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Adoption and Use of Nursing Informatics Among Nurses in Nigeria

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The paper examined the adoption and use of nursing informatics among nurses in Nigeria. The paper is a survey research anchored on the positivism research paradigm. The Technology Acceptance model was used to underpin the study. The population of the study is 150 nurses from three purposively selected hospitals in the country. The hospitals were selected because they have necessary ICT resources and human resources to operate nursing informatics technologies. Simple random sampling was used to select 30 nurses from each of the hospitals. Questionnaire was used as data collection instrument. The findings revealed that mobile health technology is the most used nursing informatics and prevention of medical errors is the main reason for using nursing informatics among nurses. Perceived usefulness and perceived ease of use influence the nurses to use the technologies. The study recommended that the hospitals managements should make funds available in order to have modern days nursing informatics. Furthermore, in design or making of technologies for nurses' usability, the technologies should be user-friendly and easy to use for effective medical practices. However, the research joined the discussion and validations of TAM and nursing informatics in the context of Nigeria. According to the researchers' understanding, this study

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appears to be the first of its sort to examine TAM and nursing informatics in Nigeria. The study also adds to the body of knowledge and offers new information on the significance of nursing informatics for decision-makers in Nigerian healthcare facilities.

Keywords: *Adoption, use, nursing, informatics, Nigeria*

1 INTRODUCTION

Technology has always been the backbone of improving medical services in order to prevent diseases and false diagnoses, identify evidence-based medicine, and treat illnesses. Furthermore, utilizing appropriate health informatics resources can be used to increase the quality of research among health workers. Health informatics, according to Lindberg, Zotterman, Söderberg, and Skar¹, is the use of ICT in promoting evidence based medicine. One of the health informatics commonly used in hospitals is nursing informatics²(Owolabi et al, 2018).

Nurses have the largest healthcare workers in various healthcare facilities around the world³. This pointed to the fact concerning the need for nurses to have access to relevant informatics tools for performing their duties because it will assist them to take clinical decisions, promote evidence based medicine and save their time. Nurses perform effective implementation of nursing informatics in the hospitals; they serve as user liaison officers by putting various information and communication technologies and interfaces with the system vendor and in so doing, nurses are also responsible for the maintenance of the product, intermediary between the vendor and the hospitals management. There are various purposes for using nursing nurses use informatics which include for knowledge sharing among nurses, prevention of medical errors and opportunity to save healthcare workers time. In addition, nurses use nursing informatics for decision making. This is due to the fact that nurses need information in making decision and using ICT resources will enable them to take accurate and reliable decision that will promote evidence based medicine. It is in line with this that the study intends to investigate the adoption and use of nursing informatics among nurses in Nigeria.

2 LITERATURE REVIEW

Literature has reported that, nurses engaged in the use of various health information technology such as electronic health records, computerized provider order entry (CPOE), computerized decision support system (CDSS) and barcode medication administration (BCMA) for their professional performance and responsibilities⁴. In addition, Agbala⁵listed various informatics that are commonly used by nurses. These include mobile phones, printers, electronic medical records, computerize decision support system, scan machine

and host of others. Demirisi and Kneale⁶ stated the tools can be categorized into the following which include diagnosis technologies, therapeutic technologies, and ICT resources. It can be said that, these resources provide opportunity for nurses to increase their level of job performance towards satisfying the needs of their patients. In a study, Berg⁷ stated that application of health informatics is necessary for effective healthcare delivery because it is the backbone for modern day healthcare services. This may be due to the fact that the resources can be used to detect and also to prevent diseases. Extant literature revealed that assessment of effective health in a country can be measured through availability and utilization of various informatics in the healthcare delivery⁸. It is in line with this, that World Health Organization WHO⁹ stated that every country needs to integrate technologies particularly nursing informatics in order to promote effective healthcare delivery which will help in the realization of qualitative healthcare in the 21st century.

Idowu *et al*¹⁰ noted various challenges facing adoption of nursing informatics usage in Nigeria. This includes poor power supply, non-availability of resources, failure to accept new technologies, poor maintenance culture. On the other hand, Oskakwe¹¹ argued that funding is the major issue facing the use of nursing informatics in Nigerian hospitals. Owolabi *et al*¹² stated that lack of technical knowledge and inability to receive adequate trainings on the use of tools are problems facing the use of nursing informatics in many African countries. Kunda and Laurence¹² maintained that lack of support healthcare management is a challenge facing the use of nursing informatics.

Aurore, Valens, Lune and Nyssen¹³ conducted a study in a teaching hospital in Africa. The finding revealed that nursing informatics is not included in the nursing curriculum. Other challenges pointed out in the study include poor internet connectivity, lack of necessary ICT resources and insufficient ICT for nurses in the hospital. The study is based on the premise that, there is a great potential on the adoption and use of nursing informatics in promoting effective healthcare delivery, and as a result, the study sought to investigate the usefulness and factors influencing the use of nursing informatics resources among nurses in Nigeria.

3 THEORETICAL FRAMEWORK

The study would be underpinned by the technological acceptance theory. The theory was established by Davis in 1986. The study was designed to examine factors that influence users to accept the use of technology¹⁴. Legris *et al*¹⁴ noted that the theory is based on two constructs which are perceived ease of use and at the same time perceived usefulness. Kim and Crowston¹⁵ noted for effective use of technology, it must be very easy to be used which means in designing the technology, the manufacturer must put this into consideration

and perceived usefulness indicates that using the technology will need little or no effort. Taylor and Todd¹⁶ noted the theory has been widely used in various studies on acceptance of technology. They went further to say that that the theory is parsimonious in nature. In addition, the theory examined variances that related to users behavioural intention to use technology and reasons for adoption in different contexts.

This theory has been widely accepted as relevant theory that explain factors that influence behavioural intention to use technology which focused on perceived usefulness and perceived ease of use as the most salient drivers of the acceptance of a new technology. The theory is widely used in acceptance studies because of its simplicity, parsimony and at the same time robustness of the theory¹⁷. Yi et al¹⁸ argued that, the theory is more relevant than other acceptance models.

4 OBJECTIVES OF THE STUDY

1. To identify the types of nursing informatics technologies available to nurses in Nigeria
2. To determine the purposes of using nursing informatics technologies among nurses in Nigeria.
3. To find out the extent of use of nursing informatics technologies among nurses.
4. To identify the challenges facing nurses towards the use of nursing informatics in Nigeria

Hypotheses

The relationships between perceived ease of use, perceived usefulness, attitude toward using, and intention to use nursing informatics were tested at 0.05 level of significance.

Statement of the Problem

The review synergized literature regarding the use of nursing informatics resources usage among nurses in Nigeria. A search on Ebschost database from 2015 to 2020 revealed that, only two articles have been done on nursing informatics resources in Nigeria. In addition, Owolabi Evans and Ocholla⁴ reported that, Nigeria's government is spending alot of money in the healthcare. In spite of huge budgetary allocation for ICT in the health care sector, There have not been effective healthcare delivery system in country, due to the fact that many have not been able to have access to quality health which is degenerating to loss of lives and this has not brought any succor to the people to justify the heavy investments. It is in line with this that the study employed the use of TAM to find out the factors that will promote the use of the technology.

Ekanoye¹⁹ explained that, despite significant funding allocated to the sector and the state of the art of information and communication technology, many hospitals in developing nations like Nigeria have failed to meet the standards and expectations of the public. As a result, the problem of missed diagnoses has become widespread, especially among medical professionals in many hospitals in Africa.

Since many individuals have died as a result of medical mistakes that could have been prevented if the appropriate ICT tools were in place, medical errors are becoming a major cause for concern. According to Owolabi et al.⁴, there might not have been enough training and inadequate ICT infrastructure for nurses at nursing schools. Additionally, nursing informatics systems in poor nations have been characterized by a lack of sufficient skills and inefficiency as well as unreliable resources' use on the side of the nurses.

5 RESEARCH METHODOLOGY

The study is a survey research anchored on positivism research paradigm. Five public hospitals were purposively selected for the study primarily from the Southwest region of Nigeria. The justification for selecting these hospitals was based on the fact that, they have necessary nursing informatics resources, and at the same time, nurses that can operate the resources. In addition, simple random sampling was used to select 30 nurses from each of the hospitals making the population of the study 150. Questionnaire was used to collect data for the study. Three research assistants were employed for administration of the questionnaires. Concerning the validation of the TAM theory, twenty questionnaire items were adopted from the theory.

However, the words were modified in order to fit the technology which the study is investigating and necessary changes were made to the user acceptance scale. The research questions were also scored on a four-point Likert scale, with 1 denoting strong agreement, 2 agreement, 3 strong disagreement, and 4 disagreement. According to Losby & Wetmore, likert scales are frequently employed in technology acceptance theories because they may be used to gauge a respondent's views by asking how much they agree or disagree with a given statement. This justifies the usage of a four-point scale in this study.

Prior to the start of the official survey, a pre-test of the questionnaire was completed. This process' main goal is to validate the research tool. A second test was conducted to evaluate the validity and reliability of the instruments. Using Cornbach Alpha, reliability assessment was performed. The Cornbach Alpha is a commonly used metric to assess reliability, which is the internal consistency of many measurements of variables. As a result, when the Cronbach Alpha value is more than 0.07, the threshold value for many constructs is

deemed to have internal consistency reliability. The reliability assessment for this study's purposes was carried out using SPSS version 21 of the Statistical Package for Social Sciences. With an overall index value of 0.853, all measures in this study exhibit a high level of dependability, ranging from 0.788 to 0.926. According to De Vaus, a reliable cronbach's coefficient alpha-values should not be less than 0.7. However, the alpha values in this case vary from 0.788 to 0.926, indicating an acceptable range for the study's continuance. This suggests that, as shown in the table, all of the sectional items are valid for use in the study.

Scale	Number of Items	Cronbach Alpha
Perceived ease of use (PEU)	10	0.811
Perceived usefulness (PU)	8	0.788
Attitude towards use (ATU)	5	0.820
Behavioural intention to use (BIU)	2	0.926
Overall reliability	25	0.853

Figure 1: Instruments reliability Cornbach Alpha

6 ANALYSIS OF DATA

Which of the nursing informatics are available to you?

The question sought to identify the nursing informatics resources that are available to the nurses in their respective healthcare facilities. 32(23%) of the respondents admitted that they have access to electronic health record, while 94(67%) agreed that they have access to mobile health technologies. On the other hand, 21(09%) number of nurses affirmed that, they have access to telemedicine. All the respondents claimed that they do not have access to wearable cloud, artificial intelligence, robotics and bookchains. However, mobile health technologies which is also known as mHealth is the most available to nursing students. Mobile health technology which can describe as smartphones used for effective healthcare deliver which is being used to capture, analyze, process and at same time transmit health-based information through sensors and other related biomedical system. The implication of the finding is that is that mHealth has been very useful in monitoring and making significant impact in promoting effective healthcare. However, the finding of the study is in tandem with the findings of Al-Azzam (2021) that mHealth is very useful for nurses in monitoring patients. In addition, Mobasher et al affirmed that nurses in the UK used mHealth in their nursing activities. Furthermore, the finding of the study supported the findings of Owolabi, Odugbemi, Odeyemi,

and Onigbogi.

What are the purposes of using nursing informatics?

The question examined the purposes of using nursing informatics by the nurses. Majority of the nurses admitted that, they used nursing informatics in order to prevent medical errors. This was supported by 66(47%) closely followed was to improve patient care 34(24.4%). 24 (17%) admitted that they used medical informatics in order to promote evidence based medicine. 12 (15%) agreed that they used health informatics in order to for knowledge sharing. From this the finding revealed that nurses used nursing informatics primarily for medical errors. This finding is in line with the findings of Owolabi et al, who in a similar study in Nigeria, found that the essence of using health informatics is basically to reduce medical errors. Similarly, Alotaibi and Federico in a similar study in Saudi Arabia affirmed that, medical personnel which include nursing students used nursing informatics in order to prevent medical errors. In addition, the finding of the research corroborated the finding of Thompson and Brailer in the United States of America confirmed that, nurses used nursing informatics technologies in order to prevent medical errors. Furthermore, the findings of the study affirmed the findings of Oyebo and Helo and Moulton.

How often do you use health informatics?

The question sought to identify how often the nurses used nursing informatics. The findings revealed that, 120 (86%) of nurses admitted that, they used the resources occasionally. However, the finding of the study revealed that nursing students used nursing informatics occasionally. This contradicts the findings of Asonye, Idowu, Sodimu, Leslie, Akinlawon and Fadipe who found that, nursing students used the resources very often. Also, the finding of the study was not in support of Harerimana and Mtshali in South Africa which revealed that nurses used nursing informatics regularly.

What are the challenges facing the use of nursing informatics?

The question sought to find out the challenges facing the use of nursing informatics technologies among the nurses. 81 (58%) admitted that, non-availability of necessary nursing informatics resources is the main challenge while 21(15%) claimed that lack of necessary ICT skills is affecting the effective use of health informatics resources. 10 (8%) respondents affirmed that power supply is the major challenge facing the use of health informatics. 27 (19%) attributed poor internet services as a challenge facing the use of health informatics. This findings corroborated the findings of Idowu et al (2008) and Ademanhagn (2013) in various studies in Nigeria and Ghana that health workers, particularly nurses do not have access to various informatics resources such as nursing informatics tools due to the issue of unavailability of the tools.

In addition, Wattas and Ibegbulam, and Maharaham and Biswal affirmed that,unavailability of nursing informatics resources in the healthcare system is a serious challenge facing many countries in developing countries like Nigeria. The implication of the finding is that,the availability of nursing informatics for nurses' usage will contribute to effective adoption of the resources in the healthcare delivery.

What are the factors that influence behavioural intention of nursing students toward use of nursinginformatics?

Hypotheses testing

As previously said, this component tested the study hypotheses using the sample size as a whole. First, hypotheses regarding the connections between the initial TAM variables are offered.

a) Perceived ease of use positively affects perceived usefulness of clinical informatics

According to the correlational statistics in Table 1, there is a strong correlation between the perceived ease of use and perceived usefulness of nursing informatics technology. H1 is therefore approved.

Correlations		
Factors		PU
PEOU	r-value	.613**
	p-value	.000
	N	139
PEOU: Perceived ease of use; PU: Perceived usefulness		

b) Perceived ease of use positively affects attitudes towards using clinical informatics

Table 2 showed a substantial correlation between attitudes toward using nursing informatics systems and perceived ease of use. H2 is therefore approved.

Correlations		
Factors		ATU
PEOU	r-value	.575**
	p-value	.000
	N	139
PEOU: Perceived ease of use; ATU: Attitude towards usage		

c) *Perceived usefulness positively affects attitudes towards using clinical informatics*

The findings in Table 3 demonstrated a substantial positive relationship between the attitude toward using nursing informatics technologies and the usefulness of those technologies. So, H3 is accepted.

Correlations		
Factors		ATU
PU	r-value	.625**
	p-value	.000
	N	139
PU: Perceived usefulness; ATU: Attitude towards usage		

d) *Perceived usefulness positively affects behavioral intention to use clinical informatics*

The data from correlational statistics in Table 4 showed a substantial correlation between behavioral intention to use nursing informatics tools and perceived usefulness. This suggests a high correlation between behavioral intention to use nursing informatics technology and perceived usefulness. H4 is therefore equally acceptable.

Correlations		
Factors		BTU
PU	r-value	.521**
	p-value	.000
	N	139
PU: Perceived usefulness; BIU: Behavioral Intention to use		

e) *Attitude towards using positively affects behavioural intention to use clinical informatics*

The attitude toward usage and behavioral intention to use nursing informatics technologies were significantly positively correlated, according to correlational results in Table 5. As a result, the H5 is approved.

Correlations		
Factors		BIU
ATU	r-value	.624**
	p-value	.000
	N	139
ATU: Attitude Towards Usage; BIU: Behavioral Intention to use		

f) *Perceived ease of use positively affects intention to use clinical informatics.*

The correlation analysis in Table 6 revealed a highly significant positive association between perceived ease of use and behavioral intention to use. Thus, H6 is approved.

Correlations		
Factors		BIU
PEOU	r-value	.513**
	p-value	.000
	N	139
PEOU: Perceived ease of use; BIU: Behavioral Intention to use		

The factors influencing behavioural intention to utilize nursing informatics were examined using TAM, as was made explicit above. The study's conclusions showed that perceived ease of use had a positive impact on the intention to utilize nursing informatics. In addition, attitudes toward using nursing informatics are positively impacted by perceived ease of use. Furthermore, attitudes about utilizing nursing informatics are positively impacted by perceived utility. Furthermore, perceived usefulness influences intention to use nursing informatics favorably. Finally, perceived usefulness influences intention to use nursing informatics favorably. However, the findings of the study corroborated the findings of David (1989). Also, the finding of the study supported the findings of Woods, Baker and Hopper (2004), Asiri, Mahmud, Abu-Bakar and Ayub (2012) Afshari, Bakar, Luan, Smamah and Fooi (2009) and Al-Gahtani, Hubona and Wang (2007).

7 CONCLUSION AND RECOMMENDATIONS

According to the survey, nurses are aware of the value of nursing informatics in providing quality healthcare. The study found that, mobile health technologies are the most available nursing informatics resources. Artificial

intelligence and robotic technologies are not available to the nurses in their respective healthcare facilities. The primary justification for utilizing nursing informatics is to prevent medical mistakes. The study revealed that, nurses used the resources occasionally. This can be the result of a lack of nursing informatics in the study's chosen facilities. TAM was also employed in the study to gauge nurses' behavioral intent to use nursing informatics. The study confirmed the association between perceptions of nursing informatics' perceived ease of use, perceived usefulness, and attitude toward their use. The study did not show any contradiction with the previous constructs. As a result, the study confirmed other empirical evidence and findings related to the theory. In view of this study's findings, the researchers recommend that, the hospitals managements should make funds available in order to have modern days nursing informatics in order for nurses to be at par with their colleagues from other countries and at the same time to reduce medical errors and promote evidence based medicine.

Extant literature revealed that, medical errors are serious challenges facing effective health service delivery particularly in developing countries such as Nigeria. As started earlier, it has become imperative for hospital management to make nursing informatics not only available but also accessible to nurses for effective healthcare. This is because adequate access to nursing informatics by nurses will facilitate effective usage. Furthermore, in design or making of technologies for nurses' usability, the technologies should be user-friendly and easy to use for effective medical practices.

The study suggests further studies among various workers in hospitals such as pharmacists, science laboratory technologists and scientists, surgeons and a host of others. Additionally, the research can be repeated at all of the nation's hospitals. such as teaching hospitals, community hospitals and general hospitals. The research has several limitations such as time constraints, and the relatively small numbers of nurses and hospitals used, therefore the results in the findings of the study should not be generalized. However, the research joined the discussion and validations of TAM and nursing informatics in the context of Nigeria. According to the researchers' understanding, this study appears to be the first of its sort to examine TAM and nursing informatics in Nigeria. The study also adds to the body of knowledge and offers new information on the significance of nursing informatics for decision-makers in Nigerian healthcare facilities.

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