Original Research Article

Exploring the Nexus between Tourism, Information Communication Technology and Economic Growth: A Case Study of Nigeria

Abstract

The research investigates the relationship between economic growth and tourism as well as information and communications technology (ICT) between 1995 and 2021. Using the autoregressive distributed lag (ARDL) process and an enhanced Solow framework for cointegration analysis; we examine how these variables interact. The findings demonstrate that, when all three are forced to depend on one another, economic growth, foreign tourism receipts—which act as a stand-in for tourism—and mobile cellular subscriptions—which indicate the pervasiveness of ICT—all display cointegration. At the 1% level, both ICT and tourism have long-term statistically significant effects. ICT and tourism have short-run coefficients of 0.006 and 0.03 respectively. Furthermore, at the 1% level, the interaction term between tourism receipts and ICT is associated with a long-run coefficient (0.148) that indicates a positive and statistically significant effect on economic growth. This finding highlights the importance of fostering the mutually beneficial interaction between the development of technology and the growth of the tourist industry as key factors in Nigeria's economic prosperity.

Keywords: Tourism, ICT, Economic Growth, ARDL bounds, Cointegration, Nigeria

I. INTRODUCTION

Traveling has always been associated with the experience of seeing unfamiliar or exotic places (Author &Neunen, 2019; Ashcroft, 2015). As a result, international tourism continues to be the largest and fastest-growing industry in the world, making up more than one-third of the value of all services traded globally (Kumar & Kumar, 2012; Seetanah, 2011). As evidenced by the millions of jobs and billions in export earnings it has generated, tourism has proven to be an extraordinarily resilient economic activity and a major driver of national economic growth (Huseynli, 2022; Olu, et al., 2018; Yusuff & Akinde, 2016; Yusuff, & Akinde, 2015). Taking note of these realities, a large number of industrialized and developing nations currently depend on tourism as a means of achieving sustainable national development. The tourism sector is now one of the fastest expanding economic sectors in the world and one of the largest industries overall (Yusuff & Akinde, 2016).

The fact that tourism contributes to economic growth and development in both developed and developing countries is one of the reasons governments support and encourage it globally (Su, et al., 2021; Pan & Dossou, 2020; Paramat et al., 2017; Khoshkhoo, et al., 2017; Tang & Tan 2015; Ertuğrul &Mangir, 2015). Global GDP is impacted by the percentage of tourist arrivals for business, pleasure, and other reasons by over 10% in 2019, but drops sharply to 5.3% in 2020 as a result of the Covid-19 pandemic, which led to travel restrictions

worldwide. The percentage then rises to 6.1% in 2021 after the restrictions are partially lifted (Travel Tourism Economic Impact TTEI, 2022). Global tourism receipts increased from 1,463 (USD billion) in 2018 to 1,494 (USD billion) in 2019, but also declined significantly to 559 (USD billion) in 2020 and increased slightly by 78 (USD billion) in 2021, according to the United Nations World Tourism Organization (UNWTO, 2022). Between 2019 and 2021, visitor arrivals reached record high numbers in advanced economies emerging markets rather than in emerging markets (UNWTO, 2022).

Africa also faces a number of other difficulties, such as poor marketing and promotion strategies, insufficient funding, security and safety issues, a lack of trained labor, and inadequate infrastructure. The Travel & Tourism sector's contribution to the region's GDP decreased from 6.8% (US$182.4 billion) in 2019 to just 3.8% (US$96.5 billion) in 2020, when the pandemic was at its worst. This represents a 47.1% fall in the sector's importance to the economy. The sector in the area provided almost 25 million jobs, but in 2020 that figure had fallen to just 19.6 million after a 22.9% loss (UNWTO, 2022). According to the WTTC's most current EIR study, the travel and tourism sector started to revive in 2021, with its contribution to GDP rising by 23.5% annually to more than US$119 billion. Nigeria is ranked 15th with over 23% in terms of how the sector has contributed to both the gross domestic product and international tourism receipts in West Africa, according to UNWTO, 2022. Despite having enormous tourism potential, Nigeria still lagged behind countries like Namibia, Gambia, Morocco, South Africa, Tunisia, Kenya, and so onand the nation's overall employment rate. Despite this, TTEI, 2022 ranks Nigeria 15th in 2019 and 18th in 2021 for employment in the travel and tourism sector, demonstrates the significance of this industry. Table 1 displays variations in the number of visitors over a certain period of time. Starting in 1995, when there were more than 650 thousand tourists registered, the number of visitors increased dramatically to 4.80 million in 2014.Following that, there was a noticeable drop in tourists, which persisted until 2021 and began in 2015. Ironically, throughout this time, revenue showed an upward trend, rising from a starting point of more than $460 million in 2015 to a remarkable peak of more than $2.6 billion in 2017. The tourist industry made $1.98 billion and $1.47 billion in the following years, respectively, before seeing a significant decline in visitor numbers in 2020 as a result of the widespread lockdowns imposed by the worldwide pandemic. Interestingly, there was a slight increase in the number of visitors in 2021; however, this increase was offset by a further decline in earnings.

Table 1: Outcomes of Tourism in Nigeria

Year	Number of Tourist	Receipt ($)	% of GNP
1995	656,000	47.00m	0.11%
2000	813,000	186.00m	0.27%
2005	1.10m	139.00m	0.079%
2010	1.56m	736.00m	0.20%

2014	4.80m	605.00m	0.11%
2015	1.26m	461.00m	0.094%
2016	1.89m	1.09bn	0.27%
2017	1.93m	2.62bn	0.70%
2018	1.97m	1.98bn	0.47%
2019	2.01m	1.47bn	0.31%
2020	502,000	321.00m	0.074%
2021	518,000	265.00m	0.060%

Source(s): Extracted from World Tourism Organisation

A significant amount of economic activity is being driven by the pervasive impact of information and communications technology (ICT) (Alao-Owunna and Adediwura, 2023; Tripathi and Inani, 2020; Toader, et al., 2018). (Kumar et al., 2016; Hodrab et al., 2016) involves integrating a wide range of tourist business tasks to create a virtual platform (WTO, 2009). Virtual platforms may be used to integrate a wide range of tourist sector functions (Rafael, et al., 2021). According to Nam et al. (2017), these platforms offer a standardized interface for accessing diverse forms of data, facilitating the personalization of travel-related content and the development of interactive smart tourism servicesin addition to enabling the smooth integration of various tourism-related processes, such as authorizing tourist destinations, assigning and advertising trips, and providing assistance to visitors both before and during their stay (Kryzhanivs'kyi, et al., 2020; Werthner et al., 2015). The ongoing development of ICT presently dominates society (Bhuiyan, et al., 2022). The progress made in this area has improved knowledge regarding methods, actions, and modifications (Pysar et al., 2018; Tom and Jung 2018; Buhalis and Amaranggana, 2015).

The information above makes it evident that there aren't many targeted studies that empirically look at the relationship between economic activity, tourism, and information and communications technology (ICT) in Sub-Saharan Africa. However, by concentrating its inquiry primarily on Nigeria, the paper attempts to close this research gap. New avenues for the travel industry have been made possible by technological advancements like virtual reality, online booking platforms, and mobile applications. These advancements have improved the overall tourist experience and allowed for seamless connectivity (Van Nuenen& Scarles, 2021; Sigala, 2020; Benckendorff et al., 2019; Nayyar et al., 2018).This has improved the interest of both domestic and foreign travelers by making travel information and services more accessible. This has also boosted income and created employment, which has had a beneficial economic impact. The following sections make up the remaining portion of this study: A quick overview of the most recent research on the relationship between tourism, ICT, and economic growth is provided before going into detail into the data sources,

methodology, and results. As the investigation draws to an end, significant implications for policy issues are highlighted.

II. Literature Review

Several studies have demonstrated that tourism is one of the most important drivers of economic growth and development. Sheldon (1997) and Kumar et al. (2016) have highlighted that the tourist industry has been more significant over the last several decades compared to previous attempts at import substitution and agriculture, completely changing the way the industry is organized and managed.

2.1 Tourism, ICT and Economic Growth

Ronald et al. (2018) used the enhanced Solow model, which was estimated using the Autoregressive Distribution Lag (ARDL) between 1960 and 2016, to investigate the effects of ICT and tourism on per worker production. The findings indicate a beneficial cointegration between ICT and tourism, although only ICT has long-term statistical significance. Similarly, Kumar et al. (2016) employed Granger causality and the bound test to evaluate the direction of the link between the variables as they examined the relationship between ICT, tourism, and growth during the years 1980 to 2008 using Fiji as a case study. According to the report, ICT and tourism are essential to the development and expansion of Fiji's economy.

Information and communication technology (ICT) and tourism both significantly contribute to the acceleration of economic growth, claims Haini (2020). Scholarly research provides evidence for the beneficial impacts of both tourism and the Internet on the growth trajectory of the economy. This influence has been ascertained by an extensive procedure that employs a fixed-effects method of moments quantile regression approach. This perspective is supported by Castro et al.'s (2020) comprehensive analysis of the literature on the connection between information and communication technology (ICT), tourism, and economic growth in the context of European and Central Asian countries. Their analysis, which covers 42 representative nations and runs from 1995 to 2018, employs panel data estimate techniques to thoroughly examine the intricate relationships that exist between ICT, the tourism sector, and the broader field of economic growth. The investigation's conclusive results strongly suggest that the development of a favorable environment for promoting economic growth is fostered by the promotion of technological advancements, the dissemination of ICT advances, and the expansion of the tourism sector.

The long-run elasticity coefficients dimension is another area where analysis shows beneficial benefits; here, ICT shows a statistically significant and positive relationship with per worker productivity (Kumer et al., 2019). Furthermore, the coupling of the dynamics of economic expansion with the development of the tourism sector identifies some countries that exhibit remarkable tourism performance, a phenomenon consistent with the business cycle's beat (Brida et al., 2020). A significant multivariate wave approach focused on Asian regions expands the paradigm for examining causal relationships. Wu et al.'s (2020) demonstration of this tactic supports the idea that there is a positive correlation between the elements driving economic growth and tourism.

2.2 Tourism and Economic Growth

The Cobb-Douglas production function was utilized by Omer et al. (2018), they take cross-sectional dependency into account in their second generation of panel data analysis. The study looks at how tourism-related income affects economic growth in the world's top 20 countries (WTR-20) that earn the most from international travel between 1996 and 2016. They emphasized that, in the nations under investigation, tourist receipts have a major impact on fostering sustainable economic growth within their existing frameworks. Using Nigeria as a case study, Yusuff and Akinde (2015) demonstrate that the growing tourist industry has a favorable long-term effect on economic growth between 1995 and 2013. This link is unilateral in nature. Numerous more research (Su, et al., 2021; Pan & Dossou, 2020; Paramat et al., 2017; Khoshkhoo, et al., 2017; Tang & Tan 2015; Ertuğrul &Mangir, 2015) conclude the same thing, despite variations in the methodologies employed.

The findings of a meta-regression analysis examining the connection between tourism and economic growth are presented by Robin et al. in 2020. The factors influencing the association between tourism and economic growth were identified by the authors through a literature study and analysis of 545 estimates from 120 studies. The authors discovered a positive correlation between tourism and economic growth, but they also noted that the degree of that correlation varies depending on a number of variables, such as the type of tourist, the degree of economic development, and how economic growth is measured. Additionally, the authors discovered that emerging nations exhibit a greater link between tourism and economic growth than do industrialized nations. In addition, a review of the research on the tourist-led economic development (TLEG) theory and associated empirical investigations that have been published in the tourism literature is given by Haiyan et al. in 2021. It goes over how TLEG studies have developed, the many methods for gauging the connection between tourism and economic expansion, as well as the drawbacks and difficulties associated with this research. The review indicates areas for further investigation and emphasizes the need for a more sophisticated and context-specific approach to comprehending the connection between tourism and economic growth.

2.3 ICT and Economic Growth

It has been shown that information and communication technologies (ICT) support economic growth in both developed and underdeveloped nations. Alao-Owunna and Adediwura (2023) looked at ICT and how it affected Nigeria's economic expansion. The influence of information and communication technology is examined in this study using the ARDL technique of estimate, employing internet usage and phone subscription as proxies for economic development in Nigeria between 1996 and 2020. The study concludes that whereas internet usage has a negative and negligible link with economic growth in Nigeria, mobile phone membership has a positive and substantial influence on economic growth both in the short and long term. Additionally, Adesokan et al. (2021) look on the dimensional entrepreneurial use of ICT for Nigerian economic empowerment. They highlighted how the nation's growing ICT potential have accelerated online enterprises and the merchandising of

ICT resources, creating more job chances in the unorganized sector and enabling workers to meet their fundamental necessities.

Virto (2009) and Bacache-Beauvallet (2011), respectively, address how ICT contributes to economic expansion. The use of ICT has been demonstrated to increase productivity and decrease costs, which promotes general economic growth, they underlined. Investigating the link between ICT and economic growth in Spain between 1985 and 2002, Mas and Quesada (2005) also discovered that the influence of ICT on productivity is still expanding, suggesting that there is potential for even bigger contributions to economic growth in the future. Niebel (2018) also examined the use of ICT in developing, emerging, and developed nations and how it affected each nation's rate of economic expansion. ICT capital and GDP growth are positively correlated, according to the study, with no discernible variations across developing, emerging, and industrialized nations. Bilan et al. (2019) highlighted that the growth of ICT may provide poor nations a fresh boost to economic development, especially through the efficient use of web technologies and e-commerce. Nonetheless, an assessment of the literature including more than 200 scholarly articles published between 1991 and 2018 was carried out by Vu et al. in 2020. October thinks it's time to shift the focus of the ICT-growth link research from proving a positive correlation to understanding the reasons and mechanisms behind the direct and indirect effects of emerging digital technologies on economic performance. Overall, the data point to the critical role that ICT plays in promoting economic growth at different levels of hierarchy.

III. Data and Methodology

3.1 Sources of Data

In order to obtain values for the variables in the model, the study used time series secondary data that covered the years 1990 to 2021. Values for variables like GDP per capital, gross capital formation, trade openness (trade % GDP), and mobile cellular subscription per 100 people (a proxy for ICT) were obtained from the World Bank Indicator 2022 publication as well as tourism receipts (% of GDP) from the United Nations World Tourism Organization Statistics Database 2022.

3.2 Definition and Measurement of variables

Table 2: Data Description and Sources

Variables	Description	Measurement	Source
GDP	Economic Growth	Output per Capital	World Bank Indicator
GDI	Capital Stock	Gross Capital Formation (constant LCU)	World Bank Indicator

MCS	ICT	Mobile cellular subscriptions (per 100 people)	World Bank Indicator
TRD	Trade Openness	Trade (% of GDP)	World Bank Indicator
TOUR	Tourism	Tourism receipts (% of GDP)	United Nation World Tourism Organisation Statistics Database

Source: Author's Computation 2023

3.3 Research Methodology

The tourist-led growth hypothesis, an economic theory that demonstrates a causal association between tourism advancement and economic growth within a certain geographic place, is the foundation of this study. This theoretical framework highlights how the expansion and development of the tourism industry act as potent catalysts for the expansion and development of the economy as a whole. This suggests that a rise in tourism-related activities may result in a possible increase in a number of economic metrics, including the GDP, employment, GDP growth, and investment opportunities. Comparably, our study used a translog production function model that considers labor and capital in addition to other pertinent factors (Haini, 2019). Several previous studies (Haini, 2020; Zhou et al., 2019; Min et al., 2016; Neves et al., 2015; Ma et al., 2015; Sequeira and Nunes, 2008) that employed a Barro-styled or production function model have examined the tourism-led growth hypothesis. The general formula is as follows:

$$y_t = A_t K_t^{\propto} L_t^{\beta} \quad (1)$$

Where A is Stock of Technology Knowledge

K is Capital Stock

L is Labour Stock

α & β are Capital and labour respectively

Recall that α + β = 1; α = 1-β (2)

Substitute equation (2) into (1)

$$y_t = A_t K_t^{\,1-\beta} L_t^{\beta} \quad (3)$$

$$\beta > 0$$

Where A & β are scalars of parameter.

Divide both side of the equation (3) by L_t to derive the output per worker (GDP) i.e. $\frac{y_t}{L_t}$

$$\frac{y_t}{L_t} = A_t . \frac{K_t^{1-\beta}}{L_t} . \left(\frac{L_t}{L_t}\right)^{\beta} \quad (4)$$

Taking the Log of both sides to obtain linearized time series equation time series equation

$$In\left(\frac{y_t}{L_t}\right) = In(A_t) + ln\left(\frac{K_t^{1-\beta}}{L_t}\right) \quad (5)$$

So, the time series equation log linear form

$$ln\ ln\left(\frac{y_t}{L_t}\right) = ln\ lnA_t + 1 - \beta ln(K_t) - ln(L_t) \quad (6)$$

$$ln\ ln(y_t) - ln(L_t) = ln\ lnA_t + 1 - \beta ln(K_t) - ln(L_t) \quad (7)$$

$$ln\ ln(y_t) = ln\ lnA_t + 1 - \beta ln(K_t) - ln(L_t) + ln(L_t) \quad (8)\ ln\ ln(y_t)$$
$$= ln\ lnA_t + 1 - \beta ln(K_t) \quad (9)$$

The dependent variable, GDP per labour is represented by y_t , while capital (K_t), technology factor (A_t), all in logarithm.

3.4 Estimation technique

3.4.1 ARDL bounds procedure

The research uses the Autoregressive Distributed Lag (ARDL) cointegration, which Pasaran et al. (2001) first proposed. In addition to investigating the interaction impact of tourism and ICT on economic growth, this research will look at the short- and long-term relationships between these three factors and Nigerian economic growth. The method is better, according to Kumar et al. (2019), since the bound testing strategy functions as long as the total of the integration orders stays under the boundaries of 2. According to Kumar et al. (2016), this suggests that, at best, every variable shows stationary in the first difference. Moreover, studies with relatively small sample sizes are considered suitable for the ARDL approach (Nkoro& Uko, 2016; Odhiambo, 2009; Duasa, 2007; Pesaran& Shin, 1995). To make sure that all variables are at most stationary after the initial difference, we thus look for the unit root characteristics. Moreover, unit root tests must be performed to ensure that all variables achieve stationarity following the first differencing procedure.

3.4.2 Model Specification

The purpose of this study was to look at the interaction between tourism and ICT and economic growth in Nigeria, as well as the link between the two. A linear regression model is used to construct this connection. To capture the relationship between tourism, ICT, and economic growth in Nigeria, an econometric model was constructed in accordance with the conceptual, theoretical, and empirical literature reviewed. Certain variables were added to the model as control variables, which have also been used by previous studies to explain the relationship between tourism, ICT, and economic growth (Kumar et al., 2019; Kumar and Kumar 2012) as well as to achieve the study's objectives. The implicit model that results from the functional relationship is as follows:

$$GDP = f(TOUR, MCS, GDF, TRD, (TOUR * MCS) \quad (10)$$

Where

GDP = Gross Per Person Employed

TOUR = Tourism Receipt

MCS = Mobile Cellular Subscription

GCF = Gross Capital Formation

TRD = Trade Openness

The model in equation (1) is specified explicitly as follows

$$lnGDP_t = \beta_0 + \beta_1 TOUR + \beta_2 MCS_t + \beta_3 GDF + \beta_4 TRD_t + \beta_5 (TOUR * MCS) + \mu_t \quad (11)$$

μ_t = Expression of errors.

While, β_1, β_2, β_3, β_4 and β_5 are parameters of the independent variables to be estimated in the course of this Study.

The generalized ARDL (p,q) model according to Nkoro, & Uko, 2016. This was recently re-specified by Alao-Owunna and Adediwura, (2023); Simeon, et al.,(2021); Olabisi, *et al.*, (2020); is shown as follows;

$$Y_t = \gamma_{0i} + \sum_{i=1}^{p} \delta_t Y_{t-i} + \sum_{i=0}^{q} \beta_i^I \ X_{t-i} + \varepsilon_{it} \quad (12)$$

Where γ *a*nd ε_{it} are constant and vector of the error terms respectively, Y_i^i is vector and X_t^i are variables which must be purely I(0) and I(1) or co-integrated ,p and q are optimal lag orders, where i = 1,..., k. However, we perform the bound test which is necessary to ascertain the co-integration between real per capita output (*GDP*), tourism receipts (*TOUR*) and *ICT(MCS)*; the condition ARDL (p, q_1,q_2 q_3,q_4, q_5) .

The ARDL equations are specified as follows

Hypothesis

H_0:$\beta_{1i} = \beta_{2i} = \beta_{3i} = \beta_{4i} = \beta_{5i} = \beta_{6i} = 0$

H_1: $\beta_{1i} \neq \beta_{2i} \neq \beta_{3i} \neq \beta_{4i} \neq \beta_{5i} \neq \beta_{5i} \neq 0$

where i =1,2,3,4,5

$$\Delta lnGDP_t = a_{01} + \sum_{i=1}^{p} \beta_{1i} \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta InTOUR_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta MCS_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta InGCF_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta TRD_{t-i} + \sum_{i=0}^{q} \beta_{6i} \Delta In(TOUR * MCS)_{t-1} + \alpha_{11} lnRGDP_{t-1} + \alpha_{21} REC_{t-1} + \alpha_{31} CF_{t-1} + \alpha_{41} TLF_{t-1} + \alpha_{51} TO_{t-1} + + \varepsilon_{1t} \quad (13a)$$

$$\Delta lnTOUR_t = a_{01} + \sum_{i=1}^{p} \beta_{1i} \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta TOUR_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta MCS_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta InGCF_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta TRD_{t-i} + \sum_{i=0}^{q} \beta_{6i} \Delta (TOUR * MCS)_{t-1} + \alpha_{11} lnRGDP_{t-1} +$$

$$\alpha_{21}REC_{t-1} + \alpha_{31}CF_{t-1} + \alpha_{41}TLF_{t-1} + \alpha_{51}TO_{t-1} + + \varepsilon_{1t} \quad (13b)$$

$$\Delta lnTRD_t = a_{01} + \sum_{i=1}^{p}\beta_{1i}\Delta lnGDP_{t-i} + \sum_{i=0}^{q}\beta_{2i}\Delta TOUR_{t-i} + \sum_{i=0}^{q}\beta_{3i}\Delta MCS_{t-i} + \sum_{i=0}^{q}\beta_{4i}\Delta InGCF_{t-i} + \sum_{i=0}^{q}\beta_{5i}\Delta TRD_{t-i} + \sum_{i=0}^{q}\beta_{6i}\Delta(TOUR * MCS)_{t-1} + \alpha_{11}lnRGDP_{t-1} + \alpha_{21}REC_{t-1} + \alpha_{31}CF_{t-1} + \alpha_{41}TLF_{t-1} + \alpha_{51}TO_{t-1} + \varepsilon_{1t} \quad (13c)$$

Thus, the short run which is also known as error correction model for the study is specified as

$$\Delta lnGDP_t = a_{01} + \sum_{i=1}^{p}\beta_{1i}\Delta lnGDP_{t-i} + \sum_{i=0}^{q}\beta_{2i}\Delta TOUR_{t-i} + \sum_{i=0}^{q}\beta_{3i}\Delta MCS_{t-i} + \sum_{i=0}^{q}\beta_{4i}\Delta GCF_{t-i} + \sum_{i=0}^{q}\beta_{5i}\Delta TRD_{t-i} + \alpha_{61}(TOUR * MCS)_{t-1} + \varphi ECT_{t-1} + \varepsilon_t \quad (14)$$

While the long run model is also specified as:

$$\Delta lnGDP_t = \alpha_{11}lnGDP_{t-1} + \alpha_{21}TOUR_{t-1} + \alpha_{31}MCS_{t-1} + \alpha_{41}GCF_{t-1} + \alpha_{51}TRD_{t-1}\alpha_{61}(TOUR * MCS)_{t-1} + + \varepsilon_{1t} \quad (15)$$

Where: $\Delta\ is\ a\ difference\ operator, \beta_1 - \beta_6$is the short run dynamic coefficient of the model in equation (14), $\alpha_1 - \alpha_6$the long run dynamic coefficient of the model in equation (15), ECT_{t-1} is the error correction term and φ is the coefficient hat will capture the speed of adjustment back to long term equilibrium after a shock in the short run.

IV. Results and Discussion

4.1 *Descriptive Statistics*

The features of the variables are examined using descriptive statistics prior to looking at the link between tourism, ICT, and economic growth in Nigeria. Table 3 presents the findings.Over the course of the study, 2014 had the largest economic growth rate of 3.51%, while 1995 saw the lowest growth rate of 2.61%. The Jarque-Bera statistic indicates that the variable has a regular distribution. However, as the value is closer to zero (0), a Jarque-Bera probability of 0.76 indicates that the Trade Openness Indicator's (TRD) distribution is probably closer to normal than the other variables. Every variable that is being examined has a normal distribution. This is corroborated by Jarque-Bera data (see Table 3).

Table 3. Descriptive statistics

	LNGDP	LNTOUR	MCS	LNGCF	TRD
Mean	3.12	8.48	40.62	12.96	36.82
Median	3.28	8.51	41.34	12.96	39.28
Maximum	3.51	9.42	98.03	13.08	53.28
Minimum	2.61	7.67	0.01	12.84	16.35
Std. Dev.	0.30	0.51	37.04	0.07	9.83
Skewness	-0.51	-0.04	0.14	-0.04	-0.27

Kurtosis	1.64	1.94	1.37	1.90	2.38
Jarque-Bera	3.24	1.26	3.06	1.38	0.76
Probability	0.20	0.53	0.22	0.50	0.68
Observations	27	27	27	27	27

Source(s): Author's computations

The average log of tourism reception (LNTOUR) is 8.48, while the greatest value of the indicator, 9.42, was recorded in 2017. Nigeria had a minimum value of 7.67 in 1995 throughout the research period. This implies that the industry has the capacity to significantly contribute to the country's economic expansion. Furthermore, the value of information and communication technology (MCS) in Nigeria varies, peaking at 98.03 in 2020 and falling to 0.01 in 1995.The average number is 40.62, while the median is 41.34. This indicates that Nigeria made advancements in information and communication technologies of around 41 percent or more throughout the research period. The country appears to be above average in most of the years that have been looked at. This suggests that Nigeria's rate of ICT development is faster than average. The standard deviation, a statistic that shows how far the data deviate from the mean value, is also presented in Table 3. It also determines the degree to which the mean matches the dataset. When compared to mean values, all variables—aside from the ICT indicator (MCS)—show low standard deviations (SD), indicating that the mean value correctly represented the data. This suggests that the variables are stable and less unpredictable, and that the data is consistently distributed. The mean (40.62) value and the standard deviation (MCS, 37.04) of the ICT indictor are quite close. It demonstrates that the data are spread out around the mean and that the average is a poor fit for the data. It indicates some volatility and asymmetry in the distribution of data, and it also implies that the ICT indicator is not entirely stable. Ultimately, it can be observed from the coefficients of kurtosis that all the variables are platykurtic relative to the normal distribution. Their data distributions are apparently less tightly concentrated around the mean than a normal distribution would be, as indicated by the fact that their coefficients of kurtosis are smaller than 3.

4.2 *Unit Root Tests*

To ensure that the right methodology and estimate approach are applied, it is crucial to verify the stationarity properties of the data after the descriptive statistics. Given this, the results of two unit root tests—the Phillip-Parron test (PP) and the Augmented Dickey-Fuller (ADF) test—are shown in Tables 4 and 5. Table 4's ADF results demonstrate that although other variables exhibit integration of order 1, the logarithms of capital formation and trade openness attain stationarity at the same level. The PP test findings in Table 5 show that all other variables are integrated at level one, but only the log of capital creation achieves stationarity at level zero. This demonstrates that none of the variables go above order one, even if they display a range of integration orders. This promotes applying the ARDL model. The lag time is automatically selected using the Akaike Information Criterion (AIC). Based on the outcomes of the unit root testing, cointegration tests are necessary.

Table 4: Augmented Dickey Fuller Test

	Level	First Difference

Variables	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Order of Integration
LNGDP	-1.900	-0.054	-3.343**	-3.722**	I (1)
LNTOUR	-1.864	-2.658	-4.100***	-4.203**	I (1)
MCS	0.196	-3.522*	-3.756***	-3.566**	I (1)
LNGCF	-0.733	-5.687***	-9.315***	-9.090***	I (0)
TRD	-2.290	-3.602**	-6.010***	-5.944***	I (0)

Note(s): ***, **, * denote levels of significance at 1%, 5% and 10% respectively
Source: Author's computation (2023).

Table 5: Phillips- Perron Test

	Level		First Difference		
Variables	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Order of Integration
LNGDP	-1.728	-0.380	-3.387**	-3.706**	I (1)
LNTOUR	-1.864	-1.583	-4.106***	-4.186**	I (1)
MCS	0.068	-2.145	-3.830***	-3.675**	I (1)
LNGCF	-2.738	-8.805***	-13.275***	-12.424***	I (0)
TRD	-2.294	-3.531	-9.489***	-12.204***	I (1)

Note(s): ***, **, * denote levels of significance at 1%, 5% and 10% respectively
Source: Author's computation (2023).

4.3*Cointegration Tests*

After verifying the mixed order of integrations and confirming the stationarity of the variables in the research—most notably, the stationarity at minor fluctuations, or first difference—the analysis uses the ARDL bounds testing approach to explore the possibility of cointegration between LNGDP, LNTOUR, MCS, LNGCF, and TRD, with LNGDP, LNTOUR, and MCS serving as dependent variables. Table 6 displays the results of the ARDL bounds testing. The computed F-statistic, which stands at 6.154, 5.700, and 5.321 when LNGDP, LNTOUR, and MCS are the dependent variables, respectively, definitely surpasses the critical values defined for both the upper and lower limits at a significance level of 5%, according to the findings. When growth rates of GDP, growth rate of tourism receipts (LNTOUR), and mobile cellular subscription (MCS) are the dependent variables, respectively, this suggests the existence of cointegration among the growth rates of GDP, growth rate of tourism receipts (LNTOUR), growth of capital formation (LNGCF), and trade openness (TRD). Consequently, the null hypothesis, which asserts that there is no long-term link, is rejected by this study. This is consistent with research by Kumar and Kumar (2012) and Kumar et al. (2019), which found a positive cointegration between tourism, ICT, and economic growth.

Table 6: Bound Test for Cointegration

Dependent Variable	K	Computed F-statistic
LNGDP	4	6.154
LNTOUR	4	5.700
MCS	4	5.321
Critiacl Values	Lower Bound I(0)	Upper Bound I(1)
2.5%	3.89	5.07
5%	3.47	4.57
10%	3.03	3.03

Source(s): Author's computations

4.4*The role of ICT in the Tourism-growth nexus*

Table 7 displays the details of the calculated short and long run coefficients of the ARDL model's error-correction version (1, 1, 1, 2, 2, 0). At the 1% level, the negative coefficient of the error-correction term (ECT,-0.613) is statistically significant. This parameter indicates the speed at which shock-induced deviations and divergences will return to the dynamic and stable equilibrium. The findings show that, within a year following a shock, the rate of convergence, or adjustment, to the equilibrium state, is 61.3%. Additionally, the short-run coefficient of the tourist indicator (0.029) has a minor positive impact on Nigeria's economic development. The result is unexpected given that previous research (Tang & Tan 2015; Erturul&Mangir 2015; Su, et al., 2021; Pan & Dossou, 2020; Paramat, et al., 2017; Khoshkhoo, et al., 2017) has shown that tourism has a considerable beneficial effect on economic growth. Despite the likelihood that this is due to a steady decline in the number of foreign visitors to the country. But in the end, things work out because the coefficient (-0.231) seems substantial but negative at the typical levels. This demonstrates how tourism consistently has a negative impact on growth. This disproves the claim made by Yusuff and Akinde (2015) that Nigeria's economy grew more rapidly between 1995 and 2013.

The short-run coefficient (0.006) for information and communication technology indicates that, at the 1% level, lag zero is significant and positive. This demonstrates how ICT momentarily accelerates Nigeria's economic development. Similarly, with a long-term coefficient of (0.004), information and communication technology (MCS) has a strong positive impact on Nigeria's economic growth. The results align with the studies conducted by Adesokan et al. (2021), Niebel (2018), Virto and Bacache-Beauvallet (2009) and (2011), Alao-Owunna and Adediwura (2023), and others that have demonstrated a noteworthy and affirmative influence of ICT on economic growth. Notably, Alao-Owunna and Adediwura (2023) also employ mobile cellular subscription as a stand-in for ICT.

Table 7: Estimated short and long run coefficient using ARDL (1, 1, 1, 2, 2, 0).

Dependent variable: Growth rate of GDP(RGDPC)				
Variable	Coefficient	Std. Err	t-statistic	Prob
Δ(LNTOUR)	0.029	0.017	1.661	0.123
Δ(MCS)	0.006***	0.000	7.837	0.000
Δ(LNGCF)	0.479***	0.098	4.889	0.000
Δ(LNGCF(-1))	0.207**	0.087	2.391	0.034
Δ(TRD)	0.004***	0.001	6.579	0.000
Δ(TRD(-1))	-0.004***	0.001	-5.747	0.000

ECT(-1)	-0.613***	0.053	-11.642	0.000
Long-run Coefficients				
LNTOUR	-0.231***	0.055	-4.224	0.001
MCS	0.004**	0.001	2.897	0.013
LNGCF	1.155	0.870	1.327	0.209
TRD	0.015***	0.003	4.963	0.000
(LNTOUR*MCS)	0.148***	0.014	10.380	0.000

Note(s): ** and *** denote 5% and 10% levels of significance, The Akaike Information Criterion was used to select the number of optimal lag length which was adopted to estimate short and long-run coefficients
Source(s): Author's computations

Lags 0 and 1 at the 1% and 5% levels, respectively, are substantial and positive, according to the short-run coefficients of capital creation (GCF) indicator (0.479 and 0.207). This proves that Nigeria's gross capital accumulation promotes rapid economic growth. These results corroborate those of Nathaniel et al. (2020); Ugochukwu and Chinyere (2013). (1.155) is also positive but negligible based on the long-run coefficient of capital formation (GCF) indicator. Similar findings are shown by the short-run coefficients of trade openness (TRD) indicator, which shows that lags zero and one (0.004 and -0.004) indicate that lag zero is substantial and positive at the 1% level, while lag one is significant and negative. At the 1% level, however, the long term coefficient (0.015) shows a strong and positive correlation between trade openness and economic development in Nigeria. This finding confirms the findings of Shahbaz (2012) and Kong et al. (2020) that trade openness eventually fosters economic development. Additionally, a positive and statistically significant influence on economic growth is revealed by the long-run coefficient (0.148) of the interaction term between tourist receipt and mobile cellular subscription (LNTOUR*MCS). This finding implies that ICT and tourism are contributing to growth in a complimentary way. According to the study, this role is beneficial and suggests that the rise of the tourist industry and the adoption of ICT advances can work as catalysts for economic growth by fostering an environment that is favorable to economic advancement. In the end, this might favorably impact the nation's overall economic growth by promoting technical developments, increasing job opportunities, and diversifying the economy. The results align with the studies conducted by Castro et al. (2020), Haini (2020), and Kumar et al. (2016).

4.5 *Diagnostic tests*

The results of the tests for serial correlation, heteroskedascity, and model specification are summarized in Table 8. The Breusch-Godfrey Serial Correlation LM test indicates that there are no problems with serial correlation in the model. This means that the model is completely unrestricted by the heteroskedascity constraint of econometrics. Furthermore, the results of the Ramsey Reset test show that there are no specification mistakes in the estimated model. Furthermore, the stability of the estimated parameters is examined by applying the cumulative sum (CUSUM) to the recursive residuals computed of the ARDL model. The variables of the estimated ARDL model are stable as shown in Figure 1 below.CUSUM confirm stability of the parameters and the calculated model since the lines are inside the 5% critical boundaries as indicated by Bahmani-Oskooee and Ng (2002).

Table 8: *Results of the Diagnostics Tests*

Test	F-statistic	Prob. value	Remarks
Breusch–Godfrey serial correlation LM test	2.432	0.139	No serial correlation
Heteroskedasticity TestBreusch-Pagan-Godfre	0.385	0.944	No Heteroskedasticity
Ramsey Reset test	0.025	0.976	No specification error

Source(s): Author's computations

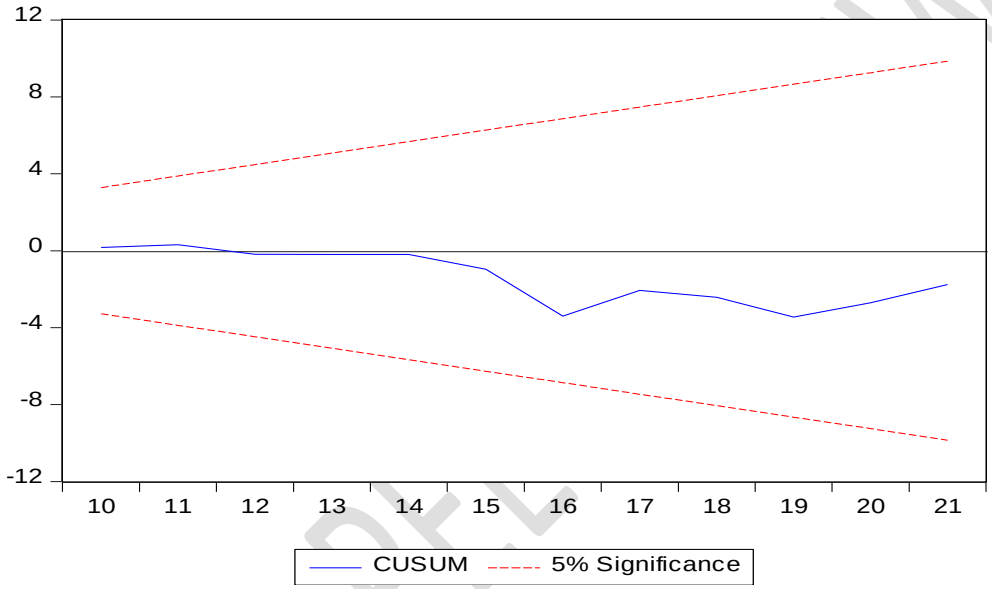

Figure 1 Stability Test: CUSUM

IV. Conclusion and Policy Recommendations

This research investigates the potential short- and long-term impacts of ICT and tourism on Nigeria's economic growth. We also look at how ICT and tourism combine to drive economic growth. Research indicates that in the near term, ICT makes for around 0.6% of economic growth, whereas tourism accounts for 2.9%. The long-term results indicate that only ICT positively contributes to economic development, at a rate of around 0.4%. Furthermore, the combined impact of ICT and tourism adds around 14.8% to Nigeria's economic development. This test highlights how tourism and ICT are complementary to the nation's economic prosperity. Thus, in order to promote the concurrent growth of ICT and tourism, our findings highlight the following policy debate points:

1. 1. Putting into practice regulations that focus investment in the ICT and tourist industries to improve their respective contributions to economic growth. This would enable investment from the public and commercial sectors.
2. It is imperative to enhance both regulatory capability and ICT policy concurrently to facilitate the seamless liberalization process. Facilitating travel will also aid in the promotion of cross-border travel.
3. 3. Enhancing ICT education at all levels to promote creativity and steady growth by making sure that the workforce remains ICT-skilled and that the benefits of ICT are openly transmitted to a variety of industries, including tourism. This might be a long-

term policy strategy that would boost employment opportunities in the hotel industry, increase service quality, and give priority to e-tourism in the sector.

4. ICT may be used to bridge the digital divide and attract tourists to Nigeria from across the globe. ICT (such as Google ads) may be used as a digital door-to-door marketing strategy where outside visitors can connect and get up-to-date trip information. This will further ensure that visitor confidence is developed and maintained through a stable and safe environment, underscoring the need for effective ICT management and security in the country.

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