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CONTEXTS OF UTILIZATION OF ICT BY MEDICAL PRACTITIONERS IN PRIVATE HOSPITALS IN NIGERIA

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Abstract: *Purpose* – This study addresses 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.

Limitations – 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: Utilization of ICT, Medical practitioners, Private hospitals in Nigeria

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INTRODUCTION

Hospitals are information intensive organizations, and information and communication technologies (ICT) play very crucial roles in hospital informational activities. ICT make work 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 payroll information, drug prescription, invoice generation and account management, among other areas. 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 *et al.*, 2003).

As elsewhere, hospitals in Osun State, Nigeria, are expected to use ICT to meet the demand for efficient healthcare delivery, but studies focusing on how 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, 2003; Nwagwu and Oshiname, 2009). The level of awareness of the role of ICT in private hospitals and the consciousness of hospital managers regarding the role of ICT may be very important variables in their use of the technology in hospital activities. This study identified the general and specific hospital-based ICT available and used in private hospitals in Osun State, and examined the various contexts—individual, technological and organizational—of medical practitioners' use of ICT in private hospitals in the state. These objectives will be supported by testing the following hypotheses:

1. There is no significant relationship between the availability of ICT and the use of ICT in private hospitals.
2. There is no significant relationship between the demographic variables and use of ICT in the hospitals.
3. There is no significant relationship between the UTAUT variables and use of ICT in the hospitals.
4. 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 a Nigerian community use information and communication technologies (ICT). Private hospitals are mainly owned by individuals,

and they mostly operate on a lower scale, with fewer staff and a 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 public hospitals.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Theoretical framework

The theoretical model adopted for this study is the modified Unified Theory of Acceptance and Utilization of Technology (UTAUT), by Venkatesh *et al.* (2003). This theory was based on the conceptual and empirical consolidation of the constructs of eight prominent competing technology acceptance models that have been employed to explain information technology usage behaviour. They comprise: Davis's Technology Acceptance Model (TAM), Roger's Innovation Diffusion Theory (IDT), the Theory of Reasoned Action (TRA), the Motivation Model (MM), the Theory of Planned Behavior (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 behavior. The UTAUT model has generally been visualized to consist of individual, technological and organizational contextual factors. These three contexts employ seven key constructs, namely performance expectancy, effort expectancy, 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 to achieve a task. Computer users with little confidence in their ability to use computers might perform poorly on computer-based tasks. In addition, previous computer experience may lead computer users to believe that computer applications and usage are easy. However, a 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. Computer attitude is related to self efficacy, which is the degree to which an individual believes he or she should use a particular system.

TECHNOLOGICAL CONTEXT

The first construct here is performance expectancy (PE). PE is defined 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 include: whether or not 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 include greater control over work, better evidence-based decisions and improved patient care (Holden and Karsh, 2010). Another construct is effort expectancy (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 skilful with the system, and ease of getting the system to do what is expected. Ease of learning to operate the system, flexibility of use/interaction, low mental effort, and ease of tasks performance are the major variables in effort expectancy.

IMPLEMENTATION CONTEXT

The study by Venkatesh *et al.* (2003) implies that implementation could be used to describe those internal and external factors that encourage or discourage implementation of technologies. The first issue in the 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 will 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 the organizational facilitating condition, which is the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system. Another element is compatibility. Although not a conventional construct of the UTAUT model, compatibility has been found to be a relevant variable in the healthcare context (Pervan and Scharper, 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. There already exist ample experiments using the UTAUT model, such as the studies of Lidia *et al.* (2008) and Onyebuchi (2009).

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 are also likely to influence medical practitioners' use of ICT.

METHODOLOGY

Location, research design, population and sampling

Osun State is one of the 36 states of the Federal Republic of Nigeria, located in the south-western region. 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).

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 technicians. According to Osun State Ministry of Health, the total number of private hospitals in the state as of February 2011 was 524. Five major towns: Iwo, Ilesa, Ife, Oshogbo and Ede, which covered ten local governments out of the thirty-one 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, from which fifty percent were decided upon. To

ensure randomness, systematic sampling was employed to include 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 were 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 longer functioning. In addition, 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 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 a list of specific medical ICT equipments in use on the premises. 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 analyzed, giving an encouraging response rate of 71 per cent. In order to test the hypotheses, the influence of demographic variables on the use of ICT in the hospitals was investigated; the effects of the various UTAUT elements were also investigated and finally, the influence of the contexts was explored.

RESULTS

Demographic characteristics of the respondents

Females accounted for 58.3% of the respondents, while 41.7% were males. The mean age of the respondents was 35.08 years with the largest proportion of respondents falling within the age group under 30. The mean age of the males was 39.64 years, while that of the females was 26.97 years. Respondents' mean working experience in years was 8.74. A large proportion of the respondents (61.8%) had been working for 1-10 years, and 11.8% did not respond to this question. Most of the respondents were Christians (61.1%), and the rest were Muslims (38.9%). The

respondents marital status was as follows: 47.4% were married, 49.8% were single, 1.9% were divorced and 0.5% were separated or widowed.

Aspects of ICT ownership and use

Data was elicited from the respondents about computer use and the majority (60.2%) reported that they have computers. More than half of the respondents reported in the affirmative that computers (54.0%), mobile phones (58.3%) and the internet (58.3%) supported them in managing 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% reported using computers daily, 16.1% used them weekly, and 6.6% monthly, while 30.3% did not respond. To reflect use in daily life, the respondents were asked when they used the technologies last: 36.0% reported computer use one day before the survey, 20.9% had used the computer the previous day, and 31.3% 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 next explored computer use in the hospitals. Less than half (37.9%) reported using the internet in the hospital daily, and 19.9% reported weekly use. On digital camera use in the hospital, 44.5% reported using the technology. A high proportion of respondents did not use a computer for registration (66.8%), demographics (68.2%), and laboratory work (66.8%). A very high percentage (73.0%) did not use any ICT for their accounting tasks.

ICT USE CONTEXTS

After examining demographics, aspects of ownership of ICT and use in the hospital, the survey went on 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. For confidence, most respondents reported that they were comfortable with the use of computers (63.5%), the internet (54.5%) and mobile phones (78.2%). For self efficacy, most

respondents agreed that they could complete a job with computers (56.4%), the internet (52.1%), and mobile phones (73.5%) with no one around to tell them what to do.

More than half also agreed that they could complete their hospital jobs, with the aid of a helper, with either computers (51.7%) or a mobile phone (62.1%). On computer attitude, most respondents reported that it was a good idea to use computers (84.8%), the internet (81.0%) and mobile phones (81.0%) in the hospital. In addition, most respondents agreed that using computers (67.8%), the internet (63.5%) and mobile phones (74.9%) in the hospital provided additional interest.

Technological context

This group of variables consisted of performance expectancy and effort expectancy. For performance expectancy, most of the respondents agreed that computers (67.8%), the internet (60.7%) and mobile phones (77.3%) were useful in the hospital. The majority of respondents also agreed that computers (61.6%), the internet (60.2%) and mobile phones (77.3%) enabled them to accomplish tasks more quickly. For effort expectancy, most respondents reported that it was easy for them to become skilful at using computers (63.0%), the internet (58.8%) and mobile phones (78.7%), and that it was easy to use computers (66.4%) and the internet (63.0%).

Implementation context

Implementation context consists of social influence, compatibility and organizational facilitating conditions. For social influence, most of the respondents agreed that people who influenced their behaviour thought that they should be using computers (60.7%) and the internet (50.8%) in the hospital. In addition, 56.4% and 50.7% respectively agreed that their superior officers were helpful in the use of the internet and computers. For compatibility, the majority reported that using computers (74.9%) and mobile phones (70.6%) fitted the ways in which they liked to work. Using computers (73.5%), the internet (69.7%) and mobile phones (76.8%) reportedly fitted their work style. On whether the organizations had facilitating conditions suitable for ICT implementation, 61.6% agreed that they had the resources required to use ICT while 59.7% agreed that they had the requisite ICT knowledge. Only 18.5% reported seeking assistance when they encountered ICT difficulty.

TESTING THE HYPOTHESES

Linear regression analysis was used to examine the functional relationship between the use of ICT and availability of ICT, the contexts and the demographic variables respectively. Since the demographic variables were specified as moderating variables for all the contexts, they were used in all the analyses involving each of the contexts.

Hypothesis one: 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 ICT use.

Hypothesis two: There is no significant relationship between the demographic variables and use of ICT in the hospitals

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

Hypothesis three: There is no significant relationship between ICT use and the UTAUT variables

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. Confidence, computer self efficacy, computer attitude, performance expectancy, effort expectancy, compatibility and facilitating conditions did not provide any explanation for the use of ICT in the hospitals.

Hypothesis four: There is no significant relationship between the contexts of ICT use and use of ICT in the hospitals

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

DISCUSSION OF FINDINGS

The whole essence of this study could be summarized in one question: How does the UTAUT model of technology use explain the use of ICT by medical practitioners in private hospitals in Osun State, Nigeria? This question was addressed by analyzing data collected using a questionnaire

from a systematic sample of 211 medical practitioners in 135 hospitals in the state. The demographic constitution of the medical workforce in the hospitals could be explained by the inclusion of all medical practitioners in the study: nurses, technicians 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 findings that computers and mobile phones (but less so 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. 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 between themselves (Nwagwu and Ejeh, in press). 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 an 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 was exploited on a daily basis, and was even reported to have been used by the majority of respondents on the day of the survey. This finding supports the suggestion that ICT is gearing up to play a significant role in the hospitals, and might soon assume even greater visibility in this regard. 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 might, therefore, be serving private purposes, or tasks other than those considered basic in the hospital and listed in the study.

The respondents cited the computer as the most available general ICT item in the hospitals, ahead of mobile phones and other technologies. In general, not all the respondents considered the mobile

phone to be a medical technological necessity. They categorised mobile phones as personal technologies rather than instruments serving health information technology purposes. Mobile technologies are the companion of 98% of Nigerian students and they would be expected to have a deeper penetration among a highly literate population such as medical practitioners. Moreover, a study by Nwagwu and Ejeh (in press) showed that mobile technologies constituted the major technologies used by medical doctors for referring their patients to other experts. Nwagwu and Ejeh 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 presence of certain technologies such as television, DSTV, radio among others shows that the hospitals have not addressed the need to 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 keep them occupied while waiting (Hurst and Siciliani, 2005). The hospitals in Osun State were not really inclined towards "high-tech". The reporting of the availability of specific medical information technologies is very low. The presence of ultrasound machines and digital thermometers, which were reportedly available in at least three of every ten hospitals, 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 the diagnosis of most tropical diseases.

Respondents were more comfortable with mobile phones than 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, which 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 training would not be necessary. In addition, mobile phones with complex functionalities suitable for patient registration purposes, for instance, might require some training to use. However, the high level of comfort with mobile technologies reported by the respondents supports the current opinions that mobile technologies might be the best strategy for expanding access to health. What is required is systematic retraining and awareness creation among doctors, particularly those in the private sector, as well as design of software services that are locally sensitive and mobile driven.

The respondents have a much more positive attitude to computers and the internet as hospital technologies than to mobile or other technologies. 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 results, and ultimately infuse ICT into the hospital system. Mobiles were also reported to fit into respondents work style more than the other technologies, but the organisational facilitating conditions for ICT generally were not reported highly positively. Acquiring ICT demands some cost; it also requires some infrastructure such as electric power and manpower. This finding is supported by the low number of respondents who reported having the required knowledge to use ICT or source 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 age and use of ICT reduce with increasing age of the respondents. Younger respondents aged less than 30 are more recent graduates and were trained when ICT had already gained prominence in medical education. This finding fits into the assumed pattern of ICT use and awareness among all professions. Younger people are expected to be more ICT-experienced than older persons, although medical persons are generally believed to be technologically adroit. In relation to the study finding concerning single persons, it could be speculated that they might have more time to learn and use ICT than those who are married. Moreover, most of the married respondents are likely to be older persons who completed their medical education before the single ones, perhaps before such technologies became widespread.

The results suggest that social influence is a factor that influences utilisation of ICTs in the hospitals, and this is validated by the test of the hypotheses. Venkatesh *et al.* (2003) found that social influence was not significant in voluntary contexts, but became important when use was mandated. Wu *et al.* (2008) found that performance expectancy, effort expectancy, and social influence were influencers of use behaviour. A study by Wills *et al.* (2008) on EMR established a result similar to that found in this study, vis–à-vis the greater role played by social influence in electronic medical records (EMR) adoption among women than performance and effort expectancy. Schaper and Pervan (2004) established that performance expectancy is important in technology acceptance decision making. Social influence is a complex phenomenon

that includes issues ranging from the opinions and choice of patrons and benefactors to use of technology for image making. The presence of ICT in the hospital could denote an image of technology currency and sophistication by the organisation, and boost the trust and confidence of clients about the capability of their healthcare provider. Further studies are required to unravel exactly what those 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 the implementation context that explained ICT use. This result supports the earlier analyses, which showed that social influence, which is an implementation context variable, explained the use of ICT by the respondents. Implementation context includes the organizational and technical infrastructural issues required to support the use of ICT. Personal and technological preparedness might not compensate for lack of power, manpower issues, sustainability and other related issues, but social influence might attract big customers and boost the image of the hospital, thus leading to increased business volume and the possibility of higher profit.

CONCLUSION AND SUGGESTIONS FOR FURTHER STUDIES

Many of the hospitals studied have computers, an observation that coupled with the positive opinion regarding 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 serving merely administrative and window-dressing purposes; they are not being used for any basic routine hospital chores, such as patient registration or accounting. The major explanations for the use of ICTs in these hospitals by the medical practitioners are as follows: younger medical practitioners in private hospitals rather than older ones; the perceived picture of the hospital in the mind of the patrons and clients; and the capability of the hospitals in implementing and sustaining ICTs. The three major medical practitioners, namely technicians, doctors and nurses, were joined together as medical practitioners. There is a need to examine these professionals separately. Moreover, a cursory observation shows that many of the hospitals are poorly staffed by technicians and nurses. Very crucially, an expanded study focusing specifically on how social influence explains ICT use by medical practitioners in private hospitals in the state will be a necessity.

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