

DIGITAL TRANSFORMATION AND SERVICE DELIVERY IN THE NIGERIAN TELECOMMUNICATIONS INDUSTRY

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ABSTRACT

This study examined the effect of digital transformation on service delivery in the Nigerian telecommunications industry. An ex-post facto design was adopted, using annual secondary data from 2001 to 2024 (24 observations) sourced from the Nigerian Communications Commission, the Central Bank of Nigeria and the National Bureau of Statistics. Service delivery was proxied by a composite Service Delivery Quality Score, which averaged 0.1714. Digital transformation was captured by mobile phone penetration, internet penetration, mobile money transaction and telecommunication network coverage, with literacy rate as a control. Unit root tests revealed a mixture of I(0) and I(1) series. The Autoregressive Distributed Lag bounds test confirmed cointegration ($F = 4.8293$), exceeding the 1% upper bound of 4.15. Long-run estimates showed that mobile phone penetration ($\beta = 0.1598$, $p = 0.0171$), telecommunication network coverage ($\beta = 0.0119$, $p = 0.0000$) and literacy rate ($\beta = 0.0591$, $p = 0.0082$) significantly improved service delivery. Internet penetration ($\beta = -0.0503$, $p = 0.2750$) and mobile money transaction ($\beta = -0.1473$, $p = 0.2782$) were negative and insignificant. The error correction term (-0.6007 , $p = 0.0000$) indicated that about 60.07% of disequilibrium is corrected annually, and the short-run model explained 89.58% of the variation in service delivery. Diagnostic tests confirmed normal residuals, no serial correlation, homoskedasticity and parameter stability. The study concluded that infrastructural reach, rather than usage intensity, sustains service quality. It recommended prioritised investment in network coverage, deeper mobile access and targeted digital literacy programmes.

KEYWORDS: Digital Transformation, Service Delivery Quality, Mobile Phone Penetration, Network Coverage, Ardl, Nigeria.

1. INTRODUCTION

Service delivery has become the principal yardstick by which telecommunications operators are judged, because subscribers now depend on mobile networks for voice communication, data access, financial transactions, learning and interaction with public institutions. In digital service industries, customers expect speed, reliability, responsiveness and convenience, and they judge operators on network reliability, billing accuracy and the quality of customer support. As dependence on mobile services deepens, operators are pressed to improve quality through infrastructure expansion, automation and digital platforms, and a substantial literature links such digital transformation with better organisational performance and service outcomes (Hanelt et al., 2021; Vial, 2019).

Across Sub-Saharan Africa, the expansion of mobile telephony and internet access has been rapid but uneven. Falowo and Falowo (2026) documented that the region still records the lowest mobile internet penetration in the world, and they attributed the gap to limited network availability, weak supporting infrastructure, affordability constraints and low digital capability. Mthobi and Kebotsamang (2024) further showed that physical proximity to mobile network towers is a decisive condition for the adoption of digital financial services. These studies suggest that access indicators and service outcomes do not move together automatically, and that the quality of the underlying network matters as much as the number of people connected to it.

In Nigeria, the telecommunications sector moved from a constrained fixed-line regime to a competitive mobile market after liberalisation in the early 2000s, under the regulatory oversight of the Nigerian Communications Commission (NCC). Mobile Network Operators (MNOs), namely MTN, Airtel, Globacom and T2 Mobile (formerly 9mobile), have expanded voice, data and mobile money services to a large subscriber base. Yet subscribers continue to report dropped calls, slow data speeds, patchy rural coverage, failed Unstructured Supplementary Service Data (USSD) and mobile money transactions, repeated deductions and weak complaint resolution. The coexistence of rapid digital expansion and persistent service failures is the central puzzle that motivates this study.

The problem is that the growth of digital transformation indicators has not translated proportionately into improved service quality. Ideally, higher mobile phone penetration should widen access, internet penetration should deepen digital interaction, mobile money transactions should be supported by stable networks, and network coverage should guarantee reliable access in urban and rural areas. Existing studies have, however, examined these indicators separately, often in relation to economic growth, banking performance or customer satisfaction rather than sector-wide service delivery quality, and few have controlled for the literacy of users who must interpret data plans, billing information and mobile money prompts. Without an integrated model that controls for literacy, the contribution of each digital transformation indicator to service delivery in Nigeria remains unclear.

The main objective of this study is therefore to examine the effect of digital transformation on service delivery in the Nigerian telecommunications industry. Specifically, the study examines the effects of mobile phone penetration, internet penetration, mobile money transaction, telecommunication network coverage and literacy rate on the Service Delivery Quality Score (SDQS). In line with these objectives, five null hypotheses were tested, each stating that the respective variable has no significant effect on service delivery of the Nigerian telecommunications industry.

2. LITERATURE REVIEW

2.1 CONCEPTUAL FRAMEWORK

Digital transformation refers to the integration of digital technologies into organisational processes in ways that alter how value is created, delivered and captured (Vial, 2019). Verhoef et al. (2021) distinguished three phases of the process: digitisation of information, digitalisation of processes and, finally, transformation of the business model itself. In telecommunications, the process is visible in the diffusion of mobile devices, the expansion of internet and broadband access, the integration of financial services into mobile platforms and the extension of network infrastructure across territory. Consistent with this view, the present study operationalises digital transformation through four proxies. Mobile phone penetration measures the extent to which the population has access to mobile devices and active subscriptions. Internet penetration measures the proportion of the population that accesses internet services. Mobile money transaction captures the scale of telecom-supported financial activity, including transfers, wallet transactions and USSD payments. Telecommunication network coverage measures the geographical and technical reach of the network that makes all other services possible.

Service delivery is the process through which an organisation conveys a service to its customers, and its quality is judged by the gap between customer expectations and perceived performance (Parasuraman et al., 1988). Grönroos (1984) separated technical quality, which concerns what the customer receives, from functional quality, which concerns how it is delivered. Both strands are relevant to telecommunications, where the technical core of the service (signal, speed, availability) is inseparable from administrative and relational elements (billing, complaint handling, customer support). In this study, service delivery is proxied by the Service Delivery Quality Score, a composite index formed from eight sub-indicators: network reliability, data speed, call quality, service availability, billing accuracy, complaint resolution, customer support responsiveness and overall user experience. Literacy rate, the proportion of the population that can read and write, is treated as a control variable because it conditions users' ability to understand data plans, complete mobile money transactions and interpret billing information. Figure 1 presents the conceptual framework of the study.

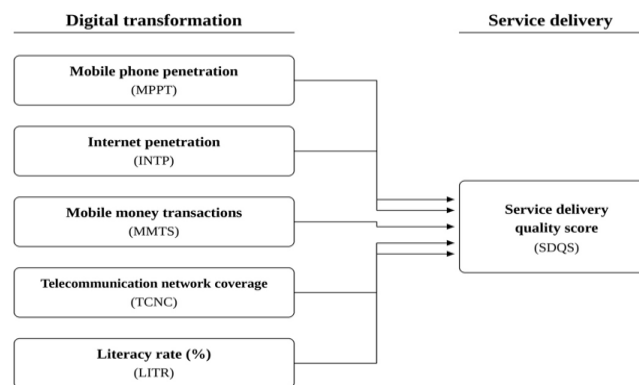


Figure 1: Conceptual Framework of Digital Transformation and Service Delivery

Source: Researcher's Conceptualisation (2026)

2.2 THEORETICAL REVIEW

2.2.1 UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

The Unified Theory of Acceptance and Use of Technology (UTAUT) was propounded by Venkatesh et al. (2003), who consolidated eight earlier technology acceptance models into one framework. The theory holds that intention to use a technology, and actual use, are shaped by performance expectancy (the perceived benefit of the technology), effort expectancy (its perceived ease of use), social influence (the pressure of significant others) and facilitating conditions (the availability of resources and technical support). Gender, age, experience and voluntariness of use moderate these relationships. The strength of UTAUT lies in its high explanatory power and its validation across banking, health and telecommunications contexts. Its main weakness is its individual-level orientation, which can understate organisational and infrastructural constraints on use. The theory is relevant to the present study because mobile phone penetration, internet penetration and mobile money transaction are, at bottom, aggregate outcomes of individual adoption decisions. Its construct of facilitating conditions explains why adoption alone may not improve service quality: where network infrastructure is weak and users lack the literacy to navigate digital services, high adoption can coexist with poor service experience.

2.2.2 RESOURCE-BASED VIEW

The Resource-Based View (RBV) traces to Wernerfelt (1984) and was formalised by Barney (1991), who argued that sustained competitive advantage arises from resources that are valuable, rare, inimitable and non-substitutable. Firms that accumulate and deploy such resources effectively achieve superior performance. The strength of the RBV is its emphasis on internal capabilities as sources of performance; its weakness is a relatively static treatment of resources, which may understate how resources must be continually renewed in fast-changing technological environments. In the telecommunications industry, network infrastructure (base stations, fibre backbones, spectrum and power systems) constitutes the core strategic resource of an operator, because it is costly to build, difficult to replicate and indispensable for delivering every other service. The RBV therefore provides the theoretical basis for expecting telecommunication network coverage and the installed mobile subscriber base to exert durable effects on service delivery, while usage-intensity indicators that are not backed by complementary infrastructure may not. The two theories are complementary: UTAUT explains the demand-side adoption that generates traffic, while the RBV explains the supply-side capability that determines whether that traffic is served well.

2.3 EMPIRICAL REVIEW

Falowo and Falowo (2026) examined low internet penetration in Sub-Saharan Africa and the role of Low Earth Orbit (LEO) satellites in addressing it. The study adopted a review and secondary-data design covering the Sub-Saharan region, drawing on industry and regulatory reports such as those of the International Telecommunication Union and mobile industry associations, with documents selected purposively by keyword search. Descriptive and comparative analysis showed that the region had the lowest mobile internet penetration globally and that inadequate network-supporting infrastructure, particularly fibre in rural areas, affordability and digital ability were the main constraints. The authors concluded that LEO satellites could complement terrestrial networks in closing the coverage gap. The study is descriptive and does not quantify how coverage or penetration affects service quality, which the present study does econometrically for Nigeria.

Akinde and Saka (2026) investigated digital financial inclusion through an efficiency analysis of mobile money penetration by Nigerian telecommunication companies. A quantitative design was used in the Nigerian telecommunications sector, with a sample of 12 purposively selected firms. Data Envelopment Analysis revealed differences in the efficiency with which mobile network operators supported mobile money services, and the authors concluded that operator efficiency, rather than mere participation, determines the inclusion dividend of mobile money.

Although the study is closely related to the Nigerian context of the present work, it measures relative efficiency at the firm level and does not link mobile money activity to the quality of service delivered to subscribers.

Uzochukwu et al. (2025) examined the effect of digital technology adoption on the performance of supervisory agencies in the Nigerian communications sector, focusing on the NCC and the Nigerian Postal Service. A cross-sectional survey design was employed among staff of the two agencies, and multiple regression was used within a UTAUT framework. Performance expectancy, social influence, perceived credibility and behavioural intention had significant positive effects on service delivery efficiency, and behavioural intention mediated the adoption-efficiency relationship. The study concluded that digital adoption improves regulatory service delivery. Its evidence rests on employee perceptions within two agencies, whereas the present study examines objective, industry-wide indicators over a long period.

Mothobi and Kebotsamang (2024) studied the impact of network coverage on the adoption of fintech and financial inclusion in Sub-Saharan Africa. The study used a survey design covering 12,735 individuals in nine countries, combining nationally representative household survey data with the geolocation of mobile network towers. A two-stage model revealed a significant positive relationship between network coverage and the adoption of digital financial services, and counterfactual simulations indicated measurable gains in financial inclusion if populations lived close to towers. The authors concluded that investment in network infrastructure is a precondition for digital finance. The study treats coverage as a driver of adoption rather than of service quality and uses a single cross-section, while the present study models coverage as a long-run determinant of service delivery.

Inakefe et al. (2023) investigated digital literacy and e-governance adoption for service delivery in the Cross River State Civil Service, Nigeria. A case-study design combining survey and interview data was adopted among civil servants and senior officials of the state service. The analysis showed that inadequate in-service training and low digital literacy, compounded by resistance from staff, undermined the effectiveness of e-governance in improving service delivery. The authors concluded that e-governance would yield better service outcomes only if digital literacy were raised through appropriate training. The study places literacy at the centre of service delivery but does not account for infrastructural constraints, a limitation the present study addresses by treating literacy as a control alongside infrastructural variables.

Liana et al. (2023) examined service quality dimensions as predictors of customer loyalty in mobile payment services, with gender as a moderator. A cross-sectional survey of mobile payment users was conducted in Tanzania, and the data were analysed with partial least squares structural equation modelling. Reputational quality strongly predicted both attitudinal and behavioural loyalty, while functional and technical quality had mixed effects across the two loyalty dimensions. The authors concluded that operators must manage several quality dimensions at once. The study shows that the technical reliability of mobile payment platforms does not automatically translate into favourable customer outcomes, but it does not relate transaction volume to sector-level service delivery, which is the focus here.

Kulu et al. (2022) examined mobile money transactions and banking sector performance in Ghana. An ex-post facto design was adopted using monthly secondary data from 2015 to 2020, and a composite index of banking sector depth, stability and efficiency was constructed. The Autoregressive Distributed Lag (ARDL) bounds test, the error correction model and impulse response analysis showed that mobile money transactions had a detrimental effect on banking sector performance, operating mainly through efficiency. The authors concluded that banks should be cautious in integrating mobile money into their business models. The study is methodologically close to the present work but concerns banking rather than telecommunications service delivery.

Bardesi (2020) measured the effect of the internet on economic growth in Saudi Arabia. A time-series design was employed using national data from 1994 to 2018, and an ordinary least squares model grounded in endogenous growth theory was estimated. Internet penetration had the strongest positive effect on non-oil gross domestic product, ahead of population and capital formation. The author concluded that internet expansion supports economic diversification. Because the outcome is macroeconomic, the study does not show how internet penetration affects the quality of services delivered within the telecommunications sector itself.

Feroz et al. (2020) reviewed the use of mobile phones to improve community health workers' performance in low- and middle-income countries. A systematic review design was adopted, drawing on published intervention studies selected against defined inclusion criteria. The qualitative synthesis showed that mobile phones improved data collection, communication, supervision and workflow organisation, although training gaps and connectivity problems persisted. The authors concluded that mobile-enabled service delivery is effective where networks are reliable. The review does not quantify how differences in penetration and coverage condition service outcomes, which the present study measures directly.

Aker and Mbiti (2010) analysed mobile phones and economic development in Africa. Using a review design based on secondary data on mobile coverage and adoption across African countries, the authors showed that mobile coverage expanded dramatically and that mobile phones reduced search costs, improved market efficiency and enabled new mobile-based services. They concluded that mobile telephony could promote development but cautioned that uneven rural penetration might deepen inequality. The study is foundational, but it does not isolate network coverage as a statistical determinant of service quality.

2.4 GAPS IN LITERATURE

The reviewed studies reveal three gaps. First, most studies relate single digital indicators to economic growth (Bardesi, 2020), banking performance (Kulu et al., 2022) or financial inclusion (Mothobi & Kebotsamang, 2024), rather than to the quality of telecommunications service delivery. Second, Nigerian studies have relied largely on perception surveys or firm-level efficiency scores (Akinde & Saka, 2026; Uzochukwu et al., 2025), which do not capture long-run, industry-wide relationships. Third, no reviewed study jointly models mobile phone penetration, internet penetration, mobile money transaction and network coverage while controlling for literacy. The present study fills these gaps by estimating a long-run ARDL model of the Service Delivery Quality Score for the Nigerian telecommunications industry over 2001 to 2024.

3. METHODOLOGY

3.1 RESEARCH DESIGN

The study adopted an ex-post facto research design. The design is appropriate because the variables of interest are historical outcomes that the researcher cannot manipulate, and the study relies on official records to examine how changes in digital transformation indicators relate to changes in service delivery over time.

3.2 STUDY AREA

The study area is Nigeria, the most populous country in Africa and one of the continent's largest telecommunications markets. The sector is regulated by the NCC under the Nigerian Communications Act, 2003, and serves dense urban centres such as Lagos, Abuja, Port Harcourt and Kano as well as extensive rural areas where coverage and quality vary considerably. The study focuses on the mobile segment of the industry, which carries the bulk of voice, data and mobile money traffic.

3.3 POPULATION OF THE STUDY

The population comprises the four licensed Mobile Network Operators in Nigeria: MTN Nigeria Communications Plc, Airtel Networks Limited, Globacom Nigeria Limited and T2 Mobile (formerly 9mobile). All four were covered, and their operations are represented through national aggregate data on the variables of the study.

3.4 METHOD OF DATA COLLECTION

Annual secondary data covering 2001 to 2024 (24 observations) were collected. Data on mobile phone penetration, internet penetration and telecommunication network coverage were obtained from the NCC; mobile money transaction data from the Central Bank of Nigeria; and literacy rate from the National Bureau of Statistics. The Service Delivery Quality Score was constructed from operators' service performance records. A small number of early-year observations for mobile phone penetration, internet penetration and network coverage were unavailable because comprehensive records were not published in the formative years of the industry; these were estimated by exponential growth interpolation, which preserves the nonlinear diffusion path typical of telecommunications indicators, while all observed values were retained unchanged.

3.5 MODEL SPECIFICATION

The dependent variable is constructed as the sum of its eight sub-indicators:

$$SDQS_t = NR_t + DS_t + CQ_t + SA_t + BA_t + CR_t + CSR_t + OUE_t \quad (1)$$

where NR is network reliability, DS is data speed, CQ is call quality, SA is service availability, BA is billing accuracy, CR is complaint resolution, CSR is customer support responsiveness, OUE is overall user experience and t denotes the year. The functional relationship of the study is:

$$SDQS_t = f(MPPT_t, INTP_t, MMTS_t, TCNC_t, LITR_t) \quad (2)$$

where $MPPT$ is mobile phone penetration, $INTP$ is internet penetration, $MMTS$ is mobile money transaction, $TCNC$ is telecommunication network coverage and $LITR$ is literacy rate. The long-run relationship is expressed as:

$$SDQS_t = \theta_0 + \theta_1 MPPT_t + \theta_2 INTP_t + \theta_3 MMTS_t + \theta_4 TCNC_t + \theta_5 LITR_t + \mu_t \quad (3)$$

where θ_0 is the intercept, θ_1 to θ_5 are the long-run coefficients and μ_t is the error term. A priori, $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5 > 0$. Following Pesaran et al. (2001), equation (3) is estimated through the unrestricted error correction form of the ARDL model:

$$\Delta SDQS_t = \alpha_0 + \sum_{i=1}^p \phi_i \Delta SDQS_{t-i} + \sum_{k=1}^5 \sum_{i=0}^{q_k} \delta_{ki} \Delta X_{k,t-i} + \lambda_0 SDQS_{t-1} + \sum_{k=1}^5 \lambda_k X_{k,t-1} + \varepsilon_t \quad (4)$$

where Δ is the first-difference operator, X_k denotes the five regressors in equation (3), ϕ_i and δ_{ki} are short-run coefficients, λ_0 and λ_k are the level coefficients from which the long-run coefficients are derived as $\theta_k = -\lambda_k/\lambda_0$, p and q_k are lag orders selected by the Akaike information criterion and ε_t is a white-noise error.

3.6 METHOD OF DATA ANALYSIS

Descriptive statistics and trend plots were used to profile the series. Stationarity was tested with the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979). Cointegration was tested with the ARDL bounds procedure, in which the null hypothesis $\lambda_0 = \lambda_1 = \dots = \lambda_5 = 0$ is rejected when the F-statistic exceeds the upper critical bound (Pesaran et al., 2001). The long-run coefficients were then estimated, and the adequacy of the model was assessed with the Jarque-Bera normality

test (Jarque & Bera, 1980), the Breusch-Godfrey serial correlation test (Breusch, 1978; Godfrey, 1978), the Breusch-Pagan-Godfrey heteroskedasticity test (Breusch & Pagan, 1979), the Ramsey RESET test (Ramsey, 1969) and the CUSUM stability test (Brown et al., 1975). Hypotheses were tested at the 5% level of significance using EViews 10.

4. RESULTS AND DISCUSSION

4.1 DESCRIPTIVE STATISTICS

Table 1: Descriptive Statistics of the Study Variables, 2001 to 2024

Statistic	SDQS	MPPT	INTP	MMTS	TCNC	LITR
Mean	0.1714	14.2034	18.2261	16.4899	10.1475	59.4417
Median	0.0817	15.8432	17.6435	16.2153	11.0916	59.0650
Maximum	0.9587	22.8055	45.1467	22.8055	11.6688	70.4100
Minimum	0.0010	2.6607	0.0899	10.8892	6.2146	51.0800
Std. Dev.	0.2238	6.4390	13.7891	3.4572	1.8585	5.6691
Skewness	2.1234	-0.5395	0.2724	0.2316	-1.3767	0.4289
Kurtosis	7.5072	1.9771	1.8992	2.0441	3.3615	2.1611
Jarque-Bera	1.4351	2.2106	1.5085	1.1284	2.7123	1.4395
Probability	0.3041	0.3311	0.4704	0.5688	0.2012	0.4869
Observations	24	24	24	24	24	24

Source: Researcher's Computation using EViews 10 (2026). SDQS = Service Delivery Quality Score; MPPT = mobile phone penetration; INTP = internet penetration; MMTS = mobile money transaction; TCNC = telecommunication network coverage; LITR = literacy rate.

Table 1 shows that the SDQS averaged 0.1714 against a median of 0.0817, with a range of 0.0010 to 0.9587, indicating modest service quality on average with episodic peaks. Internet penetration had the widest dispersion (standard deviation of 13.79), reflecting rapid and uneven growth in internet access, while network coverage was the most stable series (standard deviation of 1.86). The SDQS was strongly right-skewed (2.12) and leptokurtic (7.51), whereas the regressors were close to symmetric. The Jarque-Bera probabilities exceeded 0.05 for all six series, so normality was not rejected.

Because the SDQS is a composite, its internal structure was examined further. Table 2 decomposes the index into its eight components using the underlying series.

Table 2: Decomposition of the Service Delivery Quality Score by Component, 2001 to 2024

Component	Mean	Std. Dev.	Share of SDQS (%)	Coefficient of Variation	Correlation with SDQS
Network reliability	0.0272	0.0342	15.88	1.255	0.9958
Service availability	0.0266	0.0368	15.53	1.383	0.9961
Call quality	0.0243	0.0331	14.17	1.362	0.9941
Data speed	0.0230	0.0306	13.43	1.330	0.9948
Overall user experience	0.0205	0.0261	11.98	1.273	0.9924
Billing accuracy	0.0182	0.0232	10.62	1.275	0.9965
Complaint resolution	0.0166	0.0219	9.70	1.315	0.9981
Customer support responsiveness	0.0149	0.0188	8.70	1.264	0.9985
SDQS (composite)	0.1714	0.2238	100.00	1.305	1.0000

Source: Researcher's Computation from SDQS component data (2026)

Table 2 reveals that the four technical dimensions (network reliability, service availability, call quality and data speed) jointly account for 59.0% of the average score, while the administrative and relational dimensions (billing accuracy, complaint resolution and customer support responsiveness) account for 29.0%. Customer support responsiveness (8.70%) and complaint resolution (9.70%) contribute least, which suggests that the weakest links in Nigerian telecommunications service delivery lie on the customer-care side rather than the network side. Every component correlates above 0.99 with the composite, confirming that the index is internally coherent and that the components move together over time. The sub-period averages in Table 3 show how the index evolved.

Table 3: Service Delivery Quality Score by Sub-Period

Sub-period	Mean SDQS	Minimum	Maximum
2001 to 2008	0.1434	0.0123	0.5114
2009 to 2016	0.1494	0.0010	0.9587
2017 to 2024	0.2215	0.0817	0.4878
2001 to 2024	0.1714	0.0010	0.9587

Source: Researcher's Computation from SDQS component data (2026)

The SDQS rose only marginally between the first two sub-periods (0.1434 to 0.1494), despite the 2009 peak, before improving to 0.2215 in 2017 to 2024. The range within each sub-period remains wide, confirming that improvements in service quality have been episodic rather than steady. Figure 2 displays the trend of all the series.

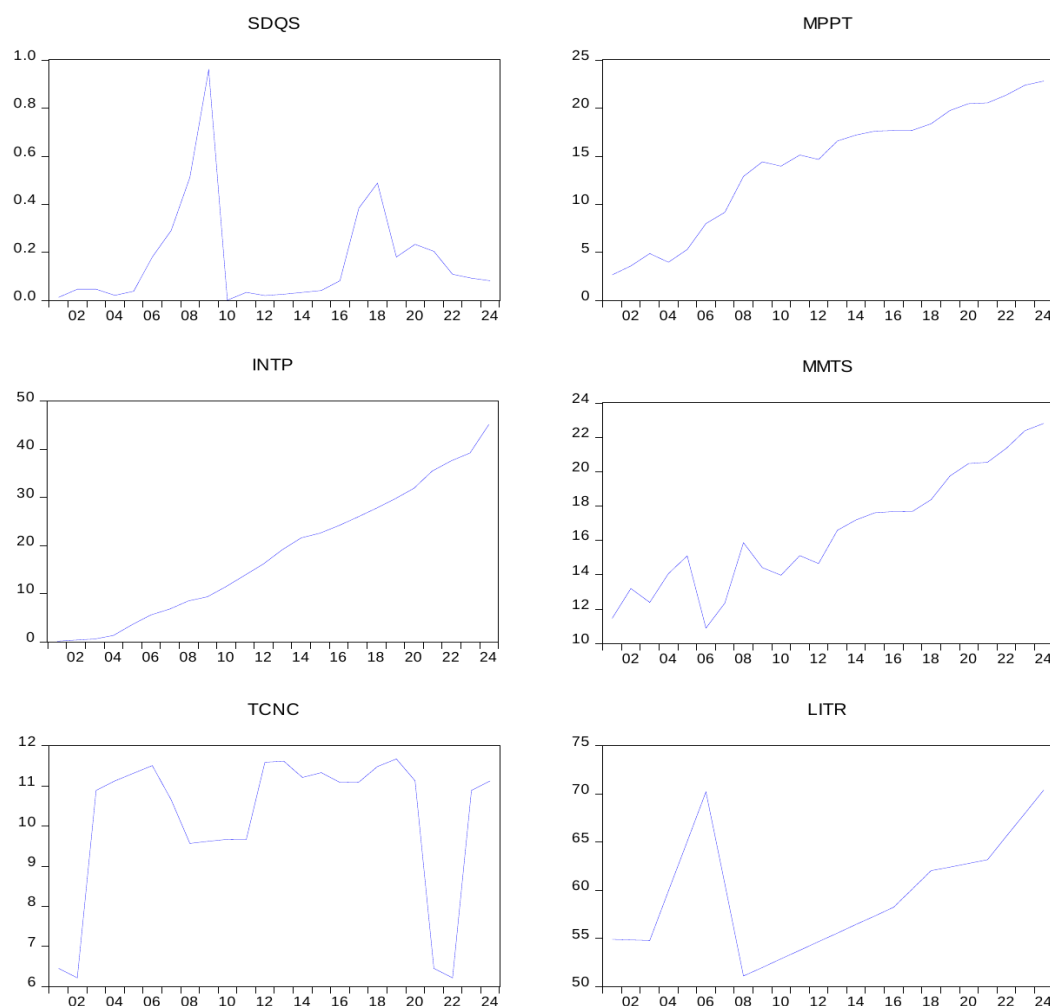


Figure 2: Trend of the Study Variables, 2001 to 2024

Source: Researcher's Computation using EViews 10 (2026)

Figure 2 shows that internet penetration, mobile phone penetration and mobile money transaction trended upwards almost continuously, while the SDQS was volatile, with peaks around 2009 and 2018. Network coverage fluctuated within a narrow band but fell sharply in 2001 to 2002 and again in 2021 to 2022, signalling shocks rather than a smooth trend. The contrast between steadily rising usage indicators and an erratic service delivery series foreshadows the mixed long-run results.

4.2 UNIT ROOT AND COINTEGRATION TESTS

Table 4: Augmented Dickey-Fuller Unit Root Test Results

Variable	ADF (Level)	5% Critical Value	Prob.	ADF (First Difference)	Prob.	Order
SDQS	-3.1217	-2.9981	0.0389	-5.6361	0.0002	I(0)
MPPT	-1.4339	-2.9981	0.5480	-4.3388	0.0028	I(1)
INTP	-3.1866	-2.9981	0.0280	-4.0049	0.0054	I(0)
MMTS	-3.9264	-3.0300	0.0142	-7.2062	0.0000	I(0)
TCNC	-4.8139	-3.0049	0.0010	-5.1839	0.0005	I(0)
LITR	-1.1306	-3.0124	0.6834	-3.0404	0.0148	I(1)

Source: Researcher's Computation using EViews 10 (2026)

Table 4 shows that the SDQS, internet penetration, mobile money transaction and network coverage were stationary at level, I(0), since their ADF probabilities were below 0.05, while mobile phone penetration and literacy rate became stationary only after first differencing, I(1). No series was integrated of order two. This mixed order of integration rules

out the Johansen procedure and justifies the ARDL bounds approach, which accommodates $I(0)$ and $I(1)$ regressors in one framework.

Table 5: ARDL Bounds Test for Cointegration

Test Statistic	Value	Significance	I(0) Bound	I(1) Bound
F-statistic	4.8293	10%	2.08	3.00
k	5	5%	2.39	3.38
		2.5%	2.70	3.73
		1%	3.06	4.15

Source: Researcher's Computation using EViews 10 (2026). Asymptotic critical values, restricted constant and no trend (Pesaran et al., 2001).

The bounds test in Table 5 returned an F-statistic of 4.8293, which exceeds the upper bound at the 5% (3.38), 2.5% (3.73) and 1% (4.15) levels. The null hypothesis of no levels relationship was therefore rejected, confirming that the SDQS and the digital transformation indicators share a stable long-run equilibrium.

4.3 LONG-RUN ESTIMATES AND TEST OF HYPOTHESES

Table 6: Long-Run ARDL Estimates (Dependent Variable: SDQS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPPT	0.1598	0.0601	2.6601	0.0171
INTP	-0.0503	0.0445	-1.1303	0.2750
MMTS	-0.1473	0.1312	-1.1226	0.2782
TCNC	0.0119	0.0013	9.4918	0.0000
LITR	0.0591	0.0196	3.0183	0.0082
C	-1.7056	2.1774	-0.7833	0.4449

Source: Researcher's Computation using EViews 10 (2026)

The estimated cointegrating relationship implied by Table 6 is:

$$ECT_t = SDQS_t - (0.1598MPPT_t - 0.0503INTP_t - 0.1473MMTS_t + 0.0119TCNC_t + 0.0591LITR_t - 1.7056) \quad (5)$$

where ECT_t is the deviation of service delivery from its long-run equilibrium path. Mobile phone penetration had a positive and significant long-run effect on the SDQS ($\beta = 0.1598$, $p = 0.0171$), implying that a unit increase in penetration raises the score by about 0.16 units, other things being equal. Internet penetration had a negative but insignificant effect ($\beta = -0.0503$, $p = 0.2750$), as did mobile money transaction ($\beta = -0.1473$, $p = 0.2782$). Network coverage had a positive and highly significant effect ($\beta = 0.0119$, $p = 0.0000$); although the coefficient is small, its t-statistic of 9.49 makes it the most precisely estimated determinant in the model. Literacy rate was positive and significant ($\beta = 0.0591$, $p = 0.0082$). The decisions on the hypotheses are summarised in Table 7.

Table 7: Summary of Hypothesis Tests

Null Hypothesis	Variable	Coefficient	Prob.	Decision
H01	MPPT	0.1598	0.0171	Rejected
H02	INTP	-0.0503	0.2750	Not rejected
H03	MMTS	-0.1473	0.2782	Not rejected
H04	TCNC	0.0119	0.0000	Rejected
H05	LITR	0.0591	0.0082	Rejected

Source: Researcher's Computation using EViews 10 (2026). Decisions at the 5% level of significance.

4.4 DIAGNOSTIC AND STABILITY TESTS

Table 8: Post-Estimation Diagnostic Tests

Test	Statistic	Value	Prob.	Decision
Jarque-Bera normality	JB	4.9806	0.0829	Residuals normal
Breusch-Godfrey serial correlation	F(2,16)	0.8042	0.4648	No serial correlation
Breusch-Pagan-Godfrey heteroskedasticity	F(5,18)	1.9073	0.1430	Homoskedastic
Ramsey RESET	t(17)	0.7614	0.4475	Correctly specified

Source: Researcher's Computation using EViews 10 (2026)

Table 8 shows that the residuals were normally distributed (Jarque-Bera $p = 0.0829$), free of serial correlation (Breusch-Godfrey $p = 0.4648$) and homoskedastic (Breusch-Pagan-Godfrey $p = 0.1430$), and that the model was correctly specified

(Ramsey RESET $p = 0.4475$). The CUSUM plot in Figure 3 remains within the 5% critical bounds throughout the recursive period, confirming parameter stability.

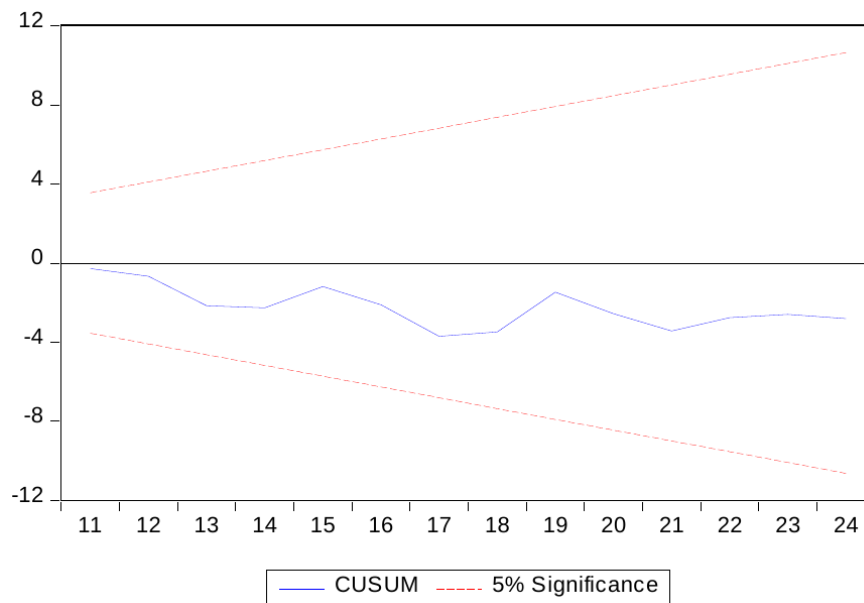


Figure 3: CUSUM Test of Parameter Stability

Source: Researcher's Computation using EViews 10 (2026)

4.5 DISCUSSION OF FINDINGS

The first finding, that mobile phone penetration significantly improves service delivery in the long run, aligns with Aker and Mbiti (2010), who showed that the spread of mobile telephony enabled new services and improved market efficiency across Africa, and with Feroz et al. (2020), who found that mobile phones enhanced the performance of community health workers. In UTAUT terms, a larger installed base reflects widespread performance expectancy, and in RBV terms the subscriber base is itself a strategic asset that justifies operators' investment in capacity. The present finding extends these largely descriptive accounts by establishing the effect statistically within the telecommunications industry itself.

The second finding, that internet penetration has a negative but insignificant effect, contrasts with Bardesi (2020), who found internet penetration to be the strongest positive driver of non-oil growth in Saudi Arabia. The divergence is explained by the outcome measured: internet access may stimulate aggregate activity while simultaneously straining network capacity and degrading the quality of service experienced by each user. The finding is consistent with Falowo and Falowo (2026), who argued that internet penetration in Sub-Saharan Africa is constrained by inadequate network-supporting infrastructure, which means that growth in users without commensurate capacity produces congestion rather than better service.

The third finding, that mobile money transaction has a negative and insignificant long-run effect, partly aligns with Kulu et al. (2022), who found that mobile money transactions were detrimental to banking sector performance in Ghana, although their effect was significant. It also aligns with Liana et al. (2023), whose evidence that technical quality in mobile payment services does not uniformly improve customer outcomes suggests that rising volumes can expose platform weaknesses. It diverges from the implication of Akinde and Saka (2026) that mobile money activity reflects operator efficiency, because volume alone does not indicate whether transactions are completed reliably. The result suggests that failed transfers, delayed confirmations and USSD downtime dilute the service benefits of mobile money in Nigeria.

The fourth finding, that network coverage is the most robust determinant of service delivery, agrees with Mothobi and Kebotsamang (2024), who found that proximity to network towers significantly raised the adoption of digital financial services, and with Falowo and Falowo (2026), who identified coverage deficits as the root of poor digital access. It strongly supports the RBV: coverage is the costly, hard-to-replicate infrastructure on which every other service depends, and its expansion yields durable quality gains. Unlike Mothobi and Kebotsamang (2024), who linked coverage to adoption in a single cross-section, the present study shows that coverage sustains service quality over a 24-year horizon.

The fifth finding, that literacy rate significantly improves service delivery, aligns with Inakefe et al. (2023), who found that low digital literacy undermined e-governance service delivery in Cross River State, and with Uzochukwu et al. (2025), who showed that users' intention and credibility perceptions drive service efficiency in Nigeria's communications agencies. Unlike Inakefe et al. (2023), however, the present study shows that literacy remains significant even after infrastructural variables are controlled, so its effect cannot be attributed to omitted structural factors. This reflects the facilitating-conditions construct of UTAUT: literate users extract more value from services and impose fewer avoidable demands on customer care.

5. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The study concludes that digital transformation exerts a meaningful but uneven long-run influence on service delivery in the Nigerian telecommunications industry. The infrastructural and access foundations of digital transformation, namely network coverage and mobile phone penetration, are the dependable drivers of service quality, while usage-intensity indicators, namely internet penetration and mobile money transaction, have not improved service delivery because their growth has outpaced the capacity and reliability of the network. Literacy plays a significant enabling role, and the weakest components of service delivery are complaint resolution and customer support rather than the technical network core. Effective service delivery therefore depends on the alignment of network capacity, access and user capability rather than on the expansion of any single digital indicator.

5.2 RECOMMENDATIONS

Based on the findings, the following recommendations are made:

- i. The NCC and operators should prioritise investment in network coverage, including base stations, fibre backbones and resilient power solutions in underserved areas, supported by infrastructure-sharing frameworks and protection of telecom sites as critical national infrastructure.
- ii. Operators and government should deepen mobile phone penetration in rural and peri-urban areas through affordable handset financing and reduced import duties on devices.
- iii. Operators should match internet subscriber growth with capacity expansion, and the NCC should enforce quality-of-service thresholds for data speed and congestion rather than tracking penetration alone.
- iv. The Central Bank of Nigeria, the NCC and operators should jointly reduce USSD and mobile money transaction failures through interoperability standards, dedicated signalling capacity and mandatory reversal timelines for failed transactions.
- v. Government and operators should invest in digital literacy campaigns and strengthen complaint resolution and customer support, which are the weakest components of the service delivery index.

5.3 LIMITATIONS OF THE STUDY

The study relied on 24 annual observations, which limits degrees of freedom, and on a composite service quality index whose aggregate form may conceal operator-level differences. Some early-year observations were interpolated. Future studies should use quarterly or operator-level panel data and test for asymmetric and threshold effects.

REFERENCES

1. Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, 24(3), 207–232. <https://doi.org/10.1257/jep.24.3.207>
2. Akinde, M. A., & Saka, K. A. (2026). Digital financial inclusion: Efficiency analysis of mobile money penetration by Nigerian telecommunication companies. *American Journal of Development Studies*, 4(1), 44–50. <https://journals.e-palli.com/home/index.php/ajds/article/view/4643>
3. Bardesi, H. J. (2020). Measuring the effect of the internet on economic growth: The case of Saudi Arabia. *International Journal of Economics and Finance*, 12(12), 61–69. <https://doi.org/10.5539/ijef.v12n12p61>
4. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
5. Breusch, T. S. (1978). Testing for autocorrelation in dynamic linear models. *Australian Economic Papers*, 17(31), 334–355. <https://doi.org/10.1111/j.1467-8454.1978.tb00635.x>
6. Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica*, 47(5), 1287–1294. <https://doi.org/10.2307/1911963>
7. Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, 37(2), 149–192. <https://doi.org/10.1111/j.2517-6161.1975.tb01532.x>
8. Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), 427–431. <https://doi.org/10.1080/01621459.1979.10482531>
9. Falowo, O., & Falowo, S. (2026). Low internet penetration in Sub-Saharan Africa and the role of LEO satellites in addressing the issue. *Telecom*, 7(1), Article 7. <https://doi.org/10.3390/telecom7010007>
10. Feroz, A., Jabeen, R., & Saleem, S. (2020). Using mobile phones to improve community health workers performance in low-and-middle-income countries. *BMC Public Health*, 20, Article 49. <https://doi.org/10.1186/s12889-020-8173-3>
11. Godfrey, L. G. (1978). Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables. *Econometrica*, 46(6), 1293–1301. <https://doi.org/10.2307/1913829>
12. Grönroos, C. (1984). A service quality model and its marketing implications. *European Journal of Marketing*, 18(4), 36–44. <https://doi.org/10.1108/EUM0000000004784>

13. Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2021). A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. *Journal of Management Studies*, 58(5), 1159–1197. <https://doi.org/10.1111/joms.12639>
14. Inakefe, G. I., Bassey, V. U., Ikeanyibe, O. M., Nwagboso, C. I., Agbor, U. I., Ebegbulem, J., Mbonu, F. I., & Ike, G. U. (2023). Digital literacy and e-governance adoption for service delivery in Cross River State Civil Service. *International Journal of Electronic Government Research*, 19(1), 1–23. <https://doi.org/10.4018/IJEGR.328327>
15. Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, 6(3), 255–259. [https://doi.org/10.1016/0165-1765\(80\)90024-5](https://doi.org/10.1016/0165-1765(80)90024-5)
16. Kulu, E., Opoku, A., Gbolonyo, E., & Kodwo, M. A. T. (2022). Mobile money transactions and banking sector performance in Ghana. *Heliyon*, 8(10), Article e10761. <https://doi.org/10.1016/j.heliyon.2022.e10761>
17. Liana, P., Jaensson, J.-E., & Mmari, G. (2023). Service quality dimensions as predictors of customer loyalty in mobile payment services: Moderating effect of gender. *Future Business Journal*, 9, Article 98. <https://doi.org/10.1186/s43093-023-00277-2>
18. Mothobi, O., & Kebotsamang, K. (2024). The impact of network coverage on adoption of Fintech and financial inclusion in sub-Saharan Africa. *Journal of Economic Structures*, 13, Article 5. <https://doi.org/10.1186/s40008-023-00326-7>
19. Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, 64(1), 12–40.
20. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
21. Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society: Series B (Methodological)*, 31(2), 350–371. <https://doi.org/10.1111/j.2517-6161.1969.tb00796.x>
22. Uzochukwu, I., Nwoye, M. I., & Azu, N. P. (2025). Effect of digital technology adoption on the performance of supervisory agencies of the Nigerian communications sector: Does behavioural intention matter? *International Journal of Innovative Research and Scientific Studies*, 8(7), 281–291. <https://ijirss.com/index.php/ijirss/article/view/10436>
23. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
24. Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
25. Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>
26. Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180. <https://doi.org/10.1002/smj.4250050207>