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Telemedicine system: service adoption and implementation issues in Nigeria

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Abstract

Objectives: The study seeks to understand why there is a wide gap in the telemedicine service implementation and adoption in Nigeria, the existing evidence shows that less than 5% of such hospital information systems has been utilized in a country of more than 180 million people. **Methodology:** We applied in-depth semi-structured interviews approach such that the opinions of clinicians were sampled at two government hospitals in Nigeria to identify other principal users' attributes affecting telemedicine implementation adoption from clinicians' perspectives. The combination of the factors from literature and thematic analysis led to the formulation of telemedicine service adoption framework that highlights telemedicine implementation issues. **Findings:** The outcome of the study led to the establishment of a telemedicine implementation framework and recommendations for a feasible and sustainable telemedicine service adoption for clinicians in Nigeria.

Keywords: Telemedicine; Adoption; Implementation

1 Introduction

The global population is growing rapidly with increasing need for quality healthcare and there is need to provide alternatives for people in the remote locations to have access to timely and specialized healthcare [1,2]. In Nigeria especially, lack of specialized clinicians have increased the mortality rate of patients suffering from various diseases [3,4] that required quick intervention. Applications of information technology in healthcare sectors have emerged as powerful platforms for improving the quality of healthcare delivered and which further enhances the efficiency of medical practitioners [5,6]. Additionally, it has a pivotal role on health care cost reduction for healthcare decision makers and organizations. Telemedicine can play an important role in addressing the issue of lack of skilled clinicians to handle chronic disease conditions in the remote regions. And it is an undeniable fact that it is changing the way medicine is being practiced both in the developed and developing countries. Nevertheless, a gap in knowledge exists about Telemedicine adoption in developing countries [7]. A number of researchers have reported that discrepancies exist in the implementation of telemedicine in developing countries' health information systems [8–10].

In Nigeria, for instance, the intuitive data projects less than 5% utilization of any form of hospital information system in a country of more than 150 million people [11]. Although, Nigerian government has initiated health ICT strategic framework which is expected to address some of the barriers to health ICT implementation including telemedicine, but preliminary investigation has revealed that the mobile satellite and other equipment used during the pilot phase of the project including the telemedicine units installed in some federal medical centers mentioned in Ukaoha and Egbokhare [12] had been underutilized. Additionally, it a common practice in Nigeria to see specialists in government hospitals travelling for consultations on weekly basis in two or more government hospitals thereby risking their lives; while also neglecting patients in their own place of domicile. These weekly consultations would not have been necessary if the telemedicine system installed at Federal Medical Centre in the state under investigation and few other states had been properly utilized. Such telemedicine would have been applied to handle chronic diseases diagnosis remotely and thereby reducing frequent travels by these specialist clinicians. Therefore, the researchers of the current study are of the opinion that telemedicine implementation strategy can only be successful when all issues related to principal users' acceptance of the technology are addressed since Nigerian clinicians' individual perceptions are pivotal to the adoption of this technology. Therefore, the objective of this study is to support the National health ICT strategic framework from clinical perspective by exploring Nigerian clinicians (medical doctors and nurses) views towards successful telemedicine implementation process and service adoption.

2 Literature Review

2.1 Challenges of telemedicine in Nigeria

Telemedicine is a field that enhances medical practice through telecommunication devices integrated sometimes with software application or working independently. This thriving area of health information systems has been implemented and proven to be a success in developed countries and some developing countries. Nigeria has equally advanced in her use of ICT in healthcare; although full potentials of this applications have not yet been realized due to lack of synergy amongst all the stakeholders. This issue of low coordination has brought about for replicated efforts, wastage of resources and reduced health outcomes. To address this, a health ICT strategic framework was launched to address this and it is expected to be fully implemented by the year 2020. However, despite the immense benefits, full scale adoption of telemedicine is still very limited, mostly in developing countries. A number of studies have investigated some factors not limited to technological, Human, organizational, social and individual characteristics. In Nigeria, however, there is little to know if the health IT strategic framework took into cognizance the individual level of telemedicine adoption from clinical perspective since these clinicians are the primary users of telemedicine system and their acceptance is one of the prerequisites of emergence and sustainability of telemedicine systems. Therefore, the researchers classified barriers to telemedicine adoption into Technological, Human, Organizational, Social and Financial Factors and these factors would serve as guide for the rest of this study.

3 Material and Methods

3.1 Research approach and data collection

The research is exploratory qualitative study in nature. Structured in-depth interview involving two specialists 5 General Practitioners/Medical officers and a Nurse was conducted at two government hospitals. The interviewees were earlier approached and letter of introduction signifying interview intention was given to them. The unit of analysis was at hospital level as highlighted to understand the perspective of clinicians who are the principal users of telemedicine. For confidentiality purpose, the participants' names were not revealed; though, each participant was coded according to their cadre. 'S1, S2' (One Obstetrics/Gynecologist and Orthopedic surgeons) for specialists, 5 'GP1, GP2……GP5' for General Practitioners/Medical officers and a 'N1' for Nurse. It was quite difficult getting all of them together in a group due to individual job engagements. Notes were taken for all the interviews and some of the interviews were audio taped. All interview sessions were transcribed and thematized for further analysis

3.2 Research findings

This section presents the findings on the factors that encourage Nigerian clinicians to adopt telemedicine. The themes were arranged based on the five factors adopted from the literature and successful theoretical model of technology adoption, such as Technology acceptance model and Unified theory of acceptance and use of technology by Davis [13] and Venkatesh, Brown [14] respectively.

3.3 Technological factor

Technological factors are important characteristics to be examined in telemedicine adoption. Thus, telemedicine is regarded as being developing in Nigeria and this specialist emphasized on the fact that the simplest form of telemedicine, they use regularly is using their mobile phones to exchange medical images for remote diagnosis.

According to interviewee S1 (A consultant gynecologist):

"*Telemedicine usage is developing in Nigeria and there is exchange of medical images between practitioners amongst one another for possible diagnosis. Electronic medical records on the other hand have recorded huge success in some established private hospitals in the country and that has helped to reduce paper work at the hospitals*".

Another specialist S2 (A consultant orthopedic surgeon) defined telemedicine as:

"*Medical interaction with medical care providers remotely and that the peak of telemedicine is in the area of remotely controlled robotic surgery*".

The introduction of ICT has made life a lot easier by bringing in new method to take the place of the obsolete ones and when respondents were asked on their thoughts concerning benefits inherent in telemedicine technology, some of the benefits mentioned include travel reduction, reduced hospital visits and medical education. Consultant Orthopedic Surgeon (Specialist) S2 stressed that:

"*telemedicine has provided many immense benefits such as saving of time by ensuring quick medical intervention and allows easy interaction with patients particularly for follow up (makes follow up a lot more convenient) to mention but a few*" The consultant orthopedic surgeon stressed again that: "*it will reduce frequent travels for consultants, less physically challenging, reach out to more patients*"

Nurse clinician N1 that the use of telemedicine for remote care will do a lot to reduce hospitals visits by the prospective patients. She stressed further that:

"*Patients Nurses ratio when on duty where I work presently is 1:22. Telemedicine innovation will help nurses in providing remote monitoring and continuous care*".

The findings revealed that all the interviewees had good understanding and interpretations of telemedicine concept.

3.4 Ease of use of the telemedicine / ICT proficiency

The successful adoption of a new technological innovation depends on the intensity at which system is utilized. During the course of the interview the respondents were asked on their thoughts concerning ease of use of telemedicine technology; Consultant Orthopedic Surgeon S2 (Specialist) said that:

"*if the technology is simplified, this would encourage them to use it since it is similar to what they are used to.*"

M1 and M2 (Medical officers) emphasized on the fact that:

"*It is obvious some medical practitioners do not see the workability and as a result of this, most medical practitioners have little knowledge of it*".

Conclusively, the respondents claimed to have an average ICT knowledge to use telemedicine. This further implies the need for the hospital management board to increase the ICT literacy level of these clinicians to further promote the usage of the available telemedicine system.

3.5 Technology availability

Studies from literature frequently indicated the diverse challenges related to telemedicine technology diffusion universally which include lack of infrastructural resources, poor telecommunication infrastructures such as bandwidth, and the effect of the Internet [15–17]. Medical officer M5 said that:

"*Despite the ease of use and benefits inherent in the use of telemedicine, internet bandwidth is still a great concern. Reliable internet connection, low internet tariffs, and uninterrupted electricity are necessary preconditions for the technology use*".

3.6 Social factor / Cultural influence

Cultural influence is an influential factor which had been investigated by Venkatesh and Morris [18] found to have significant influence on individual acceptance of telemedicine system. In this study, the researcher tried to confirm this cultural influence determinant and they replied as follows:

Orthopedic Surgeon S2, said that:

"*it is likely to be a factor*". *Although I am not affected*"

Interviewee N1 (Nurse Clinician) explained that:

"…*Nursing profession is considered as an art and science. Telemedicine may not actually fit in circumstances where there is need to touch the patient for reassurance. To a greater degree, social influence is a factor which might affect my optimal use of the technology, influence from superiors and colleagues might be discouraging since the use of this technology in nursing care contradicts most trainings nurses I have had…*"

Thus, findings from the interview highlighted that social influence could prevent a potential adopter from using telemedicine even when he or she has resolved to do so; while some agree that influence from others would not make them change their minds towards the usage.

3.7 Human factor (indifferent, perceive impersonation, medico-legal issues)

Human characteristic attribute concept was derived from Lee, et al. (2012), external factor which they tried to examine Human factor relationship with perceived behavioural control, attitude and subjective norms towards behavioural intention to use HIS using TPB model. The interviewee were asked on the salient characteristic that serve as concern for them regarding the use of telemedicine system provided by the federal ministry of health.

3.7.1 Indifferent
Nigerian clinicians presently show lack of concern towards the use of telemedicine due to many reasons which include lack of reliable internet connectivity. To support this Consultant Orthopedic surgeon S2 stressed that:

"*Most medical doctors lack interest and are reluctant in the use of internet technology.*"

Nurse clinician N1 stressed further that:

"*In Nursing physical care is very crucial. Definitely telemedicine may not be ideal is some nursing situations and this can often lead to users resisting its usage*".

3.7.2 Perceive impersonation
One of the challenges that might affect telemedicine adoption amongst Nigerian clinicians in Nigeria is the presence of quack clinicians. Quackery or Impersonation is a situation where someone disguised and practice as a clinician when in fact he or she is not qualified to do so. Consultant Orthopedic surgeon S2

"*Most Nigerian clinicians also have a concern of perceived impersonation due to lack of identity of the other clinician.*"

On the other hand, respondents M1 and M2 (Medical officers) emphasized that:

"*Clinicians are in the habit of hiding knowledge simply because they do not trust the clinician at the other end and fear of professional impersonation*".

The above was supported at different occasion by Medical officer M5:

"*Inability of users sending a particular information is crucial. There is need for sound medical knowledge on the participating clinicians so as to avoid medical error which is enough to threaten its adoption*".

3.7.3 Medico-legal concern
Another human factor issue which came up during the interview is that Nigerian clinicians want to know if they are protected under any law, should there be any medical errors as a result of using telemedicine technology. To support this, consultant Gynecologist S1, mentioned said that:

"*The patients might resist the change since the physicians are not there real time and if they eventually agree to use it then who is liable for medical errors? So therefore medico-legal concerns need to be resolved, besides it is an additional responsibility.*"

3.8 Organizational factor

Organization's role is to coordinate all other associated components that make a system work.

3.8.1 Policy and guidelines
Consultant orthopedic surgeon S2 also mentioned that: "there is need to have a sound legislation and regulation, secure internet connectivity and good telemedicine policies. Also, software copyright issue".

Patients' Privacy and Confidentiality

It is generally assumed that trust relationship exists between clinicians and prospective patients. Nigerian clinicians are interested in ensuring that their patients' privacy and confidential information are secured. This is supported by the consultant gynecology S1 response regarding his expectation from the organization:

"*There is need to have a proper guideline that would guarantee my patients data security, privacy and confidentiality*".

3.8.2 Data security and copyright protection

Due to the prevalence of cyber-crimes in Nigeria, clinicians have high expectations towards ensuring that telemedicine application to be secured and protected from hackers. This was also mentioned by the consultant gynecology S1 response regarding his expectation from the organization:

"*there is need to have a secure internet connectivity and software copyright issue must be addressed*".

3.8.3 Lack of awareness

There is lack of telemedicine awareness amongst Nigerian clinicians. This assertion was supported by Medical officers (M1) and (M2) where they mentioned that awareness provided by the organization on the usage is inadequate.

"*…Telemedicine technology awareness is inadequate…*"

Nurse clinician (N1) stressed further that:

"*Frequent workshops and seminars are needed from time to time to raise the degree of awareness. Though, telemedicine is at nascent stage in Nigeria which is sometimes due to lack of telemedicine knowledge, lack of patients' awareness and complexity associated with such technological innovation.*"
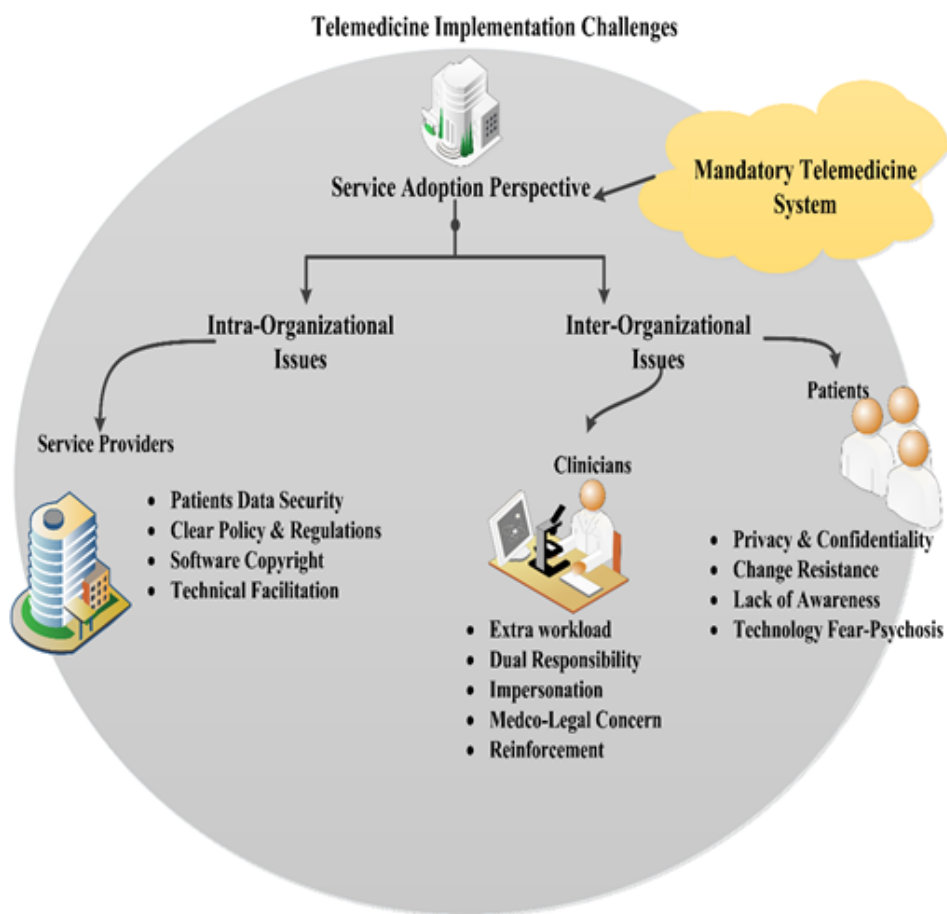
Fig 1. Telemedicine service adoption challenges

Healthcare organization have a big role to play in ensuring that all the factors that make people use a new technology are provided. In the context of this study, Nigerian clinicians would expect some inter and intra organizational issues to be resolved (shown in Figure 1) before imposing the use of this technology mandatorily on them.

3.9 Financial factor

Reimbursement in the form of provision of incentives for telemedicine adoption has been mentioned as being necessary factor to be examined due to complexity surrounding telemedicine technology. Only one recent study was found to have validated this assertion [19]. The findings from the interviewees regarding this factor are hereby transcribed as follows:

3.9.1 Incentives, motivation and dual responsibility

Extrinsic motivation in the form of incentives have been mentioned as one of the factors that facilitate the use of telemedicine technology most especially when the technology is perceived as being burdensome. This was supported by Consultant Gynecologist (S1) who asked that:

"*Who pays for using it? Tele-consultation is additional responsibility considering the present workload, there is a need to identify who bears the cost.*"

Nurse clinician (N1) mentioned that:

"*Present situation require that I stand on my feet throughout my shift. Telemedicine is outside my job schedule and therefore using it should attract additional incentives*".

The findings from interview revealed that all the respondents agreed that telemedicine usage should be incentivized. It therefore becomes important to provide framework that recommends this factor for the healthcare decision makers in Nigeria.

4 Conclusion

This study investigated the factors for under utilization of telemedicine facilities and challenges that led to failure of the pilot project implementation in Nigeria, from clinicians' perspective. Technological innovation awareness and data security assurances in the form of training is one of the areas an organization can increase employees' use of health information system and subsequently creating positive attitude in interacting with telemedicine system in healthcare management at their workplace. According to the interviews, Medical clinicians' claimed they are not so comfortable as to ascertain the qualification and expertise of the so called practitioners at the other end and fear of professional impersonation. Such reason could be due to the fact that presently they only exchange medical knowledge with professional colleagues they know and therefore calls for having sound telemedicine policies that would cater for all these foreseeable setbacks.
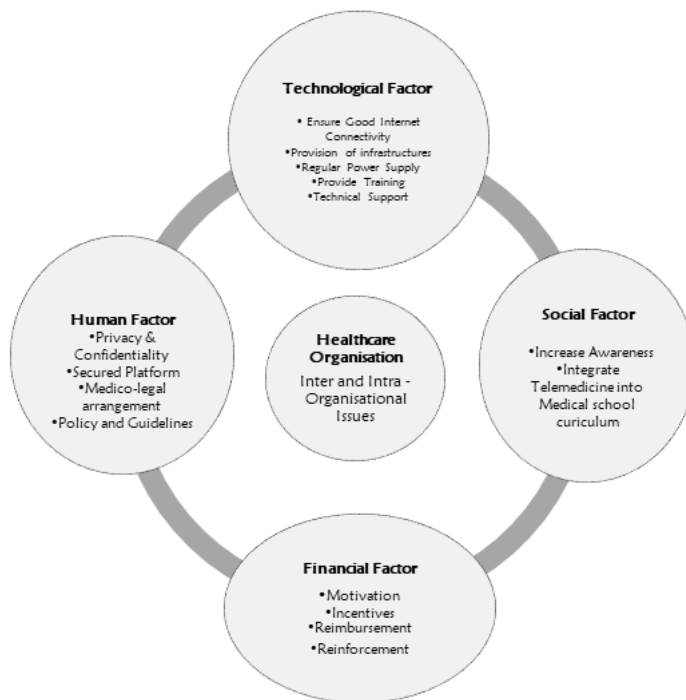

Fig 2. Telemedicine service adoption implementation framework

There is need to ensure telemedicine system is robust enough to ensure a safe platform that identifies and authenticates clinicians at both ends. Aside these, provisions of infrastructural facilities, reliable internet connectivity and regular power supply issues need to be addressed. This research contributes to knowledge practically by establishing a telemedicine implementation framework for Nigerian healthcare organization and decision makers. This study framework (shown in Figure 2) can be integrated into health ICT strategic framework and the recommendations provided are expected to guide the healthcare organization towards implementing feasible telemedicine policy that works for Nigerian clinicians. In addition, since most information system research follow a positive philosophy[20,21]; the research extends the body of knowledge theoretically by following the benefits of interpretive research approach mentioned by Creswell[22] to comprehend and explore the actual factors influencing telemedicine adoption from Nigerian clinicians perspectives and establishing a conceptual telemedicine implementation framework for these clinicians so that timely specialist healthcare intervention can get to where they are presently unavailable.

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