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# INFORMATION AND COMMUNICATION TECHNOLOGY, AND OPERATIONAL EFFICIENCY OF THE COLLEGE OF POSTGRADUATE STUDIES, NNAMDI AZIKIWE UNIVERSITY, AWKA, ANAMBRA STATE, NIGERIA

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***Abstract***

*The study examined the effect of Information and Communication Technology (ICT) on operational efficiency of the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. The study was guided by two specific objectives of the study, two research questions and hypotheses. The review of literature was conducted under conceptual, empirical and theoretical bases, and the theoretical framework for the study is the Diffusion of Innovations (DoI) by Everett Rogers (1962). The population of the study was 2477 respondents who are staff and resource persons of the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria, out of which a sample of 344 respondents was obtained. The data were collected through primary and secondary sources of data. The data collected were analyzed using statistical packages for Social Sciences (SPSS.23) and the hypotheses were tested using simple regression model at the 0.05 level of significance. The findings revealed that all the null hypotheses were rejected in favour of the alternate hypotheses, thus, leading us to conclude that the potentials that technology has will be underutilized in many organizations if the challenges of ICT infrastructure, ICT competence and internet service quality are not properly address. As a result, we recommended that a systematic process of capacity building, training and development for staff and resource persons in the College.*

***Keywords:*** *ICT, Technology, Operational Efficiency,*

## INTRODUCTION

There is no doubt that the world is currently experiencing a technological revolution on a massive scale, powered by internet of things (IoT) and artificial intelligence (AI). Technology, no doubt, has become the present and future of 21st-century organizations.

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Public sector organizations are not left out of this regard. Information and Communication Technology (ICT) has been central to the global reform of the public sector in the past five decades. The argument has been that introducing technology in governance helps make public service delivery more efficient and effective. This is because, in many parts of the Western world, ICT has proven to be an important support tool for private and government agencies and institutions as it offers an efficient, convenient, timely, and user-friendly mode of delivering goods and services (Asoya, Ewuim, Obi and Chiaha, 2021).

In recognizing the importance of technology for better service delivery, the Nigerian government, like most of its counterparts in the developing world, has, according to Asoya, Ewuim, Obi, and Chiaha, (2021), formulated policies to tap into the potential of ICT. In 2007, the Nigerian parliament passed the National Information Technology Development Agency Act to provide a legal framework for ICT adaptation and utilization in the Nigerian public sector. To this end, the ICT adaptation has become the norm in most federal and state government institutions and agencies with varying successes.

The rate of acceptance and the level of diffusion of innovation by organizations vary significantly, between public and private sector organizations on the one hand, and the developed and underdeveloped countries of the world on the other hand. In the views of Akintunde (2017), technological backwardness is one of the major reasons for the underdevelopment of third world countries. Richard (cited in Akintunde, 2017) avers that the state of technological backwardness in the underdeveloped nations is reflected in four key areas.

The area has to do with the high average cost of production despite low money wages. This is because, the production process in most developing countries is usually labour intensive, requiring individual and manual efforts, even in areas where technology can come to the rescue. Secondly, it is reflected in high labor output and capital-output as a rule, and on the average, given constant factor price thus reflecting generally low productivity of labor and capital. Thirdly, in the performance of unskilled and untrained workers and lastly, in the large quantity of capital equipment required to produce a national output. Seamlessly, this is one of the characteristics of the third world

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nations which invariably affect the quality and quantity of service delivered in the nations.

With ICT, geographical barriers have been broken so much so that it becomes possible for public goods and services to be delivered to the citizens from the comfort of their homes and other safe locations, without necessarily visiting the institution. This brings about operational efficiency that relates to the favourable relationship that exists between an organization's input and output. Efficiency is one of the reasons for the introduction of ICT in both private and public sector organizations (Ayoade, 2017).

Operational efficiency creates functional ease and convenience in the delivery of public goods and services. However, there are challenges of ICT competence, availability and nonavailability of ICT infrastructure, as well as the issue of internet penetration which have all contributed to stifling the potentials that relates to the adoption of ICT into the operational dynamics of organizations. Many public sector organizations have responded to these challenges by outsourcing many aspects of their digital operations, which in itself have created a new challenge as it relates to the issues of data security and data integrity. The need to embrace digitalization albeit with caution informs the need to conduct investigate information and communication technology and operational efficiency of the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

## STATEMENT OF THE PROBLEM

This study was informed by the wave of digitalization and the need for organizations to key into the digital train. However, the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria, faces the challenges of staff redundancy, infrastructural deficit as well as access to and quality of internet. The new innovations that technology brings come with several displacements. In every new setting, the first casualty is usually the old order. This explains why several attempts at digitalization - that comes with the public sector reforms of the 21st century - in many areas of our public sector in Nigeria often encounter some resistance (Chukwuemeka, Ubochi and Okechukwu, 2017). This

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resistance can come from the employees who have been used to the old system and unwilling to adopt new innovations that might expose their inadequacies and shortcomings. Also, the adoption of technology can alienate a good number of the clientele of the organization who might not know how to access the services of the organization using various digital platforms. Therefore, the consideration for improved organizational efficiency and effectiveness that does not consider those that might be excluded from the services of the organization might be counterproductive.

Introducing technology into the operations of the College of Postgraduate studies of the Nnamdi Azikiwe University to enhance efficiency comes with several challenges. In a society that is yet to fully embrace the digital space, such initiative can be impeded by the obsolete knowledge of staff of the institution who are not ICT savvy. This is because while many of the young people in Nigeria are at home with the innovations and dynamisms that accompany the introduction of technology in any endeavour, the older population prefer to embrace technology with caution and at a slower pace. By implication, some older academics and professors find it challenging to access and interact with digital platforms that enhance e-learning, e-examination and e-publication of results. This situation makes them to rely on the younger ones who serve as their technical assistants, thus, creating additional layers of personnel need that impact on the operational efficiency of the college and the institution at large.

In addition to the challenge of observed cases of skill deficiencies on the part of those whose responsibility it is to drive the implementation of the ICT innovation in the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, there is also the issue of poor ICT infrastructure. The challenges of network glitches and poor connectivity may have constituted a stumbling block to the implementation of online examinations and conduct of online lectures. In the final analysis, the issue of quality control in the application and use of ICT in the conduct of lectures and examinations is another source of concern. This is because the infrastructure to properly monitor candidates during online exams and ensure hitch free lectures and assessments may not be in place.

While several studies like those of Yusuf and Fasae (2021), Bisong

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and Oguwmike (2020), among others have established the linkage between ICT application and the operational dynamics of public and private sector organizations, not many have examined its impact on the inner workings of organizations in general and tertiary institutions in particular. All of these elicit questions begging for answer, thereby provoking the conduct of this empirical investigation on information and communication technology and operational efficiency of the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

## OBJECTIVES OF THE STUDY

The broad objective of the study is to examine the effect of information and communication technology and operational efficiency of the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. The specific objectives are to;

1. Analyze the effect of ICT competence on efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
2. Ascertain the effect of availability of ICT infrastructure on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

## RESEARCH QUESTIONS

The following research questions were posed to guide this study;

1. What is the effect of ICT competence on efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria?
2. What effect does availability of ICT infrastructure has on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria?

## HYPOTHESES

The following hypotheses will guide the study

1. **Ho:** ICT competence has no significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
2. **Ho:** Availability of ICT infrastructure has no significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University,

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## REVIEW OF RELATED LITERATURE

### Information and Communication Technology (ICT)

There is no universally acceptable single definition of the term Information and Communication Technology (ICT). However, the term is generally accepted to mean all devices, networking components, applications and systems that combined to allow people and organizations (i.e., businesses, nonprofit agencies, governments and criminal enterprises) to interact in the digital world.in its broad sense, ICT refers to all the technology used to handle telecommunications, broadcast media, intelligent building management systems, audiovisual processing and transmission systems, and network-based control and monitoring functions (https://www.techopedia.com).

The International Telecommunication Union (ITU, 2006) states that Information and Communications Technology (ICT) is a term currently used to denote a wide range of services, applications and technologies, using various types of equipment and software, often running over telecoms networks. ICT include well known telecom services such as telephone, mobile telephone and fax. Telecom services used together with computer hardware and software form the basis for a range of other services, including e-mail, the transfer of files from one computer to another, and, in particular, the Internet, which potentially allows all computers to be connected, thereby giving access to sources of knowledge and information stored on computers worldwide.

The term ICT is also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution and management. Information and Communication Technology· is also known as the hardware, software, processes and people working together when storing, processing, transferring and using data to communicate information and ideas; both at site and across large geographical areas with the intention of reaching a single goal. It is also seen as the convergence of information technology,

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telecommunications and data networking technologies into a single technology (Yakubu, 2018).

Information and communication applications include video conferencing, teleporting, distance learning, management information systems and stock taking. According to Lawan, Ramli and Razali (2019), technologies can be said to include a broad array of issues ranging from "old" technology such as radio and TV to "new" ones such as cellular mobile communications; while networks may be comprised of copper or fiber optics cable, wireless or cellular mobile links, and satellite links. Equipment includes telephone handsets, computers, and network elements such as base stations for wireless service; while software programmed are the lifeblood of all these components, the set of instructions being everything from operating system to the internet. Advances in telecommunication technology in the last two decades have led to the development of certain computer networks that allow access to a vast amount of information and services. Of the many computer networks that have been developed, the most prominent and widespread is the internet.

Internet according to Ifinedo (2016), is a powerful tool used for searching, retrieving and disseminating information across the globe. In other words, internet has become one of the most significant channels of communication of our time. The internet in recent times has become even more commercialised, and it is increasingly being used by all sectors of society, as against its initial conferment to the military and the academics. Hence, it is not an understatement to say that internet has made information more accessible to people the world over.

**Operational Efficiency**

Operational efficiency has to do with the relationship between an organization's output and input, that when healthy, helps organizations – whether in the public or private sector - cut down on unnecessary costs while increasing revenue (Dilshani, Praveeni and Fernando, 2019). Just like their counterparts in the private sector, operational efficiency is the ultimate goal of many public sector organizations. According to Dilshani, Praveeni and Fernando (2019), operational efficiency can be defined as the ratio between outputs and input in an

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organizational setting. When improving operation efficiency, the output to input ratio improves. Operation efficiency is often achieved by streaming a company's core process in order to more effectively respond to continually changing market force in a cost-effective manner. Operational efficiency underpins an organization's most basic strategic goals. Improving customer satisfaction and increasing shareholder value both depend on achieving operational efficiency (Dilshani, Praveeni and Fernando, 2019).

Operational efficiency is additionally clarified as the capability of an organization to diminish the unwelcomed and maximize asset capabilities so as to provide quality goods and services to clients (Ghosh and Sanyal 2019). Operational efficiency, as a key determinant of the long-term dissolvability of businesses, is the capability of an organization to abridge the unwelcome and boosts asset capabilities so as to convey quality goods and services to clients. Dilshani, Praveeni and Fernando (2019), identified several factors affecting operational efficiency in organizations. He classified the factors as human factors, organizational factors and technological factors. While the human factor, deals with the people, the organizational factors looks at the system, while the technological factors deals with the technological systems.

## THEORETICAL FRAMEWORK

The theoretical framework for this study is anchored on the diffusion of innovations theory. The theory was propounded, popularized and elaborated by Everett Rogers, a professor of communication studies in his book "Diffusion of Innovations" which was first published in 1962. The diffusion of innovation theory is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. It is concerned with the spread of an innovation through a population. Researchers in diffusion theory have developed analytical models for explaining and forecasting the dynamics of diffusion of an innovation (an idea, practice, or object perceived as new by an individual) in a socio-technical system. Rogers defines diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social

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system". As expressed in this definition, innovation, communication channels, time, and social system are the four key components of the diffusion of innovations. Four main elements in the Diffusion of Innovation Theory

1. Innovation
2. Communication Channels
3. Time
4. Social System

Rogers' diffusion of innovation theory is a widely used theoretical framework in the area of technology diffusion and adoption. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Rogers (2003) usually used the word "technology" and "innovation" as synonyms. To Rogers, "a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome". It is composed of two parts: hardware and software. While hardware is "the tool that embodies the technology in the form of a material or physical object," software is "the information base for the tool" (Rogers, 2003). Since software (as a technological innovation) has a low level of observe ability, its rate of adoption is quite slow. For Rogers (2003), adoption is a decision of "full use of an innovation as the best course of action available" and rejection is a decision "not to adopt an innovation".

## METHODOLOGY

**Research Design:** Survey research design.
**Population of Study:** 2,477 staff of Nnamdi Azikiwe University, Awka, Anambra State.
**Sample Size Determination:** Using the Taro Yamane formula, we obtained a sample of 344

A total of three hundred and forty-four copies of questionnaires were distributed to the respondents, out of which two hundred and eighty-eight were filled and returned. This represents 84 percent of the total respondents.

## DATA ANALYSIS

**Test of hypotheses using SPSS version 23**

**Hypothesis One**
ICT competence has no significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

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**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .520[a] | .270 | .073 | .38057 |

a. Predictors: (Constant), ICT Competence

**Source: Field Survey, 2024**

The table shows the model summary for hypothesis one which states that ICT competence has no significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. From the summary, the regression coefficient (R) which shows that ICT competence has a significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria and the R-Square ($R^2$) which shows the percentage change in the dependent variable caused by changes in the independent variable, it is seen that a positive relationship exists between the variables (R = .520).

**ANOVA[a]**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | .215 | 1 | .215 | 1.482 | .029[b] |
| | Residual | .579 | 4 | .145 | | |
| | Total | .794 | 5 | | | |

a. Dependent Variable: Assessment Test

b. Predictors: (Constant), ICT Competence

**Source: Field Survey, 2024**

The ANOVA output for test of hypothesis one which states that ICT competence has no significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. With significance level of 5% (0.05), and comparing it with the probability value (p-value) as represented by sig in the Table, the null hypothesis is rejected in favour of the alternate hypothesis and it is, therefore, stated that ICT competence has a significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

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**Decision:** Accept the alternate hypothesis.

**Hypothesis Two**

Availability of ICT infrastructure has no significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .118[a] | .014 | -.232 | .44238 |

a. Predictors: (Constant), ICT infrastructure

**Source: Field Survey, 2024**

The table shows the model summary for hypothesis two which states that availability of ICT infrastructure has no significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. From the summary, the regression coefficient (R) which shows that availability of ICT infrastructure has a significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria and the R-Square ($R^2$) which shows the percentage change in the dependent variable caused by changes in the independent variable, it is seen that a positive relationship exists between the variables (R = .118).

**ANOVA[a]**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | .011 | 1 | .011 | .057 | .023[b] |
| | Residual | .783 | 4 | .196 | | |
| | Total | .794 | 5 | | | |

a. Dependent Variable: Admission processes
b. Predictors: (Constant), ICT infrastructure

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**Source: Field Survey, 2024**

The ANOVA output for test of hypothesis two which states that availability of ICT infrastructure has no significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. With significance level of 5% (0.05), and comparing it with the probability value (p-value) as represented by sig in the Table, the null hypothesis is rejected in favour of the alternate hypothesis and it is, therefore, stated that availability of ICT infrastructure has a significant effect on efficient administration of admission processes by the College of Postgraduate studies, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

**Decision:** Accept the alternate hypothesis.

## SUMMARY OF FINDINGS

The summary of the findings of the study are;

1. ICT competence has a significant effect on the efficient conduct of assessment tests by the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
2. Availability of ICT infrastructure has a significant effect on efficient administration of admission processes by the College of Postgraduate studies of the Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

## CONCLUSION

As we journey deeper into the fourth industrial revolution, the use of information and communication technology ceases to be an innovation, but becomes a norm. therefore, organizations are not only expected to embrace digitalization, but to incorporate same into its core operations in order to enhance efficiency and effectiveness. The findings from the present study shows that the digitalization process in Nigeria still has a long way to get to its desired destination. Issues bordering on ICT competence, ICT infrastructure and internet service quality continues to constitute a clog in the wheel of the digitalization process. In view of the findings from the study, we conclude that if the issues identified are not addressed, the potentials that

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technology has will be underutilized in many organizations. To this end, we recommend as follows;

## RECOMMENDATIONS

Based on the findings, these recommendations were made;

1. In view of the findings from the test of the first hypothesis, we recommend a systematic process of capacity building, training and development for staff and resource persons in the College. The training should be flexible enough to accommodate the dynamic nature of technology and digitalization.
2. Sequel to the above recommendation, appropriate investment should be made to enhance and upgrade ICT infrastructure in the College and the institution at large. This can be achieved by leveraging on local and foreign partnerships and funding opportunities in this regard.

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