
Communication and Computing in Health Facilities of Southwest Uganda

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Abstract

Mobile phones are often pitched as *the* solution for Africa's development. This study examines the social changes entailed by the introduction of new technologies into a health subsidy program, and compares mobile phones and netbooks side by side in Southwest Uganda as potential health information management devices for private health facilities.

Keywords

HCI4D, ICTD, mobile phone, netbook, healthcare, OBA

ACM Classification Keywords

H.5.2 User Interfaces, User-centered Design

General Terms

Human Factors

Introduction

Mobile phones and the Internet have remarkably changed our daily lives, how we socialize and work. While some of these changes may be positive, many studies also find that the use of Internet in the workplace also results in the loss of productivity. With the rapid uptake of mobile phones and Internet in Sub-Saharan Africa, it remains to be seen whether these same patterns will hold. No matter what the outcome,

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it is clear that the introduction of new information and communications technologies (ICTs) will change communication and information management patterns.

Mobile phones, proposed as ICT interventions for healthcare in Africa are often used for data collection or data dissemination devices, either supporting epidemiology (study of the spread of diseases) or health education [6][7], 0. The devices range from basic, inexpensive phones that support short 160-character messages (i.e. SMS messages, text messages) to more expensive smartphones that support touchscreens, heavyweight applications like Microsoft Office, and Internet access, and often incorporate a camera. While the former are affordable by the health facilities but limited in capability and usability, it is questionable whether the latter is affordable without continued donor/researcher support; their cost is comparable to, possibly exceeding, that of a computer.

This study examines the social and economic changes that occur around ICTs as they are incorporated into a health program that subsidizes reproductive health care in private health facilities throughout Southwest Uganda. With a subset of facilities, we are also setting up a controlled comparative study to examine usability and device preferences, training the facility staff on both smartphones and laptops, and permitting them to choose between the two platforms as part of the study.

Background

In theory, healthcare in Uganda is free. Patients can go to government health facilities, see a health worker, and receive drugs for treatment. If necessary, they are referred to a local hospital for specialist treatment.

However, in reality, seeking treatment at a government health facility entails walking up to 10km, only to find that the health worker has gone for training or then waiting several hours to find that the facility is out of stock. As an alternative, many Ugandans choose instead to seek treatment from private alternatives – either herbal remedies during lean times, or from private health facilities when more money is available. [1,[2]. The result is that many health conditions go untreated for long periods, or mothers or infants die unnecessarily in childbirth.

The Uganda Output Based Aid (OBA) project seeks to address this by subsidizing treatment of sexually transmitted infections (STIs) and antenatal and child delivery services through private and NGO-funded health facilities. Patients purchase vouchers from community based distributors (CBDs) for 3000 Uganda Shillings (UGX), a little more than USD 1.50, which are then given to health service providers (HSPs, i.e. the health facilities) in exchange for treatment. The HSPs then submit the voucher and a copy of the patient visit record to claim payment for the visit from the OBA management agency (MA). This primarily paper-based process entails a lot of paperwork, and is subject to significant user error, with financial penalties entailed. With frequent power outages and varying mobile phone network coverage one of the primary ongoing issues in the project is communication between the MA and the HSPs. The MA often resorts to in-person visits to follow-up on or verify information communicated over the phone. However, the program involves people from a widely dispersed geographic area, including the head office of the MA in Kampala, the capital of Uganda, 270km northeast of Mbarara, the trading town around which most of the project is based, and where the

project offices are located. In-person visits to health facilities are costly and time-consuming.

We are working with the OBA management agency to understand how the use and introduction of ICTs within the HSPs improves program management within the project. Our prior work has piloted the use of mobile phones for claims processing; however, further observation and initial results from the baseline study have resulted in a broadening of study scope, which now also incorporates the use of netbooks for claims processing and general purpose health information management. We also examine how their recent deployment of a web-based bulk SMS system has affected the administration of the OBA project, how it has been received by the service providers, and how their perception of the service and the OBA project changes over the course of the study.

Methods

The primary work of this study is being conducted over a two-year period, from August 2008-August 2010. An initial two-week visit was conducted in Summer 2007, with a follow-up survey over three weeks in November 2007. We did a 5 week pre-pilot deployment in August-September 2008, followed by a 2 week visit to assist with the selection of a database vendor for the MA claims processing system in November 2009. From January 2009-March 2009 the researcher has been situated onsite in the MA offices as an information technology consultant.

There are two types of research sites in this study, the MA, and the HSPs. In both types of locations, we do participant observation, document collection, and semi-structured interviews. In addition to observing their

everyday use of ICTs (e.g. normal mobile phone and computer use, the deployment of onsite claims processing database in the MA), as an ICT consultant we also introduce new ICTs in the form of software and hardware to the project. To study overall changes in the project, we conduct periodic surveys consisting of both structured quantitative questions and semi-structured qualitative questions.

At the time that the baseline study was conducted (September – November 2009) there were 83 facilities participating in the Uganda OBA project, 37 treating patients for STIs through the HealthyLife program, and 52 overseeing mothers through the HealthyBaby program (6 facilities are participants in both programs). Although we visited most of these facilities, we were only able to acquire survey data from 59 facilities. As a result of recent expansions in geographic coverage area, there are currently 106 facilities participating in the Uganda OBA project (81 HealthyBaby, 25 HealthyLife).

Based on the results of the initial baseline survey, we are also working with a subset of the health facilities on a controlled pilot study around the mobile claims processing system, Claim Mobile [5]. 19 facilities were selected as being eligible for the pilot based on pre-qualifiers (they were required to be active participants in good standing in the STI component of the OBA project), and further divided into two groups based on level of computer knowledge. The "A" group checked email more than twice monthly, had computers in the facility, or had prior training in Microsoft Office, while all others fell into the "B" group. From there 4 facilities have been selected randomly from the A group to participate in the pilot, and 4 facilities have been

selected randomly from the B group. The remaining facilities will serve as a form of control group, although it is clear that they will communicate with the other facilities.

Deployment

Each intervention facility will be provided with a Palm Treo 680 mobile phone (~200USD), and an Asus EeePC 10" Netbook (~350USD, including accessories) running Windows XP and Microsoft Office, with three exceptions. Two facilities already have computers, and will be provided with only the mobile phones, and the capability to connect the existing computers to the Internet. Two facilities randomly selected do not have access to grid power. In both cases we have deployed solar power to supplement their power needs. The WE CARE Solar kit includes two 200W panels and is sufficient to power the EeePC, phone, and lighting for one health facility. However, the Barefoot Power 5W PowaPak is sufficient only to charge the phone. So, a third facility will have one phone and no computer.

Sustainability

It is important for the design of this project that we ensure that it is sustainable. As a result, we incorporate a financing component into the research, which is also used to help understand how device preferences play out against real purchasing decisions. After two months of training on the use of the phones and the computers each of the facility proprietors will be given the option to enter a binding lease plan for either the mobile phone or the netbook, or both. We hope to find out in this study how this value will actually play out against real purchasing decisions: laptops vs phones, Internet subscriptions (45USD/month) vs pay per kb Internet use. In

addition, we will observe over time how the health facilities and the Uganda OBA project MA will make use of their ownership of these devices, and how the new uses play into relationships, communications, and the management of the OBA program in general.

Software

We are working with the HSPs to develop a library of software and electronic documents (open source and freeware) that would be useful for healthcare providers in Uganda. This includes:

- A php and mysql-based web application for searching and navigating downloaded medical library e-books (netbook only)
- Electronic copies of Hesperian's books, including Where There is No Doctor [4] and A Book for Midwives [3] and other medical textbooks (both)
- Medical Calculators (both)
- Freeware typing tutor software (netbook)
- Electronic Bible and Quran reference software (both)
- Audio media, including some of Barack Obama's speeches (both)
- Microsoft Office Templates for Patient Registers, Drug Inventory, Accounts (both)
- Freeware file system backup software
- Anti-Virus software
- Claim Mobile Software [5] (both)

Of course, it is not sufficient to hand a computer loaded with software to new computer users and expect them to use it. We are working in collaboration with the Institute of Computer Science at Mbarara University of Science and Technology to develop a training program

for the HSP staff to effectively and safely use the netbooks and mobile phones, and to recover their systems in case they are compromised. The training program consists of workshops, in-person training sessions, and a written guide with health-facility oriented examples on the use of the applications. Over the course of the study we will visit each facility on a regular basis and track their usage.

Phone Usage Log Entries	
Date	Date of Log Entry
Battery	Morning Battery Level Evening (7pm) Battery Level Did You Charge the Phone? Charge Location
Usage	Did you use the Internet? (describe) Other Applications Used/Notes
Phone	Calls Made (count) SMS Sent (count) Airtime Loaded (UGX)
OBA Claims	SMSes sent from OBA MA (count) Claims Entered (count)

Preliminary Analysis

While some work has been done, including a baseline survey, and a pre-pilot study, we are in the preliminary stages of the deployment, as well as the analysis of the baseline survey. Results from the pre-pilot study can be found in [5].

Baseline Survey

The baseline survey was intended to gather information about the individual health facilities, the mobile phone and ICT use of the proprietors, their financials, and their perceptions of the OBA program. While we have not yet conducted a full statistical analysis of the data, we can draw some numbers out of the survey.

Topic	Question	Result
Mobile Phones	Average Airtime	20,000 UGX
	Spending	(10 USD)
	Internet Use	12/59 (20.3%)
	Average SMS Sent	8.84
	Mobiles Owned	1.47 (mean)
	Mobile SIMS Owned	1.93 (mean)
Computers	Available in Facility	17/59 (28.8%)
Internet Usage	Distance	15.8.km (mean)
	Freq of Use:	
	- Every Day	8/59 (13.6%)
	- Weekly	13/59 (22.0%)
	- Monthly	18/59 (30.5%)
- None	20/59 (33.9%)	
Finances	Monthly Profit	
	- Non-Profit HSPs	16/55 (29.1%)
	- For-Profit HSPs	875,770 UGX (450 USD)
	Comp. Lease Payment	(willingness to pay per month)
	- <100,000 UGX	17/59 (28.8%)
	- 100,000 UGX	24/59 (40.7%)
	- >100,000 UGX	12/59 (20.3%)

Based on an initial analysis of these results, we can observe that it is feasible for the HSPs to make monthly payments of about 100,000 UGX (50USD) per month for the mobile devices. About one third of HSPs don't have email address, another third check email monthly, a little more than a fifth check weekly, and those with Internet access in the health facility check every day. HSPs must travel an average of 15.8km to the nearest location with Internet access, paying about 3000UGX (1.50 USD) per hour for Internet use in cafes in the nearest major town center.

We will conduct further analysis on this and additional data to see if there are any correlations between the

factors. In addition, we will conduct follow-up surveys to examine trends in both the quantitative and qualitative observations over time.

Deployment

The equipment has been deployed in three HSPs so far, with positive reception in all three locations. However, additional training and oversight is necessary. We found that computer-based logs were not being maintained, and thus it has become necessary to mine for usage data, and to introduce paper-based recordkeeping. Primary initial usage is reading the provided e-books, and brief practice sessions with Microsoft Office applications. In addition, there has been some demand for training on taking photographs of patient cases and emailing as attachments to the OBA Project MA staff. The MA has also introduced a MS Word based monthly report for the HSPs to use to email back to the MA each month.

Initial Conclusions

While it is early to draw any conclusions from the data gathered thus far, this study endeavors to reflect on the role of ICTs for healthcare in Africa, and to further reflect on our role as researchers introducing new technologies into these contexts.

As a result of our baseline study, we have shifted our mobile phone deployment to incorporate the deployment of netbooks, and corresponding computer training programs. It is the perception of HSPs that the use of computers will help them save time, and they have expressed great interest and willingness to invest in computers. Given that many research projects directed towards rural healthcare emphasize the benefits of mobile phones over computers, we hope to

discover over the course of the study whether their perceptions change, and they might find that mobile phones may be a more useful or affordable investment.

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