Research Article

Democracy, Design, and Development in Community Content Creation: Lessons From the StoryBank Project

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Abstract

Mobile and Web 2.0 technology have the very real potential to democratize the creation and sharing of multimedia content in developing communities, even beyond the levels currently seen in community radio and television. In this article, we report the findings of an exercise to test this potential in partnership with a Budikote village in southern India. We show how a system called StoryBank supported the creation of short digital stories on a text-free camera phone, and how these stories could be shared through a community repository and touch-screen display. Despite the success of a field trial in which 137 stories were created and shared over a one-month period, various technical and social factors meant that the devices and content were more hierarchically managed and controlled than expected. The implications of these experiences for rural development and community-centered design are discussed.

1. Introduction

1.1 Background

Reflect for a moment on how many times a day you access the Internet for information or to check your e-mail, and how many messages or pieces of information you create to share over the Internet with others. Think also about whether you could do your job without these exchanges. The chances are that, if you live in the so-called developed world, you do these things more than once a day, and that the nature of your job would be very different, if not impossible, without them. For billions of people in developing countries, however, life goes on without the Internet, or indeed any form of computing technology. Even to simply make a living, information is a lot harder to come by. This is one aspect of the "global digital divide" that has challenged governments and industry for many years, and recently challenged us through a UK Research Council initiative. This was designed to bring HCI (human-computer interaction), computing, and social science researchers together with international development partners (NGOs) on research projects attempting to bridge the global digital divide in different ways.[1] In this article, we report on lessons from the StoryBank project, which was one of four research projects funded by the UK Research Council in 2006. We show how community radio can be extended with new mobile technology to allow stories to be created and shared in pictures as well as in sound. We focus especially on

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the biggest surprise of the exercise in relation to the democratization of information creation and access, which was viewed differently by the design team, our NGO partners, and the villagers. This leads us to recommend two trajectories for future research, turning on this issue, and a re-conceptualization of user-centered design in this context to accommodate conflicting points of view within a target community.

1.2 Motivation

Our starting point was an observation about the nature of the digital divide among developed and developing countries. High-level discussions usually center around the differential access to information and communication technology (ICT) infrastructure and platforms, especially the Internet. For example, "modern information and communications technologies" are listed as an essential infrastructure for modern life alongside water, sanitation, energy and roads in Sachs' (2005) Millenium Project report to the United Nations (Box 1.3, p. 8). Similarly, equal access to the Internet is an unquestioned assumption of the World Economic Forum's initiative on Information Technology Access for Everyone (World Economic Forum, 2008). Following from this, government and industry initiatives often focus on infrastructure rollout, such as the vision described by the Prime Minister of India at the end of 2006 to provide "free bandwidth for anyone, anywhere, anytime" (Fildes, 2007). This is potentially very important to national growth and social equality, especially if it can improve the rural economy and reverse migration to urban centers (e.g., Aiyar, Alabbar, Mahindra, & Verwaayen, 2007). Other examples include the 50×15[2] and the One Laptop Per Child[3] initiatives.

In contrast, non-governmental organizations responsible for implementing many of these initiatives stress the importance of content, literacy, and useful applications provided over that of infrastructure. For example, in reviewing a range of community ICT projects in south Asia, UNESCO showed that ICT and literacy skills training is a prerequisite for engagement with newer forms of technology (Slater & Tacchi, 2004). If people cannot read text or operate a computer, there is no use providing an Internet café or kiosk in a village ICT center. UNESCO also found that local content creation was a key factor in any engagement that hoped to empower communities to have a greater say in their own development.

This explains why many ICT interventions have not had a good track record of benefits. As pointed out by Marsden (2003), both access and content are keys to success and neither may be particularly well-provided through an Internet PC. One of the best examples we have found of presenting local information on a PC is the eNRICH system, originally designed by the National Informatics Centre of India and UNESCO. This system provided a community PC portal to access Web-based information created locally (Pringle & Subramanian, 2004); however, it still requires trained community reporters, translators, and operators to input textual information and retrieve and interpret it for the majority of rural "users." What is needed here is a more radical re-examination of the type of access and the form of content that could be used by the majority of rural

2. http://50x15.amd.com/
3. http://laptop.org/

users without extensive training. We decided to consider this in the Indian context, given the importance of supporting rural development there as mentioned above. Against the failure of many Internet initiatives in rural India, we became interested in the success of state and community radio and the rapid uptake of the mobile phone.

All India Radio was started by the government in 1936 to "inform, educate and entertain the masses" and now has 229 analogue broadcasting centers covering 92% of the country and reaching 99% of the population.[4] Programs are produced in a variety of local languages (24) and dialects (146), and they comprise a rich mix of local, national, and international news, music, and documentaries. Despite legislation in place at the outset of our project in 2006 banning community radio transmission in India, a number of community groups across the country were operating successful local versions of these programs, distributed over cable TV networks or simply broadcast locally on a shared loudspeaker (Thomas, 2005). These groups are part of a worldwide grassroots movement using participatory communication for social change (Dragon, 2001).

In this connection, it is interesting to note the rapid rise of another audio-based communication device in India: the mobile phone. India is the largest growth market in the world for mobile phones, with 6 million new handsets being bought every month (TRAI, 2007). Penetration is statistically one quarter of the population, or 250 million people, as of the end of 2007. Most new phones have multimedia capabilities including image, sound, and video recording, and many can connect to the Internet with the appropriate subscription. As with radio, mobiles are already being used to support a range of development-related activities including emergency calls, sharing market information, social networking, and renting out the phone itself (Souter et al., 2005; Donner, 2007). This has led to the conclusion that mobiles are more suitable than computers as an ICT development tool and are already closing the digital divide in regard to Internet access (Banks & Burge, 2004; Sachs, 2005).

1.3 Approach

Putting these insights together, we wondered if the modern multimedia mobile phone might be used to extend community radio and television in rural India. In principle, the cameraphone has the ability to support the creation of more sophisticated audio news items, with pictures or video incorporated (i.e., "digital stories"). This could make the production of short TV items much more achievable for a local community, and also could create new opportunities for sharing the content in different ways. For example, in addition to broadcasting video content through analogue transmissions or over satellite and cable TV networks, the same content could be sent from phone to phone in rich multimedia messages or archived on an Internet server for ad hoc access over wired or wireless networks. This reasoning led us to the idea of a local bank or library of audio-visual story information, which we called StoryBank, created for public consumption on a mobile phone.

This led to two major research questions, both involving major HCI challenges for interaction design and system utility:

- Could a StoryBank system be designed in an accessible, text-free form that would overcome the literacy barrier of most Internet content and technology?
- What value would the system have in a local community, compared to the value of community radio or TV?

This led us to the parallel activities of considering the architecture and interaction design options for the system while also carrying out a study of community radio use with a willing NGO partner and village community. Details of the design exploration have been published elsewhere (Jones et al., 2008; Rachovides, Frohlich, & Frank, 2007). In the next section, we report the first detailed findings from the community radio study before describing the final system design and how it was used in a one-month trial. An overview of the system and trial is given in Frohlich et al. (2009), but here we develop the community media analysis and implications further.

2. Community Radio Use and Requirements

2.1 Village Context

Budikote village in southern India was chosen as our field site because of its experimentation with community radio and openness to new technology. It is

4. http://allindiaradio.org/about1.html

Figure 1. Budikote ICT resource and telecenter.

located 100 kilometers east of Bangalore. Today, 600 families live in the village, which has two banks, cell phone connectivity, three government schools, one dairy center, one local village government called the Panchayat, and two private schools. A recent addition has been a telecenter, consisting of six computers. This telecenter is adjoined to another novelty, a community radio station called Namma Dhwani. Both reside in the same building (see Figure 1), have been partially funded by UNESCO, and were set up with support from two agencies, MYRADA and VOICES, both Bangalore-based nonprofit organizations. MYRADA runs the telecenter and radio station on a day-to-day basis, while VOICES set up and maintains the community radio station infrastructure as part of its work on communication media development. VOICES was a formal partner throughout the project, while MYRADA became an informal partner during the course of the work.

2.2 Namma Dhwani Community Radio Station

The radio station was first set up by training a team of women from 10 self-help groups (SHGs) in the area, and the team was taught to make and edit programs. Initially, the studio room on the top floor of the telecenter was used merely to produce programs, and time was purchased off All India Radio to broadcast these programs from Bangalore. This continued for about 28 episodes, when MYRADA, VOICES, and the SHGs decided to adopt a more localized dissemination strategy. Simultaneously, loudspeakers were set up at the studio, and every Tuesday, programs were "narrowcast" to the local farmers' market next door. Collaboration with the local cable operator was also formalized, and cables between the studio and cable operator's office were laid. Now people with television sets and a cable connection could access radio on their TV sets, which was about 35% of the Budikote population. Due to the novelty of the technology, there was high interest. Namma Dhwani therefore started off with two daily broadcasts. A management committee consisting of representatives from the SHGs and MYRADA was then elected to plan and commission program content from local volunteers.

Subsequent developments involved a change in program scheduling, additional loudspeaker broadcasts, and re-use of recorded program segments in schools and self-help groups. Programs came to be broadcast once a day. Additional loudspeaker cables were suspended in trees, extending from the studio to two other villages about 2 kilometers away. In addition, some of the more popular and educational programs came to be played again from audio cassettes in group settings. Hence, by the time the StoryBank Project began in the summer of 2006, Namma Dhwani was sending out daily audio broadcasts through local cable TV and loudspeakers, and regular narrowcasts to school and women's groups.

The programs themselves were planned collectively by management committee members and regular volunteer reporters. Because the first volunteers were women from the SHGs, early programs were oriented to women's issues and included items on women's health, micro-credit, and birth registration, among others. Gradually, younger volunteers started

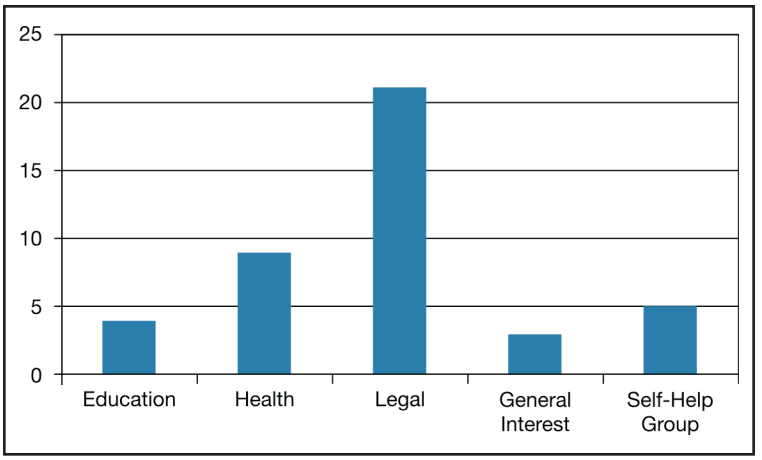

Figure 2. Number of radio programs broadcast on different topics over one month.

coming to Namma Dhwani out of interest in the technology. This had the effect of broadening the content to include more education-related and general interest programs. This resulted in the kind of program mix shown in Figure 2, based on a content analysis of 42 archived program items broadcast over a month, beginning on June 20, 2006. These items were scheduled into each broadcast among non-archived content such as live presenter introductions, devotional and film songs, and live interviews.

2.3 Listening Practices and Values

Although the operation of Namma Dhwani had been studied before and shown to be self-sustaining (Bailur, 2007; Pringle & Subramanian, 2004; Thomas, 2005), we were particularly interested in why this was so and whether its value could be further increased with digital technology. We therefore designed a new study of community radio listening to identify more detailed requirements for the StoryBank system. This was based on the content analysis of 42 recent programs (See Figure 2), an interview survey with 20 individual listeners, and the observation of several group listening sessions in narrowcast meetings and around public loudspeakers.

To understand the value of these kinds of programs, we asked a cross-section of 20 listeners about their personal program preferences and benefits. One typical respondent, M, was a 30-year-old farmer's wife who earned extra money from rolling *beedi* cigarettes out of local leaves and tobacco. She liked to listen to the Namma Dhwani broadcast each night on her family's cable TV as a form of "infotainment" while she worked. Compared to the other seven cable channels, Namma Dhwani was more understandable and relevant to her as a source of information, and of extra interest because she knew the makers and subjects of program items. M remembered certain programs as being particularly exciting, such as the live broadcast of local election results and the related discussion, which made her feel part of the unfolding drama. When asked what was the most useful program she had heard, however, she named one describing the link between street garbage, personal hygiene, and disease. This helped her identify and remove a source of repeated skin infections in her children and adopt a new attitude toward cleanliness around the house. These twin values of entertainment and information were characteristic of many people's experience with Namma Dhwani, and led them to become regular listeners.

A range of direct benefits—concerning legal rights, health, and hygiene—were reported from development-related programs. For example, shopkeeper K appreciated a program on consumer rights because it helped him negotiate more effectively with wholesalers and also know how to deal with his own customer complaints. There were also several stories about the immediate value of health-related programs for taking care of common colds and reducing the risk of infection through personal and environmental hygiene. Educational programs were considered both fun and useful; for example, a 14-year-old boy, J, remembered a program on animal behavior as being his favorite but also helping him get better grades in his biology exam. Some programs were educational for teachers and helped them prepare better lessons.

A final set of programs on local events and culture were found to be entertaining in their own right and generally informative for everyday living. Many people mentioned enjoying the live election coverage. Others reported enjoying the film songs

played between interviews, although MYRADA felt these songs reduced the time available for more serious content. This reflected a tension indentified in an earlier study between the NGO's view of what information should be broadcast on Namma Dhwani and the listener's view (Bailur, 2007); listeners were more eclectic in their choices and tended to want more cultural and entertaining items.

Observations of the re-use of recorded programs at women's self-help groups showed that the programs were usually too long for discussion. In one session, 18 women listened to a 40-minute program on accountability of self-help groups while another 15 women listened to a 20-minute program on consumer rights. Listeners tended to get distracted after 10 or 15 minutes of continuous listening so facilitators tried to pause the program intermittently before holding a main discussion at the end. This was easier with the shorter consumer rights program, which was designed as a mock phone-in with natural breaks between the questions, and consequently, this session was more lively, interactive, and informative.

We also found that facilitators often used visual aids along with the audio programs to explain their content (see also Pasha, 2002). This was something studio staff had been trying informally to introduce into cable broadcasts, manually synchronizing a PowerPoint slideshow of still images along with a radio item. A small number of experimental video programs had also been made. The attraction of this audiovisual content was further confirmed in interviews with some villagers, who told us they preferred to listen to Namma Dhwani on cable TV where these illustrations and videos were available.

Observations of people listening together under loudspeakers showed that many were not paying attention to the radio content. Later discussion of this behavior revealed that listeners could not predict when items of interest to them were coming up and that they therefore had to attend to the entire broadcast just in case one did. They also told us it was easy to miss the broadcast of a particular item by turning up late or talking to friends. Some people, such as the local reporter, had to work late and could not make the broadcast at all. In these cases, it was difficult to borrow program recordings that were not freely available from the studio.

2.4 Requirements for Improvement

Findings from the listener interview survey showed that Namma Dhwani was of significant benefit to the village in improving quality of life through information and was generally working well. The opportunities presented by new technology appeared to be in expanding access to the service over a wider geographical area and increasing participation in content creation so that more diverse and entertaining programs might be made.

Further findings from the observation of narrowcasting sessions suggested that villagers might benefit from a "listen-again" facility for radio programs, and that the programs themselves might be designed in shorter segments, which were more suitable for discussion. The use of a cable broadcast channel also created an opportunity to illustrate radio content with still or moving images in a form of community TV. This was something already being tried out by Namma Dhwani in broadcast and narrowcast sessions, and was highly appreciated by its listeners. These insights became the guiding principles or requirements for the design of the StoryBank system, which sought to extend the Namma Dhwani experience with digital technology.

3. Trial System

3.1 Architecture

Early plans to use a mobile Internet architecture were modified by findings from fieldwork. The local Internet connection was of low quality, and there was no cell tower coverage in the area. In terms of content consumption, the collective, face-to-face listening and discussion of radio and tape content suggested the use of community-oriented playback on a shared display rather than on individual, single-person phones. This led us to design a stand-alone media system with no telecom operating costs, which supported story creation on a Nokia N80 phone and story archiving and playback on a community repository with a dedicated touch screen display. All the editing and preparation of the content was done on phone, so there was no need to transfer content to a computer. These stories could then be transferred to other phones or gifted to the StoryBank repository using Bluetooth, a wireless connection technology. Stories could also be downloaded to the phone from the repository using

Figure 3. Story creator interface.

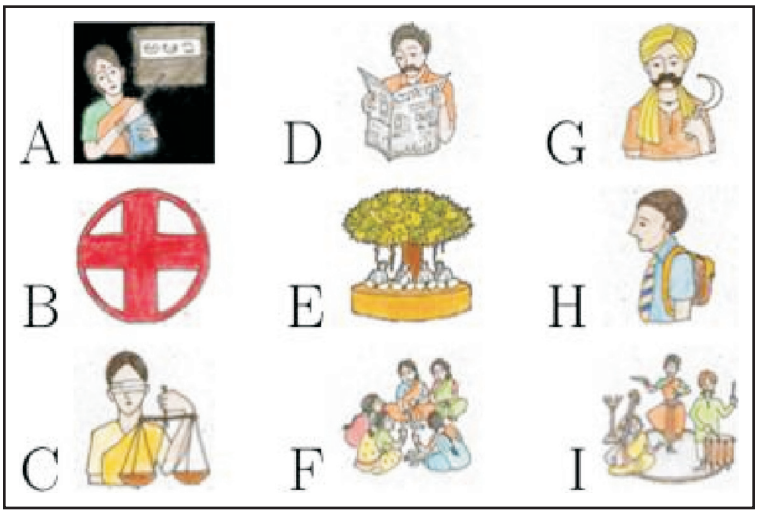

Figure 4. Story topic icons created with villagers. These include Education (A), Health (B), Legal (C), News (D), Panchayat (local government) (E), Self-Help Groups (F), Farming (G), Student (H), and Entertainment (I).

Bluetooth. In practice, we found that transfers between the phones and the repository via Bluetooth were slow and unreliable, so a USB cable connection eventually replaced this form of wireless transfer.

3.2 Cameraphone Interface and Interaction

Three text-free applications were designed for the Nokia N80 mobile phones in the trial. A Story Creator application allowed people to assemble simple digital stories comprising up to six still images and a two-minute voiceover. A story player application allowed users to select and playback locally stored stories from a stack of thumbnail images. A story transfer application allowed users to exchange stories with other phones or the StoryBank repository by Bluetooth connection. Icons for each of these applications were shown on the home screen of the phone and were the only features of the phone used in the trial.

The story creator interface is shown in Figure 3. Users filled up to six image slots, shown in the top two rows of the figure, by taking pictures in sequence. They also recorded a voice narration or other sound track, shown in the bottom row of the figure. These two media streams were then synchronised by playing the sound clip again and then tabbing through the images to mark their introduction in the resulting slide show. Undesirable images or sound clips could be deleted during this process, and half-completed stories could be saved and retrieved to allow users to pause and move to different locations to record different media elements.

After making each story, users were prompted to classify it by topic, using one or more of the topic icons shown in Figure 4. These topics were developed with the villagers and constitute a first guess of the kind of information they would like to share on a StoryBank system. Comparison with the radio topics shown in Figure 2 shows the addition of new categories for news, local government, farming, student, and entertainment items.

3.3 Repository Interface and Interaction

A working prototype of the community center access point was built. It consisted of a repository and touch-screen interface, the latter aiming for a primarily visual style of interaction. The prototype was installed in the main gathering area of the community center. Villagers were able to interact with it

Figure 5. StoryBank repository interface on the touch screen display.

Figure 6. An audio-visual story being played in full-screen mode.

by touching the screen. Index images corresponding to stories were shown to move and shrink on screen, recommending themselves to users before disappearing from view (See Figure 5). By default, content was randomly selected from the repository and added to the collage. If one watched the display long enough, all the content could be viewed. Greenstone, the open source digital library software from the New Zealand Digital Library Project,[5] was used to organize the content, and we have adapted the collage approach provided by this software.

Touching an image caused the corresponding story to start playing full screen, as shown in Figure 6. Playback could be paused by pressing the "pause" icon (which then turns into a "play" icon). Pressing the "rewind" icon on the left restarts the presentation. Pressing the "arrow" icon downloads the story to the user's mobile phone. The number to the right of the display is the story's unique identifier.

In addition to this passive browsing, a user could direct which content was shown in two ways. First, users could use on-screen icons, or buttons, to filter the story images shown in the collage. There were nine topic buttons shown on the left of the canvas. These corresponded to the topics by which stories were tagged when created (see Figure 5). Pressing any of these icons led to only content of the relevant category being displayed. Along the top of the canvas were three further icons that relate to the source of the stories: content from the community radio broadcasts ("Namma Dhwani"), the trial itself ("StoryBank"), and stories of life in the village previously created by villagers for a design competition hosted by the Royal Society of Arts, UK. Furthermore, on the right side of the canvas were the identifier numbers for each of the phones used in the trial. Pressing any of these buttons filtered the content based on which phone it had come from. It was possible to filter by topic, source, and phone together in any combination, forming a composite query (e.g., show only trial content about farming). Leaving any dimension unselected showed content from all items on that dimension.

Second, users could type in a unique number for any story to access it directly. Using a number to access content was particularly appropriate since users were numerate, with experience in dealing with money, for instance, and they understood the notion of telephone keypads. To re-access the same story from the general collage in Figure 5, users simply had to tap the number icon at the bottom right of that screen to access an on-screen keypad and re-enter the number (Figure 7). This allowed villagers to note a number and tell it to others later so they could view the same content, analogous to sending a URL by e-mail.

4. StoryBank Use

4.1 Trial Methods

The StoryBank system was made available to the village in a one-month trial, between November 10

5. http://www.nzdl.org

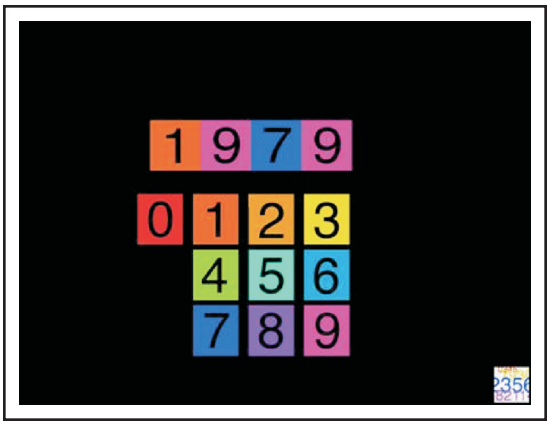

Figure 7. Numeric keypad. The user has touched 1-9-7-9. Tapping on the entered number retrieves the associated content and plays it in full screen mode.

and December 14, 2007. Ten Nokia N80 camera-phones were made available by three community resource people (CRP) and Maxine Frank (the local ethnographer on the project) to anyone interested in making a story. Publicity for the phones was created by word of mouth and by the public availability of the touch screen display. This was pre-loaded with three kinds of content corresponding to the story collection buttons shown at the top of the screen in Figure 5. Sixteen popular radio programs previously broadcast on Namma Dhwani were digitized and each associated with a different index photograph on the system. There were also 24 first-person stories stored in the repository, illustrating both work and home life, as well as events and problems in the village. These were recorded for a design competition called Sandals which was hosted by the Royal Society of Arts in 2008. Finally, 11 example stories were made by Frank and others to start off the trial collection. These represented our best guesses of the range of content that might usefully be shared through StoryBank and included stories on an advertisement for a local product, an agricultural crop problem, route directions to the general hospital, and an announcement of an upcoming event, among others.

This initial set of 51 stories was a showcase for the kinds of content that could be made and uploaded with the phones, and it was supplemented daily with new stories coming in from each phone. Authors tended to invite their friends to see their stories on the display, and viewers tended to want to author their own stories; this created a circle of supply and demand. This was further fed by inviting groups already visiting the telecenter for other reasons to view and comment on the current set of stories. Feedback discussions were held individually with 80 viewers from visiting groups. Three further groups of students, women, and community resource people were also interviewed after the trial (26 in all). An additional four interviews were done with individual NGO staff from MYRADA and VOICES (two from each). In our analysis, we drew on these materials, together with the story corpus itself, to understand how the story content differed from the radio content discussed earlier and what differing values were evident with the use of the StoryBank system. This deepens an analysis presented in Frohlich et al. (2009).

4.2 Story Creation and Categorization

By the end of the trial, 137 new stories had been added to the repository by 79 authors. Author occupations varied from auto drivers, farmers, and carpenters to health workers, students, and teachers. The most common author categories were self-help group members (12%), housewives (16%), and students (25%), although this might have had as much to do with their availability to take part in the trial as with their interest in the technology and information. The number of stories created over the trial period is more than three times the number of radio programs (42) created over a similar period. This is testimony both to the usability of the phone interface (as discussed further in Frohlich et al., 2009) and to the way the approach generated a burst of creativity in the village over a relatively short time. We also note the effect of involving far more members of the community in comparison to those involved in our earlier radio program sample. Seventy-nine people created digital stories with our phones compared with 22 volunteers who made the radio programs. Participation in content creation was therefore democratized to this extent, albeit under semi-controlled conditions.

The topics of stories created are shown in Figure 8. Since stories could be classified by more than one topic, these figures add up to more than 137, but the relative proportions give an idea of which topics were more commonly used. We can see that some of the new categories not present in the radio content were very popular, such as education, news,

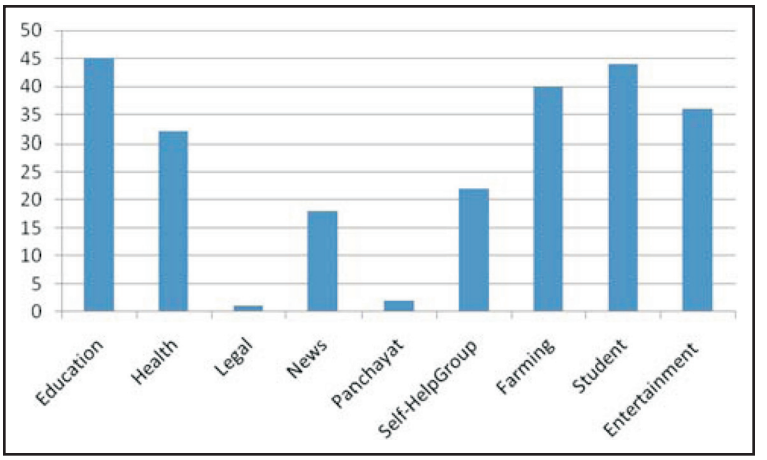

Figure 8. Number of stories categorized by topic. Stories could belong to more than one topic category.

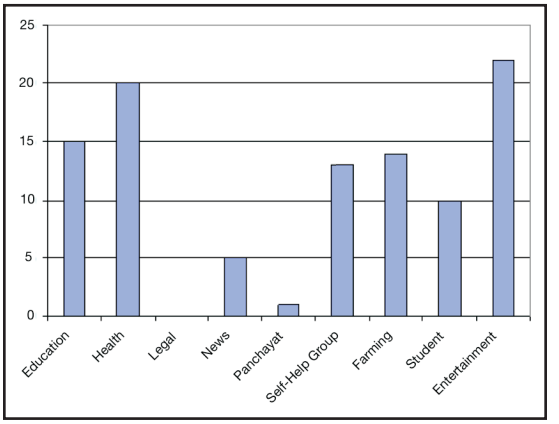

Figure 9. Percentage of best-liked topic categories.

farming, student, and entertainment. Health remains a common subject as it was on the Namma Dhwani broadcasts, shown in Figure 2, but only one story was made in the legal category—presumably because it requires an expert author (a lawyer) to make. The same applies to the Panchayat local government category, which has only two related stories and was therefore not really populated in the trial. Other expert categories such as health, education, and farming were better represented because of the participation of two health workers, four teachers, and five farmers in the trial, and also because other members of the community felt able to share related information such as herbal remedies, educational experiences, and plant growing tips.

The resulting story profile shown in Figure 8 is especially interesting in light of an unexpected development in the administration of the trial. MYRADA recruited the community resource people (CRP) responsible for the phones and spontaneously organized a meeting of CRPs to brainstorm story content ideas. This was done by working through the topic categories of Figure 4 and listing possible stories in each. A total of 146 story ideas were generated in this way, with more suggested in the health, SHG, farming, and legal categories than in the combined cateogories of news/entertainment and education/students. Some story suggestions about farming included information on natural fertilizers, how to grow crops, and animal rearing procedures.

Of those stories suggested, only about a third (30%) were made on planned topics, with other topics being generated by the authors themselves. In this, they may have been influenced by our own set of demonstration stories running on the Storybank repository. In comparison to the MYRADA suggestions, the demonstration stories included more personal and cultural content, such as local music, events, or a child's fictional story. Personal content was further emphasized by the RSA design competition stories, which described life and problems in the village in first-person narratives. These proved to be surprisingly popular with viewers of the repository and far outstripped the interest shown in legacy radio programs. Viewer interest in the new story content was also indicated by votes for the "best liked" story type. The results of this poll are shown in Figure 9. Entertainment stories came on top, followed by health and education stories.

4.3 Story Content Analysis

The dual representation and interest in cultural as well as developmental stories was reflected in an analysis of the content itself. This was performed on about half the story corpus, which was translated and subtitled in English for analysis. This analysis showed that the line between serious developmen-

Figure 10. Developmental story promoting breast feeding (No. 1274; 38 seconds).

Figure 11. Opening two audiophotographs from a local Hindu festival (No. 1276b; 1 minute, 24 seconds).

tal content and entertaining cultural content was a difficult one to draw, indicating more of a continuum between them.

For example, the story shown in Figure 10 is a typical developmental item that might have appeared on Namma Dhwani without the associated images, albeit in longer form. It is 38 seconds long and shows two images, both taken from a health education poster. This shows that stories shorter than two minutes can still be effective for certain messages, and that using all six available image slots is not always necessary. Indeed, the average form across all stories in the corpus was 4.5 photos with 65.7 seconds of voiceover. The capture of non-scenic information from posters, wall paintings, and other man-made sources was relatively common and represented a creative use of the cameraphone as scanner.

The beginning moments of an noncontroversial cultural story are shown in Figure 11. This is less story-like because it uses only ambient sound combined with five photographs of a festival that took place in the village during the trial period. The sound is of the festival music being played in the background. In this respect, the item represents a small set of naturalistic audiophotographs documenting a community event in much the same way that family events might be captured with photographs and sound in the Western world (cf. Frohlich, 2004). Putting this up for consumption on a village display does not necessarily need narrative explanation because most of the viewers will know the

Figure 12. A vegetable advertisement comprising four vegetable photographs (No. 1232; 2 minutes).

story of the photographs as they attended the event. They can also discuss the content with others who happen to be near the display at the time of viewing. This was an unexpected form of implicit storytelling, which begins to show the flexibility of the medium for a range of communicative purposes and contexts. It also reveals, in the absence of personal photography in the village, a latent need for a shared photography and media library in the community.

A common form of story often linked to farming was the description of farm produce, as in an advertisement. One of these ads is shown in Figure 12, which comprised four vegetable photographs with a two-minute voiceover. The voiceover describes the kind of vegetables for sale, their price, and the success of the venture. In this respect, the story is more personal than Western TV ads, describing the individual merchant and their perspective on the business. In a local context, this makes sense because it leverages the reputation of the seller who may be known to viewers. Some ads were more personal than others, focusing more on the seller and their business model than on the produce for sale.

A final example story is shown in Figure 13. This depicts a community event of clearing the school grounds of rubbish. It is described, however, in a way that emphasizes the value of keeping the environment clean, and in this respect, communicates a health message. A number of similar stories had the character of advice from elders, including a song sung by a teacher about the importance of learning respect as children. Others involved the sharing of local knowledge about the value of plants for healing or cooking, describing a personal practice that might be useful for others. These were not items that usually appeared in Namma Dhwani radio broadcasts, which tended to feature expert rather than layperson advice.

4.4 System Use and Value

In group discussions and individual interviews held after the trial, villagers and NGO staff commented on the overall StoryBank system and its potential

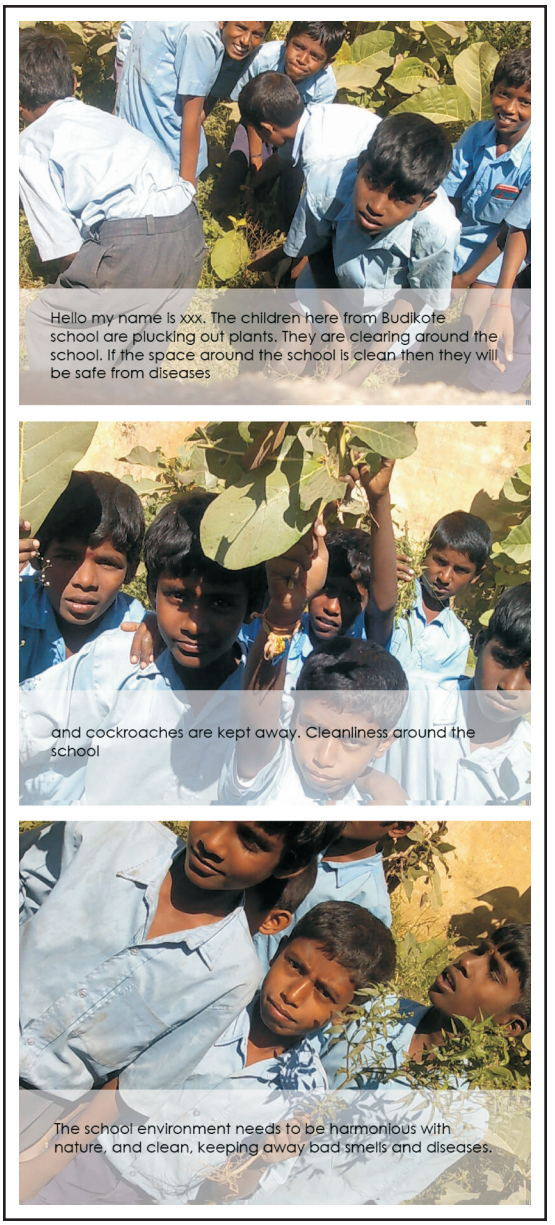

Figure 13. School cleaning as activity and advice (No. 1231; 43 seconds).

value in the village. Villagers found it difficult to articulate major benefits but were overwhelmingly positive about the TV-like quality of story content and its relevance to their lives. Not everyone wanted to be story authors, since there was an overhead of learning the technology and having something to communicate. Most people and groups, however, found something of personal interest in the trial content and wanted the experiment to continue.

This desire was accentuated because Namma Dhwani had gone off-air at the time of the trial, making StoryBank the only source of published community information in the village. Some groups, such as students and Namma Dhwani volunteers, went further in requesting unlimited image and sound capture, better editing facilities, and compatibility of the phone applications with a PC. They also wanted to be able to transmit stories directly to the ICT center. These could then be shared via community radio, or on the situated display we had installed. This begins to indicate a broader role for StoryBank as an adjunct to existing community media activities.

In this connection, we asked NGO staff from both MYRADA and VOICES how they felt StoryBank related to community radio as embodied by Namma Dhwani in the village. Both partners could see how mobile digital storytelling and community media repositories could be used as tools in radio production and distribution. Both the phone and repository applications we had developed were seen as useful in promoting Namma Dhwani as it currently works. For example, the audio from some of the best trial stories could be broadcast on their own or in combination with other stories. As mentioned above, the remote transmission of spoken stories recorded in the field on a mobile phone could be used to support outside broadcast, late-breaking news, or simply the input of a larger number of stories from more lay reporters in surrounding villages. The same stories could also be made more widely available on demand to the community through situated displays but also remote voice services.

VOICES and MYRADA staff could also see the potential for turning Namma Dhwani into a multimedia publishing center, producing radio, TV, and digital content for consumption in multiple ways. While Namma Dhwani has limitations in terms of reflecting its geographical, cultural, and other communities, it is useful in terms of being a hub from which other models of community content can be stationed. With the right kind of synergies and collaborations, Namma Dhwani need not only mean radio, but also other kinds of ICT applications. TV production had already been attempted by Namma Dhwani, but, it took a long time, whereas the StoryBank phone applications were seen to be quicker and more accessible. The possibility of making multiple versions of the same story for dissemination was also discussed.

Where the two NGOs differed was in their attitude toward the cultural content generated in the trial and the core value of StoryBank as a community information system. MYRADA staff felt the personal and cultural information was of little value for development, which they took to be their main priority and the most urgent need of the community. This is summarized in the following quote: "StoryBank is a good concept. . . . We did some brainstorming on which kind of program would be useful . . . But then the required program the people could not do. So general programs they made—too general and that is not their mistake." The solution to this problem was felt to be in better training and tighter control of content production and quality: "You can make a team of Community Resource People, you can train them nicely, you can do some surveys, based on that you can make some programs."

VOICES staff, on the other hand, thought that the main achievement of the StoryBank project had been to facilitate more democratic program-making by a wider section of the community. This is indicated in the following quote: "Personally for me StoryBank is about creating a platform for sharing information without gatekeeping. Anybody can make information, share information, and view information." The fact that this involved the creation of rough-and-ready cultural items with more entertainment than educational value was seen as indication of its success. It specifically acknowledged the multi-faceted nature of village life and the desire, suppressed by Namma Dhwani programming, to enjoy information for its own sake rather than as a means to self-improvement and development.

5. Discussion

5.1 Answers to Research Questions

The starting point for this project and article was an observation about the textual literacy barrier to Internet access and information sharing in the developing world. In contrast to the Web 1.0 model of passive textual information presentation on a PC, we wanted to know if the Web 2.0 model of user-generated content, shared on a variety of platforms, could overcome this barrier, specifically when content was generated in audiovisual form on a modern cameraphone.

Although the StoryBank system was implemented without using an Internet infrastructure, it did manage to use the beginnings of a Web 2.0 design philosophy and, in the future, might be scaled up by moving the digital library repository onto the Web. The success of the field trial—supporting the creation of 137 stories from a diverse cross-section of the community—demonstrates the power of this philosophy and approach for information sharing in a form that everyone can use. The non-literate section of our author and viewer community, which we assume statistically to be about 50% of the sample, was able to take part in an intensive period of creativity and communication, enabled by technology that might otherwise have excluded them. This trial extended an ongoing practice of spoken information sharing, set up in the village through the community radio station Namma Dhwani. A small number of volunteers were already used to making radio programs for community use; this number was simply increased in quantity and diversity by the invitation to make audiophoto narratives on the StoryBank phones. Findings on the use of Namma Dhwani and StoryBank together, therefore, vividly demonstrate the strong value and use of information in a developmental context, and the enthusiasm and capacity of the community to make it themselves—when given the right ICT tools.

The question of how StoryBank compared to community radio was an interesting one that we addressed in the radio study and Storybank trial. The radio study suggested a shorter illustrated format might be better for discussion in narrowcasting groups and more appealing than audio alone over a cable TV network. We never got to test either of these predictions directly because of the demise of the local cable operator and lack of time to assess the impact of stories in self-help groups and classroom discussions. We did find, however, that the audiovisual narrative format was more attractive than legacy radio content on the situated display, and encouraged heated discussion around the display. The village's community display was itself a big success of the project. This is because it again extended an existing practice of community radio listening, this time with the more attractive form of TV-style content. This suggests to us that cable TV broadcast via this form of radio-with-pictures would be an effective method of distribution to a much wider collection of villages, especially in combination

with local digital libraries of content that could be accessed again either in person or remotely over a mobile phone. This is reminiscent of recent developments in digital TV distribution in the West, such as the BBC's iPlayer service to access recent TV programs. One difference here is that we recommend a permanent physical embodiment of this kind of service at a community location to allow promotion and discussion of material face-to-face. This might even be accentuated by broadcasting new content to a public display at regular times or for special events, as is done with the Namma Dhwani broadcasts using public loudspeakers. This would create a form of public cinema, but for content created locally for community consumption.

5.2 Democracy

The further democratization of content creation and sharing was also something suggested by the results of the radio study. We designed StoryBank to achieve this goal, with mixed results.

One one hand, there was evidence of a three-tier democratization of authorship, content, and consumption. At the first tier, authorship was democratized by the use of a simple story template and the removal of centralized training and supervision. This resulted in greater participation in the content creation process, which no longer involved committee planning or approval and could be done on a mobile phone anywhere at any time. At the second tier, the content itself was democratized by these improvements in authorship. Additional categories of information were created freely by a wider group of volunteers. This included more cultural- and entertainment-based information than was normal on Namma Dhwani, a change that proved to be highly popular with villagers. At the third tier, consumption was democratized by making content publically available on the touchscreen display and supporting peer-to-peer phone communication, in principle at least.

On the other hand, this kind of democratization resulted in a lowering of the quality of programs in some people's eyes, and a failure to generate more professional content by experts in particular fields, such as lawyers. It also apparently was threatening to one of our NGO partners, which was concerned that the technology was not being used for serious enough purposes that would benefit the development of the community. This resulted in attempts to reinstate control over content creation and ensure quality programming. In many respects, they were right, and one trajectory for future systems is to directly support NGOs in the communication of developmental information. However, this is not the only future for this technology, which might also be used to give the people what they want, whether or not it is seen as good for them. This raises issues about whose claims should be prioritized in the design process, and what is meant by the "development" that information is supposed to be facilitating. Both these questions bring us back to the HCI focus of the special issue and its role in ICT for development.

5.3 Design

Throughout the StoryBank project, we attempted to pursue a user-centered design approach involving repeated design iteration with constant reference to user feedback. The problem with this approach is that it quickly broke down in the context of designing both phone and repository components for shared community use. Even in the initial user requirements work, we were confronted by conflicting views of radio content and its role in development. This got worse in the early user tests where the selection of which parts of the community to include in the trial became a political question. As we have described, the trial itself was rich in politics and resulted in various mismatches among the perspectives of the project team, the villagers, and our NGO partners, which themselves disagreed about the meaning of the trial results.

All this leads us to propose that the application of HCI in a development context requires a community-centered design approach in which there is greater acknowledgment of differences and politics arising among its multiple user groups. We define this approach as a design philosophy and process in which the differing needs, wants, and limitations of community members are given extensive attention at each stage of the design process. Solutions emerging from this approach should therefore be tailored to the social, infrastructural, and political context and optimized for the benefit of the community. Exactly how this should be done we do not know, but we would be interested to compare and apply techniques used in the development of groupware systems, which are multi-user systems rather than single-user. We imagine these would

involve being explicit about conflicting requirements and perceptions of different user groups, and perhaps generating multiple versions of systems which can be customized and used in different ways. This may involve a more participatory methodology than we have used here, although that participation by itself will not solve problems of conflict or necessarily improve design. The multidisciplinary nature of HCI practitioners and practice is likely to benefit here, because this kind of research and design work demands careful listening, multiple perspectives, and the ability to reconcile these things in creative ways.

5.4 Development

A hidden assumption of all our work has been that we can advance international development through information technology. This appears to be required in developing communities, by definition, and is reinforced by the adjective "developing" and phrases such as "HCI/ICT for development." A final lesson of the StoryBank project is that communities themselves may have priorities and interests other than their own development, at least as the term is sometimes narrowly defined. The creation and enjoyment of cultural stories in the trial shows that Indian villagers have rich traditions of faith, art, sport, and social interaction that transcend everyday problems of making a living, and telling those stories with technology can be as much an enhancer to these walks of life as it can be of material prosperity. Furthermore, the StoryBank experiment shows that new media technology has a large part to play in this respect, by giving semi-literate communities a new voice by which to express themselves and their place in the world. This effect is consistent with a broader view of development as freedom, proposed by Sen (1999). He argues that development is "a process of expanding the real freedoms that people enjoy," both as "the primary end and the primary means of development" (p. 36). In this view, freedom—including freedom of speech and freedom of information—should be a goal of developmental initiatives in its own right, both as a moral good and as a means by which material development can be brought about. We agree with this perspective, which echoes the secondary value of media initiatives in facilitating empowerment of communities to fight poverty themselves (e.g., Slater & Tacchi, 2004). With greater exposure to mobile phones and their use as multimedia creation tools, we believe that communities like Budikote village would also benefit materially from the freedom to express themselves in new ways, whatever they want to say. ■

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