

Apps and Skits: Enabling New Forms of Village-To-Clinic Feedback for Rural Health Education

Maletsabisa Molapo
University of Cape Town
Cape Town, South Africa
+27 21 650 3551
mmolapo@cs.uct.ac.za

Melissa Densmore
University of Cape Town
Cape Town, South Africa
+27 21 650 3551
mdensmore@cs.uct.ac.za

Limpho Morie
Bophelo Haeso
Maseru, Lesotho
+27 21 650 3551
lmorie@herchancetobe.org

ABSTRACT

We present the results of deploying a feedback mechanism in a community health education project, which enables rural-based nurses to elicit feedback from rural villages in order to improve their efforts in health education and service delivery in these areas. We implemented a mobile asynchronous-voice platform, through which Community Health Workers (CHWs) in rural Lesotho report previously unknown health challenges and knowledge gaps to the nurses, who then create new digital content and redesign service delivery to address these challenges. Beyond this, we also used role-play both as an additional feedback channel and a design tool. Our results demonstrate the combined benefits of implementing creative methods for effective human-to-technology and human-to-human communication in ways that enable new forms of expression; and highlight the importance of using role play in HCI4D contexts. We also present the benefits of incorporating an effective village-to-clinic feedback mechanism in health education programs.

CCS Concepts

• **Human-centered computing** → **Interaction Design** → **Systems and tools for interaction design.**

Keywords

Role-play; feedback; community health workers; CHWs; community health education; HCI4D; asynchronous voice.

1. INTRODUCTION

There are several projects that use mobile multimedia such as video for the purposes of health education in hard-to-reach rural settings [11,16,22]. These approaches have been successful because video, being non-textual, enables the educational content to reach populations that cannot read. The missing link in these programs, however, is an effective feedback loop that connects the rural communities that consume the health content to the health professionals that plan, create and disseminate the content.

Traditional public health interventions, and even many ICTD efforts, are still top down, primary focused on getting health information to the rural population rather than also getting

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

ACM DEV '16, November 17-22, 2016, Nairobi, Kenya

© 2016 ACM. ISBN 978-1-4503-4649-8/16/11 \$15.00

DOI: <http://dx.doi.org/10.1145/3001913.3001922>

relevant feedback from the consumers of the information. In the case of The Bophelo Haeso project in Lesotho, for example, rural-based nurses had created multimedia content on varying topics for over three years. In that time, Community Health Workers (CHWs) carried the videos on their mobile phones into the villages and used them to educate the members of their communities. However, there was little feedback from the villages to the nurses on how the content was received, and how future content could be improved in order to fully address the issues that affect the communities being served.

One of the benefits of content that is produced by or in close collaboration with health professionals who are based in the rural communities is that the content can be made in local languages (linguistically and culturally local), and be specific to the information needs of the target populations [11,16,17]. By working at a village-based clinic, a nurse interacts with patients, learns their challenges, and identifies the areas in which they hold misconceptions or need further health education. While this is useful, there are hundreds of rural inhabitants who do not interact with the nurses because they never make it to the health centres (clinics), but these are people who interact daily with CHWs.

In this paper, we describe a study that sought to find ways to give CHWs a voice; to give them new channels through which they could effectively communicate, enabling them to relay feedback from the villages in which they live to the health centres where the health education content is planned and created. We present the CHW-led village-to-clinic feedback mechanism, which was achieved by role play in combination with a collaboratively designed mobile asynchronous-voice platform.

The contribution of this paper is the articulation of an effective mobile-based mechanism to support feedback from distributed CHWs to centralized nurses as part of a health education initiative, and evidence that this feedback is beneficial in terms of bringing previously unknown health challenges to the attention of the nurses, thus leading to more relevant future health education content and improved service delivery. We also demonstrate that role-play workshops in which CHWs are allowed to report experiences through user-created drama effectively supplement the technologically sourced feedback, also opening a new form of expressing valuable village-to-clinic feedback. The lessons learned from these cases can be applied by researchers working towards strengthening rural health education programs by enabling the incorporation of feedback.

2. BACKGROUND

Many in rural Lesotho still ail and die of preventable and treatable conditions, mainly due to insufficient health knowledge on care and prevention, non-adherence to treatment, and to holding on to wrong beliefs that lead to poor health choices. The Bophelo Haeso project is a health education initiative situated in rural Lesotho

that seeks to address this issue by enabling the spread of health education videos in rural villages to educate the rural public, many of whom cannot read. The videos are created by the nurses who work in rural health centres, and are carried into the villages on the mobile phones of CHWs. The nurses create content on different topics including maternal and child health, tuberculosis, HIV, other STIs, Ebola, family planning, child nutrition, hygiene, etc. The goal for the nurses is to address the specific issues and challenges that face the villages that surround the health centres at which they work, and to correct any health misconceptions they may hold. CHWs are members of their villages who have been selected to offer support health services in the villages. CHWs do not have any formal education in the health sciences, but are trained on a monthly basis by the nurses who work at the closest health centres to their villages.

The Bophelo Haeso project started in 2012, with the goal of enabling rural-based nurses to create health content for the purpose of community health education (Bophelo Haeso is a Sesotho phrase that means “Good Health for My Home Village”). In the Bophelo Haeso project, the CHWs are equipped with a Nokia Lumia smartphone, on which the Bophelo Haeso mobile application is installed, which includes a dedicated gallery and media player for the Bophelo Haeso videos. The application makes it easy for the CHWs to access the Bophelo Haeso videos, by separating them from the rest of the media on their devices [15]. By 2014, the nurses had released more than fifteen videos, and it was believed that the videos were helping to educate the public, from the CHWs’ comments in monthly meetings.

From the usage logs generated by the Bophelo Haeso application, the videos were shown more than 100 times per month across the villages where CHWs worked. However, the nurses did not know enough about the different ways in which the video content was consumed by the rural public, the contexts in which the content was used, and how people responded to it. Additionally, the nurses wanted to know if the content was addressing the real information needs of the communities they serve; they wanted to find out more about the knowledge gaps that exist in the communities, so as to tailor future content to the more specific needs and feedback of the villages they serve.

However, only a small percentage of the rural population visit the health centres and meet with the nurses; so how could the nurses discover their gaps in knowledge, or understand their daily health challenges? Through CHWs. The CHWs live and work in the villages, and interact daily with people who never or seldom meet the nurses. So if feedback from the villages was to reach the nurses, it would be by giving CHWs the tools to be the voice of their communities. This study came in, therefore, to explore means to use the existing Bophelo Haeso mobile application to capture village-to-clinic feedback, and to explore other ways in which CHWs can be equipped to express their experiences, in order to complete the feedback loop and increase the impact of the health education project. We set to investigate how asynchronous voice and role-play could give CHWs a voice in this sense.

3. RELATED WORK

While there is need to give CHWs a voice because of the integral role they play in the rural health system [5], not much work has been done to open appropriate communication channels to enable them to contribute to the shaping of technologies and content used in their settings of work. Perrier et al. [21] built a web based tool to analyse questions asked using the showing of Digital Public Health videos, in order to generate feedback to content creators. Beyond this, we have found no technological interventions that

have been developed to assist CHWs in bringing the health challenges and realities of their remote rural villages to the forefront and at the attention of those who provide health services and education in these areas, and this is the gap that this study sought to fill by the use of asynchronous-voice and role play. We therefore examine related work from the two bodies of work: asynchronous voice and role play towards general feedback generation.

3.1 Asynchronous Voice and Feedback

While not directly related to CHWs, there are several ICT4D projects that use asynchronous voice to gather information in rural areas using mobile devices. Some of these tools, such as Our Voices (OV) [1], allow rural citizens to record voices and listen to those of others in their communities; and in projects like CGNet Swara [18], Avaaj Otalo [20], and AppLab Question Box [8] the local voices are also forwarded to authorities who are able to respond with relevant information or improved services. Grover et al. [9] developed a voice-based service for obtaining feedback from school children and found strong preference for the use of speech as input.

Our work builds upon the results of these projects, but beyond creating a solution for recording voice and transmitting it offline and asynchronously, we sought to find ways to situate the new asynchronous voice solution within the CHWs’ current ways of life and work, and atop existing tools they already use, as recommended in [1]. This includes focusing on offline transmission of voice from the rural villages to the centrally located clinics because the costs of uploading voice over the web or calling over an interactive voice response system would not be feasible and affordable in rural Lesotho. Additionally, we wanted to explore the complementary power of a non-technical approach to feedback generation, which is role-play, and sought to find ways to use both approaches in combination.

3.2 Role-Play and Feedback

Role-play has historically been used for centuries in the design process [25]. In HCI, role-play is mostly used to evoke new ideas, to bodystorm, to evaluate ideas or prototypes, to communicate a concept, to train specific behaviours, to build user empathy, to seek deeper user understanding, and to navigate contexts that are initially unfamiliar to the designers [10,13,19,25,26]. The value of role-play in general is in leading to new insights and richer communication that could not easily be expressed or understood in a discussion [13]. The bodily approach of a dramatized act allows tacit knowledge to be explicit, and inspire creativity and deeper thought as drama appeals to more senses than verbal language, while making the process more personal, experiential and generative [2,12,24]. However, in the majority of the cases, designers and researchers play the roles of the users; acting out usage scenarios and user-life depictions, as a next step after extensive user studies to deeply understand users, their needs and their contexts [3,4,19]. In cases where people play themselves, such as in therapeutic sessions [2], they are normally given a certain plot to act out [13], or in design, a product or idea to test. In Bophelo Haeso, we used an open-ended approach to role-play as a tool for reporting, where the nurses and researchers took a step back in acceptance that they know little about the work and life settings in the rural villages where CHWs live, and allowed CHWs to design all aspects of the role-play. We describe this approach to “completely CHW-led” role play in the sections that follow.

4. METHODS

4.1 Participants

The Bophelo Haeso launched a new phase in 2014 where the 54 active CHWs were provided with Nokia Lumia smartphones for the purpose of showing and distributing the health videos in their communities. None of the CHWs had ever owned a smartphone before. The 54 CHWs originate from 45 villages and are trained and monitored at two different health centres. CHWs receive little financial compensation for their services (22 USD a month), sometimes none, yet most of them are dedicated to the voluntary services they offer their communities. Some have to walk for up to three hours one way to reach the closest health centre for the monthly meetings and trainings. All but one CHW are female, and the CHWs have an average age of 52 (oldest 70, youngest 29). 58% of the CHWs have primary school education only, 12% went through a year or two of high school, and 30% did not complete primary school. All CHWs can read and write in Sesotho, at varying speeds.

4.2 3- Staged Participatory Action Research

A participatory approach was used in the design of the feedback mechanism. For a period of 18 months, the researchers engaged with the 54 CHWs to identify the best ways to capture feedback in a manner that fits within their existing and preferred methods of work, incorporating technology in ways that make it easy for them to use it. We employed Participatory Action Research (PAR), described in detail in [15], and over 18 months, we sought ways to give CHWs a voice in shaping the concept of the feedback mechanism and the artefacts and processes that implement it. The PAR process began as a new phase in the project after three years of the research team working with the community of nurses and CHWs on mere content creation and consumption on basic phones. The new phase of the project involved the switch of CHWs' phones to smartphones. We started the PAR process as a step towards enriching the project and solving any needs that had emerged over time and use.

The first stage of the PAR process was **Needs Identification** for nurses and CHWs, which included semi-structured interviews and consultation/brainstorming workshops with nurses and CHWs. From this process, the CHWs and nurses decided, among other needs, that village-to-clinic feedback was one of the priorities for the future of the Bophelo Haeso project. The next phase of the PAR journey was **Exploration**. We had started with the premise that CHWs need time to explore smartphones and “the idea of apps” before they could fully participate in the design of any feedback solution that would be built for them on a smartphone. We understood that as people with no experience with smartphones and the use of apps in their work, they were not immediately enabled and empowered to communicate their ideas and experiences to the design process of an effective feedback mechanism [14,23].

CHWs were given a Nokia Lumia 520 smartphone to explore for six months, on which the basic Bophelo Haeso application was installed. The application allowed easy viewing and playing of videos, plus an option to pause videos and ask questions. The CHWs explored the devices for six months, during which workshops were held to encourage further learning and exploration through work and play. During this time of exploration, we began to use drama (role-play where CHWs play themselves) to seek to understand the progress CHWs were making in exploring the smartphones. In the skits, some CHWs played themselves, others played members of their communities and families, and demonstrated the ways in which they used the

smartphones in their personal lives and for work. It was through these observed skits by CHWs that we were inspired to experiment with role-play as a complementary approach to village-to-clinic feedback. This was on the basis that: if CHWs can so meticulously report their activities with smartphones in their homes, then maybe they could use drama in the same way to report the state of health affairs in their communities.

The last stage of the 18-month PAR journey was one termed **Productive Participation**, where CHWs were guided to use the experiences of the second cycle to address the needs from the first cycle. We had truly participatory sessions at this stage because CHWs understood the mobile phone tools and their capabilities well [15]. What emerged out of our participatory design sessions was that the technological Bophelo Haeso feedback mechanism would involve CHWs recording their experiences onto the Bophelo Haeso app in the form of audio, and that nurses would collect and listen to the voice recordings and extract feedback. The specific design considerations for this new module of the Bophelo Haeso application were well stated by the CHWs in the workshops. At the end of the 18-month design process, we ended up with a feedback-integrated Bophelo Haeso application that is described in the next section. Our next step in the study was to research answers to the questions: 1) Does a CHW-appropriate voice-recording technology help elicit public health feedback in rural settings? 2) In what ways can the non-technological approach of role-play supplement the technological feedback to open new forms of communication and expression?

5. TWO APPROACHES TO FEEDBACK

Over a period of twelve months following the 18-month PAR journey, two complementary approaches (technological and non-technological) were deployed to implement the envisioned Bophelo Haeso feedback mechanism: apps and skits.

5.1 ‘Apps’: Asynchronous Voice as Feedback

The technological implementation of the BH feedback mechanism comprises an application that allows CHWs to easily record audio diaries of their work. The concept behind the mechanism is that as CHWs experience and observe different phenomena in their villages, they, in their own spaces, report these experiences and observations as soon as the day they happened. Each CHW would then submit all her voice files to the nurse during the monthly meeting, and the nurse and her assistants would listen to the recordings and identify health issues from the different villages that were previously unknown, those that warrant action or response, and those that are just note-worthy or interesting. For instance, a CHW's report can be about a meeting she had with a group of village men, the lessons she taught them, the videos she showed them (if any) and the issues and arguments they posed to her. Also of interest to the nurses are the demographics of the people with whom CHWs have contact, the contexts in which encounters happen, and the comments and questions from the people.

When it was time to implement this concept of feedback, it was agreed with the nurses and CHWs that a voice recorder module would be built into the Bophelo Haeso application, so that the recorder could be tailor-made to meet the needs of the project and preferences, experiences and language abilities of the CHWs. During the participatory workshops, the CHWs had expressed the importance of having the Bophelo Haeso app, in that it made it easy for them to access videos due to its large buttons and being a dedicated “place” on their devices to go for all Bophelo Haeso activities. So they had specifically requested that the new

feedback feature be included in the app with which they had all become comfortable. One of the CHW's opinion on this was:

“Bophelo Haeso has been made it very easy for us by the introduction of this app. It is comforting to know that there is one dedicated place on my phone where I can go for everything related to the project. It will be difficult to forget anything.”

Beyond this, since CHWs use their phones for non-project uses, their phones' galleries contain many personal recordings. If we used the native voice recorder on the devices, it would be much harder for the nurses to identify relevant health recordings among the clutter of CHWs' personal recordings. An additional need for all BH activities to happen within the app is to enable usage logging that is not available in native smartphone apps. Logs help us to further understand CHWs' interactions and interaction needs. Lastly, the BH recorder interface would be in Sesotho, which is useful for the CHWs.

5.1.1 The Bophelo Haeso Feedback Feature

The feedback recorder feature was integrated into the Bophelo Haeso app that already housed the CHWs' content gallery, media player and sharing tools. No new application was developed, and the CHWs would continue to use a familiar environment which they did not struggle to learn. The same large button theme was maintained with non-ambiguous labels that were agreed upon with the CHWs. The feedback page was added as an additional page or tab, and allowed the CHWs to begin a recording, stop a recording, and view the list of recorded reports. Simplicity was the goal in this design. The CHWs were trained on this feature when it was first launched in August 2015, and in October 2015 and March 2016, more trainings were done to ensure that all CHWs could use the feature.

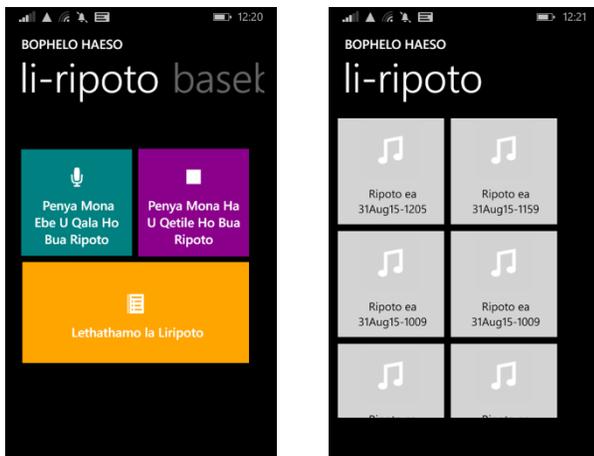


Figure 1 a) The main feedback reporting page b) the list of recorded files

At the end of the 12-month period in which CHWs engaged with the recording feature (August 2016), we conducted usability tests with 36 CHWs to determine how many of them could actually use the feedback feature. CHWs were tested one-on-one, and each asked to launch the app, make a recording, find the recording and play it. Of the 36 CHWs, 81% (n=29), launched the app without any struggle, navigated to the reports page, pressed the green button to begin the recording, made the mock recording, and completed the recording by pressing on the purple button. 8% (n=3) also managed to complete their recordings, but not as swiftly. They easily navigated to the reports page but seemed unsure of where to press at first, but were then guided by the

Sesotho labels on the buttons to perform the actions correctly. The rest of the CHWs (n=4, 11%) admitted to being unfamiliar with reporting and sought further assistance and guidance. All the CHWs who managed to make a recording also managed to open the list of recordings. However, 30% of them were not aware that they could scroll further down to access more recordings, they thought the six they saw on the list were all the recordings on the phone, one even complaining that some of her recordings went missing.

In the next sections, we discuss the details of how the audio recording feature was used in the 12-month study period from September 2015 to August 2016.

5.1.2 Audio Reporting Trends

In 12 months, a total of 298 reports were collected across the two health centres (218 from Health Centre 1 and 80 from Health Centre 2). Of the 298 reports, the average report length is 1 minute 31 seconds, the minimum length is 5 seconds, and the maximum length is 6 minutes, 18 seconds. In the period reported in this paper, 42 CHWs were actively involved with the BH project, and among them, 32 submitted at least one report in the study period. Of the CHWs who submitted reports (n=32), the total number of reports collected per CHW ranged from 3 to 38, with mean = 9.3, median=6.8, STD=9.7. Figure 2 and 3 show the distribution of the total number of reports collected from each CHW over the 12 months' period.

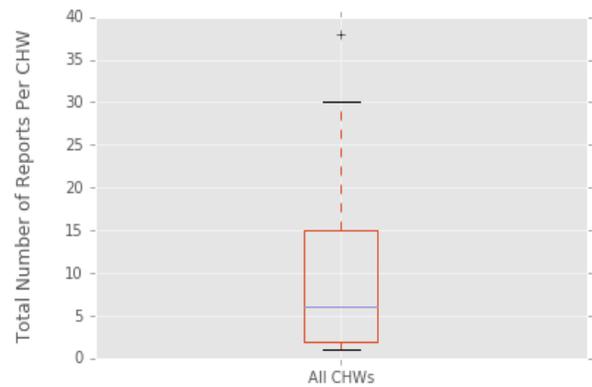


Figure 2 - Distribution of Total Number of Reports Collected Per CHW

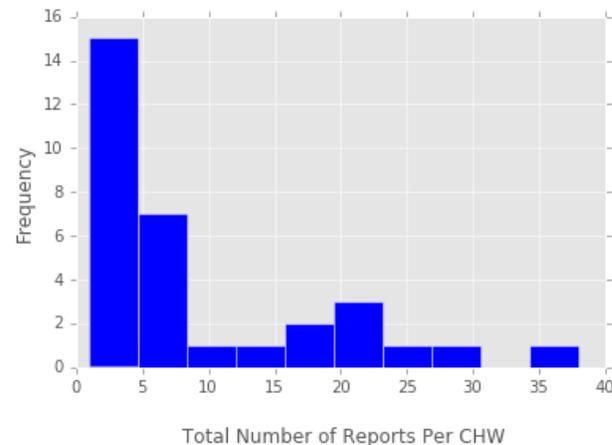


Figure 3 – Histogram Showing The Distribution of Total Number of Reports Collected Per CHW

66% of the CHWs (n=21) submitted less than 10 reports in 12 months, 16% (n=5) submitted between 10 and 20 reports, and 18% (n=6) submitted more than 20 reports. Figure 4 shows the average number of reports received (based on the number of CHWs who submitted reports in that month), showing how the number of reports submitted over the months varied. On average, when CHWs reported, they submitted between two and seven reports a month, and the highest number of reports ever received from one CHW in one month was 18.

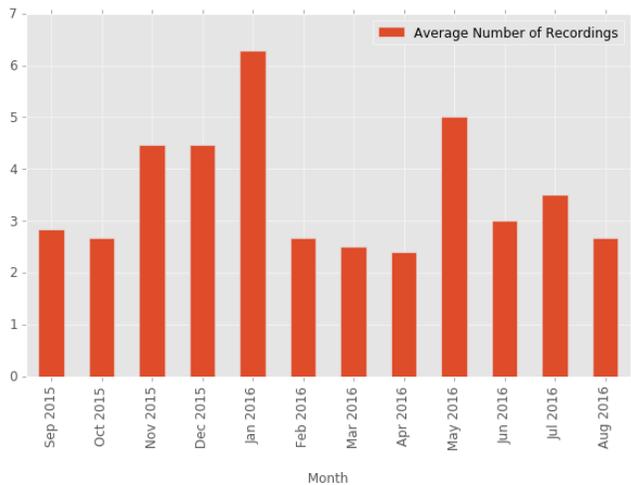


Figure 4 - Average Number of Recordings Received Per CHW, Per Month

The most mentioned topic in the audio feedback was Sexually Transmitted Infections (21%), followed by Tuberculosis (TB) (20%), HIV (16%), Newborn Health (12%), Pregnancy (9%), Ebola (9%), Immunisations (7%), Family Planning (3%) and Health Centre Services (3%).

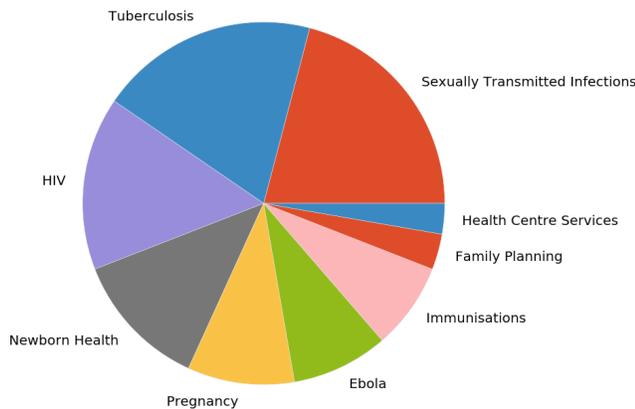


Figure 5 - Proportions of Health Topics in Audio Reports

5.1.3 Approaches to Feedback Capturing

While the initial agreement was for CHWs to personally report on their experiences by making recordings of themselves, a variety of other recording types were found a few months into the deployment of the feedback mechanism. While some of these methods of “reporting” were not envisaged during the co-design sessions, the CHWs used them in ways that enriched the feedback and opened the possibility of important discoveries. In the typical, expected approach to reporting (71% of all reports), CHWs

recorded themselves speaking a report of their engagement with people; reporting their observations, the people’s challenges, and the arguments and complaints they posed to them. In other cases, 16%, CHWs directly recorded their conversations with individuals or groups – some of the conversations were arguments had after a video showing, and in others, discussions on various health related issues that led the CHW to play the video to clarify certain concepts to the person or people.

In 6% of the reports, CHWs quizzed a group of people on record, as a way to report to the nurses how little or how much the people knew on the subject being discussed. The members of the CHWs’ communities also took advantage of the reporting platform to pass specific requests to the nurses or other health professionals, found in 5% of the audio files. Another 2% of the recordings were voluntary testimonials, e.g., CHWs recorded people who are practicing proper healthcare (e.g., adhering to TB treatment) for the purpose of playing the recordings to others who have doubts on the topic.

The recordings reported here are “relevant recordings,” meaning recordings in which there were health related content. A number of non-relevant recordings (total 64 recordings) were found in CHWs’ phones also recorded using the Bophelo Haeso report recorder. These included blank recordings seemingly a result of the record button pressed by mistake, a CHW demonstrating to others how well she can use the app and the feature, and CHWs’ recordings of personal activities such as a community council meeting, a village women’s group meeting, a church session, random family conversations, the CHW singing, and a song or favourite programme playing on radio.

5.1.4 Feedback Elicited from Asynchronous Voice

The audio reports help nurses to understand why certain groups do not seek timely medical attention as is recommended. For example, four CHWs’ audio reports indicated that in the villages involved, women are seen to be weak when they start antenatal care at the health centres at the beginning of their pregnancies, as the belief is that a “real woman” must use only traditional herbs and wait until she has started to feel the movements of her foetus (well beyond four months of pregnancy) before going for antenatal appointments. This is an issue of concern to the nurses because of the importance of the antenatal visits at the beginning of a pregnancy, especially for the timely Prevention of Mother to Child Transmission (PMTCT) of HIV if the mother is HIV+.

Some reports revealed new, dangerous practices that need immediate attention from the nurses. Such reports include two that revealed a new type of herb that claimed traditional herbalists sell to pregnant women, which is potentially dangerous to the mother or even teratogenic to their embryo or foetus. Coming from one of the villages, there was a report that young people were being led to believe that taking drugs in high school could help a student improve his/her grades, and that in some villages, men were planning to beat and chase away people from Central, West and East Africa if any of them ever set foot in their village because they believed everyone from these countries carries the Ebola virus. These are examples of misleading misconceptions that nurses could correct in their future videos.

Six of the CHWs’ reports included complaints where individuals pointed to the poor handling of patients at the health centres (clinics) and the frequent absence of medical equipment (e.g., HIV testing kits), which discourage many from visiting the facilities. This is valuable feedback for nurses as they are always looking to learn reasons that prohibit people from visiting the

health centres. According to the nurses, one of their priorities is to ensure that the general public makes use of the facilities and services offered at the health centres because most of the high HIV/TB/maternal/neonatal mortalities and morbidities in rural areas could be easily prevented by people taking timely tests and receiving and adhering to treatment and support. Additionally, seven reports included community members' requests and suggestions for ways in which service delivery methods could be redesigned to make health services more accessible to everyone, such as the request that ARV therapy be made available closer to the villages for those who are too weak to walk or travel to the health centres.

One of the concerning issues that was found in 22 CHW audio diaries is that many people in Lesotho's rural villages were unable to take up recommended health practices because of extreme poverty and hunger. There were reports of people who stopped ARV therapy because the treatment increased their appetite significantly while they did not have access to enough food. CHWs also reported of women who, despite the recommendations in the videos for exclusive breastfeeding and proper infant nutrition, fed unhealthy food to their infants early in their lives due to limited access to healthy (or any) food options. There was a direct request heard in one of the reports from an elderly village woman, calling for the health professionals (nurses) and other authorities to intervene in the life of a young pregnant teenager, who, in the speaker's words: "*is worryingly underweight and weak for a pregnant woman.*" Additionally, nurses continue to discover that due to poverty, young mothers still give birth from within their villages, even though they are aware of the recommendations to give birth in hospitals.

From the audio reports, nurses also learn of the knowledge gaps among the people, and their reasons for resistance towards certain healthcare practices, the two below being some of the comments heard in the reports:

"Condoms are against the will of God!"

"The ministry of health contributed to bringing these strange diseases into our country so that they can benefit at our expense. First they bought HIV from overseas, and introduced it in Lesotho via these unending injections you want us to take. So now they are doing it again, they have brought Ebola in, just so that they can find new ways to make money and control our lives. None of my family members will go to those clinics, we will stick to traditional remedies."

The nurses have also learned, from more than 30 reports, of the need for special health education for men, from reports that show how men refuse to cooperate with their wives in planning and living healthy lives, especially with regards to HIV, other STIs, TB, and planned parenthood. For example, three CHWs reported of women who told the CHWs that their husbands clearly have TB symptoms, but they have stopped convincing them to go to the health centres to test because their husband beat them every time they talked about TB and testing. In one of the stories, the woman said sadly her husband eventually infected her three children, who were now receiving treatment secretly while their father continued untreated. In more than five reports, CHWs carried enquiries from young women who sought advice on how they could be best supported to protect themselves from HIV and STIs in marriage, saying that many women begin marriage without these infections but end up infected because of their husbands' extra-marital affairs. Many of these reports showed that men physically abuse

their wives when the wives suggest the use of condoms in their marriages.

Sometimes one type of question indicating the public's misinformation is repeated over time from the reports originating from the same village or area, indicating that attention must be paid to that specific village.

5.1.5 Outcomes Following Feedback

As a result of the feedback, the clinics are re-designing some of the services they offer to the communities, and nurses are creating new videos to address the needs identified through the feedback. For example, there were reports of men that said they would never take TB treatment because it is believed to cause impotence. Upon discovering this, the nurse then created a follow-up TB video, in which she corrected the misconception, providing statistics and other assuring facts. Additionally, nurses have created new videos on pregnancy complications and use of traditional remedies in pregnancy in response to the knowledge gaps identified through the audio feedback.

5.2 'Skits': Role Play as Feedback

On the quest to complement the asynchronous-audio feedback, we use role-play where CHWs 1) simulate their interactions with the public in their villages and 2) report actual experiences that they went through at some point in the past. The 'skit-workshops' were held three times in the 12-month feedback deployment period. Before the Bophelo Haeso project, role-play had been used in the training of CHWs in the past, to reinforce concepts, so it was not an entirely new experience, and it was one with which they felt comfortable.

The use of drama (skits) was initially used to open channels of communication with focus on design and exploration, with the hope that the skits would illustrate CHW-patient interactions and hence inform the design of the technologies that support such interactions, but it evolved into role-play as a supplementary feedback mechanism: role-play for reporting. The thinking behind this choice was that role-play would enable the CHWs to deeply explore their experiences and interactions and report those rich findings in the form of drama to the nurses for further discovery on the state of affairs in the villages.

5.2.1 Scenario building by CHWs

During the workshops, the CHWs are divided into groups of five to seven individuals, and asked to talk through the different experiences they have with the public in their communities, and from these build scenarios and then act out the scenarios to demonstrate these experiences. Each group independently picks its own setting and then assigns CHWs to respective roles. Some CHWs play the role of themselves (a CHW), while others play different roles representing the various members of their village communities – villages chiefs, men, women, youth, entertainers, etc. In their skits, CHWs attempt to capture the true picture of the village life. They put much thought into presenting as much detail as possible about the settings where they meet with patients and the ways they communicate to them. After brainstorming and agreeing on one scenario to stage, the CHWs rehearse for a few minutes and then present their drama.

The core of the CHW skit-reporting is that the CHWs create their own scenarios and decide on the storyline to be staged. They are not told what to act, or what to focus on. They decide among themselves to combine their experiences into one piece of a three to five minutes' act. They design the entire script for their skits, assign actors to parts, and self-direct the play: a truly CHW-

created, CHW-directed skit. Each of the CHWs gets the chance to be an actor and to sit in the audience watching the performances of others. Discussions among the larger group with the nurses and researchers follow the performances.

5.2.2 Examples of CHW-Created Role-Play Scenarios

At every role-play workshop, the researchers and nurses are taken away by the dramatic creativity of the CHWs, the manner in which they are able to capture detail in their delivery, and the manner in which they immerse themselves in the moment of drama. An example is one the shyest CHWs playing the character of loud, aggressive, argumentative village man, and doing so in the true depth of the character, demonstrating her experience of dealing with difficult male figures in her village. Below are three examples of the scenarios the CHWs staged:

Scenario 1:

A CHW visits a sick patient, whose house is also a beer-selling spot, and the spot operator is also the caregiver for the sick woman. Upon arrival, the CHW starts by advising the drunken women to reduce the rate at which they drink; they make fun of the CHW as she turns to the sick woman. The CHW is discontented with the situation in which her patient lives and is doubtful that she gets enough attention, and food. As they discuss her latest health status, the patient discloses that she has been hiding to her caregivers that she has unusual symptoms in her private area, to which the CHW immediately says: "it sounds like a bad STI." The caregiver is angry that the patient has divulged this information to the CHW, saying a woman must keep certain things to herself. The CHW tells the patient that the symptoms she is experiencing are of a condition called genital warts, and that there is a video on her phone (on STIs) that describes the ailment. The CHW holds the phone showing the video to the patient, who listens and watches. The caregiver listens too, but doesn't see the images, as the screen is not visible to her. Midway through, the patient requests to ask a question, and the CHW pauses the video, allowing the patient to ask. At the end, they resume playback until the end, and the woman, convinced by the video, eventually agrees that she will go to the health centre to get herself tested and treated.

Scenario 2:

A group of women are preparing food for a funeral. The women are expressing disbelief over the death of the person to be buried the next day, in part because they are aware that this woman's death means an addition to the many orphans that already live among them. The CHW joins in the discussion, with the intent to also join in hands in the food preparation process. As they all work and chat, they continue to talk about how no one really knows what caused this death. One says all that is known is that the deceased had chest pains at some point. The CHW comes in and says, "You all know that everywhere I am, I am your CHW, and will take advantage of any situation to talk about good health. I will do that even as we work now...especially because I have information that is directly relevant to the dilemma behind our friend's death." The CHW tells them that to make her work even better, she has just received a new phone from the Health Centre to help her with her work. All women are excited to learn of this development and exclaim of the phone's advanced look. The CHW then brings out the phone and says she will play one video for them as they continue to work; it's a video on TB. One woman then picks up the phone, and looks at the images accompanying the voice, and then as they all continue to listen, the phone is

passed around for others to see the changing images. The women comment in joyful surprise that the person teaching in the video is the nurse from health centre, who they appear to respect very much. The CHW then takes the phone, places it on the table, and they listen to the rest of it as they continue to chop the vegetables in silence. When the video ends, the women are appreciative of how much they have learned. One, seeming scared, rises to her feet and tells the CHW that after hearing the TB symptoms being mentioned in the video, she thinks she might have TB. The CHW encourages her to go and test, and promises to support her through her treatment. A long discussion on TB and many other issues follows as they work, with the women frequently thanking the CHW for the video that ignited such a useful discussion.



Figure 6 - Examples of CHWs performing their skits

Scenario 3:

A CHW runs into a heavily pregnant woman in the village, who is on her way to dig traditional herbs to heal some pains and discomforts she has been feeling (she says her grandmother taught her which herbs to dig). The CHW then begins to discourage the use of such herbs because of the dangers they have caused in the past, and encourages the woman to visit the health centre where all her discomforts will be addressed by professionals; she even recommends that the woman makes plans to give birth at the health centre. The woman says she would like to give birth at the health centre, but her mother in law is adamant – she will not allow it due to the belief that new-born babies can be bewitched if born outside the home. The CHW then talks to the woman at length about the dangers of giving birth in the village, and concludes by showing her a video on Good Health for the Mother and The New-Born. They watch the video silently until the end, and then the woman appreciates the truths in it, and

requests that the CHW visits her family urgently to present these matters to her mother in law.

CHWs enjoy expressing their experiences in this manner, and the rooms are normally filled with energy, new ideas and lively discussions.

5.2.3 Feedback Elicited from Skits

In their skits, CHWs "report" experiences, struggles, etc., related to their work with people and their use of the videos, and related comments. A number of contextual details emerge from the CHWs' skits, which give useful feedback to the nurses and the researchers too. For example, looking at only the three scenarios quoted above, we learn of the settings in which some patients are treated, the external influences within families that are against good health practices, the people's attitude of preferring to hide health challenges, general knowledge gaps on basic health issues like the symptoms of TB, the way the CHW asserts her authority to her fellow village-men, the way CHWs provide necessary customized support 'in the moment,' examples of scenarios in which CHWs showed Bophelo Haeso videos (to groups, to individuals, and at different points in the conversation), reasons why certain groups don't use health facilities (e.g., most women are controlled by mothers in law), misconceptions originating from issues such as witchcraft, and the people's faith (or lack of) in CHWs.

Role-play, for this purpose, is about opening a new channel of communication where CHWs can express themselves better. It is about affording them an opportunity to say:

"This is what my day looks like, these are the issues I deal with, these are the questions I hear, these are the most common struggles for the people I serve, these are the tools I use and this is how I use them, this is how I behave in my natural context, this is how people perceive me, this is how I incorporate Bophelo Haeso technology into my work, this is how others react to the technology and content I present to them, these are the settings in which I use Bophelo Haeso videos, this is what happens when we watch a Bophelo Haeso video."

6. DISCUSSION

6.1 Improved Expressions and Reduced Biases Through Role-Play

For the first three years of the Bophelo Haeso project, the primary method of feedback elicitation from CHWs was check-in meetings, where CHWs would go in a circle to state their experiences with the Bophelo Haeso videos in their villages. Up to four meetings would be held a year, and in the three years, the typical response from the CHWs was:

"People love the videos. We love the phones. They make our work so much easier."

There were a few examples of the ways in which people received the content that was shared with them by the CHWs, mostly coming from the few outspoken CHWs, and there were few details about the context in which the Bophelo Haeso videos were shown.

In some cultures, as is the case with CHWs who are traditional Basotho women, people can be reserved in speech, especially in formal focus group or interview settings, and not fully expressive of their experiences. In a project like the Bophelo Haeso project where the opinions and voices of the CHWs are integral to the

design process and the village-to-clinic feedback, this can be a real limitation. In addition, our experiences and those of other researchers [6] are that participants can be biased when asked straight on about their experiences, especially to people of authority like their nurses and the researchers who developed the technologies under review; tending to give responses that will give more appraisal to the researcher and nurses than true reflections of their experiences.

We discovered that with role play, the skits do a great job in getting the CHWs out of their reserved, non-articulate selves. Being forced to be a different person than the reserved woman a CHW is cultured to be, the CHW can be more expressive and demonstrate struggles that would not be easy to articulate in a discussion. We found that drama opened new forms of communication and expression that could not be as thoroughly expressed verbally or visually [13], and the CHWs commented that they enjoyed expressing themselves through play, saying:

"Some things are not easy to describe in words, but easy to demonstrate in play..."

We therefore recommend role-play activities in which participants are allowed to report their experiences through self-created scenarios for research and design cases where deeper expression is preferred, but the natural culture is to be less expressive; or in cases where formal descriptions of experiences are not easy in words.

6.2 New Revelations – True Feedback Mechanism

The feedback mechanism confirmed our hypothesis that tools to support new forms of expression would enable the elicitation of deeper details about the CHWs' work, the people they serve and the health challenges in the villages. The audio reports included such details as the descriptions of the individuals or groups that the CHWs met, and the skits enlightened on such details as the contexts in which CHWs meet patients for care and education, and the scenarios in which videos are played. In interviews with the nurses, they confirmed that through the feedback mechanism (voice logging and the skits), there is significant improvement in the number of issues reported by CHWs and the depth of contextual details revealed, one saying:

"I have worked with some of these CHWs for more than three years, and yet I am learning for the first time the majority of the struggles they go through. I think these new opportunities to give feedback encourages them to speak even more. So many village experiences remained untold in the past"

The primary benefit of increased number of reports is the feedback itself, because it allows new types of information to be revealed to the nurses, which would never reach them otherwise. Having the information revealed in the feedback, nurses discover the topics that are more urgent to address with their educational videos, and the groups that need more attention or help. Also, the nurses said by listening to the CHWs' reports, they were able to gauge the competence and growth of their CHWs, and learn more about the confidence and sense of urgency with which they address different health issues. Also, the nurses reported that they observed from the CHWs direct recordings, a growing confidence of expression and ability to articulate experiences. This growth is made possible by the fact that CHWs make recordings in the absence of nurses and other health professionals, where they feel free to express themselves and explore different ways of reporting.

6.3 In-Situ Logging: Improved Reports

Because of the ubiquity of the mobile phone, reporting from within the Bophelo Haeso app can be done anywhere, and at any time; so knowing that they have a chance to report frequently makes CHWs more vigilant in the community, to observe and report issues that they would otherwise overlook. Also, in-situ audio reporting presents new benefits for capturing the majority of issues in the communities, many of which remained unsaid or were forgotten when the primary platform for feedback exchange was the discussion at the CHWs' monthly meetings. We demonstrate, here, the importance of giving CHWs feedback tools in their hands, in-situ, where they do their work and live daily lives, towards the enablement of quality feedback.

6.4 Feedback Easy for CHWs

The two approaches for feedback in Bophelo Haeso are easier to do than other previously explored methods, such as writing. According to the nurses, as regards the voice reporting:

"Speaking is the easiest thing for CHWs...all they need to know now, is where to press on their phones, and they seem well adept with that."

With voice, there is no limit of expression, unlike on paper - CHWs and the public can express themselves to a point where they are convinced they will be understood. By being available in the field, the mobile Bophelo Haeso audio recorder also enables the direct recording of the public where preferred or necessary, leading to even richer expressions of the state of health in the villages.

6.5 Complementary Tech and Non-Tech

In-situ reporting and role-play reporting complement each other, as each offers different affordances. Mobile phone reporting in the comfort of a CHW's home, happening soon after a CHW's interaction with members of her community, enables her to articulate a fresh experience, including useful details and demographics. With group skits, we observed that in-group reflections allow collaborative reporting, and integration of experiences into one performance, enabling easier peer-to-peer communication and sharing of experiences among CHWs. Drama also allows CHWs to imagine better due to the embodied experience that might spark imagination and creativity in ways that may not occur otherwise [4]. Looking at the results of both employed approaches, we realise the benefits of leveraging them together; and we confirm previous research that demonstrated that while mobile technologies are powerful and ubiquitous, sometimes, a complete solution lies not only in a technological intervention [7].

6.6 Methods Matter

Methods are an important component of what made the Bophelo Haeso feedback mechanism intervention work. The 18-month PAR journey allowed CHWs to fully participate in the conception and design of both approaches to feedback. Additionally, we attempted to take advantage of the CHWs' current ways of saying [1], and situated the designs and activities accordingly. It is important to take advantage of ways of learning and communication that preceded the intervention.

7. FUTURE WORK

The next step in this research, having established the success of asynchronous voice and CHW-created drama in soliciting feedback, is to find effective ways for the nurses to analyse the audio reports generated by CHWs. Additionally, at the choice of the Bophelo Haeso nurses and the CHWs, some of the CHW

drama footage will be used in future videos that nurses will create. For instance, if a scenario staged by CHWs demonstrated a man who is not cooperating with his wife, the next video could include this scene and a message for all family men. This will help address some of the most pertinent issues head-on, while also motivating CHWs and building their reputation by having them featured in the videos to be shown in their villages [11,22].

8. CONCLUSION

This paper presented the first attempt at using asynchronous audio diaries and user-created drama to enable feedback generation to support rural health education and service delivery. We developed and deployed a mobile asynchronous-voice application supplemented by role-play to successfully give CHWs a voice in Lesotho - enabling them to generate valuable village-to-clinic feedback. Our results indicate that when CHWs are equipped with a mobile tool that they can use in their own space, they are able to report more experiences and the challenges that face their communities, than when old approaches such as check-in meetings were used without supplementation. We argue further that while technology artefacts such as the Bophelo Haeso feedback-integrated mobile application are useful in enabling communications, further forms of reporting can be opened by leveraging bodily forms of expression, like role-play. In the Bophelo Haeso project, role play where CHWs stage the experiences in their communities enables deeper feedback that supplements what is captured by the asynchronous voice solution alone. We showed how the incorporation of village-to-clinic feedback communicates the real challenges of the rural communities, and that CHWs as the core players of the rural health system, can assist the education process substantially when given a voice. Thus we hope to demonstrate that while clinic-to-village health education initiatives are impactful, effective feedback mechanisms using CHWs are important for community engagement, and in bringing the voices of the public to the forefront.

9. REFERENCES

- [1] Bidwell, N.J. and Siya, M.J. Situating Asynchronous Voice in Rural Africa. *Human-Computer Interaction – INTERACT 2013*, Springer Berlin Heidelberg (2013), 36–53.
- [2] Brandt, E. and Grunnet, C. Evoking the future: Drama and props in user centered design. *PDC*, 2000, 11–20.
- [3] Buchenau, M. and Suri, J.F. Experience prototyping. *Proceedings of the conference on Designing interactive systems processes, practices, methods, and techniques - DIS '00*, ACM Press (2000), 424–433.
- [4] Burns, C., Dishman, E., Verplank, W., and Lassiter, B. Actors, hairdos & videotape---informance design. *Conference companion on Human factors in computing systems - CHI '94*, ACM Press (1994), 119–120.
- [5] Campbell, N., Schiffer, E., Buxbaum, A., McLean, E., Perry, C., and Sullivan, T.M. Taking knowledge for health the extra mile: participatory evaluation of a mobile phone intervention for community health workers in Malawi. *Global Health: Science and Practice* 2, 1 (2014), 23–34.
- [6] Dell, N., Vaidyanathan, V., Medhi, I., Cutrell, E., and Thies, W. "Yours is better!" *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12*, ACM Press (2012), 1321.

- [7] Densmore, M. Claim mobile: When to Fail a Technology. *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12*, ACM Press (2012), 1833.
- [8] Futterman, N.F. and Shuman, R.S. AppLab Question Box: A Live Voice Information Service in Rural Uganda. *94112*, (2010).
- [9] Grover, A.S., Calteaux, K., Barnard, E., and van Huyssteen, G. A voice service for user feedback on school meals. *Proceedings of the 2nd ACM Symposium on Computing for Development - ACM DEV '12*, ACM Press (2012), 1.
- [10] Iacucci, G., Iacucci, C., and Kuutti, K. Imagining and experiencing in design, the role of performances. *Proceedings of the second Nordic conference on Human-computer interaction - NordiCHI '02*, ACM Press (2002), 167.
- [11] Kumar, N., Lal, P., Anderson, R., et al. Projecting Health: Community-Led Video Education for Maternal Health. *Proceedings of the Seventh International Conference on Information and Communication Technologies and Development - ICTD '15*, ACM Press (2015), 1–10.
- [12] Leon, G. Linking Ethnography to Design . Role Playing as a Design Method. *Interaction Design and Technologies*, (2005), 1–4.
- [13] Matthews, M., Gay, G., and Doherty, G. Taking Part: Role-play in the Design of Therapeutic Systems. *Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14*, ACM Press (2014), 643–652.
- [14] Maunder, A., Marsden, G., Gruijters, D., and Blake, E. Designing interactive systems for the developing world - reflections on user-centred design. *2007 International Conference on Information and Communication Technologies and Development*, IEEE (2007), 1–8.
- [15] Molapo, M., Densmore, M., and Morie, L. Designing with Community Health Workers : Enabling Productive Participation Through Exploration. *Proceedings of the 1st African Conference on HCI (AfriCHI)*, (2016).
- [16] Molapo, M. and Marsden, G. Health Education in Rural Communities with Locally Produced and Locally Relevant Multimedia Content. *Proceedings of the 3rd ACM Symposium on Computing for Development - ACM DEV '13*, (2012), 3–4.
- [17] Molapo, M. and Marsden, G. Software support for creating digital health training materials in the field. *Proceedings of the Sixth International Conference on Information and Communication Technologies and Development Full Papers - ICTD '13 - volume 1*, ACM Press (2013), 205–214.
- [18] Mudliar, P., Donner, J., and Thies, W. Emergent practices around CGNet Swara, voice forum for citizen journalism in rural India. *Proceedings of the Fifth International Conference on Information and Communication Technologies and Development - ICTD '12*, ACM Press (2012), 159.
- [19] Oulasvirta, A., Kurvinen, E., and Kankainen, T. Understanding contexts by being there: case studies in bodystorming. *Personal and Ubiquitous Computing* 7, 2 (2003), 125–134.
- [20] Patel, N., Chittamuru, D., Jain, A., Dave, P., and Parikh, T.S. Avaaj Otalo: a field study of an interactive voice forum for small farmers in rural India. *Proceedings of the 28th international conference on Human factors in computing systems - CHI '10*, ACM Press (2010), 733.
- [21] Perrier, T., Kaustubh, A., Gupta, A., and Anderson, R. Questioning feedback. *Proceedings of the Sixth International Conference on Information and Communications Technologies and Development Notes - ICTD '13 - volume 2*, ACM Press (2013), 112–115.
- [22] Ramachandran, D., Canny, J., Das, P.D., and Cutrell, E. Mobile-izing health workers in rural India. *Proceedings of the 28th international conference on Human factors in computing systems - CHI '10*, ACM (2010), 1889.
- [23] Ramachandran, D., Kam, M., Chiu, J., Canny, J., and Frankel, J.F. Social dynamics of early stage co-design in developing regions. *Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '07*, ACM Press (2007), 1087.
- [24] Simsarian, K.T. Take it to the next stage: The Roles of Role Playing in the Design Process. *CHI '03 extended abstracts on Human factors in computing systems - CHI '03*, ACM Press (2003), 1012.
- [25] Svanaes, D. and Seland, G. Putting the users center stage: role playing and low-fi prototyping enable end users to design mobile systems. *Proceedings of the 2004 conference on Human factors in computing systems - CHI '04*, ACM Press (2004), 479–486.
- [26] Thoring, K. and Mueller Roland M. The Role of Role Play: Intangible Systems Representations for Business Innovations. *Learning Through Design*, (2012), 537.