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Exploring the Potentials of ICT Adoption in Healthcare: T.A.M Study at Sir Yahaya Memorial Hospital, Birninkebbi Nigeria

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ABSTRACT

In both developed and developing nations, information and communication technology (ICT) has been acknowledged as a tool with the potential to increase the value of health care systems and the efficacy of health workers. Sadly, despite several attempts by the government and other non-governmental organizations (NGO), the majority of programs either fail or are abandoned because of a lack of ICT aware and professional people. This research looks into the possibility for health professionals in Northern Nigeria to use information and communication technology (ICT). At sir Yahaya Memorial Hospital Brininkebbi in Nigeria, a quantitative survey was conducted to gather information from carefully selected healthcare professionals. Clinical and non-clinical employees each got one of 150 on-paper surveys, of which 140 (93.3%) will be collected and evaluated using a modified technology acceptance model (TAM). There is significant correlation between the knowledge (dependent variable) and independent variables (Perceive usefulness and perceive ease of use) both at significant level of 0.05. This indicates that presence of prior computer knowledge and exposure has significant influence on health workers perceptions (Perceive usefulness and perceive ease of use), overall attitude toward adoption and eventually usage of information and communication technologies. Regression analysis revealed that despite lower level of prior computer knowledge of younger participants they were more likely to score higher on perceived usefulness and perceived ease of use whereas older health workers scored higher in knowledge are more likely to score lower in perceived usefulness and perceive ease of use. The result also shows increase in knowledge when compared with a study by Ameh et al., (2008). This indicates that knowledge and attitude scores of health workers in this study reflect progress despite the lack of institutional training.

Keywords: Perceived Usefulness, Perceive Ease of Use, Technology Acceptance, Information Communication Technology

Introduction

Nguyen et al. (2020) information and communication technologies have a role in the way our world is developing. Every human action, including economic, social, political, cultural, religious, and the provision of health care, is impacted by development in this region. Enormous networking potential have had a significant impact on how healthcare is delivered around the world.

Tonetto et al. (2021) these changes include the ability for patients to be closer to caregivers, access to the best medical technology, and the availability of experts in remote areas of the globe study on the location of health information found that using healthcare information systems increases efficacy.

Additionally Tonetto et al. (2021) it helps patients by enabling them to easily identify healthcare institutions and staff members who have full access to patient records while keeping them private via an encryption password barrier to provide the most effective and efficient healthcare facilities to its teeming population, advanced nations like Canada and the United Kingdom, among others, seriously spend a significant amount of their resources in ICT health care.

Dela et al. (2021) believed that implementing ICT in the healthcare sector would help to lower the costs associated with managing hospital operations. As an illustration, the UK's health system uses "NHSnet" to fully use all of the NHS's activities. The NHS can provide decent patient delivery services and ambulances thanks to this facility.

However, Kyakulumbye (2019) noted that many technological initiatives fail due to human problems during the implementation stage, as demonstrated by a comparable project in Uganda (Opande 2019). In order to develop a tailored solution that would satisfy the ICT requirements of the primary health sector in Nigeria, it became necessary to conduct an end user assessment research to comprehend the current human context. In general, a survey of the literature indicates that even in affluent nations, research like this are few. Hassan (2020) developed a model for the adoption of ICT by health professionals in Africa, however they advise more study to concentrate on the perception of usability, perceived utility, and maybe prior computer experience.

Methods

The purpose of this study was to examine the Sir Yahaya Memorial Hospital Birninkebbi health staff's adoption potential utilizing the technology acceptance model (TAM). TAM was especially used since the research on information systems has acknowledged it as a model of behavioural intention (BI) (Muchran and Ahmar 2019). The original TAM proposes that an intention to adopt technology is determined by three constructs: attitude, perceived utility, and perceived ease of use, as was previously mentioned in Chapter 2. (Davis et al., 1989).

However, despite TAM's 30–40% predictive power (Darren and Deborah, 2021), it ignores the impact of outside factors and technological constraints like access (Ma and Lee 2019). To meet the environment in which they were being utilized, numerous TAM variants were advanced, as indicated by a survey of information system literature (e.g. Davis, 1989; Malatji et al. 2020; Jacobs et al. 2019; Murillo et al. 2021; Fussel and Truong 2022).

Based on the enlarged framework proposed by Jimoh (2019), a modified technology acceptance model was used in this study. The basic TAM construct, attitude, perceived utility, and perceived usability was still a part of his study, but it was enlarged to incorporate end-user preferences for ICT applications and endemic hurdles to technology as a distinct element. According to Granic (2019), acceptance is significantly influenced by prior computer expertise. In line with this, Pal and Vanijja (2020) recommended that future research on perceived usability and ease of use build prior computer exposure or familiarity. As a result, a modified framework that contains the basic TAM construct (attitude, perceive utility, and perceive ease of use) as well as a construct for past computer exposure and expertise was employed in this study.

Questionnaire Design

The questionnaire was primarily created to assess four constructs: attitude, perceived usefulness, perceived ease of use, and knowledge (including prior computer knowledge and exposure). As a result, the questionnaire contained multiple question items for each construct. A total of 31 items 4 on demographics, 12 on knowledge, 5 on perceived utility, 5 on perceived ease of use, and 5 on preferred ICT use-cases are included in the survey. All 31 items clearly written in English, including descriptions were created utilizing advice from a variety of sources. The majority of the survey questions were unique, although several were modified from earlier research. Although the original question was updated by adding extra items and explanations to make the questions simpler, the items on computer expertise were derived from a prior research by (O'learyd, 2019). The research by was used as the source for the survey questions on end-user preferences for electronic health applications (Jimoh, 2012).

There were a few parts to the question. Describe the demographics of the participants in Part 1. (job title, age, gender, and education level). Part 2 was divided into two sub-parts; 2A refers to the knowledge, training, and level of personal computer knowledge (the 8 ICT software; Operating systems, Network Diagnostics, Programming Languages, Word Processing, Database Designs, Spreadsheets, Communications, and Graphics) rated from 1 (deep understanding) to 4 (high understanding) (No understanding). Part 2B covers matters related to the use of the school and its use. To evaluate the effectiveness and ease of use, Likert scales were used. The final topics covered in Section 3 relate to end-to-end options for electronic health applications.

Data Collection

The author and a few students from the hospital's in-house school of information systems collected the data. In order to help translate and clarify survey questions to participants as needed, students who aided were informed and educated on every component of the questionnaire. Health professionals were each given a set of 150 on-paper surveys to complete. The questionnaire may be completed at home by participants who are busy throughout the day, however the majority of them did it in privacy at their workplace.

The questionnaire's ethics statements are made known to the participants. These sentences were written in a clear manner. Participants are informed that it is not necessary for them to complete the questionnaire, that all personal information gathered for the study will be kept anonymous, and that they may get in touch with the ethics committee by phone or email if they have any questions or objections. Before continuing, it was advised to the participants to read these declarations and gain their verbal agreement. The data gathering procedure took two weeks. Out of the 150 questionnaires distributed, 140 were retrieved (representing a 93.3% response rate), and these were utilized in the study. Every participant in this research is a resident of in the facility together with computer and mobile phones access

Results

A total of 140 (giving 93.3% response rate) questionnaires were retrieved out of the total 150 administered and these were used for the analysis. All participants included in this study reside in facilities with access to computers and mobile phones.

Demographic

Table 1: Number/Percentage of participants by Gender

Sex	Number of Participants	Percentage (%)
Male	88	62.9
Female	52	37.1
Total	140	100

The distribution of participants by gender is seen in the table above; male participants make up 88 (62.9%) of the total, while female participants make up 52 (37.1%).

Table 2: Number/frequency of participants by Age

Age Group	Frequency	Percentage (%)
18-24	7	5
25-30	22	15.7
31-35	34	24.3
36-40	36	25.7
Above 40 years	41	28.3
Total	140	100

The age breakdown of the participants is displayed in the table above. The majority of participants were above the age of 40 (28.3%), followed by those between the ages of 31 and 35 (approximately 34; 24.3%), and people under the age of 24 (about 7; 5%).

Table 3: Number/Percentage of participants by Education Level

Education Level	Number of Participants	Percentage (%)
Diploma	36	25.7
Bachelor's Degree	47	33.6
Master's Degree	24	17.1
PhD	18	12.9
Others	15	10.7
Total	140	100

The table above shows the distribution of participants by educational level within the hospital. The result shows that majority of the participants are holders of Bachelor's degree 47 (33.6%), followed by Diploma 36 (25.7%) while others with other relevant educational level were less with 15 (10.7%) participants.

Table 4: Number/Percentage of participants by profession

Profession	Number of Participants	Percentage (%)
Doctor	32	22.9
Nurse	22	15.7
Physiotherapist	6	4.3
Lab Scientist	20	14.3
Health Information Manager	46	32.9
Others	14	10

The distribution of participants by profession is shown in the table above. The majority of participants were health information managers, with 46 (32.9%), followed by doctors with 32 (22.9%), nurses with 22 (15.7%), and lab scientists with 20 (14.3%).

Computer Knowledge and Exposure

Table 5: Do you have prior knowledge of computers and exposure?

Knowledge and Exposure	Number of Participants	Percentage (%)
Yes	112	80
No	28	20
Total	140	100

The number and proportion of participants with and without prior computer expertise and exposure are shown in the table above. 28 (20%) of the participants claimed they had no prior knowledge of or exposure to computers, while 112 (80%) of the participants said they had.

Table 6: How do you first learn to use ICT?

	Number of Participants	Percentage (%)
Self-Taught	14	10
Family, Friends, Colleagues	22	15.7
Short Course	65	46.4
Library Training	7	5
In-house Training at work	32	28.9
Total	140	100

The table above demonstrates that 65 participants, or the majority, (46.4%) learn to use computers largely through paid short courses, 32 participants (28.9%), in-house training at work, 22 participants (15.7%), 14 participants (10%), and self-taught participants (14%) accordingly.

Table 7: What have you been using a computer for?

	Number of Participants	Percentage (%)
Typing and Printing	-------	--------
Research	42	30
Medical Designers	38	27.1
Social Network	14	10
Patient Data Processing	46	32.9
Total	140	100

According to the table above, 14 (10%) users utilize social networks, whereas 46 (32.9%) use computers for patient data processing, 38 (27.1%) for medical diagnosis, and 42 (30%) for research.

Table 8: Have you ever received ICT training in previous years?

Have you ever received ICT training?	Number of Participants	Percentage (%)
Yes	22	15.7
No	118	84.3
Total	140	100

Only 22 people (15.7%) have obtained ICT training, according to the table above, whereas 118 people (84.3%) have not. ICT training was not the main element contributing to their total knowledge and exposure to computers, even though 112 (80%) of them indicated having prior knowledge and exposure to computers

Perceived Usefulness

Table 9: Perceived Usefulness

Questions on perceived usefulness	**Number of Participants**					
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Does ICT promote continuous medical education among urban health workers	110 (78.6%)	24 (17.1%)	4 (2.9%)	1 (0.7%)	1 (0.7%)	140 (100%)
Does ICT Improve the management of and access to information and knowledge	107 (40.7%)	18 (12.9%)	14 (10%)	28 (20%)	23 (16.4%)	140 (100%)
Does ICT such as mobile technology enable Doctors to exchange information with other doctors, patients, and co-workers	57 (40.7%)	18 (12.9%)	14 (10%)	28 (20%)	23 (16.4%)	140 (100%)
Does ICT enable health workers to frequently keep track of their patients	82 (58%)	29 (20.7%)	11 (7.9%)	10 (7.1%)	8 (5.7%)	140 (100%)
Do mobile technologies such as mobile devices enable health workers to be notified about emergencies more quickly	119 (85%)	12 (86%)	2 (1.4)%	4(2.9%)	3 (2.1%)	140 (100%)

The replies of participants to questions on the perceived utility of ICTs are displayed in the table above. Seventy-six percent (76.6%) (110) of the participants strongly agreed that ICT encourages urban health workers to continue their education, whereas 4 (2.9%) and 1 (0.7%) were indifferent and disagreed, respectively. 57 of the participants agreed that mobile technology enables doctors to exchange information with other doctors, patients, and coworkers, while 58.6% (82), 85% (119) of the participants strongly agreed that ICT enables health workers to frequently keep track of their patients also enable them to be informed about any emergency quickly. The remaining 1.4%, or two participants, were either neutral or disagreed.

Perceive Ease of Use

Table 10: Perceived Ease of Use

Questions on perceived Ease of Use	**Number of Participants**					
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Do you find it easy to use a computer	78 (55.7%)	26 (18.6%)	16 (11.4%)	12 (8.6%)	8 (5.7%)	140 (100%)
Do you find it easy to use a mobile device?	94 (67.1%)	34 (24.3%)	10 (7.1%)	1 (0.7%)	1 (0.7%)	140 (100%)
Do you find it easy to search electronic resources from the internet using a mobile phone	46 (32.9%)	39 (27.9%)	24 (17.1%)	20 (14.3%)	11 (7.9%)	140 (100%)
Do you find it easy to search electronic resources on the internet using a computer?	67 (47.9%)	33 (23.6%)	21 (15%)	9 (6.4%)	10 (7.1%)	140 (100%)

The responses of participants to questions on how simple they thought ICTs were to use are displayed in the table above. Of the participants, 78 (55.7%) strongly agreed that they found computers to be simple to use, 16 were indifferent, and the remaining 12 (8.9%) and 8 (5.7%) disagreed and severely disagreed. The majority of participants 94 (67.1%) said "yes" when asked if using mobile devices was easy. Only 0.7% (1) disagreed and strongly disagreed, whereas 34 (24.3%) agreed and 10 (7.1%) strongly agreed.

This study's three primary conclusions are based on the examination of the data that was gathered. First, the analysis's findings indicate that there is a statistically significant link between the knowledge (the dependent variable) and the independent variables (perceived usefulness and perceived ease of use). This suggests that past computer experience and expertise have a considerable impact on health professionals' evaluations of the utility and usability of information and communication technologies, as well as their general attitude toward their acceptance and eventual use.

The majority of participants more than 118 (84.3%) said they had not previously received any ICT training, despite the fact that 80% of health workers 112 said they had prior computer expertise. This is because the majority of participants learned about ICT through paid short courses (65.4%), in-house training at work (28.1%), family, friends, and/or colleagues (22.1%), self-taught learning (14.0%), and library instruction (5%), among other sources. However, in this study, older users' scores were higher and younger users' scores were lower due to higher and lower levels of education, respectively. Younger participants score better on perceived utility and perceived ease of use despite having less knowledge. It is therefore reasonable to believe that younger workers, although having low education levels, have a positive attitude toward embracing and utilizing technology.

Discussion

The purpose of this study was to look at the possibility for health personnel at sir Yahaya Memorial Hospital Birninkebbi, Nigeria, to use information and communication technologies. by gathering information on users' perceptions of the product's usefulness and usability, as well as their knowledge and attitudes toward adoption. This study's three major findings are based on the examination of the data that was gathered. First, the analysis's findings indicate that, at a significance level of 0.05, there is a connection between the knowledge (the dependent variable) and the independent variables (perceived usefulness and perceived ease of use). This suggests that earlier computer exposure and expertise have a considerable impact on health professionals' opinions of the usefulness and ease of use of information and communication technologies as well as their general attitude toward their uptake and eventual deployment.

The majority of participants more than 118 (84.3%) said they had not previously received any ICT training, despite the fact that 80% of health workers 112 said they had prior computer expertise. This is because the majority of individuals learned ICT skills via family, friends, or coworkers 22 (15. 7%), paid short courses 65 (46.4%), in-house training at work 32 (28.9%), self-taught 14 (10%), and library instruction 7 (5%). ICT is not a component of the medical education system in Nigeria, according to a 2008 survey of Nigerian medical students. However, 50.6% of the medical students in this research had understanding of the use of computer technology, despite the fact that none of them possessed a computer (Ameh et al., 2019). Consequently, this study's knowledge and attitude ratings for healthcare professionals progress despite lack of institutional training

However, this also demonstrates that the effort put forth by governmental or non-governmental organizations is still not a contributing factor to the general level of knowledge held by health professionals, or possibly there are still certain variables that render such effort insufficient (Korpela et al. 2019; Heeks, 2019; Braa et al., 2020). Therefore, more study into the variables influencing information transmission in projects by governmental and non-governmental organizations among early adopters of new technology is advised.

The findings of both this study and Ameh et al (2008)'s study point to the need of include computer instruction in the curricula for medical schools in Nigeria and other developing nations.

Second, a similar study by Jimoh et al. (2019) revealed that, despite differences in participants' ICT knowledge and attitudes, younger participants who have had greater exposure to these technologies exhibit surprising patterns for perceived usefulness and perceived ease of use. However, in this study, older users' scores were higher and younger users' scores were lower due to higher and lower levels of education, respectively. Younger participants score better on perceived usefulness and perceived ease of use despite having less knowledge. It is therefore reasonable to believe that younger workers, although having low education levels, have a positive attitude toward embracing and utilizing technology.

The most logical explanation for this counterintuitive finding is that younger healthcare professionals have more exposure to ICT due to increased accessibility of ICTs like GSM, mobile devices, and mobile data connections, whereas older healthcare professionals may have a more realistic view or more reasonable expectation regarding the issues surrounding the adoption of ICT into routine operational workflow.

Furthermore, older health professionals may have performed worse because they were less confident in their capacity to adapt new technology due to exposure to it in the Nigerian context, which was plagued by insufficient infrastructure.

It might be difficult to integrate new technology into daily routine at first since the learning curve could be long. This is due to the fact that most information system implementations tend to follow a pattern where the management continues with distinct times of intensive implementation rather than with continuous improvement, according to (Tyre and Orlikowski, 2020). One of the variables impacting ICT utilization, particularly in developing countries, has frequently been noted as the lack of sustainability or abandonment of ICT projects after installation. This happened as a result of managements, governments, and NGO's failing to provide staff with advanced training necessary to support such a system. Personnel capable of using, maintaining, and maybe even disseminating knowledge of ICTs can be produced by including a change management strategy that enables ongoing training and improvement.

Using ICT becomes simpler with time with the right instruction, assistance, and orientation, as stated by (Jimoh et al., 2019). A fresh contribution to the literature on electronic health (eHealth) is the analysis of end-user preferences for ICT applications in table 11 below. The most essential application was a decision support system that alerts the worker to all required check-ups based on patient history and gestation age, which was followed by information technology that enables continual education and training through computer system. This finding can be explained more simply by the fact that medical professionals now understand the value of ICT applications for health, as seen by the higher perceived usefulness ratings.

An information technology system that enables video-call consulting with general hospitals is the least popular use. This may be due to the health professionals' skepticism, which stems from the country's documented lack of adequate ICT infrastructure. This confirms the claim made by Heeks (2019), according to which technology is a dead box unless it generates value and processes data. For instance, unless the recipient likewise has such a system in place, an information system that permits video-call consultation with a general hospital is of little use in changing information. This is particularly true in underdeveloped nations, where only the elite and corporate organizations have widespread access to ICT components (Idowu, 2020). The introduction of ICT elements like computers and the internet among distant populations.

Conclusion

This study serves as an example of how quantitative research methodology can produce perceptive insights by examining how knowledge (prior computer exposure and experience), perceived usefulness, and perceived ease of information and communication technologies affect health workers' adoption of technology in a Nigerian institution. This study's evidence also highlights the importance of three arguments. First, management, governments, and NGOs should organize advanced people training or ongoing knowledge growth in ICT efforts. minimizing the rate of system desertion and increasing the rate of adoption, usage, and maintenance. Second, several developed nations like Nigeria are incorporating computer education into their medical schools' curricula. Last but not least, the need of providing ICT to distant users in order to enhance information and accelerate adoption.

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