

Initial fieldwork for LWAZI: A Telephone-Based Spoken Dialog System for Rural South Africa

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Abstract

This paper describes sociological fieldwork conducted in the autumn of 2008 in eleven rural communities of South Africa. The goal of the fieldwork was to evaluate the potential role of automated telephony services in improving access to important government information and services. Our interviews, focus group discussions and surveys revealed that Lwazi, a telephone-based spoken dialog system, could greatly support current South African government efforts to effectively connect citizens to available services, provided such services be toll free, in local languages, and with content relevant to each community.

1 Introduction

There is a growing interest in deploying spoken dialog systems (SDSs) in developing regions. In rural communities of developing regions, where infrastructure, distances, language and literacy are barriers to access, but where mobile phones are prevalent, an SDS could be key to unlocking social and economic growth (Barnard et al., 2003). Some notable recent studies in this field include “Tamil Market” (Plauché et al., 2006) and “VoiKiosk” (Agarwal et al., 2008). Both were kiosk-based SDSs providing agricultural information that were tested in rural, semi-literate communities in India. Nasfors (2007) also developed an agricultural information service, aimed at mobile telephone users in Kenya. “Healthline” was evaluated by a small set of community health workers in Pakistan (Sherwani et al., 2007), who had trouble with the voice-based interface, presumably due to their limited literacy. In a more recent study, Sharma et al. (2008) evaluated a SDS designed for

caregivers of HIV positive children in Botswana. The researchers found that the users performed equally well using touchtone as speech input, when navigating the system. In the current paper, we expand on this body of work by investigating the potential role for SDSs in connecting rural citizens of South Africa with government services, such as free education opportunities and stipends.

South Africa is the leader in Information and Communications Technology (ICT) in Africa and has the most developed telecommunications network on the continent (SA year book 2006/2007: 131). In particular, mobile phone usage has experienced massive growth due in part to its accessibility by non-literate people and its “leapfrog” development, which skipped the interim solutions adopted in the developed world (Tongia & Subrahmanian, 2006). The amount of mobile phone users in South Africa is an astonishing 30 million people - out of a total population of 47 million (Benjamin, 2007). The percentage of both rural and urban households with mobile phones tripled from 2001 to 2007, while “landline” use declined. The accessibility and widespread use of mobile phones make SDSs a good candidate for low-cost information access.

In South Africa, there are eleven official languages. Private companies, NGOs and government offices who wish to reach South Africans through print or audio, find it extremely costly to do so for each language. Heugh (2007) shows that in terms of speakers' proficiency, there is no single lingua franca for South Africans (see Figure 1). In fact, in 2001, only 3 million of 44 million South Africans were English speakers, the language in which most government messages are currently disseminated (Household survey 2001).

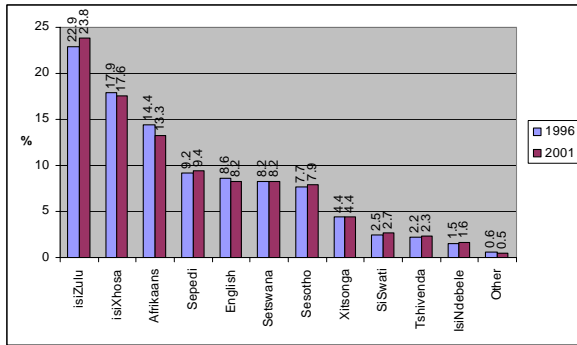


Figure 1: Percentage of speakers per language in South Africa.

Heugh (2007) reports that between 35% and 45% of South Africans above the age of 16 cannot read or write. Illiteracy is disproportionately high for women and for people living in the primarily rural provinces: KwaZulu-Natal, Limpopo and Mpumalanga. Mobile phone use is widespread in these areas among semi-literate citizens and speakers of all languages.

Communities in rural areas struggle to access government services due to their remote locations. Most community members must travel long distances by foot or rare and costly public transport to access basic services. In their longitudinal household study on costs and coping strategies with chronic illnesses, Goudge et al. (2007), for example, found that people in rural areas of South Africa do not go to free health care facilities because they cannot afford transport.

NGOs face the same challenge when trying to reach rural populations. Many produce information to assist households affected by HIV/AIDS, for example, but most of the materials are published on websites; the cost of providing multilingual print materials is often too high. Due to low literacy levels, language, and a lack of infrastructure, the information remains inaccessible to the people who need it, especially those living in rural areas and townships (Benjamin, 2007).

Given the well developed mobile phone network and the relatively sparse alternative options in rural South Africa, the authors believe that multilingual SDSs can provide a low-cost solution to improving the ICT access of citizens who may currently be excluded from government services due to language, literacy and location. However, it is imperative to

understand the target users and their environmental context as a first step to designing such a system (Nielsen, 1993). In this paper, we provide background on the current state of rural government service delivery in South Africa and introduce the Lwazi project. We describe our field methods, and finally, we present our findings from the initial field work with design and deployment implications for the Lwazi system.

2. Background

In South Africa, rural citizens are faced with a lack of economic activities and limited access to resources. The South African government is aware of both the need to improve citizen access to services and the specific challenges that rural communities face.

In this section, we note two successful rural initiatives of the South African government (Section 2.1) and we describe Lwazi (Section 2.2), a SDS designed to augment government's accessibility by eligible citizens.

2.1 Rural Initiatives in South Africa

Two national efforts that are successfully connecting rural South African citizens to government services are (1) The Thusong Service Centres (TSCs) and (2) Community Development Workers (CDWs).

Thusong Service Centres (TSCs), formerly known as MPCC (Multi-Purpose Community Centres), were initiated in 1999 as a national initiative to integrate government services into primarily rural communities, where services and participation by citizens was limited due to the long distances they needed to travel (TSC 2008). In June 7, 2008, the 100th TSC was opened. Each TSC is a one-stop centre providing integrated services and information from government to rural community members close to where they live.

Community Development Workers (CDWs) were formed in 2004 as a national initiative to further bridge the gap between government services and eligible citizens, especially the rural poor (CDW 2008). CDWs are members of rural communities who are trained and employed by the Department of Public Service and Administration (DPSA) under the office of the presidency. They work within their communities and coordinate with municipal and provincial offices. The primary responsibilities of a CDW is

to keep informed, notify citizens about events, and inform them about services for which they are eligible then follow up to ensure they successfully receive these services.

2.2 Project Lwazi

As part of the ICT initiative, an ambitious, three-year project is currently being conducted by the Human Language Technology (HLT) research group under the Meraka institute, at the Council for Scientific and Industrial Research (CSIR) in South Africa. This project is funded by the South African Department of Arts and Culture to develop a multilingual telephone-based SDS that would assist South African government service delivery. “Lwazi,” derived from the IsiZulu word for *knowledge*, aims to make a positive impact in the daily lives of South Africans by connecting them to government and health services (Lwazi, 2008). The ability of SDSs to overcome barriers of language, literacy, and distances led the Lwazi team to explore a low-cost application that would support the current rural initiatives mentioned in 2.1.

3. Method

First, we consulted previous research on development and technology in South and Southern Africa. We reviewed the most recent census conducted (Statistics SA, 2007) for data on infrastructure, income, language, and technology use.

Then, eleven communities were visited by small, interdisciplinary teams of researchers over a period of 3 months in 2008. Of these eleven centres, two were in peri-urban societies another two in urban and the rest were based in rural communities (Table 1). In each visit, the Lwazi team gained access to the community through the Thusong Service Centres (TSC’s) manager. These individuals provided materials, office space, and meetings with CDWs and key people at the TSC.

We conducted between one and five key informant interviews at each site with the TSC employees, CDWs, and community members. In four of the eleven sites, we also conducted a focus group discussion. In two sites, we shadowed a CDW during a typical day. We visited farms, day-care centres, churches, markets, youth centres, clinics, businesses and households.

Community	Type	TSC	CDWs
Sterkspruit	Rural	Yes	Yes
Tshidilamolomo	Rural	Yes	Yes
Botshabelo	Peri-urban	Yes	Yes
Kgautswane	Rural	Yes	Yes
Waboomskraal	Peri-urban	Yes	No
Durban	Urban	No	No
Orhistad	Rural	Yes	Yes
Sediba	Rural	Yes	Yes
Atteridgeville	Urban	Yes	Yes
Laingsburg	Rural	Yes	Yes
Vredendal	Rural	Yes	Yes

Table 1: Sites visited in Spring 2008.

Data collection in these communities was primarily to investigate the suitability of the Lwazi SDS and to determine key user and contextual factors that would drive its design. In particular, we sought to:

- Gather rural community information needs.
- Investigate how people currently get information.
- Determine which cultural factors would impact the Lwazi system.
- Determine level of technical competency.
- Gauge interest in a low-cost SDS that improves access to government services.

4. Results

In this section, we present our overall results from field visits in eleven communities of South Africa (Section 4.1). In particular, we report on factors that influence the design and potential uptake of the Lwazi system in this context: the information needs and sources (Section 4.2), cultural and social factors (Section 4.3), suitability of the technology (Section 4.4), and user experience (Section 4.5).

4.1 Overall Results

The eleven communities we visited were located throughout seven of the nine provinces of South Africa. They varied greatly in available infrastructure and languages spoken. They shared an economic dependency on nearby cities and, in

some cases, reported social problems. These communities also share a dependency on government social grants.

During interviews and focus group discussions with government employees and community members, interviewees identified what they perceived as the primary problems in their communities. Across all eleven sites visited, unemployment was most often reported as the primary problem (Figure 2). In fact, our team observed that in at least 8 of the sites visited, the community's livelihood was entirely sustained by government grants.

After unemployment, access to health and social services was viewed as a primary problem in six of the sites visited. Crime and substance abuse were also reported as community problems.

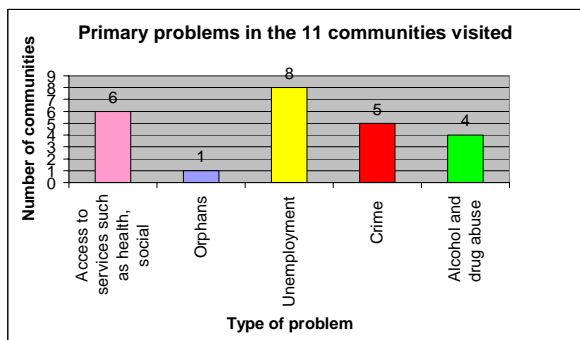


Figure 2: Number of the eleven communities that site these as primary problems in the community, as reported by interviewees.

There are four mobile providers in South Africa namely Cell-C, MTN, Virgin Mobile and Vodacom. The two landline companies, Neo-tell and Telkom are not familiar in the communities visited by Lwazi team. Community members prefer and use mobile phones because of ease of use and accessibility. Figure 3 illustrates the use of mobile providers in the eleven visited communities.

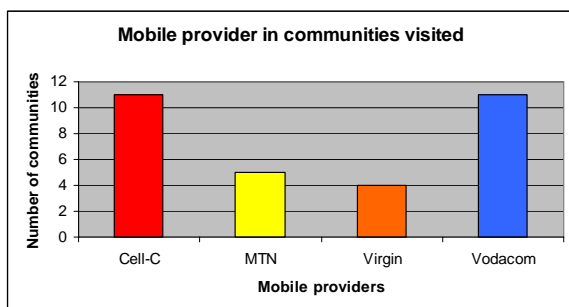


Figure 3: Mobile provider in communities visited

4.2. Information Needs and Sources

The majority of communities visited reported lack of economic activity as the primary problem in the community, and as could be expected, we observed very high levels of unemployment. Grants are offered by the South African government to address the imbalance and stimulate the economy of these areas. There are six types of grants, namely: War Veteran grant, Old Age grant, Disability grant, Care dependency grant, Foster care grant and Child support grant. Citizens can apply for these at their nearest local South African social security agency (SASSA) or district office.

Figure 4 shows that all eleven communities visited received Vukuzenzele magazine, a monthly government information sharing medium. This is however not effective in these communities where literacy levels are low. This, as mentioned earlier, is one of the problems the government is trying to address. The second commonly used source of information was the CDWs. This is a useful source because they are the 'foot soldiers' of the government; they are responsible for door to door visits, collecting and delivering information.

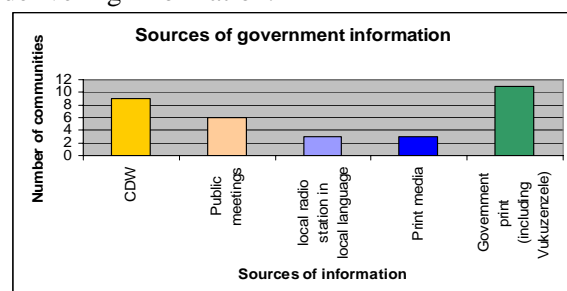


Figure 4: sources of government information

At the time of the visits, the eleven communities received information from the Thusong Service Centres. Government departments, NGOs, municipalities and research institutes such the CSIR, used the TSCs as a platform to disseminate information. At a more grass roots level, African communities in South Africa share information by word of mouth. Local radio stations and newspapers in local languages are also important sources of information.

4.3 Cultural and Social Factors

The population in the communities we visited consists mostly of older people taking care of grandchildren whose parents work in nearby

cities and visit only once or twice a year. As we have previously mentioned, the lack of economic activity means that these communities depend heavily on government social grants. Older people in these communities are often unable to read and write. In some cases, their low literacy levels and possible unfamiliarity with technology restricts their ability to use the cheaper “texting” feature of their mobile phones. In the communities we visited, ten out of the eleven official South African languages were spoken. Each community typically spoke two or more languages. A Lwazi system that delivers information about SASSA services would be more accessible to the older, rural population than current print methods; the proposed system would support a majority of the eleven languages in order to offer a better information channel.

4.4 Suitability of Technology

The research prior to the design of the Lwazi system investigated how to ensure that the proposed system will be suitable to the lifestyle of the community to be served. We do know that currently, communities have other means of accessing government information, including the free “Vukuzenzele” monthly magazine and local radio stations. Like these current means, Lwazi must be free in order to be effective and it must contain content that is locally-relevant to these peri-urban and rural communities. Government departments will find Lwazi to be a very useful and low-cost way of disseminating their information. Rural South Africans will benefit from the alternative source of critical information.

4.5 User Expertise

We also sought to evaluate the current expertise of potential Lwazi system users with telephony and other ICT technologies. The user expertise of telephony systems differ between young and old. As mentioned earlier, households have at least one cell phone. The older members of the community use it to call and receive calls from friends and children in neighbouring urban areas. They do not know how to send text messages. Some children have saved the full ‘Please call me’ line as a quick dial so that their elder family members can just press it in cases of emergency.

The young people on the other hand are well versed with telephony technology. Most of them

are also familiar with the basic use of a computer, despite their limited access to them. The Lwazi system must be as simple as making a phone call to a friend or relative in order to be accessible to all. In most households, however, there is someone who is technically competent. Based on our fieldwork and recent user studies of SDSs in developing regions, a Lwazi system could be useable in the rural context of South Africa, especially among the elderly and those who do not read and write.

5. Discussion

5.1 Potential Uptake

We saw two main areas where a telephony service could be very useful. The first is in supporting communication between community and government. For example, a multilingual, automated service could direct calls from community members to the appropriate TSC office or CDW, or perhaps provide locally-relevant information such as office hours of operation, directions to the office, and eligibility requirements for services. Such a service might reduce the amount of calls that a TSC office or CDW would need to take personally. It could also likely save a community member a trip if they were sure beforehand what paperwork they needed to bring and when the office was open. It is important to mention here that the project will require a buy-in from the local councillors of the communities we will be piloting in.

The second area in which a telephony service could be useful would be in facilitating internal communication among government service providers. CDWs may need to meet community members face to face whenever possible. Coordinating with government staff across the municipality, district, province, or country could happen remotely and efficiently if government staff could use an automated telephony service to send audio messages to several staff members at once. The national coordinator for CDWs, for example, could notify every CDW in the country of upcoming events and policy changes with a single phone call.

Many government officials, including Thusong centre managers, felt the system might assist them in communicating with the communities they serve. There was, however, a concern from one site that there are sections of the population that do not have mobile

connection or a reliable source of electricity to charge their phones. These could be the communities that need government services the most. In these cases, Lwazi will have to play a supportive role to the existing services provided by the CDWs, rather than allowing direct access by community members.

Our field work revealed the effectiveness of national government programs to connect rural citizens to available government services. Our major finding was that although particulars about the communities differed, individuals in the eleven communities visited experienced barriers to information access that could be mitigated with automated telephony services, provided that such services are toll free and localized to the language and information relevant to the particular rural community. Whereas infrastructure such as roads, services, and in some cases, electricity were limited, the mobile phone network of South Africa is reliable and widespread. We feel optimistic that the Lwazi system will build on the available infrastructure to transcend the barriers of geography and improve the connection between citizens and services.

5.2 Challenges

In a large and culturally diverse country such as South Africa, deploying a SDS intended to provide universal access is a great challenge. Designing for any given user group often requires a multiple iterations of testing and user feedback. Our fieldwork revealed a diverse set of end users; a successful design will require a greater investment in time and resource to gather detailed and accurate information about rural South Africans. Although we plan to rely on our partners (TSC and CDWs) on the ground for a great deal of this information, we believe it is an ambitious goal to expect deployment of the Lwazi project in eleven languages country wide by summer 2009.

Not only is the technological aspect very ambitious, this kind of national government sponsored system requires tactful management of stakeholders. The success of the Lwazi project relies on community members, government partners, researchers, NGO's, and corporate interests, all of whom have conflicting needs and interests. Our team recognizes the importance of managing stakeholder interests and has devised a problem structuring method to facilitate

feedback and discussion (Plauché et al., submitted).

Community buy-in is critical to the success of an ICT deployment. We found not only that the TSC and CDW national coordinators but also each of the communities visited were all excited about the potential of the proposed system. Generally, rural communities are comfortable with the use of a mobile phone. But there is an age difference in preference of different applications. Because Lwazi is voice-based, the senior citizens of the community will be more likely to be excited about it than the younger generations. Younger South Africans are comfortable with the cheaper, text interface to mobile phones. We recognise that Lwazi may not suit the needs of all South Africans, but we aim to make it accessible to those who are historically excluded. In doing so, we hope to have an overall impact in this country where only 26% of the population has a Matric or tertiary education (Stats SA, 2007).

6. Conclusion

In this paper we evaluated the potential role of Lwazi, a proposed telephone-based SDS, in improving rural access to important government services. The Lwazi project will create an open platform for telephone-based services for government to provide information in all eleven languages. Lwazi will be especially useful if it can reduce cost or the distances that people travel to access government services and that the distances that government workers travel to check in with municipal offices. Our team plans to conduct pilots in two communities in the summer of 2009. A successful pilot in one of these communities will then burgeon into a national service for all South Africans to empower themselves through improved access to information, services and government resources.

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