



# A Review of Recent Trends in the Application of Information and Communication Technology in Nigeria (1999-2015)

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## Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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## ABSTRACT

This paper presents the study of the current Nigerian ICT policy, its evaluation and an investigation into its application and adoption for socio-economic development of Nigeria's ICT infrastructure and a knowledge based society. The research is grounded in the co-evolving theory of the innovation systems approach and the information society. The analytical framework is based on three stage model of ICT - readiness, intensity and impact. This model intersects between network society and innovation systems theory, showing technology/innovation as a significant element of how ICTs contribute to economic growth and integration at country level (Nigeria); networks as the enablers of coordinated activity in innovation processes linking actors and systems of innovation, e. g. firms, government, research institutes, regulatory frameworks; and the policy, dimension focusing on the role of national actors for enhancing innovation and networking. A survey was conducted in three most industrialized cities of Nigeria (Abuja, Lagos, and Port Harcourt) in order to explore attitudes of Nigerians towards application of the Nigerian ICT policy. The review on which this report is based covers the whole of the ICT sector in Nigeria and the regulatory ICT policies from 1999 to 2015. The purpose of the study is therefore to assess the performance and application of the ICT sector with attention to areas that need to be improved upon.

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## 1. INTRODUCTION

The use of ICT is central to the development of a knowledge society in that it has contributed to changes in how we conceptualise knowledge and what it means to know, patterns of business and economic operations, and the ways people interact and communicate with each other.

The positive pivotal role of ICT to development has led to trend in developed countries of creating and maintaining a National ICT Policy. According to [1], National ICT policy have been developed due to the observed positive experience of the use of ICT with a bid to facilitate the harmonization of its use in technology and industry to enhance socioeconomic developments in those countries.

Before 1999, development in the ICT sector in Nigeria was poor for a country of its size. This in part was due to the series of military juntas who actively discouraged the adoption of ICT's in the country. With the return of civilian rule in 1999, the Federal Government of Nigeria adopted the National Telecommunications Policy (NTP) to guide the development of the telecommunications industry in Nigeria. This was promptly followed by the enactment of the Nigerian Communications Act (NCA) 2003 to give legal effect to the NTP. This was also followed by the enactment of the National Information Technology Development Agency Act 2007 which became the legal platform for the creation of NITDA. The IT policy had a mission to make Nigeria an IT capable country in Africa and a key player in the Information Society by the year 2015, using IT as the engine for sustainable development and global competitiveness. However in terms of implementing the objectives of this policy, there were several challenges due to changes and advances in ICT globally and in Nigeria.

According to [2], the ICT policies generally covered three main areas: telecommunications (especially telephone communications), broadcasting (radio and TV) and the internet and According to the United Nations Economic Commission for Africa (1999), ICTs cover Internet service provisions, telecommunications and information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information

providers, network-based information services, and other related information and communication activities.

Although there are observed noticeable leaps in the adoption and implementation of ICT technology in Nigeria and a corresponding impact on society albeit a limited one, there is still a need to assess the impact of ICT and the existing infrastructure in Nigeria in relation to developed countries; as well as identify the challenges in the application of the existing ICT policies in order to improve the impact. This paper therefore conducts a review of the recent Information and Communication Technologies (ICTs) policies in Nigeria with a view to evaluating its effectiveness in facilitating the adoption of ICTs within the Nigerian economy and stimulating development.

The specific objectives of this paper are to:

1. Assess the status of ICT and the necessary technological infrastructure
2. Identify the challenges with respect to application of the existing ICT policies in Nigeria?
3. Offer policy recommendations on how the challenges to the adoption of ICT policies can be overcome in Nigeria

## 2. REVIEW OF LITERATURE

The use of Information and communication technology (ICT) systems has many favourable consequences, because they support interaction and collaboration, workplace learning [3], and work performance [4,5,6,7].

Several studies demonstrate that ICT investments are beneficial for performance and productivity (e.g., [8,9]). However, the implementation of an ICT infrastructure always entails both organizational and individual changes (e.g., [10,11]), and therefore user adoption and establishing the use of ICT have proven challenging [12,13,14,15,16].

The challenges and problems associated with the implementation and adoption of ICT infrastructure have led scholars and practitioners to seek to understand and manage the processes and phenomena related to the topic, spawning an extensive literature on the field.

Many reviews have been conducted addressing ICT implementation and adoption in organizations. [17] reviewed 115 empirical studies focusing on the coding of dependent and independent variables or indicators affecting ICT adoption. [18] observes that there is a big difference between ICT implementation and use between developed and developing countries. However, [19] observes that similarities can also be expected. These similarities include funds which are never sufficient, bureaucracy and user needs. The difference is how problems are addressed in different countries. It can be argued that, with their adequate resources and advanced technology, the Western countries have an easier way of implementing ICT infrastructure or projects than developing countries. Most developing countries are characterised by limited computer applications in the public sector, inadequate infrastructure and shortage of skilled manpower [20]. [20] also notes that “this situation exists not merely due to lack of financial resources, but largely due to lack of coordination at different levels in making effective use of the technology”. This uncoordinated efforts can only result in duplication if each department implements its own ICT projects without due regard to compatibility within the government.

### 3. METHODOLOGY

The paper will attempt to answer the research question which states that “Is there a significant level of implementation of Nigeria’s ICT Policy?”

The data set for the **design** of the study are obtained from the careful analysis of policy documents such as ICT policy and action plan, telecommunication deregulation policy, broadband policy, publications of the Central Bank of Nigeria (CBN) and the World Bank among others. Qualitative data set for **actuality** are collected from 100 citizens from the period of 13th October 2014 to 20th November 2014. These two perspectives (design and actual) would be evaluated for the identification of gaps that exists between Nigeria and developed countries in terms of the application of ICTs, and to access the applications of ICT in Nigeria with respect to the technological infrastructure available.

#### 3.1 Population and Sample Size

The criteria which was used to find the population and select the sample relates to the

spatial and sectorial boundaries of an innovation system. The spatial character of the physical location of the firms also has a metropolitan character because a well-established ICT infrastructure in highly developed cities or regions would mean that the ‘innovative milieu’ is a complex setting occurring in metropolitan area where ICTs tend to cluster [21].

##### 3.1.1 Spatial

If all economic activities are said to be organised through information processing, and that the ICTs enable the formation and evolution of a networked, informational and global economy [22], then it was expected that the ICT companies would not have to consider the geographical proximity to the sector as significant as they should do for the market.

The three cities – Abuja, Lagos, and Port Harcourt were chosen because they are the most industrialised cities in Nigeria. The data available from Nigerian government services portal, suggests that, of the three most industrialised cities of the country as is seen on Table 1, had the top GDP shares with current prices compared to the rest of the country, Abuja the seat of government also has its GDP as at 2010 shown in the same table.

**Table 1. Gross domestic product in the most industrialised three cities of Nigeria (2010)**

Cities	GDP (millions of USD)
Abuja	11,448
Lagos	74,674
Port Harcourt (Rivers State)	21,073

##### 3.1.2 Sectoral

While trying to define an ICT sector, it is easy to realise how broad the definition can be. The ICT sector includes traders of components and finished products, producers of integrated systems, customised systems, software developers, telecommunication companies, video-audio technologies, consumer electronics manufacturers, media technologies, etc. This work did not deliberately exclude any particular area from ICTs during the sample selection, but the sample evolved naturally according to the responses and to some selection criteria:

1. From a technology perspective; individuals were selected according to how technology savvy or not they were.

2. From a networking perspective; whether they were in a formal/informal network within the sector.
3. From a policy perspective; whether the experts and professionals would be able to give opinions about the application of ICT Policies in Nigeria

Naturally some individuals had two or more of the criteria above. The key emphasis has been on the features of the ICT sector as a whole and the ways which they can play a role in bridging the gap that exists between Nigeria and developed countries in terms of the application of ICTs.

### **3.1.3 Sample**

The sample included professionals of the ICT sector who could give their professional views on Nigeria ICT policies and the ICT sector. 45% individuals from Abuja, 33% from Lagos, and 22% from Port Harcourt. The number depended on the positive responses, the usability of data in this research and the availability of potential individuals who understood the sector.

### **3.1.4 Instrument (Constructing the questionnaire)**

The questionnaire, based on standardised ways, was prepared for individuals covering the period between 1999 and 2015. This set of questions was used as a 'check list' or a 'topic list', i.e., a guide to make certain that vital topic areas were covered. In addition to the standard checklist, the respondents were required to rate their answers according to a five point linkert scale. The list of topics included questions on the individuals:

1. Perception of rate of growth of the Information and Communication Technology (ICT) in Nigeria,
2. Evaluation of the government's role in Nigeria's telecommunications reforms, and Information and Communication Technology (ICT) policy development and satisfaction,
3. Opinion of the role of the Nigerian Communication Commission (NCC),
4. Opinion of the role of the NITDA,
5. Knowledge of Nigeria's ICT Policy with its vision 20:20 plan and views on it,
6. Opinion of projects related to Information and Communication Technology (ICT)

initiated or under implementation in Nigeria.

7. Role and involvement in telecommunications restructurings and Information and Communication Technology (ICT) policy-making process in particular,
8. Views on the Information and Communication Technology (ICT) policy and social development

## **3.2 Method of Data Analysis**

Saunders, [22] suggests that in analysing data, explanatory research and descriptive research can be employed. Explanatory research is used mainly to explain the relationship between variables, in particular cause-effect relationships. Descriptive research on the other hand, is used to describe the characteristics of a population. It does not answer questions of when, how and why characteristics occur. Rather it tends to address what questions.

This research makes use of both descriptive research and explanatory research. Descriptive research is used mainly in the analysis of demographic profile of the respondents, while explanatory research is used mainly in identifying the various sources of job related stress. Since the data required for this study is of primary source, and relates to the application of ICTs in households, businesses and other fields or sectors. The research was not analyzed using rigorous statistical analysis; the research used simple statistical averages in the analysis and percentage values.

Researcher developed five major themes adapted from United Nations International Telecommunication Union (ITU) basic three-stage model framework. The framework is an index to measure how people have assessed the level of adoption of ICTs. A series of statements about outcomes and asked subjects to respond on a five-point Likert type scale, with responses ranging from "Disagree Strongly" to "Agree Strongly," then we averaged the results of thematically-related scales to produce the indexes). Although the results of a Likert type scale are actually ordinal, it is conventional to treat them as interval-level data, and it can be shown that analysing the data as interval-level produces results similar to analyses at the ordinal level.

## 4. DATA ANALYSIS

### 4.1 Demographic Profile of the Respondents

Five demographic issues have been considered in the respondents used for this analysis. The age, the gender, marital status, work status and the level of education of the respondents.

#### 4.1.1 Age

The age bracket with the largest population is the 21-35 years bracket with 42.2% of the population, it is also observed that over 72% of this group is female. The next group by size is the under 21 years which accounts for 24.5% of the respondents the males and females population in this group have an almost equal population with just a marginal difference in size in favour of the females and it account for 49 and 51 percent respectively of the group population. The 36-50 age bracket account for 23.3% of the population and also has an almost equal distribution between the males and females with the males at 50.6% and the females at 49.4%. The Group with the smallest population is the over 50 years group which account for a measly 10% of the respondents.

The population in this group is distributed in favour of the females with the females accounting for 69% of this group and the males 31%, this information is displayed in detail in the Table 2.

**Table 2. Age demographics of respondent in percentages**

Gender	Male %	Female	Total
Under 21	12.1	12.4	24.5
21 – 35	11.5	30.7	42.2
36 – 50	11.8	11.5	23.3
Above 50	3.1	6.9	10.0

An examination of the gender of the respondents shows that there were more females than males with a percentage population of 63.5 and 36.5 percent respectively. The age distribution within the age groups are displayed in the Table 2 above also the distribution of the sample population by sex is shown in Fig. 1.

#### 4.1.2 Marital status

The marital status data showed that 46 percent of the sample were married, 38.1 percent single,

12.7% divorced and 3.2 percent are widowed. This is displayed in the Fig. 2.

#### 4.1.3 Type of work

In the work category of the respondents, there are three divisions: Unemployed, Manual, and office based. In all the respondents, the work categories reveals that unemployed respondents account for 13.1 percent of the group, the group engaged in manual work were 39.3 percent of the sample and the office based worker accounted for 47.5 percent of the group. The profile of work of the adoption of ICTs survey is displayed in Fig. 3.

#### 4.1.4 Level of education

An examination of the educational attainment of the respondents of the adoption of ICTs survey shows that about 33.9 percent of the respondents have a diploma, 39 percent have a first degree, 16.9 percent have a master's degree and 1.7 and 8.5 percent have a PhD and other types of qualifications respectively. The profile of the distribution of the survey group based on educational attainment is shown in Fig. 4.

## 5. ANALYSIS OF THE REDISPOSING FACTORS FOR THE ADOPTION OF ICTS IN NIGERIA

To properly assess the adoption of ICTs, the five most common predisposing factor to the adoption of ICTs as identified by the United Nations International Telecommunication Union (ITU) will be adopted as a framework for this analysis.

1. Access to ICT infrastructure
2. ICT infrastructure
3. ICT usage indicators
4. Strategy
5. ICT capability or skills.

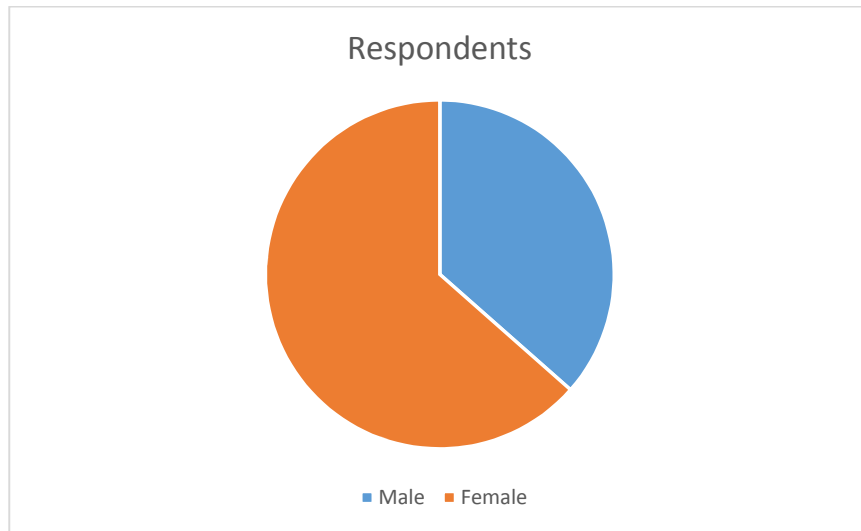
Two scales were developed for use in measuring level of adoption of ICTs in Nigeria. The first scale is used to capture the responses of respondents to the United Nations International Telecommunication Union (ITU) model. The model has five key factors that it applies to the analysis of the adoption of ICTs.

The maximum number of points that can be scored in any one statement is 5. For example, In the Access to ICT infrastructure segment the total number of statements in the section are five,

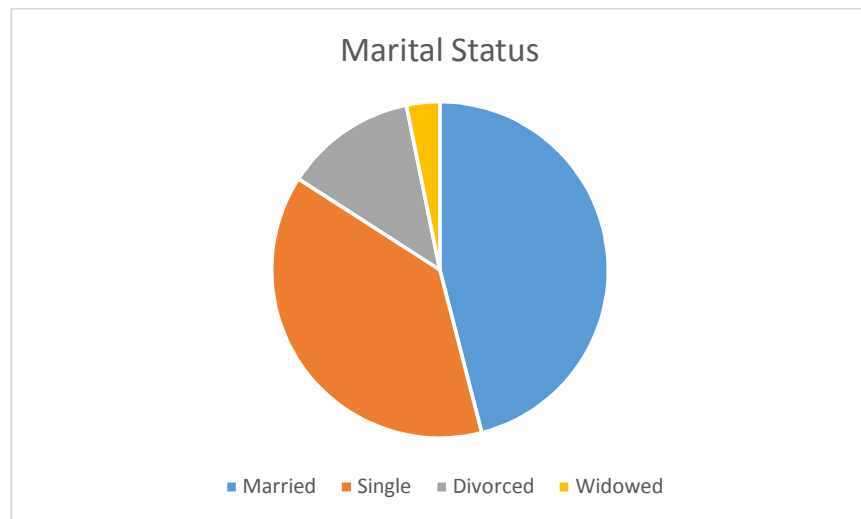
the maximum number of points any factor can score would be 5 multiplied by 5– which gives 25. The closer the value is to 25, would be interpreted as the more relevant that factor is perceived to be to that particular respondent to boosting the adoption of ICTs. Where any respondent scores that factor between 5-10 on the scale in the Access to ICT infrastructure segment would be considered that the respondent perceive Access to ICT infrastructure as relevant to adoption of ICTs and this on the scale is graded as very poor. If the respondent rates the factor between 11 - 15, the grade would be classed as an average ranking, in the sense that the respondent feels that the factor plays a

role to some extent but may not be relevant in all situations. The factor that are scored values between 16-20 by the respondents are viewed as relevant and not very important while the factors ranked between 21-25 are viewed as both relevant and important to adoption of ICTs by the respondents.

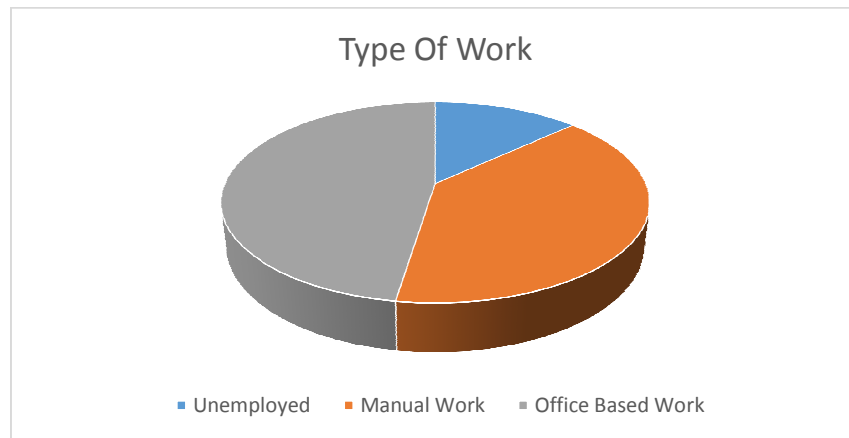
The second method utilised in analysing the level of adoption of ICTS in Nigeria was to look at the individual parameters that are used as yard stick for measuring level of adoption of ICTS (Access to ICT infrastructure, ICT Infrastructure, ICT Usage Indicators, Strategy, ICT Capability or Skills).



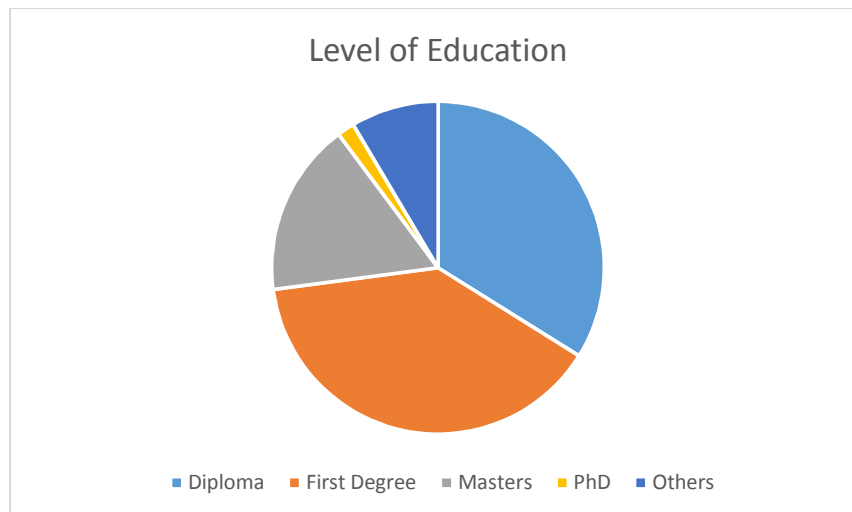
**Fig. 1. Profile of gender of respondents of the adoption of ICTs survey**



**Fig. 2. Profile of marital status of respondents of the adoption of ICTs survey**



**Fig. 3. Profile of work category of respondents of the adoption of ICTs survey**



**Fig. 4. Profile based on educational attainment of the adoption of ICTs survey**

## 6. DISCUSSION OF RESULTS

Findings from the field studies and quantitative survey provide potentially important insights into the level of development of the predisposing factors or input indicators on ICTs adoption in Nigeria. These findings and their correspondence with literature are discussed in this section. This discussion will be based on how the factors relate to the research question:

Is there a significant level of implementation of Nigeria's ICT policy?

### 6.1 Input Indicator One: Access To ICTs Infrastructure

Access to ICTs Infrastructure as was identified from the literature review is very important for the

adoption of ICTs since for the technology to be adopted or applied there need to be access to that technology. Going by the results of the survey it can be concluded that the level of access to ICTs in Nigeria is very good as it was rated 21.5 out of a possible 25.

### 6.2 Input Indicator Two: Availability of ICTs Infrastructure

Availability of ICTs Infrastructure as identified from literature this indicator is extremely important and going by the results of the survey the level within Nigeria is very good with a score of 22.46 out of a possible score of 25 also implying a significant level of development.

### 6.3 Input Indicator Three: ICT Usage Indicators

The level of development of the ICT Usage Indicators within Nigeria as measured by the results of the survey show that the level of usage is about average with a score of 17.8 out of a possible 25, implying that the technology might be available but it is not used at the same level of availability. However the level is still significant.

### 6.4 Input Indicator Four: Strategy

The ICTs Strategy in Nigeria based on the results of the survey is good with a score of 19.71 out of a possible 25 which is significant. It can thus be inferred that the respondents rate the existing ICTs strategy in Nigeria highly and feel that significant progress has been made in this factor.

### 6.5 Input Indicator Five: ICT Capability or Skills

The ICTs Capability or Skills level in Nigeria is viewed poorly by the respondent scoring it 12.62 out of a possible 25. The implication of this is that the view of the respondents is that significant progress needs to be made in this factor so as to improve the possible gains from the application of ICTs in the country.

## 7. CONCLUSION

In conclusion looking at the results of the individual input indicator in the survey, it can be inferred that there is a significant level of implementation of ICTs policy in Nigeria since the level of development of four of the five input indicators identified from the literature are significantly high. It can, thus be inferred that there is a significant level of development of Nigeria's ICT policy.

## 8. RECOMMENDATION

Based on the findings of this study, which identified that the level of ICTs capability or skills as low. The researchers would recommend that the government increase its investment in ICTs education through either direct funding or by offering incentives to the private sector to invest in this. Since education and knowledge of ICTs were found to be crucial aspects that promoted ICT adoption within the literature and the study showed that the level was poor. This implies that

a focus on increasing skill levels of citizens by providing basic ICT training and increasing awareness of ICTs to make them understand how ICTs may be usefully applied to reap potential benefits for socio-economic development of the country.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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