

Chapter 10

Evaluation of Telemedicine Systems User Satisfaction in Developing Countries: The Case of Mali and Senegal

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ABSTRACT

This article describes how in developing countries, the work on regulatory aspects of telemedicine systems and applications is still in infancy. During our literature review and on-site research in Sub-Saharan Africa, we could not point out any work on measuring the quality of service (QoS) and quality of experience (QoE or QoX) provided by the telemedicine systems, thus making it impossible to measure the overall level of system user satisfaction in Sub-Saharan Africa. Therefore, we conducted a qualitative and quantitative study to measure network QoS performance and end-user QoE perception of telemedicine systems using publicly accessible conversation tool Skype in Mali and Senegal. The results show that about 75% of the users were satisfied with the quality of teleconsultation service provided and 60% of the users have good impression on the network performance. Based on obtained results, we propose KPIs such as global QoS for measuring QoS and propose a mathematical formula to predict the corresponding QoE, since there exists a relationship between QoS and QoE.

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1. INTRODUCTION

Telemedicine is the use of Information and Communications Technologies (ICT) to provide clinical services where participants are at different locations. Closely associated with telemedicine is the term Telehealth. This term is often used to encompass a broader application of technologies to distance education, consumer outreach, and other applications wherein electronic communications and information technologies are used to support healthcare services.

Video-conferencing, transmission of still images, eHealth services including patient portals, remote monitoring of vital signs, continuing medical education and nursing call centers are all considered part of telemedicine and telehealth (A.T. Association, 2009). Telemedicine systems are implemented and launched in Sub-Saharan Africa through pilot projects such as the RAFT (Francophone Africa Network of Telemedicine) pilot project in Mali, and other telemedicine projects in Morocco and Mauritania (Bagayoko, Muller & Geissbuhler, n.d.; Geissbuhler, Ly, Lovis & L'Haire, 2003). Telemedicine systems are thus becoming common in West African countries. Certain medically underserved regions in (West)-Africa have access to healthcare services through the telemedicine systems launched in these countries. As an example, in Uganda, Philips in collaboration with the NGO 'Imaging The World' has trained midwives in village health centers to scan and acquire ultrasound images that are compressed and sent to a specialist center resulting in a near-doubling of newborns delivered by skilled health care workers (Ross et al., 2013).

The telemedicine applications generally use telecommunication and/or networking technologies to remotely provide health care services. The overall acceptability of an application or service, as perceived subjectively by the end-user is referred to as Quality of Experience (QoE) and depends on Quality of Service (QoS) provided by underlying communication systems (Ullah, Fiedler & Wac, 2012). To the best of our knowledge, there exists no systematic study conducted in Senegal as well as in other Sub-Saharan African Countries to assess the QoS and QoE of telemedicine systems, solutions or applications. Therefore, there exists an opportunity to investigate/assess the overall level of QoE experienced by the users of telemedicine systems in Sub-Saharan Africa. This research study conducted in Western Africa aims to assess the performance of telemedicine system by measuring the network QoS and end-user QoE.

The remainder of this paper is organized as follows: Section 2 begins with a short tutorial in order to point the background and contexts in the scope of this work followed by related work on regulatory aspects of telemedicine in Sub-Saharan Africa and state-of-the-art of QoS and QoE in telemedicine domains. Section 3 presents study objectives, material, and methodology for conducted research. This section further focuses on experimental work and data collection conducted in two West African countries: (1) Mali and (2) Senegal. Section 4 presents and discusses the results of on-site testing. Section 5 concludes the research work and states some open questions which can be considered by forthcoming work.

2. BACKGROUND AND RELATED WORK

2.1. Background and Context

The World Health Organization (WHO) defines telemedicine as "The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using Information and Communication Technologies (ICT) for the exchange of valid information for diagnosis, treatment and prevention of

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