Impact of Information and Communication Sector on Economic Growth in Nigeria: (1985 - 2023)

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Abstract

The role and growing recognition of information and communication in driving modern economies, which despite its rise, limited empirical evidence exists on the disaggregated impact of its sub-sectors on economic growth in Nigeria. This paper examines impact of information and communication sector on economic growth in Nigeria from 1985 to 2023. The paper used the ARDL technique and found telecommunication services (TCS) had a coefficient of 1.0561 signifying a positive impact on real gross domestic product with a probability value of 0.4807, which is greater than 0.05 and indicating that telecommunication services have an insignificant positive impact on economic growth in the long run. While publishing services (PBS) with coefficient of -501.8714 and probability value of 0.5073, which is greater than 0.05. This implies that publishing services have an insignificant negative impact on economic growth in the long run. Also, music production services (MPS) show coefficient is 140.1159 with a probability value of 0.0000, which is less than 0.05. This indicates that music production services have a significant positive impact on economic growth in the long run. Similarly, broadcasting services (BCT) with coefficient of -47.2304 with a probability value of 0.0003, which is less than 0.05 shows that broadcasting services have a significant negative impact on economic growth in the long run and recommended that the Nigerian Communications Commission (NCC) should collaborate with telecommunication service providers to expand network coverage, improve service quality, and reduce the cost of data and voice services. The Federal Ministry of Information and National Orientation, in partnership with the Nigerian Copyright Commission (NCC), should support the digitalization of publishing services by providing grants and incentives for the adoption of digital publishing platforms. This will boost the contribution of publishing services to economic growth through wider information dissemination.

Keywords: *Information and Communication, Economic Growth, Nigeria, ARDL Technique, Telecommunication Services*

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Background to the Study

The continuous rise in the production of economic output like goods and services in one period of time compared with a previous period is called economic growth as it is measured in real terms and global economic growth which was projected to have rebounded in 2021 was not visible, with the World Bank Global Economic Prospects Report showed that an expected expansion of 5.6% which was to be the fastest post-recession pace in 80 years (World Bank, 2024). However, growth was forecasted to slow in subsequent years, with projections of 3.1% in 2024 and 3.2% in 2025 (World bank, 2024). The global economy was expected to have grown by 5.9% in 2021 and 4.9% in 2022. Despite this rebound, the growth profile remains weak compared to previous years (World bank, 2024).

Nigeria's Gross Domestic Product (GDP) grew by 3.46% (year-on-year) in real terms in the fourth quarter of 2023. This growth rate is lower than the 3.52% recorded in the fourth quarter of 2022 and higher than the third quarter of 2023 growth of 2.54%. The performance of the GDP in the fourth quarter of 2023 was driven mainly by the Services sector, which recorded a growth of 3.98% and contributed 56.55% to the aggregate GDP. The percentage contribution in 2023 of the combined sectors of information and communication which include Information and Communication, Telecommunications and Information Services, Publishing, Motion Pictures, Sound Recording & Music Production, Broadcasting to gross domestic product as shown in the CBN Statistical Bulletin (2024) is calculated to be 14.59 per cent as it is the highest compared to previous years with lower percentage which is a positive progressive progression (National Bureau of Statistics, 2025).

National Bureau of Statistics (NBS) (2025) showed that the sector recorded a 4.3 per cent increase from its performance in the last quarter of 2022 when it recorded 13.55 per cent. When compared on a year-on-year basis, the growth showed positive progression from 12.94 per cent in the first quarter of 2022, to the 2023 figure of 14.13 per cent which is an approximate growth of 9.19 per cent. The percentage of telecom contribution to GDP was calculated from 46 distinct sectors of the economy, which constitute telecom and information services baskets. Telecommunications and Information Services in 2023 contributed 6.050 percent to the national gross domestic product and also is expected to have a positive relationship on economic growth, Also Publishing contributed 0.0114 per cent to gross domestic product showing a positive relationship on gross domestic product. Also Motion Pictures, Sound recording & Music production contributed 0.442 percent to the national gross domestic's product and also is expected to have positive impact on gross domestic product. The broadcasting sector contributed 0.793 percent to the gross domestic product which is expected to also have a positive impact on gross domestic product (NBS, 2025).

Several government policies have been implemented to increase the level of economic growth like NITEL was incorporated as a limited liability company in December 1984, the liberalization of the telecommunications sector in 1992, which led to the establishment of mobile service providers, significantly increased access to telecommunication services, contributing to economic growth (Bureau of Public Enterprises, 2025), introduction of the Digital Switch Over (DSO) policy in 2016 was to mark a turning point for the broadcasting

sector. However, these contributions are yet to be fully quantified and analyzed as issues such as inadequate infrastructure, limited satellite coverage, insufficient data centers, outdated telecommunication buildings, and a lack of advanced technologies like fiber-optic networks and 5G services, digital device, regulatory bottlenecks, and limited access to financial resources are hindering the potential of information and communication sector to drive economic growth.

This study seeks to examine the impact of information and communication services sector on economic growth in Nigeria from 1985 to 2023, focusing on telecommunication services, publishing services, music production services, and broadcasting services. By investigating these sectors, the study aims to understand their respective roles and the challenges that need to be addressed to maximize their contribution to Nigeria's economic growth. Based on the study objective the hypothesis to be test are;

H_{01}:   Telecommunication services have no significant impact on economic growth in Nigeria.
H_{02}:   Publishing services has no significant impact on economic growth in Nigeria.
H_{03}:   Music production services have no significant impact on economic growth in Nigeria.
H_{04}:   Broadcasting services has no significant impact on economic growth in Nigeria.

Literature Review
Conceptual Review
Telecommunications and Information Services
Telecommunication and Information services is the process of transmitting information over a distance using technology such as telephone lines, cable, or satellite. Also, Adebayo (2023) explained that telecommunication and information services is the science and practice of transmitting information by electromagnetic means. It is a key part of the modern world, as it allows people to communicate with each other and access information and resources from around the globe. It involves voice communication, data communication, multimedia communication (Ochei & Mamudu, 2020), satellite communication, wireless communication and optical communication. The system in telecommunication and information services uses devices and technologies like telecommunication networks, telephone networks, radio and television networks, the internet, satellite networks, cellular networks, and optical networks to transmit and receive information over a distance. According to Mendonça *et al.* (2022) described the future of telecommunication and information services to be in 5G, Artificial intelligence, Quantum communication, Space-based communication and Increased connectivity.

Publishing
Publishing is the activity of making information, literature, music, software, and other content available to the public for sale or for free (Aboyade *et al.* 2024). Traditionally, the term refers to the creation and distribution of printed works, such as books, comic books, newspapers, and magazines (Afolabi & Zolkepli, 2023). It is the process of getting an author's manuscript into the hands of a reader, by materializing it as a book (Ajayi & Ihebuzor, 2023). It is also a

business or profession. Publishing has been defined by Nigerian Copyright Commission (2022) as the skeleton production and circulation of written matters. It noted the publisher's function as, to seek out or accept to publish good manuscript and having produced the works in print to promote and market them. Publishing could also be defined as the business of issuing books, music, photographs, maps and other printed materials for sale to the public which includes negotiating contracts with authors and their library agents, editing the authors manuscripts, designing the physical items (typography, layout etc.), producing the finished product (printing, binding etc.), marketing the work, and deciding for its distribution through regular market channels.

According to Okon and Ekanem (2022) that any person, group of individuals, or corporate organizations, engaged in the business of producing and sales of books and other printed materials to the public is called a publisher. He said that there are different types of publishing which are Traditional and Trade Publisher which involves contract with an author, ideally offering an advance against royalties, Mass Market Publishers which offer similar contracts to trade publishers though sometimes the copyright may be in the publisher's name or a joint copyright. Book Packagers also known as book developers generate story and series concepts, which they sell to Traditional, Small Presses publish books for young readers; Educational Publishers publish curriculum; Self-Publishing requires the author to oversee all of the details of book production, from total cost to marketing and distribution, Foreign or Non-Indigenous Publishers. This is a publishing house where a non-Nigerian parent corporation holds a majority ownership interest. Examples of foreign publishers in Nigeria are Macmillan, Longman, Thomas Nelson, Oxford University Press etc.; Indigenous Publishers house in which the Nigerian firms are the controlling body.

Motion Pictures, Sound Recording
Motion pictures are based on the phenomenon where the human brain perceives continuous movement from a rapid succession of still images, typically exposed at a rate above 15 frames per second (Oyeniran & Onikosi-Alliyu, 2016). This concept was first demonstrated by Eadweard Muybridge in 1877 using multiple cameras to capture the motion of a galloping horse.The development of motion pictures involved innovations such as the motion-picture camera, which uses mechanisms like the Geneva watch movement to capture images at regular intervals, and the use of celluloid film, which allowed for the storage and projection of these images. Thomas Edison and the Lumière brothers were pivotal in advancing motion picture technology, with Edison developing the Kinetoscope and the Lumières creating the cinématographe, which allowed for projection to audiences. While sound recording involves capturing vibrations in the air onto a storage medium, such as phonograph discs, magnetic tapes, or digital formats (Kujore *et al.* 2021). The process of sound recording and reproduction has evolved through mechanical, magnetic, and optical systems. In motion pictures, sound recording has seen significant advancements in fidelity, synchronization with images, and postproduction manipulation. Early sound systems like Vitaphone used discs, but sound-on-film systems became more prevalent due to their convenience and ability to synchronize sound with motion pictures. The development of technologies like the Audion vacuum tube and optical sound recording systems facilitated the integration of sound in films, leading to the era of "talkies" in the late 1920s.

Music Production
Production in music refers to the multifaceted process of creating, recording, and finalizing a musical piece, transforming raw vocal and instrumental sounds into a polished auditory masterpiece (Aigheyisi, 2021). Music production is the process of creating and manipulating music, so it can be distributed and enjoyed by the fans. All the recorded music that we currently listen to is made available, thanks to the minds and talents of music producers. The process of music production is getting the idea, recording, editing, mixing and mastering.

Broadcasting
Broadcasting has been defined as the transmission of information through radio waves from a radio or television station, to the audience in far and near places, through their receivers, which help in decoding such information (National Broadcasting Commission (NBC), 2022). Similarly, broadcasting can also be defined as the dissemination of information by an organization (radio or television station) to a widely dispersed heterogeneous audience through their radio or television receivers. Basically, broadcasting serves three broad purposes; it informs, educate and entertain the audience (Mendonça *et al.* 2022).

Economic Growth
Economic growth is a broad term that describes the process of increasing a country's real gross domestic product (GDP). The growth can be measured as an expansion of real GDP or gross national product (GNP) over a given period. The economy moves through different periods of activity. This movement is called the business cycle. It consists of four phases which are expansion that happens as a result of increase in employment, income, industrial production, and sales, and there is a rising real gross domestic product, while the Peak happens when economic expansion hits its height which can be seen as prosperity. Also, contraction is a phase where the characteristics of an expansion all begin to go down and becoming a recession when as a significant decline in economic activity spreads across the economy. The Trough phase is a point in the economic cycle where activity is at its nadir, marking the end of a contraction phase. Economic growth and the expansion of production capacity according to Ochei and Mamudu (2020) comes from technological change and capital accumulation. If a country puts all its resources to produce goods and services and none of its resources to accumulate capital, its production capacity will not change.

Empirical Review
Akawu *et al.* (2024) investigated the Effects of Telecommunication and Solid Minerals Revenues on Economic Growth in Nigeria from 1986 - 2022 by using ARDL methodology to model. The granger causality result showed a bidirectional causality relationship between solid mineral revenue (SMR) and economic growth of Nigeria (proxied by RGDP) and unidirectional causality between telecommunication sector revenue (TSR) and RGDP within the study's period and SMR, TSR and TIN positively affects economic growth in Nigeria. The continuous rise in the production of economic output like goods and services in one period of time compared with a previous period is called economic growth. It was recommended to boost investment in telecom infrastructure and improve the regulatory framework of the telecom sector to optimize performance and enhance revenue generation from the industry.

A study by Akanmu *et al.* (2024) used systematic review to investigate essential aspects and consequences of predatory publishing within the realm of Nigerian academic librarians. The study utilized a qualitative and explanatory research method as **it** delineated the characteristics of predatory publishers and journals, shedding light on their subtle methods of enticing unwitting authors. Their findings navigated the intricate dimensions of predatory publishing and its detrimental impacts on research and scholarship within the librarian community, emphasizing the devastating effects on the future of research and scholarship. The study recommended that academic libraries and librarians should lead the awareness campaign, and individual institutions should organize periodic seminars and workshops on the consequences of predatory publishing.

By delving into the paramount role of book publishing in steering Nigeria's socio-economic development, Ajayi and Ihebuzor (2023) used comparative appraisal methodology and found that by comparing global publisher numbers and situating Nigeria's meager 31 indigenous publishers against a potential 2,712, the disparity becomes glaring. Employing a blend of primary and secondary data sources, the research illuminates the transformative journey of book publishing. The study advocated for substantial investments from government bodies, NGOs, and corporate entities to amplify the circulation of knowledge.

Also, the literature reviewed that studies on technology innovation adoption in the context of book publishing, with a focus on big data, Afolabi and Zolkepli (2023) examined Big Data Analytics for Publishing Development: Prospects and Challenges in the Nigerian Book Industry and found that the use of big data for publishing development in a number of developed nations, including the use of big data analytics in publishing houses and book development processes. Big data analytics also give book publishers the boost they need for distribution, sales, and advertising as well as price optimization. However, there is no clear proof that Nigeria's publishing sector has adopted big data for book publishing processes, although results showed that big data analytics can help publishers increase the effectiveness of their book publishing operations. Given the potential to improve productivity and profitability, implementing big data analytics in the Nigerian book publishing sector as a new avenue to development has to be explored further. Also research on Information and Communication Technology and Its Impact on the Economic Growth of Nigeria which was conducted by Alao-Owuuna and Adediwura (2023) with the help of auto regressive distribution lag (ARDL) methodology and found that mobile telephone subscription has a positive and significant effect on economic growth both in short run and long run, while Internet Usage revealed a negative and insignificant relationship with the economic growth in Nigeria.

Kwujeli *et al.* (2023) investigated service sectors foreign exchange transaction incentives and economic growth in Nigeria used ARDL and ECM in the estimation of variables as both long-run and short-run results revealed that the transportation sector foreign exchange transaction incentive has a positive and significant impact on economic growth in Nigeria. Therefore, the paper recommended that government should adopt both long and short-term policies of transportation sector. Also, in another studies, Thoyibah and Sugiharti (2022) examined the

effect of telecommunication infrastructure on economic Growth in the six ASEAN Countries with regression methodology and Neo-Classical growth theory. The results showed that telecommunications infrastructure with indicators such as Mobile Cellular Subscriptions (Per 100 people) is a significant negative effect on economic growth. Labour shows that there is no effect but positive significance on economic growth. Covering the period from 2001 to 2018, Kujore *et al.* (2021) examined the effect of tax revenue proxied by Value Added Tax (VAT) on the economic growth, proxied by Real GDP of the telecommunication sub-sector by employing autoregressive distributed lag (ARDL) approach. They found that value added tax (with Adjusted R 2 of 0.515, and F-Statistic [Prob.(F-Stat)] of 6.66 [0.006] is significant. VAT has significant effect on the economic growth of telecommunication sub-sector in Nigeria for the period under study. The study therefore concluded that tax revenue has positive effect on the economic growth of telecommunication sub-sector in Nigeria. Thus, it was recommended among others that government should develop more workable policies in the utilization of tax revenue while companies in the GSM telecommunication sub-sector should embrace voluntary tax compliance.

Aigheyisi (2021) examined the effect of economic growth on employment in Nigeria's services sector during the period from 1991 to 2020. The ARDL approach to cointegration and error correction modeling was employed for the analysis. The study found that economic growth spurs employment generation in the services sector in the short-run and in the long-run. He further found that employment generation in the services sector is also spurred by trade openness and financial sector development. In another study, Adeyemi *et al.* (2021) explored the awareness, perception and readiness of academic librarians on the application of gamification to library services. The study adopted an interpretative research design and a qualitative research approach and using purposive sampling technique which was used to select a sample of 20 participants but only 15 participated in the study. The study found that most of the academic librarians in Nigeria were not aware of gamification to library services. However, the few that were aware knew about the gamification of library services through their personal academic reading.

While, Pearce *et al.* (2021) examined the impact of intangible assets on economic growth in Nigeria from 1990 to 2019 by using ARDL bound test was adopted in estimating the model. They discovered that government expenditure on R&D, intellectual capital and intellectual property do not have significant relationship with economic growth proxied by RGDP; meanwhile service sector employment had a significant relationship with economic growth in Nigeria. The government recommended that institutions such as producers' protection agencies should be empowered to protect intellectual properties in Nigeria. Also, Ishola and Olusoji (2020) investigated service sector performance, industry and growth in Nigeria from 2010 to 2016 by using OLS. They found that the service and the industrial sector contributed significantly to the economic growth (GDP) of Nigeria. Furthermore, it recommended strengthening the service and industrial sectors so as to maximise the potentials therein through the prescription of sector-specific policies. By using annual data series, endogenous growth model, and autoregressive distributed lag technique, Adetokunbo and Edioye (2020) examined the response of economic growth to the dynamics of the service sector in Nigeria

from the windows of governance indicators and found that transportation and communication service subsector is significant and positively related to economic growth. The study recommended that efforts to control corruption and promote government effectiveness should be reviewed frequently to checkmate the processes of governance, so that bureaucratic processes would not hinder services from contributing significantly to economic growth.

Ochei and Mamudu (2020) examined the Contributions of Transport Sector to Economic Growth in Nigeria with the application of the Phillips-Perron test statistics, Johansen Cointegration techniques, Pairwise Granger Causality techniques and the Error Correction Mechanism on a multiple log linear regression framework. The annual time series data from 1981 to 2019 on economic growth (Real gross domestic product (RGDP) and transportation variables (Road transport (RDTP), Rail transport and pipelines (RLTP), Water transport (WRTP), Air transport (ARTP), Transport services (TPSS) and Post and courier services (PTCS)were sourced from Central Bank of Nigeria Statistical Bulletins. The empirical results revealed that RDTP, ARTP and PTCS had direct and significant contributions to real gross domestic product in Nigeria. Also, David (2019) investigated the effect of telecommunication operations on economic growth and development in selected African countries. The analysis used panel of 46 African countries from 2000 to 2015. The empirical results suggested that telecommunication operations promote economic growth and development in Africa. Thus, he recommended appropriated policy to improve overall investment in Africa and most especially in the telecommunication sector since the spillover effect cut across other sectors and the general economic performance. In another studies, Dynamic panel GMM technique was used by Adebayo (2019) to investigate protection of intellectual property rights spanning 1995 and innovation the was observed that in the selected countries, protection of intellectual property right had a negative impact on economic growth in the selected countries. He recommended that developing countries must seek ways of protecting intellectual property assets without compromising their objective of industrial growth and development.

Theoretical Framework
The theoretical framework of this paper is based on the unified theory of acceptance and use of technology (Venkatesh *et al.*, 2003). Unified theory of acceptance and use of technology was formulated to explain the behavioral intention to adopt and use technology. It integrates constructs from various established models, including the technology acceptance model, the theory of reasoned action, and the innovation of diffusion theory. The unified theory of acceptance and use of technology model is especially relevant for understanding the influence of technological advancements, such as telecommunication and broadcasting services, on economic growth. Venkatesh *et al.* (2003) proposed four key constructs that determine the acceptance and usage behavior of technology which are performance expectancy: The degree to which an individual believes that using the technology will enhance job performance; Effort Expectancy: The ease associated with the use of technology; Social Influence: The extent to which individuals perceive that important others believe they should use the technology; Facilitating Conditions: The degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the technology. The

unified theory of acceptance and use of technology framework is particularly applicable to this research, which examines the impact of information and communication technology (ICT) services on economic growth in Nigeria. The independent variables—Telecommunication Services (TCS), Publishing Services (PBS), Music Production Services (MPS), and Broadcasting (BCT)—are components of ICT and align with the constructs of performance and effort expectancy in UTAUT. For instance: Investments in telecommunication services enhance connectivity and productivity, directly influencing GDP growth. The adoption of ICT services such as broadcasting and publishing is influenced by societal trends and policies. The availability of supportive infrastructure, such as internet access and telecommunication networks, plays a crucial role in maximizing ICT contributions to economic growth.

Methodology
Sources of Data and Method of Analysis
The research design for this study is *ex-post facto* research and the secondary annual time series data from 1985 to 2023 was sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin December 2024 which aligns with the study's objective to evaluate the influence of the independent variables which are telecommunication services (TCS), publishing services (PBS), music production services (MPS), and broadcasting (BCT) on real gross domestic product (RGDP) known to be the dependent variable representing the economic growth of Nigeria. The data was selected for their relevance in analyzing the impact of information and communication on economic growth in Nigeria.

Model Specification
This study employs the autoregressive distributed Lag (ARDL) methodology, aligning with the theoretical framework established herein and the study adapted Alao-Owuuna *et al.* (2023) model who analysed the nexus among tourism, information communication technology and economic growth: A case study of Nigeria as the model's implicit form is:

$$GDP = f(TOUR, MSC, GDP, TRD, (TOUR*MCS)) \tag{1}$$

Where GDP is gross per person employed, TOUR is tourism receipt, MCS is mobile cellular subscription, GCF is gross capital formation and TRD is trade openness.

Equations 1 was modified based on the research objectives and to establish the functional relationship between effect of information and communication on the economy indicator in Nigeria. Thus, the functional form of the model of this study with information and communication on the economy indicator incorporated is implicitly expressed as:

$$RGDP = f(TCS, PBS, MPS, BCT) \tag{2}$$

Specifying equation (2) for in a stochastic (linear regression) form:
$$RGDP_t = \beta_0 + \beta_1 TCS_t + \beta_2 PBS_t + \beta_3 MPS_t + \beta_4 BCT_t + \varepsilon_t \tag{3}$$

Where: $RGDP_t$ = Real gross domestic product at time t (dependent variable), TCS_t = Revenue generated by Telecommunication services at time t, PBS_t = Revenue generated by Publishing services at time t, MPS_t = Revenue generated by music production services at time t, BCT_t = Revenue generated by broadcasting at time t, β_0 = Constant term. $\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of the independent variables, representing their marginal effects on RGDP.
ε_t = Error term capturing unobserved factors influencing RGDP.

Autoregressive Distributed Lagged (ARDL) model that was used in this paper is specified as follows:

$$\Delta RGDP_t = \beta_0 + \sum_{i=1}^{q} \beta_1 RGDP_{t-1} + \sum_{i=1}^{q} \beta_2 TCS_{t-1} + \sum_{i=1}^{q} \beta_3 PBS_{t-1} + \sum_{i=1}^{q} \beta_4 MPS_{t-1} \sum_{i=1}^{q} \beta_5 BCT_{t-1} \quad (4)$$
$$+ \beta_6 \Delta RGDP_{t-i} + \beta_7 \Delta TCS_{t-i} + \beta_8 \Delta PBS_{t-i} + \beta_9 \Delta MPS_{t-i} + \beta_{10} \Delta BCT_{t-i} + \varepsilon_t$$

Equation (4) was employed to assess both the short-run and long-run relationships, as well as the impact of information and communication on economic growth in Nigeria. The Error Correction Model (ECM) used in this investigation is formulated as follows:

$$\Delta RGDP = \beta_0 + \sum_{i=1}^{q} \beta_1 RGDP_{t-1} + \sum_{i=1}^{q} \beta_2 TCS_{t-1} + \sum_{i=1}^{q} \beta_3 PBS_{t-1} + \sum_{i=1}^{q} \beta_4 MPS_{t-1} \sum_{i=1}^{q} \beta_5 BCT_{t-1} \quad (5)$$
$$+ \beta_6 \Delta RGDP_{t-i} + \beta_7 \Delta TCS_{t-i} + \beta_8 \Delta PBS_{t-i} + \beta_9 \Delta MPS_{t-i} + \beta_{10} \Delta BCT_{t-i} + ECM$$

Equation (5) was employed to assess both the short-run and long-run relationships, as well as the impact of information and communication on economic growth in Nigeria.

Variable Description, Measurements and Apriori Expectation
Table 1: Description of the Variables Used for the Model

Variable	Description/Measure	Type	Source	Apriori Expectation
RGDP	Real Gross Domestic Product (₦Billion)	Dependent	CBN Statistical Bulletin, 2024	Not Applicable
TCS	Telecommunication Services (₦Billion)	Independent	CBN Statistical Bulletin, 2024	$\beta_1 < 0$
PBS	Publishing Services (₦Billion)	Independent	CBN Statistical Bulletin, 2024	$\beta_2 > 0$
MPS	Music Production Services (₦Billion)	Independent	CBN Statistical Bulletin, 2024	$\beta_3 > 0$
BCT	Broadcasting (₦Billion)	Independent	CBN Statistical Bulletin, 2024	$\beta_4 > 0$

Source: Author Compilation, 2024

From table 1 the apriori expectation for this paper whose values are measured in Nigeria billion is that the coefficients $(\beta_{1 \text{ to }} \beta_4)$ of the independent variables (Telecommunication Services (TCS), Publishing Services (PBS), Music Production Services (MPS), and

Broadcasting (BCT)) are expected to have a positive impact on the dependent variable (Real Gross Domestic Product (RGDP)), signifying that increase in the information and communication indicators will lead to rise of economic growth in Nigeria

Method of Analysis
This paper used the Autoregressive Distributed Lag (ARDL) method of analysis, these methods was introduced by Pesaran and Pesaran in the late 1990s (Ezie & Ezie, 2021). The ARDL technique is particularly useful for analyzing the dynamic relationships between variables, as it allows for the examination of both short-run and long-run effects within a single framework.

Data Analysis
Table 2: Descriptive Statistics

	RGDP	TCS	PBS	MPS	BCT
Mean	41728.41	2830.771	12.69230	353.1237	512.8140
Median	36057.74	852.5140	10.80866	267.0908	327.5795
Maximum	76684.94	11027.87	20.77686	805.0054	1444.341
Minimum	16997.52	18.32974	7.001627	52.92574	128.8189
Std. Dev.	21220.82	3402.573	4.597251	277.0316	431.0450
Skewness	0.347781	0.863836	0.455330	0.424286	0.912943
Kurtosis	1.482003	2.460232	1.627145	1.612951	2.357916
Jarque-Bera	4.530698	5.323819	4.410305	4.296466	6.087459
Probability	0.103794	0.069815	0.110234	0.116690	0.047657
Sum	1627408.	110400.1	494.9996	13771.82	19999.75
Sum Sq. Dev.	1.710000	4.400000	803.1192	2916367.	7060392.
Observations	39	39	39	39	39

Source: Researcher's EViews 12 computation, 2025

Table 2 is the descriptive table. The real gross domestic product (RGDP), has a mean value of 41,728.41, indicating the average output of the Nigerian economy over the study period. The median value of 36,057.74, while the maximum and minimum values are respectively 76,684.94 and 16,997.52, highlighting the range of economic growth within the period. Also, telecommunication services (TCS) have a mean value of 2,830.77, with a median of 852.51, revealing that the average volume of telecommunication services is higher than the middle value, suggesting the presence of some extreme values. The maximum value of 11,027.87 and a minimum of 18.33 further confirms the wide variation in telecommunication service levels. Publishing Services (PBS) has an average value of 12.69, with a median of 10.81, while the minimum and maximum values are 7.00 and 20.77, respectively. While descriptive statistics for music production services (MPS) show a mean value of 353.12, with a median of 267.09. The minimum and maximum values are 52.92 and 805.00, respectively, highlighting significant growth in the music industry over time. Similarly broadcasting (BCT) has an average value of 512.81, with a median of 327.58, while the maximum and minimum values are 1,444.34 and 128.82, respectively. The kurtosis values for RGDP, TCS, MPS, PBS, and BCT are less than 3, indicating that these variables exhibit platykurtic distributions with flatter

peaks and thinner tails compared to the normal distribution. The Jarque-Bera probability values for all variables are greater than 0.05, indicating that the variables are normally distributed at the 5% significance level.

Table 3: Correlation Analysis

Correlation Probability	RGDP	TCS	PBS	MPS	BCT
RGDP	1.000000				

TCS	0.960394	1.000000			
	0.0000	-----			
PBS	0.909758	0.870901	1.000000		
	0.0000	0.0000	-----		
MPS	0.992594	0.952931	0.911760	1.000000	
	0.0000	0.0000	0.0000	-----	
BCT	0.954747	0.975785	0.908314	0.964191	1.000000
	0.0000	0.0000	0.0000	0.0000	-----

Source: Researcher's EViews 12 computation, 2025

From the table 3, the correlation result is established as the correlation coefficient between telecommunication services (TCS) and real gross domestic product (RGDP) is 0.9604, indicating a strong positive relationship which suggests that an increase in telecommunication services is associated with higher economic growth in Nigeria. Similarly, publishing services (PBS) shows a positive correlation of 0.9098 with RGDP which implies that publishing services contribute significantly to economic growth, albeit at a slightly lower magnitude compared to telecommunication services.

Furthermore, music production services (MPS) exhibit the highest positive correlation with real gross domestic product (RGDP) at 0.9926, suggesting a very strong association between the music production sector and economic growth and the finding shows the increasing importance of the entertainment industry in the Nigerian economy. Additionally, broadcasting services (BCT) is positively correlated with real gross domestic product (RGDP) at 0.9547 which indicate that the broadcasting sector plays a vital role in promoting economic growth. All correlation coefficients are statistically significant at the 5% level, as evidenced by the corresponding probability values of 0.0000, which are less than 0.05. This implies that the observed relationships are not due to random chance but reflect genuine associations between the information and communication sub-sectors and economic growth in Nigeria.

Stationary Tests (Unit Root Tests)
This part of the papers looked at the unit root of each of the variable using the augmented dickey-fuller (ADF) test to ascertain stationarity of the datas specifically at 5%.

Table 4: Unit Root Test Result

Variable	Augmented Dickey-Fuller (ADF) Test		
	ADF	Critical Value	Status
RGDP	-3.341243	-2.943427	1(1)
TCS	-3.613431	-3.536601	1(1)
PBS	-7.444716	-2.943427	1(1)
MPS	-4.936836	-2.945842	1(1)
BCT	-4.567932	-2.943427	1(1)

significant level is 5% level

Source: Researcher's Computation Using EViews-12 (2025)

Table 4 shows that the variables with their stationarity test which the augmented dickey-fuller (ADF) method was conducted to examine the presence of unit roots in the time series data for the study on the Impact of Information and Communication on Economic Growth in Nigeria (1985–2023). The results indicate that all variables were non-stationary at their levels but became stationary after first differencing, confirming that they are integrated of order one, denoted as I(1). The results suggest that all the variables are integrated at the same order, which is I(1), implying that they exhibit long-run equilibrium relationships, making them suitable for further econometric analysis such as co-integration and error correction model.

Co-integration of ARDL-Bounds Test
This section shows the ARDL co-integration bounds test of the variables used in this paper.

Table 5: ARDL-Bound Testing

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	10.61716	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Researcher's Computation Using EViews-10 (2023)

Table 5 of the ARDL bound test shows that at 5 per cent level of significant that the F statistics 10.61716 is greater than the lower critical bound 1(0) value of 2.86and upper critical bound 1(1) value of 4.01 signifying that the overall model has a long run impact.

Presentation and Interpretation of Results
Auto regressive Distributed Lag (ARDL) Regression Results
This part of the paper shows the shortrun, longrun impact ARDL regression analysis, the error correction and the model fit.

Table 6: Autoregressive Distributed Lag (ARDL) Model Results
Dependent Variable: RGDP
Error Correction Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TCS)	-0.280392	1.123689	-0.249528	0.8059
D(TCS(-1))	0.045012	1.490759	0.030194	0.9763
D(TCS(-2))	-2.904395	1.377934	-2.107789	0.0502
D(TCS(-3))	3.969676	0.965751	4.110456	0.0007
D(PBS)	25.086612	92.986219	0.269788	0.7906
D(PBS(-1))	-51.319135	154.056929	-0.333118	0.7431
D(PBS(-2))	103.093059	166.603565	0.618793	0.5443
D(PBS(-3))	335.427231	152.997991	2.192364	0.0426
D(MPS)	18.697864	9.243587	2.022793	0.0591
D(MPS(-1))	2.518093	20.475155	0.122983	0.9036
D(MPS(-2))	6.477495	17.138231	0.377956	0.7101
D(MPS(-3))	-31.074682	11.685408	-2.659272	0.0165
D(BCT)	-17.426162	6.355673	-2.741828	0.0139
CointEq(-1)	-0.368961	0.125185	-2.947330	0.0090
R-squared	0.999437			
Adjusted R-squared	0.998874			
F-statistic	1775.552			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.179296			
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TCS	1.056106	1.464760	0.721010	0.4807
PBS	-501.871414	740.917512	-0.677365	0.5073
MPS	140.115980	20.440371	6.854865	0.0000
BCT	-47.230410	10.508163	-4.494640	0.0003
C	23856.975660	6264.241553	3.808438	0.0014

Source: Researcher's Computation Using EViews-12 (2024)

From the longrun result from table 6 which shows the autoregressive distributed lag (ARDL) model estimation for the study on the Impact of Information and Communication on Economic Growth in Nigeria (1985–2023) which presents both the Error Correction Mechanism (ECM) and Long Run Coefficients. Error Correction Term (CointEq (-1)) is -0.368961 with a probability value of 0.0090, meaning that it is statistically significant at the 5 percent level. While negative sign indicates that any short-run disequilibrium will be corrected at a speed of 36.9% annually towards the long-run equilibrium path as it confirms the presence of a long-run relationship between information and communication variables and economic growth in Nigeria.

In the Long-run, telecommunication services (TCS) had a coefficient of 1.0561 signifying a positive impact on real gross domestic product with a probability value of 0.4807, which is greater than 0.05 and indicating that telecommunication services have an insignificant positive impact on economic growth in the long run. While publishing services (PBS) with coefficient of -501.8714 and probability value of 0.5073, which is greater than 0.05. This implies that publishing services have an insignificant negative impact on economic growth in the long run. Also, music production services (MPS) show coefficient is 140.1159 with a probability value of 0.0000, which is less than 0.05. This indicates that music production services have a significant positive impact on economic growth in the long run. Similarly, broadcasting services (BCT) with coefficient of -47.2304 with a probability value of 0.0003, which is less than 0.05 shows that broadcasting services have a significant negative impact on economic growth in the long run.

Therefore, the null hypothesis H_{01} stating that telecommunication services have no significant impact on economic growth in Nigeria is accepted based on the insignificant probability value of 0.4807 and also, the null hypothesis H_{02} stating that publishing services have no significant impact on economic growth in Nigeria anl is accepted based on the insignificant probability value of 0.5073. In contrast, the null hypothesis H_{03} stating that music production services have no significant impact on economic growth in Nigeria is rejected based on the significant probability value of 0.0000, similarly, the null hypothesis H_{04} stating that broadcasting services have no significant impact on economic growth in Nigeria is rejected based on the significant probability value of 0.0003.

The R-squared (0.999437) indicates that approximately 99.94% of the variation in economic growth (RGDP) is explained by the independent variables, which include telecommunication services, publishing services, music production services, and broadcasting services. This high R-squared value suggests that the model has an excellent explanatory power while adjusted R-squared (0.998874), which adjusts for the number of explanatory variables, further confirms that 99.88% of the variation in economic growth is accounted for by the independent variables. The slight difference between the R-squared and adjusted R-squared values indicates that the model does not suffer from the problem of overfitting and remains robust. The F-statistic value of 1775.552 with a probability value of 0.000000 shows that the overall model is statistically significant at the 5 percent level. This implies that the independent variables jointly have a significant impact on economic growth in Nigeria, rejecting the null hypothesis that all coefficients are equal to zero. Looking at the Durbin-Watson statistic of 2.179296, it is seen that the value falls within the acceptable range of approximately 2, suggesting the absence of significant autocorrelation in the model's residuals. This indicates that the model's estimates are reliable without the influence of serial correlation.

Post-Estimation Checks (ARDL Diagnostic Test)
The ARDL result as in table are hereby validated in this section

Table 7: Results of ARDL Diagnostic Checks

Tests		Outcomes	
		Coefficient	Probability
Breusch-Godfrey-Serial-Correlation Test	F-stat.	0.261370	0.7734
Heteroscedasticity-Breusch-Pagan-Godfrey Test	F-stat.	0.648838	0.8093
Normality Test	Jarque-Bera	2.266071	0.322054

Source: Author's Computation Using EViews-12 (2024)

Table 7 shows post-estimation diagnostic tests which Breusch-Godfrey Serial Correlation Test was employed to assess the presence of serial correlation in the residuals and the F-statistic value of 0.261370 with a probability of 0.7734 indicates that the null hypothesis of no serial correlation cannot be rejected at a 5% significance level. This suggests that the residuals are free from serial correlation, implying that the model is correctly specified while heteroskedasticity test using Breusch-Pagan-Godfrey was conducted to test whether the residuals exhibit constant variance and the F-statistic value of 0.648838 with a probability of 0.8093 fails to reject the null hypothesis of homoskedasticity, indicating that the residuals have a constant variance. Therefore, the model does not suffer from heteroskedasticity, enhancing the reliability of the estimates and lastly, the Jarque-Bera Normality Test was used to examine whether the residuals are normally distributed. The Jarque-Bera statistic of 2.266071 with a probability value of 0.322054 suggests that the null hypothesis of normal distribution cannot be rejected. This confirms that the residuals are normally distributed, satisfying one of the key assumptions of the regression model.

Discussion of Findings
This paper looked at the long-run results which revealed the impact of various components of information and communication services on economic growth in Nigeria between 1985 and 2023 by using the autoregressive distributive lag (ARDL). The coefficient of telecommunication services (TCS) shows a positive but statistically insignificant relationship with economic growth. This finding aligns with the study by Addae-Korankye and Lade (2019), who found that telecommunication services significantly contribute to economic growth in Ghana. Publishing services (PBS) exhibit a negative but statistically insignificant effect on economic growth. This result supports the findings of Aboyade *et al.* (2024) who argued that publishing on predatory journals have negative impact on Nigeria academics.

Music production services (MPS) have a positive and statistically significant impact on economic growth, consistent with the findings of David (2019) who highlighted that telecommunication operations, promote economic growth and development in Africa. Broadcasting services (BCT) show a negative and statistically significant impact on economic growth. This finding contrast with the work of Oyeniran and Onikosi-Alliyu (2016) who argued that telecommunications positively influenced economic growth.

Conclusion and Recommendations

This paper investigated with the help of ARDL methodology examined the impact of information and communication services on economic growth in Nigeria from 1985 to 2023. The long-run results revealed mixed effects of various components of information and communication services on economic growth. Telecommunication services showed a positive but insignificant impact, while music production services significantly contributed to economic growth. In contrast, broadcasting services exhibited a negative and significant influence, and publishing services had an insignificant negative effect. These findings underscore the role of information and communication services in driving economic growth, albeit with varying levels of significance. The study highlights the need for strategic policy interventions to maximize the potential information and communication sector in Nigeria's economic development.

Recommendations

Based on the findings, the following recommendations are made:

i.   The Nigerian Communications Commission (NCC) should collaborate with telecommunication service providers to expand network coverage, improve service quality, and reduce the cost of data and voice services. This will enhance the contribution of telecommunication services to economic growth.

ii. The Federal Ministry of Information and National Orientation, in partnership with the Nigerian Copyright Commission (NCC), should support the digitalization of publishing services by providing grants and incentives for the adoption of digital publishing platforms. This will boost the contribution of publishing services to economic growth through wider information dissemination.

iii. The Ministry of Art, Culture, and Creative Economy should collaborate with the Bank of Industry (BOI) to provide funding opportunities, capacity-building programs, and export promotion initiatives for music producers and artists. This will strengthen the music industry's contribution to economic growth and increase its global competitiveness.

iv. The National Broadcasting Commission (NBC) should enforce regulations that promote responsible broadcasting and curb the spread of misinformation. Additionally, the commission should encourage the development of content that promotes social cohesion and economic awareness.

v.   The Federal Ministry of Communications, Innovation, and Digital Economy should promote partnerships between the government and private sector investors to finance infrastructure projects in the information and communication sector. This will enhance the sector's capacity to drive economic growth.

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APPENDIX I
1: Data for Regression

	RGDP	TCS	PBS	MPS	BCT
1985	16,997.52	18.45	7.29	52.93	130.37
1986	17,007.77	18.33	7.00	55.08	128.82
1987	17,552.10	18.51	7.36	55.63	130.11
1988	18,839.55	18.70	8.30	56.18	131.42
1989	19,201.16	19.07	8.44	57.02	133.38
1990	21,462.73	19.45	9.08	58.16	136.05
1991	21,539.61	19.84	9.93	59.03	138.10
1992	22,537.10	20.54	9.45	62.99	145.01
1993	22,078.07	21.25	9.06	69.29	153.70
1994	21,676.85	21.47	8.98	78.78	154.48
1995	21,660.49	22.54	8.48	91.38	156.80
1996	22,568.87	23.67	8.57	105.09	161.51
1997	23,231.12	25.08	8.59	120.85	172.80
1998	23,829.76	26.34	8.26	145.02	190.08
1999	23,967.59	27.71	8.55	174.03	210.98
2000	25,169.54	29.40	8.85	187.95	236.30
2001	26,658.62	339.92	9.23	206.74	265.84
2002	30,745.19	422.73	10.24	237.83	283.07
2003	33,004.80	536.44	10.81	240.95	295.52
2004	36,057.74	852.51	12.11	267.09	327.58
2005	38,378.80	1,112.66	13.26	295.14	354.43
2006	40,703.68	1,497.58	14.50	326.45	385.27
2007	43,385.88	2,016.07	15.88	361.13	418.88
2008	46,320.01	2,715.05	17.28	399.77	455.53
2009	50,042.36	3,657.88	18.63	439.32	494.18
2010	54,612.26	4,931.99	8.78	479.19	535.10
2011	57,511.04	4,992.42	12.12	481.56	596.95
2012	59,929.89	5,176.56	12.63	491.89	587.43
2013	63,218.72	5,420.65	14.23	610.87	737.32
2014	67,152.79	5,677.88	16.05	735.77	827.37
2015	69,023.93	5,933.09	17.70	765.64	991.68
2016	67,931.24	6,053.66	18.13	734.43	1,052.47
2017	68,490.98	5,930.25	18.54	730.21	1,097.90
2018	69,799.94	6,602.08	19.66	727.01	1,178.92
2019	71,387.83	7,355.31	20.17	728.49	1,205.95
2020	70,014.37	8,525.16	18.80	728.69	1,264.49
2021	72,393.67	9,145.60	19.11	752.70	1,309.65
2022	74,639.47	10,126.35	20.17	796.53	1,379.99
2023	76,684.94	11,027.87	20.78	805.01	1,444.34

Source: CBN Statistical Bulletin 2024

Note: Real Gross Domestic Product (RGDP), Telecommunication Services (TCS), Publishing Services (PBS), Music Production Services (MPS) and Broadcasting (BCT).