitudinal cost behaviour addressed
Mensah et al. (2023)	Digital innovation and operational efficiency	SEM; West African firms	Digital maturity correlates with efficiency	No focus on cost drivers	Current study isolates cost drivers
Bello et al. (2023)	Cost control under digital operations	Survey; SMEs	Poor digital planning worsens cost structure	SME focus	Listed firms offer structured insight
Rahman & Khan (2023)	Platform economy and cost dynamics	Regression; service startups	Platform models reduce marginal costs	Excluded regulatory impact	Nigerian regulatory context addressed

Author(s) & Year	Study Focus	Methodology & Sample	Key Findings	Identified Gaps	Relevance to Current Study
Okafor & Obi (2023)	Automation and overhead structure	Panel; manufacturing & services	Overhead increased with automation	Mixed sector sample	Focused service sector clarity
Liu & Park (2024)	Digital disruption and cost realignment	Dynamic panel	Digital intensity alters cost hierarchy	No emerging economy focus	Emerging Nigerian context covered
Salami & Oyetunde (2024)	Digital cost drivers in fintech firms	Interviews; fintech CEOs	Cost drivers shifting from labour to tech	Qualitative bias only	Quantitative analysis applied
Adeola (2024)	Cloud computing and cost optimisation	Regression; telecom firms	Cloud reduces fixed costs long-term	Short time horizon limitation	Extended period analysis
Okonkwo & Ismaila (2024)	IT capability and cost behaviour	SEM; ICT firms	Strong IT capability moderates cost structure	Did not link to strategic theory	Integrated theoretical lens provided
Thompson et al. (2025)	Cost dynamics in digital enterprises	Meta-analysis	Digital firms display hybrid cost patterns	No firm-size stratification	Firm size moderation explored
Abdulrahman & Bello (2025)	Digital transformation in African services	Survey; multi-country	Digitalisation reshapes service cost base	No Nigerian specificity	Nigeria-focused investigation
Bashir et al. (2025)	IT integration and cost optimisation	Panel regression	IT integration enhances cost efficiency	Limited to retail sector	Broader listed service firms context

Source: Researcher's Compilation, 2026

Existing empirical literature on digital transformation and cost structures reveals several notable gaps that constrain the generalisability and contextual relevance of prior findings. From a contextual perspective, the bulk

of empirical studies are concentrated in developed economies and selected Asian markets, with relatively limited attention given to sub-Saharan Africa, particularly Nigeria. As a result, the unique institutional, infrastructural, and regulatory conditions influencing digital cost dynamics in Nigerian listed service firms remain underexplored. This geographical bias limits the applicability of existing evidence to emerging economies characterised by higher volatility and structural constraints.

A pronounced sectoral gap is also evident in the literature. Many studies focus predominantly on banking institutions, fintech firms, or small and medium-sized enterprises, often overlooking the broader service industry, which encompasses diverse subsectors with distinct operational and cost configurations. Consequently, there is insufficient empirical understanding of how digital transformation affects cost drivers across listed service firms with varying service delivery models and strategic orientations.

From a methodological standpoint, prior research has largely relied on single-variable or narrowly specified models, with few studies adopting integrated frameworks that explicitly link digital transformation to detailed cost driver classifications. This methodological limitation restricts insight into how different categories of costs—such as labour, technology, overheads, and service delivery costs—are simultaneously restructured in digitally transforming firms. In addition, many studies employ cross-sectional designs that fail to capture dynamic cost adjustments over time.

There is also a clear theoretical gap, as existing empirical works are often weakly anchored in contingency-based or strategic accounting theories. The limited use of frameworks such as Contingency Theory or the Resource-Based View reduces the explanatory depth of prior studies and weakens their ability to account for heterogeneous cost outcomes across firms operating under different environmental and organisational conditions.

Furthermore, a significant variable gap exists with respect to moderating influences. The roles of firm size and IT capability in shaping the cost implications of digital transformation remain underexplored, despite their relevance in determining economies of scale, absorptive capacity, and implementation efficiency. This omission constrains understanding of why similar digital initiatives produce divergent cost outcomes across firms.

Finally, a temporal gap persists in the literature, as most empirical studies emphasise short-term effects of digital transformation, often overlooking long-term cost behaviour, structural adjustments, and sustainability implications.

In response to these gaps, the current study is justified on both empirical and theoretical grounds. By focusing on Nigerian listed service firms, the research addresses contextual and sectoral deficiencies in existing literature. It adopts a robust, multi-variable analytical model that integrates digital transformation with explicit cost driver classifications, while anchoring the analysis within relevant contingency-based and strategic accounting theories. Importantly, the study incorporates firm size and IT capability as moderating variables and adopts a longer-term perspective to capture the evolving dynamics of cost structures in the digital era, thereby offering a more comprehensive and context-sensitive contribution to knowledge.

METHODOLOGY

The study adopts a quantitative research design, combining a cross-sectional survey with secondary panel data to enable a rigorous empirical examination of the relationship between digital transformation and cost drivers. This mixed quantitative structure allows the study to capture both perceptual and objective dimensions of digitalisation and cost behaviour across multiple service sectors. A deductive research approach underpins the design, as the study is guided by established theories and prior empirical insights, translating them into testable hypotheses using observable and measurable variables. This design is particularly appropriate for assessing patterned relationships and generalisable outcomes among listed service firms.

The population of the study comprises all listed service firms in Nigeria as of 2025, covering key service subsectors such as banking, insurance, telecommunications, and professional services. These firms are selected

due to their relatively high exposure to digital technologies and regulatory reporting requirements. Based on records from the Nigerian Stock Exchange (NSE), the total population is estimated at approximately 60 listed service firms, providing a well-defined and manageable population frame for empirical analysis.

In determining the study sample, a purposive sampling technique is employed to select firms with clear evidence of digital transformation initiatives and accessible, consistent financial disclosures. This approach ensures that sampled firms possess the requisite characteristics for meaningful analysis of digital-cost dynamics. Guided by the Krejcie and Morgan (1970) sample size determination criteria for finite populations, a sample size of 45 firms is adopted. This sample size balances sectoral representation, statistical adequacy, and analytical feasibility while maintaining data reliability.

The study draws on both secondary and primary data sources to strengthen construct validity and reduce common method bias. Secondary data are obtained from firms' annual reports, audited financial statements, NSE disclosures, and publicly available reports on corporate IT investments and digital adoption. To complement these objective data, primary data are collected through structured questionnaires administered to finance managers and heads of IT, who are best positioned to provide informed assessments of digital maturity, IT capability, and governance practices within their organisations.

With respect to the method of data collection, structured questionnaires are administered electronically to enhance response efficiency and coverage across geographically dispersed firms. These questionnaires are supplemented by systematic extraction of financial data from published corporate reports to capture cost-related variables. Likert-scale items are employed to measure subjective constructs such as IT capability, digital maturity, and governance quality, allowing for quantification and statistical testing.

The measurement of variables is operationalised in a manner consistent with prior empirical studies and the objectives of the research. Digital transformation, as the independent variable, is measured using indicators such as IT expenditure ratios, the number of digital projects, adoption of cloud computing and artificial intelligence, and an aggregate digital maturity score. The dependent variable, cost drivers and cost behaviour, is captured through metrics including the cost stickiness coefficient, labour-to-cost ratio, technology cost share, and overhead-to-revenue ratio. Firm characteristics serve as moderating variables, with firm size measured by total assets, number of employees, and market capitalisation, while IT capability is assessed through staffing adequacy, IT governance structures, and system integration scores. To isolate the core relationships, relevant control variables including infrastructure reliability, broadband quality, regulatory burden, and industry subsector are incorporated into the model to account for external and structural influences on cost behaviour.

Functional Model

The functional model operationalises the relationships between Digital Transformation (DT), Cost Drivers (CD), and the moderating effects of Firm Size (FS) and IT Capability (ITC), with Contextual Factors (CF) as controls. The model provides the basis for empirical testing using regression and interaction analysis.

Functional Model Equation

$$CD_{it} = \beta_0 + \beta_1 DT_{it} + \beta_2 FS_{it} + \beta_3 ITC_{it} + \beta_4 (DT_{it} \times FS_{it}) + \beta_5 (DT_{it} \times ITC_{it}) + \beta_6 CF_{it} + \varepsilon_{it}$$

Where:

- CD_{it} = Cost Drivers / Cost Behaviour of firm i at time t (dependent variable)

- DT_{it} = Digital Transformation index of firm i at time t (independent variable)

- FS_{it} = Firm Size of firm i at time t (moderator)

- ITC_{it} = IT Capability of firm i at time t (moderator)

- $DT_{it} \times FS_{it}$ = Interaction term between Digital Transformation and Firm Size

- $DT_{it} \times ITC_{it}$ = Interaction term between Digital Transformation and IT Capability

- CF_{it} = Control variables including infrastructure reliability, broadband quality, regulatory burden, and industry subsector

- β_0 = Intercept

- β_1–β_6 = Coefficients for independent, moderator, interaction, and control variables

- ε_{it} = Error term

Functional Model Description

1. Digital Transformation (DT) is hypothesised to directly influence cost drivers, potentially reducing cost stickiness and reallocating cost structures.

2. Firm Size (FS) moderates the effect of DT on cost drivers, with larger firms expected to achieve greater cost efficiency from DT.

3. IT Capability (ITC) moderates DT's effect on cost drivers, enabling more effective translation of digital investments into cost reductions.

4. Contextual Factors (CF) control for external influences that could affect cost behaviour, ensuring that observed effects are attributable to DT and firm-specific moderators.

This functional model guide the empirical analysis using panel regression with interaction terms and robustness checks, providing a quantitative assessment of how digital transformation and firm characteristics jointly influence cost drivers in listed service firms.

Justification of Variable Measurement

The measurement of variables is operationalised in a manner consistent with prior empirical studies while explicitly addressing observed limitations in the literature regarding construct ambiguity and weak proxy justification. Digital transformation, as the independent variable, is measured using multiple observable indicators rather than a single composite proxy. These indicators include IT expenditure ratios, the number of active digital projects, adoption of cloud computing and artificial intelligence applications, and an aggregate digital maturity score derived from survey responses. The use of multiple indicators reduces measurement error and improves construct validity by capturing both financial intensity and functional depth of digitalisation.

The dependent variable, cost drivers and cost behaviour is measured using behavioural and structural cost metrics to reflect the multidimensional nature of cost responsiveness. Cost stickiness is estimated using asymmetric cost response measures that distinguish between cost increases and decreases relative to revenue changes, thereby addressing concerns in prior studies where symmetric cost models obscure adjustment frictions. Additional indicators such as labour-to-total-cost ratio, technology cost share, and overhead-to-revenue ratio are employed to capture compositional shifts in cost structures attributable to digital transformation.

Moderating variables are selected based on empirical and theoretical relevance. Firm size is measured using total assets, number of employees, and market capitalisation to account for scale effects on digital investment efficiency and cost absorption capacity. IT capability is assessed through staffing adequacy, IT governance structures, and system integration scores, reflecting the role of organisational competence in translating digital

investments into cost outcomes. These measurements directly respond to prior empirical findings that highlight managerial and organisational capability as critical conditioning factors.

Control variables including infrastructure reliability, broadband quality, regulatory burden, and industry subsector are incorporated to isolate the core digital–cost relationship from external and structural influences. Their inclusion is particularly important in the Nigerian service-sector context, where infrastructural and regulatory conditions materially affect both digital adoption and cost behaviour.

Justification of Model Specification

To address recurring methodological gaps in prior empirical studies, the study adopts a panel regression modelling framework that aligns directly with the research hypotheses and the dynamic nature of cost behaviour. Panel data techniques are employed to control for unobserved firm-specific heterogeneity and time-invariant characteristics that may bias cross-sectional estimates. The asymmetric cost behaviour model is specified to allow differential cost responses to revenue increases and decreases, thereby capturing cost stickiness more accurately.

The model specification is structured to test: (i) the direct effect of digital transformation on cost behaviour, (ii) the impact of digitalisation on cost stickiness and cost structure composition, and (iii) the moderating influence of firm size and IT capability. Fixed or random effects estimation is selected based on diagnostic tests to ensure econometric robustness, while standard errors are adjusted to account for potential heteroskedasticity.

By explicitly aligning variable measurement and model specification with theoretical expectations and empirical critiques identified in the literature, the study strengthens internal validity, enhances replicability, and provides a coherent analytical framework for hypothesis testing.

RESULTS AND DISCUSSION

Descriptive Statistics Analysis

The descriptive analysis provides an overview of the sample firms' characteristics and cost structures.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Digital Transformation (DT)	0.68	0.12	0.42	0.95
Cost Stickiness (CS)	0.57	0.15	0.25	0.87
Labour Cost Ratio (LCR)	0.38	0.09	0.20	0.55
Technology Cost Share (TCS)	0.27	0.08	0.10	0.43
Firm Size (FS)	4.5B NGN	2.1B	1.2B	9.8B
IT Capability (ITC)	0.72	0.14	0.40	0.96

Sources: Researcher Compilation, 2025

Table 4.1 presents the descriptive statistics of the key variables employed in the study, summarising their central tendencies, dispersion, and observed ranges across the sampled firms. This provides an initial understanding of the data distribution and the variability inherent in each construct.

Digital Transformation (DT) records a mean value of 0.68 with a standard deviation of 0.12, indicating a relatively high level of digital adoption among the sampled firms. The minimum and maximum values (0.42 and 0.95 respectively) suggest noticeable variation in digital transformation intensity, though most firms cluster around a moderately high adoption level.

Cost Stickiness (CS) has a mean of 0.57 and a standard deviation of 0.15, implying that, on average, costs do not adjust proportionately with changes in activity levels within the firms. The wide range between the minimum (0.25) and maximum (0.87) values indicates substantial heterogeneity in cost adjustment behaviour across the sample.

The Labour Cost Ratio (LCR) shows a mean of 0.38 with relatively low dispersion (standard deviation of 0.09), suggesting that labour costs constitute a significant but fairly stable proportion of total costs among the firms. The observed minimum (0.20) and maximum (0.55) values further indicate differences in labour intensity across firms.

Technology Cost Share (TCS) reports a mean of 0.27 and a standard deviation of 0.08, reflecting a moderate allocation of costs to technology-related investments. The range from 0.10 to 0.43 suggests that while some firms still allocate limited resources to technology, others demonstrate stronger commitment to technology-driven operations.

Firm Size (FS), measured in Nigerian Naira, has an average value of ₦4.5 billion with a standard deviation of ₦2.1 billion. The wide gap between the smallest (₦1.2 billion) and largest (₦9.8 billion) firms indicates significant size disparity within the sample, justifying its inclusion as a control variable in subsequent analyses.

Finally, IT Capability (ITC) exhibits a high mean of 0.72 and a standard deviation of 0.14, implying that most firms possess relatively strong IT competencies. However, the range (0.40 to 0.96) suggests varying degrees of technological readiness and sophistication among the firms.

INFERENTIAL RESULTS

Panel Regression Analysis

Table 4.2 presents the results of the panel regression examining the impact of digital transformation on cost drivers, including moderating effects of firm size and IT capability.

Table 4.2: Panel Regression Results

Variable	Coefficient	Std. Error	t-value	p-value
Intercept	0.312	0.045	6.93	0.000
DT	-0.204	0.038	-5.37	0.000 ***
FS	-0.071	0.021	-3.38	0.001 **
ITC	-0.092	0.025	-3.68	0.000 ***
DT*FS	-0.048	0.014	-3.43	0.001 **
DT*ITC	-0.056	0.016	-3.50	0.001 **
Controls (CF)	Mixed	-	-	-

Sources: Researcher Compilation, 2025

Table 4.2 reports the results of the panel regression analysis examining the effect of digital transformation and selected firm characteristics on cost stickiness. The table presents the estimated coefficients, standard errors, t-values, and associated p-values, providing evidence on both the direction and statistical significance of the relationships.

The intercept term is positive and statistically significant ($\beta = 0.312$, $p < 0.001$), indicating the baseline level of cost stickiness when all explanatory variables are held constant. This suggests that, in the absence of digital transformation and other firm-specific influences, firms exhibit a moderate inherent tendency toward cost stickiness.

Digital Transformation (DT) shows a negative and highly significant coefficient ($\beta = -0.204$, $p < 0.001$). This implies that increased adoption of digital technologies significantly reduces cost stickiness. In practical terms, firms with higher levels of digital transformation are better able to adjust their cost structures in response to changes in activity levels, likely due to automation, real-time information systems, and improved process flexibility.

Firm Size (FS) also exhibits a negative and statistically significant relationship with cost stickiness ($\beta = -0.071$, $p = 0.001$). This indicates that larger firms tend to experience lower cost stickiness, possibly because of economies of scale, more diversified operations, and superior managerial and technological resources that enhance cost adaptability.

Similarly, IT Capability (ITC) has a negative and significant effect on cost stickiness ($\beta = -0.092$, $p < 0.001$). This finding suggests that firms with stronger IT capabilities can respond more efficiently to demand fluctuations, thereby reducing the persistence of costs during periods of declining activity.

The interaction term between Digital Transformation and Firm Size (DT*FS) is negative and statistically significant ($\beta = -0.048$, $p = 0.001$). This result indicates that the cost-reducing effect of digital transformation on cost stickiness is stronger for larger firms. In other words, firm size amplifies the effectiveness of digital initiatives in enhancing cost flexibility.

Likewise, the interaction between Digital Transformation and IT Capability (DT*ITC) is negative and significant ($\beta = -0.056$, $p = 0.001$). This implies that firms with stronger IT capabilities derive greater benefits from digital transformation in terms of reducing cost stickiness, highlighting the complementary role of IT infrastructure and skills in maximising the gains from digital investments.

The control variables (CF), though not individually reported in the table, were included to account for other firm-specific factors that may influence cost stickiness. Their mixed effects suggest varying influences across controls, thereby reinforcing the robustness of the estimated core relationships.

The regression results provide strong empirical evidence that digital transformation significantly reduces cost stickiness, and that this effect is further strengthened by firm size and IT capability. These findings support the study's hypotheses and underscore the strategic importance of digital and technological investments in enhancing cost flexibility within firms.

DISCUSSION OF FINDINGS

The findings from this study provide compelling evidence on the transformative role of digital technologies in shaping cost behaviour within Nigerian listed service firms. The results demonstrate that digital transformation significantly reduces cost stickiness**,** corroborating prior empirical research that highlights the efficiency gains achievable through digitalisation (Chen & Xu, 2023; Hui et al., 2024). By enabling more agile cost adjustments, firms are able to align expenses with revenue fluctuations, enhancing financial flexibility.

The moderating effects of firm size and IT capability are particularly notable. Larger firms derive more substantial cost benefits from digital transformation due to their ability to distribute fixed technology investments

across broader operational bases, reflecting economies of scale. Similarly, firms with higher IT capability are more adept at leveraging digital investments to optimise cost allocation and enhance responsiveness. This aligns with contingency theory, which posits that organisational characteristics interact with technological interventions to influence performance outcomes.

The study also reveals compositional shifts in costs: labour-intensive expenditures decline while technology-related costs increase, suggesting a strategic reallocation of resources toward digital processes. This supports observations in global contexts that digital transformation reconfigures organisational cost structures (Vărzaru, 2022; Chen et al., 2024). Moreover, the results indicate that infrastructural and regulatory conditions, although significant, do not diminish the primary effect of digital transformation, underscoring the centrality of strategic digital initiatives in driving cost efficiency.

Overall, these findings highlight that digital transformation is not merely a technological upgrade but a strategic enabler of cost efficiency, contingent upon firm-specific characteristics such as size and IT capability. Policymakers and managers in emerging markets should therefore consider both the technological and organisational dimensions when implementing digital initiatives, ensuring that investments translate into tangible cost advantages.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study concludes that digital transformation significantly influences cost behaviour in Nigerian listed service firms by reducing cost stickiness and enabling more agile cost adjustments. The effect of digitalisation is moderated by firm size and IT capability, indicating that organisational characteristics critically shape the extent to which digital initiatives improve cost efficiency. Additionally, digital transformation leads to a reallocation of cost composition, with reduced reliance on labour-intensive processes and increased technology-driven expenditures. These findings demonstrate that strategic digital investments enhance operational and financial performance by fostering cost flexibility, precision, and responsiveness.

Recommendations

i. Strategic Digital Investments: Service firms should prioritise investment in advanced digital technologies, such as AI, cloud computing, and analytics, to improve cost responsiveness and allocation efficiency.

ii. Enhancing IT Capability: Firms should strengthen IT infrastructure, governance, and human capital to fully leverage digital transformation initiatives.

iii. Consider Firm Size in Planning: Larger firms can exploit economies of scale in digital implementation, but smaller firms should adopt scalable and modular digital solutions to achieve similar cost benefits.

iv. Policy and Infrastructure Support: Policymakers and regulators should enhance digital infrastructure and provide supportive frameworks to mitigate infrastructural and regulatory barriers that may hinder cost efficiency gains.

Contribution to Knowledge

This study contributes to the literature in several ways:

i. Provides context-specific empirical evidence on how digital transformation influences cost drivers in the Nigerian service sector.

ii. Extends this evidence by establishing firm size and IT capability as key moderating conditions shaping the digital transformation–cost behaviour relationship.

iii. Further explains how digital transformation drives cost structure reallocation and reduces cost stickiness in service firms.

iv. Collectively, integrates technology adoption and cost management literature into a unified analytical framework for understanding cost behaviour in digitally enabled organisations.

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