

# An Asymmetric Communications Platform for Knowledge Sharing with Low-end Mobile Phones

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## ABSTRACT

We present Awaaz.De (“give voice”), a social platform for communities to access and share knowledge using low-end mobile phones. Awaaz.De features a configurable mobile voice application organized into asynchronous voice message boards. For poor, remote and marginal communities, the voice-touchtone interface addresses the constraints of low literacy, language diversity, and affordability of only basic mobile devices. Voice content also presents a low barrier to content authoring, encouraging otherwise disconnected communities to actively participate in knowledge exchange. Awaaz.De includes a web-based administration interface for Internet-connected *community managers* to moderate, annotate, categorize, route, and narrow-cast voice messages. In this paper we describe the platform’s design, implementation, and future directions.

**Author Keywords:** Voice UI, ICT4D, HCI4D, IVR

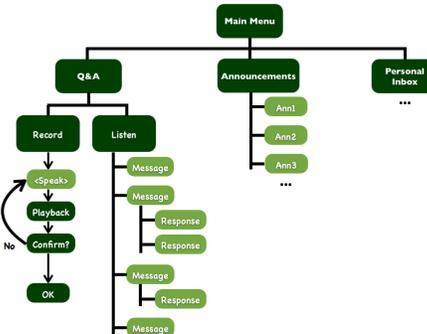
**ACM Classification:** H5.2 [Information interfaces and presentation]: User Interfaces. - Graphical user interfaces; H.5.2 User Interfaces: Voice I/O User Interfaces;

**General terms:** Design, Human Factors

## INTRODUCTION

Of the world’s almost seven billion people, less than two billion have access to the Internet. For the remaining five, access is constrained by affordability, lack of power and infrastructure, language, and literacy. This paper presents Awaaz.De, a software platform that leverages cheap mobile phones and opportunistic Internet access for group-based knowledge exchange. Group members interact with the platform by dialing a phone number and navigating simple automated prompts using touchtone keys. All content is in the form of audio recordings, organized into voice message boards that the caller can post to, browse, and respond over. An audio-only system addresses a number of challenges to creating and consuming information for poor, historically offline communities. People can interact with audio content using the most basic phone. A voice interface is adaptable to any language by re-recording the standard system prompts. Reading and writing are not required to consume or author audio content; the only skills required are dialing numbers and speaking into the phone.

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**Figure 1: Example call tree. Dark boxes are system prompts, light boxes are user-generated content. From the welcome prompt, callers choose any available message board, or a board of personally authored messages. Within each message board, if allowed there is an option to record, and to listen to messages, one at a time.**

While most of the community interacts through the voice UI through phones, a small number do have Internet access. These could be people from within the community or staff members of grassroots organizations. These *community managers* perform a number of administrative tasks through a web-based interface. Awaaz.De’s asymmetric ‘web for a few and voice for the rest’ model evolved from the context in which it originally evolved: a tool for a rural development organization in India to communicate with and disseminate agricultural information to farming communities [1]. Awaaz.De builds on this and a number of similar IVR systems by providing high application customizability, web-based administration, and combining both call-in and information push functionality.

## EXAMPLE USAGE SCENARIO: FARMER Q&A

Babu farms cumin on three acres in a remote village in Gujarat, India. One day he spots a green sucking pest attacking a section of his field. He picks up his mobile phone and calls “Organic Farmers United”, an information service for organic farming advice. Amongst the several message board options, he chooses the “Question and Answer” board, and then selects the record option. After the beep he introduces himself and records his question. A couple hours later, Pares, the community manager, logs into the web

interface from his office. He listens to Babu’s question and assigns it to Kapil, an expert organic farmer in Baroda. In addition, he places the question at the top of the list of threads on the public Q&A message board. Kapil receives a phone call that evening. For Babu’s problem, he prescribes a homemade pesticide made from sugar water. The next morning Paresh checks the Q&A inbox and finds Kapil’s response. Finding the answer satisfactory, he clicks to approve it. Immediately Babu gets a call on his phone, which plays the response, and then prompts for a follow-up question or comment to be sent back to Kapil, the responder. At the same time, other farmers are making their morning call to browse the Q&A forum. One farmer listens to the discussion on the sugar water remedy, and chimes in to suggest adding neem oil. Later, Paresh wants to generate a broader discussion, so he schedules the thread to be sent to all cumin farmers in the area later that day.

## DESIGN PRINCIPLES AND SYSTEM COMPONENTS

Awaaz.De’s design philosophy rests on three principles. First, keep humans in the loop. Listening to lots of audio is tedious, so the system must index and moderate content for speedy and precise retrieval. Humans are more accurate than speech-to-text, and are cost-effective in certain labor markets. Second, assume blank-slate users. Many callers have barely interacted with an automated system before. The voice UI should balance simplicity and functionality. Third, support rich conversation. It should be social, with opportunities for community members to give their voice and interact with others.

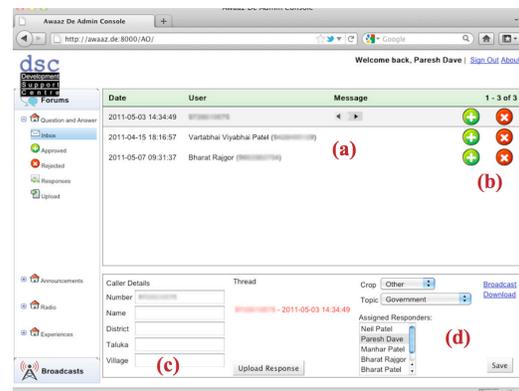
The platform consists of a voice UI and web-based administration interface. The voice UI is an automated interactive voice response (IVR), navigable through touchtone. Figure 1 illustrates an example call tree. Administrators define a number of purpose-based (“Q&A”) and/or topical (“Cumin”) message boards. Each board option is presented from the main menu. A final, optional “personal inbox” plays the caller’s own messages, identified by their phone number. Message boards are configured with a number of policy settings. A message board can be listen or post-only, moderated, and allow community response. It can also define sub-message boards based on hierarchical categories.

When browsing a message board, callers listen to messages in a linear fashion, using the touchtone menu to skip ahead, backward, pause, and replay. For rapid navigation, the skip commands can “barge-in” at any time while listening.

*Community managers* moderate user-generated content through the web interface (Fig 2). They also set post ordering, categorize (used to define sub-boards), route messages to specific community members, upload pre-recorded content, deploy polls and surveys, and narrow-cast cherry-picked content for timely and navigation-free access.

## IMPLEMENTATION

The voice UI is implemented as a Lua script for FreeSWITCH (www.freeswitch.org). The script names a set of system prompts to be played at set points, which can



**Figure 2: The web-based administration interface. The left panel displays a widget for each live message board. For each board, community managers (a) listen to messages, (b) moderate, (c) add caller details, and (d) categorize, assign, and broadcast.**

be recorded in any language with the standard filenames. FreeSWITCH interfaces with the network through a Primary Rate Interface (PRI) line supporting up to 30 simultaneous channels. The web interface is implemented with a Google Web Toolkit front-end, and Django back-end. The code is open source.

## FUTURE DIRECTIONS

A significant challenge is providing a powerful yet simple way to search through a mass of audio content. One approach is leveraging speech-to-text for voice-driven search. Another complementary approach is applying machine learning and crowdsourcing to personalize the content offered to each person. Automated approaches to transcribing and indexing content will also help community managers quickly triage and respond as the system scales. Awaaz.De has currently deployed with 8 development organizations in 6 states across India, logging over 40,000 calls from 5,000 unique callers. Future work will continue to apply the platform to new domains including health, education, and citizen’s empowerment.

## CONCLUSION

We have presented Awaaz.De, a social platform for a context with limited Internet access and end-user language, literacy, and affordability constraints. Beside usability issues, financial and social challenges remain. Who pays for the service? How do you protect against abuse like voice spamming? Along with the challenges is great potential to support online social interaction for the next five billion.

## ACKNOWLEDGMENTS

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## REFERENCES

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