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Communicating in Designing an Oral Repository for Rural African Villages

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Abstract: We describe designing an asynchronous, oral repository and sharing system that we intend to suit the needs and practices of rural residents in South Africa. We aim to enable users without access to personal computers to record, store, and share information within their Xhosa community using cellphones and a tablet PC combined with their existing face-to-face oral practices. Our approach recognises that systems are more likely to be effective if the design concept and process build on existing local communication practices as well as addressing local constraints, e.g. cost. Thus, we show how the objectives for the system emerged from prolonged research locally and how we communicated insights, situated in the community, into the process of design and development in a city-based lab. We discuss how we integrated understandings about communication between situated- and local-researchers and designers and developers and note the importance of recognising and centralising subtle differences in our perception of acts of oral communication. We go on to show how the materiality of the software, the tablet form factor, and touch interaction style played into our collaborative effort in conceiving the design.

Keywords: design, mediation, oral, communication, repository

1. Introduction

In this paper, we describe designing an asynchronous, oral repository and sharing system that we intend to suit the needs and practices of rural residents in South Africa. Our goal is to enable users without access to personal computers to record, store, and share information within their isiXhosa-speaking community. Our approach recognises that a system to enable local communication is more likely to be effective if both the design concept and process build on existing local communication practices as well as meeting constraints, such as access to technology. Thus, we structure the paper to show how the concept for the system emerged from prolonged local research and how we communicated insights, situated in the community, into the process of developing the technical system in a city-based lab. First we introduce the community and summarise our methods to gain insight into communication.

The impoverished rural area of Mankosi, in South Africa's Eastern Cape, has a population of approximately 11,000 people spread across twelve villages. Some 80% of the Xhosa families survive on less than 10% of the median income for a working white man in South Africa and co-operate to survive [1, 2]. Families live in homesteads distributed across hills and connected by paths and comprising up to five adults and seven children. Residents, who can often trace their ancestry to the area's settlement some eight generations ago, often

move between homesteads within their village and also have extensive family networks between villages. Governance and co-ordination within and between villages occurs through an inherited tribal structure. This comprises a Headman, who oversees twelve Sub-headman, each of whose homesteads serve as sites for local administration, from hosting weekly community meetings to discuss all local matters, to resolving disputes and signing residents' proof of address documentation. Villages are, however, geographically spread across difficult-to-traverse hills and less than 1% of residents own a car, few own bikes and there is only one bus, which takes at least 2 hours to move from one end of Mankosi to the other and does not reach all villages. Thus, most people move in Mankosi by walking.

This presents significant challenges for people to co-ordinate between villages, socially and administratively. So, in 2011, as part of an international collaboration, we launched the "Mankosi Communications Mobile Phone Project", "Unxibelelwano" to support local communication in one district in Mankosi [4]. We introduced our intention to explore ways to support local communication in meetings with community members who, after extensive discussion, proposed two sites at which we should deploy cellphone charging stations along with Tablet PCs running applications to extend low-cost local communication and act as an information repository accessible to local residents.

2. Methods

One of us (Author-2: A2) has lived for a cumulative 25 months in a village in Mankosi and a village in a neighboring district since 2008 where we observed communication practices, movements of people and technology use, and to explore and deploy technologies [1, 2, 3, 4]. However, six months prior to deploying the charging stations we recruited local people as fellow researchers who could translate linguistically and culturally. Local researchers (LRs) are integral to our Ethnographic Action Research (ERA) [14] approach to identify and understand communication problems; define social practices and concepts to explore; and, devise and execute plans with the community [4]. We distributed initial tasks based on the LRs confidence in English and translation, personal disposition and interest; and, one LR (Author-3: A3) became indispensable in translating discussions with the traditional governors in meetings and in workshops and coordinating the other LRs.

Author-3 has recently become the Education Centre Manager with TransCape, a local NPO, and teaches teenagers and children in the 'after-school' program. He has matriculated from high school and has certificates from short courses in training basic computer use; but has no higher qualifications either in computers or research. LRs are informants about social structures and processes and their everyday practices, social networks, problems, interests and aspirations help academic researchers (e.g. A2) understand and adapt. LRs also continuously adapt and refine methods, according to the local situation and gather and interpret data and negotiate meanings and refocus interpretations as understandings of all participants in dialogue, planning or arrangements, evolved. Thus, A3 is critical in mediating between local and non-local understandings of requirements.

We engaged with residents in various ways to explore ways in which a system could support communication within and between villages. Our vast data set includes, but is not limited to: prolonged discussions with local traditional leaders and community members; interviews and focus groups with some 200 residents on communication practices, phone use and non-use, and specific phone services; face-to-face and remote interviews; 'diary studies' and observations on social networking services; and many gigabytes of community-generated content (photos, videos). We have run workshops with LRs, Sub-headmen, Headman's 'messengers' and community association members around the use of prototype applications; and also monitored prototype use with daily logs, ethnographic characterizations and interactive focus groups. In deploying earlier prototypes, on the Tablets at the two cellphone charging stations, we provided Bluetooth capable phones to

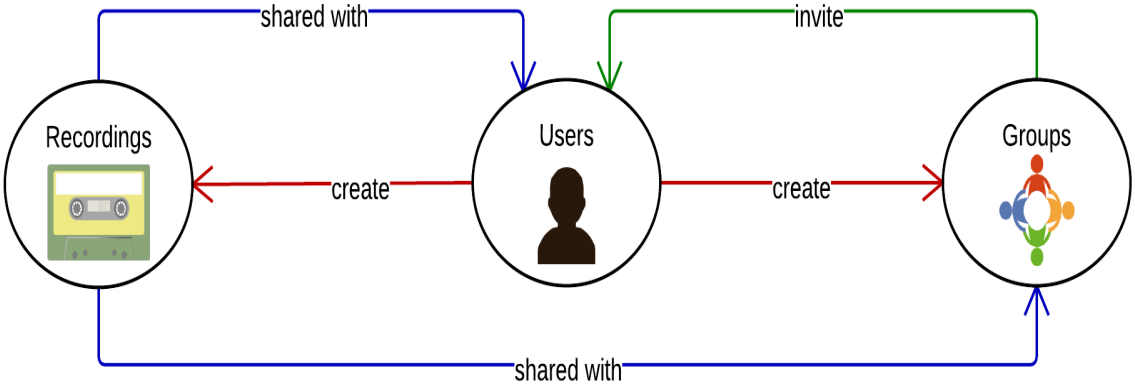
Community Association members, Sub-headman and the Headman's messengers and this revealed further insights on communication needs and how repositories of locally-generated media content might work within established mechanisms to disseminate information.

3. Oral Communication & Communication Constraints and Needs

In our workshops, interviews and earlier prototype deployments residents repeatedly noted the need to record and store voice messages, a requirement that reflects the role of oral communication in local governance and community cohesion. They often said they could archive the minutes of meetings for access by those unable to attend; publicize notices and opportunities, such as building a new clinic or the availability of temporary work on government projects; and, hold people accountable to verbal commitments, or more literally 'to stop people lying'. Such preference for voice recordings reflects how oral communication pervades daily life in Mankosi, much of which is spent outdoors and integrates extensive bonds between residents. The dominance of oral practices, over printed text, relates to the local importance of collectivity and co-operating in order to survive [1, 2]. Such collectivity involves prioritizing relationships and achieving consensus and unity. Thus residents devote significant time to talking face-to-face, be that in greetings or prolonged debate, and are at ease with platonic proximity.

The requirements to record and store voice messages also reflect local constraints on owning and using technologies, in particular cellphones. Poverty shapes Mankosi's residents' technological and written literacy in general [1] and significantly shapes access to and use of phones. In the absence of electricity, people own few technologies; some may own a radio or on rare occasions watch TV in a shebeen, but no one owns or accesses a computer, even in schools. Print literacy is much lower in Mankosi than elsewhere in South Africa, especially for older people, and often participants in our interviews or workshops said that they were "not educated to use the phone" [e.g. 4]. In contrast with the, increasingly conventional, perspective, that cellphones are ubiquitous in South Africa [8] only about 65% of people over 14 years own cell-phones. Further phone owners use, on average, airtime to the value of R5 ($0.60) per week; which, at the current lowest rate of 3c per second, is enough to speak for less than 3 minutes or send ten SMSs, or mobile text messages. Poverty also means that people tend to own low-end models; for instance, nearly 80% of the Nokia phones owned locally are 1100, 1200 and 1600 models [4]. Thus, less than half of phones are Bluetooth enabled and less than 15% have data access, e.g. to the Internet. This constrains residents' use of low cost IRC-like (Internet Relay Chat) services that are popular elsewhere in South Africa, e.g. MXit [10]. Further, low-end phones do not always show that people have a missed call when the phone is beyond coverage or switched off, and this constrained functionality combines with other access issues. Residents have no access to grid electricity so most charge their phones at 'shebeens' (informal bars in homesteads) and 'spaza' shops, where they pay on average R5.50 ($0.72) per charge. This means that they charge infrequently, so they often switch off their phones [4].

Finally, although local cellular network coverage is mostly acceptable people undertake daily duties, such as in pasture and forests, beyond coverage. A deeply embedded familiarity with other residents shapes local phone use. For instance, to avoid costs people use services such as 'Callback' which allows subscribers to request that the network send a free 10-character message. They determine suitability in sending callbacks with reference to constraints on the receiver, such as relative financial positions and illiteracy [4]. People balance the demands of co-operation, transparency and familiarity with each other's lives carefully with maintaining privacy, and this also shapes interactions with technology. People use PINs on their phones but share these within close families if they require assistance. For instance, it is typical for a mother in her 20s, who recognizes names but cannot read and write, to wait for her 13 year old daughter to walk home from school to



read messages and missed calls to her. Young people also use Callback to send highly abbreviated messages intended to their friends, but since Callback allows for creating only one message a day, people will also send this same message to others, such as a family member, who they do not expect to read the text but just be alerted by the callback [4].

4. Mediating Requirements & Implementing the Backend

Based on situated experiences and insights we (A2) specified some functional requirements for a system, which we sent to the designer-developer (A1), based in an ICT4D Research Lab. The functional requirements specification (FRS) defined the exact capabilities and functionalities of the system: how users register and then, create, delete, share, and retrieve voice recordings. For software developers the FRS describes exactly what the system should do and, through that, what the system is: an asynchronous repository and sharing system. We, the developer (A1), easily identified, while reading the document, all *Entities* and *Relationships* that need to be understood in order to develop the backend of the system.

4.1 Implementing the Backend

The system runs a 7inch Android tablet and is implemented in `Java` and `SQLlite`. The general capabilities of the system (Figure 1) have fairly simple technical requirements: users create and share recordings with other users or groups of users. Thus, we implemented the backend by creating a database of three main tables: Users, Groups, and Recordings. Then, we used join tables, to implement three many-to-many relationships between, Users and Groups; Recordings and Users; and Recordings and Groups. With the database in place, we then implemented an API to support the main capabilities of the system: creating, accessing, and sharing recordings, as well as creating and joining groups.

5. Designing the User Interface

In contrast with developing the backend, designing the user interface (UI) bought considerable challenges. The FRS adequately and appropriately specified the backend system but deliberately compressed the design of the UI into two statements: that the system should suit “close-knit impoverished South African communities” and to ensure that all interfaces are “accessible and useable by alphabetically illiterate but number literate users.” The concise statement invited reflection and interrogation. To design the recording interface we (A1) drew upon our prior experiences in designing mobile digital storytelling technologies in rural African communities, including Mankosi [3, 11, 12]. To design the sharing interface we discussed communication and sharing practices in Mankosi with the situated-researcher (A2) and to refine UIs we consulted an LR (A3) .

5.1 Recording

We started with the audio recording interface, which we modelled on an interface we developed for a text-free mobile digital storytelling application and where we found that people were generally at ease in using text-free, icon-based recording interfaces [11, 12]. In order to keep the recording interface as simple as possible we provided only recording and stopping functionalities and combine these into one button, so once a user pressed record and starts recording, the button turns into a stop button. We visually represent recording using a large green and yellow cassette tape icon in the recording interface. Once the user presses the record button we display on the tape: the user's name, the word 'Recording' in a large, red font, a timer, and a VU-meter to indicate to the user that something is happening: that the system is, indeed, recording. In contrast to our earlier design of a digital storytelling application, which ran on small, first-gen S60 phones and was driven through keypad interactions, our Audio Repository runs on a large touch screen tablet. Thus, we also adjusted to an unfamiliar, yet fascinating, form factor and interaction style (touch). This was not very problematic for the recording interfaces, as it has only recording and stopping functions; but, the sharing interface proved to be much more challenging.

5.2 Sharing

The sharing interface and interactions are the crux of the system. Sharing is what transforms this system from a mere media-store to a social application. Initially, we explored Android's built-in UI widgets as the foundation for the sharing functionality (see Figure 2). After users create a recording and press 'share', a list of registered users is shown. Users can then check-off the people they wish to share their recording with. While functional and efficient this implementation does not seem to do justice to what *sharing* actually is. By sharing, users are *giving* that recording to other people and in Mankosi such information flow through talking, physically gesturing, and/or walking. By abstracting such actions into something mechanical (e.g. checkboxes), they seem to loose most of their meanings.

We thought about what *sharing* is and how people might want to *communicate* through the sharing of recordings through the Mankosi Repository. While we can assume we know what is meant by such terms in general we must be careful to localize their specific, cultural meanings. This discourse was informed by our practice and the sensibilities we developed in our previous work. For instance, as part of our digital storytelling project, we discovered that digital storytelling in rural environments is about supporting social and oral practices, rather than just providing a means to synchronize photos to audio [3, 11, 12]. But, in contrast to our experience of implementing the backend, we found that unpacking the meaning behind concepts of sharing information, the seemingly simple task of designing the Mankosi Repository, was transformed into a range of questions, some of which relate to the very essence of what it means *to communicate* and *to be human*.

To unpack what sharing and communicating might mean in "close-knit impoverished South African communities" we needed a richer picture than the specification presented. Thus, we (A1) and the situated-researcher (A2) started to discuss the latter's experiences during her immersion in situ and engagement with residents in and around Mankosi. We talked about mediated and face-to-face communication, sharing practices, and cell phone usage. We discussed how, given the cost of airtime and charging cellphones, the system might be used in the community; what might people want to record; whether they would record purposefully or playfully; and if they would share information deliberately or spontaneously. We learnt that the Headman's messengers and Sub-headman disseminate information across Mankosi and considered likely scenarios in using the system.

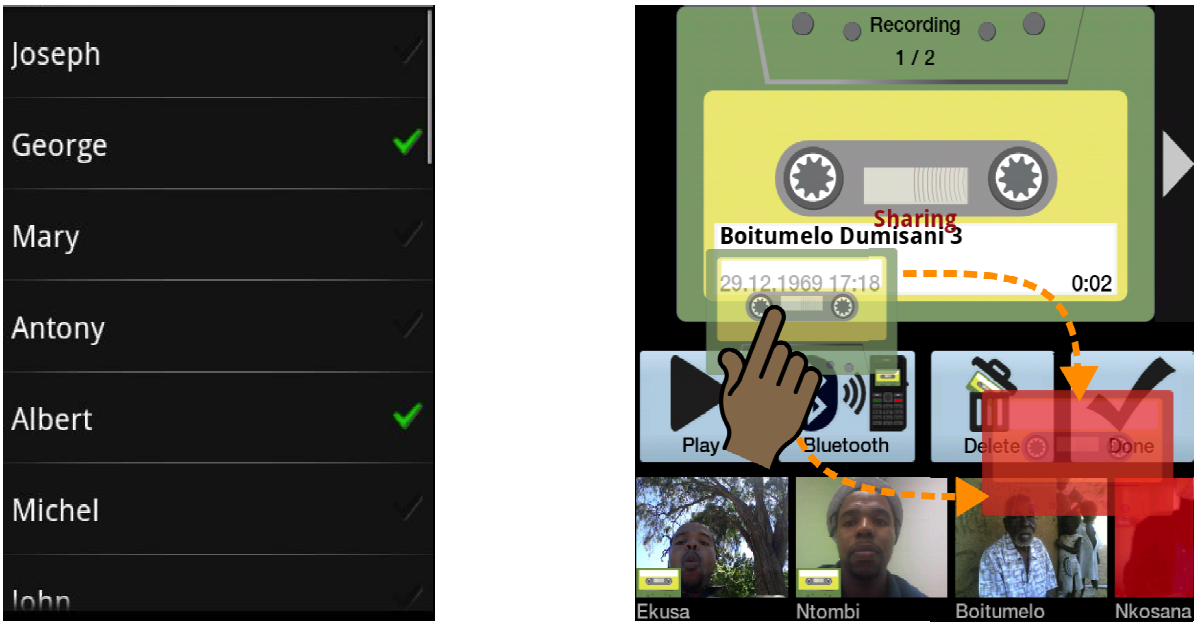


Figure 2. The initial (left) and redesigned (right) sharing interfaces.

With this information, we (A1) redesigned the sharing interface. We envisioned use of the system as a very central and deliberate activity, inspired by learning how the Headman's messengers have the responsibility to deliver messages between villages. But this information alone did not inspire the interface. It was an *interaction*, between the materiality of the software, the tablet form factor, and touch interaction style on the one hand, and the heightened awareness of community's locale and the interactions between community members that we gained in our discussions [5].

The *materiality* of the system running on the tablet afforded us design opportunities and allowed us to articulate and express in design the meanings shaped by our discussions. The comparatively large screen size and touch interaction style allowed us to revisit direct manipulation interfaces, the principle on which touch interfaces are built. The term direct manipulation refers to systems that have the following properties [7]:

1. Continuous representation of the object of interest.
2. Physical actions or labelled button presses instead of complex syntax.
3. Rapid incremental reversible operations whose impact on the object of interest is immediately visible.

But, instead of mapping direct manipulation onto largely mechanical buttons, dials, and widgets, which carry with them cultural values and assumptions [3], we designed a more deliberate and social sharing interaction (See: Figure 2). The recording is represented by a large tape; below it we show a horizontal list of all the users of the system, which are represented by their profile picture and name. To share a recording the user presses and holds (or long-presses) on the recording. The system then creates a small, semi-transparent copy of the tape, which is displayed at the position of the finger and follows the finger around. When the user moves his or her finger, and with it the scaled copy of the tape, over a person, both the tape and the picture are highlighted in red to indicate that the tape can be dropped at this position. Finally when the user lifts his/her finger, the tape drops onto the bottom left corner of the profile picture over which it was hovering and remains there, to indicates that the recording is now shared with that person. Should the user want to reverse this operation, all s/he needs do is long-press on a profile picture containing a tape. This again creates a small, semi-transparent copy of the tape. By dragging the tape out of the profile picture area, the system 'unshares' the recording from that user.

The sharing interaction fulfils all criteria of direct manipulation [7] listed above. The operation is reversible if either the tape is dropped somewhere other than over a person's picture, in which case nothing happens, or the user can 'unshare' a recording by dragging the tape outside that person's profile picture. While the list and checkbox implementation can also be considered to be direct manipulation, we hope that our less mechanical and more human interaction style, where sharing becomes a physical activity of dragging and dropping, to a degree reflects the bodily acts [9] of giving a recording to someone. We hope that this deliberate interaction style might resonate with the way acts of *sharing* actualise values important to Mankosi residents.

5.3 Localizing

To further localize the system the LR (A3), who normally lives in Mankosi, visited us (A1) in Cape Town. While we had hoped to have developed the system more prior to his visit, we had, at least, implemented the sharing interface and established the general feel and interaction style. In design, ideas, insights, feedback from prototypes, or timetables of visiting researchers often come in inopportune orders. This means that designers need to be *continuously receptive* to any and all relevant events that help them to further their understanding [5]. Indeed, the half-completed system, proved to be of great value in our discussions by acting as an object "of reasoning composed of representations and interpretations" [5]. It demonstrated and exposed some of the (mis)understandings we formed about the community. Once the LR had familiarized himself with the system, we (A1) asked him to demonstrate to us how he would introduce it to people in his community and train them to use it. Together, we interrogated the design and fixed usability and other problems as they arose. The LR projected his experience of facilitating our earlier technology endeavours in Mankosi onto his interactions with the current system, so the system enabled him to map his impressions to design patterns and also mediated many of our discussions.

We, the LR, had not visited a large city before and our conversations about the system in the context of this novelty yielded insights into designing the system to suit rural life. In using the system we found that it can be hard to identify a particular recording without listening to it. In talking about this problem, we began to discuss the differences between everyday life in rural and urban areas. Our (A1 & A3) contrasting lifestyles invited reflection, and we concluded that the anonymity of the city contrasts starkly with life in Mankosi, where people spend considerable time outdoors, to undertake domestic, work and leisure activities, and prioritise collectivist values [2]. We knew that people's familiarity with each other shapes how they determine the relevancy of messages they send and receive using cellphones [4], thus, we considered how people might use social cues to recognize recordings. We thought it would be helpful if users could see at a glance with whom a recording is shared, and thus adapted the playback and sharing interface to split the list of users into two sub-lists. The first sub-list shows all the people with whom the recording has been shared, while the second sub-list shows everybody else (see Figure 2). Both sub-lists are sorted alphabetically. Now, when users browse through their recordings, they can immediately see who a recording is shared with, which we hope will provide social clues to the user on what that particular recording is about, without first having to listen to it.

6. Conclusions

The biggest challenge of cross-cultural design and research is the diversity and extent of the distances we must traverse: geographical, economic, cultural and experiential. Here, we have shown the importance of recognizing and placing these distances at the centre of design discourse. Initially, we used feature requirements specifications (FRS) to bridge

some of this distance; but, quickly realized that, while useful to the backend-developer, such documents are too abstract to portray design challenges, let alone operationalize design. Knowledge, about systems, interfaces, or communities, cannot be assembled through hand-offs in some neutral or universal language [13]. This very concretely expressed itself in our anxiety once much of the responsibility for designing and implementing the system was handed off to the designer-developer. As designer-developers our perspective of the world, while specialized, is also partial [13] and embodied [9]. We respond to what we see as the user's world from our own perspective, shaped by our experience and knowledge of interfaces, design patterns, etc. With only the FRS in our hand, we could not proceed responsibly and, instead, searched for meaning elsewhere. We drew upon our previous design experiences and the sensibilities we developed, and most importantly we engaged with both situated and local researchers. Such engagements were mutual learning experiences and were mediated by the understandings that we had expressed in interfaces and interactions. In turn, we tried to express the new meanings we formed in new interfaces and interactions or by improving existing ones. In doing so we positioned the software as a *material of design*, and in our designs we tried to move beyond objects, features, and affordances to consider interactions, environments, and futures [5].

Communication in urban, technologized environments is often about interacting through Skype or collaborating in real-time over high-speed, low latency networks. In contrast, our system is asynchronous, deliberate, and slow. So we are eager to see how the community will interpret our asynchronous system and put it into practice. Our system is deliberately simple and designed to serve rather than impose. This also makes it flexible, which allows for differing, creative, and, to us, unexpected usage. We deployed the system in January 2012, and as community members learn to use it we are now gathering data on the ways that "new modes of expression and new communications acts evolve through use" [6] and how these expressions and communications are situated in the nuances of Mankosi's particular social system.

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