



ABSTRACT

This study explores the impact of innovativeness on Nigerian Telecommunication operators' performance in the Federal Capital Territory (FCT) and its implications for the country's GDP. Data was collected through questionnaires from 500 customers of Airtel, Globacom, MTN, and 9mobile in Abuja Municipal Area, with 423 respondents analyzed. The study applies Joseph Schumpeter's Innovation theory of Profit, investigating technical, marketing, and product innovations as independent variables affecting telecom firms' profitability. The survey method research design was

INNOVATION AND FIRMS' PERFORMANCE IN THE TELECOMMUNICATION INDUSTRY IN THE FEDERAL CAPITAL TERRITORY (FCT), ABUJA, NIGERIA.

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Introduction

Conventionally, human life assumes a process that moves toward growth and development. Within this process lie the variables that necessitate the manifestations of growth and development. These two are assessed through the positive changes that occur over time. The changes may be in the form of abilities (technology) acquired and achievements (performances) recorded. Hence, the process must be an active and not a passive one because a passive life cannot be productive; it cannot endure competitiveness in the long run. Similarly, the growth and performance of any industry or economy cannot be accelerated without investment in productive capabilities, which provide an underlying basis for its growth. The terminology most common in explaining this dynamism is "innovation." It is a natural property of people, nay, firms to explore, adopt, and develop certain growth patterns in order to remain or become relevant, relative to the signs of time and the competitive environment.

Individual firm performance drives market power and competitiveness. High-performing firms gain more market power, a crucial growth indicator. Industry and individual firm performance contribute to the sector's economic value, influencing both market value and growth in other sectors (Ahmed, Ahmed & Usman, 2011).

The introduction of GSM in Nigeria in 2001 led to over 10 telecom companies entering the market, intensifying competition, seen through fluctuating network subscribers. Despite MTN's prominence, July 2018 stats showed Globacom gaining the most subscribers (214,646), followed by Airtel (149,880), reaching a total of 40,048,328 subscribers. Conversely, MTN and 9mobile lost 999,891 and 246,221 subscribers respectively (Vanguard, 2018). In 2019, 9mobile's market share fell to 7.4%,



employed. The findings indicate that marketing innovation, product innovation, and technical innovation can enhance the likelihood of profitability for telecom operators in the FCT. Notably, a significant link is established between marketing innovation and telecommunication performance, supported by a p-value of 0.0377 at a 5% significance level. However, technical and product innovations' p-values are 0.5460 and 0.3444 respectively, rendering them statistically insignificant. While technical and product innovations exhibit positive connections with telecom firms' profitability, their impact is relatively weak. On the other hand, marketing innovation exerts a more robust influence on telecommunication service providers' performance in the FCT. Consequently, the study recommends increased investment in marketing innovation by telecom companies to enhance their profitability.

Keywords: Innovation, Firms' Performance, Telecommunication Industry, Telecom Services, Telecom Subscribers, Abuja, Nigeria.

losing 2,743,322 subscribers, while MTN gained 2,097,256, Globacom added 6,096,414, and Airtel increased by 5,216,015 subscribers (NCC, 2019). Between September 2020 and September 2021, MTN lost 9,068,156, Airtel lost 4,215,233, and Globacom lost 1,319,560 subscribers, while 9mobile gained 254,211, the sole operator to avoid losses (Punch, 2021). These declines were influenced by the government policy linking National Identity Numbers (NIN) to SIM cards, halting SIM sales and setting a deadline for NIN-SIM linkage by December 31, 2021 (Punch, 2021).

Trade, regardless of scale, relies heavily on information, communication, and technology. Information signifies economic opportunities, while communication conveys and invests in it, and technology improves communication infrastructure due to evolving conditions. As telecom subscriber numbers change, innovation becomes vital. Innovation, transforming invention into commerce, drives growth and living standards. The advent of 4G LTE resulted from this need, elevating service quality and consumer preferences among telecom operators. This illustrates how technological advancements shape consumer choices and elevate living standards.

Alabi (1996) noted that all societies, regardless of advancement, rely on telecommunications networks, vital for defining collective identity and decision-making. Telecommunication's absence would stifle economic activities, while improved communication systems through innovation can enhance economic growth rates by renewing communication infrastructure, thereby shaping society.

Since the introduction of GSM, significant contributions have been made to employment, foreign direct investment, and private investment in telecommunications. In Q1 2014, telecom contributed 8.27% to GDP, slightly lower than Q1 2013. Economic activity improved in Q1 2014 with a 4.48% growth rate, driven by increased consumer activity and active lines. The NCC reported a rise in GDP contribution from 8.50% (2015) to 9.50% (2017), dropping to 7.41% and 8.66% in Q3 and Q4 2017. It rose in Q1 and Q2 2018 by 0.53% and 1.77% respectively. By Q2 2019, telecom's GDP contribution reached 11.39%, up 1.54% from Q4 2018's 9.85%.

Telecommunication plays a crucial role globally, vital for communication in both developed and developing nations. The connection between a nation's economic progress and effective telecom is undeniable. Developed countries usually have advanced infrastructure, while developing ones lag. Accessible telecom is crucial for economic growth, necessitating significant investment. Innovation



drives telecom progress, with value linked to addressing user needs. To boost technology and socio-economic development, planned telecom expansion is key for an improved quality of life.

Statement of the Research Problem

GSM mobile subscriber numbers are falling due to changing consumer preferences towards data bundles and Over the Top (OTT) services. Q4 2016 saw a rise in subscribers to 154 million, but Q1 2017 witnessed a drop to 152 million, and Q2 2017 further decreased to 143 million. Telecom operators and Internet providers compete for cheaper data prices, resulting in revenue contraction. OTT services contribute to this competition, delivering voice/video calls at lower costs. Although Nigeria's data prices are the lowest in the region, pricing below costs poses risks to the sector and long-term customer benefits.

Incidentally, before the emergence of the Global System of Mobile Communication (GSM), it was assumed by many that the Nigerian Telecommunication Limited (NITEL) Plc was badly run and non-profitable; characterized by corruption, administrative inefficiency and technical deficiency (Muhammad, 2012). Consequent upon the advent of GSM the company became operationally and financially wanting and had to fold because it could no longer pay itself. The folding up of NITEL was, apart from infrastructural decay, its inability to efficiently provide the needed services to Nigerian users. This constitutes a serious need especially, in a society that is hungry for data to access the many social media forums like Facebook, Twitter, Instagram, LinkedIn, YouTube, etc. It failed to upgrade service standards vis-à-vis the living standard and awareness of the populace in telecommunication. And, according to Osei & Owusu (2015), failure to innovate affects the performance of such enterprises.

Nigeria's telecom industry faces reduced performance due to subscriber attrition. In 2018, MTN lost 999,891 subscribers and 9mobile lost 246,221 (Vanguard, 2018). Dissatisfaction stemming from poor service quality, unfair charges, inaccurate billing, and lack of information drives subscriber withdrawals. Constant subscriber losses can shrink customer bases and potentially force operators to exit the market. **Therefore**, this study seeks to address the challenges of slow performance and output of the telecom industries in Nigeria's Federal Capital Metropolis. The point of departure from previous works lies in the combination of the chosen variables. Thus, the thrust of the gap that this study seeks to investigate is this: a firm might improve on its technological base through innovation but without a necessary and corresponding market strategy, its performance in terms of the subscriber base may still be unfavourable due to lack of proper awareness. Similarly, if the firm invests in marketing innovation but does not have the technical skills to improve upon service/product to satisfy customers they will certainly leave (port) to networks that satisfy them at some point.

Research Questions

The research questions that guided this study are stated below:

- i. What impacts does technical innovation have on the performance of firms in the Nigerian Telecommunication industry within the Federal Capital Territory (FCT)?
- ii. To what extent does marketing innovation impact the performance of firms in the Nigerian Telecommunication industry within FCT?
- iii. How does product innovation determine firms' performance in the Nigerian Telecommunication industry within FCT?

Objectives of the Study

The main objective of this study is to investigate the extent of innovativeness and its possible implications on the performance of Nigerian Telecommunication operators. The specific objectives of this study are:



- i. To determine the impacts of technical innovation on the performance of firms in the Telecommunication industry in FCT.
- ii. To establish how marketing innovation affects the performance of firms in the Telecommunication industry in FCT.
- iii. To investigate how product innovation influences the performance of firms in the Telecommunication industry in FCT.

Conceptual Review

Market Performance

The term 'performance,' on a common notion, directly illustrates an act of carrying out any given task or role. In business, performance simply denotes how successful a thing is and it is not unrelated to economic growth. It has been defined as an assessment for an organization of its success in areas related to its assets, liabilities and overall market strength (Kenton, 2023). In this manner, many business operators take regular stock on either a formal or less formal basis of the general economic performance of their company to ascertain its economic position and market power. The market performance of individual firms depends on their respective goals. Thus, performance is the result of activities undertaken by firms in pursuit of their goals. Although there are many ways of assessing the market performance of the com firms, the parameter chosen for this study as an indicator of performance was its profitability. Three key metrics used to analyze a telecommunications company are average revenue per user (ARPU), churn rate, and subscriber growth. The average revenue per user (ARPU) measures the average revenue a company generates per user over a given time. This average revenue per user (ARPU) is calculated by dividing the total revenue for a period by the average number of users. This is an important metric in the telecommunications industry as it illustrates the company's operational performance. The ability to maximize profits and minimize costs associated with servicing each end user is key to these companies.

Profitability

Profitability is a business's ability to produce a return on an investment based on its resources in comparison with an alternative investment (Horton, 2021). The profit is usually gleaned from a company's quarterly and annual financial statements to determine the company's intrinsic value. The profitability of the telecom industry has a great impact on the revenue of the federal government due to taxes. The greater the profit, the higher the income tax will be. Firms' profitability (FP) will be adjudged as a binary variable that denotes 1 if the telecom operator is profitable and 0 if otherwise. Explication of the details is appropriately attended to in chapter three (3).

Telecommunication

The word 'telecommunication' comes from the combination of the Geek prefix 'tele' which means distant, with the Latin word 'communicare' which means to share. Thus, telecommunication means communicating or sharing of information across a distance via some technologies. Important telecommunication technologies include the telegraph, telephone, radio, television, video-telephony, satellites, closed computer networks, and the public internet. According to Rouse (2014), telecommunication is the exchange of information over significant distances by electronic means; it refers to all types of voice, data, and video transmission. This is a broad term that includes a wide range of information-transmitting technologies. Regan (2016) defines telecommunication as a branch of



technology that is concerned with the transmission of information over a distance, whereby a transmitter sends the information to a receiver. Therefore, telecommunication involves connecting and sharing information for societal benefits from different locations or distances by agents of communication through different media. In the past centuries, the exchange of important messages on the Country's economic, social, political, or cultural concerns was physically discharged by human persons as messengers who made use of various means of transportation or signals to disseminate. The means were such that incurred a lot of challenges thereby, affecting the growth of the economy.

The need for human beings or groups to exchange information more effectively and efficiently has always created a strong motivation in people to devise greater means of satisfying this need.

This pressing need for better ways of passing information gradually led to the invention of telecommunication; telephones and other electronic devices. The history of telecommunication is dated back to the 18th Century. The word telecommunication was created in 1904 by Edouard Estaunie (1862-1942). Estaunie defined telecommunication as information exchange using electrical signals (Dilhac, 2008). By this definition, he limited telecommunication to electrical signals. Gradually, telephone service which was introduced in few a cities spread fast and became a widely used service which led to the emergence of the Global System for Mobile Communication (GSM) in 2001.

Innovation

Etymologically, the word "innovation" comes from the Latin noun "novus," meaning "new" and the verb "innovare," meaning "to change; to renew." Thus, innovation can simply be described as a new method, idea, product, etc., and is crucial to the continuing success of any organization (Innovation, 2020 in lexico.com). Innovation is the implementation of a new or significantly improved product (good or service), process, new marketing method, or a new organizational method in business practices, workplace organization, or external relations. The minimum requirement for an innovation is that the product, process, marketing method, or organizational method must be new (or significantly improved) to the firm. Innovation activities are all scientific, technological, organizational, financial, and commercial steps that actually, or are intended to, lead to the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation. Innovation can be defined as all the scientific, technological, organizational, financial, and commercial activities necessary to create, implement, and market new or improved products or processes (Leger & Swaminathan, 2007). Therefore, the need to constantly upgrade and update goods and services is the driving force of most economies.

Bessant, Lamming, Noke & Philips (2005) stated that innovation represents the core renewal process in any organization. Furthermore, they explained the changes that it offers the world product/ service. Ducker (1985) also explained innovation as a change that creates a new dimension of performance.

Tiwari (2008) categorizes four types of innovation: (i) Product Innovation involves new or improved goods/services with novel characteristics or uses; (ii) Process Innovation introduces enhanced production/delivery methods, aiming to reduce costs or improve quality; (iii) Marketing Innovation involves significant changes in product design, packaging, placement, promotion, or pricing; (iv) Organizational Innovation implements new methods in business practices, workplace, organization, or external relations, often aiming to reduce costs or enhance productivity. It's clear that organizational innovation is crucial as it can amplify the positive impacts of other types of innovation.

Innovation encompasses various aspects like product, process, billing, and marketing. These innovations impact market shares, especially through billing methods and small product improvements,



like the introduction of pre-paid cards in mobile markets. Such innovations blend business models with technology advancements (Henten, Falch, & Tadayomi, 2004). Technical innovation varies in its degree of radicalness, from incremental improvements like new internet-based services to more radical changes like upgrading to 3G or 5G network standards, as seen in Nigeria and other countries (Henten, et al, 2004).

Research Gap

The effects of innovation on the performance of firms in telecommunication have been discussed extensively by several researchers. While some use customer satisfaction and retention vis-à-vis service innovation to explain the impact of innovation on firms' performance (Ogunnaike, Ibidunni & Adetowubo-King, 2014; Diaw & Asare, 2018; Osei & Owusu, 2015), others either use technical innovation and/ or administrative innovation to explain the impacts of innovativeness on performance of firms in telecommunication industry (Muhammad, 2012; Abdi and Ali, 2013). While past studies often examine the impact of individual innovation variables on organizational performance, this study uniquely explores the combined influence of technical, product, and marketing innovations. It addresses a crucial gap in understanding: improving technology without effective marketing or lacking product innovation can hinder performance. Likewise, a telecom firm investing in marketing without strong product innovation may operate suboptimally, leading to subscriber losses. This study aims to investigate how innovation impacts performance, using the Nigerian telecommunication industry as a case study.

Theoretical Framework

As its basis, the study employs the theory of Innovation as propounded by Joseph Schumpeter. The relevance of the theory of Innovation to the present study is in its practical relatedness. As it is the assertion of the theory that any new sustainable policy adopted by a firm is ideal in yielding a higher demand for the product, such is equally applicable to telecommunication firms, that the value of innovative measures inserted into the service in terms of its technology, marketing strategy and products, will definitely and correspondingly determine the high demands of the firm's services and products.

The innovation theory of profit states that entrepreneurs profit by successfully reducing production costs or increasing product demand. Initially, an innovator enjoys a monopoly and higher profits, but as competitors imitate the innovation, profits decline. This theory relates to subscriber numbers reflecting firm profitability, and it shows that innovation diffusion prevents firms from maintaining a market monopoly. Thus, the profitability of the firms will depend on constant entrepreneurial activities to sustain profit margin.

METHODOLOGY

The research used a survey method, suitable for large populations where a census is impractical. The study focused on Nigeria's FCT, Abuja, established in 1976, located north of the Niger and Benue Rivers confluence. The region is bordered by Niger, Kaduna, Nassarawa, and Kogi states. It spans 2,824 square miles, with coordinates within latitude 7°25'N to 9°20'N and longitude 5°45'N to 7°39'N. In 2006, the population was 1,406,239, while 2016 estimates placed it at 3,564,100. Abuja, about 300 miles northeast of Lagos, has cooler climate and lower humidity levels.

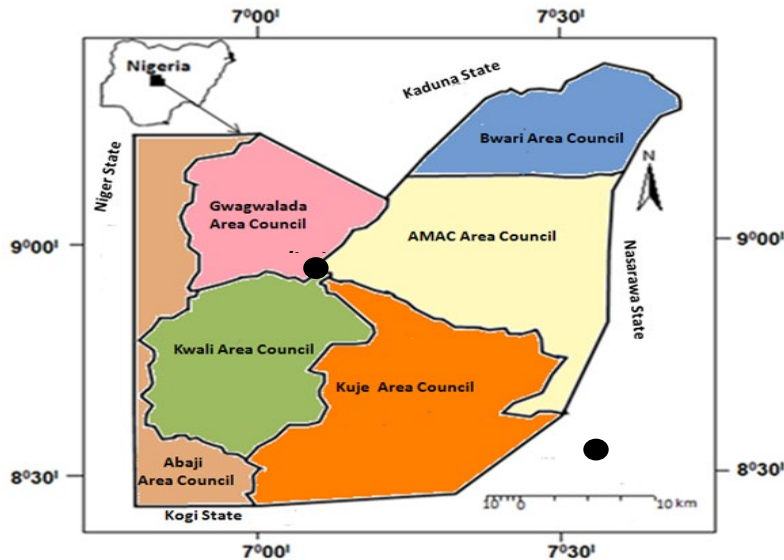


Figure1: Map of FCT, Abuja
Source: Abuja Master Plan

This study focuses on the four primary mobile telecom firms in Nigeria: MTN, GLO, 9MOBILE, and AIRTEL. The research is confined to subscribers of these operators in the Federal Capital Territory (FCT). The study population comprises randomly selected consumers from these companies in the FCT, chosen due to its substantial customer base stemming from high population growth.

Data were collected from a sample of 500 subscribers through individual questionnaires. A sample represents a subset of a population, allowing for scientific statements about the larger group. The population size being unknown, a formula known as Andrew Fisher's Formula was used to estimate the sample size. According to Kibuacha (2021), a sample size of around 385 offers sufficient data to make assumptions about various population sizes at a 95% confidence level with a 5% margin of error. Andrew Fisher's formula involves determining population size (if known), confidence interval, confidence level, standard deviation (0.5 is often chosen when unknown), and converting confidence level into a Z-Score. The formula for sample size determination is thus given:

$$\text{Sample size} = \frac{(z\text{-score})^2 \times \text{StdDev} \times (1 - \text{StdDev})}{(\text{confidence interval})^2}$$

Where:

- Confidence level of 95% = (converted into a z-score of 1.96);
- Standard deviation = 0.5;
- Confidence interval (margin of error) of ±5%.

Putting the figures into the sample size formula to get your sample size.

$$\begin{aligned} & ((1.96)^2 \times .5(.5)) / (.05)^2 \\ & (3.8416 \times .25) / .0025 \\ & .9604 / .0025 \\ & = 384.16 \end{aligned}$$



From the result, the sample size which should be about 385 was increased to 500 to ensure elaborate coverage and analysis. The convenience sampling technique was adopted, whereby the researcher selected respondents based on the ease of accessibility and collection of data. Elements in the study population were given an equal chance of being selected at random without any specific selection criteria. Therefore, the simple random technique was also used.

Model Specification

The study employs a logistic regression function (Logit model) to assess telecom firms' performance (Y) based on three innovation indicators: Technical Innovation, Marketing Innovation, and Product Innovation. The Logit model is utilised when analyzing binary or dichotomous regressands. It overcomes the linear probability model's limitations by allowing non-linear probability values. The choice of the Logit model is due to its widespread use in applied research, despite similarities with Probit Models according to Gujarati (2013).

This research will employ the use of the binary Logit Model, a binary response model in which the dependent variable can take only two values, 0 or 1, for *i* observations. The linear probability model is transformed using the cumulative logistic regression function.

The functional form of the model is specified as follows:

$$FP = f(TI, MI, PI, U) \dots \dots \dots 3.1$$

The functional Model in 3.1 is stated explicitly as follows:

$$L = \ln \left(\frac{p}{1-p} \right) = \alpha + \lambda_1 TI + \lambda_2 MI + \lambda_3 PI + U \dots \dots \dots 3.2$$

Where:

FP = Profitability of Telecommunication Operators

FP = 1 if the firm is profitable

FP = 0 if otherwise

TI = Technical Innovation

MI = Marketing Innovation

PI = Product Innovation

α = intercept term

λ 's = coefficients of the explanatory variables.

U = Error Term

A-priori Expectation

The indicators of innovation are expected to have a positive effect on the performance of telecom operators in Nigeria: $\lambda_1 > 0$, $\lambda_2 > 0$ and $\lambda_3 > 0$

The variables used in this study are represented in Table 1:

Dependent Variable	Features
Firms' profitability (FP)	A binary variable that denotes 1 if the telecom operator is profitable and 0 if otherwise
Independent Variables	Features
Technical Innovation (TI)	This variable is measured using six (6) distinct indicators namely: i. 4G network standard. ii. sustainable strategies to arrest complications on connections. iii. Capacity to minimize service disruptions iv. Capacity to absorb more subscribers without compromising service quality v. quality of voice transfer and vi. The functionality of network service given adverse weather conditions.



Marketing Innovation (MI)	This variable is measured using six (6) indicators of marketing innovation namely: i. Accurate and regular advertisements ii. Good volume and method of information provision iii. Social promotions to customers. iv. Provision of adequate feedback for channelling customers’ concerns. v. quality of customer service and vi. Social promotions to customers
Product Innovation (PI)	Product innovation is also measured using six distinct indicators of innovation including i. service coverage to very remote areas ii. Affordability of data bundles iii. provisions for enterprise sales iv. accessibility of mobile money services v. data plans that give more value for money and meet customer needs and vi. Quality of business relationship.

Table 1: The Variables

Method of Data Analysis

This study employs the **Maximum Likelihood method of estimation** on account of the desirable properties it possesses and the fact the dependent variable is binary (Gujarati, Porter & Gunasekar, 2013). The maximum likelihood estimation method uses the sample to estimate the parameters of the probability distribution that generated the sample (Taboga, 2021).

Also, the **Marginal effects** of the resultant coefficients will be calculated to explain by how much the probability of obtaining an outcome of $y_i=1$ will alter as a result of a unit change in a particular variable while keeping other variables constant at their average values.

Also, various test statistics which include the Likelihood Ratio Test and Z-test shall be adopted in assessing the goodness of fit of the model, the explanatory power of the estimated regression model, and the statistical significance of estimated parameters. The test of the hypothesis shall be carried out at a 5% (0.05) level of significance.

RESULTS AND THEIR INTERPRETATION

Questionnaire Administered

The Figure below shows the summary of the questionnaire administered which explains in detail, the distributed and retrieved copies of the questionnaire.

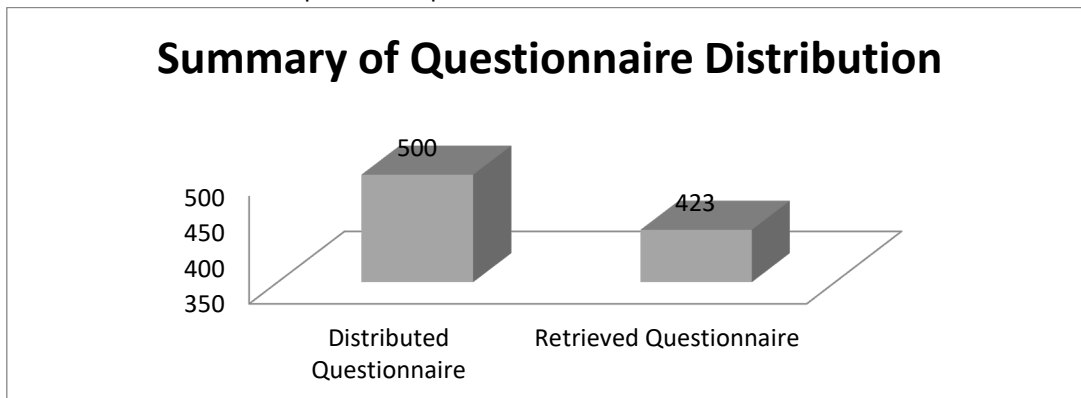


Figure 1: Summary of Questionnaire Distribution



Figure 1 highlights the response rate of the five hundred (500) questionnaires administered to some selected telecommunication subscribers within the Abuja Municipal Area to investigate the extent of innovativeness and its possible implications on the performance of Nigerian Telecommunication operators. As indicated in Figure 1, from the 500 hundred (100%) questionnaires distributed, 423 (about 85%) were retrieved. The magnitude of retrieved questionnaires is adjudged adequate and suitable for the analysis in this study.

Demographic Information of the Respondents

Table 2: Gender Distribution of Respondents

Gender	Frequency	Percent
Male	170	40.2
Female	253	59.8
Total	423	100

Source: Field Survey, 2021

Table 2 comprises the gender distribution of respondents. From the table, it was observed that out of the total population of 423 respondents, 170 of them representing 40.2% of the entire population indicated that they were males while the remaining 253 respondents signifying 59.8% of the population informed that they were females. In this, it was noted that the female gender participated more than their male counterparts.

Table 3: Age Distribution of Respondents

Age Interval	Frequency	Percent
18-30	147	34.8
31-59	264	62.4
60 and Above	12	2.8
Total	423	100

Source: Field Survey, 2021

In Table 3, it was noted that 147 respondents representing 34.8% of the entire population reported that they were between the ages of 18-30 years, 264 respondents signifying 62.4% of the population were between the ages of 31-59 years while the remaining 12 respondents (showing 2.8% of the population) were between 60 years and above. This shows a more youthful participation in this exercise and most of the participants were between the ages of 18 and 59 years of age.

Table 4: Marital Status of Respondents

Status	Frequency	Percent
Single	234	55.3
Married	185	43.7
Total	419*	99*

Source: Field Survey, 2021

On the marital status of the respondents, Table 4 informs that out of the total population of 423 responses, 234 of them representing 55.3% of the population indicated that they were singles while 185 respondents (signifying 43.7% of the entire population) informed that they were married. Worthy of



note also is the fact that there are other marital status variables than the ones designed in the questionnaire for this study. *As shown in the last row of Table 3, the population of respondents is not up to 423, meaning that the remaining 4, representing 1% of the respondents are neither single nor married. This accounts for the marital status variables not captured, which could be due to cases of divorce, widowhood, etc. This information shows that more than 50% of the respondents were single.

Table 5: Telecommunication Service Used by Respondents

Telecom Network	Frequency	Percent
Airtel	74	17.5
Globacom	30	7.1
MTN	308	72.8
gMobile	11	2.6
Total	423	100

Source: Field Survey, 2021

On the telecommunication service used by respondents, this study observed that out of the total population of 423 respondents, 74 people representing 17.5% of the population are Airtel subscribers, 30 respondents (indicating 7.1% of the population) reported that they use Globacom network, 308 respondents representing 72.8% of the population are MTN subscribers while the remaining 11 respondents (signifying 2.6% of the population) reported that they are subscribers of gMobile. This made the researcher conclude that most of the respondents are MTN subscribers. Figure 2 gives more illustration of Table 5

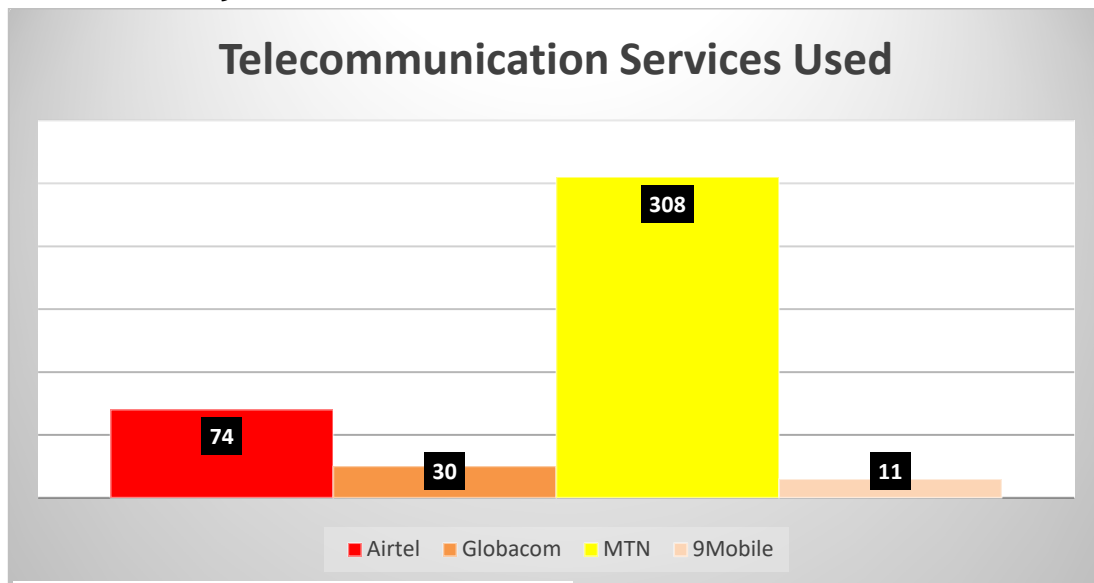


Figure 2: Telecommunication Services Used

Table 6: Period of Usage of Network by Respondents

Period	Frequency	Percent
1-5 years	72	17
6-10 years	110	26



11 years and above	241	57
Total	423	100

Source: Field Survey, 2021

On the period of usage, table 6 informs that 72 respondents representing 17% of the entire population reported that they had been using their network provider for 1-5 years, 110 respondents (that is, 26% of the entire population) have been using their network provider for 6-10 years while the remaining 241 respondents (signifying 57% of the population) have been using their network provider for over 10 years. This outcome shows that the various respondents had been with their chosen network for a very long time and their views of these providers may be a true reflection of the topic under review.

Model Estimation

To further understand the nature of the relationship between the dependent and independent variables employed in the study, the Ordinary Least Square method of regression analysis was employed. The estimated relationship was extracted from the model earlier specified.

The following was the outcome of the Regression analysis:

Descriptive Statistics

Table 7: Descriptive Statistics of Variables Used for Regression Analysis

Descriptive Statistic	FP	MI	PI	TI
Mean	0.858156	5.122931	4.543735	5.165485
Median	1.000000	6.000000	6.000000	6.000000
Maximum	1.000000	6.000000	6.000000	6.000000
Minimum	0.000000	1.000000	0.000000	0.000000
Std. Dev.	0.349303	1.332787	1.874587	1.384080
Skewness	-2.053117	-1.422244	-0.923060	-1.973228
Kurtosis	5.215289	3.708088	2.440306	6.437911
Jarque-Bera	383.6727	151.4428	65.58991	482.8148
Probability	0.000000	0.000000	0.000000	0.000000
Sum	363.0000	2167.000	1922.000	2185.000
Sum Sq. Dev.	51.48936	749.6076	1482.941	808.4161
Observations	423	423	423	423

Source: Authors' computation from Eviews Output

Table 7 displays descriptive statistics for the entire sample, encompassing both dependent and independent variables. Analysis reveals key insights: Marketing Innovation (MI) has an average weight of 5.122931, ranging from 1 to 6, with a standard deviation of 1.332787. Product Innovation (PI) has an average weight of 4.543735, ranging from 0 to 6, and a standard deviation of 1.874587. Technical Innovation (TI) holds an average weight of 5.165485, ranging from 0 to 6, with a standard deviation of 1.384080.

Regression Results and Interpretation

The logit regression framework was used to examine the effect of innovation on the performance of telecom operators in FCT using the Newton-Raphson / Marquardt steps. The E-views 10 statistical



software was used in this research to run the regression results and all other econometric tests except the marginal effects that were calculated using Stata 13.

Table 8: Logit Regression Results

DEPENDENT VARIABLE: FP				
VARIABLE	COEFFICIENT	STD. ERROR	Z-STATS	PROB
C	0.110297	0.613676	0.179732	0.8574
TI	0.065160	0.107911	0.603833	0.5460
PI	0.081159	0.085838	0.945495	0.3444
MI	0.202975	0.097661	2.078366	0.0377
PSEUDO R ²	0.0255			
LOG-LIKELIHOOD	-168.3061			
LR STATISTIC	8.806862			
PROB (LR STATISTIC)	0.031972			

Source: Authors' Computation from Eviews Output

Table 8 summarizes regression outcomes and key statistics. In non-linear models like binary Logit, coefficients aren't directly interpretable. Marginal effects are used to gauge conditional probability changes of the dependent variable (FP), while keeping other regressors constant. This accounts for the complex nature of probability shifts involving multiple regressors (Gujarati, 2013). Therefore, in the regression result in Table 7, only the signs of the coefficients can be used to make real inferences on existing relationships between variables.

From the estimated Logit regression in Table 8, the signs associated with the coefficients of marketing innovation (MI), product innovation (PI), and technical innovation (TI) are all positive. Hence, the signs associated with the estimated coefficients of marketing innovation (MI), product innovation (PI), and technical innovation (TI) conform to a-priori expectations. This is an indication that marketing innovation, product innovation, and technical innovation will increase the likelihood of profitability of telecom operators in the FCT.

Technical innovation's estimated coefficient lacks statistical significance (p-value = 0.5460), as evident from the z-statistic. Similarly, the coefficient for product innovation lacks significance (z-statistic = 0.945, p-value = 0.3444). On the contrary, marketing innovation's coefficient holds significance (z-statistic = 2.078, p-value = 0.0377) at a 5% level. The researcher has also computed the marginal effects of marketing innovation (MI), product innovation (PI), and technical innovation (TI) for better inference. The results are shown in Table 8.

Marginal Effects of Independent Variables

Table 9: Marginal Effects

Variables	MARGIN ($\delta y / \delta x$)	STD ERROR	Z	P > z
MI	.0241441	.011576	2.09	0.037
PI	.0096539	.0102077	0.95	0.344
TI	.0077509	.0128318	0.60	0.546

Source: Authors' Computation from Stata 13 Output



In the regression analysis (Table 9), only marketing innovation is significantly impactful at a 5% level. The telecom industry's profitability in FCT sees a 2.4% rise with a unit increase in age. Product innovation contributes a smaller 0.096% increase in profitability, while technical innovation has a 0.077% impact, keeping other variables constant.

Post-Estimation Diagnostics

Pseudo R²: The pseudo R² value stands at 0.025496 which implies that this model can explain 2.54% of the variability in the performance of telecom firms in FCT.

LR- Statistics: The LR- Statistic is 8.806862 and it has a p-value of 0.031972 which is less than 0.05. This shows that jointly, the coefficients of technical innovation (TI), product innovation (PI), and marketing Innovation (MI) are all statistically significant at a 5% level of significance.

Discussion of Findings

Carefully examining the impact of technical, marketing, and product innovation on the performance of firms in the telecommunication industry, this study found a significant joint relationship between the performance of firms in the FCT Telecommunication industry and technical innovation, product innovation as well as marketing innovation. However, this study noted that technical innovation and product innovation had the right sign but did not exert significant effects on the performance of firms in the FCT Telecommunication industry. These views serve as the basis for the researcher's conclusion. Additionally, Nguyen, Nguyen, Phung, and Nguyen (2019) found marketing innovation to have a significant relationship with Vietnamese Manufacturing Firms. This view is consistent with the findings of this study. To scholars, manufacturing firms play an important role in Vietnam for their contribution towards employment and income and are significant drivers for the industrialization and modernization strategy of the whole economy. To support the drive for industrialization and modern strategy, there is a need for an effective marketing innovation that will boost the mission and vision of the lead firms involved. Also, the findings of this study support the views of Atalay, Anafarta, and Sarvan (2013) where the scholars assert there is a significant relationship existing between innovation and the performance of the telecommunication industry in Turkey.

However, the views of Diaw and Asare (2018) regarding innovation and firm's performance were at variance with the findings of this study. Diaw and Asare (2018) found a negative and insignificant relationship between technical innovation and the growth of telecommunication industries in Ghana. The study's findings support its objectives robustly. Regarding the first objective on technical innovation's impact on FCT's telecom firms, results indicate a direct link between technical innovation and profitability. Nevertheless, the effect is relatively weak due to an insignificant estimated coefficient. For the second objective about marketing innovation, the study finds a strong and significant relationship between marketing innovation and profitability. Marketing innovation is shown to enhance telecom firms' performance significantly, surpassing the impact of product and technical innovation. Hence, marketing innovation is more likely to drive telecommunication firms' performance improvements compared to other forms of innovation.

Also, the findings of this study provide the requisite evidence for assessing the third objective of this study regarding the impacts of product innovation on the performance of Telecommunication firms in FCT. The findings reveal that product innovation has a direct relationship with firms' profitability but the effect is relatively weak. Given that its estimated coefficient is not statistically significant, the product



exerts a relatively weak influence on the performance of telecommunication firms relative to marketing innovation.

The finding of this study is, therefore, of tremendous relevance regarding policy mechanisms designed to engender optimal performance and productivity of firms in Nigeria's telecommunication industry.

Conclusion

Having thoroughly analysed the impact of innovation on the performance of the Nigerian telecommunication industry, the study concludes that there is a significant relationship between marketing innovation and the performance of the telecommunication industry in FCT. Product innovation has a positive effect on the performance of telecommunications firms in the FCT but the effect is not statistically significant. It was noted that technical innovation has a positive but insignificant effect on the performance of telecommunications firms in the FCT.

Recommendations

To ensure the improvement of innovation in the Nigerian telecommunication industry, the following recommendations are made.

- i. The findings of this study show that marketing innovation has a positive and significant effect on the performance of telecom firms with particular reference to profitability. Therefore, the study recommends that telecom service providers should intensify investments in marketing innovation to enhance their profitability and overall performance.
- ii. It is recommended that the NCC should monitor the technical standard of each telecom network to ensure quality service to the populace.
- iii. The findings of the study show a positive but weak effect of product innovation on the performance of telecommunication firms in FCT. Hence, it is recommended that telecommunication service providers should reevaluate and restructure their parameters of product innovation to enhance the magnitude of product innovation on their performance. This can be achieved through investments in research and product development initiatives geared towards evolving new and improved product variants.
- iii. Considering the positive but weak effects of technical innovation on the performance of telecommunication firms, it is recommended that telecommunication service providers should invest more in enhancing their technical capacity to improve their performance.
- iv. Lastly, the NCC should provide a regulatory environment that fosters additional investments in marketing innovation, product innovation, and technical innovation, intending to enhance the overall performance of firms in the telecommunication sector.

Recommendation for Further Study

Having carried out the study on the impact of innovation on the performance of the Nigerian telecommunication industry in FCT, further studies should be carried out on the effect of innovation on the firm performance in the telecommunications industry in the entire country.

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