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Potentials of Information and Communication Technology (ICT) Adoption by Health Workers in Nigeria: A Case Study of Abdullahi Wase Specialist Hospital Kano

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Abstract

Information and Communication Technology (ICT) has been identified as a vehicle with the potential to improve the quality of health care systems as well as the efficiency of the health workers both in the developed and developing countries. Non-governmental organizations initiatives often fail in making use of ICT technology possibly due to lack of ICT knowledgeable and skilled personnel in the health sector. This study investigates the potentials of information and communication technology (ICT) adoption by health workers in Nigeria. Quantitative survey was used to collect data from randomly chosen health workers at Abdullahi Wase Specialist Hospital Kano in Nigeria. A total of 150 on-paper questionnaires were distributed among clinical and non-clinical staff and 140 (93.3%) questionnaires were collected and analysed using a modified technology acceptance model (TAM). The results showed that there is significant correlation between the knowledge (dependent variable) and perceive usefulness and perceive ease of use (independent variables) 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. This indicates that knowledge and attitude scores of health workers in this study reflect progress despite the lack of institutional training.

Keywords: *Adoption, Clinical, Information Communication Technology, Non-Clinical, Potentials*

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INTRODUCTION

According to Hossain (2019) information and communication technologies have a role in the way our world is developing. The development described in this section permeates every aspect of human life, including economic, social, political, cultural, and religious activities. ICT's vast networking potential has substantially altered how health care is delivered across the world and it has organized health care information with a fair amount of clarity, given patients the opportunity to be closer to care providers, provided access to the best health care system technologies, and made experts available in remote places of the world (Haider *et al*., 2021).

According to Alsharo *et al*., (2020) in their research on the location of health information, adopting a health care information system increases the efficiency of medical staff, which reduces waiting time and physical labour. In the same vein, it helps healthcare professionals provide information in the easiest way to understand. According to Record *et al*., (2021) patient test results can be conveniently stored in each person's file for easy access. Additionally, he said it helps patients by allowing them to easily identify healthcare institutions and staff members who have full access to patient records while maintaining the privacy of those documents through encryption and password protection (Yang *et al*., 2019). According to Ngwa *et al*., (2020) many advantages associated with the use of ICTs in contemporary healthcare institutions and organizations are already in effect. Every firm must have ICTs in order to pursue projects that will properly thrive and achieve goals (Mazhar et al. 2022).

ICTs allow growth efforts to show the potential advantages if healthcare professionals in hospitals successfully employ ICTs to address development challenges and close the digital divide (Omotosho *et al*., 2019).

The challenges identified above emphasized the need for thorough research on how health workers adopt ICT in their working places through the use of any Technology Acceptance Model. It can be evidently clear that, this study could be the first of its kind that focused on ICT adoption by health workers implemented strictly by following Technology Acceptance Model developed by Davis *et al*., (2019) that highlighted the Perceived Usefulness, Perceived Ease of Use and Behavioral Intention.

The aim of this study is to investigate the potentials of information and communication technology (ICT) adoption by health workers in Nigeria. The objectives of the study includes; to determine the level of ICT adoption, use of technology acceptance model (TAM) in health institutions, to determine factors influencing health workers ICT adoption and determine the potentials for ICT adoption in improving management of health services with a case study of Abdullahi Wase Specialist Hospital, Kano Nigeria.

This study used TAM model to address the problems associated with the lacking of ICT infrastructure and Internet accessibility, ICT training, co-opting of computer courses in medical school curriculum and manual hospital operations and procedures.

METHODOLOGY

The methodology adopted in this study is a carefully constructed questionnaire distributed to randomly select 150 health workers at Abdullahi Wase Specialist Hospital in Kano State, Nigeria. Data were gathered quantitatively from a sample of randomly selected healthcare professionals. Clinical and non-clinical workers were given a total of 150 on-paper surveys

utilizing the standard deviation approach, 140 of these were gathered and evaluated using a modified technology acceptance model (TAM). This study used the technology acceptance model (TAM) to look at the adoption potential of health professional at Abdullahi Wase Specialist Hospital Kano State, Nigeria. TAM was used since the research on information systems widely accepts it as a model of behavioral intention (BI).

Sample Size

Abdullahi Wase Specialist Hospital Kano was used as a representative sample where 150 on-paper questionnaire was distributed to health workers both Clinical and Non-clinical staff in the hospital randomly selected and filled the questionnaire, sample size was calculated and arrived by adopting the Krejcie and Morgan (1970) sample size formula given below:
X/6.5 x p where x = sample size, p = population size and 6.5 = 6.5% of population size
X/6.5 x 1003 = 154 therefore, sample size is 150.

Data Collection

Data collection was conducted by the researchers and some staff from different departments that resides within the hospital. Staff that assisted were briefed and trained on every aspect of the questionnaire so that they can help in translating and explaining survey items to the participants where requested. A set of 150 on-paper surveys were handed out to health workers individually to complete. Participants who are busy during the day were allowed to complete the questionnaire at home, but most of the participants completed the questionnaire privately at their workspace. 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 this study reside in facilities with access to computers and mobile phones.

Data Analysis

In the statistical evaluation of the data, all analyses were performed and conducted by using SPSS 25.0 for windows.

Research Model

Technology Acceptance Model (TAM) was applied for it has been extensively accepted as a model of behavioral intention (BI) in the literature of information systems (Revythi and Tselios 2019). The original TAM recommends that a purpose to accept technology is resolute by 3 constructs: attitude, perceived usefulness, and perceived ease of use" (Davis *et al.*, 2019). In the case of this paper, a modified technology acceptance model was adopted based on Jimoh (2019)'s expanded framework. His research included the original TAM construct (attitude, perceived usefulness, and perceived ease of use) but expanded it by incorporating end-user preferences of ICT applications and endemic barriers to technology as a separate factor. Figure 1 below depict how the paper embrace the Technology Acceptance Model (TAM)

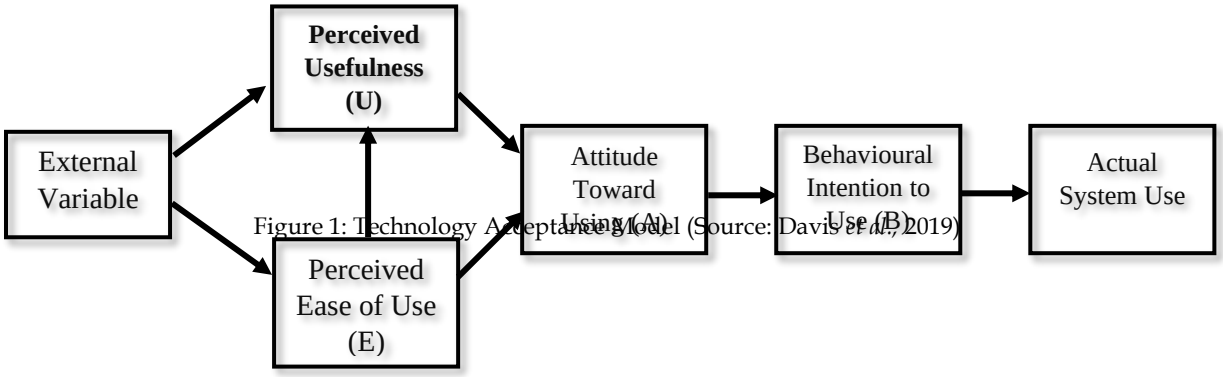

Figure 1: Technology Acceptance Model (Source: Davis *et al.*, 2019)

RESULTS

Out of the 150 questionnaires distributed, 140 were retrieved (representing a 93.3% response rate), and these were utilized in the study. In this paper, every participant lives in a facility with access to computers and mobile phones.

Demographic Parameters

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%).

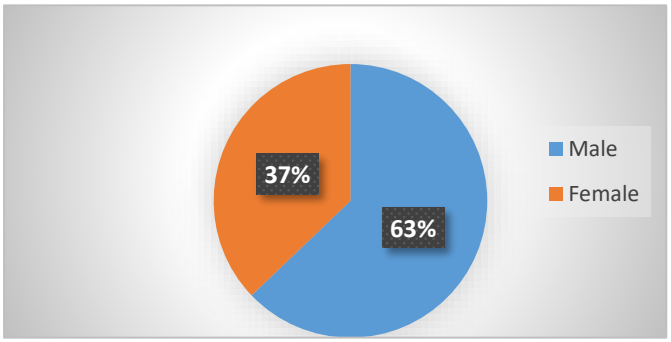

Figure 2: Gender of respondent

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%).

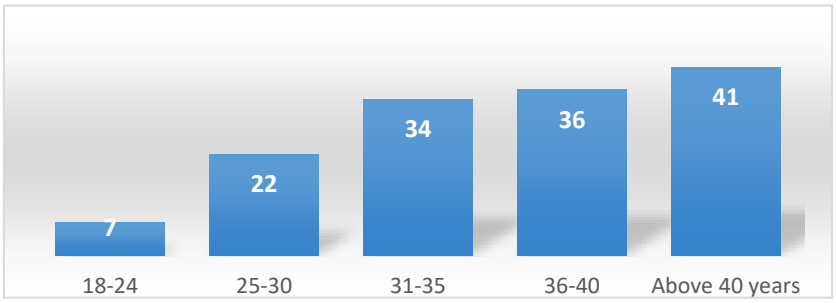

Figure 3: Age group of respondent

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 distribution of participants by educational level inside the hospital is shown in the table above. The results reveal that 47 (33.6%) participants had bachelor's degrees, followed by 36 (25.7%) participants with diplomas, and just 15 (10.7%) participants with other relevant educational levels.

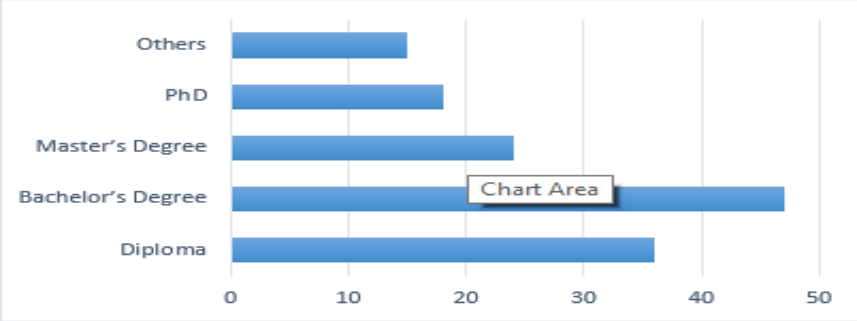

Table 4: Number/Percentage of participants by profession

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%).

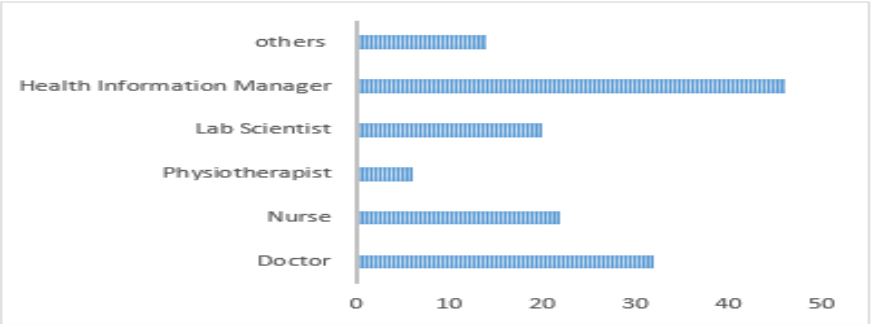

Figure 5: Job description of respondent

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.

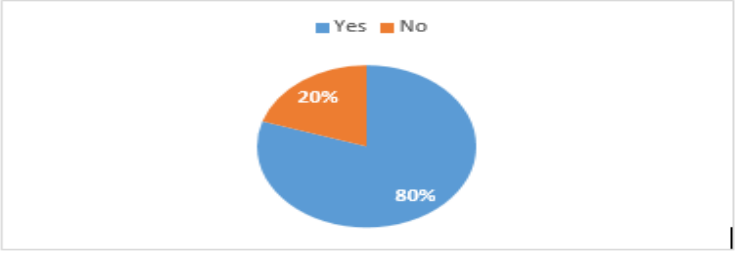

Figure 6: Prior Knowledge of Computers and Exposure

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

In accordance with the graph above, 32 participants (28.9%) learn through on-the-job training, 22 participants (15.7%), and 14 participants (10%) learn from family, friends, and co-workers, respectively. 65 participants (46.4%) learn how to use computers mostly through paid short courses.

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

The aforementioned table reveals that among the participants, computers are used by 46 (32.9%) for processing patient data, 38 (27.1%) for medical diagnosis, 42 (30%) for research, and 14 (10%) for social networking.

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 usefulness 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 co-workers, while 58.6% (82), 85% (119) of the participants strongly agreed that ICT enables health workers to frequently keep track of their patients. 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%) Strongly agreed, 34 (24.3%) agreed, and 10 (7.1%) said they found mobile devices to be simple to use, while just 0.7% (1) disagreed and strongly disagreed.

While 80% (112) of the health workers reported having prior computer expertise, more than 118 (84.3%) of the participants overall said they had never undergone any ICT training. This is due to the fact that the majority of participants acquired their ICT expertise through either a Short Course (paid) 65 (46.4%), in-house training at work 32 (28.9%), family, friends, and/or co-workers 22 (15. 7%), self-taught 14 (10%), or library instruction 7 (5%). However, due to their greater and lower levels of education, older and younger users in this research had different scores, with older users' being higher. The perceived usefulness and perceived ease of use of the younger participants are also greater despite their lower level of education.

DISCUSSION

The purpose of this study was to look into the possibilities for health personnel at Kano State's Abdullahi Wase Specialty Hospital to utilize information and communication technologies by gathering information on users' perceptions (Perceive usefulness and perceive ease of use) as well as their knowledge and attitudes toward adoption.

This study's three main findings are based on the analysis of the data that was gathered. First, the analysis's findings indicate that, at a significance level of 0.05, there is a correlation between the knowledge (the dependent variable) and the independent variables (perceived usefulness and perceived ease of use). This shows that prior computer exposure and knowledge significantly affects how health workers perception (perceive usefulness and perceive ease of use) of information and communication technologies as well as their general attitude toward their uptake and eventual use.

Although 80% (112) of health workers indicated having prior computer knowledge, more than 118 (84.3%) of the overall participants indicated they have not received any prior ICT training. This is as result of most participants acquiring ICT knowledge either through Short Course (paid) 65 (46.4%), in-house training at work 32 (28.9%), family, friends and/or colleagues 22 (15. 7%), self-taught 14 (10%) and Library Training 7 (5%). Compared to a survey of Nigerian medical students which shows despite ICT is not part of the medical education system in Nigeria, 50.6% of medical students in his study had knowledge about the use of computer technology even though none owned a computer (Park *et al.,* 2019).

Despite the lack of institutional training, the knowledge and attitude scores of health workers in this paper reflect progress, yet 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 some variables that render such effort insufficient (Lewis et al. 2020; Malakoane *et al.,* 2020). The findings of both this study and that of Park *et al.,* (2019) point to the importance of including computer instruction in the curricula for medical schools in Nigeria and other developing nations.

A similar study by Keržič *et al.,* (2019) revealed that, despite differences in participants' ICT knowledge and attitudes, younger participants who have had greater exposure to these technologies exhibit unexpected patterns for perceived usefulness and perceived ease of use of ICT. However, in this study, older users' scores were higher and younger users' scores were lower possibly due to higher and lower levels of education, respectively. Younger participants score higher on perceived usefulness and perceived ease of use despite having less education. It is realistic to infer 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 health professionals have more exposure to ICT due to increased accessibility of ICTs like GSM, mobile devices, and mobile data connections (2G and 3G) in Nigeria, whereas older health professionals may have a more conservative view or more reserved expectation regarding the issues surrounding the adoption of ICT into regular operational workflow as reported by Nigerian Times (2011). Furthermore, older health workers 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. A simpler explanation for this result is that health workers have recognized the significance of ICT applications within the health institutions thus the higher scores in perceive usefulness. The least requested application is an information technology system which allows video-call consultation with general hospital. This might be as a result of the sceptical opinions of health workers that roots from the known existence of poor ICT infrastructure in the country. This confirms the claim made by Wicki and Hansen (2019), according to which technology is a dead box unless it generates value and processes data. For instance, unless the recipient also has such a system in place, an information system that permits video-call consultation with a general hospital is of no use in changing information. This is particularly true in developing nations, where only the elite and corporate organizations have widespread access to ICT components (Lehmbruch 2019). Yet, by bringing ICT elements like computers and the internet to scattered people, value is added to the knowledge, encouraging adoption from one person to the next.

CONCLUSION

This study serves as an example of how the quantitative research approach can yield perceptive insights by examining how knowledge (prior computer exposure and experience), perceived usefulness, and perceived ease of information and communication technologies influence health workers in a Nigerian health institution toward adopting technology. This study discovered evidence that highlights the importance of three arguments. First, managements, governments, and NGO's should organize advanced staff training or ongoing knowledge growth in ICT efforts. Consequently, the rate of adoption, usage, and maintenance of such systems will rise while the rate of system abandonment will decline. Second, medical institutions in Nigeria and other developing nations should include computer knowledge in their curricula and lastly, the importance of implementing ICT among dispersed users is to enhance information and speed up acceptance.

Therefore it is recommended that additional research into the variables influencing information transmission in projects by governmental and non-governmental organizations among early adopters of new technology is advised

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