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Contexts of utilization of ICT by medical practitioners in private hospitals in Osun State Nigeria

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Abstract

Purpose – This study aims to address the question of how the unified theory of acceptance and utilization of technology (UTAUT) model explains the use of ICT by medical practitioners in private hospitals in Osun State, Nigeria.

Design/methodology/approach – Data were collected from a systematic random sample of 211 medical practitioners in 135 hospitals using a questionnaire.

Findings – The respondents were more comfortable with mobile phones than they were with any other technologies. The significance of the relationship between age of respondents and use of ICT reduced with increasing age of respondents higher than 39. Availability of ICTs and the social worlds of the medical practitioners, together with ICT implementation contexts, positively and significantly explained the use of ICT in the hospitals.

Research limitations/implications – An expanded study focusing specifically on how social influence promotes ICT use by medical practitioners in private hospitals in the state will be a necessity.

Practical implications – The medical practitioners seemed to have overcome the challenges of individual and technological factors in using ICT in the hospitals, but not so for implementation context, which explained ICT use, supporting the need for improved community-hospital relationship.

Originality/value – Information technology use models have been used extensively in various studies in Nigeria, but none have deployed the recent version of the technology acceptance model in the hospital sector.

Keywords Information, Innovation adoption, Hospitals, Health, Nigeria

Paper type Research paper

Introduction

Hospitals are information intensive organizations, and information and communication technologies (ICTs) play very crucial roles in hospital informational activities. ICT make work a lot much easier, quicker and more efficient and could reduce administrative and other costs in the hospitals. ICT could be used in the hospitals for purposes that encompass patients' medical records management, diagnosis, staff records management, staff payrolls information, drug prescription, invoice generation and account management, among others. Properly deployed, ICT have the potential to improve the quality of healthcare systems and improve the efficiency of health workers as well as increasing access to health services (Idowu and Ogunbodede, 2003).

Generally, ICT could help healthcare providers reach a series of desired outcomes such as: health workers making better treatment decisions, hospitals providing higher quality and safer care, people making informed choices about their own health, and

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governments becoming more responsive to health needs. National and local information systems that support the development of effective, efficient and equitable health systems could be built around ICT capabilities, with the advantage that policymakers and the public become a team in the pursuit of the health of the people. Dzenowagis (2005) has shown empirically the roles ICT play in ensuring that people have better access to the information needed about their health, and ICT's capability to lead to increasing reach and support to caregivers in rural and marginalized areas. Dzenowagis also observed that ICT is good for conducting basic training of healthcare workers, thus increasing their ability to monitor and access information.

Like in many other work environments, ICT in the hospital is a complex affair. Medical practitioners are generally known to be savvy with technology; an observation that could translate to an expectation of high ICT competence in the hospitals. ICT in the hospital could be viewed from a general perspective, that is, including all the conventional information technologies such as computers, mobile technologies, internet and others. Besides these, specific hospital technologies such as thermometers are increasing automated or are computer or other ICT enabled to the extent that they could be considered ICTs within the context of hospital.

Adequate deployment of ICT in the hospitals will be defined by many factors. Schaper and Pervan (2004) have suggested that the use of ICT by medical practitioners can be studied in three contexts: individual, technological and implementation. The individual context model encompasses issues about computer confidence, computer self-efficacy and computer attitude. They also include the degree to which health workers believe that using ICT will help them improve their performance. The technological context refers to the perception of a potential user of a technology about the role and necessity of the technology. The specific professional environment of the user includes the determinants of social influence, organizational facilitating conditions and compatibility.

Like elsewhere, hospitals in Osun State, Nigeria, are expected to be using ICT to meet the demand for efficient healthcare delivery, but studies focusing on how the private hospitals are implementing the technologies do not exist. Rather there exist studies on how medical practitioners in some teaching hospitals are using ICT (Idowu and Ogunbodede, 2003; Nwagwu and Oshiname, 2009). The level of awareness about the role of ICT in private hospitals and the consciousness of the hospital managers about the role of ICT may be very important variables in their use of the technology in the hospital activities. This study identified the general and specific hospital-based ICT available and used in private hospitals in Osun State, examined the various contexts – individual, technological and organizational – of medical practitioners' use of ICT in the private hospitals in the State. These objectives will be supported by testing the following hypotheses:

(1) *H1*: There is no significant relationship between the availability of ICT and the use of ICT in private hospitals.

(2) *H2*: There is no significant relationship between the demographic variables and use of ICT in the hospitals.

(3) *H3*: There is no significant relationship between the UTAUT variables and use of ICT in the hospitals.

(4) *H4*: There is no significant relationship between the UTAUT contexts of ICT use and use of ICT in the hospitals.

There are several reasons to study how medical professionals in private hospitals in Osun State, Nigeria are utilizing ICT. Private hospitals are mainly owned by individuals. A cursory observation shows that private hospitals in Nigeria mostly operate on lower scale, with fewer staff and smaller space, and provide mainly primary healthcare services in comparison with government or corporate hospitals. Deployment of information technologies in this sector might not be as elaborate as it is in the general or teaching and other hospitals. Generally, the technology environment in Nigeria can be considered low. There is need to develop empirical information about technology usage within the private hospitals, examining issues that could guide information system implementation.

Literature review and theoretical framework

Use of ICT in hospitals

Technology has always been the backbone of improving medical services to prevent, diagnose and treat illness and disease. The use of appropriate technologies can increase the quality and the reach of health services. Several empirical studies exist that show how ICT are employed in the hospitals in Norway (Arving, 2007), India (Sahay, 2007), Finland (Ranta, 2005), among others. Some evidence has also been identified in Africa. For instance, Ahmed (2007) showed that most hospitals in Uganda have few ICT and that these few are scarcely used for both operational and managerial purposes. In a similar study carried out by Archangel (2007), it was discovered that the problems encountered by the implementation of ICT in hospitals in Tanzania is financial, and partly political; he identified poor capacity building for health workers and an overall non-interest in computer usage. In a study in Ethiopia, Sahay (2007) found that low capacity in ICT was a discouragement of the adoption and deployment of e-health in the country.

Idowu and Ogunbodede (2003) carried out a study on the use of ICT in Nigerian university teaching hospitals, and they concluded that teaching hospitals in Nigeria are lacking adequate connectivity to the internet and that this severely impairs the quality of healthcare services they provide. Six years later, Akadiri *et al.* (2009) carried out a comparative study of selected teaching hospitals and observed that the fast growth of telecommunication industry in Nigeria has had to tangible impact on intra-hospital communication. In a similar study, Asangansi *et al.* (2008) discovered that acquisition of ICTs for the use of employees in the health sector has a positive influence on the acquisition of ICT-related skills by these employees; they therefore recommended that the incorporation of ICT training into the curriculum of medical schools is a necessity and that health authorities should support the acquisition of personal computers for employees. Olatokun and Adeboyejo's research on the use of ICT by reproductive health workers revealed that reproductive health workers mainly use ICT in their jobs to exchange of information with colleagues. Idowu *et al.* (2008) discussed the firmament of health informatics in Nigeria, and concluded that the level of ICT availability and usage was immature.

According to Kimaro (2006), locally based health information systems have limited results and are also locally unsustainable. The health information systems are plagued by poor data quality, lack of appropriate local capacity and absence of formal roles and responsibilities. The lack of effective and locally sustainable health information system was generally viewed as a major obstacle for efficient management of the health services and the health sector in Africa generally. Kimaro further observed that the sustainability of ICT was a major problem in the implementation of ICT in health.

Theoretical framework. The theoretical model adopted for this study is the modified Unified Theory of Acceptance and Utilization of Technology (UTAUT) theory by Venkatesh *et al.* (2003). This theory was formulated based on the conceptual and empirical consolidation of the constructs of eight prominent competing technology acceptance models (TAMs) that have been employed to explain information technology usage behaviour. They are: Davis' TAM, Roger's innovation diffusion theory (IDT), the theory of reasoned action (TRA), the motivation model (MM), the theory of planned behaviour (TPB), the Combined TAM and TPB, the model of PC utilization (MPCU) and, the social cognitive theory. The general aim of UTAUT is to explain user intentions to use an innovation and subsequent usage behaviour. UTAUT model has generally been visualized to consist of individual, technological and organizational contextual factors. These three contexts employ eight key constructs namely performance expectancy, effort expectancy (EE), social influence, computer efficacy, facilitating conditions, confidence and compatibility which are direct determinants of usage intention and behaviour. Let us examine these contexts one by one.

Individual context. This refers to all factors that emanate from an individual's technology and related strengths and weaknesses. A crucial element here is computer self-efficacy which refers to the capability to perform a specific task using the computer (Hayashi *et al.*, 2004). Another component is confidence or the level/degree to which a person trusts the ability of the information system, technology, technique or device to enable him or her achieve a tasks. Sam *et al.* (2005) revealed that computer users with little confidence in their ability to use computers might perform poorly on computer-based tasks. Also, previous computer experience may lead computer users to believe that computer applications and usage are easy. However, high level of self-efficacy may cause computer users to expend little effort towards learning new ways of doing things manually. A person that is self-efficacious in computing might be unwilling to engage in tasks without computers. Related to self-efficacy is computer attitude which is the degree to which an individual believes he or she should use a particular system.

Technological context. The first construct here is PE. El-Gafar and Moran (2010) defined PE as the degree to which users of an information system believe that using the system will help them improve their performance. Holden and Karsh (2010) described it as the perceived usefulness of the technology or innovation. The basic metrics used in measuring the PE is whether the technology is useful to the job, quicker task completion; easier work, increased quality of care or quality of work, improved efficiency, more accurate or more objective accomplishment of tasks and support of critical tasks. Others are greater control over work, better evidence-based decisions and improved patient care (Holden and Karsh, 2010). Another construct is EE which refers to the degree of ease associated with the use of the technology. EE captures the notions of perceived ease of use and complexity of technology. The metrics used in understanding EE are ease of use, clarity and understandability, ease of becoming skillful with system and ease of getting the system to do what is expected. Other metrics include ease of learning to operate the system, flexibility to use/interact with, low mental effort and ease of tasks performance are the major variables in EE.

Implementation context. There is implication in the study of Venkatesh *et al.* (2003) that implementation could be used to describe those internal and external factors that encourage or discourage implementation of technologies. The first issue in implementation context is social influence, which describes the degree to which an individual is influenced by the opinions and beliefs of other people. How does one

accept and incorporate other people's opinions and observations about the use of ICT into one's personal task? Normally, technology users are expected to show some sensitivity to the opinions of others so that their decisions would be consistent with the social norms. Some of the metrics used to measure social influence include the effect of opinions of colleagues who are important in one's tasks. Beside social influence is organizational facilitating condition, which is the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. Another element is compatibility. Although not a conventional construct of the UTAUT model, compatibility has been found a relevant variable in the healthcare context (Scharper and Pervan, 2004). It is the degree to which an innovation is perceived as being consistent with the existing practices, values, needs and code of conduct. Compatibility involves consideration of the work practices, values, needs and experiences of the user becoming a crucial determinant in acceptance decision making.

Some empirical studies on UTAUT. There already exist ample experiments using UTAUT model. Wang *et al.* (2006) validated the applicability of the UTAUT model to different contexts of IT, and the results indicated that PE, EE, social influence and facilitating conditions were all significant determinants of intention to use kiosk systems. Furthermore, Kuo and Yen (2009) carried out a study using the model to measure the influence of the user's experience towards each potential determinant of intention to use 3G mobile telecommunication services in Taiwan. They found that PE, EE and social influence were influencers of use behaviour. In the health sector, while examining healthcare professionals' acceptance of electronic medical records (EMRs) using UTAUT, Wills *et al.* (2008) discovered that social influence may play a greater role in EMRs adoption, particularly among women, than performance and EE. Lidia (2008) also validated the UTAUT across countries of different cultural backgrounds and found that the model is useful in measuring the use of ICT in any part of the world. A study by Onyebuchi (2009) on the predictive power of UTAUT constructs relative to its relationship with a certain cultural framework found that the relationship between the constructs and intention to use social media were mediated by cultural indexes.

Demographic characteristics. In addition to the constructs identified, several studies have shown that gender, age and experience significantly influence technology use. For instance, younger medical doctors would be expected to be more ICT savvy than older ones.

Research model. Simply stated, at varying degrees, individual contexts, technological contexts and implementation contexts influence the use of ICT by medical practitioners in the hospital. The individual elements of the contexts also have likelihood to influence medical practitioners use of ICT. In this study, use of ICT is described by use of computers, internet and mobile phones by medical practitioners such as doctors, technologists, nurses or pharmacists to perform any activity, whether medical or otherwise, in the hospital setting. Defining use of ICT loose this way was necessitated by the speculation that use of ICT in the private hospitals in Nigeria generally might be at their earliest stages probably serving mainly administrative purposes; specific delivery of medical services using ICT might not obtain at any significant scale.

Methodology

Location, research design, population and sampling

Osun State is one of the 36 states of the Federal Republic of Nigeria, located in the southwestern part. The State has a population of 2.2 million across 200 major

communities/towns (www.osunstate.gov.ng/geography.htm). Although there are no indications that the state has specifically embraced e-health, tele-medicine or m-health, the electronic government project of the state encompasses health components (Badejoko, 2010) (Figure 1).

The population in this study consists of all the medical practitioners working in private hospitals in the State, and they include: doctors, pharmacists, nurses and laboratory technologists. According to Osun State Ministry of Health, the total number of private hospitals in the State as at February 2011 was 524. Five major towns: Iwo, Ilesa, Ife, Oshogbo, Ede which covered ten local governments out of the 31 local government areas in the state were chosen for the study. According to Osun State Ministry of Health, these five towns have 271 private hospitals, out of which 50 per cent was decided. To ensure randomness, systematic sampling was employed to choose every second hospital after arranging the list of hospitals from each town in alphabetical order. In each of the 135 hospitals, one each of doctors, nurses and laboratory technicians was selected for data collection. The total number of respondents therefore was expected to be 405. However, a pre-field survey revealed that 33 of the registered hospitals did not have registered nurse(s) and 23 were no more functioning. Also, very few hospitals have laboratories. These circumstances reduced the number of respondents to 298.

Data collection instrument and methods

Data were collected from the respondents using two major instruments: a questionnaire and a checklist. Providing the definition of general hospital ICT to

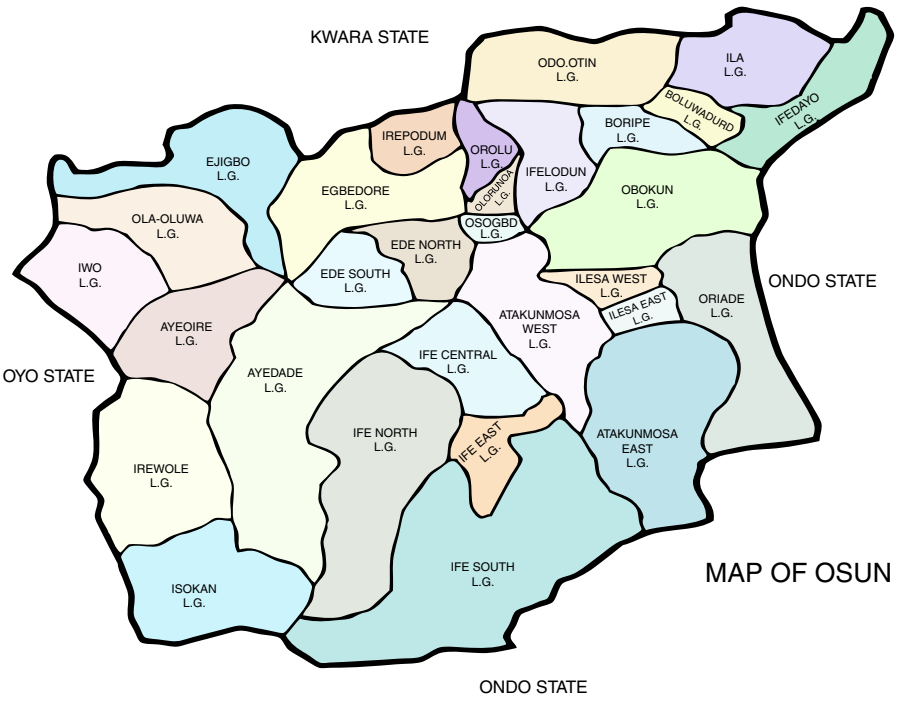

Figure 1.
The map of Osun state

Source: www.osunstate.gov.ng/geography.htm (2011)

mean any of the conventional but computer aided technologies that could be used in the hospitals, a checklist was given to each of the hospitals requesting for a list of specific medical ICT equipments they have. In addition to this, a self-administered questionnaire, considered very suitable due to the high level of literacy of the respondents, and the busy nature of their schedule, was used to collect data from the respondents.

A total of 298 copies of the questionnaire were distributed to the medical practitioners in the selected hospitals. Two hundred and sixteen copies were completed and returned; five were unusable because of illegible responses. Hence, data collected from a total of 211 copies were analysed, an encouraging response rate of 71 per cent. To test the hypotheses, it was deliberate to investigate the influence of demographic variables on use of ICT in the hospitals; the effects of the various UTAUT elements were also investigated and finally the influence of the contexts was investigated.

Results

Demographic characteristics of the respondents

Table I presents the demographic characteristics of the respondents. Females accounted for 58.3 per cent of the respondents, while 41.7 per cent were males. The mean age of the respondents was 35.08 years with the largest proportion of respondents falling within the age group <30. The mean age of the males is 39.64 years while that of the females is 26.97 years.

Respondents' mean working experience in years is 8.74. A large proportion of the respondents (61.8 per cent) have been working for between one and ten years, 11.8 per cent did not respond to this question. Most of the respondents were Christians (61.1 per cent), and the rest were Muslims (38.9 per cent). Also, most of the respondents reported being married (47.4 per cent) while 49.8 per cent single; 1.9 per cent divorced while 0.5 per cent were separated and widowed, respectively.

Variable	Measures	Frequency	%
Age	Less than 30	97	49.0
	30-39	61	28.9
	40-49	29	13.7
	50-59	17	8.1
	Above 60 years	7	3.3
Gender	Male	88	41.7
	Female	123	58.3
Working experience	No response	25	11.8
	1-10	129	61.1
	11-20	24	11.4
	21-30	23	10.9
	31-40	10	4.7
Religion	Islam	82	38.9
	Christianity	129	61.1
Marital Status	Single	105	49.8
	Married	100	47.4
	Divorced	4	1.9
	Separated	1	0.5
	Widow	1	0.5

Table I. Demographic characteristic of the respondents

Aspects of ICT ownership and use

Data were elicited from the respondents about computer use, and the result is shown in Table II. Majority of the respondents (60.2 per cent) reported that they have computers. More than half of the respondents reported in the affirmative that computers (54.0 per cent), mobile phones (58.3 per cent) and internet (58.3 per cent) supported them to manage patients in the hospital. To elicit data about frequency of use of ICT, the respondents were asked how often they used the computer. The response showed that 46.9 per cent reported using computers daily, 16.1 per cent used it weekly and 6.6 per cent monthly, while 30.3 per cent did not respond. To reflect everyday life use concept, the respondents were asked when they used the technologies last; 36.0 per cent reported that they have used computer a day before the survey, 20.9 per cent used computer the previous day and 31.3 per cent did not respond to the question.

ICT use in the hospitals

Having developed some knowledge of ICT ownership and use characteristics by the respondents, the survey went further to inquire about computer use in the hospitals. Table III shows that 37.9 per cent reported using the internet in the hospital daily; 19.9 per cent reported weekly use. On digital camera use in the hospital, 44.5 per cent reported using the technology. High proportions of respondents reported that they did not use computer for registration (66.8 per cent), demographics (68.2 per cent) and laboratory works (66.8 per cent). A very high percentage (73.0 per cent) reported not to using any ICT for their accounting tasks.

Conventional and specific ICTs available in the hospitals. Conventional ICTs such as computers, internet and mobile phones were merely listed and the respondents were asked to select the ones that were available in the hospitals. For the specific hospitals ICT, the medical officer in charge in each hospital was given a checklist with which he or she supplied the list of such ICT.

Table II.
Perceived usefulness of the computer by the respondents

Variable	Measures	Frequency	%
Do you have computer?	Yes	127	60.2
	No	84	39.8
Does your computer support you?	No response	3	1.4
	Yes	114	54.0
	No	94	44.5
Does your mobile phone support you?	No response	7	3.3
	Yes	123	58.3
	No	81	38.4
Does your internet support you?	No response	20	9.5
	Yes	95	45
	No	96	45.5
How often do you use computer?	No response	64	30.3
	Daily	99	46.9
	Weekly	34	16.1
	Monthly	14	6.6
When last did you use computer?	No response	66	31.3
	Today	76	36.0
	Yesterday	44	20.9
	Last week	15	7.1
	Last month	10	4.7

Variable	Measure	Frequency	%
How often do you use internet?	No response	80	37.9
	Daily	79	37.4
	Weekly	42	19.9
	Monthly	10	4.7
Do you use digital camera?	No response	7	3.3
	Yes	94	44.5
	No	110	52.1
Do you use computer for registration?	No response	10	4.7
	Yes	60	28.4
	No	141	66.8
Do you use computer for demographics?	No response	10	4.7
	Yes	57	27.0
	No	144	68.2
Do you use computer in laboratory?	No response	8	3.8
	Yes	62	29.4
	No	141	66.8
Do you use ICT in your account department?	No response	21	10
	Yes	36	17.1
	No	154	73

Table III.
ICT use by the respondents

General ICTs in the hospitals

Table IV presents the general ICTs available in the hospitals. Only very few respondents reported having computers (37.9 per cent), mobile phones (33.6 per cent), internet (12.8 per cent), intercom (10.4 per cent), televisions (30.8 per cent), DSTV (21.8 per cent), scanners (4.3 per cent), printers (6.6 per cent), radio (14.7 per cent), DVD (10 per cent), digital camera (3.8 per cent), projectors (0.9 per cent) were available in the hospitals.

Availability of specific hospital ICT

Table V presents the specific hospital ICT available in the hospitals. Few of the respondents reported that digital thermometer (15.6 per cent), digital glucometer (6.6 per cent) and ultra sound machine (22.7 per cent) were available. Other available technologies included ECG (2.8 per cent), digital Sphygmomanometer (8.5 per cent),

	Yes		No	
ICT	Frequency	%	Frequency	%
Computer	80	37.9	131	62.1
Mobile phone	71	33.6	140	66.4
Television	65	30.8	146	69.2
DSTV	46	21.8	165	78.2
Radio	31	14.7	180	85.3
Internet	27	12.8	184	87.2
Intercom	22	10.4	189	89.6
DVD	21	10.0	190	90.0
Printer	14	6.6	197	93.4
Scanner	9	4.3	202	95.7
Digital camera	8	3.8	203	96.2
Projector	2	0.9	209	99.1

Table IV.
General ICTs in the hospitals

	Yes		No	
	Frequency	%	Frequency	%
Ultra scan machine	48	22.7	163	77.3
Digital thermometer	33	15.6	178	84.4
Digital sphygmomanometer	18	8.5	193	91.5
Digital glucometer	14	6.6	197	93.4
X-ray machine	9	4.3	202	95.7
ECG	6	2.8	205	97.2
Cardiocartograph	5	2.4	206	97.6
Shucking machine	4	1.9	207	98.1
Compound microscope	2	0.9	209	99.1
Senocade	1	0.5	210	99.5
Genotype machine	1	0.5	210	99.5
Autoclave machine	1	0.5	210	99.5
Breast watch	1	0.5	201	99.5

Table V.
Specific hospital ICT

senocade (0.5 per cent), shucking machine (1.9 per cent), genotype machine (0.5 per cent), autoclave machine (0.5 per cent), x-ray machine (4.3 per cent), breast watch (0.5 per cent), cardiograph (2.4 per cent) and compound microscope (0.9 per cent).

ICT use contexts. After examining the demographic characteristics of the respondents and aspects of ICT ownership and use in the hospitals, the survey went ahead to examine the specific ICT use contexts namely: individual context, technological context and implementation context.

Individual context

This variable captured confidence on ICT, self-efficacy and computer attitude among the respondents in Table VI. For confidence, most respondents reported that they were comfortable with the use of computer (63.5 per cent), internet (54.5 per cent) and mobile phones (78.2 per cent). For self-efficacy, most respondents agreed that they could complete a job with a computers (56.4 per cent), internet (52.1 per cent) and mobile phones (73.5 per cent) with no one around to tell them what to do.

More than half also agreed that they could complete their hospital jobs with a helper around with either computers (51.7 per cent) or mobile phone (62.1 per cent). On computer attitude, most respondents reported that it was a good idea to use computers (84.8 per cent), internet (81.0 per cent) and mobile phone (81.0 per cent) in the hospital. Also, most respondents agreed that using computer (67.8 per cent), internet (63.5 per cent) and mobile phone (74.9 per cent) was interesting in the hospital.

Technological context

This group of variables consisted of PE and EE, and the result is presented in Table VII. For PE, most of the respondents agreed that computers (67.8 per cent), internet (60.7 per cent) and mobile phones (77.3 per cent) were useful in the hospital. Also, majority of the respondents agreed that computers (61.6 per cent), internet (60.2 per cent) and mobile phones (77.3 per cent) enabled them to accomplish tasks more quickly. For EE, most respondents reported that it was easy for them to become skillful at using computer (63.0 per cent), internet (58.8 per cent) and mobile phone (78.7 per cent) mobile phone, and that it was easy to use computer (66.4 per cent) and the internet (63.0 per cent).

Variable	No response	Disagree	Agree	Do not know
Confidence in ICT				
Are you comfortable with mobile phone?	0.9	7.1	78.2	13.7
Are you comfortable with computer?	4.3	11.8	63.5	20.4
Are you comfortable with internet?	5.2	16.1	54.5	24.2
Computer self-efficacy: job completion with				
Mobile phone no assistance	1.4	12.8	73.5	12.3
Job completion with mobile phone with helper	4.7	15.6	62.1	17.5
Computer with no assistance	3.3	16.6	56.4	23.7
Internet no assistance	3.3	18.5	52.1	26.1
Job completion with computer with helper	3.3	21.3	51.7	23.7
Job completion with internet with helper	4.7	24.6	46.4	24.2
Computer attitude				
Using computer is a good idea	1.9	4.3	84.8	9.0
Using internet is a good idea	2.4	7.6	81.0	9.0
Using mobile phone is a good idea	1.4	8.5	81.0	9.0
Using mobile phone is interesting	2.4	10.0	74.9	12.8
Using computer is interesting	3.3	10.0	67.8	19.0
Using internet is interesting	3.3	13.7	63.5	19.4

Table VI.
Individual context

Variable	N.R	Disagree	Agree	Do not know
Performance expectancy of ICT				
Computer is useful	1.4	6.6	67.8	24.2
Internet is useful	2.8	12.3	60.7	24.2
Mobile phone is useful	2.4	8.1	77.3	12.3
Task is fast with computer	4.7	9.5	61.6	24.2
Task is fast with internet	3.8	9.0	60.2	27.0
Task is fast with mobile phone	2.4	6.6	77.3	13.7
Effort expectancy on ICT				
It is easy to be skillful with computer	2.8	10.9	63.0	23.2
It is easy to be skillful with internet	3.8	13.3	58.8	24.2
It is easy to be skillful with mobile phone	3.3	7.6	78.7	10.4
It is easy to use computer	3.3	11.4	66.4	19.0
It is easy to use internet	4.3	13.7	63.0	19.0

Table VII.
Technological context

Implementation context

Implementation context, consisting of social influence, compatibility, organizational facilitating condition are presented in Table VIII. For social influence, most of the respondents agreed that people who influenced their behaviour thought that they should be using computer (60.7 per cent) and internet (50.8 per cent) in the hospital. Also, 56.4 and 50.7 per cent, respectively, agreed that their superior officers were helpful in the use of internet and computers. For compatibility, majority reported that using computer (74.9 per cent) and mobile phone (70.6 per cent) fitted the ways they like to work; also, using computers (73.5 per cent), internet (69.7 per cent) and mobile phones (76.8 per cent) reportedly fitted their work style.

On whether the organizations had facilitating conditions suitable for ICT implementation, 61.6 per cent agreed that they had the resources required to use

Variable	No response	Disagree	Agree	Do not know
Social influence				
People who influence me advise me to use computer	2.4	16.1	60.7	20.9
People who influence me advise me to use internet	3.8	17.1	57.8	21.3
My superior officers are helpful in computer use	4.3	19.4	56.4	19.9
My superior officers are helpful in internet use	3.8	22.7	50.7	22.7
Compatibility				
Computer fits ways I like to work	3.3	6.2	74.9	15.6
Internet fits ways I like to work	3.3	6.6	70.6	19.4
Mobile phone fits ways I like to work				
Computer fits my work style	4.7	6.2	73.5	15.6
Internet fits my work style	5.2	7.1	69.7	18.0
Mobile phone fits my work style	2.8	8.5	76.8	11.8
Organizational facilitating conditions				
I have required resources for ICT use	4.3	11.8	61.6	22.3
I have required knowledge for ICT use	4.3	10.9	59.7	20.4
I get assistance with ICT difficulties	5.2	18.5	49.3	27.0

Table VIII.
Implementation context

ICT while 59.7 per cent agreed that they had the requisite ICT knowledge. Only 18.5 per cent reported that there they sought assistance when they have ICT difficulty.

Test of the hypothesis. Linear regression analysis was thereafter used to examine the functional relationship between the use of ICT and availability of ICT, the contexts and the demographic variables, respectively. The independent variables were diagnosed for adequacy by running a bivariate correlation analysis, a process which also helped reduce the number of variables in the analysis. A high relationship ($r = 0.6$) meant that the variables were measuring the same constructs and the variables were added together to form a new construct. Since the demographic variables were specified as moderating variables for all the contexts, they were used in all the analysis involving each of the contexts. Which ones did you remove?

H1. There is no significant relationship between the availability of ICT and their use in the hospitals in Osun State.

A regression of availability of ICT and their use in the hospitals yielded $B = 0.557$ and $p = 0.032$, indicating that availability of the technologies positively explain their use:

H2. There is no significant relationship between the demographic variables and use of ICT in the hospitals.

Demographic variables have consistently explained technology use, and the hospital environment may not present a different result. Table IX shows the relationship between demographic variables and various use levels of ICT.

Respondents aged less than 39 significantly explained use ($p < 0.05$) while age 40-49 did not:

H3. There is no significant relationship between ICT use and the various UTAUT variables.

Several studies have shown how various elements of the UTAUT model predicted use of ICT. Table X shows the result in this present study with the indication that social influence ($B = -0.250$, $p = 0.025$) and availability of the technologies ($B = 0.570$, $p = 0.031$) predicted use of ICT in the hospitals.

The other constructs, confidence, computer self-efficacy, computer attitude, PE, EE, compatibility and facilitating condition did not provide any explanation for the use of ICT in the hospitals:

H4. There is no significant relationship between the contexts of ICT use and use of ICT in the hospitals.

This hypothesis is tested against the backdrop of several findings that show how much the various contexts influence utilization of ICT. Table XI shows the regression result between use of ICTs and the contexts.

With a negative slope, $B = -0.499$, implementation context is the only UTAUT variable that significantly explained use of ICT in the hospitals ($p = 0.046$).

Table IX. Regression analysis of demographic variables and use of ICT

Demographic variables	Unstandardized coefficients (B)	*t*	Significance
Age (ref category = above 60 years)			
Less than 30 years	1.170		0.001
30-39 years	−0.331		0.046
40-49 years	0.803		0.052
50-59 years	0.442		0.696
Gender (ref category = male)			
Female	2.223		0.004
Marital status (ref category = widowed)			
Single	2.013		0.005

Table X. Regression analysis between ICT use and the variables

UTAUT variables	Unstandardized coefficients (*B*)	*t*	Significance
Confidence on ICT	−0.039	−0.245	0.807
Computer self efficacy	0.183	1.298	0.196
Computer attitude	0.244	0.875	0.383
Performance expectancy	−0.303	−1.240	0.216
Effort expectancy	−0.263	−1.432	0.154
Social influence	−0.250	−2.264	0.025
Compatibility	−0.068	−0.341	0.733
Facilitating condition	0.163	1.382	0.169
Availability	0.570	2.177	0.031

Table XI. Regression analysis of use of ICT vs utilization contexts

UTAUT contexts	Unstandardized coefficients (*B*)	*t*	Significance
Individual context	0.098	0.458	0.647
Technological context	−0.194	−0.879	0.381
Implementation context	−0.499	−2.008	0.046

Discussion of findings

The whole essence of this study could be summarized in one question: How does the UTAUT model of technology use explain use of ICT by medical practitioners in private hospitals in Osun State, Nigeria? This question was addressed by analysing data collected using a questionnaire from a systematic sample of 211 medical practitioners in 135 hospitals in the State. The demographic constitution of medical workforce in the hospitals could be explained by the inclusion of all medical practitioners in the study: nurses, technologies and medical doctors. What could be interpreted as a positive sign that ICT application in the hospitals will grow and diversify in the state is the observation that many of the hospitals reported that they have computers. This optimism arises from inferences from the convergence phenomenon which has centralized availability and use of the computer as good indicators of further ICT implementation.

This optimism is supported by the acknowledgement by the respondents that computers and mobile phones, but not as much of the internet, supported their activities in the hospitals. This pattern of response points to the likely activities ICT is used for. Computers serve well as administrative facilities, especially in word processing and related tasks. Mobile phones are presently an inevitable companion of medical practitioners (Nwagwu and Areo, in peer review). A study by Nwagwu and Areo (in peer review) has shown that medical practitioners at the University College Hospital, Ibadan, are currently relying on mobile technologies to connect with their clients and also provide some medical advisory services to their clients. Mobile phones also constituted the major tool used by hospitals in linking among themselves (Nwagwu and Ejeh, 2011). The internet could be regarded as a "higher technology" whose use for hospital activities would require network connectivity and some advanced skill as well as interoperable environment. Using the internet for health-related activities might in some cases require that clients of the hospitals, to a large extent have access to the same facility.

Interestingly, the support offered by computers and mobile phones were exploited on daily basis, and were even in fact reported to have been used by majority of the respondents on the day of the survey. This finding supports the enthusiasm that ICT are gearing up to play great roles in the hospitals, and might in fact assume greater visibility in this regard in a short time to come. As would probably be expected, the reported ownership, availability and use of the technologies did not translate to their use for hospital-based activities such as registration, records or accounts. The ICT therefore might be serving private or other purposes those considered basic in the hospital and listed in the study.

The respondents reported computer to be the most available general ICT in the hospitals, more than they did mobile phone and other technologies. Basically, not all the respondents would reckon with the mobile phone as a medical technology. Or still, the respondents might not reckon with their use of personal technologies such as mobile phones serving a health information technology purposes. Mobile technologies are the companion of 98 per cent of Nigerian students and would be expected to have a deeper penetration among highly literate population such as medical practitioners. Moreover, a study by Nwagwu and Ejeh (2011) showed that mobile technologies constituted the major technologies used by the medical doctors for referring their patients to other experts. Nwagwu and Areo have also shown that mobile technologies are being used by medical doctors at the University College Hospital in Ibadan Nigeria for various medical/health advisory purposes.

The low report of the presence of certain technologies such as television, DSTV, radio among others shows that the hospitals have not reckoned with the need engage patients and or their relations in waiting rooms or in the wards. Most studies have suggested that frustrations encountered in queues in the hospitals can be ameliorated if service providers engaged clients with facilities that can keep them occupied while waiting (Hurst and Siciliani, 2003). The hospitals in the Osun State were not really hitech inclined. The reporting of the availability of specific medical; information technologies is very low. Ultrasound machine and digital thermometer which were reportedly available by at least three of every ten hospital could probably be explained by a high-maternity clientele, a surmise that is supported by popular knowledge, as well as the centrality of temperature monitoring as a crucial step in diagnosis of most tropical diseases.

Although the respondents did not reckon with mobile phones as medical technologies, they reported being more comfortable with mobile phones which they also used without much assistance than they did the other technologies. The use to which the mobile could be put might be determined by the type and complexity of the mobile the respondents have, and this is a good moderator for this observation. If the respondents need the mobiles only for contacting and linking with people, complex phones which might require further learning would not be necessary. On the other hand, mobile phones with complex functionalities which could serve patient registration purpose, for instance, might require some learning to use. However, the high level of comfort with mobile technologies reported by the respondents support the current opinions that mobile technologies might be the best means of expanding access to health. What are required is a systematic retraining and awareness creation among doctors, particularly those in the private sector as well as design of software services that are local sensitive and mobile driven.

Very interestingly, the respondents have a much more positive attitude to computers and the internet as hospital technologies than they did mobile or other technologies. Reconciling this dilemma might require an examination of the computer literacy skill of the respondents in order to understand why they were not using computers for even some housekeeping functions the positive disposition notwithstanding. In a sense, the positive computer and internet attitude also suggests that a well directed and channelled intervention on use of ICT in the hospitals might yield positive result, and ultimately infuse ICT in the hospital system. Mobiles also were reported to fit into respondents work style more than the other technologies, but the organizational facilitating conditions for ICT generally were not highly positively reported. Acquiring ICT demands some cost; they also require some infrastructure such as electric power and manpower. This finding is supported by the low number of respondents who reported having required knowledge to use ICT or get assistance when they have difficulty using ICT, as well as the low levels of willingness of respondents to start using ICT soon.

A very interesting result in this study is the finding that, technically, the levels of significance of the relationship between use of ICT reduce with increasing age of the respondents. Younger respondents aged <30 are definitely somewhat fresh graduates and were trained when ICT has gained prominence in medical education. This finding fits into what could be assumed in the pattern of ICT use and awareness among all professions. Younger people are expected to be ICT savvier than older persons, although medical persons are generally believed to be technology savvy. For the result about persons who were single, it could be speculated that single persons might have

freer time than those who are married in respect of learning and using ICT. Moreover, most of the married respondents are likely to be older persons who also probably completed their medical education much longer time ago than the married ones.

Discussions based on the data presentation suggested, and is validated by the test of the hypotheses that social influence would be a factor that influences utilization of ICTs in the hospitals. In their validation tests, Venkatesh *et al.* (2003) found that social influence was not significant in voluntary contexts, but became important when use was mandated. Kuo and Yen (2009) study found that PE, EE and social influence were influencers of use behaviour. A study by Wills *et al.* (2008) on EMR established a result nearly similar to that in this study *vis-à-vis* that social influence played a greater role in EMR adoption among women than performance and EE. Schaper and Pervan's (2004) study was also in health context, but they established that PE is rather important to technology acceptance decision making. Social influence is a complex phenomenon, including issues that range from the opinions and choice of patrons and benefactors to use of technology for image making. The presence of ICT in the hospital could pass a message of technology currency and sophistication by the organization, and boost the trust and confidence of clients about the capability of their healthcare provider. Further studies are required to unravel exactly what the hospitals that have ICTs are actually doing with them.

Medical practitioners seemed to have overcome the challenges of individual and technological factors in using ICT in the hospitals, but not so for implementation context which explained ICT use. This result supports the earlier analysis which show that that social influence, which is an implementation context variable, explained use of ICT by the respondents. Implementation context include organizational and technical infrastructural issues required to support use of ICT. Personal and technological preparedness might not take care of lack of power, manpower, issues, sustainability and other related issues, but social influence could attract big customers and boost the image of the hospital thus leading to increased business volume and possible higher profit.

Conclusion and suggestion for further studies

What has emerged in this study is an understanding of the factors influencing utlization of ICT by medical practitioners in private hospitals in one of relatively high literate states in Nigeria, Osun State based purely on the UTAUT research model. Many of the hospitals have computers, an observation that coupled with the positive opinion about ICT implementation in the hospitals was interpreted to mean optimism about the future of ICT implementation in private hospitals in the State. But the computers are probably serving merely administrative and window dressing purposes; they are not being used for any of the basic routine hospital chores such as registration of patients or keeping of accounts. The report of respondents being very comfortable with mobile phones as medical technologies supports recent increasing awareness and projects on mobile health. Younger medical practitioners in private hospitals than older ones, the perceived picture of the hospital in the mind of the patrons and clients, and the capability of the hospitals to implement and sustain ICTs are major explanations to the use of ICTs in these hospitals by the medical practitioners.

This paper has defined ICT generally to mean computer, mobile phone and the internet. Although these technologies represent the commonest conventional information technologies, the study might yield a different result if the analysis were discriminated to reflect the technologies differently. Furthermore, the three major

medical practitioners namely technologists, doctors and nurses were joined together as medical practitioners. There would be need to examine these professional differently. Moreover, a cursory observation shows that many of the hospitals are poorly staffed with technologists and nurses. Very crucially, an expanded study focusing specifically on how social influence explains ICT use by medical practitioners in the private hospitals in the state will be a necessity.

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