



Research Paper

Towards reinforcing telemedicine adoption amongst clinicians in Nigeria



Kayode I. Adenuga*, Noorminshah A. Iahad, Suraya Miskon

Department of Information Systems, Universiti Teknologi Malaysia, Skudai Johor Bahru, Malaysia

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ABSTRACT

Telemedicine systems have been considered as a necessary measure to alleviate the shortfall in skilled medical specialists in developing countries. However, the obvious challenge is whether clinicians are willing to use this technological innovation, which has aided medical practice globally. One factor which has received little academic attention is the provision of suitable encouragement for clinicians to adopt telemedicine, in the form of rewards, motivation or incentives. A further consideration for telemedicine usage in developing countries, especially sub-Saharan Africa and Nigeria in particular, are to the severe shortage of available practising clinicians. The researchers therefore explore the need to positively reinforce the adoption of telemedicine amongst clinicians in Nigeria, and also offer a rationale for this using the UTAUT model. Data were collected using a structured paper-based questionnaire, with 252 physicians and nurses from six government hospitals in Ondo state, Nigeria. The study applied SmartPLS 2.0 for analysis to determine the relationship between six variables. Demographic moderating variables, age, gender and profession, were included. The results indicate that performance expectancy ($p < 0.05$), effort expectancy ($p < 0.05$), facilitating condition ($p < 0.01$) and reinforcement factor ($p < 0.001$) have significant effects on clinicians' behavioural intention to use telemedicine systems, as predicted using the extended UTAUT model. Our results showed that the use of telemedicine by clinicians in the Nigerian context is perceived as a dual responsibility which requires suitable reinforcement. In addition, performance expectancy, effort expectancy, facilitating condition and reinforcement determinants are influential factors in the use of telemedicine services for remote-patient clinical diagnosis and management by the Nigerian clinicians.

1. Introduction

The application of information and communications technology or “electronic health”(e-health) has intensified many facets of healthcare service delivery and improved the efficiency of clinicians worldwide. It also contributes towards reducing healthcare costs for hospital management boards. According to the medical literature, electronic health is the confluence of healthcare procedures, the Internet and communication technologies. It is spread across various services, designed to enhance medical practice using information technology. The services include telemedicine, mobile health and medical knowledge management [26,83]. Health Information Systems (HIS) offer many advantages as depositories and management of invaluable hospital data. Most HIS studies have been carried out under conditions of mandatory use, using a suitable technological acceptance model. Consideration of HIS adoption in a voluntary capacity has received little academic attention.

In the field of psychology, volition is a cognitive process by which an individual decides on or commits him or herself to a specific plan of action. In this context, it is the stage where a clinician considers

whether or not to use innovative telemedicine technology. When a behaviour is reinforced, there is tendency for the will to commit that behaviour to be strengthened and sustained [76]. Telemedicine has been classified as a type of HIS which is difficult to consider in mandatory settings, because of its complexity [108,112]. The choice of telemedicine in developing countries is largely due to the dearth of medical specialists and clinicians. In Nigeria, for instance, the ratio of medical practitioners to population is 1:6400 as against the 1:600 standard recommended by WHO [5,70], a situation aggravated by the exodus of medical doctors to countries where they will be given better incentives. This has necessitated investigation of telemedicine as an alternative to meet this shortfall. Despite the inherent benefits telemedicine systems have to offer in terms of remote clinical diagnosis, management and administration, the obvious challenges are whether clinicians are willing to use this technological innovation. This is evident from the neglect this technology has suffered in the few government hospitals in Nigeria in which this technology has been installed.

Telemedicine readiness and adoption factors have been widely

* Corresponding author.

E-mail addresses: Iakayode2@live.utm.my, ibrahimnuga@gmail.com (K.I. Adenuga), minshah@utm.my (N.A. Iahad), suraya@utm.my (S. Miskon).

studied in developed and some developing countries, using many theoretical models to support their findings. Very few authors have considered the reinforcement factor among critical user characteristics, which might delay the adoption of telemedicine. Previous studies in developing countries lack empirical research examining the impact of principal adopters' perception and behaviour towards telemedicine, either as dual responsibility or an extra workload which calls for reinforcement in the form of incentives [65,66,111,110]. The objective of this study is therefore to investigate the consideration of voluntary adoption of telemedicine by clinicians in Nigeria.

2. Literature review

2.1. Healthcare system in Nigeria

The Nigerian government has declared that a healthy nation is a precondition for swift socio-economic progress, and the national healthcare budgetary allotment is close to that for education. The United Nations has emphasized that approximately 50 percent of the world's population lives in remote areas, with the figure rising to over 70 percent in under-developed countries [27]. In Nigeria, for instance, this fact increases the challenges to the health system brought about by the acute shortage of competent healthcare workers.

This shortage is characterized by various circumstances, particularly the obvious inadequate funding, insufficient social infrastructure and defective pay provisions resulting in migration of staff [23], a development that has also led to rural healthcare services being managed by community health workers who are not qualified to handle chronic and complicated health issues. The available social services and healthcare interventions are insufficient, coupled with other factors affecting the system, and the Nigerian government has embarked on various reforms to revitalize the healthcare sector.

The primary healthcare centres are administered by local government and the secondary and tertiary levels by the federal government [49]. There is also cooperation with NGOs, private hospitals and traditional medicine. Administration of the health sector is through templates established by the executive arm constituted by members of the National Advisory Council on Health. The healthcare hierarchy reaches from the federal ministry to state ministries of health and down to local government level. In spite of this well arranged healthcare system, primary healthcare for those living in rural areas is largely inadequate, and; the healthcare sector's contribution to the national economy remains a huge issue.

Revenue generation for the health division is insufficient owing to issues ranging from growing indigence in the nation, to poor fund disbursement to the sector. In 2000, Nigeria was ranked a disappointing 187 among the 191 United Nations member states [89]. In the same year Nigeria spent \$4 dollars per capita on health, compared to the global minimum recommendation by the World Health Organization for underdeveloped countries of \$14 [73], this meagre figure raising issues concerning the revenue spending template of Nigeria. Another obstacle to the Nigerian healthcare system is the systematic removal of free medical services with the introduction of cost-recovery mechanisms in all healthcare divisions at all levels [73,69].

Notwithstanding these problems, the need for new ways to dispense efficient healthcare services in Nigeria has been followed by considerable technological advances, resulting in a surge in the use of ICT applications in healthcare settings. The incorporation and assimilation of e-health into the everyday life of healthcare workers is, indeed, becoming a reality in developing as well as developed countries [81]. It is obvious that timely access to healthcare expertise can go a long way in preventing cases of sudden death, especially in rural communities, with the use of telemedicine services in early diagnosis and treatment of chronic health disorders.

2.2. Telemedicine in Nigeria

In Nigeria, a medical practitioner is expected to have touched and seen his patient face-to-face before the patient is believed to have been given effective treatment. There is nevertheless no doubt that information technology has a major role to play in modern-day medicine, and telemedicine systems have been found to contribute significantly in the developed world towards providing effective specialist medical care in remote areas. However, this crucial component of modern medical practice is almost unknown in the healthcare sector of Nigeria, and individuals still have to travel from state to state seeking medical attention which they ought to have on their doorsteps.

Telemedicine is not a new system in Nigeria, but failure of political will, the lack of a receptive attitude of healthcare workers to such technological innovation, poor funding most especially in the area of infrastructure and Internet connectivity, and individual attitudes towards technology have all militated against its successful implementation in the country. Furthermore, in spite of this evident advantages, telemedicine technology has proven cumbersome to implement [58]. The inability to provide the required telemetric medical equipment is instrumental in the neglect of the telemedicine concept. The literature also indicates non-technological challenges such as organizational, socio-economic and human factors, as well as legal and policy standards.

Omogbadegun [72] described one of the challenges to implementing telemedicine in Africa as Internet bandwidth. Internet connectivity is erratic throughout much of Nigeria, with few Internet Service Providers in the market offering indigent services because of the bandwidth limitation. Other challenges include implementation cost, poor infrastructural facilities, and limited trained manpower [1]. Although rural Nigeria lack access to good roads, electricity, technology and social infrastructures, the effect of not using this technology in rural areas has dire consequences for the population, as the present rural healthcare system is being managed by workers without the skills required to manage chronic cases that require swift skilled medical intervention.

To combat this, in a previous study the authors recommended a framework for rural cloud telemedicine. This framework was proposed to minimize telemedicine implementation issues affecting rural areas. Similarly, although in urban regions the proliferation of smart digital devices with pay-as-you-go Internet subscription favoured the exchange of medical knowledge and advice amongst clinicians, in those hospitals where telemedicine units had been installed the technology was abandoned. The concern is whether clinicians are willing to use this significant innovation. This study, in the context of information systems, therefore explores the use of a suitable technological adoption model to establish clinicians' behavioural intentions to use telemedicine systems. The result is expected to be recommendations for a suitable telemedicine implementation benchmark for healthcare decision makers in Nigeria.

2.3. Telemedicine adoption in developed and developing countries

To identify obvious barriers affecting the general adoption of telemedicine, the authors applied the systematic literature review method adopted in their previous study, using combinational approaches and guidelines (adapted from [103,54,50,101,8,60]). The objective was to review selected publications within the setting of telemedicine adoption in both developed and developing nations, providing a good background in both contexts. Journals indexed in Scopus, ScimagoJr, Web of Science, Elsevier, IEEE, Medline, Springer were searched using keyword such as Telemedicine AND Adoption; Telemedicine AND Acceptance; and Telemedicine Developed AND Developing Countries.

Literature published from January 2010–2016 was considered eligible for inclusion. 48 papers were considered relevant, most of these papers highlighting the following factors affecting telemedicine adoption: envir-

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