

A Mobile Application for Interactive Voice Forums: Design and Pilot Deployment in Rural India

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ABSTRACT

This paper describes the design and pilot deployment of a mobile application to support interactive voice forums, in which users can record messages and listen to messages that others have recorded. While such forums have typically relied on voice calls for participation, participation through a mobile application (and mobile Internet) can offer benefits in terms of costs, offline access to downloaded content, and supplements with other media types, such as photos. Using the Android platform, we implement an application to support CGNet Swara, a voice-based citizen journalism platform. We describe an early-stage pilot deployment that is already seeing unsupervised usage in rural India.

Categories and Subject Descriptors

H.5.0 [Information Interfaces and Presentation]: User Interfaces

Keywords

Interactive voice forums; IVR; citizen journalism; smartphones

1. INTRODUCTION

Interactive voice forums, in which users record audio messages that can later be heard by others, have been used to report, share and access information in developing regions [1]. Users of these forums place a phone call to a system which then prompts them to either record a message or listen to previously recorded messages. The operational costs associated with these phone calls, however, is often a limitation that prevents scaling these systems beyond the pilot stage [1]. As the price of smartphones decreases, the accessibility and prevalence of smartphones are expected to increase, especially in developing regions [2].

This paper describes the design and initial usage of a smartphone application that allows users to contribute and listen to CGNet Swara [3], a popular interactive voice forum in India. CGNet Swara is used by rural communities to report locally relevant news and grievances, and to listen to messages reported by others. Instead of accessing CGNet Swara via a phone call, the smartphone application downloads files via mobile Internet and plays them locally from the device. A smartphone application offers three distinct benefits:

(i) **Reduces operational costs.** Though smartphones are more expensive than feature phones, the smartphone application can offer long-term cost savings by using mobile Internet in place of a

voice call. In India today, a data pack from BSNL costs about \$1.60 for 250MB over one month. Assuming GSM's bitrate of 12.2kbps, this would allow downloading about 45 hours of audio per month, at an effective cost of \$0.00059 per minute. This is about 25 times cheaper than using voice calls, which cost about \$0.015 per minute in India. In practice, the cost saved depends on the amount of usage. If one listens to only 10 minutes of content per day, then mobile Internet is 2.8 times cheaper than voice calls.

(ii) **Enables offline access.** Once an audio file has been downloaded by the application, it can be played locally without any connection to the server. In addition to enabling replay of content in regions with intermittent connectivity, this avoids the costs incurred by repeatedly streaming the same content to the same user (a very common practice today). Saving audio files locally also enables users to propagate them via Bluetooth and SD card sharing, extending their reach to local feature phone users without incurring any additional cost [4].

(iii) **Supports photos as well as audio.** Users of the smartphone application can supplement an audio recording with a photo, which can be a powerful tool for citizen journalism. As bandwidth and pricing improve, it would be natural to support video as well.

The remaining sections describe our design and implementation of the application, as well as our initial pilot deployments.

2. DESIGN & IMPLEMENTATION

The mobile application was designed on the Android platform and mirrors the functionality of the interactive voice response (IVR) system; users of the application can record a message or listen to other messages. The target users are rural activists who are literate in Hindi and have some familiarity with technology. Such users often serve as intermediaries for poor and non-literate beneficiaries of CGNet Swara.

To record a message, users are presented with buttons to start and stop recording or to listen to their recording prior to submitting it. Users are also given an option to attach a photo to supplement a recording. Given that users may often be in locations with limited or no mobile Internet, if a stable connection cannot be made, the audio recording (and optional photo as well) are queued to be sent. When the phone later has a reliable Internet connection, the audio files and photos are sent to moderators as email attachments (the same workflow used for the IVR system). Using email to upload files is robustly supported by Android; we used the JavaMail API and SendGrid's SMTP server. Once the moderators approve a message, it can be accessed on the CGNet Swara website as well as via the IVR system and the mobile application.

To browse messages that others have recorded, the mobile application automatically pulls the textual titles and summaries of recent posts from the CGNet Swara RSS feed and displays them using an open source feed reader, FeedEx. Because the audio

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content is slower to download, the application allows the user to manually select posts of interest; the application downloads the corresponding audio in an incremental fashion, supporting intermittent connectivity. Once downloaded, all textual and audio content is stored locally on the phone, available for access in the future. Audio files can also be shared over Bluetooth, allowing broad dissemination throughout the community [4].

3. ITERATIVE PROTOTYPING

To understand and improve the usability of the application, we conducted pilot testing at a CGNet Swara training workshop held in Dewas, Madhya Pradesh, India in August, 2014. Over the course of two days, 50 newcomers to the CGNet Swara platform were trained to use the application (running on Nokia X phones that were provided by us). The users originated from nearby villages and though they owned basic or feature phones, they had low levels of familiarity with smartphones. Working in small groups, we trained participants to use the application, observed their interactions, and requested their feedback regarding the functionality as well as the ease and intuitiveness of use. We also solicited input from CGNet Swara trainers and experienced users.

This session led to valuable feedback that we incorporated into the application. For example, users with low familiarity with technology would often exit the app accidentally, which would discard an audio file they had already created. Based on this, the application was modified with a prompt asking users if they wanted to exit if they were in a position that could discard an audio file that had been generated. Users also wanted to have the recordings saved locally on their device so that they could listen to them at a future time; this feature was implemented.

4. PILOT DEPLOYMENT

After the application was completed, we held a second two-day workshop in which 25 participants were trained to use the smartphone and application. The workshop included nine of the top contributors to CGNet Swara, who were based in rural areas and traveled to Bhopal for the workshop. In order to enable these people to use the application in the field, we gifted each person a Nokia X phone with the CGNet Swara application installed.

In the training session, we made groups of 2-3 participants and encouraged them to learn the application from each other. We used peer-to-peer training, scenarios and role playing exercises. We observed each participant and subsequently convened a large group discussion to address shared concerns and corner cases. Initially, participants were hesitant in using smartphones because of the fear of breaking them. This hesitation stemmed from their perception of smartphones as an expensive and unattainable device. At the end of the workshop, participants were not only comfortable with the mobile application but also able to use the camera, Bluetooth, and memory card sharing.

The application has been used in the field since September 15, 2014. Within the first month of deployment, CGNet Swara published 44 posts that were submitted via the application, including 34 that had photos attached. For example, Figure 1 shows a photo that was attached to a recent post (<http://cgnetswara.org/index.php?id=45744>) from a village in which the hand pump is broken. Because authorities have not responded to this problem, women in the village need to walk 1.5 kilometers to fetch water from an unclean river. This post was recorded in a village with no Internet connection; it was uploaded



Figure 1: Photo submitted using the CGNet Swara mobile application to highlight a problem in a low-connectivity area.

automatically two days later, when the contributor traveled to an area with better connectivity. Grievances such as this are often redressed via CGNet Swara. For example, another recent post includes a photograph of a hand pump that was fixed as a result of using CGNet Swara (<http://cgnetswara.org/index.php?id=48055>).

5. CONCLUSIONS & FUTURE WORK

We are hopeful that a mobile application for low-end smartphones can significantly bolster the reach and effectiveness of interactive voice forums in rural India. The mobile application reduces the cost of access by sending content via mobile Internet instead of a voice call, and enables offline access via local playback and peer-to-peer sharing. The ability to send photos as supplements to an audio report may also have a large impact on bringing attention to unresolved issues and ensuring a timely response.

In the future, we plan to conduct a rigorous evaluation of the mobile application based on sustained usage among CGNet Swara contributors. We have instrumented the application with fine-grained analytics that will enable detailed understanding of patterns of use. We also plan to analyze the impact of photographs submitted, for example, by looking at the average time needed to resolve issues reported with and without photographs.

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