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Improving Public Healthcare with E-Governance

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Abstract

Introduction: Healthcare is a vital and unavoidable sector to which the government must pay attention to, especially in delivering quality service to care seekers. Adoption of technology can help improve public healthcare performance. This study examined the possibilities of improving public healthcare with the help of E-government by considering the correlation and relationship among telehealth application, health information management software, electronic-based training, and healthcare performance.

Methods: The study adopts a cross-sectional research design to achieve the aim of the study. A structured questionnaire was used to obtain data from one hundred and five (105) nurses in a public hospital in the study area. Data were collected and analyzed using SPSS 23. Regression and Pearson Product Moment Correlation were used to test the hypotheses.

Results: The findings revealed that telehealth application had a relationship with healthcare performance. It also showed that health information system software had a significant relationship with public healthcare performance. Finally, it revealed a positive relationship between electronic-based training and public healthcare performance.

Conclusion: The study concludes that e-government is a veritable tool that can improve public healthcare performance. Therefore, it is recommended that the government should invest in technology to improve health sector performance in the country. Both health workers and the general public should be orientated on the need to embrace technology in the country's health sector to improve their performance.

Keywords: Telehealth, Technology health, Healthcare, Government

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Introduction

One of the essential services any government must seek to provide for its citizens is healthcare which must be treated with utmost importance. To show the importance of healthcare, the third goal of the 2030 Agenda for Sustainable Development Goals (SDGs) is known as good health and wellbeing. Nigeria is categorized as a developing nation. Most developing nations are characterized by little investment in the public health sector, inefficient allocation of scarce resources, and resource wastage, to mention but a few (1). E-governance or electronic governance can simply be described as the application of Information Technology (IT) for the effective delivery of government services (in this context, public health services), exchange of information, and communication within the whole public health care framework (2). Private providers or the government provides healthcare through its three tiers (3). The public health sector in Nigeria is a collection of all organized activities that the government sets up to prevent diseases, increase life span, and advance its citizens' health and wellbeing.

As stated by World Health Organization (WHO) in 2004, the health sector has often depended on technologies; they form the bedrock for conveying healthcare services to prevent, diagnose, treat, and heal diseases. E-governance can be used as a tool in the hands of any government working to improve healthcare and healthcare services (4). By applying e-governance to the Nigerian public health sector, healthcare services will become more accessible to all and sundry in a fast, efficient and transparent way. In Nigeria, the absence of quality or standard infrastructure has limited the public healthcare sector's well-timed delivery of quality healthcare services. It has also been identified that the reason for improvements in the delivery of healthcare services in developed countries is communication technology (5). Health and healthcare are pertinent

to human daily living just as how technology is now what drives most human daily activities; hence the importance of e-governance to healthcare is obvious (6).

In a bid to improve the public health service in Nigeria, significant consideration is attached to e-governance as this will enhance the overall efficiency and effectiveness of the public health sector in Nigeria and meet the ever-increasing health needs of its population. This paper seeks to analyze the effect of e-governance in the public health sector in Nigeria. According to (7), healthcare in Nigeria is often characterized by a long queue because of the imbalance between patient-doctors ratio which could be traced to a drastic increase in the population over the years without complementary growth in the number of medical practitioners in the country; this has reduced the level of health care performance in the country. The author in a study (8) believes that introduction of ICT to organizations' operations can influence the organizational performance. It is expedient to empirically validate aresearcher's (8) claim in the country's health sector.. Also, different studies have considered ICT and health sector in Nigeria; A study (9) examined the influence of ICT on the healthcare sector in Niger Delta in Nigeria, but it only focused on determining central areas of the health sector that require the application of ICT; the study discovered that e-health and staff training require the introduction of ICT to perform better, but the study failed to validate the degree of impact of these variables on health sector in Nigeria. Another study (10) also examined the impact of ICT in the hospital management system; it was discovered that ICT would have a significant impact on health sector performance if introduced, but the study failed to point to a particular ICT tool that will be of benefit to healthcare in Nigeria; this will leave policy makers confused on which ICT tools to introduce. Against this backdrop, the study seeks to see if e-government can be used to improve public healthcare performance. This study will be of significant benefit to the government in planning and implementing policies that will enhance efficiency in the health sectors of the country. The government will get to know with certainty the capability of e-government in improving health sector performance in the country and help create awareness of the overall importance and impact of e-governance to the public health sector in Nigeria. It will also help identify the challenges of e-governance in the public health sector that may reduce efficiency in service delivery.

Literature Review
Theoretical Review

The theoretical framework used in this paper was the Diffusion of Innovation Theory by Everett Rogers, which goes beyond the two-step flow theory. A study (11) indicated that diffusion was how innovation was passed on with time among the individuals involved in a social system. It is a hypothesis that outlines how new technologies and advancements spread across societies and cultures through the introduction to broader adoption. It explores why new ideas and practices are adopted with timelines spread across an extended period.

A researcher (11) has indicated that the steps of taking on an innovation shows the mental process a person goes through from the awareness about the innovation to the last application or use of such innovation. There are four stages between the time a person gets to know about and innovation and the time he/she adopts it. The stages listed by Rogers are innovation-decision process, individual innovativeness, rate of adoption, and perceived attitude. In the first stage, diffusion of innovation or technological breakthrough takes a long approach, and it can be grouped into five parts: knowledge, decision, persuasion, implementation, and confirmation. This implies that potential adopters of the innovation must know or acquit themselves with the innovation, be convinced as to the benefit of such innovation, make a decision to adopt it, and finally implement the innovation and vet the decision to utilize the innovation.

According to a study (11), the second stage is known as individual innovativeness. (11) stated that individuals who are open to being innovative will tend to adopt a new technology or innovation earlier and faster than less susceptible individuals. This was further exemplified by guiding a bell-shaped distribution model of individual innovativeness, and the percentage of potential adopters theorized to be sectioned into each group. The rate of adoption of the innovation is the next stage in this theory, which identifies that, over time, new technology or innovation is diffused in a manner resembling an S-shaped curve. The rate of adoption of an innovation simply implies that a new technology passes through a stage of slow development before moving to a phase of rapid and fast growth. In the perceived attitude stage, which is the last stage, according to (11), potential adopters of an innovation are seen to judge the innovation grounded on their perception regarding the five attributes of innovation: trialability, observability, relative advantage, complexity, and compatibility.

Hence, diffusing e-governance in the public health sector in Nigeria will enable improvement in the existing public health sector and rectify the known inefficiency in the public healthcare system while improving service delivery of the sector in Nigeria.

Conceptual Review
Telehealth

Telehealth is a growing area and can simply be defined as the distribution of services and information related to health through electronic information and telecommunication technologies and is synonymously referred to as telemedicine. A typical example of telehealth is two clinicians discussing a health case via video conferencing, using digital monitoring instruments for physical therapy, forwarding tests between facilities for interpretation by an experienced specialist, videophone interpretation while consulting, having a robotic surgery through remote access, to mention but a few (12)

Telehealth is incredibly beneficial to patients situated in secluded communities and outlying areas. Patients can receive care from specialists or doctors far away without traveling a mile to see them (13). With the recent improvements in mobile collaboration, healthcare specialists in varying locations can now use technology to pass across information and converse with patients like they were in the same location (14). Mobile technology enables remote patient monitoring; this in turn reduces the need for outpatients visits and oversight of drug administration, reducing the overall cost of medical care (15). Other benefits include reducing the possible rate of transmission of diseases from patients to doctors and nurses, comfortability to patients who feel shy to talk to health practitioners physically, to mention but a few.

Despite the numerous benefits of telehealth, there are some stumbling blocks to the full actualization of bringing telehealth into the health sector in Nigeria. First, health practitioners may not be willing to adapt to the change in the system and leave the old hands-on way behind (16). Also, despite the prediction that telehealth will be used in consultations and health interactions, telehealth cannot be fully used in physical examination, diagnostics, rehabilitation, or mental health (16). This led to the formation of the first hypothesis

H0: Telehealth Application has no significant relationship with healthcare performance.

Health Information System (HIS)

HIS, also known as Health Management System, is a part of health informatics that majors on the administrational demands of hospitals which is all-encompassing and consolidated and designed to manage various facets of a hospital operation. Such operations include medical, administrative, financial, and legal issues in a hospital with their corresponding services processes. Hospital information systems give a primary origin of information about each patient's health history. This improves the ability of health care professionals to coordinate care by having access to various patients' health information and history when needed. HIS also makes room for internal and external communication among health care providers. There is a need to check if HIS has any relationship with healthcare performance empirically.

The advantages of HIS to the public health sector include:

Data analytics will help the health sector gather, compile, and analyze health data to help manage healthcare and population health costs.

Collaborative care will help healthcare providers exchange health information and enable healthcare facilities to access common healthcare records. This is because patients need treatment from different health care providers at different times.

Cost control and population management will create efficiency and save the costs of the health sector due to the use of digital networks and electronic health records. There are numerous patients using health care services, and HIS can help aggregate and analyze the patients' data and identify the trends in the population.

However, the adoption of health information systems in public healthcare has been hindered by the high cost of implementation, adaptation time of staff, fear of overdependence on technology, and susceptibility to hacking which may allow aggregate patient data to be lost. Despite these challenges, is it worth it for care providers to adopt HIS in their operations? The led to the formulation of the second hypothesis.

H0: There is no significant relationship between health information management software and healthcare performance

Electronic-based Training

For having seasoned healthcare workers and practitioners, trainings must be carried out often to keep them updated on the new health care processes. The health industry is key to helping patients recover from diseases and preventing them. The best solution to this is by making available platforms for training

as much as possible about the causes, symptoms, and prognoses of diseases. E-training is beneficial to healthcare professionals as it helps them stay abreast of recent developments in diagnosis and treatment virtually without having to attend the training physically. E-trainings are convenient as they can be accessed anywhere by simply having access to a laptop or smartphone. It is more effective than traditional learning and less expensive as health practitioners need Internet access and electricity. Finally, it is conducive to all learners. Arguments on the benefits of e-training above paved the way for formulating the last hypothesis.

H_0: *Electronic-based training has no significant relationship with healthcare performance.*

E-Government in Nigeria

E-governance can be briefly described as the two-way communication process, which involves using information and communication technology to provide various government services and make sure that the services are made accessible to the citizens.

Nigeria is a developing nation and is trying, like every other country in the global community, to create a grade where e-governance is available. (17) found that Nigeria has employed different methods to enhance its ICT sector to the sprightly growing market in Africa. He opined further that the government needs to introduce e-government in various parts of society to ensure that there is efficiency in the delivery of public services and the non-interrupted flow of information within and among sectors in Nigeria. The survey of the United Nations on e-governance showed that Nigeria mainly delivered e-governance services through the use of mobile applications. (18) also found out that Nigeria's telecommunication and ICT sector had significantly alleviated in the endeavor to make available boundless Internet access to its citizens.

E-governance in Nigeria would provide an avenue for telehealth, e-training, and health information system, enabling the public health sector in Nigeria to match up with that of developed nations in the long run. Limiting factors in e-governance in the Nigerian public health sector may include erratic power supply, inadequate funding, lack of infrastructural facilities, and a few which have greatly endangered the sector over the years.

Relationship between ICT and Health Sector Performance

There has been a proliferation of ICT in the delivery of health care (19). The assumption is that the use of ICT will remarkably increase the health sector's performance and make sure that people in the under-serviced areas can have access to health care services (Kwankam, 2004; Mars and Scott, 2015).

Empirical Review

Empirical studies on e-governance or Information and Communication Technology (ICT) and health sector abound in both developed and developing countries. Various researchers with various findings adopted several methods. Some are stated in this session. (20) investigated the effect of ICT on reproductive health workers (RHW). The study used a descriptive survey design and selected a sample of 360 RHW. They found out that RHWs specified extensive use of ICTs in their various job functions. The main challenge in ICT was the unpredictable power supply and insufficient access to ICT facilities. The result of the study carried out by (21) on the usage of ICT by occupational therapists shows that 58% of therapists ranked their proficiency level as good on the use of ICTs, roughly one-third of respondents were not happy with the level of technical support they had available to them, whilst just 38.4% of the therapists had engaged in basic computer training made available by their present-day employer (22). conducted a survey of four general hospitals, 10 primary healthcare centers, and six private hospitals in Nigeria and gave an account that 0% of the institutions had way into an email address or website, 5% of workers had personal computers, and 7% of healthcare workers were computer erudite. Only 2% had measurable computer knowledge, while 65% had ingress to a mobile phone (23). did a study on the actual and potential usage of ICTs in health sector in Mozambique. The study showed that it was rare to use application software developed to meet specified needs. The healthcare sector in Mozambique was a predecessor with such an innovation.

Materials and Methods

The study adopted a cross-sectional research design to examine the consequences of e-government on public health sector performance. The study subjects consisted of nurses who were working in a public health center in Abeokuta. The study employed judgmental sampling techniques to select 150 nurses for the survey. Judgmental sampling was used due to our inability to determine the total number of nurses who work in the selected hospital due to the tight schedule of the human resource manager. To make room for invalid and inaccurate questionnaires, we administered 165 questionnaires, hoping that extra

15 copies would cater for invalid and incorrect ones. Still, due to the flexitime work schedule of nursing job, 135 questionnaires were retrieved, of which only 105 were found useful for further analysis. The questionnaire was structured in two sections; the first section focused on demographical characteristics of the respondents with five questions, while the second section focused on e-government in health sector variables, such as telehealth application (5 questions), health information system software (5 questions) and Electronic-based training (5 questions), and questions on health sector performance (5questions). Questions were scored on a 5 Likert scale ranging from 5 to 1 where 5 stands for strongly agreed, 4 for agree, 3 for undecided, 2 for disagree, while 1 stands for strongly disagree. The questionnaire was given to 2 experts in a teaching hospital and 1 expert in the healthcare industry to determine the face and content validities. To validate the reliability of the questionnaire, Cronbach's alpha was used to test the items in the questionnaire; the result returned a Cronbach alpha value of 0.793, which is greater than 0.7. This implies that the questionnaire is reliable to achieve the aim of the study. Data were analyzed through Statistical software called SPSS (Statistical Package for Service Solution) 23. Both descriptive and inferential analyses were carried out using frequency and percentage, while regression analysis and Product Pearson Moment Correlation were used to test the hypotheses. Permission was sought from the Chief Medical Officer with the presentation of the questionnaire and an introductory letter explaining our motive of enhancing healthcare performance with our research and highlighting how valuable their cooperation would be in achieving this aim. The letter also assured them of their privacy and our commitment to using their responses for academic purposes only.

Results

Table 1 above shows the demographical characteristics of the sampled nurses who participated in this study. The above table shows that females dominated the study with 98.1% as nursing is a female-dominated profession, while 1.9% of the respondents were male. 70.48% of the respondents were married, while the remaining 29.52% were single; this informs us that married nurses dominate the study. The majority of the respondents representing 51.43% of the respondents were between age 31 and 35, 26.66% between age 36 and 40; the older people who were above age 40 represented 11.44% of the respondents, while people of lower age (between 25 and 30) and those below age 25 represented 8.57% and 1.9% of the total respondents, respectively. A little bit above half of the total respondents representing 53.33% were working as caregivers between 3 and 5 years, 22.86% of the respondents had between 1 and 3 years of work experience, 19.05% had over 5 years work experience as a caregiver, while 4.76% of the had a work experience of less than a year; this implies that the majority of the respondents had many years of experience as caregivers. Regarding their tribes, the majority of the respondents representing 85.71% were from Yoruba, while the remaining 11.43% and 2.86% were from Igbo and Hausa, respectively; this connotes that Yoruba people dominate the present study.

Hypothesis One

H_0: Telehealth Application has no significant relationship with healthcare performance

Table 2 explains the results of the regression analysis. The analysis revealed a significant

Table 1: Demographical Characteristics

Characteristics	Frequency	Percentage	Characteristics	Freq	Percentage
Gender			Marital Status		
Male	2	1.9	Married	74	70.48
Female	103	98.1	Single	31	29.52
Age			Years of Experience		
Below 25 Years	2	1.9	< 1 year	5	4.76
25 – 30	9	8.57	1 – 3 Years	24	22.86
31 – 35	54	51.43	3 – 5 Years	56	53.33
36 – 40	28	26.66	Above 5 years	20	19.05
Above 40	12	11.44			
Tribe					
Yoruba	90	85.71			
Hausa	3	2.86			
Igbo	12	11.43			

Table 2: Correlation of telehealth application and health sector's performance

Model		Unstandardized iCoefficients		Standardized iCoefficients	t	Sig.
		B	Std. iError	Beta		
1	(Constant)	4.336	0.521		8.326	0.000
	Telehealth	0.529	0.054	0.526	9.799	0.000
R=0.526^a	R^2=0.277	Adjusted R^2=0.274	F-Stat=96.015			

a. iDependent iVariable: Healthcare Performance

Table i3: Correlation analysis between health information management software and healthcare performance

		Health Information System Software	Healthcare performance
Health Information System Software	Pearson	1	0.290
	Correlation Sig. (2-tailed)		0.000
	N	105	105
Healthcare Performance	Pearson	0.290	1
	Correlation Sig. (2-tailed)	0.000	
	N	105	105

*Correlation is significant at the 0.05 level (2-tailed).

Table 4: Correlation analysis between electronic-based training and healthcare performance

		Electronic-based training	Healthcare performance
Electronic-based training	Pearson	1	0.107
	Correlation Sig. (2-tailed)		0.000
	N	105	105
Healthcare Performance	Pearson	0.107	1
	Correlation Sig. (2-tailed)	0.000	
	N	105	105

*Correlation is significant at the 0.05 level (2-tailed).

relationship between telehealth application and healthcare performance (r=0.526, R^2= 0.277, P=0.000). This indicates that there is 52.6% positive relationship between telehealth application and healthcare performance. It also reveals that of the variation in healthcare performance, telehealth application accounted for 27.7%. Also, the F-values statistics (96.015) show that the overall equation is significant (Sig. level=0.000; P<0.05). Therefore, the first null hypothesis (H$_O$) is hereby rejected and the alternative accepted.

Hypothesis Two : There is no significant relationship between health information management software and healthcare performance

The result of the Pearson correlation shows a value of 0.290 (29%). It reveals that health information management software has a weak and positive relationship with healthcare performance with 29%. This relationship is significant; the analysis shows a P value of 0.000, which is less than 0.05 (5%) significance level. We then conclude that health information management software has a significant relationship with healthcare performance. We therefore, reject the null hypothesis and accept the alternative hypothesis (Table 3).

Hypothesis Three
H0: Electronic-based training has no significant relationship with healthcare performance

The Pearson correlation value of the hypothesis is 0.107 (10.7%). It shows that electronic-based training has a positive relationship with healthcare performance showing an r-value of 0.107 and a p-value of 0.000, which is less than 0.05 (5%). Hence, it can be concluded that electronic-based training has a significant association with healthcare performance. Therefore, the decision to be made would be to reject the null hypothesis (H$_0$), which states that, electronic-based training has no significant relationship with healthcare performance and accept the alternative hypothesis (Table 4).

Discussion

The study examined how public healthcare can be improved using e-government. The first hypothesis that was tested reveals that telehealth application has a significant relationship with public healthcare performance with an r-value of 0.526, which is positive; this implies that a unit increase in the level at which telehealth application is adopted in an organization will lead to 52.6% increase in the healthcare performance since the relationship is positive. This also shows a direct relationship; the higher the telehealth application utilization in public healthcare, the higher the level of healthcare performance. Care seekers' ability to interact with caregivers and receive healthcare services without leaving their comfort zone will improve the service delivery and enhance the overall performance of the health sector. This finding resonates with a study (24) indicating that telehealth can improve the total performance of the healthcare sector. (25) Also, the mentioned telehealth could improve healthcare provider productivity.

The second hypothesis states that health information management software has a significant relationship with healthcare performance. The result of the analysis showed that the relationship was weak with an r-value of 29%, which is weak, but the relationship exists and it was positive; this implies that to a little extent an increase in the adoption of health information management software in healthcare operations will lead to an increase in healthcare performance. A unit increase in health information management systems will cause a 29% increase in healthcare performance. The health information management system helps healthcare givers keep, store, and manage care seekers' information that could be used to enhance service quality and delivery. The study affirmed that adopting technology in keeping care seekers' information would improve healthcare giver performance. (26) confirmed this finding in their research on health information technology; they discovered that health information technology directly impacted the healthcare giver performance.

The third hypothesis that was tested with correlation analysis reveals the level of relationship that exists between electronic-based training and healthcare performance; it showed that there was a direct and upward relationship between electronic-based training and healthcare performance, so that a unit increase in the adoption of electronic-based training will lead to 10.7% increase in healthcare performance. Attending virtual training, seminars and workshops, watching medical documentaries

online, seeking senior colleagues' advice via the Internet, and reading professional journals and articles are identified as means of equipping nurses with knowledge needed to effectively and efficiently give healthcare service to seekers, which will lead to an increase in overall performance. This finding is in the same line with the outcome of the study carried out by (27) on leveraging e-learning technology to enhance healthcare trainee performance. They established that e-learning which is synonymous to electronic-based training has the capacity to enhance healthcare trainee performance. The study of (28) is also consistent to this finding that e-learning health education programs have a significant and positive effect on graduates of nursing and midwifery school service delivery.

The present study demonstrated how e-government could improve public healthcare performance by leveraging on telehealth applications, health information management software, and electronic-based training. However, the study focused on nurses without considering the doctors who were also stakeholders in the healthcare sector; tight schedule of nurses limited the total number of nurses used in this study. Also, the study was unable to study patients to determine the level of service they received from these nurses. We suggest future studies should focus on patients who seek care from health caregivers to understand their views on e-government and healthcare performance.

Conclusion

This study examined the role of e-government on public healthcare in Nigeria. Three hypotheses were raised to verify the effect of e-government on healthcare performance based on three independent variables used to represent e-government: telehealth application, health information management software, and electronic-based training. The first tested hypothesis revealed that telehealth application significantly affected healthcare performance. This implies that telehealth has the capacity to control the performance of the health sector in Nigeria. The second hypothesis that was tested also revealed that health information system has a significant impact on public health sector performance in Nigeria. This connotes that if the government intends to improve healthcare performance in the public sector, they can initiate a health information system to achieve this goal. The last hypothesis that was tested showed that electronic-based training had a significant association with healthcare performance which implies that attending virtual workshop, conferences

and seminars, and watching health documentaries can influence and empower public health sector workers to perform better which will translate to increase in the way public health sector delivers their services to the public.

The study concludes that e-government (Telehealth Application, Health Information Management Software, and Electronic-based-training) is a veritable tool that can be adopted to improve Nigeria's public health sector performance. For governments to ensure improvement in public sector performance in Nigeria, e-government (Telehealth Application, Health Information Management Software, and Electronic-based training) can be initiated. This finding affirms the claim of (8), who believes that the introduction of ICT to any establishment can influence the performance of such an establishment. The government should invest in technology in the health sector to enhance their performance and satisfy the public better. To improve public healthcare, the government must ensure citizens are well-oriented about the importance of telehealth to increase acceptability level when introduced. The health sector needs to embrace electronic database which will improve their performance compared to the traditional way of keeping information which often consumes time and space and can be easily destroyed. Health workers are to be empowered with adequate training to enable them to utilize ICT in order to improve their service delivery optimally. Virtual conferences, workshops, and seminars have to be encouraged among health workers to facilitate knowledge sharing.

Conflict of Interest: None declared.

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