

# Usability evaluation of the MuTI rural telehealth system

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**Abstract—In South Africa, ICT and ICT services are currently available only to a select portion of the population. The acceptance of mobile phones in rural areas has proved that if such services are truly made available and affordable they will be utilized effectively. Bridges.org and UCT’s MuTI project have shown that technologies such as VoIP and WiFi can be effectively applied and accepted in a rural context provided that the technology is applicable and useful in the target user’s daily life. This paper discusses the future direction of the MuTI project in terms of the usability of the system interfaces and the information requirements for effective rural hospital-clinic collaborations.**

**Index Terms— ICT development, user interfaces.**

## I. INTRODUCTION

South Africa in many ways reflects the current world situation with regard to distribution of ICT and ICT services, in that only a very small percentage of the population can afford to access them. The split between those who have access to ICTs and the related ICT services and those who do not is commonly termed the ‘*Digital Divide*’. Many believe that in order to uplift third world, poverty stricken nations the ‘*Digital Divide*’ must first be closed or conquered, essentially providing information access as a precursor to education and ultimately the empowerment of the community.

Bridges[1] have been actively researching possible solutions for developing world ICT problems. One of their key findings was that successful, pre-packaged solutions from developed nations must be re-evaluated in accordance with an understanding of the local needs and conditions of the third-world, target area before being deployed. This initiative was further developed into the ‘*Real Access*’ and ‘*Real Impact*’ criteria presented by Bridges[1]. It states that ICT development planners must evaluate whether the proposed solution aims to truly help the target user’s access and use ICT in their daily lives or if it is just a useless developed world technology accessory.

## II. BACKGROUND

### A. MuTI rural tele-health system

Chetty et al. developed the MuTI[2] rural tele-health system, a project that utilised technologies such as VoIP and ‘*store and forward*’ messaging in an ICT development type application. Their research incorporated extensive field research in order to fully understand the needs of the target

users, the doctors and nurses, as well as the environmental and cultural context in which the system would be deployed.

They found that the extensive distances between hospitals and clinics, as well as unreliable communications and power networks demanded a creative solution to aid the current doctor-patient consultation process. As mentioned VoIP together with a ‘*store and forward*’ messaging framework resulted in a custom solution that compensated for such service delivery obstacles.

At present the MuTI framework has been deployed in the field on an outdoor WiFi network between a hospital and clinic in the rural Eastern Cape and currently provides a multi-modal communications platform tailored for use in a rural tele-health setting. The forthcoming phases of MuTI project will focus on the user interaction paradigm, in particular how the tool can be incorporated into the daily workflow of the doctors and nurses. Dourish[4] believes it is essential that information seeking activities should be seamlessly integrated into the daily work processes of the doctors, nurses and the hospital lab technician. Such integration is essential when considering that the healthcare workers taking part in the MuTI project have busy work schedules as a result of high patient to doctor/nurse ratios and thus do not have time for additional consultations via a tele-health system, especially *synchronous* or ‘*online*’ interactions.

The MuTI framework also provides features that cater for *asynchronous* or ‘*offline*’ interactions between the doctors and nurses. This is an essential feature when considering that their schedules may rarely be synchronized for any ‘*online*’ form of tele-consultation. It is clear that such offline collaborations will require additional attention and thought. In particular the difficulties associated with creating user interfaces that allow efficient information capture, by the nurses, yet providing sufficient levels of granularity for accurate diagnosis by the doctors.

The emphasis of the MuTI project now shifts from the communications framework to a purely user centric focus, that is the design of user interfaces that cater for ‘*online*’ and ‘*offline*’ collaborations and information sharing between users of varying cultures and computing backgrounds. In addition nursing staff rotations and redeployment may result in situations where ‘*untrained*’ nurses are required to utilize the MuTI system thus requiring an interface that presents sufficient familiar usage cues that have been learnt from other communication technologies such as cellular handsets. The idea here being not to replicate or reproduce a mobile phone solution but to create a solution that maintains the broader communication concepts such as a voice mail message, phone book and message inbox.

### III. PRELIMINARY FINDINGS

#### A. Field trip #1 – March 2005

The findings from recent field work (15-22 May 2005) revealed two separate yet equally important information paths that exist between the remote clinic nurses, a doctor and the hospital lab technician. Once every three weeks the mobile doctor visits the Lwandile clinic to see patients and draw samples i.e. blood, urine and sputum. The samples return with the mobile doctor to the hospital that afternoon and are analysed the next day by the lab technician. In most cases the test results are available the next working day but resultant delivery may only occur after 7-21 days thus delaying the initialisation of any medication programs.

Extensions to the MuTI's 'offline' messaging format as well as the development of separate user interfaces for the creation and dissemination of test results may result in the sample analysis turnaround time being reduced from as much as 21 days down to a few seconds. The Eastern Cape department of health has identified the sample result turnaround time as one of their quality of service indicators and thus justifies this information path as one of high priority.

The second information path represents the referral process of patients, by the nurses, to the hospital. Currently the referral information is documented in a patient's personal history book that resides with the patient. Digitally recording the patients condition at the time of referral with the MuTI and then forwarding the information thread to the hospital ahead of the patient will provide the hospital with valuable information about the progression of the patients condition. The hospital may use the data for possible predictions of expected patient numbers and documenting the delay between patient referral and arrival at the hospital or possible non-arrivals.

#### B. Field trip #2 – May 2005

The second field trip consisted of a 7 day complete rural WiFi network installation. This included two endpoints and two routing points that accommodated for the topography of the area. Initial test results were promising with VoIP and video communication working exceptionally well over the 15km long link.

### IV. OBJECTIVES

As mentioned, future work on the MuTI project will be user centric, with the goal of discovering what type of interface hardware and GUI components will allow effective technology acceptance and usage by the doctors, nurses and lab technicians. The research objectives for the forthcoming phases of the MuTI project can be summarised as

1. Evaluate the effectiveness of existing, developed world usability principles in a rural healthcare context with the aim of understanding why certain concepts are successful as well as those that are not.
2. Implementation of message thread visualization techniques similar to those used in the LifeLines[7] project in the mid 90's. It is important that the doctors and nurses at the hospital are presented

with all the necessary information about a referred patient quickly and succinctly. Once again a developed world solution will be evaluated for its effectiveness for users with little experience with computers or computerized data.

3. The hospital and clinic nursing interface will be ported onto a mobile device such as a PDA. Such a device will allow the nurses to have patient information and test results with them at all times, whether they are in the dispensary looking for the prescribed medication, in the patient waiting area or in a consultation room. Valuable information concerning the factors affecting technology acceptance and trust will be gained, especially when considering issues such as reliability and applicability.

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