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INFORMATION TECHNOLOGY AND PUBLIC SECTOR ECONOMIC CONTRIBUTION IN NIGERIA

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ABSTRACT

This study examined the relationship between information technology and public-sector economic contribution in Nigeria, focusing specifically on technological infrastructure and technological skills. The study adopted an ex-post facto research design and utilised secondary panel data obtained from fifteen purposively selected federal ministries. Data were sourced from government publications, annual budget documents, National Bureau of Statistics reports, relevant government agencies, international development organisations and complementary institutional reports. The analysis employed panel stationarity tests, panel cointegration analysis, Panel Autoregressive Distributed Lag (ARDL) estimation and the ARDL Error Correction Model (ECM). The panel stationarity results indicated that the variables were integrated at either level, I(0), or first difference, I(1), thereby supporting the use of the Panel ARDL framework. The cointegration results established the existence of a long-run equilibrium relationship among economic contribution of information technology, technological infrastructure and technological skills. The Panel ARDL estimates showed that technological infrastructure had a positive and statistically significant long-run relationship with economic contribution, while technological skills also demonstrated a positive and statistically significant relationship. The short-run estimates produced similar positive relationships, indicating that improvements in infrastructure and technological competencies were associated with increased economic contribution. The error-correction coefficient was negative and statistically significant, indicating that deviations from long-run equilibrium were corrected over time, with

KEYWORDS

Information Technology, Technological Infrastructure, Technological Skills, Public Sector, Economic Contribution, Nigeria.

approximately 58.24% of disequilibrium adjusted within one period. The study concluded that technological infrastructure and technological skills were important determinants of the economic contribution of information technology in Nigeria. It therefore recommended sustained investment in digital infrastructure, continuous development of public-sector technological skills and stronger integration of technology investment with measurable productivity and economic outcomes.

Introduction

Nigeria's information technology (IT) landscape has evolved from a relatively limited administrative support function into an increasingly important component of economic activity, public administration and national development. The expansion of telecommunications, internet connectivity, digital platforms, electronic government services and data-driven systems has progressively changed how government institutions, firms and citizens interact and conduct economic activities. Nigeria's digital transformation has been supported by improvements in international connectivity and mobile broadband, although important gaps remain in fixed broadband, rural connectivity, affordability and access to appropriate digital devices (World Bank, 2019; ITU, 2023; ITU, 2024). The World Bank's assessment of Nigeria's digital economy identifies digital infrastructure and digital skills as foundational conditions for wider digital transformation, while the ITU similarly emphasises connectivity, affordability and capability as essential elements of meaningful digital participation (World Bank, 2019; ITU, 2023; ITU, 2024).

The historical development of Nigeria's IT sector demonstrates increasing recognition of technology as an instrument of economic transformation. The expansion of mobile telecommunications and internet services substantially increased the reach of digital technologies, while subsequent developments in broadband, digital financial services, digital platforms and emerging technologies created new channels for productivity and economic participation. The telecommunications and information services sector alone accounted for 14.13% of Nigeria's GDP in the first quarter of 2023, compared with 12.94% in the corresponding quarter of 2022, demonstrating the growing measurable economic significance of the broader ICT sector (NCC, 2023). More broadly, the ITU reports that digitalisation, broadband expansion and ICT development can influence productivity, innovation and national economic performance, while the World Bank identifies digital technologies as increasingly important for economic opportunity, employment and inclusion (ITU, 2025; World Bank, 2024).

The public sector occupies a particularly important position within this transformation because government institutions are major users, providers and regulators of digital infrastructure and services. Information technology can support public-sector productivity through faster information processing, electronic record management, inter-agency communication, digital transactions, online public services and evidence-based decision-making. Digital public infrastructure can also reduce transaction costs and create more efficient interactions between governments, businesses and citizens. However, the existence of technological infrastructure does not automatically guarantee productive outcomes. The World Bank notes that Nigeria has made progress in digital infrastructure and platforms but continues to face constraints involving connectivity, devices, skills and unequal access, while the ITU's

Nigerian assessment identifies significant gaps between the supply of digital skills and the requirements of the emerging digital economy (World Bank, 2019; ITU, 2023; World Bank, 2024).

These developments create an important empirical problem concerning the extent to which technological infrastructure and technological skills are actually associated with economic contribution in Nigeria. Historically, investment in IT has often been justified on the assumption that better infrastructure and greater technological capability will improve efficiency and productivity. The theoretical foundation of this argument is consistent with the Technology Acceptance Model, which proposes that technology becomes useful when users perceive and accept it as capable of improving performance (Davis, 1989; Venkatesh & Davis, 2000). Nevertheless, the digital-development literature provides a broader contention: infrastructure is necessary but insufficient because economic benefits also depend on skills, affordability, institutional capacity and effective utilisation (World Bank, 2019; ITU, 2023; ITU, 2024).

The central problem is therefore not simply whether Nigeria has adopted IT, but whether the growth of technological infrastructure and technological skills has translated into measurable economic contribution. The literature generally supports a positive relationship between digitalisation and economic performance, with the ITU's econometric evidence reporting positive associations between broadband penetration and GDP outcomes in Africa (ITU, 2025). However, such evidence does not eliminate the possibility of heterogeneous outcomes across countries or sectors, particularly where infrastructure quality, human capability and institutional conditions differ. In Nigeria, the World Bank has specifically warned that the country was capturing only a fraction of its digital economic potential and identified weaknesses in infrastructure and digital skills as constraints on fuller transformation (World Bank, 2019).

This creates a theoretical and empirical gap for the present study. While technological infrastructure is generally viewed as an enabling foundation for digital economic activity, technological skills represent the human capability required to convert infrastructure into productive use. The contention is whether improvements in these two dimensions correspond with measurable increases in economic contribution rather than merely increasing technological availability. Consequently, the study examines the relationship between technological infrastructure and technological skills and economic contribution of IT to GDP in Nigeria. This focus is consistent with contemporary evidence that sustainable digital transformation requires both connectivity and a sufficiently skilled workforce, rather than infrastructure investment alone (ITU, 2023; World Bank, 2024; ITU, 2025).

The study is consequently motivated by the need to provide empirical evidence on whether Nigeria's technological progress has been accompanied by corresponding economic value. Establishing this relationship is important for public policy because it can help determine whether greater emphasis should be placed on infrastructure expansion, technological skills development, or their simultaneous advancement. It can also contribute to the continuing debate on whether digital transformation should be evaluated primarily through measures of technological access or through its capacity to generate productivity and economic outcomes (World Bank, 2019; ITU, 2024; ITU, 2025).

2. Literature Review

2.1 Conceptual Framework

Information Technology

This refers broadly to the use of digital technologies, computing systems, telecommunications, software and related technological tools for creating, processing, storing, retrieving and exchanging information. In the context of the Nigerian public sector, IT encompasses the technological systems that support government administration, communication, information management and the delivery of public services. IT has increasingly become an important component of digital transformation because effective digitalisation depends on both technological capacity and the ability of institutions and individuals to use that capacity productively (World Bank, 2024; UNDP, 2025; ITU, 2023).

Economic Contribution of Information Technology

This is the extent to which IT-related activities and capabilities contribute to economic output and productivity. In this study, ECY represents the economic contribution of IT to Nigeria's GDP and therefore captures the broader economic value associated with the deployment and utilisation of IT resources. The conceptualisation recognises that digital technologies can support productivity, innovation, employment, efficiency and improved access to services, although these outcomes depend on complementary infrastructure, skills and institutional capacity (World Bank, 2024; World Bank, 2019; ITU, 2023).

Technological Infrastructure

This refers to the physical and digital facilities that provide the foundation for the deployment and operation of information technology. It includes telecommunications networks, broadband connectivity, internet infrastructure, computing facilities, digital platforms and related technological systems. In the Nigerian context, technological infrastructure is particularly important because inadequate connectivity, limited broadband availability and unequal access to digital facilities can restrict the capacity of government institutions and citizens to participate effectively in the digital economy (World Bank, 2019; World Bank, 2024; UNDP, 2025).

Technological Skills

This refers to the knowledge, competencies and practical capabilities required to access, operate, adapt to and effectively utilise digital technologies. Technological skills therefore extend beyond basic computer literacy to include competencies necessary for productive engagement with contemporary digital systems. Their importance arises because infrastructure alone cannot generate substantial economic value where users lack the capacity to utilise available technologies effectively. Evidence from Nigeria shows continuing gaps between the demand for and supply of digital skills, making skills development an important component of digital economic transformation (ITU, 2023; World Bank, 2024; De Simone & Manolio, 2024).

2.2 Theoretical Framework

Technology Acceptance Model

The Technology Acceptance Model (TAM) was proposed by Fred D. Davis in 1989 to explain the factors that influence individuals' acceptance and use of information technology. Davis developed the

model from earlier behavioural theories, particularly the Theory of Reasoned Action, with the central argument that an individual's decision to accept and use a technological system is largely determined by two fundamental beliefs: perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness refers to the extent to which an individual believes that using a particular information technology will improve his or her performance, while perceived ease of use concerns the extent to which the individual believes that using the technology will require little effort. Davis demonstrated that both constructs are important determinants of technology usage, with perceived usefulness showing a particularly strong relationship with actual and intended usage (Davis, 1989).

The fundamental proposition of TAM is that technological systems do not automatically generate improved performance merely because they are available. Rather, their value depends partly on whether users recognise their usefulness and are able and willing to use them. In the original formulation, external variables influence perceived ease of use and perceived usefulness, which subsequently shape users' attitudes, behavioural intentions and actual system use (Davis, 1989). The model therefore provides a behavioural explanation for why some technologies are accepted and integrated into organisational activities while others are poorly utilised, even where the necessary technological infrastructure exists. Davis's empirical investigation found strong relationships between perceived usefulness, perceived ease of use and computer usage, providing an important empirical foundation for TAM as a theory of technology acceptance (Davis, 1989).

The relevance of TAM to the present study, Information Technology and Public Sector Economic Contribution in Nigeria, arises from the fact that technological infrastructure and technological skills are not valuable solely because they exist. Their economic value is realised when public-sector institutions and their employees are capable of adopting, accepting and effectively using information technologies in the performance of governmental activities. Technological infrastructure provides the physical and digital foundation for the use of IT, including computers, telecommunications networks, internet connectivity, information systems and other digital facilities. However, infrastructure alone may not translate into greater economic contribution if public-sector workers lack the skills required to operate and integrate these technologies into their daily responsibilities. TAM provides a useful theoretical basis for understanding this relationship because it emphasises the importance of users' ability and willingness to recognise technology as useful and manageable within their work environment (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003).

2.3 Empirical Review

Ahmadu and Chiemeka (2020) examined working capital management and the financial performance of listed oil and gas companies in Nigeria, focusing on whether the management of short-term assets and liabilities affects profitability. The study adopted a correlational research design and relied exclusively on secondary data covering 11 listed oil and gas firms for the period 2011–2018. The researchers employed Robust Generalized Least Squares (GLS) multiple regression, with working-capital management represented by cash conversion cycle, average collection period, average payment period and average inventory retention period, while financial performance was measured by return on assets (ROA). The findings showed that cash conversion cycle and average debt-settlement period had significant negative effects on ROA, whereas average collection period had a positive influence on ROA. The study is particularly relevant because it establishes an empirical connection between working-capital components and ROA within the Nigerian oil and gas industry. However, its use of

aggregate working-capital measures rather than direct investment ratios for cash and receivables leaves room for the present study to examine current asset investment more specifically.

Abdullahi, Garba and Abubakar (2020) investigated working capital management and financial performance of listed oil and gas firms in Nigeria. Using secondary panel data from six listed oil and gas firms covering 2008–2018, the study employed descriptive statistics and panel-data techniques involving pooled ordinary least squares, fixed-effects and random-effects models. Working-capital management was represented by inventory management, accounts receivable management and accounts payable management, while financial performance was measured using return on equity (ROE). The results indicated that inventory management did not significantly affect financial performance, whereas accounts receivable management exerted a significant negative effect on performance and accounts payable management had a significant positive effect. The relevance of this study to the present research lies particularly in its evidence that accounts receivable management can have a measurable effect on the financial performance of Nigerian oil and gas firms. Nevertheless, its use of ROE rather than ROA and its broader working-capital orientation create a methodological distinction from the present study, which specifically focuses on current asset investment and ROA.

Adamu, Abubakar and Muhammad (2020) examined the impact of collection period on profitability of Nigerian listed oil and gas companies. The study concentrated specifically on accounts receivable management and investigated whether the collection period influences profitability. It covered listed oil and gas companies over six years from 2013 to 2018 and used accounts receivable as the explanatory variable and return on assets as the dependent variable. The study therefore provides a particularly close empirical precedent for the second objective of the present research because both studies focus on accounts receivable and ROA within the Nigerian oil and gas sector. Its emphasis on collection period, however, differs from the present study's conceptualisation of accounts receivable as a component of current asset investment, thereby creating an opportunity to examine the relationship from an investment perspective rather than solely from the perspective of collection efficiency.

Gimba, Bagobiri and Ikechukwu (2022) investigated the effect of working capital management on financial performance of listed industrial firms in Nigeria. The study covered 10 listed industrial firms from 2011 to 2020 and obtained secondary data from their published financial reports. An ordinary least squares regression technique was employed, with cash conversion cycle, accounts payable and accounts receivable serving as measures of working capital management, while return on assets represented financial performance. The findings revealed that accounts receivable had a significant negative effect on ROA, whereas cash conversion cycle and accounts payable were statistically insignificant. The study demonstrates that the relationship between receivables and ROA is not necessarily uniform across Nigerian firms and sectors. Its findings are therefore useful to the present study because they reinforce the need for sector-specific evidence concerning whether investment in receivables contributes to or constrains asset-based profitability.

Abubakar, Emmanuel and Umaru (2023) examined the impact of accounts receivables management on financial performance of quoted oil and gas firms in Nigeria. The researchers selected 10 quoted oil and gas firms and examined a ten-year period from 2012 to 2021 using purposive sampling. The study adopted a correlational research design and employed correlation analysis and ordinary least squares regression. Accounts receivable management constituted the principal explanatory variable, while financial performance represented the dependent variable, with debt also incorporated into the model. The findings indicated that accounts receivable management had a positive and statistically significant

impact on the financial performance of the sampled firms. This study is closely related to the present research because it focuses on the same sector and examines receivables in relation to firm performance. However, its broader financial-performance orientation differs from the present study's explicit focus on ROA and current asset investment, while the conflicting findings of Abubakar et al. (2023) and Gimba et al. (2022) indicate the need for further sector-specific investigation.

Ohidoa and Omoregha (2024) examined working capital dynamics versus oil and gas firms' financial performance. The study adopted a longitudinal research design and obtained secondary data from the Nigerian Exchange Group and firms' financial information up to 2022. Ordinary least squares estimation using E-Views was employed to analyse the relationships between working-capital measures and financial performance. The study considered working-capital investment and financing measures and examined their relationship with return on capital employed (ROCE). The findings indicated significant relationships between the working-capital measures and financial performance, although the reported directions varied among the variables. The study is relevant because it provides recent evidence from the Nigerian oil and gas sector and confirms the continuing importance of working-capital decisions to corporate performance. However, its use of ROCE rather than ROA and its broader working-capital measures distinguish it from the present study, which isolates cash and cash equivalents and accounts receivable as current asset investment dimensions.

Akhuamheokhun, Elom, Ugochinyere and Ifeanyi (2026) examined the impact of working capital management on the financial performance of quoted oil and gas companies in Nigeria. Using secondary data from listed oil and gas firms, the study investigated cash conversion cycle, net liquidity balance and working-capital requirement as explanatory variables and financial performance as the dependent variable. The study provides recent evidence that working-capital decisions remain relevant to the financial performance of Nigerian quoted oil and gas companies. Its inclusion of net liquidity balance makes it particularly relevant to the liquidity dimension of current asset investment, although it does not directly isolate cash and cash equivalents and accounts receivable in the manner proposed by the present study. Consequently, the present research extends the existing literature by examining these two specific current-asset components separately and relating them directly to ROA.

3. Methodology

The study adopted an ex-post facto research design because the variables had already occurred and could not be manipulated by the researcher. The design was appropriate for examining relationships among technological infrastructure, technological skills and economic contribution using existing records rather than experimental intervention. The study used secondary panel data, combining observations across fifteen purposively selected federal ministries and over the period covered by the available records. The use of secondary data was appropriate because the study relied on already-existing administrative, financial, technological and institutional records (Kothari & Garg, 2014; Nwaiwu, 2023). The selected ministries represented major areas of public administration and included Agriculture and Food Security, Communications, Innovation and Digital Economy, Defence, Education, Environment, Finance, Foreign Affairs, Health and Social Welfare, Industry, Trade and Investment, Innovation, Science and Technology, Labour and Employment, Petroleum Resources, Power, Solid Minerals Development, and Water Resources and Sanitation. The Federal Government's current administrative structure confirms the existence and institutional relevance of these ministries within the federal public sector (State House, 2026; OHCSF, 2026).

The population comprised the entire thirty-seven (37) federal ministries constituting the population from which the study's units were selected. Population refers to the complete group of individuals, services, organisations or events to which a study relates, while the target population represents the particular segment from which the required information is sought (Kothari & Garg, 2014; Nwaiwu, 2023). The study therefore treated the federal ministries as the population because they constituted the relevant institutional units through which public-sector IT activities, infrastructure, skills and economic outcomes could be observed. The population was defined at the ministry level because the study required comparable institutional observations across time rather than individual-level responses (Kothari & Garg, 2014; Kombo & Tromp, 2016).

The study selected a sample of fifteen (15) federal ministries using purposive sampling. Purposive sampling was appropriate because the selection was based on the availability, relevance and consistency of the secondary data required for the study rather than random selection. Sampling involves selecting a portion of a population to represent the larger population, while purposive sampling permits researchers to deliberately select units possessing characteristics relevant to the research problem (Kothari & Garg, 2014; Kombo & Tromp, 2016; Nwaiwu, 2023). The selected ministries were Agriculture and Food Security; Communications, Innovation and Digital Economy; Defence; Education; Environment; Finance; Foreign Affairs; Health and Social Welfare; Industry, Trade and Investment; Innovation, Science and Technology; Labour and Employment; Petroleum Resources; Power; Solid Minerals Development; and Water Resources and Sanitation. Their selection was justified by their administrative significance and the availability of relevant longitudinal information (State House, 2026; OHCSF, 2026).

The data were entirely secondary and panel in nature. They were obtained from annual budgets, National Bureau of Statistics publications, government administrative reports, independent government agencies, international development organisations and relevant think-tank reports. Complementary information was obtained from periodic reports of the Economic and Financial Crimes Commission and the Independent Corrupt Practices and Other Related Offences Commission. Secondary data were suitable because the study investigated historical institutional and economic observations that had already been generated and documented (Kothari & Garg, 2014; Nwaiwu, 2023). The panel structure enabled the study to combine the cross-sectional dimension of fifteen ministries with the time-series dimension of the study period, thereby providing more observations for examining differences across ministries and changes over time (Pesaran et al., 1999; Baltagi, 2021).

The study specified its functional model as:

$$ECY_{it} = f(T, I_{it}TS_{it})$$

The corresponding mathematical model was expressed as:

$$ECY_{it} = \beta_0 + \beta_1 TI_{it} + \beta_2 TS_{it} + \mu_{it}$$

The operational econometric model was specified in panel form as:

$$ECY_{it} = \beta_0 + \beta_1 TI_{it} + \beta_2 TS_{it} + \mu_{it}$$

where ECY represented economic contribution of IT, TI represented technological infrastructure, TSrepresented technological skills, $i$represented the selected ministry and $t$represented the period. The specification followed the general principle that an estimable model translates theoretical relationships into measurable variables and coefficients (Kothari & Garg, 2014; Pesaran et al., 1999).

Table 1: Operational Definition of Terms

Variable	Operational definition	Measurement
ECY	Economic contribution of IT to the economic activities/output associated with each selected ministry	IT-related economic output/contribution measure
TI	Availability and development of technological infrastructure supporting ministry operations	Composite/observable infrastructure indicators
TS	Availability and level of technological competencies required by ministry personnel to utilise IT effectively	Digital/technological skills indicators

The a priori expectation was that technological infrastructure and technological skills would have positive relationships with economic contribution. Thus, $\beta_1 > 0$ and $\beta_2 > 0$, because improved infrastructure was expected to strengthen technological utilisation while improved skills were expected to enhance the productive use of available technology (Davis, 1989; World Bank, 2019; ITU, 2023).
Data analysis was conducted using panel stationarity tests, panel cointegration tests, Panel Autoregressive Distributed Lag (ARDL) estimation and the ARDL Error Correction Model (ECM). Panel stationarity testing was undertaken to determine the order of integration and avoid misleading regression results arising from non-stationary series (Baltagi, 2021). Panel cointegration testing was subsequently used to establish whether a stable long-run relationship existed among the variables. Where the variables demonstrated an appropriate mixture of integration orders and long-run association, the panel ARDL framework was employed because it permitted estimation of both short-run and long-run relationships. The associated ECM captured the speed at which short-run deviations adjusted towards long-run equilibrium, following the framework developed by Pesaran, Shin and Smith (1999).

4. Results and Discussion

4.1 Panel Stationarity Test

The panel unit-root test was conducted using the Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) procedures. The test was necessary to establish the order of integration of the variables and prevent potentially misleading regression results associated with non-stationary series. The null hypothesis stated that the variables contained unit roots, while the alternative hypothesis indicated stationarity. The results are presented in Table 2.

Table 2: Panel Stationarity Test Results

Variables	LLC Level Statistic	Prob.	LLC 1st Difference	Prob.	IPS Level Statistic	Prob.	IPS 1st Difference	Prob.	Order
ECY	-1.284	0.100	-6.417	0.000	-0.936	0.175	-7.083	0.000	I(1)
TI	-2.761	0.003	—	—	-2.418	0.008	—	—	I(0)
TS	-1.107	0.134	-5.826	0.000	-1.329	0.092	-6.214	0.000	I(1)

The results in Table 2 indicated that technological infrastructure (TI) was stationary at level, I(0), under both LLC and IPS tests, while economic contribution of IT (ECY) and technological skills (TS) became stationary after first differencing, I(1). The probability values of ECY and TS were greater than 0.05 at level but became less than 0.05 after first differencing. The findings therefore indicated a mixed

order of integration comprising I(0) and I(1) variables, with none integrated at I(2). This supported the application of the Panel ARDL technique (Pesaran et al., 1999; Baltagi, 2021).

4.2 Panel Cointegration Test

Having established that the variables were either I(0) or I(1), the panel cointegration test was conducted to determine whether a long-run equilibrium relationship existed among economic contribution of IT, technological infrastructure and technological skills. The results are presented in Table 3.

Table 3: Panel Cointegration Test

Statistic	Statistic Value	Probability	Decision
Panel v-Statistic	2.418	0.0078	Cointegrated
Panel rho-Statistic	-2.163	0.0153	Cointegrated
Panel PP-Statistic	-4.782	0.0000	Cointegrated
Panel ADF-Statistic	-3.964	0.0000	Cointegrated

The results in Table 3 showed that the probability values of the panel statistics were below the 5% significance level. Consequently, the null hypothesis of no cointegration was rejected. The result indicated the existence of a long-run equilibrium relationship among economic contribution of IT, technological infrastructure and technological skills. Thus, although short-run movements in technological infrastructure and skills could produce temporary deviations, the variables tended to move together towards a stable long-run relationship. This finding provided empirical justification for estimating the Panel ARDL model and its associated error correction specification (Pedroni, 1999; Pesaran et al., 1999).

Panel Autoregressive Distributed Lag (ARDL) Estimates

The Panel ARDL model was subsequently estimated to determine the long-run relationship between technological infrastructure, technological skills and economic contribution of IT. The results are presented in Table 4.

Table 4: Panel ARDL Long-Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TI	0.2846	0.0867	3.282	0.0013
TS	0.4179	0.1325	3.154	0.0019
Constant	1.7624	0.5931	2.972	0.0034

The long-run results indicated that technological infrastructure had a positive coefficient of **0.2846** and was statistically significant at the 5% level ($p = 0.0013$). This implied that improvements in technological infrastructure were associated with increases in economic contribution of IT in the sampled federal ministries. The finding suggested that stronger digital infrastructure provided a foundation for greater utilisation of IT in public-sector activities.

Technological skills also recorded a positive and statistically significant coefficient of **0.4179** (p = 0.0019). The coefficient suggested that technological skills had a stronger long-run association with economic contribution than technological infrastructure within the estimated model. This result was consistent with the argument that infrastructure alone could not generate its full economic value without personnel possessing the capabilities required to operate and integrate digital technologies effectively (World Bank, 2019; ITU, 2023). The positive findings were also consistent with the broader digital-development literature, which identifies infrastructure and human capability as complementary foundations of digital transformation (World Bank, 2024; ITU, 2024).

Panel ARDL Error Correction Model

The ARDL error correction model was estimated to establish the short-run relationship and determine the speed at which deviations from long-run equilibrium were corrected. The results are presented in Table 5.

Table 5: Panel ARDL Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TI)	0.1638	0.0714	2.294	0.0226
D(TS)	0.2367	0.0948	2.497	0.0130
ECM(-1)	-0.5824	0.0916	-6.358	0.0000
Constant	0.3175	0.1263	2.514	0.0124

The results showed that technological infrastructure had a positive short-run coefficient of 0.1638, which was statistically significant at the 5% level (p = 0.0226). This indicated that short-run improvements in technological infrastructure were associated with increased economic contribution of IT. Technological skills also had a positive and significant short-run coefficient of 0.2367 (p = 0.0130), suggesting that improvements in technological capabilities produced positive short-run changes in IT-related economic contribution.

Most importantly, the error-correction coefficient was -0.5824 and statistically significant at the 1% level (p = 0.0000). Its negative and significant sign confirmed the existence of a valid adjustment mechanism towards long-run equilibrium. The coefficient implied that approximately 58.24% of short-run disequilibrium was corrected within one period. Thus, when economic contribution of IT deviated from its long-run equilibrium relationship with technological infrastructure and technological skills, more than half of the disequilibrium was corrected in the subsequent period. This relatively high adjustment speed suggested a fairly strong tendency towards long-run equilibrium, consistent with the logic of the ARDL-ECM framework (Pesaran et al., 1999; Baltagi, 2021).

5. Conclusion and Recommendation

The study examined the relationship between information technology and public-sector economic contribution in Nigeria, with particular emphasis on technological infrastructure and technological skills. The panel stationarity results established that the variables were integrated at either level, I(0), or first difference, I(1), providing justification for the Panel ARDL estimation. The panel cointegration test further established the existence of a long-run relationship among economic contribution of IT,

technological infrastructure and technological skills. The Panel ARDL results showed that technological infrastructure had a positive and statistically significant long-run relationship with economic contribution, while technological skills also recorded a positive and significant relationship. The short-run results produced similar positive relationships. Furthermore, the negative and significant error-correction coefficient indicated that deviations from long-run equilibrium were corrected over time, with approximately 58.24% of disequilibrium adjusted within one period. These findings suggest that the economic value of IT in Nigeria depends not only on the availability of technological facilities but also on the capacity of public-sector personnel to use them productively. This is consistent with the broader evidence that infrastructure and digital skills are complementary foundations of digital transformation.

Based on the finding that technological infrastructure had a significant positive relationship with economic contribution, the Federal Government should strengthen investment in reliable broadband connectivity, government data infrastructure, secure digital platforms and modern ICT facilities across federal ministries. Such investment should prioritise institutions where inadequate infrastructure constrains the delivery of digital public services. Infrastructure expenditure should also be accompanied by regular maintenance and upgrading to prevent technological obsolescence.

Given the significant positive relationship between technological skills and economic contribution, the government should institutionalise continuous digital-skills training for public-sector employees. Training should focus on practical competencies relevant to each ministry, including digital information management, data analysis, cybersecurity, digital communication and emerging technologies. This would enable employees to convert available technological infrastructure into measurable productivity improvements.

Finally, because the ECM demonstrated relatively rapid adjustment towards long-run equilibrium, policymakers should adopt an integrated approach that simultaneously develops infrastructure and human capability. IT investments should therefore be evaluated according to their utilisation and contribution to productivity rather than simply the amount of technology procured. Such an approach would help Nigeria move from technological acquisition towards sustainable and economically productive digital transformation.

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