



ABSTRACT

An organization must acquire a wide range of competencies for successful digital transformation, with the value of each capability varying based on the business environment and demands of the individual firm. Information and communication Technology have a significant impact on how the Nigerian media is run. Media organizations in Nigeria may compete with media companies outside the country when ICTs is being embraced. The study investigated the nexus between ICT and digital communication in Nigeria. The research design used in this study is survey and 125

ICT AND DIGITAL COMMUNICATION IN NIGERIA: A NEXUS

***BANJO ABOSEDE OLUBUNMI PhD; & **GANIY AJIBOLA KAREEM**

**The Federal Polytechnic, Ilaro Mass Communication Department.*

***University of Lagos, Akoka, Lagos State*

Introduction

The use of information and communication technology when fundamentally new capabilities are produced in business, public administration, and individual and societal life is referred to as "digital transformation" as opposed to purely trivial automation. Any technology used to send, receive, store, generate, share, or exchange data is referred to as information and communication technology (ICT) (Oyedokun, & Oladesu, 2022).

ICTs, as Ogunsola and Aboyade (2005) note, are derived from linked technologies, which are well demonstrated by their practical application in centralised online information access and communication. In the digital age, the advantages of information and communication technology are substantial. The management and processing of information using electronic computers and electronic software to convert, store, process, secure, transmit, and retrieve information is the focus of information and communication technology (ICT) (Okute, 2011).

Like any ICT-enabled change, the success of the digital transformation hinges on improvements to the organization's operations and process management (Dremel, Wulf, Herterich, Waizmann, & Brenner, 2017). To execute such management, people need to be trained in a change process that considers the unique difficulties presented by information technology (Benjamin & Levinson, 1993). A digital revolution is advantageous to the standard and digital workplaces (Lei & Jing, 2010). According to Adigwe (2012), computer technology has aided in the processing and reporting of news, and journalists can now utilise the internet to look up local or even international news for a future broadcast.

ICT has generally changed the globe in all aspects of existence. By removing more restrictions on time and distance than ever before, it



media practitioners and journalists were selected randomly and administered questionnaire from Lagos State chapter of Nigerian Union of Journalists (NUJ). The result of the study showed that some of the challenges associated with adoption of ICT into digital transmission are shortage of technical skills ($X = 2.06$, $SD = 0.74$), lack of funding ($X = 1.94$, $SD = 0.68$), legal and regulatory issues ($X = 1.62$, $SD = 0.55$) and lack of research & development ($X = 1.51$, $SD = 0.56$). Also, majority of the respondents agree that ICT brought about innovation technology into communication field, it has made communication faster and cheaper and brings exciting ways to entertainment world with the introduction of sophisticated digital tools. The result of the hypothesis showed that a positive significant relationship between ICT and digital transmission ($r = .648$, $p < .05$) which indicated that ICT positively influences digital transmission. This study recommends that government and related authorities should make funds accessible for media practitioners and journalists in acquiring the required ICT tools for their profession.

Keywords: ICT, Digital Communication, Technology, Digitization, Transmission

has decreased manual labour. One sector that has profited immensely from the use of ICTs is the media. ICTs provide faster and more accurate news reporting and processing while also removing geographical and spatial constraints. ICTs are a crucial part of enhancing timely news delivery in the broadcast business since they make it easier to generate, store, and disseminate information through electronic means utilising ICTs

Adamu (2011) contends that the information society is propelled by the rapid advancement of technology and the ways in which it is adapted to different cultural contexts. The use of smartphones for downloading, viewing emails, gathering news, and other purposes shows how digital technology and telecommunication network developments have caused traditional mass media to merge with new media forms. The advancement of digital technologies and their widespread adoption across all marketplaces have forced a swift and significant transformation on society as a whole (Ebert & Duarte, 2016).

For a company to successfully adapt to the digital age, a wide range of abilities must be acquired, with the importance of each competency varied depending on the business climate and expectations of the specific company. In order to remain competitive, businesses must reevaluate and possibly reinvent their business models, and digital technology must become central to how the company operates (Carcary *et al*, 2016). The digital economy has created disruptive waves. There are now new companies and communication methods. According to Deloitte (2018), many industries and businesses that did not utilise new technology to adapt their business models saw declining revenues, declining market share, and even complete collapse. It is becoming less common for people to purchase newspapers before they can read them and understand what is going on in the world. Live news may be viewed anywhere and at any moment of the day using a smart phone and other mobile devices.

However, digital media still has drawbacks despite its benefits, including the propagation of false information, hate speech, crime and terrorism, privacy concerns, social separation, manipulation etc. Therefore, this study examines the nexus between ICT and digital communication in Nigeria.



Objectives of the study

The primary aim of this study is to examine the nexus between ICT and digital communication in Nigeria. The secondary objectives are as follows:

- i. To examine the extent at which ICT impact digital communication in Nigeria
- ii. To examine the challenges encountered in the adoption of ICT into digital communication.
- iii. To determine the advantage of digital transmission over analogue transmission

Research Questions

- i. To what extent does ICT impact digital communication in Nigeria?
- ii. What are the challenges encountered in the adoption of ICT into digital communication?
- iii. What are the advantages of digital transmission over analogue transmission?

Research Hypothesis

H₀: There is no significant relationship between ICT and digital transmission in Nigeria.

Literature Review

Knowledge that is acquired from someone or something is referred to as information. Data that has been transformed into a meaningful form is likewise considered to be information. At its most fundamental level, information is any propagation of cause and effect inside a system. Information can be sent through the content of a message or by the direct or indirect observation of anything. Information is communicated by way of perception, which can be thought of as the content of a communication in and of itself.

The most widely used good today is information, which is crucial to development (McDonald & Rowsell-Jones, 2012). It helps to improve knowledge, which makes it a reliable problem-solving tool. The goal of the broadcast industry is to simultaneously send reliable information to every person, and radio and television stations now use information technology to connect with their wide-ranging audience. Liu (2006) emphasised the importance of ICTs in news presentations by claiming that they have made it easier for communicators and receivers to transmit ideas.

Utilizing computers and the internet has made communication simple thanks to modern technologies. Through the employment of transmitters and audio current broadcasting equipment, it has also made broadcasting simple. The development of the internet has had a significant impact on society today as a result of information technology. The internet has acted as a vast space where everyone may access whatever information they require at any time and from any location, which has aided in the dissemination of accurate information. Information communication technology has also helped in improving radio broadcasting by making it a personal but yet interactive medium, as people could call into the station and give their own opinion on an issue.

In the view of Oyedokun and Oladesu (2022), before now, journalists in Nigeria collected, processed, and distributed news using manual and analogue technology, which caused transmission to the intended audience to be delayed. However, with the development of more sophisticated and visually appealing technical apparatus, the use of various tools for creating material, capturing it, editing it, scripting it, acquiring data, processing it. There has been an improved or updated delivery of broadcasting by Nigerian television broadcast stations services.



As a result, traditional broadcasting techniques and the expertise needed to handle them are changing the numerous ICT gadgets (Eludu, Mbazie & Ndinojuo, 2016).

It has helped in the fostering a close network between the journalist and the audience, and this has helped in the development of feedback and has also made the communication process participatory. Information technology has also helped in bringing various people, cultures in all regions of the world together for the exchange of news, entertainment and art forms through the electronic and print media. Nigeria has benefitted from Information Communication Technology most especially in the broadcasting industry. It has helped in the development of new equipment that has helped in the dissemination of news effectively.

There are some types of information and communication technology as it comes in various forms, and they are:

Sensing technologies: These are tools that aid in obtaining data from the environment and converting it into a language that a computer can easily understand. Computer keyboards, scanners, electronic pens, and other devices are some examples of sensing technology.

Communication technologies: On the other side, these are technologies that connect various types of technology and facilitate information exchange between them. Fax machines (FAX), telephones, computer networks, telecommunications networks, and more are examples of communication technology.

All technologies used to modify and transfer information are collectively referred to as information and communication technologies (ICT). It covers all forms of information broadcasting, such as radio and television, as well as devices for voice, sound, and image communication. Examples of these devices include paper records, magnetic disks/tapes, optical diskettes (CD/DVD), flash memory, and telephones to mobile phones. It includes a broad spectrum of computing hardware, including desktop and laptop computers, servers, mainframes, and networked storage, as well as the rapidly growing hardware market, which includes MP3 players, smartphones, and other small gadgets.

Scientific and technical developments led to the creation of ICTS. According to Rogers, innovation is "a new method of doing things; incremental, radical, and revolutionary changes in thinking" (1986:139). During the first several decades of research on the diffusion of innovations, individuals were emphasised as the unit of adoption. Then it was found that groups frequently embrace ideas more readily than individuals do. This shift in the adoption unit is particularly important for organisations that frequently adopt new technologies, such as schools that use microcomputers and enterprises that use teleconferencing and email.

Numerous types of media are referred described as being "digitalized" (print and electronic). It alludes to a method that entails examining data that has been offered and rated as binary integers. A system that transforms information, including as sound, text, data, images, and video, into a series of on-and-off pulses, commonly represented by the numerals zero and one, is another definition of digital technology offered by Dominick (p.65) After being transformed into digital form, the information can be easily duplicated and distributed at incredibly low costs. The discrete representation of an analogue signal, object, sound, image, or document by a sequence of zeros and ones is what is meant by the term digitalization.



Dominick refers to Negroponte, who describes the phenomenon as one in which atoms provide information. Negroponte writes that "traditionally, the mass media delivered information in the form of atoms: books, newspapers, magazines, CDs, and DVDs are material products that have weight and size and are physically distributed." This is quickly changing as the instantaneous transmission of electronic data that travels at the speed of light is about to replace the sluggish human handling of the majority of information in the form of recorded music, books, magazines, newspapers, and videocassettes. In essence, bits take the place of atoms (3, p. 65).

The electronic programme guide (EPG), subtitling, additional language options, and interactive services like weather and sports could all be seen as ways that digitization, particularly with regard to television transmission, enhances the viewing experience for viewers. All of these point to the fact that radio and television broadcasting in particular, as well as mass media in general, are being revolutionised by digitalization.

High-definition television (HDTV) and Standard Definition Television are two separate digital formats. The former is a format that allows up to six channels to be broadcast on the same frequency area, while the latter is a wide-screen format with an ultra-clear, high-resolution picture and superior sound. Although the visuals on a standard definition television are not as sharp as those on an HDTV, they are still far superior than those on other televisions. Here, it's equally crucial to emphasise the differences between digital television and high-definition television (HDTV) (DTV).

The best type of digital television is HDTV. Wide-screen aspect ratios (16:9) and others are used in high-definition TV, which has around four times the resolution of a standard definition system. It is equally designed for huge displays that are over one metre across. Therefore, in order for receivers to receive signal, a Set-Top Box (a device inserted into a television set to convert signal to digital) is required.

For digital television broadcasting, there are four different signal transmission options: cable, satellite, digital terrestrial television, and telephone connection (DSL). Transmission over cables is very flexible and adaptable (as far as the number of channels it can transmit). In actuality, it has the capacity to transmit more than 200 digital television channels to consumers at home. It can offer both regular telephone service and quick Internet access. "Liberate" refers to the transmission standard used in cable broadcasting. On the other hand, satellite broadcasting has the ability to transmit 100 channels. It is a one-way digital transmission service whose "open TV" broadcast standard.

A network of terrestrial transmitters serves as the foundation for the digital terrestrial television broadcast. It is also a one-way transmission in which an antenna picks up the broadcast signals. This type of broadcast uses a transmission standard known as "MPEG-5." The viewer is given the option to select a specific television show to be sent to him in the case of transmissions made over a telephone line (DSL) (this home). This form of transmission is made possible by the fact that in the majority of developed nations, telephone service bandwidth has significantly expanded to the point where it is appropriate for also transmitting television signal.

The way the Nigerian media is run has been significantly impacted by ICT. As a result of embracing ICTs, many media firms in Nigeria may face competition from media groups outside of the nation. Going back in time, Reverend Henry Townsend started Iwe Irohin in 1859, which was printed on a



crude printing press and hence became Nigeria's first newspaper and media organisation. Like other publications that came before it, it was produced gradually. Even when Western Nigeria Television (WNTV), the country's first broadcaster, was established in 1959, its operations were relatively primitive in comparison to how things are now. Up to the 1990s, a large number of media outlets in the country still ran and produced their content manually and analogously.

However, the ICTs have helped to improve every aspect of the global mass media operation. The introduction of digital cameras, digital printing, satellite news gathering, and electronic satellites has made news much more immediate.

The Diffusion and Technological Determinism Theory was first presented in 1986 by Everest Rogers. The dissemination part of the concept explores the use of communication to spread technological innovation from development organisations to their clients in an effort to spark public enthusiasm in change by creating a modernised environment. This theory holds that technology can alter any environment, but particularly one that involves communication.

A study on journalism and new media in Nigeria: Issues, Complexities, and Opportunities was conducted by Nwanne (2016). It bases its hypotheses on the technological determinism theory, which contends forcefully that communication technology, regardless of age, has a tremendous impact on how people think and believe. The study outlines some of the problems that Nigerian journalists face when using new media, such as a lack of funds and an insufficient power supply, among other things. In spite of the obstacles, the media industry has performed impressively, resulting in what has been termed media convergence.

The study suggests, among other things, that the government resolve the nation's power situation speedily and appropriately, that a knowledge economy be established, and that workers and employers in the media industry get involve in consistent training and retraining. The study of Obayi, Onyebuchi and Uwanuakwa (2018) on journalists' perception of the influence of ICT in enhancing journalism practice in Owerri showed that ICT has improved journalism practice in Imo State.

Oyedokun, & Oladesu, (2022) assessed the application of information and Communication Technologies in the Nigerian Broadcast Industry: Benefits and Challenges. The study found that numerous broadcasting organisations in Nigeria, including AIT, NTA, Channels TV, Radio Nigeria, Cool FM, and Raypower FM, have extensively implemented ICT. The article found that the use of ICTs in Nigerian broadcasting had several advantages, including the removal of time and geographic restrictions, improved output quality, digital information access, immediate feedback, and online cinemas. The significant obstacles preventing these media organisations from completely integrating ICTs into their operations are the high cost of ICTs equipment procurement and maintenance, the staff's inability to manage technological devices with perfection, and power outages.

In the same vein, the study of Olugbenga (2017) with title governing the "Digital Shadows": Public Policy and Information Communication Technology (ICT) Acquisition and Utilization in Africa, established that despite the difficulties facing African ICT development, the technology is a lifeline that African states should resolutely embrace through deliberate public policy. It makes this argument on purpose to emphasise how crucial it is to formulate ICT policies with a clear goal in mind in order to meet Africa's needs for social and economic revival and to advance the many



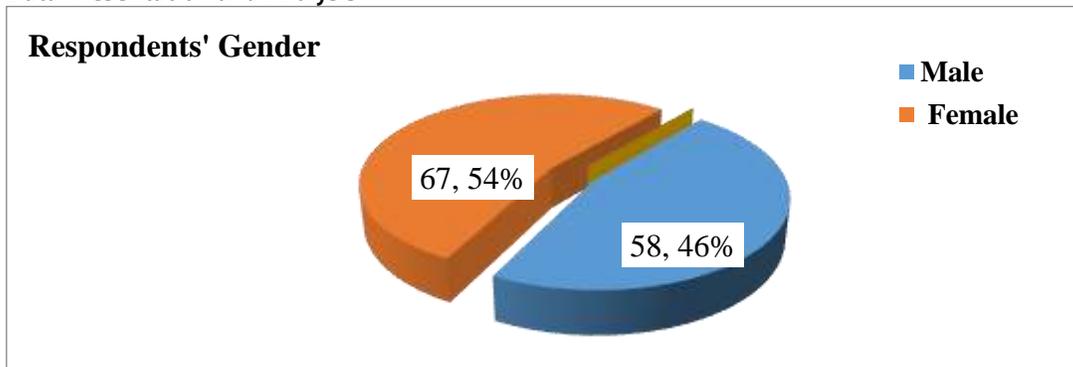
national and continental interests that cut across the wide gamut of the continent's political, cultural, and economic landscapes.

The study of Mlambo, (2022) titled the Nexus between Information Communication Technology and Human Rights in Southern Africa, showed a tenuous link between ICT and the expansion of human rights.

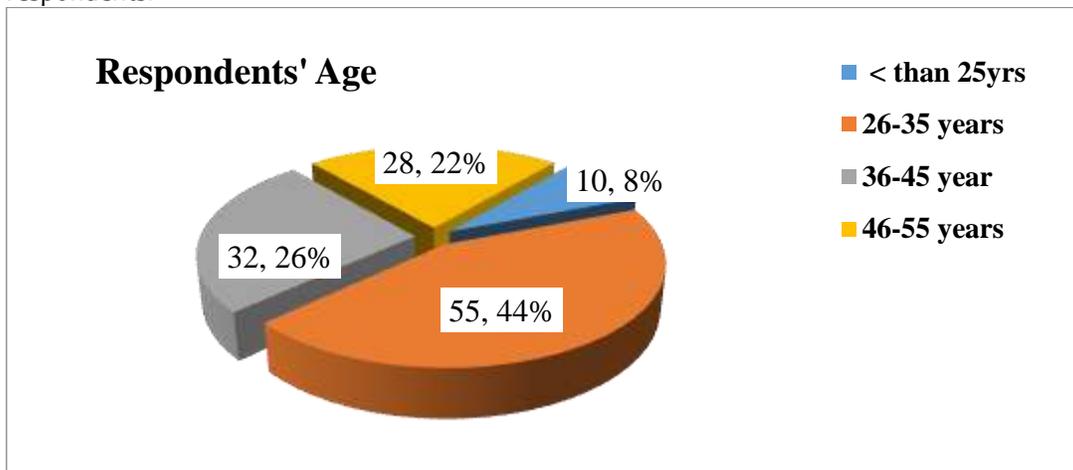
Methodology

In this study, a survey research design was adopted with the aid of questionnaire that was administered to respondents. The population of this study was media practitioners and journalists. A total number of One Hundred and Twenty-Five (125) media practitioners and journalists were selected randomly from media houses in Lagos State. Data were collected using a research questionnaire and interview method as data collection instruments. Data analysis was done using the Statistical Package for Social Sciences (SPSS). The analysis involves Inferential and Descriptive statistics. The data analysis was done using Measures of dispersion such as Mean and Standard deviation while demographic variables were analyzed using charts and percentages.

Data Presentation and Analysis

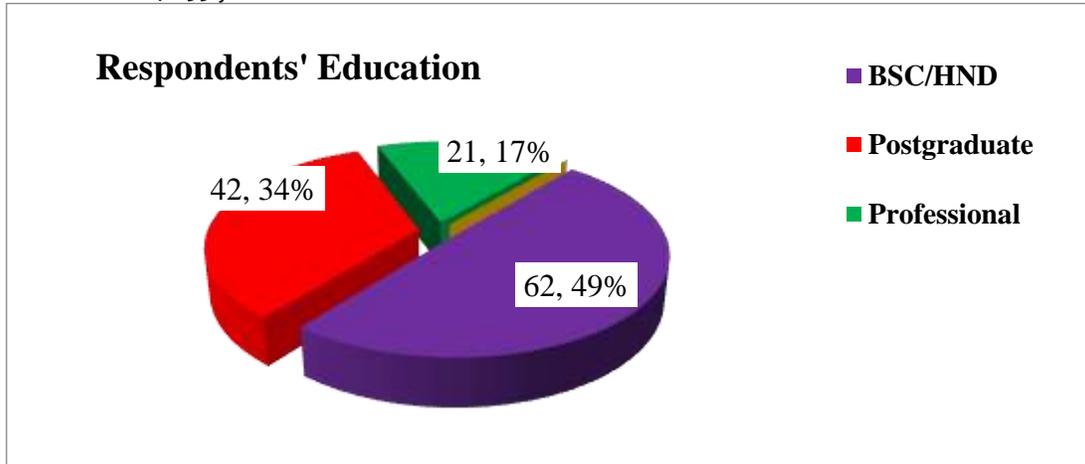


According to the chart above, (54%) of the respondents were female and (46%) were male respondents.





According to the above chart, (8%) of the respondents were with age less than 25 years, (44%) of them were within the age category of 26-35 years; (26%) were within 36-45 years and (22%) of them were within 46-55 years.



According to the chart above, (49%) of the respondents had BSC/HND educational qualification, (34%) of them had postgraduate degree and (17%) of the respondents had professional certificate.

Table 2: Extent at which ICT impact digital communication in Nigeria

S/No	Statement	SA	A	D	SD	Mean	SD
1.	ICT brought about innovation technology into communication field	34 (27.2%)	74 (59.2%)	16 (12.8%)	1 (0.8%)	1.88	0.68
2.	ICT tools has made communication faster and cheaper	53 (42.4%)	71 (56.8%)	1 (0.8%)	-	1.58	0.51
3.	It brings exciting ways to entertainment world with the introduction of sophisticated digital tools	68 (54.4%)	43 (34.4%)	14 (11.2%)	-	1.29	0.99

Table 2 shows that 34 (27.2%) strongly agree, 74 (59.2%) agree, 16 (12.8%) disagree while 1 (0.8%) strongly disagree that ICT brought about innovation technology into communication field, 53 (42.4%) of the respondents strongly agree, 71 (56.8%) agree while 1 (0.8%) disagree that ICT tools has made communication faster and cheaper. Also, 68(54.4%) of the respondents strongly agree, 43 (34.4%) agree while 14 (11.2%) disagree that ICT brings exciting ways to entertainment world with the introduction of sophisticated digital tools.

Table 3: The challenges encountered in the adoption of ICT into digital communication

S/N	Statement	SA	A	D	SD	Mean	SD
1.	Shortage of technical skills	62 (49.6%)	32 (25.6%)	29 (23.2%)	2 (1.65)	2.06	0.74
2.	Lack of funding	70 (56.0%)	51 (40.8%)	4 (3.2%)	-	1.94	0.68



3.	Lack of research & development	65 (52.0%)	56 (44.8%)	4 (3.2%)	-	1.51	0.56
4	Legal and regulatory issues	87 (69.6%)	21 (16.8%)	17 (13.6%)	-	1.62	0.55

Table 3 shows that 62 (49.6%) strongly agree, 32 (25.6%) agree, 29 (23.2%) disagree while 2 (1.65%) strongly disagree that shortage of technical skills is one of the challenges encountered in the adoption of ICT into digital communication, 70 (56.0%) of the respondents strongly agree, 51 (40.8%) agree while 4 (3.2%) disagree that lack of funding is one of the challenges encountered in the adoption of ICT into digital communication. Also, 65 (52.0%) of the respondents strongly agree, 56 (44.8%) agree while 4 (3.2%) disagree that lack of research & development is one of the challenges encountered in the adoption of ICT into digital communication. Furthermore, 87 (69.6%) strongly agree, 21 (16.8%) agree while 17 (13.6%) disagree that Legal and regulatory issues one of the challenges encountered in the adoption of ICT into digital communication. Shortage of technical skills has the highest mean score of ($X = 2.06$, $SD = 0.74$) followed by lack of funding with ($X = 1.94$, $SD = 0.68$) and Legal and regulatory issues ($X = 1.62$, $SD = 0.55$).

Table 4: The advantages of digital transmission over analogue transmission

S/N	Statement	SA	A	D	SD	Mean	SD
1.	High capacity for data transmission	69 (55.2%)	48 (38.4%)	8 (6.4%)	-	1.83	0.96
2.	It facilitates video conferencing that saves time, money, and effort.	64 (51.2%)	56 (44.8%)	5 (4.0%)	-	1.62	0.55
3.	The correction and detection of errors are easy in digital communication, as there is a use of channel coding	72 (57.6%)	35 (28.0%)	17 (13.6%)	1 (0.8%)	1.51	0.56
4	The configuring process is easy as compared to analog signals	46 (36.8%)	67 (53.6%)	7 (5.6%)	5 (4.0%)	1.94	1.54

Table 4 shows that 69 (55.2%) strongly agree, 48 (38.4%) agree while 8 (6.4%) disagree that high capacity for data transmission is one of the advantages of digital transmission over analogue transmission, 64 (51.2%) of the respondents strongly agree, 56 (44.8%) agree while 5 (4.0%) disagree that it facilitates video conferencing that saves time, money, and effort. Also, 72 (57.6%) of the respondents strongly agree, 35 (28.0%) agree, 17 (13.6%) disagree while 1(0.8%) strongly disagree that the correction and detection of errors are easy in digital communication, as there is a use of channel coding. Furthermore, 46 (36.8%) strongly agree, 67 (53.6%) agree, 7 (5.6%) disagree 5 (4.0%) strongly disagree that the configuring process is easy as compared to analog signals.

Hypothesis

H_{01} : There is no significant relationship between ICT and digital transmission in Nigeria

Table 5: Correlation between ICT and digital transmission in Nigeria

Variable	ICT	Digital Transmission	Mean	SD	Sig
ICT	1	.648**	5.97	1.52	.000
Digital Transmission	.648**	1	9.47	1.86	



** Correlation is significant at 0.01 level (2-tailed)

Table 5 showed a positive significant relationship between ICT and digital transmission ($r = .648$, $p < .05$) which indicated that ICT positively influences digital transmission. Since the probability value of the hypothesis is less than .05, this implies that the null hypothesis of no significant relationship was rejected while the alternative hypothesis of a significant relationship between ICT and digital transmission was accepted.

Conclusion and Recommendations

The study used a survey research design with the aid of questionnaire that was administered to respondents. The population of this study are One Hundred and Twenty-Five (125) media practitioners and journalists were selected randomly from media houses in Lagos State. The study concludes that ICT significantly correlated with digital transmission. The finding of this study showed that some of the challenges associated with adoption of ICT into digital transmission are shortage of technical skills ($X = 2.06$, $SD = 0.74$), lack of funding ($X = 1.94$, $SD = 0.68$), legal and regulatory issues ($X = 1.62$, $SD = 0.55$) and lack of research & development ($X = 1.51$, $SD = 0.56$). This finding supports the study of Nwanne (2016) who reported that lack of funds and an insufficient power supply, among other things are some of the challenges facing use of ICT by journalists in Nigeria.

- i. This study recommends that government and related authorities should make funds accessible for media practitioners and journalists in order for them to be able to acquire the required ICT tools for their profession.
- ii. The study also recommends that government and various media houses should give more attention to research and development in the area of digital transmission.

References

- Adamu, S.L. (2011). "The Role of Convergence Journalism in News Production", In *Journalism and New Media Technologies in Africa*. (Ed) Biakolo, J.T. Tsaiior, A. & Tam-George, A. Center for Black and Africans Arts and Civilization, Lagos Island.
- Adigwe, I. (2012). The impact of information and communication technology (ICT) on news processing, reporting and dissemination on broadcast stations in Lagos, Nigeria. *Library Philosophy and Practice* (e-journal). 861. <https://digitalcommons.unl.edu/libphilprac/861>
- Benjamin, R., & Levinson, E. (1993). A framework for managing IT-enabled change. *Sloan Manag. Rev.* 34(4), 23–33
- Carcary, M., Doherty, E., & Conway, G. (2016). A dynamic capability approach to digital transformation—a focus on key foundational themes. 10th European Conference on Information Systems Management. *Academic Conferences and publishing limited*, pp. 20–28.
- Deloitte, G.(2018). What is digital Economy? Available from <https://www2.deloitte.com/mt/en/pages/technology/articles/mt-what-is-digitaleconomy.html>.
- Dremel, C., Wulf, J., Herterich, M., Waizmann, J., & Brenner, W. (2017). How AUDI AG established big data analytics in its digital transformation. *MIS Q. Executive* 16(2), 81–100.
- Ebert, C., & Duarte, C. (2016). Requirements engineering for the digital transformation: Industry panel. *Requirements Engineering Conference IEEE 24th International*, pp. 4–5.
- Lei, Z., & Jing, Y. (2016). Study on human resource reform in the digital transformation. *Proceedings of the 2016 Joint International Information Technology, Mechanical and Electronic Engineering. AER – Advances in Engineering Research*, vol. 59, pp. 471–477.
- Liu, C. (2006). De-Skilling Effects of Journalists: ICTs and the Labour Process. Chung Cheng University (Taiwan).
- McDonald, M., & Rowsell-Jones, A. (2012). The digital edge: Exploiting information & technology for business advantage. Gartner Inc.
- Nwanne, B.U. (2016). Journalism and new media in Nigeria: Issues, challenges and prospects. *International Journal of Academic Research and Reflection*, 4 (3), 86-92
- Obayi, P. M., Onyebuchi, A. C. & Uwanuakwa, P. C. (2018). Journalists perception of the influence of ICT in Enhancing journalism practice in Owerri
- Ogunsola, LA & Abovade, W.A. (2005). Information and Communication Technology in Nigeria: revolution or Evolution. *Journal of Social science*, 11 (1); 7 – 14.
- Okute, A. L. (2011). Impact of information and communication technology on the Nigerian business environment: Implication for business educators. *Journal of Information System*, 3 (1), 9- 14.
- Olugbenga, E.O. (2017) Governing the "Digital Shadows": Public Policy and Information Communication Technology (ICT) Acquisition and Utilization in Africa. *Open Access Library Journal*, 4: e3564
- Oyedokun, D.M. & Oladesu, A.O. (2022). Assessing the Application of Information and Communication Technologies in the Nigerian Broadcast Industry: Benefits and Challenges. *Hmlyan Jr Eco Bus Mgn;* 3(2) 145-153