

Using a Virtual ICT Training Framework to Support Doctors in Rural Hospitals in South Africa

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ABSTRACT This paper investigated how ICT skill levels of doctors deployed to rural hospitals contribute to effective usage of computer-mediated tools in hospitals in South Africa. A case study approach was used. Participants were selected from a population group of doctors. Ten doctors were selected from ten government-owned hospitals for interviews. Data was collected using semi-structured open ended interview questions. Doctors were asked to rate their knowledge on computer and e-health skill and indicate if they need training. The findings revealed that majority of the doctors in rural hospitals (n=75%) are computer illiterate. When those with computer skills were asked to rate their knowledge in computer usage, 46% said they were novice, 42% were average and only 12% stated that they were experienced. The results led to a proposed virtual *ICT training framework* to provide basic ICT training through virtual tutoring to support doctors in rural hospitals.

INTRODUCTION

Doctors are often deployed to remote locations where access to knowledge-sharing facilities to improve their work performance becomes impossible. Computer-mediated communication systems (e-mail, telemedicine system and video conferencing), which are components of Information and Communication Technology (ICT), have become the foremost tools to bridge the gap and share professional ideas between doctors in remote locations and specialist doctors in urban areas (Dates 2008). These tools provide support to doctors in remote rural areas; they are not just mere mechanisms for exchange of knowledge but mechanisms for creating a knowledge repository and for accessing the knowledge repository to improve upon their work performance (Wenger 2000). Sharing knowledge and putting the shared knowledge into a repository is an important start in knowledge management and a basis for organisational memory (Davenport et al. 1996). However, a number of factors influence the efficiency of knowledge sharing, including time availability and doctors' ICT skills. Despite the compelling advantages of computer-mediated tools in the health care sector, many doctors who are deployed to remote regions in South Africa are unable to use ICT tools to share professional knowledge which would lead to the improvement and efficient delivery of health care services to rural South Africans.

The objective of this paper is to investigate how ICT skill levels of doctors deployed to rural

hospitals contribute to effective usage of computer-mediated tools in the hospitals and, based on the findings, proposed a virtual ICT training framework to support doctors in ICT usage to improve health care delivery.

The proceeding sections of this paper are presented as follows: literature and theoretical framework, methods, results, discussion and proposed ICT framework to promote efficient health care delivery.

Literature

E-training is the process of acquiring knowledge and skills that are related to work requirements by using computers or guided means but excluding general supervision, job-specific innovations and learning by experience (Sloman 2002). Sloman (2002) further states that training lies within the domain of the organisation and it is an intervention designed to produce behaviour from individuals to effect positive organisational results. In this study, e-training means a set of applications and processes which use ICT media to deliver e-health application training to health care professionals.

The e-training system proposed is based on constructivist ideas. Redmond and Lock (2006) define constructivism as the engagement and active construction of knowledge by learners. Brown (2004:36) further states that learners construct their learning through their environment and at their individual learning rates. Swan et al. (2008) advocate that while the learners are con-

structuring knowledge, they should have support from more knowledgeable people such as educators, peers, mentors or experts in that particular field of knowledge. These knowledgeable people can provide additional expertise, different perspectives and scaffolding of the co-construction of knowledge to enhance the learning process (Redmond and Lock, 2006). For e-training to occur, ICT systems are needed to be seamlessly integrated and grounded in the context of the learner (Good et al. 2004). The ICT system revolves around network-delivered interactive multimedia courses and network-based tutoring which constitute the main learning features (Pratikakis et al. 2007). Networked based tutoring has become one of the learning methods because of the spread of technology and globalisation. This has in part resulted in the emergence and development of *virtual only* ICT training. A virtual ICT training is a formal learning practices through the web (Murillo 2008, Thomas 2005). The web includes, Internet message board where people can discuss thoughts or ideas, online chat rooms where communication and exchange of ideas are in real time, and social network services where the website allow people to connect and look for support from peer and acquaintances (Quan and Young 2010)

METHODS

The study was carried out in the North West Province of South Africa. Ten community hospitals (Taung, Ganyesa, Revilon, Bloemhof, Klerksdorp, Rustenburg, Christiana, Boitumelong, Empilisweni and Classic House hospitals) were purposefully selected. These hospitals were selected based on their geographical locations, which span across the entire province, and they form part of the government-owned institutions in South Africa.

The participants of the study were drawn from the entire population of doctors in the ten hospitals. In describing population, Polit and Beck (2008) indicate it is the aggregate of cases with a common and designated criterion that is accessible as subjects for study. A purposive sampling technique was used in recruiting participants from the population of doctors. A doctor from each of these hospitals was selected. The participants were selected by their professions, which was relevant to the study. Ten doctors volunteered to participate in the study.

Data was collected using semi-structured open ended interviews. The interviewees represented different roles ranging from specialist doctors to general practitioners. The interviewees were asked to tell in their own words how often and for what purpose they use their personal computer at work. The doctors were asked to rate their knowledge on computer and e-health skills and indicate if they need training.

The interview lasted for three hours with each interviewee and was audio-recorded and transcribed by the researcher.

Integrity of data entry from the study was checked by another researcher. Transcripts were coded using Wolcott's (1994) methods of case study analysis techniques. After the initial coding, broad categories were identified by searching for patterns in the participants' responses. The categories were computer and internet usage among doctors in rural hospitals, doctors' self-rated knowledge in computer usage and the need for ICT skill training.

RESULTS

The results are presented under the categories, computer and internet usage among doctors in rural hospitals, doctors self-rated knowledge in computer usage and the need for ICT skill training.

Computer and Internet Usage among Doctors in Rural Hospitals

The frequency of computer usage of the doctors was assessed to determine if basic ICT training through virtual training opportunities will be necessary to enhance the basic computer skills of the health care professionals. It was found that 60% of the doctors never used a computer or the internet for their daily duties, while 20% indicated that they use a computer or the internet daily. The remaining 20% of doctors indicated that they use it weekly or monthly. The doctors who indicated that they use computers, emphasised that they use this for the purpose of communication, presentations, e-mails and report writing. They spend an average of about four hours a day on the computers. One respondent stated "*I do not use computer/Internet because of heavy workload, I have many patients. I will have to attend to them instead of sitting in front of a computer*". Another respondent also said

“we do not have the basic skills to waste time on using the computer”. Further evidence obtained from doctors indicate that the computers that are in the hospitals are not used by the health care professionals but by the administrative staff for clerical and other administrative purposes. The doctors do not have any e-health applications to support their daily work.

Doctors’ Self-rated Knowledge in Computer Usage

The doctors were asked to indicate their competence in basic computer skills. The results demonstrate that the majority of health care professionals in rural hospitals/clinics are computer illiterate. When those with computer skills were asked to rate their knowledge in computer usage, 46% said they were novice, 42% were average and only 12% stated that they were experienced. This is further depicted in Figure 1 .

Furthermore, the doctors indicated that they have no experience with using e-health applications such as e-health patient record systems. Almost 95% have no training in basic computer skills or e-health application usage. These respondents indicated their willingness to learn any e-health application put in place. One respondent indicated “The training is needed for the settlement of our job. We need to use the basic computer literacy skills to improve our job. It going to be of great benefit, because some patient old files get lost but computer skills will help use e-Patient Health record system in the future”

However, the respondents were positive about training entirely on the computer or through the web, in order to save time during their working hours to help the high number of patients they serve. A high percentage (98%) indicated that they will need training in the use of computers and e-health applications and they are willing to spend additional time after hours to learn e-health applications implemented in their hospital.

The Need for Virtual ICT Training Framework

The assessment of the computer skills of the healthcare professionals in the hospitals indicates that many healthcare professionals in the rural hospitals do not use computers in their daily routine work due to lack of computer skills and e-health application facilities. The interview with the doctors revealed that, there is a need to train healthcare professionals not only in basic computer literacy skills but also the usage of e-health application. Therefore, an ICT virtual training framework is to provide guideline on basic ICT training through virtual tutoring to improve healthcare delivery in rural hospitals is proposed. The virtual-training program will assist doctors, and other healthcare professionals to acquire basic computer skills and to master the use of the relevant e-health applications. The Figure 2 depicts the of the Virtual ICT training Framework.

To initiate the training process, the healthcare professional uses the User Interface (UI) to reg-

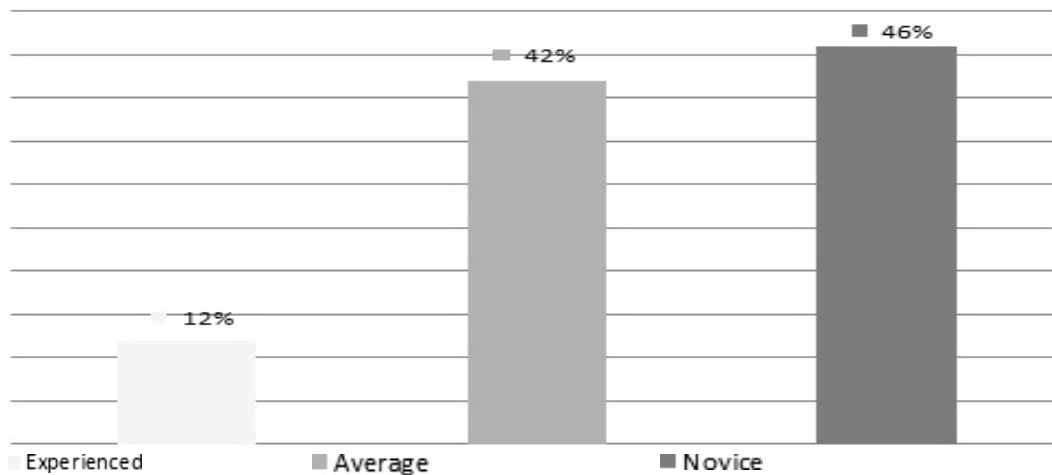


Fig. 1. Rural healthcare professionals’ Knowledge in computer usage

ister as a learner and request for the course content which are divided into modules (basic computer skills, e-consultation lessons, e-prescription lessons, e-referral lessons and patient health record system lessons). As the user registers as a learner and selects a module, the Learning Management System (LMS) which is a component of the Virtual ICT training framework automatically assigns a mentor to the learner who guides and assesses the learners work. The learner requests the course material for the selected module. The learner completes the assignment on that module through an interactive lesson on a computer. The activities completed are forwards to the mentor who will assess it and provide feedback to the learner. During the completion of assignments, the learner can consult with an appointed facilitator in the local hospital if assistance is needed.

The LMS delivers electronic content in the form of lessons about how to use the healthcare applications. The LMS is integrated as part of the e-health applications on the provincial and local hospital database servers. The LMS will support interactive learning but assignments will

be submitted through the uploading of files. The LMS has collaborative features like discussion forums where learners will exchange ideas, post questions and offer answers which are relevant to the subject. There is a keyword search tool to assist learners to find supportive content to complete their assignments. Furthermore, there will be a visual authoring tool for experienced authors to create and update assignments, tests and other supporting materials which will be stored in both the hospital and provincial e-health database servers.

Communication: This is concerned with the interaction between components across the different systems in other hospitals. In the communication layer, an appropriate transport protocol, such as Hyper-Text Transfer Protocol (HTTP) for Internet communication and Transmission Control Protocol (TCP) for intranet communication are considered for sending messages. All the components of the LMS communicate through a shared network infrastructure using an agreed service protocol. An HL7 messaging standard has been adopted as the messaging standards for the healthcare sector in South Africa.

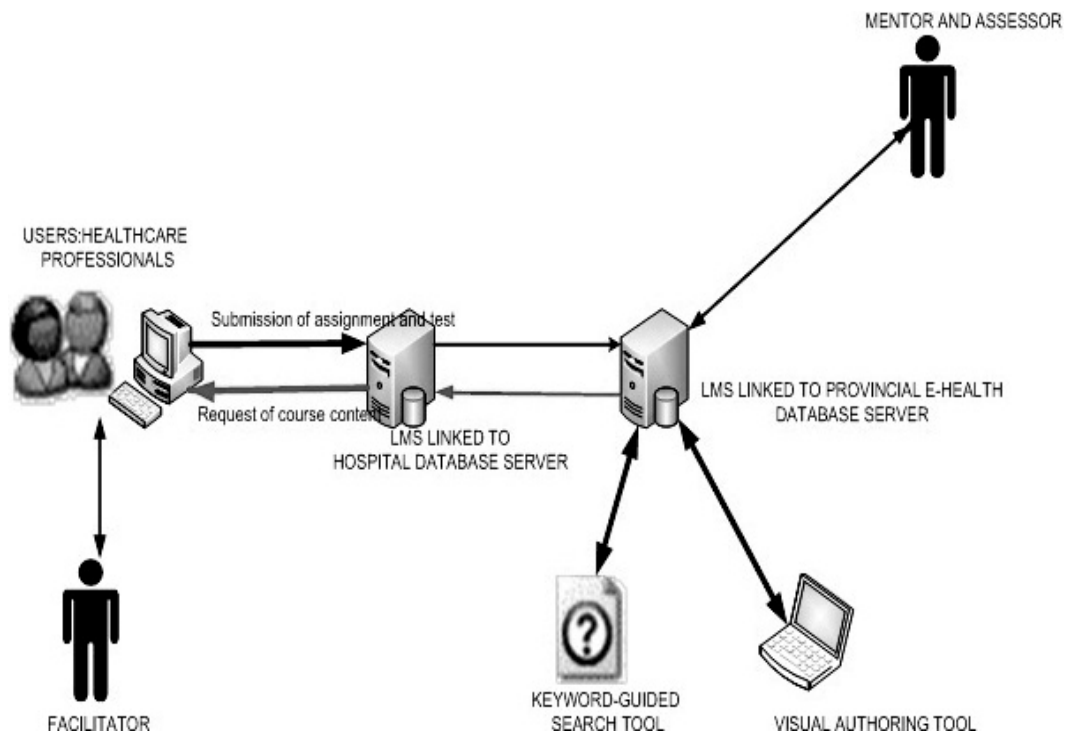


Fig. 2. ICT E-training framework for rural hospitals

Security: The implementation LMS in the context of the ICT E-training Framework must be done in a secure environment. This means that there will be reliable, secure user identification, authentication and authorization. The issue of security and confidentiality of patient information became evident during the interviews and therefore, it is important that such identification measures are put in place. One of there will be signatures and passwords assigned to the doctors to grant them access to the LMS.

CONCLUSION

Having reviewed the problems associated with computer and internet usage among doctors and unpacked doctors' knowledge of basic computer skills, it was noted that majority of the doctors (60%) do not use computers or e-health applications in completing their duties. However few doctors (20%) indicated that they use computers for their personal e-mails. It was also revealed that a great percentage of the doctors do not have basic computer skills. This constituted a huge problem of doctors' non-usage of computers and other computer-mediated tools.

The results of the research led to the proposal of a virtual ICT training framework to provide an e-training program which will assist doctors and other health care professionals to acquire basic computer skills and to master the use of relevant e-health applications.

RECOMMENDATION

Based on the findings, it is recommended that the proposed virtual ICT training framework be implemented on a pilot scale in the North West Province of South Africa. The pilot implementation should take into account the installation of a

broader internet bandwidth to improve internet connectivity and speed in rural communities.

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