A review on information communication technology adoption in the Nigerian healthcare sector

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Abstract: Studies on information communication technology (ICT) adoption in the Nigerian healthcare sector posit that the objective of encouraging information sharing throughout all public hospitals in Nigeria is still far-fetched following the limited number of hospitals that utilise ICT in their everyday clinical and administrative operations. The proposed study is framed under four objectives, which seek to critically examine existing literature on the issue, recognise obstacles to ICT adoption in Nigeria, consider the context of the administrative policy during and post ICT adoption, and suggest potential solutions that can be implemented by the Federal Ministry of Health Nigeria as part of the effort to introduce ICT to improve the service quality within the sector. This study conducted a systematic review of relevant literature using the ATLAS.ti 9 software. The result demonstrates that the current environment recognises the value of information and communication technology to improve the healthcare sector.

Keywords: healthcare sector; Nigerian healthcare; information communication technology; ICT; hospital management.

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1 Introduction

The world is experiencing a time of transformative change (technological revolution) brought by information and communication technology (ICT) that has extended through all industries. As the emergence of ICT is transforming the workplace, it is also revolutionising the healthcare industry, which inevitably affects the improvement, quality of operation, research, learning, administration, and management (Omotayo and Chigbundu, 2017). Also, communication is a mechanism in which individuals establish and exchange knowledge to shared understanding. Particularly in healthcare, Nigeria is a nation in demand of consistent communication solutions (Olaronke and Oluwaseun, 2016).

The technology of information communication is becoming more important for communication. ICT comprises an immense range of technologies, software, and devices that allow information and expertise to be distributed, processed, and used (Ajah and Chigozie-Okwum, 2019). It also allows the use of wired and wireless media as well as related devices to provide services such as voice/audio calls, data, video, and fax that are integrated through internet protocol (IP) and non-IP networks. As the Nigerian ICT Minister for Information Technology said, ICT has prominent roles to play in the current government's new reform plan, especially the health sector. The invention of the internet has revolutionised the processing, interpretation, and dissemination of health-related information (WHO, 2015). The internet allows powerful and fast connectivity between societies that provides better access to more opportunities, libraries, and global resources.

Furthermore, ICT has also transformed the healthcare system (Abandu et al., 2019). For example, Cebul et al. (2011) reported that the deployment of electronic documents has increased the standard of diabetes treatment in the United States irrespective of the patients' form of health insurance. Furthermore, it was evident according to the results of a study among diabetes patients in Jordan that self-efficacy was a predictor for self-management, and information technology positively moderated the relationship between these variables (Qutaishat, 2018).

Digital media and its integration in communication influences how communications can be employed for growth. ICT has been accepted as a tool to boost the quality, productivity, and expertise of employees in healthcare services at both developing and

developed nations (Moshood, 2020). Good healthcare distribution is one of the crucial social services and the cornerstone for infrastructural growth of a country. The healthcare providers are continuously evolving and communication with the public has been more generous (Abandu et al., 2019).

Theoretically, the most cost-effective and realistic approach for a sustained healthcare reform is to employ appropriate measures of accurate health records for health workers in emerging countries. The majority of health-related ICT studies in Nigeria have looked at narrow aspects that mostly benefiting the doctors (Ajuwon, 2015; Odusanya and Bamgbala, 2002; Onwujekwe et al., 2019). The present research aims to examine the ICT used in healthcare from the viewpoint of the 'health providers' and those who benefit from the clients and patients' services. In a particular sector and development communications, the research should lead to information on ICT use. Since connectivity technologies tend to be diverse, the focus of this study is limited to the role of ICT in supporting the knowledge about health and healthcare provision such as the internet, iPads, smartphones and telemedicine.

2 Methodology

2.1 Literature search

One potential method of implementing qualitative analysis to text data is illustrated by the methodology presented in this manuscript. Numerous distinct phases are defined in the planning and exploring the potential and implementation of ICT in the Nigerian healthcare sector using the ATLAS.ti version 9 (ATLAS.ti 9) software. Therefore, every phase of the appraisal process is structured around the Methods, Conclusions, and Discussion parts in helping readers to better understand how the data was analysed and follow the ramifications process as well as the data. A review was initially conducted that allowed the authors to define the analytical structures used to process and analyse the data (Moshood et al., 2020a). The sources used for the search were Google Scholar, Taylor & Francis, Emerald, Springer, and Elsevier. This study proposed and validated the methodological concept produced by academic and literary contributions. In one scenario, the characteristics of the interest parameters are to be determined by descriptive analysis. This study shows the types of changes that will benefit the information communication technology in the healthcare sector to shape the efficiency of the service quality in Nigerian healthcare, increase competitiveness, recognise potential technologies, recognise business risk, and encourage investments in technology.

2.2 Literature consideration

ATLAS.ti 9 is an appropriate software to save, classify, and interpret the evidence in this research. One benefit of using the software is the keywords, patterns, relationship charts, and other analysis features provide easy access to quotations. The auto-code invention was originally used to identify and mark all aspects of the information organisation as quotes, in which ATLAS.ti 9 was used for the primary stage of analysis. These quotes were grouped for review into a separate document and they were regularly analysed in connection with the method of study. All papers were read repeatedly and clarified to

identify recurrent trends and concepts driven by the research subject (Moshood et al., 2020a; Paulus and Bennett, 2017).

The collected materials were planned in order to achieve three kinds of reports. First is the overall report where the papers obtained are initially explained by their research backgrounds to describe the overall intent of the literature assessment. The second report is detailed description in which the main focus of this study is on the benefit of information communication technology to increase the reliability of service quality in Nigerian healthcare. Five primary word forms discussed above distribute the papers received. A comprehensive report on the items collected is handled by relevant items such as the research priorities, strategies and productivity, and the relevance and advantages of information communication technology in order to increase the performance of healthcare service delivery in Nigeria. Finally, the third report is an interaction analysis which is an additional statement on information communication technology to increase the reliability of service quality in Nigeria's advanced architecture healthcare study through many papers that have been carried out. In addition, past studies have reported on other possibilities such as the challenge of implementing information communication technology in the Nigerian healthcare sector in order to increase its performance and quality of service (Chang and Hsieh, 2020; Moshood et al., 2020b).

2.3   A systematic review using ATLAS.ti 9

This section explains the organisation of the section-each phase technique used in the research. The ATLAS.ti 9 software was used to save, identify, and interpret the research evidence. For someone who is unfamiliar with the software, the use of ATLAS.ti 9 (quotation, families, and network) jargon would certainly mean nothing. In contrast, Lu and Yuan (2011) used and explained machine terms for readers to understand. In this overview, the researchers identified the approach, software and version, and the characteristics used for this analysis (quotes, codes, device hierarchy with memos). This explicitly expresses the meaning and link between the quotations and codes (Paulus and Bennett, 2017).

The researcher advised the readers on how the program could be used to teach people who are unfamiliar with qualitative analysis software (Moshood et al., 2020a). One benefit of ATLAS.ti 9 is that keywords, topics, relationship maps, and other search features provide easy access to quotations. In the software, Figure 1 displays word cloud data that helps novices to understand how software analysis is enabled. Meanwhile, Figure 2 and 3 contain a network view of ATLAS.ti 9 and illustrates how data codes are linked with the two major themes. The authors have indicated in this case that the data is produced through the network functionality of ATLAS.ti 9.

2.3.1   Word cloud

Running the word cloud and creating ATLAS.ti 9 software knowledge helps novices learn how to view applications. Word cloud is commonly utilised in viewing textual content where a keyword's font size might reflect its frequency in the text. There are many methods for the organisation of words (Friese et al., 2018). Word cloud is a simple and intuitive visualisation tool which is often used to give text documents a first impression. The most frequent words in a text are usually presented in a defined spatial structure as a weighted list of words (e.g., sequential, circle, random). For decorative

purpose, the words' font sizes reflect their meaning or frequency of occurrence or encode additional details visually.

On the other hand, the color, position, and orientation are also varied. For more in-depth text analysis, word clouds can serve as a starting stage. However, accessible word cloud visualisations offer very little assistance in comparing various text documents' terms and word frequencies (Friese et al., 2018). We used the ATLAS.ti 9 software which is an expanded word cloud visualisation that systematically merges and shows the words from many text documents to resolve this constraint. It gives a summary of the publications which highlights noticeable differences and commonalities in the use of terms.

Basically, the ATLAS.ti 9 software comprises a series of smaller word clouds that define numerous document combinations. The word cloud is organised with those reflecting individual documents at the outer circle's and the inner circles combine those in a cantered sequence. The cloud concept contains the words inside the innermost loop that exist in all documents. The background color saturation, which increases with the degree of aggregation, reinforces this composition principle. The word cloud (Figure 1) is explained in detail in this article. We describe the visualisation theory and its application after summarising the related works.

Figure 1   Word cloud information on ICT and healthcare sector (see online version for colours)

2.3.2 Data analysis

After developing the coding frame, the principal investigator had a simple description of the results. The codes used to evaluate and re-read the data were optimised. The next step was to group codes into a cohesive pattern. It involved the process of making a plot-line where the theme is formed by part of the plot. Although the papers on ICT adoption factors were reviewed, 11 different factors were classified under ICT adoption factors. These codes are financial, skills and resources, technology type, infrastructure, government, trend, perceived benefits, ICT training, culture, generation, and trust. The analysis on the benefits and role of ICT resulted in nine separate codes, namely efficiency, productivity and growth, job creation, competitiveness, financial benefits, globalisation advertisement, customer relationship, crime and fraud prevention, and improved communication (see Figure 2 and 3). Figure 2 and 3 illustrate how the codes

surrounding work-related benefits were further discussed in the theme creation process. The network feature of ATLAS.ti 9 was used for this purpose where all codes that contributed to ICT adoption in healthcare to enhance the efficiency of the service quality in Nigerian healthcare were drawn into a network and connected to each other. This is not an automatic method (Moshood et al., 2020b; Soratto et al., 2020). The software created no connections or names for the links but rather it only provided the researcher with a space for conceptual thought. This occurs as the networks arrange the nodes, think of meaningful connections, and name those connections. For example, the above network (Figure 2 and 3) indicates that ICT activities are prominent to enhance the efficiency of service quality in Nigerian healthcare. The required information for mathematics is shown in Figure 2 and 3.

Figure 2   ATLAS.ti network view on ICT adoption factors (see online version for colours)
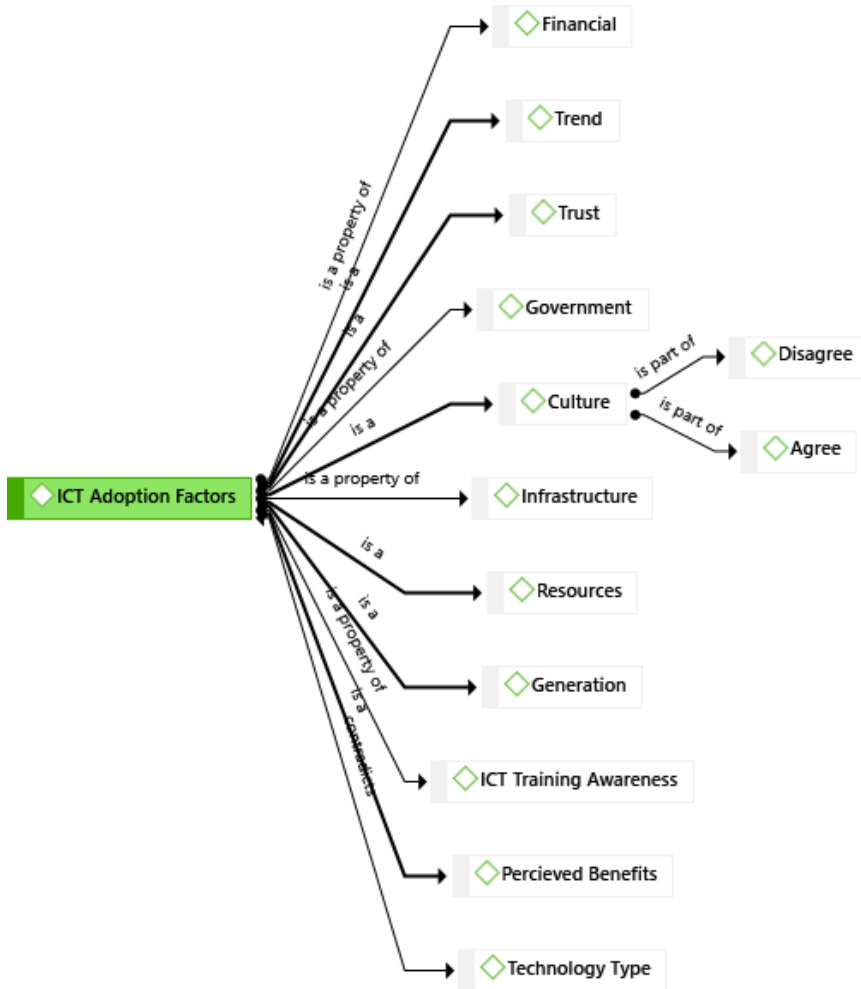
Figure 3 ATLAS.ti network view on ICT role and benefits (see online version for colours)
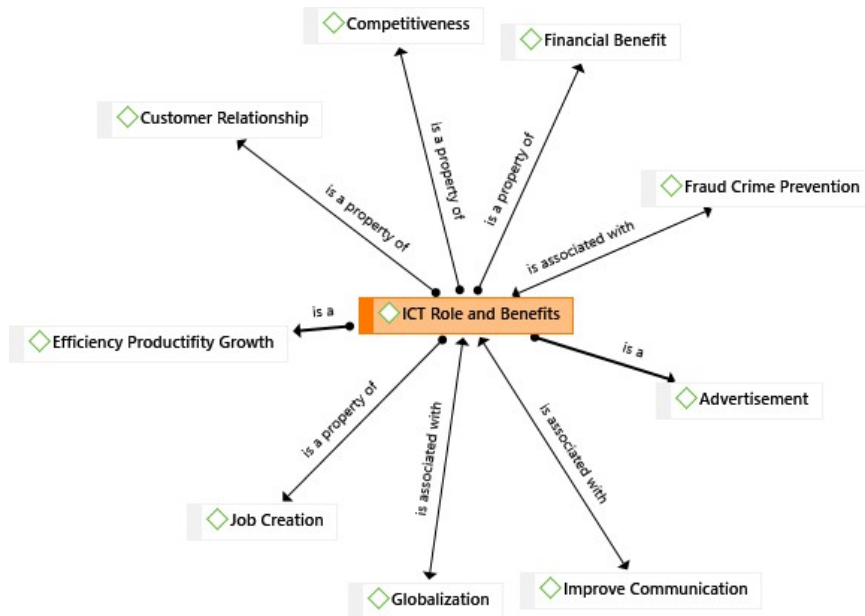
3 Overview of ICT and healthcare in Nigeria

Many analysts believe that changes are required and that the use of emerging technology will make healthcare services more efficient and competitive, enabling information to be exchanged across organisational borders (Christensen et al., 2016). However, such innovations have become difficult to introduce although they can support improvements in the way treatment is delivered. This suggests a strong understanding on how the healthcare industry could be affected by these innovations (Laurenza et al., 2018). In the 21st century, there was significant progress in the area of information and communication technology. In the context of emerging technology such as the internet, these advances have introduced fundamental shifts and a high standard of living worldwide, in areas ranging from villages in indigenous regions within the Middle East and East Africa to rural places (Kolawole et al., 2020).

Furthermore, significant advancements in communication system have been made, culminating in an unprecedented growth in global knowledge flows. Radio and TV, the first examples of ICT, have multiplied exponentially. In the health system, ICT is used to facilitate adequate health services at the hands of the people (Donner and Mechael, 2012). Many health organisations are using ICT to electronically provide critical information and resources, automate internal organisational transactions that were once tedious, and deploy corporate internet and web-based information systems and databases especially in developed countries and more recently in many developing countries (Ogbuabor et al., 2020). The world has developed into a digital community with the internet and the various networks inside it. The revolution in information and

telecommunications technology has dramatically affected health practitioners, notably in the areas of information access, storage, processing, analysis, and dissemination (Vázquez-Martínez and Ortega-Padrón, 2016). In general, technical interventions have significantly changed clinical practice and a modern and increasingly growing area of applications has arisen, known as health or medical informatics.

Likewise, more people have been reached by wireless telecommunication networks and mobile phones than any other technology, particularly in developing countries (Thirumurthy and Lester, 2012). Although internet usage has risen dramatically in recent years, internet access was only available to 26% of people in developing countries in 2011 while 79% of them had a cellular phone or mobile subscriptions (ITU-D, 2010). By addressing resource shortages on the demand side, cell phones will support both providers and patients (Ayanlade, 2018; Thirumurthy and Lester, 2012). Bello et al. (2004) investigated the use of ICT in a teaching hospital in Ile-Ife, Nigeria, to change contemporary health systems in the areas of communication, teaching, storage, and retrieval of medical information by health care practitioners and students. They argued that medicine relies on experience to remain an ever-evolving discipline. As such, having formal computer and IT training for all members of the health staff would provide them with the expertise to practice up-to-date and evidence-based medicine that is essential in improving the standard of patient care. A strong ICT infrastructure is thus a prerequisite for enhancing the well-being of a nation (Makinde et al., 2018).

It is beneficial for health workers in developed countries like Nigeria to use ICT in this manner with limited resource settings since patient data can be submitted remotely for timely and appropriate diagnosis to specialists in other partnering centres. Besides, it is possible to address complicated medical situations and emerging techniques by audio or video conferencing. Olatokun and Adeboyejo (2009) proposed that health workers might use the internet to find research challenges, scan databases of literature, look for a survey and clinical trial information, and publish findings. The development of quality healthcare in a country is driven by the number of ICT facilities that that country owns and uses (Ogirima et al., 2019; Olatokun and Adeboyejo, 2009).

In the Nigerian teaching hospitals, Idowu et al. (2003) stated that mobile telephones have more usable capacities (mobile phones, personal computers, and the internet). Their discoveries show that in all teaching hospitals, computers and cell phones were in use but not much internet service was available. Instead, the health staff concentrated solely on cybercafé facilities and minimal internet access such as email. Meanwhile, the findings of a more recent analysis (Olatokun and Adeboyejo, 2009) by the reproductive health workers (RHWs) at the University College Hospital (UCH), Ibadan, Nigeria, seek to improve the use of ICT, revealed that these workers made equal use of various ICT facilities available including e-mail, access to the World Wide Web, as well as audio and video conferencing (Ogbuabor et al., 2020).

The researchers also stated that male respondents used ICT facilities more frequently than women to varying degrees, particularly email and video and audio conferencing. This adds some credence to the results of previous studies that technology is a male domain. Although the adoption of ICT has a considerable influence on the health sector, it would be unwise to presume that the advent of ICT immediately embraces a new digital colonisation paradigm as the impact of ICT in Africa still seems far-fetched (Baridam and Govender, 2019). In the effort 'to get connected' in Nigeria and Africa as a whole, enormous difficulties inhibit disseminating ICT (Ojo, 2006). These obstacles include high level of illiteracy, the spread of poverty, poor leadership and administration,

and the lack of telecommunication facilities such as insufficient and intermittent access to electricity. These problems make it difficult to disseminate ICT (Omotosho et al., 2019).

4   ICT policy for development in Nigeria

It is generally accepted that ICT is evolving and that it plays an essential role in fostering rapid development across all economy, socio-culture, and political fields of society (Olatokun and Adeboyejo, 2009). Adebara et al. (2017) and Akanbi et al. (2005) have stressed on the competitive vulnerability of governments, organisations, and industry unless they are willing to use ICT to exploit their operations in the developing global economy as instruments. The Nigerian government sponsored ICT because it sees it as establishing a strong IT sector, creating jobs, filling the skill deficit, diversifying the economy, producing foreign income, and improving the country's profile (Popoola et al., 2010). The Federal Government of Nigeria (FGN) adopted and introduced a range of policies and regulations relating to ICT from the beginning of the 1990s to today that have contributed to the sector's growth to exploit its advantages for national development. The government's attempts to encourage ICT reforms in Nigeria include the initiation of the National Telecommunications Policy in September 2000, the adoption of the understandable Science and Technology Policy in 2001, the development and introduction of the 2001 National IT Policy, as well as the setting up and launch of the NTDA in 2001 (Babalobi, 2010).

This effort is an addition to further growth steps, such as legalising mobile network operators, starting with MTN in 2001 (Oyelekan, 2008). On 18 May 2010, Abuja in Nigeria launched the Production Information and Communications Technology (ICTT4D). The National Info Development Agency (SIDA) organised the development of ICT4D's National Strategic Action Plan in cooperation with the United Nations Economic Commission for Africa (UNECA). It offers realistic delivery plans for the major sectors of health, education, infrastructure, human capital, and sustainability over a span of five years.

As a critical path to national development in the form of the Seven-Point Agenda of the Nigerian Federal Government, the National Economic Empowerment and Development Policy (NEEDS) has introduced numerous socio-economic development programs and initiatives including agricultural legal/regulatory, privately-owned business, and media/community. Internet penetration in Nigeria has improved tremendously particularly over the last four years (Federal Government of Nigeria, 2015). Although internet networking technology has evolved tremendously, mobile telephone technology remains another ICT that has seen a comparable use. Investing in ICT in the Nigerian education sector was unlike GSM communications that could reasonably be anticipated (Babalobi, 2010; Ifinedo et al., 2020).

Diverse scholars have agreed that Nigeria's tertiary institutions remain exceedingly poor and shallow (Adekunle, 2016; Babalobi, 2010). The government had taken an audacious measure by approving the National ICT Strategy in January 2012. Furthermore, these national ICT policies have been established in favour of the implementation of Nigerian Vision 2020 (Federal Government of Nigeria, 2015). In comparison to similar investments in GSM communications, the national ICT strategy aims to have reasonable expectations in creating a favourable environment for the rapid

growth of ICT networks and facilities that are available to everyone at affordable rates and to turn Nigeria into the knowledge-based economy (Federal Government of Nigeria, 2015; Health Strategic Framework, 2019).

5   Patient management system

According to Florissi et al. (2020), the registry regulation for patients controls the enrolment and participation records that must be kept by all hospitals. It also maintains the right to grant leave of absence from exceptional hospitals and retained hospitals. By statute, hospitals are obliged to report whether the patient is available, unavailable, engaging in an authorised and monitored off-site operation, or unable to attend due to unusual circumstances as specified in the regulation, first at the start of the early morning and once mostly during the evening in the attendance registry (Jensen et al., 2017). When a mandatory patient is unavailable, the documents must indicate whether the absence is allowed or illegal. The nature of any authorised and monitored activities must also be registered. Reduced lack of patients and continuous absence of care and supervision is an essential and central part of hospitals work and municipal authorisation for:

- promoting the health and safety of patients

- ensure that any patient has full-time access to which they are entitled

- it is ensuring the success of patients when in the hospital

- ensure that after they leave school, patients have access to the broadest possible variety of resources.

According to Shickel et al. (2017), electronic applications that handle clinical records from a range of healthcare settings are nursing attendance schemes for patient information systems, which are made accessible in a timely and orderly way to help patients optimise patient treatment (Mathur et al., 2012). To do this, most nursing attendance scheme patient information systems are generated using a database and at least one nursing classification language, such as the North American Nursing Diagnosis (NANDA), Nursing Intervention Classification (NIC) and Nursing Diagnosis Extension and Classification (NDEC).

It may consist of one or a few field-specific extension software modules as well as a wide variety of subsystems for medical specialties such as the radiology information system (RIS), image archiving and correspondence system (PACS), or laboratory information system (LIS) (Mathur et al., 2012; Shickel et al., 2017).

Basically, electronic patient management system is a computer system that can process all the data to allow healthcare providers to improve their work. Since its first adoption in the 1960s, the system has been developed over time parallel with the modernisation of healthcare services (Mathur et al., 2012). Previously, the machines were not as fast and could not deliver real-time information as they are today. The workers used them mainly for billing and hospital resource control. All this has improved now where all health, financial, and logistical applications are merged into patient information systems today. The current electronic patient care program provides several programs that meet the demands of all different departments within a hospital. It supervises the data

relating to the clinic, financial department, laboratory, nursing, pharmacy, and even the radiology and pathology divisions (Christianto, 2020).

Hospitals that have transitioned to the electronic patient management system have connections to fast and accurate data, including the patient reports that demonstrate statistics on demographics such as gender and age. This allows relevant stakeholders to easily and quickly obtain essential details available on the device for hospital funding, patient diet, and even medicines delivery. Such information enables them to track and increase the quality of medicines at the facility (Akanbi et al., 2005). The electronic patient engagement system aims to ensure the availability of the best patient support, output, and administration by sending data as required and receiving data in networked electronic data collection as part of medical information technology (Al-Khatib et al., 2016).

5.1 Types of electronic patient management system

5.1.1 Physician information system

The PIS program seeks to improve doctors' practices and is therefore suggested for use by the government. Doctors will see the stimulus plan proposed by the Federal Government as an effort to promote better patient services. Different packages can be incorporated into multiple budgets to maximise performance, minimise costs, and have high-quality treatment for patients. The physician IT system is supported by computers, servers, networks, and commonly distributed and standard software such as EMRs and electronic health records. Most of these services have 24/7 remote support, thus enabling hospital personnel to resolve any system related problems (Shan et al., 2019).

5.1.2 Nursing information system

NIS comprises computer-based information system that supports nurses to provide better care to patients. A good NIS can achieve various tasks to enhance workforce planning, correct patient diagrammatic procedures, and improve clinical data integration. The nursing department has the best-handled staff to accommodate absences and overtime via scheduling software (Khajouei and Abbasi, 2017). It also tracks the employee levels and achieves a more cost-effective workforce. The application for patient graphics allows users to insert information on the patients' vital signs. The patients also use it to provide information on registration, treatment schedules, and other related nursing notes. Such information is kept safe and can be recovered if necessary. All these features in the NIS minimise the preparation time and have improved assessment and evaluation. It is also possible to administer the incorrect pharmaceutical substance, considering the fact that electronically distributed medications are now referenced (Gonçalves et al., 2019).

5.1.3 Radiology information system

RIS is common for offering radiology billing facilities, scheduling appointments, monitoring, and preserving the patients' database. With technical developments, the field of radiology has become more complicated as more hospitals now use RIS to handle their practice on the business side (Gichoya et al., 2018).

5.1.4 *Pharmacy information system*

PIS allows physicians to track how drugs are used in hospitals to meet the pharmaceutical department's requests. It enables consumers to control allergies towards pharmaceutical products and other medicinal problems. Furthermore, PIS also encourages users to identify opined reactions and helps to prescribe the right medication, depending on the patients' physiological conditions (Bayati et al., 2017).

6 Importance of ICT to healthcare

The reason for addressing this part of the ICT/health partnership is rooted in the fact that recent technical developments have ensured that various forms of ICT are now available to individuals and households. Increased transparency and use of such ICT may also translate to increased access by households and individuals to information with a major involvement on the use of the health system (Abekah-Nkrumah et al., 2014).

Therefore, information organisation related to hospitals and ICT plays an important role to the information operation in hospitals. ICT makes works much smoother, safer, and more effective along with eliminating hospital administration and other costs. In hospitals, ICT can be used for various purposes including the management of the patient medical history, diagnosis, management of personnel records, details of staff payrolls, prescribing of medications, as well as production of invoices and account management. If properly deployed, ICT has the power to enhance the quality of healthcare facilities, improve the productivity of health staff, and expand access to health services (Nwagwu and Akeem, 2013). The following section explains the importance of ICT to the healthcare sector.

6.1 *Improved healthcare practices*

Following its large potential, ICT has often been utilised to increase the provision of quality healthcare. For instance, technical advancement has made gadgets available to the practitioners' decision aids, instructions, recalls, treatment routes, guidance, resources for clinical administration such as electronic health reports, audit tools, guidelines for education, medical instruction, as well as electronic clinical communication tools for referral, booking, discharge, email, and clinical practice. It also leads to the availability of electronic archives for record connections (Sondheim et al., 2017).

6.2 *Research and studies*

Medical is a dynamic field with a rapidly increasing pool of knowledge. A wide variety of expertise is needed for medical technology and professionals. Access to healthcare records worldwide can also solve the issue of insufficient scientific evidence on disease conditions and leads to the propagation of new medical knowledge through the internet (Sondheim et al., 2017).

6.3 Networking and advocacy

Increasing communication network and email system have allowed professional network growth and online group activities to grow and connect rapidly and efficiently across regional boundaries. In previous research, there has been much evidence on the concept of networking to leverage the possibilities of ICT. The membership of such electronic focus groups is intended to be compulsory. It may be active or passive so that individuals with an actual involvement will partake in the project that they have selected. Besides, online dialogue groups promote working partnership and improve new learning in combination with face-to-face engagement at conferences or training courses (Olaifa et al., 2018).

6.4 Enhanced efficiency

While health workers demonstrate a significant role in the socio-economic and political development of a nation, they can significantly enhance their productivity in these sectors by using ICT to fulfil their needs. Processes and clinical information systems allowed by the ITC will enhance medical reports, bed-side data collection, laboratory monitoring, prescription receipts, and demographic changes between hospitals, subsequently rendering them as crucial to doctors and other stakeholders. Braimah et al. (2017) consider its immense benefits particularly in the areas of healthcare to build mobile and teleconferencing facilities as well as ICT multimedia power. This revolution has reduced the geographic gaps between medical experts, medical centres and patients.

7 Challenges of implementing ICT solution in healthcare

The healthcare system is complicated and includes a wide range of clinical, logistical, and data functions. Healthcare techniques are often sophisticated and involve the collaboration of many actors in the healthcare industry. Thus, a successful and efficient support system is essential (Laurenza et al., 2018). In health education and practice, not every stakeholder shares similar appreciation to the ICT. Tortorella et al. (2020) reported that ICT implementation could expand the gap between the rich and the poor and also the 'digital divide', which the WHO described as more dramatic than any other health or revenue inequality.

Tortorella et al. (2020) also asserted that the enormous volume of unreliable internet knowledge by controversial authors may result in a more difficult decision making. This would indicate that while the technology is more and more widespread, it is unevenly spread and does not address either schooling or health challenges (Moshood et al., 2020b). Nevertheless, in a study on implementing telemedicine projects in India, it is evident that patients do not have complete trust in the outcome of telemedicine (Bhatia and Taneja, 2018).

Although the solution to many challenges is always represented on e-learning, factors such as depression, time management concerns, inadequate physical testing capacity, and difficulties following the research content are often concerned. Students often have problems to assume their own independent learning and feel that access to technology and technical literacy is limited (Moshood et al., 2020a). Unfortunately, academic

deception has spread rampantly over the past three decades among students who are ICT literate. Zeadally et al. (2019) addressed the obstacles faced by educators and found positive impact portrayed by approaches that focus on respect, fairness, confidence, and obligation. The consequence is that educators themselves must be mindful of the risk of deception in the modern age.

Alaboudi et al. (2016) pointed that the decline in hardware and bandwidth prices, improved imaging devices, and compression technology are among the significant reasons for ICT adoption despite the growing use of the internet and suitable technology in the developed world. The implementation of an electronic health records (EHR) system in Indian hospital involves huge investments which include the hardware and software costs as well the cost of training healthcare practitioners (Bhatia and Taneja, 2018).

While the telecommunication system in Africa remains inadequate for all internet-based technology especially digital video transmission, South Africa has the best-developed and most modern communication infrastructure in Africa. This signifies an optimistic sign on the potential for changes to happen. Jalghoum et al. (2019) stated the challenge of reaching networks from places with limited internet connection is due to the shortage of resources. However, wireless and satellite networks are deemed as possible alternatives (Jalghoum et al., 2019; Makinde et al., 2018).

8   Recommendations to the Federal Ministry of Health Nigeria

For the purpose of amending the strict restriction on the sharing of health data among doctors, the Federal Ministry of Health Nigeria should recommend several amendments to the existing legislation. Such reform should also provide procedures for maintaining the security of personal health records when sharing details. Relevant portfolios (actors) for health officials should be implemented and appointed as well in order for the best people to be assigned with the right roles and with the right expertise. As far as interoperability is concerned, interoperability specialist personnel can use it to manage healthcare programs.

The Federal Ministry of Health Nigeria should also align the necessary evaluation process with increased organisational efficacy and execution. Furthermore, the use of standardised medical terminology should be promoted and implemented in various public hospitals as the initiative would lay the groundwork for all hospitals to use numerous medical terminologies in their medical records. Moreover, it is recommended for the Federal Ministry of Health Nigeria to create more ICT-based projects in exposing its staff to the creative use of ICT in their thinking and working processes. These projects should foster creative culture among staff and encourage them to follow the ICT implementation innovations in the healthcare sector.

The ministry should encourage its staff to expand their operation support system (OSS) innovation through creative efforts. This opportunity would allow the staff to participate in technology that can foster transparency and resource sharing. In addition, the Federal Ministry of Health Nigeria should optimise its effort to help ICT usage by changing management initiatives among doctors in public hospitals. Acceptance and denial are essential considerations to ensure that interoperability projects are implemented successfully. In any deal between the Federal Ministry of Health Nigeria

and dealers, the ministry should have greater oversight and legal protections over the rights and title to licenses.

The case of the Federal Ministry of Health Nigeria is entitled to greater power over the software's ownership and restrict the vendors' potential to be less accountable after delivering the program. In order to convert the current proprietary applications into OSS services, the ministry should introduce relevant programs to update the source and licensing codes. The transition would expand the use of OSS in Nigerian healthcare. The Federal Ministry of Health Nigeria should provide guidance and information for all national public hospitals on the basic necessity of ICT infrastructures. The project manager for healthcare programs will use the criteria and details to evaluate technical requirements in accordance with current ICT infrastructure capabilities. This should be accompanied by certain guidelines that include the allocation of all projects in the field of ICT. Diversity and collaborative talents from ICT and medical districts in project management on health programs should be encouraged by the Federal Ministry of Health Nigeria.

9 Conclusions

Many scholars such as Omotosho et al. (2019) and Ikediashi and Ogwueleka (2016) have investigated on ICT usage in various areas. The pool of knowledge is further enriched by useful and relevant information available on the internet and online sources. Most of the technology and social change scenarios fall into two fields that positively and negatively affect the health, economic, and political climate. In some instances, ICT increases living condition and creates significant societal improvement for economic development, although it does carry potential threats such as phishing and online theft. In certain parts of the world particularly where the issues of scarcity of vehicles, goods, and infrastructure are prominent, the effort to enhance the utilisation of ICT is hampered by various obstacles such as the lack of infrastructure, financial issue, negative perceptions, and poor government policies. These problems are particularly prominent and often reflected amongst developing countries. This indicates that for ICT to work, it must be contextualised as part of a social structure (Giotopoulos et al., 2017).

Moreover, the current environment has continued to evolve dramatically following the emergence and development in agencies, theories, and strategies (Ariani et al., 2017). It has been proposed that grow in the theories, policies, and interventions proposed by the Western institutions cannot be tailored to the reality faced by the countries that they seek to change (Moshood et al., 2020b; Ogbuabor et al., 2020). Recent debates have confirmed the longitudinal potential of ICT utilisation where the effective role played by ICT in mobilising information, partnerships, and networks can be further strengthened. Furthermore, promoting human intelligence to achieve sustainable development can boost the situation in developed countries. A number of arguments suggest that the position of ICT in a sustainable evolution is yet to be understood and it is still very early to implement ICT resources at this stage. Hence, the prediction of any immediate sustainability result is still premature. Furthermore, the development and improvement of mentality within a society is subject to global preparation (Petersen et al., 2020). While rich ICT and development literature is available, little research has been carried out on its strategic significance.

Acknowledgements

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