

Design Opportunities

and Challenges

in Indian Urban Slums

- Community Communication and Mobile Phones

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Master's Thesis

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ABSTRACT

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Abstract

This thesis investigates the area of community communication for marginalized communities belonging to Indian urban slums. The aim of the thesis is to identify design challenges and opportunities for mobile based community communication services for residents of Indian urban slums.

The thesis is based on two ethnographic field research done in urban slums of India. The research is qualitative in nature and is best identified as participatory bottom-up exploration. The research is grounded in the conceptual frameworks of Community Informatics, Communicative Ecology and Communities of Practices.

The thesis discusses the existing practices of mobile phone's use amongst the residents of Indian urban slums, identifies the 'Human Nodes' in community communication at an Indian urban slums, presents design opportunities and challenges for community communication services for residents of Indian urban slums, and proposes a design concept called as 'Asynchronous Voice based Community Communication Service' for residents of Indian urban slums.

*Materials**Keywords*

Community Communication, Community of Practice, Communicative Ecology, Community Informatics, India, Mobile Phones, Urban Slums

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Legends

Legends used in the thesis:

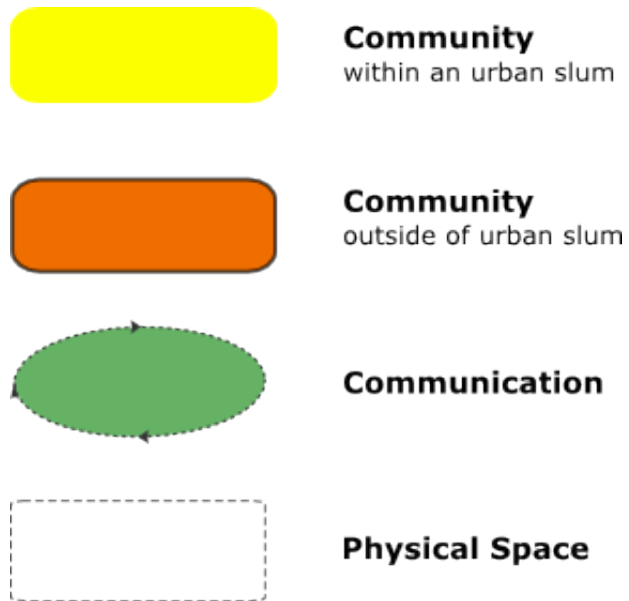


Figure 1 Legends used in the thesis

1 Introduction

Urban Slum, a design opportunity!

Urban Slum, a design challenge!

According to UN-Habitat (2003), 31.6 % of world's urban population i.e. 924 million people lives in slums. 3 billion of world population i.e. around half the world lives on less than US\$2 per day. One-third of world's poor belong to India (Rao 2009).

This thesis investigates the area of community communication for marginalized communities belonging to Indian urban slums. There have been many community level ICT initiatives targeting poorer section of developing countries like India. Most of these initiatives have failed to sustain and progress beyond the pilot phase (Ashraf et al. 2007; Nnadi & Gurstein 2007; Gurstein 2006). One of principal reason for the failure has been that the focus was always on technological infrastructure rather than utilizing the local social context. (Ashraf et al. 2007; Nnadi & Gurstein 2007).

The main aim of this thesis is to identify design challenges and opportunities for mobile based community communication services for residents of Indian urban slums. The thesis is based on two ethnographic field studies in urban slums of India. The research is qualitative in nature and is best identified as participatory bottom-up exploration. The research is grounded in the conceptual frameworks of Community Informatics (Garside 2009), Communicative Ecology (Tacchi et al. 2003) and Communities of Practices (Wenger 2004).

This thesis discusses the existing practices of mobile phone's use amongst the residents of Indian Urban Slums, identifies the 'Human Nodes' in community communication at an Indian Urban Slums, presents design opportunities and challenges for community communication services for residents of Indian Urban Slums, and proposes a design concept called as 'Asynchronous Voice based Community Communication Service for residents of Indian Urban Slums. The participatory nature of the field research and inclusive nature of the design concept brings the thesis close to areas of social design (Papanek 2000; Papanek 1983) and service design (Miettinen & Koivisto 2009).

1.1 Objectives and Research Problem

The main aim of this thesis is to identify design opportunities and challenge for mobile based community communication services for Indian Urban Slums. To address this aim I had identified following objectives:

- a. Identify practices of mobile phone's use amongst residents of Indian urban slum.
- b. Identify existing communication specific practices of a community belonging to Indian urban slum.

This thesis addresses the following research problem: What are the design opportunities and challenges for mobile based community communication services for residents of Indian urban slums?

1.2 Context of Research

1.2.1 *India*

India is a democratic country with multitude of languages and cultures. India amounts to 17% of world population and includes one-third of world's poor (Rao 2009). According to the last Census of India (2001), India's overall population was 1027 million, out of which 285 million (27.8 %) lived in urban areas. 67 million of the urban population of India are below poverty line i.e. people living on less than US\$ 2 per day (Rao 2009).

This thesis is primarily based on field study done in Bangalore city of India. Bangalore is located in southern part of India and it is capital city of state of Karnataka. Bangalore has population of over 6.5 million and is ranked fifth most populous city of India (Raman 2008). Bangalore is a world famous Information Technology (IT) center and is widely known as 'Silicon Valley of India'. The city has played a major role in economic growth of India and has also been test bed for number of ICT initiatives for development (Singhal & Rogers 2001). A considerable number of Bangalore's population has remained untouched by economic developments (Raman 2008).

1.2.2 *Urban Slums*

It is widely accepted that 'slums' are difficult to define and there are multiple definitions and meanings co-existing (Sliwa 2008). According to UN-Habitat (2003, p.xxxi):

Slums are distinguished by poor quality of housing, poverty of inhabitants, the lack of public or private services and the poor integration of the inhabitants into the broader community and its opportunities.

31.6 % of world's urban population i.e. 924 million people lives in slums. About 60% or 554 million of the slum dwellers across the globe belonged to Asia. Population of urban slums across the globe is estimated to increase by 2 billion in next thirty years. Much of the labor forces in cities of developing countries live in slums. Urban Slums are marginalized and represents the most disadvantaged group of urban dwellers.

Accordingly, urban slums' growth in cities like Bangalore is related to rapid growth of urban population in the city outpacing the development of infrastructure and capacity of the city (ibid.).

1.2.3 *Literacy, Illiteracy and Semi-literacy*

Census of India's definition of 'literacy' is ability to read and write in any language and 'illiteracy' is not having the ability to read and write in any language (Mathew 2006). This definition is widely accepted and is used by all the Government of India offices. According to the last Census of India (2001), overall literacy rate measured 64.8% while urban centers possessed 79.9% literacy rate. This translates to overall 560.7 million literates with 198.8 million literates in urban India. According to some estimates, 50% of these 'literate' just fulfil a basic literacy level and cannot read and write even a basic text in any language (Kothari 2008). This group of people who fulfil basic literacy requirements but cannot read and write much are termed as 'Semi-Literates' (Findlater et al. 2009).

1.2.4 *Mobile Phones*

Late start but fast pace, this phrase very well summarizes India's mobile markets growth. According to *The Economist* (2009) India is world's fastest growing mobile

market and in terms of overall mobile user base it is globally second being behind China. According to recent report of Telecom Regulatory Authority of India (2010), total mobile phone subscriber base reached 545.05 Million users mark by end of January 2010. 19.9 Million new mobile subscribers were added in month of January 2010 alone. Despite the rapid growth of mobile phones in India, mobile teledensity is still low at 46.37 percent. This also indicates the potential for future growth. Cellular Operators Association of India (COAI) estimates that mobile subscriber base will rise to 893 Million users with mobile teledensity of 64.69% in 2012 (Thomas 2009). Indian mobile telecom sector is growing in the range of 35-40 percent per annum in terms of new subscriber addition (Pai 2008).

While mobile market of India has seen rapid growth in recent years, wireline phone teledensity is mere 3.13 percent with 36.76 Million user base and registered a decline in January 2010 by 0.31 Million users. Total broadband internet subscriber base is 8.03 million as on January 2010 (Telecom Regulatory Authority of India 2010). It is largely believed that a bulk of 250 Million new mobile users belonging to poorer section of Indian society will soon add to mobile subscriber user base. It is also expected that this huge group will primarily rely on voice services of mobile phones (Pai 2008).

1.3 Motivation

I have academic background in engineering with Bachelors in Information and Communication technology (ICT). After finishing my bachelors in 2005, I worked as User-Interface Designer in India for couple of years. In 2007, I joined Media Lab, University of Art and Design Helsinki (Taik) to pursue Master of Arts in New Media Design. At Media Lab, I also worked as Research Assistant at ARKI Research Group. The study at Media Lab introduced me to areas of Design Research and Participatory Design approaches, which formed the foundation for this thesis work.

This thesis represents my growth from an engineer to a design researcher and includes my first experience of conducting an ethnographic field study. The study has been followed with lot of personal motivation for self-learning and exploration.

1.4 Similar Research and Cases

In this section I present some research projects, and examples from industry which are related to my research.

- a. *Finding a voice* Project: *Finding a voice* is a research project initiated by UNESCO and UNDP in India, Nepal, Sri Lanka and Indonesia. This project addresses the issue of poverty alleviation in rural areas of south-east Asia by use of community radio, telecenters and other community based ICT initiatives (Tacchi & Kiran 2008; Skuse et al. 2007; Watkins & Tacchi 2008). This project introduced me to methodological framework of Ethnographic Action Research (EAR) and conceptual framework of Communicative Ecology (described in chapter 2). The research approach of my thesis is inspired by the research approach of Finding a Voice Project.
- b. *MobilEd*: *MobilEd* is primarily a South African research initiative focusing on use of mobile phones in educational settings in developing countries. The project has been piloted in Finland, India and Brazil. One of the mobile prototype developed by MobilEd team called 'mobile audio-wikipedia' facilitates asynchronous voice access to information (Ford & Leinonen 2009). This project served as an initial inspiration for my research. It directed my attention to asynchronous voice and on use of low cost mobile phones (described in chapter 5).
- c. *Urban Mediator*: *Urban Mediator* is a research initiative which is part of ICING (Innovative Cities for the Next Generation) project and is funded by European Union. This initiative targets interaction between citizens and a city. This initiative is based in cities of Barcelona, Dublin and Helsinki (Botero & Sullonen 2008). I was involved in Urban Mediator as a Research Assistant and my work involved development of a mobile prototype which enables citizens to capture and publish information (like digital images, geo-information and user-generated tags) from a physical space to an on-line interface. This project serves as an initial inspiration for my thesis. This project introduced me to concepts of community-driven approach to design and relevance of participatory design activities.
- d. *DakNet*: *DakNet* initiative, also termed as 'Moving Content Project', is an innovative commercial project recently started in state of Orissa, India. The

project provides asynchronous internet access to rural population of Orissa by leveraging on local buses. The local buses are mounted with Wi-Fi transceivers which assists in storing and forwarding information. The project also relies on human intermediaries to cater to local needs for products of everyday use (Watkins et al. 2009). The aspects of engaging human intermediaries and use of asynchronous mode of communication are related to findings of my research (described in chapter 5).

Other Academic Research Initiatives:

Table 1.1 briefly presents some examples from academic research initiatives which have experimented with asynchronous voice communication. Asynchronous Voice mode is central theme of the design concept proposed in this thesis (discussed in chapter 5).

Title	Comments
RadioActive	An interaction design focused project that highlights the importance of Mobile based Asynchronous Communication (Zinman & Donath 2007).
Voicepedia	A technology driven research on providing 'speech-based access' of unstructured information to non-literate users (Sherwani et al. 2007).
Impromptu	A technology driven project to develop a mobile audio device. The device caters to asynchronous voice channels (Schmandt et al. 2002).
PengYo	An explorative project to develop a mobile application prototype based on concept of missed call or beeping (Bilandzic et al. 2009).
Quiet Calls	A technological exploration which extends the asynchronous voice-mail's technology and utilizes mixed-mode communication (Nelson et al. 2001).
e-tuktuk	A community building initiative utilizing a three wheeled motorcycle as mobile tele-center and community radio broadcasting unit (etuktuk.net).

Table 1.1 Academic research initiatives related to the thesis

Service Industry Initiatives:

Table 1.2 briefly presents some examples from service industry or businesses in India which are relying on voice mode for their functioning. These highlights the significance of voice mode which is central theme of the design concept proposed in this thesis (discussed in chapter 5).

Title	Comments	URL
LifeLines	A phone based information service delivery initiative targeting rural population in India.	http://lifelines-india.net
Just Dial	A phone based local search service operating in over ninety-one cities in India. It relies on voice mode to address the people's search requests.	www.justdial.com
Onmobile	A Bangalore based company which developed services like Voice-SMS and Voice-Mail for mobile network providers in India.	www.onmobile.com
Ubona	A Bangalore based company which provides value added services using mobile phones and voice mode.	www.ubona.com

Table 1.2 Service Industry Initiatives related to the thesis

1.5 Research Design

In this section I describe major phases of the research and briefly mention what was done in each of the phases. The project's initial idea was conceived in June 2008 when I was working as Research Assistant on Urban Mediator Project at ARKI research group, Media Lab, University of Art and Design Helsinki (Taik) Finland. The whole research is divided into four major phases (See Figure 1.1):

- a. Phase 1 (July-August 2008, India) : *Identifying practices of mobile phone's use*

The Phase 1 of the research consisted of a broad study to understand practices of mobile phone's use amongst residents of Indian urban slums. This qualitative research is based on ethnographic field study conducted in cities of Bangalore

and Mumbai in India. This field study was for a period of seven weeks and it was funded by ARKI Research Group as part of ENCOMPAS project.

b. Phase 2 (September-November 2008, Finland): *Analysis and Documentation*

The Phase 2 the research consisted of detailed analysis of data gathered in Phase 1 and documentation of subsequent findings. This phase was conducted in Helsinki, Finland. During this phase, I realized certain aspects of data indicating role of local community in context of communication for the residents of Indian urban slums (described in section 3.4.5). This required an in-dept study and it directed my focus to aspects of community communication at Indian Urban Slums. Hence, a second fieldwork was needed to exclusively explore this aspect.

The Phase 1 and the Phase 2 are together discussed in chapter 3 of this thesis.

c. Phase 3 (January-February 2009, India): *Understanding Community and Communication of an Indian Urban Slum*

The Phase 3 of the research consisted of ethnographic field work to study community communication at an Indian urban slum. Due to many logistical reasons I chose Bangalore for the fieldwork. The research was focused on Sudarshan Layout, an urban slum in Bangalore. The research approach was inspired by Ethnographic Action Research (EAR) and Participatory Rural Appraisal (PRA). This field work was not funded and it was conducted on my own expenses.

d. Phase 4 (September 2009-February 2010, Finland): *Analysis, Documentation and Design Concept*

The Phase 4 of the research consisted of detailed analysis of data gathered in the Phase 3, documentation of research findings and identification of a design concept. The Phase 3 and the Phase 4 are discussed in chapter 4 and chapter 5 of the thesis.

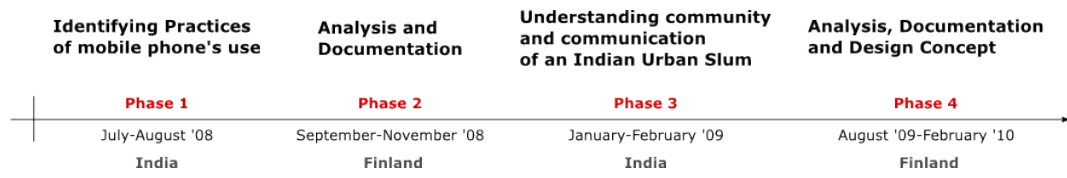


Figure 1.1 Thesis Time line

2 Methodological and Conceptual Framework

2.1 Introduction

This chapter presents the methodological and conceptual frameworks that this research is based on. While Ethnography, Ethnographic Action Research (EAR) and Participatory Rural Appraisal (PRA) make-up the methodological framework followed for this research; Community Informatics, Communicative Ecology and Communities of Practices (CoPs) are utilized as the conceptual frameworks.

2.2 Ethnography and Ethnographic Action Research (EAR)

Ethnography is the research approach which primarily deals with detailed observation of a particular set of people in a particular social setting . Participant observation, field notes and in-dept interviews are most common methods employed in ethnographic field study (Silverman 2000).

Ethnographic Action Research (EAR) is the research approach to study impact of Information and Communication Technology (ICT) especially in the area related to poverty alleviation (Tacchi et al. 2003). EAR combines Ethnography with Action Research. While Ethnography emphasizes in-depth understanding of the culture of the locale, Action Research connects the research in iterative fashion to four step process cycle i.e. a) Planning b) Doing c)Observe d) Reflect. EAR encourages participatory methods of engaging participants or group under study as fellow researchers in all the cycles of the project.

Tacchi et al. (2003) stress that understanding of local context is of prime importance and the research process should be adapted according to the challenges faced in the field. They suggest the use of conceptual framework of 'communicative ecology' to study ICT and its impact in people's life. Communicative Ecology is described in section 2.4.

They also recommend use of methods like participant-observation, field-notes, group interviews, in-dept interviews and 'self-documentation' exercises . They describe 'Self-documentation' exercise as a creative use of media, like photography, in research process by allowing people to document themselves and their environment.

2.3 Participatory Rural Appraisal (PRA)

Participatory Rural Appraisal (PRA) is a research methodology which advocates bottom-up research approaches and the flexible and innovative mix of various methods with sensitivity for the local context (Kumar 1996). Kumar (2007) adds that PRA (Participatory Reflection and Action) is especially relevant in engaging illiterate or semi-literate participant groups in research process. Tacchi et al. (2003) also acknowledge significance of PRA and recommend using methods described by PRA along with Ethnographic Action Research (EAR).

Kumar (2007) recommends that researchers should act as a facilitator and contrive according to the local context. PRA emphasizes triangulation or cross checking by use of various methods with same participant group or use of same methods with different participants groups. At other place Kumar (1996) also stresses the attitudinal shift in researchers' approach to believe that local people are capable of analysing their situations or problems. According to him including games and activities followed by reflection and analysis is helpful. One of the most popular method of PRA is Social Map which suggests participants to hand draw a map depicting social infrastructure of the locality (Kumar 2007).

2.4 Community Informatics

Moor (2009) describes Community Informatics as a branch of study based on community and technology. According to him Community Informatics is focused towards social context of technology use and is driven by instances or stories from the field. Community Informatics research recognizes that it is crucial for sustenance of Information and Communication Technology (ICT) initiatives in developing countries to understand social context of use of introduced technologies, for example mobile phones (Garside 2009).

2.5 Communicative Ecology

Ethnographic Action Research (EAR) uses the concept of 'communicative ecology' to understand the use of Information and Communication Technologies (ICTs) and their effects in people's lives (Tacchi et al. 2003). The communicative ecology approach proposes that instead of evaluating use of a particular ICT and its effect, researchers should aim to build a broader picture by looking at the use of mix of

ICTs, social networks, communication channels, and resources available. Communicative ecology suggests that to build an appropriate understanding we need to evaluate how people combine various media in their use, how and with whom people communicate, and how various ICTs are localized in people's everyday life. Communicative ecology aims to build a broader context for the communication that people engage in. By evaluating communicative ecology, communication could be studied as a process. The possibility of success of an ICT initiative is much higher if the design of media is grounded in these processes.

Tacchi et al. (2003) also suggest to gain understanding of communicative ecologies of multiple groups belonging to different castes, religions, social, and economic sections of society. This will make researchers better equipped to work with a specific group as it reveals variation in communication models, needs and problems.

Foth and Hearn (2007) further define the concept of communicative ecology as consisting of three layers:

- a. The Technology Layer comprising of devices, media and various channels used for communication.
- b. The Social Layer comprising of people, social groups, networks and communities. It takes into account formal groups as well as informal gatherings.
- c. The Discursive Layer consists of the content of communication.

2.6 Communities of Practices (CoPs)

Wenger (2002, p.4) defines the concept of Communities of Practices (CoPs) as:

groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.

According to him, Communities of Practices are crucial part of everyone's life and are ubiquitous. He adds that everyone is part of multiple Communities of Practices at the same time. Some of them are informal while others are formal, some are recognized while others remain unrecognised, some have names while others do

not (Wenger 2004; Wenger et al. 2002). All the Communities of Practices have a basic structure consisting of:

- a. Domain: A set of themes, problems, and issues.
- b. Community: A group of people who jointly address the domain.
- c. Practice: The specific knowledge and learning which the community produces, shares and maintains in the process of addressing the domain.

He adds that a Community of Practice also creates a collective identity as a result of sustained mutual engagement.

3 Identifying Practices of Mobile Phone's Use

3.1 Introduction

This chapter discusses Phase 1 and Phase 2 of the research. As mentioned in section 1.4, the Phase 1 (*Identifying practices of mobile phone's use*) of the research consisted of ethnographic fieldwork conducted in July-August 2008 at Bangalore and Mumbai, India. The aim of the fieldwork was to build a broad understanding of the practices of mobile phone's use amongst the residents of Indian Urban Slums. Phase 1 of the research was funded by ARKI Research Group of Media Lab, University of Art and Design Helsinki (Taik), Finland.

Phase 2 (*Analysis and Documentation*) of the research consisted of analysis of data gathered in Phase 1 and documentation of findings. Phase 2 was conducted in September-November 2008 at Helsinki, Finland.

In this chapter, I will start by describing the participants of research, followed by the research process and methods, the data gathered and finally I will briefly present the findings relevant for the thesis.

3.2 Description of Participants

Participants in the phase 1 of the research reside in slums of Bangalore and Mumbai. All of them were part of the lower strata of Indian society. They worked as taxi drivers, auto rickshaw drivers or autowalas, street vendors, house maids etc. Most of the participants were semi-literates or illiterates. Most of the participants had started using mobile phones in the recent past. These participants were approached on the field itself and were selected for interview on the sole criteria of whether they use mobile or not. In total, 18 individuals (2 women and 16 men) participated in this research. See figure 3.1.

3.3 Research Process and Methods

The research process consisted of three parts: 1. In-dept Interviews 2. Field Notes 3. Analysis. See figure 3.2 below.



Street Vendor

House Maid

Auto rickshaw driver

Figure 3.1 Photos: Participants in Phase 1 of the research

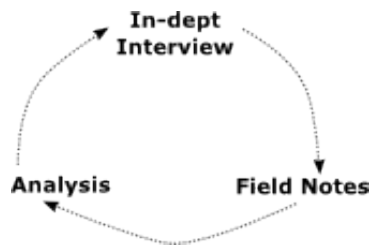


Figure 3.2 Research Process (Phase 1)

- a. In-dept Interviews: In-dept interviews formed the core part of phase 1 of the research. Although these interviews were unstructured and free flowing, a list of broad themes to be covered during interviews was prepared beforehand which was referred during the interviews (Tacchi et al. 2003).

Most of the interviews were conducted on streets, or communal spaces within the slums. These spaces were part of participants' everyday life. Duration of interviews varied a lot, while some were for fifteen minutes others went for over one hour duration. Participants' engagement in work related activity was the major reason for this variation. Running notes were taken during the interviews. Canon A450 point and shoot digital camera was used to take pictures while Philips Sound Recorder cum mp3 player was used to audio record all the interviews.

It is worthwhile to mention that most of the participants from Bangalore spoke Kannada and were not comfortable in conversing in English or Hindi (languages I am capable of communicating with). Two local residents of Bangalore assisted in these interviews as translators.

- b. Field Notes: Field notes are detailed notes to document the interviews and

observations (Silverman 2000; Tacchi et al. 2003). Field notes were prepared after every interview and were maintained throughout the research.

- c. Analysis: Newly prepared field notes were briefly analysed and compared with field notes of previous interviews. Any relevant observation in this process of comparison was noted down. Based on this analysis, the list of themes for interviews was updated.

During the early stages of research, I had prepared a rudimentary mobile application prototype named as Voice Annotation Service for Mobile Images and Videos. Details of the prototype are provided in appendix A.1. The prototype was based on a pre-conceived idea and was not addressing any design problem identified during the field work. During interviews I requested participants to test the prototype. This exercise was useful as it informed me of many issues related to the use of mobile phones by residents of Indian urban slums.

Phase 2 of the research started with evaluation of audio recordings of the interviews. Based on this evaluation relevant observations were noted down. These observations were compared with field-notes. This helped in identifying some prominent themes. Finally, existing literature on the identified prominent themes was referred and a text document was prepared based on field notes and audio transcription. Contents of the text documents are presented in the next section (3.4).



Figure 3.3 Photos: Field study in Bangalore, India

3.4 Initial Research Findings and Area Identified for Further Research

In this section I present the findings of Phase 1 and Phase 2 of the research. I discuss only those findings which are relevant for the research question. In the end of this section I discuss area identified for further research.

3.4.1 *Significance of Voice Call*

During interviews most of the participants informed that they have absolutely no problems in using mobile phone. I investigated this aspect further and it revealed that many of illiterate participants' mobile phone's use was primarily limited to making and receiving calls. Many of them still see mobile as just a device for voice calling and receiving. For the participants, voice call was very important mode for getting information, letting others know of well-being, directions to places and coordination in regular activities. Participants informed that whenever they needed assistance or information they preferred calling their friends, relatives, elders etc rather than contacting the concerned services like information kiosks, helpline services or government departments. Almost all of them regarded getting information from someone much more personal and reliable and voice call played an important role in this regard.

3.4.2 *Level of simplicity needed in Mobile Service's Interface Design*

During interviews and prototype testing, people remarked that interface of mobile phone should be as simple as that for making a phone call. Almost all of the participants informed that they feel very comfortable in using a mobile phone for calling but feel unsure if they have to use any other functionality. Reason for this is making a call relies on just two keys (apart from the number keys) and both are presented upfront. Green key to dial while Red to disconnect. Both are colored and can be easily differentiated. For this process each key has a single meaning attached. Hence the whole process becomes intuitive. This was an interesting design direction for this research i.e. mobile interface of any service or application addressing illiterate users group of India mobile interface design should aim to be as simple as that for making a phone call.

3.4.3 *SMS*

Rao and Desai (2008) inform that in India SMS service is being extensively used for political campaigning, TV shows, games, quizzes, and advertising . But use of SMS was found quite limited amongst participants of the research. Primary reasons identified were lack of education and experience with technology. This correspondence between education level and SMS use finds support from another study done on fishing industry in India by (Abraham 2007).

3.4.4 *Missed Call or Beeping*

During the research I found that the concept of missed call or beeping is quiet popular amongst participants of the research. Missed call or beep could be defined as dialing a phone number and disconnecting the call before the receiver picks up the phone. Missed call allows one to communicate in various ways without having to speak. And as network service providers do not charge for missed calls, communication happens without spending any money. Donner (2007) has defined three major types of missed call: 'Pre-Negotiated Instrumental Beeps', 'Relational Beeps' and 'Callback Beeps'. Most of the instances of use of missed call amongst research participants falls into the category of 'Pre-Negotiated Instrumental Beeps' and 'Callback Beeps'. While 'Pre-Negotiated Instrumental Beeps' are mutually negotiated and agreed grammar of use, 'Callback Beeps' are missed calls which simply request for a callback (Donner 2007).

An example of use of 'Pre-Negotiated Instrumental Beeps' by an auto rickshaw driver from Mumbai:

The participant (auto rickshaw driver) can read and write in Hindi. His use of mobile is limited to making and receiving calls. He uses the concept of missed call for his daily work. He has given his mobile phone number to his customers and have requested them to give him a missed call whenever they need his service. He maintains a list of phone numbers of his regular customers in a small paper diary. So, whenever he gets a missed call he matches the number with the names in his paper diary, gives back a missed call indicating his availability and compliance with his customer's request. As soon as he reaches the doorstep of the caller he again gives them a missed call indicating his arrival. This approach brings him business and his customers have the convenience of having an auto rickshaw

waiting for them at their doorstep. He also added that he never picks up the phone before it has beeped at-least thrice. This is his way to ensure whether someone wants to speak to him or it is a missed call.

As indicated above some groups have created complicated grammar for use of missed call. The meaning of missed call is negotiated by the group and is indicative of social practices developed by people around the use of mobile phone's technology (Donner 2007; Donner 2005).

3.4.5 *Community Communication, an area for further exploration*

During the later stages of Phase 2, I realized that there are numerous instances in the interviews which indicate role of local community in context of communication for the participants. Some of these instances being:

- a. Reliance on friends, relatives and local group for crucial information. Preferring them over any established channel.
- b. Recurrence of themes of communication in context of well-being, survival, solidarity and togetherness.
- c. Existence of negotiated grammar of missed call indicated association.
- d. Most of the participants were found to be associated with some or the other local NGOs or associations. They informed that they address their social and civic issues by communicating with these NGOs rather than reporting directly to the concerned governmental departments.

All of these indicated significance of community communication for residents of Indian urban slums but to understand this relation I needed another field visit. So, I focused on studying community communication in an Indian Urban Slum in Phase 3 of the research (described in next chapter).

3.5 Conclusions

As described in the introduction of this chapter, Phase 1 and Phase 2 of the research were helpful in forming a broad understanding of practices of mobile use amongst the residents of Indian Urban Slums. These two phases also revealed community communication as an area for further investigation which led to Phase 3 and Phase 4 of the research.

4 Understanding Community Communication of an Indian Urban Slum

4.1 Introduction

This chapter discusses Phase 3 and Phase 4 of the research. As mentioned in Section 1.4 (Research Design), in Phase 3 (*Understanding Community and Communication of an Indian Urban Slum*) the fieldwork was conducted in January-February 2009 at Bangalore, India. The aim of the Phase 3 was to focus on community communication in an Indian Urban Slum (the area identified for further research in the Phase 2). Phase 4 (*Analysis, Documentation and Design Concept*) consisted of analysis of data, documentation of findings and identification of a design concept. Phase 4 was conducted in Helsinki, Finland.

Association for Planning and Social Action (APSA), an NGO based in Bangalore, India introduced me to the members of Ambedkar Community Computing Center (AC3), an informal computer education center in Sudarshan Layout. Sudarshan Layout is a slum in Bangalore city. My association and collaboration with the members of AC3 proved crucial for this research. In this chapter I start with the description of and research challenges at Sudarshan Layout, followed by discussion on Ambedkar Community Computing Center (AC3). Finally I present my research process and discussion on Communicative Ecology of AC3 members.

4.2 Description of Sudarshan Layout

Sudarshan Layout is a residential area for the (marginalized) community of construction workers, domestic helps, labourers belonging to scheduled caste (SC), as recognized by Indian constitution, and also refereed as Dalits or previously 'untouchables'. Sudarshan Layout is located in Gurappana Palya, near Bannerghatta Highway, Bangalore, India.

Sudarshan Layout is roughly a hundred meters (length) by fifty meters (breadth) in area. It is surrounded by big corporate offices. There are a few cybercafes and mobile SIM recharging centers in the close vicinity of the Sudarshan Layout. A wide open sewage canal runs byone boundary of Sudarshan Layout and it leads to many health related issues amongst the residents, especially children.

In Sudarshan Layout, around three hundred families live in over hundred and fifteen houses, most of which are one room tenements. Family income varies between Indian National Rupees (INR) 1500-10000 (40-150 Euros) per month. As for religion, most of the residents were Hindus barring a few Muslim families. The residents have limited access to civic amenities and services. See table 4.1 and figure 4.1.

Sudarshan Layout has regular electricity supply but persistent voltage fluctuation hampers use of electronic equipments. Almost every household in Sudarshan Layout has a television set; and DVD players are very common as well. Mobile phone is the most pervasive electronic device in Sudarshan Layout. I found that almost every household has at least one mobile phone with a maximum of four mobile phones per family. Mobile phone was usually owned by working member of the family. It is a general belief amongst Sudarshan Layout residents that anyone who has to go out of Sudarshan Layout for work deserves to keep a mobile phone. Major reasons for this belief, as explained by locals, is sense of safety and connectedness with members community. Residents of Sudarshan Layout were like a close-knit big family. Sense of belonging for the local community was noticeable among the residents.

4.3 Research Challenges at Sudarshan Layout

Sudarshan Layout posed three major challenges for this research:

- a. **Language Barrier:** Most of Sudarshan Layout residents speak Kannada, Tamil, Telugu and Malayalam. Very few of them were comfortable in communicating in English or Hindi (the only languages I am capable to communicate with).
- b. **Issue of Literacy:** Most of the local residents, except local youth, were non-literate or illiterate. Overall there was reluctance among the locals to participate in any activity which required them to write. This posed problems in collaborative research activities. Oyugi et al. (2008) have documented this issue in the context of participatory design activities conducted in developing regions of the world .
- c. **Issue of Identity:** Most of the Sudarshan Layout Residents were reluctant to communicate with me because of my own identity. Some of the residents

Category	Resource	Number	Remarks
Human Population	Families	300	
Residence	Houses	150	Most of them are one room tenements
	Streets	4	Each street is approximately 50 meters in length and 5 meters wide
Water and Food Supply	Small Multi-purpose Shops	3	These small shops sells snacks, chocolates, items for regular use etc
	Bakery	1	Sells ready to eat food, tea, coffee, cold-drinks etc
	Roadside Tea Shop	1	Sells Tea, biscuits, and some snacks
	Ration Shop		Ration shop is not within the premises of Sudarshan Layout. It is at 15-20 min. of walking distance.
	Clean Water Supply Taps	3	Each street, except for fourth street, has one tap
Communication	Telephone Coin-Booth	6	Installed at the Multi-purpose shops
	Mobile Phones		Almost every households has a mobile phone.
Health and Hygiene	Medical Facility		A private doctors clinic available in nearby area. A multi-facility hospital is 500 meters away.
	Toilets	8	Most of the houses in Sudarshan Layout do not have toilets. Residents use a public toilet which has eight toilet pots. Four are for men while other four for women.
School	Government and Private Schools		Not in Sudarshan Layout but in nearby area.

Table 4.1 Overview of resources at Sudarshan Layout



Figure 4.1 Photos: Streets in Sudarshan Layout

considered me as a 'Hindi-speaking' North Indian while others considered me as an 'outsider' belonging to privileged section of Indian society. Oyugi et al. (2008, p.295) have explained this issue as 'Power Distance' arising due to indifferent perception of status.

These challenges required me to creatively experiment with various research methods. This aspect is described in Section 4.5 (Research Process and Methods).

4.4 Ambedkar Community Computing Center (AC3), a Community of Practice

Ambedkar Community Computing Center (AC3) is described by residents of Sudarshan Layout as an informal computer education center for children of slums. It is based in Sudarshan Layout. In this section I assert that significance of AC3 goes beyond just being a computer education center in an Indian Urban Slum: AC3 is a Community of Practice.

The idea of AC3 was conceived during a meeting of local youth of Sudarshan Layout with Stree Jagurati Samiti (SJS) and Ambedkar Youth Association (AYA). The local youth aspired for computer education and during the meeting they expressed their aspirations. AYA agreed to provide space to start a computer center while SJS contacted Association for India's Development (AID) with request for teachers. Local youth took the responsibility to take care of affairs of the computer center and other Sudarshan Layout residents helped in building the necessary infrastructure. Finally, the computer center was formally inaugurated on 6th July 2008 and it was named Ambedkar Community Computing Center (AC3). See figure 4.2 for visual representation of birth of AC3. Refer to appendix A.2 for description of SJS, AYA and SJS.

AC3 is a bottom-up initiative. Local community of Sudarshan Layout holds the ownership of AC3. It was created and is sustained by joint efforts of various groups of people. Some of the groups belong to Sudarshan Layout while others are from outside. AC3's primary goal is to impart computer education in slums of Bangalore. All the participants in AC3 strongly believe in the ideology of Free Software and GNU-Linux. AC3 follows a layered and community oriented approach of teaching i.e. the AID volunteers teach the local youth while local youth teach the younger children from Sudarshan Layout.

AC3 fits Wenger's (2002) description of the basic structure of a Community of Practices i.e. Domain, Community and Practice. This structure is also mentioned in section 2.6 (Community of Practices).

- a. **Domain:** Computer education for slums, belief in ideology of Free Software and GNU-Linux, social development are themes or issues which bind all the participants together. These themes or issues define the domain.
- b. **Community:** AC3 is collectively owned by the local community. People participate voluntarily in activities of AC3. I identified following groups involved in AC3:
 1. A self-organized group consisting of members of local youth of Sudarshan Layout. This group learns computer skills from AID volunteers. This group voluntarily took responsibility to conduct computer classes for children of Sudarshan Layout, for safety of equipments, and for many other issues

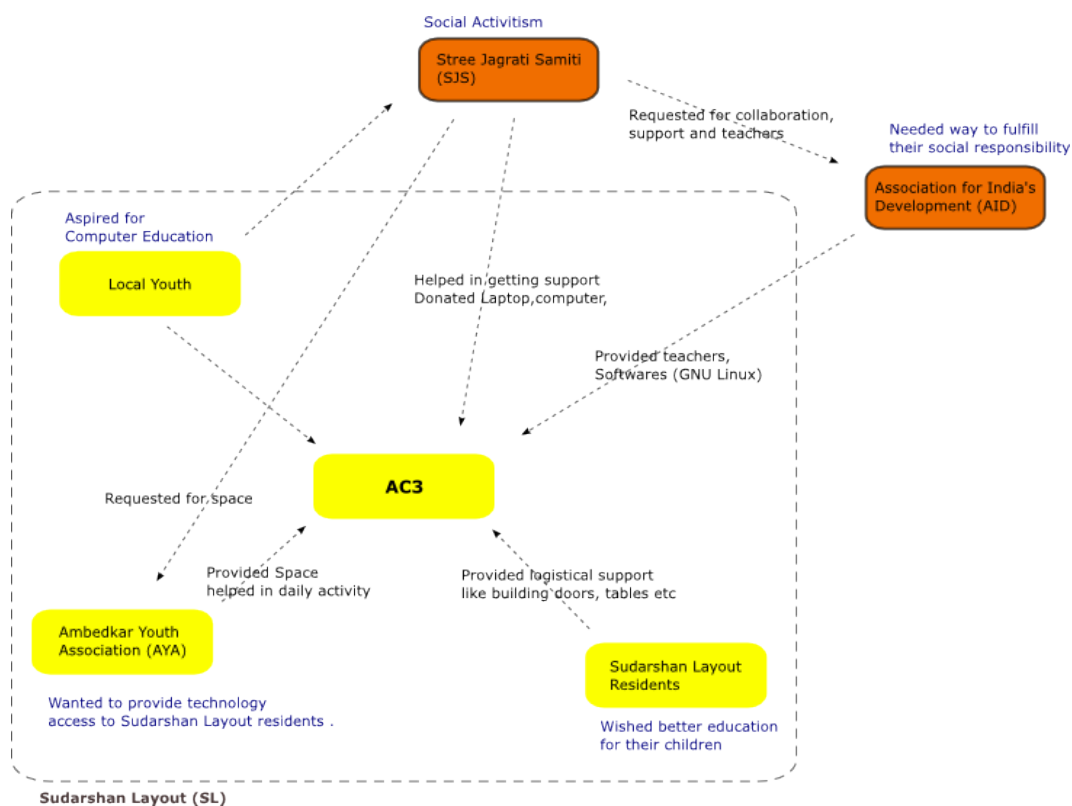


Figure 4.2 Creation of AC3

concerning AC3. It is an open group and anyone can be part of it. I refer to this group as 'AC3 Members'.

2. Children of Sudarshan Layout who learn computer skills from AC3 Students. They visit AC3 every evening for the computer class. I refer to this group as 'AC3 Students'.
3. Parents of AC3 Members, AC3 Students and other locals help in various daily issues related to AC3. I refer to this group as 'AC3 Support Group'.
4. Members of AYA, AID, SJS and some other independent volunteers are actively engaged in various activities of AC3 like teaching, helping in homework, motivating AC3 Members etc.

This fits well in Wenger's (2002) description of heterogeneous nature of some Communities of Practices.

- c. Practice: Till the time of writing this thesis, four more similar centers have been opened up in nearby slums. Some of the AC3 Members voluntarily took

the initiative to create a syllabus for computer education for children of slums. AC3 Members and AC3 Students have developed various computer, writing, and public speaking skills. All of these instances constitute Wenger's (2002) definition of practice.

All of the above helped me in concluding that AC3 is a Community of Practice. Table 4.2 further helps in distinguishing AC3 as Communities of Practices (CoP) from being a Communities of Interest (CoI).

	What's the Purpose?	Who Belongs?	What holds them together?	How long do they last?
Communities of Practice (CoP)	To create, expand, and exchange knowledge, and to develop individual capabilities	Self-selection based on expertise or passion for a topic	Passion, commitment, and identification with the group and its expertise	Evolve and end organically (last as long as there is relevance to the topic and value and interest in learning together)
Communities of Interest (CoI)	To be informed	Whoever is interested	Access to information and sense of like mindedness	Evolve and end organically

Table 4.2 Distinction between Communities of Practices and Communities of Interest. Adapted from (Wenger et al. 2002, p.42)

4.5 Research Process and Methods

As mentioned earlier, Association for Planning and Social Action (APSA), a NGO based in Bangalore city introduced me to AC3 Members. The AC3 Members was the only group in Sudarshan Layout which could communicate in English. During the initial meeting I updated them about this research and all of them expressed interest in participating in the study.



AC3 Members and AC3 Students



AID Volunteer and AC3 Members



AC3 Members



AC3 Support Group

Figure 4.3 Photos: AC3

The research process followed in Phase 3 was inspired by Ethnographic Action Research (EAR) and Participatory Rural Appraisal (PRA) methodologies. Both EAR and PRA insists on use of participatory methods to engage participants as fellow researchers and suggests adaptation of research process according to challenges faced in the field. EAR and PRA have been discussed in chapter 2 of this thesis.

During the initial meeting, AC3 Members expressed interest in learning and using digital camera. Hence, I shared with them a point and shoot digital camera (Canon A450 digital camera) and a N95 Nokia Mobile Phone. I held informal teaching sessions explaining basic camera functions. This provided me an opportunity to creatively use digital camera based methods. During the research, AC3 Members participated in various activities involving visual documentation of their environment. These methods are described as 'Self Documentation' in EAR (mentioned in section 2.2). These methods are also described as part of visual ethnography

(Pink 2007). Digital Camera presented an opportunity not just to record data but became a medium of engagement and collaboration between AC3 Members and me.

AC3 Members also participated in Social Map Exercise as described by PRA (mentioned in section 2.3). These maps were hand drawn to visually illustrate the urban landscape of Sudarshan Layout. AC3 Members were provided with pencils, color sketch pens, erasers and paper (A3 and A4 sizes). Participants themselves decided on the color scheme, labels, pictographic and schematic elements used in the maps. These Social Maps are presented in appendix (A.3) of this thesis. The hand drawn Social Map formed a basis for further discussion. The whole process of map drawing and discussion was documented in video.

These visual artefacts (hand-drawn Maps and digital photographs) operate as 'boundary objects' enabled a dialogue and promoted a negotiation of meaning between informants (AC3 Members) and researcher (me). My definition of 'boundary object', a concept originally introduced by Susan L. Star and James R. Griesemer, is an entity whose meaning and use is shared, an entity which mediates and facilitates collaboration amongst various stakeholders (participants and researcher). AC3 Members were interested to learn and experiment with digital technology while I was interested to understand communicative ecology of AC3 Members. This overall situation presented a unique opportunity to have a deeper insight into the community communication aspect of Sudarshan Layout. The Phase 3 also included methods described by EAR like participant-observation, field notes, group interviews and in-depth interviews. As recommended by PRA, multiple methods were used with same group to triangulate or cross check the information provided by the participants. See table 4.3 for a list of research activities and corresponding participants.

All the digital images produced during the Phase 3 were shared with AC3 Members. Field notes were maintained all throughout the Phase 3. All the interviews, discussion on social map exercises and 'self documentation' exercises were documented in video. The video documentation was done using a Panasonic miniDV hand-held camera while other equipments used were a wireless microphone, a shotgun microphone, a small tripod, a mono-pod and a steady-bag.

In Phase 4 (*Analysis, Documentation and Design Concept*) of the research, I transcribed all the videos captured in Phase 3. During analysis of these transcripts, recurring

Date	Activities	Participants
22/02/09	Walk in Sudarshan Layout	Two AC3 Members
23/02/09	Group Interviews	Six AC3 Members
23/02/09	Group Interview	Three Independent Volunteers
24/02/09	First 'Self Documentation' Exercise and discussion	An AC3 Member
24/02/09	In-dept Interviews	Three AC3 Members
25/02/09	First Social Map Exercise & discussion	Two AC3 Members
26/02/09	In-dept Interview	Association for India's Development (AID) Volunteer
27/02/09	In-dept Interview	Association for India's Development (AID) Volunteer
27/02/09	Second 'Self Documentation' Exercise and discussion	Three AC3 Members
28/02/09	Second Social Map Exercise & discussion	An AC3 Member
28/02/09	Three In-dept Interview	Three AC3 Support Group members
28/02/09	Group Interview	Four AC3 Students
01/03/09	Group Interview	AYA Secretary and AYA Head or 'Community Leader' of Sudarshan Layout
01/03/09	Group Interview	Software Professionals living in Jayanagar, 9th Block
03/03/09	In-dept Interview	Stree Jagurati Samiti's (SJS) head

Table 4.3 Research Activities and Participants (Phase 3)

themes were identified and textual codes were added to the transcripts (Tacchi

et al. 2003). These codes and the transcripts were compared with the field notes. This method of data analysis led to identification of design concept and research findings as discussed in chapter 5.



Figure 4.4 Photos: Research Activities (Phase 3)

4.6 Two examples of Communicative Ecology in AC3

During the research, I found that there is a huge variation in Sudarshan Layout Residents' technological know-how and educational qualifications. This variation is reflected in an individual's Communicative Ecology. I hereby present two examples, which are the extremes in this regard. All the individuals I interviewed fall in between these two extremes.

4.6.1 *Z's Communicative Ecology*

Z is a female, forty five years of age and a resident of Sudarshan Layout. She is part of the AC3 Support Group. She informs that her family migrated to Bangalore

from Tamil Nadu (a south Indian State) thirty years ago. She got married at the age of twelve and has four children. She did not have any formal education and does not know to read and write in any language. Later her children have taught her to make her signature. She speaks in Tamil, Hindi and Kannada. Her son works as a driver while her son-in law is a day labourer. All of them stay together in one house.

She has a television in her home. She watches regional language channels. Among them Sun TV, Raj TV, Vijay TV are her favourites. She gets to know about events in Bangalore either from television news or from her children.

Her family has four mobile phones out of which two have camera functionality. She says that she does not use mobile phone much. She just knows how to make and disconnect a call. She acknowledges that her children have taught her this skill. She added that the camera functionality of mobile phone is important in her life as her children bring photos from the places they visit. In this way, she gets to 'see' those places.

4.6.2 *J's Communicative Ecology*

J is a 19 years old male and is a resident of Sudarshan Layout. He is one of the AC3 Members. He is studying in an English medium school and at the time of this research was in tenth grade (high school). He speaks Tamil, Telgu, Hindi, English and Kannada. According to him, other AC3 members are his 'best friends' and he spends most of his evening time in their company. He says that technology and gadgets fascinate him and he is quite keen to learn more. He regularly uses AC3's laptop. He is learning basics of computer programming from AID volunteers and has recently learnt to install Ubuntu operating system on computers. He conducts evening classes at AC3 for children of Sudarshan Layout. He voluntarily prepared a syllabus to teach in the computer class and at the time of this research he was teaching basics of OpenOffice to young AC3 Students.

He accesses Internet four times a week from some cybercafe. He uses a Sony Ericsson R300 Mobile phone and has two SIM cards. He reasons that one of the SIM card for Bangalore while the other one is used when he travels to Chennai (capital city of Tamil Nadu). He informs that by doing so he does not have to pay 'roaming charges' (extra service charges levied by mobile network providers when users

move out of their base location). His monthly mobile phone bill is around 200 Indian Rupees (approximately 3 Euro). During his interview he demonstrated in detail how he uses various mobile services:

- a. According to him the most useful functionality of his mobile phone is the contact book. He demonstrated how he has saved multiple numbers for the same person (mobile no, home phone no etc) picture of the person, assigned ring tone, email address, home address and birthday information.
- b. He uses SMS service a lot and has organized SMS-inbox in groups. He is well versed with other SMS related features like saving drafts and sent messages.
- c. He uses Bluetooth to share images and songs with other mobile phones.
- d. He informs that he has used GPRS connection once to download a mobile software called 'converter'. He uses one of the software's functionality to calculate water bills and house rent.
- e. His mobile phone has camera but without video-capture functionality. He uses his camera to click pictures of his relatives and friends. He finds camera especially useful to capture family functions.

The above mentioned examples (sub-section 4.6.1 and sub-section 4.6.2), showcase the two extremes of communicative ecologies from Sudarshan Layout. While Z represents communicative ecology of local population of Sudarshan Layout with lower literacy level, J represents communicative ecology of literate and young population. A relevant finding is that relationships and bonding are important part of communicative ecology of people of Sudarshan Layout. As in case of Z, children have taught her to write her signature, to use mobile phone and they also serve as source of information. In another research, Sambasivan et al. (2009) have also reported relevance of relationships. In the next section I discuss communicative ecology of AC3 Members.

4.7 Analysis of Communicative Ecology of AC3 Members

I follow Foth and Hearn's (2007) description of communicative ecology as comprising of social, discursive and technological layers. Hence, I present the discussion on communicative ecology of AC3 in three sections based on the three layers.

4.7.1 *Social Layer*

In this section I describe the social layer of AC3 Members' communicative ecology. Foth and Hearn (2007) describe social layer of communicative ecology as comprising of social networks, social groups, people and communities. Social Layer takes both formal and informal associations into account. See figure 4.3 for a graphic representation of the social layer.

At the time of research, the AC3 Members went to schools or college or work in the morning and met each other in the evening, usually at AC3. Trust, friendship and sense of belongingness for each other was very noticeable among them. AC3 Members were respected by Sudarshan Layout residents. AC3 Members held computer classes for AC3 Students every evening. AC3 members had a sense of responsibility towards AC3 students. It also emerged that many of the children from Sudarshan Layout were enrolled for formal schooling after AC3 members convinced the children's parents. AC3 Support Group, primarily consisting of parents of both, AC3 Members and AC3 Students, were regular visitors to AC3. AC3 Support Group helped the AC3 students in various activities related to regular functioning of the class.

Sudarshan Layout has a few small shops like a road-side tea stall, a bakery and few small multi-purpose shops. AC3 Members were socially connected to these shopkeepers. Most of the AC3 Members were regular visitors of these shops.

Head of (Ambedkar Youth Association) AYA, was referred to as a 'Community Leader' of Sudarshan Layout. He was a social worker and was actively involved in supporting AC3. Other members of AYA were respected and trusted by all the residents of Sudarshan Layout. AC3 Members met Stree Jagurati Samiti (SJS) volunteers once in a while. Their meeting used to be at SJS's office. Interaction of AC3 Members with AID volunteers consists of evening classes. At the time of this research, these classes were held for one hour per day and five days per week. Some independent volunteers, primarily software professionals, also visited Sudarshan Layout regularly. Most of these independent volunteers came to know of AC3 through AID volunteers and started participating in the activities of AC3. AC3 Members and other groups from Sudarshan Layout were found to trust and respect these volunteers while volunteers acted with responsibility.

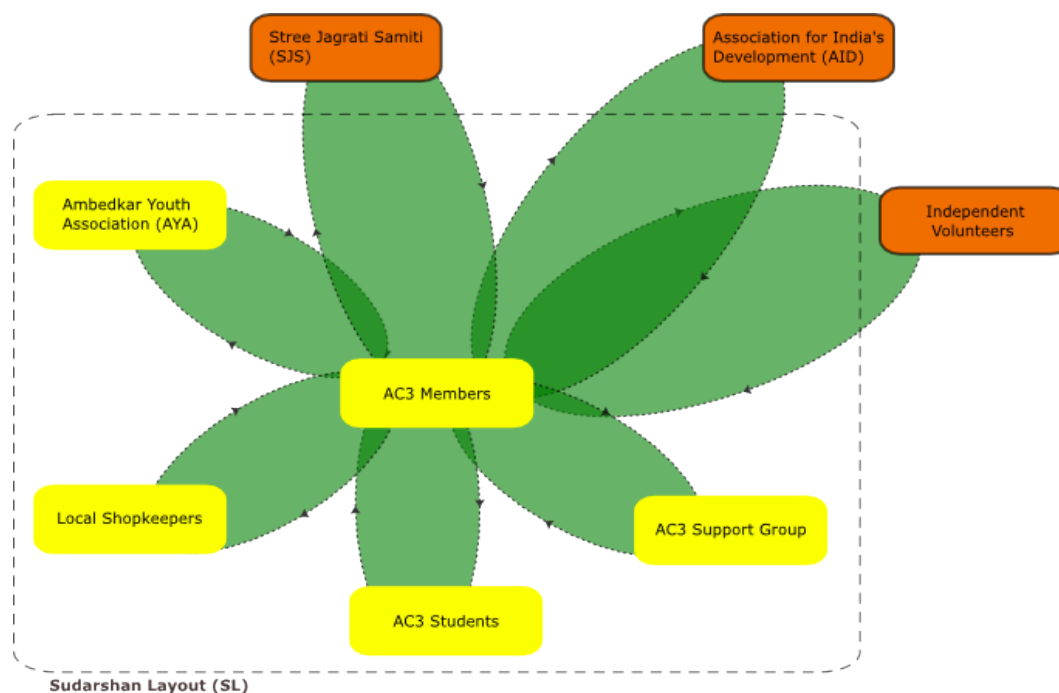


Figure 4.5 Social Layer of AC3 Members' Communicative Ecology

4.7.2 *Discursive Layer*

Foth and Hearn (2007) describe discursive layer of communicative ecology as comprising of information or content of interaction. See figure 4.4 for a graphic representation of the discursive layer.

AC3 Members serve as an information channel for AC3 Support Group, AC3 Students and other residents of Sudarshan Layout. It was observed that many of the members of AC3 Support Group, especially older men and women, do not visit places far away from Sudarshan Layout. They get information about events around Sudarshan Layout from AC3 Members, AID Volunteers and other local groups. The communication between AC3 Members and AC3 Support Group consists of information sharing related to daily activities of AC3. Communication between AC3 Members and AC3 Students is also related to computer education and discussion on everyday events.

AC3 Members and AC3 Support Group discussed local problems, depending on the context, with AYA, SJS and AID volunteers. AC3 Members added that whenever some unfavourable event happens in Sudarshan Layout they definitely communicate with AID volunteers. It was found that AID volunteers and independent

volunteers were well informed and concerned about the regular happenings in AC3 and Sudarshan Layout. Regular conversation of AC3 members with the AID volunteers consisted of casual chat, informing volunteers about daily events, and discussion on AC3 and computer education. These volunteers also informally served as a channel for information. They informed locals including AC3 Students about events, news from around the globe.

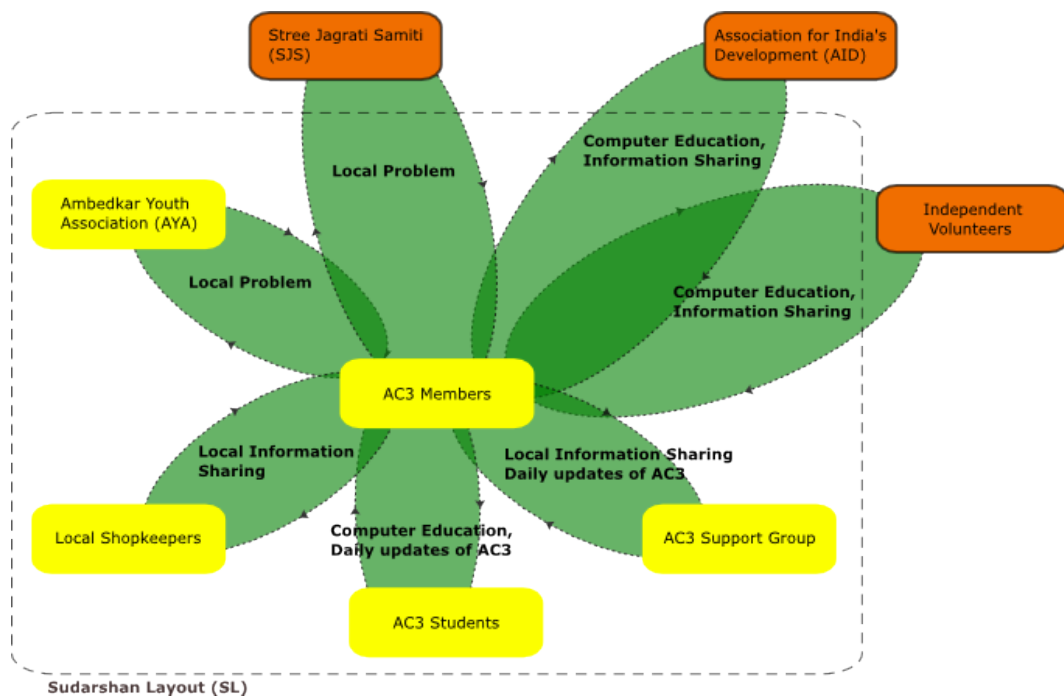


Figure 4.6 Discursive Layer of AC3 Members' Communicative Ecology

4.7.3 Technological Layer

Foth and Hearn (2007) describe technological layer of communicative ecology as comprising of applications, devices, gadgets, media and various channels of communication. In this section I describe the technological layer of AC3 members' communicative ecology. See Figure 4.5 for a graphic representation of the technological layer.

Almost every household in Sudarshan Layout has a television set. Financially better off families have access to satellite television, which requires dish antenna while others receive Indian government's national television channel called 'Doordarshan'. Many of the households have personal DVD players at home. AC3

Members informed that once every week someone from the locality gets a film's DVD and then many of them watch it together. At times movies are played on AC3 laptop for children of Sudarshan Layout. Movie watching is not limited to a family but is a social event where friends and other families are invited. Another study done in urban slums of Bangalore has reported similar findings (Sambasivan et al. 2009).

In Sudarshan Layout, very few families were found to have subscribed to newspapers. Most common way, especially amongst male population, is to read newspaper at the local tea stall and bakery. These shops also use newspapers as serving plates for the snacks. None of the families in Sudarshan Layout owns a computer or a laptop. AC3 has two donated laptops which have Ubuntu (linux based operating system) installed. There are few donated desktop computers but they do not work because of recurring power fluctuation. AC3 Members and AC3 Students usually use laptops for basic computer functionalities like word processing, games, movie watching, image editing and digital drawing. Neither AC3 nor any household in Sudarshan Layout has Internet access. AC3 Members access Internet primarily from cybercafes or from AID volunteers' homes. Very few households have land line phones connection. Sudarshan Layout residents also have access to six telephone coin-booths. These coin-booths are installed at Small Multi-purpose Shops.

Mobile phones penetration is quite high in Sudarshan Layout. Every household has at least one mobile phone. It was found that mobile is the primary device for mediated community communication in Sudarshan Layout. It was also found that 'Voice' is the prevalent mode and in many cases the only possible mode of community communication in Sudarshan Layout. 'Voice' includes Face-to-Face (F2F) communication as well as mobile mediated communication. AC3 Members informed that whenever they have option to either make a voice call or send sms, they always prefer voice call. As represented in figure 4.5 all the communication of AC3 Members with communities or groups within Sudarshan Layout is voice based i.e. either Face-to-Face (F2F) or mediated by phone call (mobile phone or telephone coin-booth). In a similar study done in urban slums of Bangalore, Sambasivan et al. (2009, p.160) note that *All information was orally created, maintained, stored, guarded, shared, and transmitted through face-to-face or voice based phone channels*

There is a huge variation in use of SMS service among the residents of Sudarshan Layout. While AC3 Members use SMS service extensively many of Sudarshan Lay-

out residents reported not to have ever used a SMS. AC3 Members and volunteers use SMS service to communicate and coordinate for classes. In many cases, AC3 Members send an SMS to a volunteer who in reply makes a phone call. Volunteers primarily rely on text mode i.e. sms, e-mail, blogs, yahoo groups, google groups to communicate among each other.

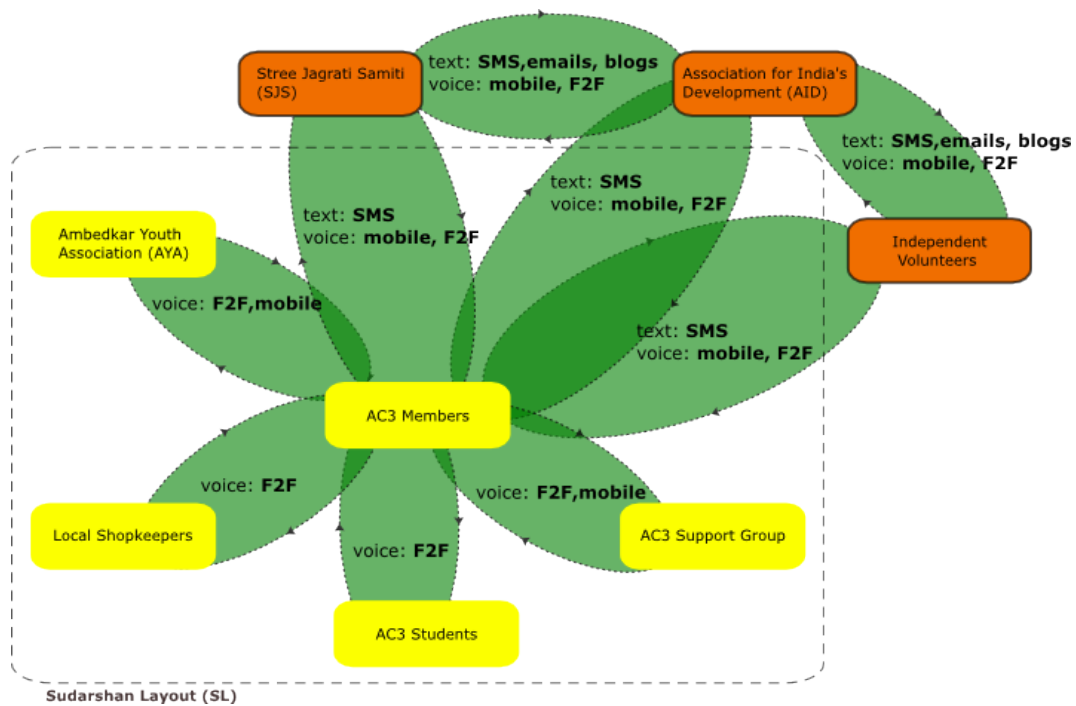


Figure 4.7 Technological Layer of AC3 Members' Communicative Ecology.

4.8 Conclusion

Chapter 4 dealt with Community Communication in Sudarshan Layout. It described the social context of Sudarshan Layout and then focused on communicative ecology of AC3 Members. In the analysis of the communicative ecology following understanding was built:

- People act as a source of information.
- Significance of 'voice' as a mode of community communication in Sudarshan Layout. Both of these aspects are further discussed in the chapter 5.



TV and DVD player



Multi-Purpose Stores with
telephone coin-booth



AID Volunteer
and AC3 Member

Figure 4.8 Photos: AC3 Members' Communicative Ecology

5 Research Findings and Design Concept

5.1 Introduction

This chapter presents and discusses the findings of Phase 3 and Phase 4 of this research. As mentioned in section 1.5 (Research Design), Phase 4 also led to identification of a design concept termed as *Asynchronous Voice based Community Communication Service*. This design concept is discussed in section 5.5. The content of this chapter showcases design opportunities and challenges for mobile based community communication services for residents of Indian urban slums.

5.2 Human Nodes in Community Communication

This section extends the discussion on social relationships, trust and bonding as described in section 4.7 (Analysis of Communicative Ecology of AC3 Members). During the research, I identified three social groups which play crucial role in the context of community communication in Sudarshan Layout. I have termed these social groups as 'Human Nodes'. Three types of such Human Nodes identified at Sudarshan Layout are Community Leaders, Local Shopkeepers, and Volunteers (as introduced in section 4.7). The relationships of these Human Nodes with the local community enable them in playing a significant role in community communication at Sudarshan Layout. Their bonding with local residents continuously engages them in doing so. The trust that local residents have in them brings mutual accountability and responsibility to do so. These Human Nodes play a role in community communication at Sudarshan Layout usually without consciously being aware of it.

My argument finds support for significance of Human Nodes from recent findings related to the topic:

- a. Sambasivan et al. (2009) informs role of 'human mediators' in access to technology among members of local community in an Indian Urban Slum.
- b. Watkins et al. (2009) acknowledge the role of 'human intermediaries' in DakNet initiative in rural India.

- c. Ford & Leinonen (2009) remarks on significance of 'cause champions' in acceptance of mobile services addressing education in Africa.
- d. Jones et al. (2008) successfully engaged with NGO members for creation of audio visual data in rural India.

All the above mentioned cases, highlight role of Human Nodes addressing various aspects relevant to the local community. In the following sub-sections (5.2.1, 5.2.2, 5.2.3) I discuss each type of the identified Human Nodes i.e. Community Leader, Local Shopkeeper and Volunteers.

5.2.1 *Community Leader as Human Node*

Community leader of Sudarshan Layout i.e. head of Ambedkar Youth Association (AYA), plays an important role in community communication in context of local problems. Community Leader is usually the first person to be contacted by local group to address any issue concerning the community. Generally the communication is many to one. Face to face mode is preferred over any mediated channel i.e. a group of residents meet the community leader and discuss the concerning problem. All the communication is voice based.

Depending on the context of the problem, the community leader communicates and registers complaint with the concerned government organization like municipal corporation, police etc. Community Leader also shares the information with NGOs active in the area and other similar local community associations of nearby slums. As mentioned in Section 3.4.5, one of the important reason for the locals to share their problems with community leaders was that these leaders were accepted as transparent, trust worthy and part of the community. Trust and relationship of locals in the community leaders play a significant role in this respect. Significance of notion of trust in communities belonging to Indian Urban Slums has also been acknowledged by Sambasivan et al. (2009). In this way, the community leaders serve as Human Node in community communication concerning local problems with the world outside slums. Refer to figure 5.1.

5.2.2 *Local Shopkeepers as Human Node*

As mentioned in section 4.7.1 (Social Layer), AC3 Members were regular visitors to local shops (roadside teashop, bakery and small multi-purpose shops) and shared a

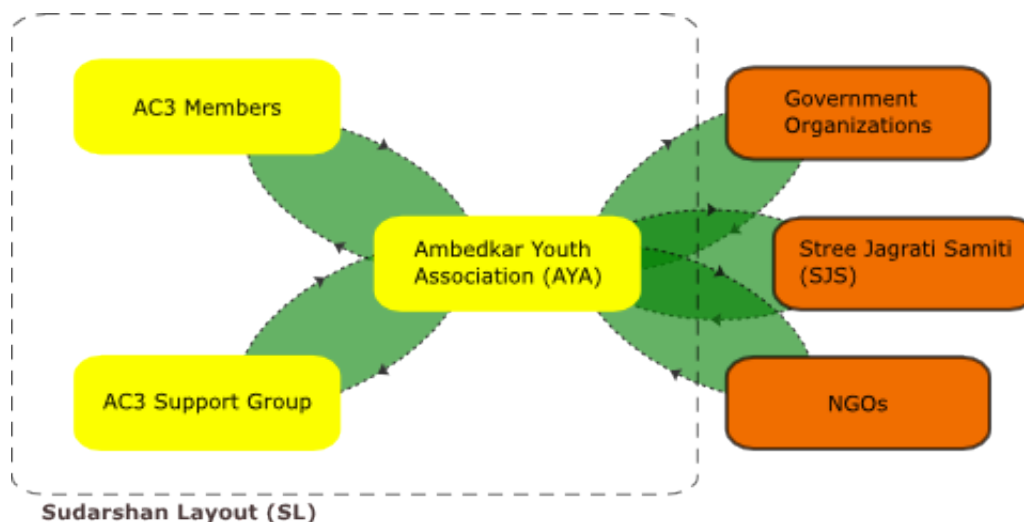


Figure 5.1 Community Leader as Human Node

social relationship with the shopkeepers. Discussion about shopkeepers emerged during many of the interviews:

AC3 Member : He is my friend. He speaks nicely. Whenever I go to his shop he will ask of my family and friends. I will also ask and chat with him.

AC3 Member : He is a good person. He will give things [with the account to be settled later]. He talks nicely. When I will go to his store he will speak about himself and myself. We will chat. We have a good relationship. He will give some discounts.

The relationship between these local shopkeepers and Sudarshan Layout residents (including AC3 Members) is not limited to that of a supplier-buyer or a businessman-customer. The relationship involves concern for each other, information sharing and trust. As explained by Sambasivan et al. (2009):

'the notion of trust in maintaining stable livelihoods was built into the numerous everyday social livelihoods and was renewable and regenerative process through constant social interactions'

The shopkeepers were found not just interested in selling goods but were interested in everyday life of locals as well. They shared a bond of trust and friendship with the local residents of Sudarshan Layout. During the short stay at these shops,

residents of Sudarshan Layout interacted with the shopkeepers. This communication will deal with sharing of information. Information sharing can vary from a trivial matter like current cricket scores to grave issues like a theft in the locality. This informal mode of information sharing spreads local information and contributes to the community communication. It was an important realization that local shopkeepers serve as a Human Node in community communication within Indian urban slums. This further highlights the significance of trust in context of community communication in Indian Urban Slums. Refer to figure 5.2 and figure 5.3.

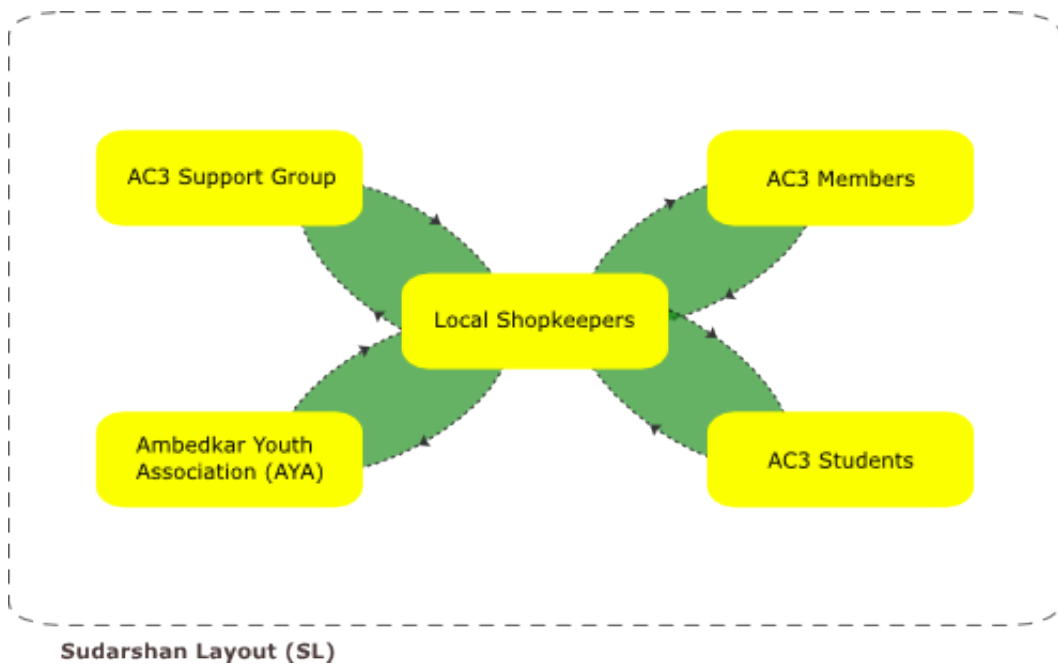


Figure 5.2 Local Shopkeepers as Human Node



Figure 5.3 Photos: Local Shopkeepers

5.2.3 *Volunteers as Human Node*

As mentioned in section 4.7.1 (Social Layer) and section 4.7.2 (Discursive Layer), relationship between AC3 members and volunteers (AID, SJS and Independent volunteers) is of trust, respect, and mutual responsibility. During this research numerous examples were found on how volunteers serve as a channel or mediators in information access for residents of Sudarshan Layout. Two such instances:

- a. *AID Volunteer: Sarsu's [AC3 Member] friend wanted some document about AIDS. So she called me and said that she needs some documentation on AIDS can you bring some? I was in office. I browsed web, took some printouts and gave them to her in the evening. And she [Sarsu's friend] got second prize in the talk!*
- b. *AID Volunteer: Recently they [AC3 Members] came to my house to learn on astronomy. We had a nice class on astronomy and we were using Internet to search for images of stars...*

Apart from above mentioned role as channels of information access, volunteers were also found to inform local residents of events outside, supporting locals in their problems, and spreading local information to the outside world. The relationship of volunteers and AC3 Members enables community communication of Sudarshan Layout with the world outside. Volunteers were found engaged in everyday affairs in the lives of residents of Sudarshan Layout. They assumed responsibility for well-being of AC3 Members in particular and local community in general. I argue that volunteers' engagement with local community can be attributed to the success of AC3 as a community of Practice. I find support for my argument from Wenger et al (2002) who inform that a community of practice fosters relationships between its members, brings sense of belonging, trust, mutual respect and accountability. In case of Sudarshan Layout the strengthening of relationship between local community and volunteers assists in community communication. This further engages volunteers as Human Node in community communication at Sudarshan Layout. Refer to figure 5.4

5.3 **Identified Needs for Community Communications Services**

During the research, I identified two specific areas of community communication

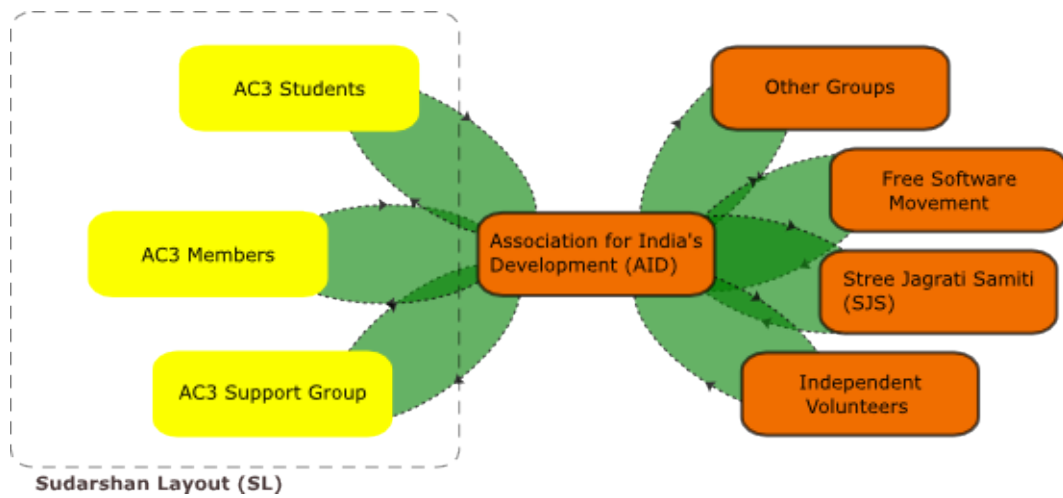


Figure 5.4 Volunteers as Human Node

at Sudarshan Layout which need to be addressed. In this section, I present and discuss these:

5.3.1 *Community Communication of Slums with world outside*

As described in Section 4.7.1 (Social Layer), section 4.7.2 (Discursive Layer) and section 5.2.3 (Volunteers as Human Node), the relationship between AC3 Members and Volunteers serves many purposes. Volunteers belonged to privileged section of Indian society while the local residents of Sudarshan Layout belonged to marginalized section of Indian society. The significance of the relationship between Volunteers and local residents highlights the importance of community communication of slums with the world outside. I argue that there are many other people, belonging to privileged section of society, who are willing to participate and help in addressing various issues related to Indian urban slums but at the moment there are no such community communication services which address this area. These services are also crucial for sustenance of bottom-up initiatives like AC3.

To get a better understanding of community communication of slums with the world outside, I interviewed six software professionals living in Jayanagar 9th Block. All of them have been living in that area, which is just a kilometre away from Sudarshan Layout, for more than two years. During the interview, one of the point which was reiterated by everyone was that all of them are willing to participate in socially relevant initiatives but they do not know where to contribute

or who needs help. None of them was aware of existence of AC3 or Sudarshan Layout or any other such initiative in their locality. There is a need for community communication services that cater to communication of Indian Urban slums with world outside. Refer to figure 5.5 for visual depiction of the identified need for community communication at Sudarshan Layout.

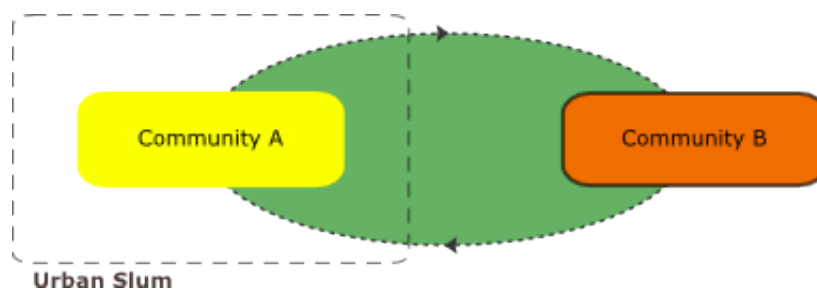


Figure 5.5 Community Communication of Slums with world outside

5.3.2 *Community Communication between Slums*

This research identified community communication between slums as another area which needs to be addressed. There are many communication and social aspects which are covered by this area: sharing of information between slums, addressing local problems, regular communication between communities belonging to different slums, communication in context of well-being, security, and solidarity. Some other advantages of community communication between slums:

- a. AID Volunteer: *Many of the people from nearby areas [slums] came here [Sudarshan Layout] to see [AC3]. And now they also feel if Mani and Sarsu [AC3 Members] can do it then why cant we...*
- b. AID Volunteer: *They [AC3 Members] feel proud when outsiders come to speak to them. It is seen as appreciation of there work.*

The communication of AC3 with nearby slums was one of the important reasons why four more centers could be started since 2008. This service is needed for propagation and sustenance of bottom-up initiatives like AC3. A research done by Redhead & Brereton (2006 , p.363) informs:

Community groups such as the local community association hold a variety of knowledge and information relating to short and long term community issues.

Hence, community communication service between slums will present a channel for sharing local knowledge with other similar groups. At the moment there are no community communication services for Indian Urban Slums which address this aspect. Refer to figure 5.6 below for visual depiction of the identified need for community communication at Sudarshan Layout.

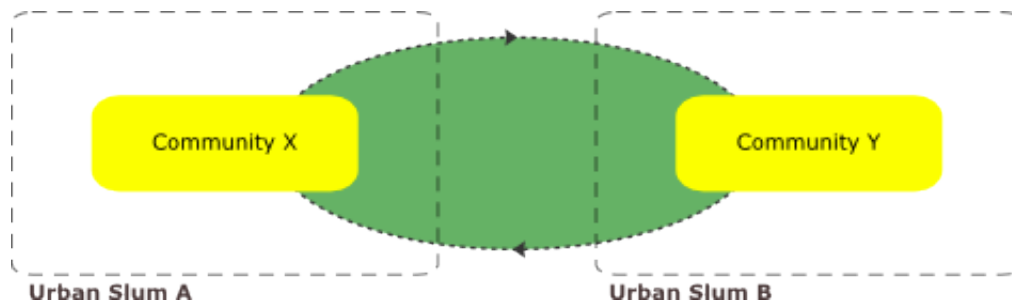


Figure 5.6 Community Communication between Slums.

5.4 Identified Design Challenges for Community Communication Services

During the research at Sudarshan Layout, I identified design challenges concerning community communication services in an Indian Urban Slum. In this section, I describe these design challenges:

- a. Community Communication Service that works with existing technological infrastructure of an Indian Urban Slum: I follow the recommendation by community informatics that ICT initiatives should focus on making use of available technological infrastructure (Nnadi & Gurstein 2007; Salvador & Sherry 2004). As mobile phones are the most pervasive communication device in Sudarshan Layout, I propose engaging them for community communication. The design challenges identified at Sudarshan Layout in this regard are:
 1. Design which does not require people to upgrade their mobile phones to participate.
 2. Design of community communication services which is not dependent on any particular mobile phone i.e. services which work with basic mobile phones.
 3. Design which engages people without mobile phones in community communication as well.

4. Design of service where people can participate using telephone coin-booths as well.
 5. Design which is not dependent on access to Internet.
 6. Design which is cheap and robust.
- b. Design which utilizes significance of voice in community communication. The design challenges identified at Sudarshan Layout in this regard are:
1. Design of service which is completely voice based i.e. which does not need any text input for communication.
 2. Design which addresses non-English speakers as well as multilingual user group.
- c. Simplicity in design. The design challenges identified at Sudarshan Layout in this regard are:
1. Design which includes illiterate population of the local community. Design which caters to users like Z (section 4.6.1).
 2. Design with minimum amount of learning required.
 3. Design which is as easy to use as calling and disconnecting a call.
 4. Design which utilizes existing practices of mobile use.
- d. Design which utilizes existing social context of community communication. The design challenges identified at Sudarshan Layout in this regard are:
1. Design which utilizes existing relationships, social bondings, and elements of trust.
 2. Design which engages identified Human Nodes in community communication.
 3. Design which is decentralized i.e. design which is not dependent on one person or one channel of communication for its functioning.
- e. Design which addresses the identified needs for community communication:

1. Design which addresses community communication of slums with world outside.
2. Design which addresses community communication between Slums.

5.5 Design Concept: *Asynchronous Voice based Community Communication Service*

5.5.1 *Introduction*

This section presents a broad description of a service design concept titled: Asynchronous Voice based Community Communication Service. The design concept is inspired by the research findings (section 3.4 and section 5.2), identified needs for community communication services (section 5.3) and identified design challenges (section 5.4). The design concept was identified during the Phase 4 and it needs to be further developed in active participation with the real users i.e. residents of Indian Urban Slums. I present this design concept as a starting point or a proposal for further development.

5.5.2 *Synchronous Voice vs Asynchronous Voice*

Synchronous communication, in simple words, means a communication which facilitates two individuals to communicate in real time. For example, a phone call where caller and the receiver of the call are talking in real time. Ross (2003, p.70) defines Asynchronous Voice as:

the interactive communication process of people leaving voice messages for other people and the other people responding with their voice messages.

While synchronous voice have been technologically and solution-wise much explored medium, it is widely accepted that asynchronous voice is highly unexplored medium (Ross 2003; Zinman & Donath 2007). Refer to table 5.1.

5.5.3 *Advantages of Asynchronous Mode*

Zinman & Donath (2007), Ross (2003), Schmandt et al. (2002), Honicky et al. (2007), and Koskinen (2000) have argued on various advantages of asynchronous mode

Synchronous Voice	Asynchronous Voice
Land line call	Voice Mail
Internet Calls	Voice SMS
Face-2-Face Communication	
Mobile Phone call	

Table 5.1 Synchronous Voice vs Asynchronous Voice

of communication over synchronous mode of communication. Based on their arguments I present following points:

- a. Asynchronous mode is time shifted i.e. individuals are not required to be simultaneously engaged in communication at the same time.
- b. Asynchronous mode facilitates store and forward technique i.e. data could be stored and later forwarded. This assists in improved network utilization. Daknet initiative is creatively utilizing this technique to provide Internet access in rural India (Watkins et al. 2009).
- c. Asynchronous communication systems could be much cheaper, consume less power and more robust than their synchronous equivalent.

I argue that asynchronous voice is very relevant in context of Indian Urban Slums where voice remains prevalent mode of community communication. Due to the possibility of 'storing', asynchronous voice also facilitates documentation of information which as remarked by Sambasivan et al. (2009) completely resides in vocal form in Indian Urban Slums.

5.5.4 *Description of the Design Concept*

The proposed design concept is called *Asynchronous Voice based Community Communication Service*. The concept is based on Asynchronous Voice Mode and addresses community communication in Indian Urban Slums. The concept consists of two integral components:

- a. **Human Nodes:** Human Nodes are nodes of community communication identified during the research (discussed in section 5.2). This is the 'human' side of

the proposed service. In case of Sudarshan Layout local shopkeepers, community leader and volunteers serve as human nodes.

- b. Human Node’s Mobile Phone with Asynchronous Voice Communication Mobile Application: A mobile phone application developed and installed in the Human Nodes’ mobile phone. This is the ‘technology’ side of the proposed service.

This design concept relies on both ‘human’ and ‘technology’ side for its functioning. Refer to figure 5.7

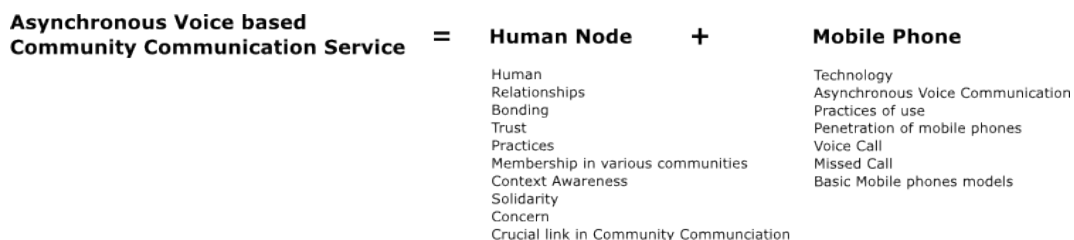


Figure 5.7 Asynchronous Voice based Community Communication Service

This design proposal utilizes asynchronous voice mode of communication where human nodes are engaged to store and forward information by use of their mobile phones. Human Nodes shall facilitate the proposed service by incorporating their relationships, trust, context awareness, bonding, practices, concern for local community and their existing dynamics of engagement with local community as a node in community communication. Mobile phone with the asynchronous voice communication mobile application installed provides technical infrastructure for storing ‘voice files’ and transferring them. I use the term ‘voice file’ for an audio format file (.amr, .mp3 etc). I use the term ‘voice’ instead of any other prevalent terms like ‘audio’ or ‘sound’ to distinguish the content of the file i.e. a recorded human voice.

The proposed service is voice based and hence the content is created, stored, transmitted and understood using voice files. The functioning of this mobile application is described in next section (5.5.5) and the overall functioning of the proposed service is explained with the help of scenarios (Carroll 1995) in section 5.5.6 and section 5.5.7.

5.5.5 Description of the Asynchronous Voice Communication Mobile Application

Asynchronous Voice Communication Mobile application's primary function is to store and forward voice files. Hence, it facilitates mechanism for multiple ways to input and output content i.e. voice files. It is proposed that this application be installed in human node's mobile phone. This is the only change proposed in the existing technical infrastructure of a community of an Indian urban slum.



Figure 5.8 Asynchronous Voice Communication Mobile Application

Asynchronous Voice Communication Mobile Application consists of five states. Out of these five states, two are input states while three are output states. The user i.e. a Human Node can activate any of these states. Description of the five states of proposed mobile application:

- a. **'Record'**: This is an input state. When this state is activated, mobile phone records a voice file using a built-in microphone and saves the file in its memory. A human node can activate 'record' mode and request individuals or groups in close physical proximity to 'speak' to the mobile phone. A voice file gets recorded in the mobile phone. This aspect of service utilizes the fact that people in Indian urban slums physically meet and share information i.e. face to face communication. This also caters to the people who do not have mobile phone. This also supports many to one communication.
- b. **'Record Call'**: This is an input state. When this state is activated mobile phone records a voice file from an active phone call. A node while communicating on a voice call can activate 'record' mode to capture information being communicated. A 'voice file' gets recorded in his mobile phone. This aspect of service

utilizes the fact that people of Indian urban slums use voice call extensively to share information. This also caters to the people who do not have mobile phones but uses landline phone. This supports one to one communication.

- c. 'Play': This is an output state. When this state is activated mobile phone allows human node to select a recorded voice file and play the file using inbuilt loudspeaker. This aspect of service utilizes the fact that people meet and share information. This also caters to users who do not have mobile phone. This supports one to many communication.
- d. 'Make Call and Play': This is an output state. When this state is activated the mobile phone allows human node to select a recorded voice file and phone numbers from the contact book. The application sequentially dials the selected phone numbers and when someone picks the call it plays the selected voice file. This supports both one to one and one to many communication.
- e. 'Beep and on Callback Play': This is an output state. When this state is activated mobile phone allows human node to select a recorded voice file and phone numbers from the contact book. The application sequentially gives beeps or missed calls to the selected phone numbers and when someone calls back it plays the recorded voice file. This supports both one to one and one to many communication.

In the following sections (5.5.6 and 5.5.7) I describe the overall functioning of Asynchronous Voice based Community Communication Service using scenarios.

5.5.6 *Scenario 1: Amit, a local shopkeeper as a human node*

Amit is a 35 years old male. He is resident of a slum in Jayanagar, Bangalore, India. He runs a small tea shop in the area for past ten years. Most of the local residents of the slum are his regular customers. Rohit, a 20 years old male, works in a small car-repair garage near the tea shop and is resident of the same slum as Amit. Rohit and Amit have known each other for many years and share a cordial relationship.

Every afternoon Rohit takes a twenty minutes tea break from his work and visits Amit's tea shop. Whenever they meet, they informally talk and share happenings in their lives. Today, when they meet Rohit informs Amit about an urgent job opening for a mechanic in the car-repair garage. Amit knows that many of his

other regular customers may be interested in the job. Amit starts asynchronous voice communication mobile application installed on his phone and activates the 'Record' mode. He requests Rohit to speak to his mobile phone and describe the details of the job. Soon after doing so Rohit finishes his tea and goes back to his work.

Amit decides to inform his regular customers and friends about the job opening. He activates 'Beep and on Callback Play' mode of the mobile service. The mobile service allows him to select Rohit's recorded voice file and then a list of phone numbers from phone's contact book. After having done so Amit starts cleaning cups while his mobile phone sequentially sends beeps or missed calls to the selected list of phone numbers. The mobile phone service waits for call backs from the dialled phone numbers and when someone calls back it plays the recorded voice file.

In the meanwhile, Kapil, a 22 years old male and neighbour of Amit arrives at the tea shop. Kapil is unemployed. Amit activates 'Play' mode and selects Rohit's recorded voice file. The mobile phone application plays the voice file using the inbuilt loudspeaker of the mobile phone. Kapil is very excited as the job profile matches his skill set. He immediately rushes to the car-garage and secures the job.

Relation of the scenario to the findings of research:

- a. Social Layer: It makes use of the relationship between slum residents and local shopkeepers.
- b. Discursive Layer: It assists in spreading timely and relevant local information.
- c. Technological Layer: It is voice based and enables community communication in Asynchronous mode i.e. it stores the voice file in mobile phone and then forwards it. It caters to Face-to-Face (F2F) as well as mobile based communications. It caters to those who have mobile phone and also to those who do not have. It utilizes the existing practices of mobile use like missed call.
- d. It engages identified human nodes (i.e. local shopkeeper) in community communication.
- e. It helps in identified need for community communication i.e. communication between communities belonging to two different slums.

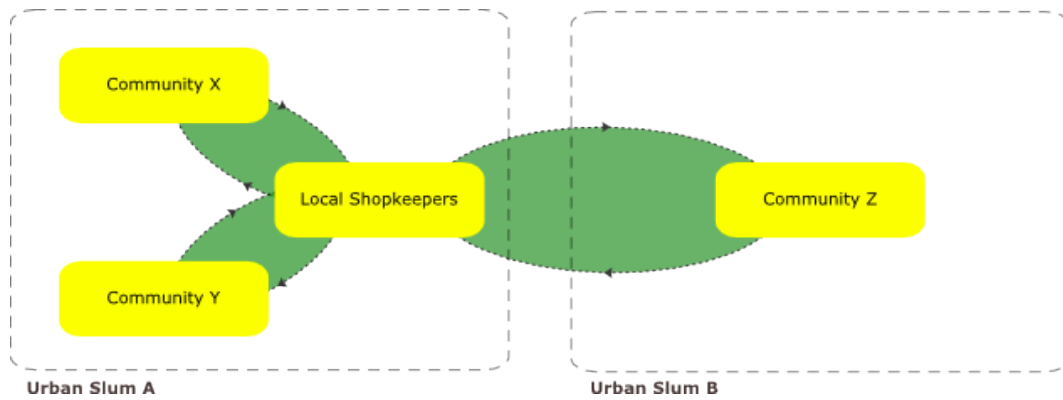


Figure 5.9 Scenario 1: Amit, a local shopkeeper as a human node

5.5.7 Scenario 2: Kishore, a volunteer as a human node

Kishore is 28 years old male and works as a software developer in a multinational company based in Bangalore. Apart from his work he is active member of Corporate Social Responsibility (CSR) group of his company. Every weekend he conducts mathematics-teaching class in a slum in Jaya- -Nagar, Bangalore. He has been conducting these classes since past two years. Over this period, he has formed a close bond with his students and he has always tried to help them in many ways.

It is Monday morning and Kishore is working in his office. He receives a call from Rajeev, a 16 years old and one of his student. Rajeev is going to appear in his high school examination in a few months time. Rajeev informs that he is struggling in Biology and needs assistance from someone. On hearing this, Kishore activates 'Record Call' mode of a mobile service installed on his mobile phone. He requests Rajeev to briefly describe about his need and the topics he needs assistance in. Rajeev does so and mobile service saves a voice file.

After finishing the call with Rajeev, Kishore activates 'Make Call and Play' mode of the mobile service. Service allows him to select Rajeev's recorded voice file and then a list of phone numbers from phone's contact book. The service sequentially starts calling the selected phone numbers and when someone picks up the call it plays the selected voice file. Vandana, a biology teacher gets to know of Rajeev's situation and agrees to spare few hours over weekends to assist him in the subject.

Relation of the scenario to the findings of research:

- a. Social Layer: It makes use of relationships between slum residents and volunteer.
- b. Discursive Layer: It assists in spreading timely and relevant localized information.
- c. Technological Layer: It is voice based and enables community communication in Asynchronous mode i.e. it stores the voice file in mobile phone and then forwards it. It caters to face-to-face (F2F) as well as mobile based communications. It caters to those who have mobile phone and also to those who do not have one.
- d. It engages identified nodes in existing community communication i.e. volunteers.
- e. It helps in identified need for community communication i.e. communication of a community belonging to a slum to those outside of it.

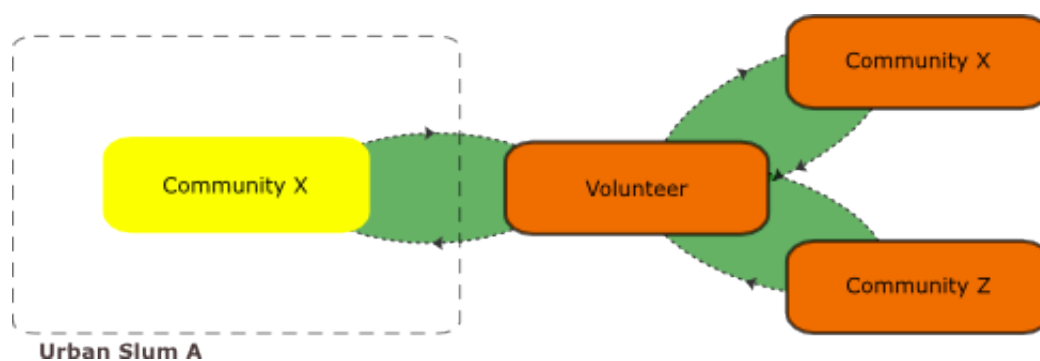


Figure 5.10 Scenario 2: Kishore, a volunteer as a human node

5.5.8 Advantages of the Design Concept

In this section I briefly present the advantages of the proposed design concept i.e. Asynchronous Voice based Community Communication Service:

- a. The design concept is completely voice based. Hence it includes illiterate population as well as multilingual user group.
- b. This design concept caters to Face-to-Face communication hence it includes even those who do not have mobile phones. User groups can participate using telephone coin-booths as well.

- c. The design does not require local population to upgrade their mobile phones to participate. Only change proposed is installation of asynchronous voice communication mobile application in a human node's mobile phone.
- d. This design is cheap for the local population.
- e. It is easy to use as it utilizes existing practices of mobile phone's usage. Hence it requires minimum amount of learning.
- f. It engages human nodes and hence utilizes existing relationships, social bondings, elements of trust to address community communication.
- g. This design is decentralized. It is not dependent on one person or one channel of communication for its functioning.
- h. This is a design which addresses community communication of slums with the world outside.
- i. This is a design which addresses community communication between Slums.
- j. It utilizes asynchronous mode and facilitates documentation of local information.
- k. The design utilizes existing practices of the community like visit to tea shops, meeting with volunteers, sharing of problems with community leader, missed call etc.
- l. This design is community centered and has a bottom-up approach for its functioning.

I will stress that development of the proposed, asynchronous voice communication mobile application, by itself will not provide any of the above mentioned advantages. Engagement of the human nodes for the service is much more important than the development of the application.

I acknowledge that I have deliberately limited the description of the Asynchronous Voice Communication Mobile Application to the broad functioning of it and I have not delved into the discussion on technical possibilities. This was not the focus of the research. Research works of Bilandzic et al. (2009), Schmandt et al. (2002),

Nelson et al. (2001), Vemuri et al. (2004), Honicky et al. (2007), and Sherwani et al. (2007) demonstrates that the functionalities needed for the proposed mobile application can be easily developed.

5.6 Conclusions

This chapter presented the research findings of Phase 3 and Phase 4. This chapter started with discussion on three Human Nodes (i.e. community leader, local shop-keeper and volunteers) of community communication at Sudarshan Layout. In the following section, I discussed two identified needs for community communication i.e. community communication of slums with the world outside and community communication between slums. Moving further, I discussed identified design challenges for community communication at Sudarshan Layout and finally it presented a design concept, Asynchronous Voice based Community Communication Service.

6 Conclusion and further development

This thesis investigated area of community communication for marginalized community belonging to Indian urban slums. Phase 1 and Phase 2 of research concentrated on identification and analysis of practices of mobile phone's use amongst residents of Indian urban slum. Phase 3 and Phase 4 focused on understanding community communication of an Indian urban slum.

This research concentrated on understanding local social context rather than technological infrastructure. The research utilized the conceptual framework of communicative ecology to analyse communication at Sudarshan Layout. This framework helped in understanding community communication at Sudarshan Layout in broader context. The approach helped in establishing the significance of voice, relationships, trust, bonding and role of Human Nodes in context of community communication in an Indian urban slum. The research identified AC3 as a Community of Practice. This thesis discussed design opportunities and challenges for mobile based community communication services for residents of Indian urban slums.

I consider this research as a starting point for further work. I aim to extend this research in following possible directions:

- a. **Public spaces:** I will research upon public spaces inside and near slums where community communication happens. Spaces like Road side teashops, Multi-purpose food stores, Community Centers etc. During the research, I observed that different groups acquire different postures and configuration while engaging in these space. For example, young men stand and talk during their stay at local tea shops while old women sit in a semi-circular fashion and discuss amongst each other. I feel that engagement of local residents with these spaces will help in identifying elements which will enrich the design of community communication services.
- b. **Mobile Interfaces:** I will research on how residents of Indian urban slums use mobile phone's functionalities like contact books, voice recorder, in-built loudspeaker and microphone. This will help in improving the existing design

of these functionalities and will help in integrating them in the interface of community communication services.

- c. Sharing or Transfer of Voice files: I will research on possibilities for residents of Indian urban slums to share or transfer voice files stored on mobile phones.

I aim to further develop the design concept of *Asynchronous Voice based Community Communication Service* in active collaboration and participation with real users i.e. residents of Indian urban slums. Participatory design is relevant framework to involve users in the design process (Ehn 2008). Participatory design methods assist in engaging local community in a sustained, democratic, bottom-up design process (Redhead & Brereton 2006; Redhead & Brereton 2008). Hence, I believe that participatory design activities will be right starting point for further development of the proposed design concept.

Urban Slum, a learning paradise!

A Appendices

A.1 Design Concept: Voice Annotation Service for Mobile Images and Videos

Voice Annotation for Mobile Images and Videos is an exploration to add vocal description to images and videos. This concept is based on mobile phones and utilizes the existing in-built functionalities of camera and microphone (voice recorder). The concept facilitates users to click a picture or a video using mobile phone's camera and then provides functionality to add a vocal description to the image or the video. Voice also helps in capturing the users emotions. During the phase 1 of the research, I developed a rudimentary working prototype. The prototype allowed users to perform two tasks:

- a. Click a picture and then add voice annotation to the picture.
- b. Shoot a video and then add voice annotation to the video.

Data i.e. picture (.jpeg), video (.3gp) and voice file (.amr) were saved in the mobile phone's memory. The prototype was developed using Python for S60 platform and hence should work on most of Nokia's 2nd and 3rd edition mobile phones (Scheible & Ville 2007). Nokia 6630 was used as a test phone for the prototype and was tested by four participants. The prototype was also tested on Nokia 6630, N95, N72 and N93 phones. Voice Annotation Service for Mobile Images and Videos is also an attempt to overcome the limitation of illiteracy. It also helps in situation when users cannot type the text. This design exploration is universal in appeal and could be used in various other contexts.

A.2 Description of Social Groups involved in creation of AC3

- a. Ambedekar Youth Association (AYA) is an association of local youth of Sudarshan Layout. At the time of research, AYA consisted of seven active members. All of them were residents of Sudarshan Layout. They have a small office space in Sudarshan Layout. The head of AYA is a social worker and was considered as community leader of the Sudarshan Layout.
- b. Stree Jagurati Samiti (SJS) is a Bangalore based Non-Governmental Organization (NGO). It is primarily concerned with social issues related to women

especially those belonging to marginalized section of society. SJS was based in Sudharshan Layout for over a decade before moving to a new office near East End Circle, Jayanaga, Bangalore. SJS has been actively involved in Sudarshan Layout for over past twenty years and have been helping local residents in dealing with many local social and civic problems.

- c. Association for India's Development (AID) is a group of volunteers primarily software professionals working in Information Technology (IT) industry of Bangalore. All the members are educated and belong to privileged section of India's society.

A.3 Social Map of Sudarshan Layout

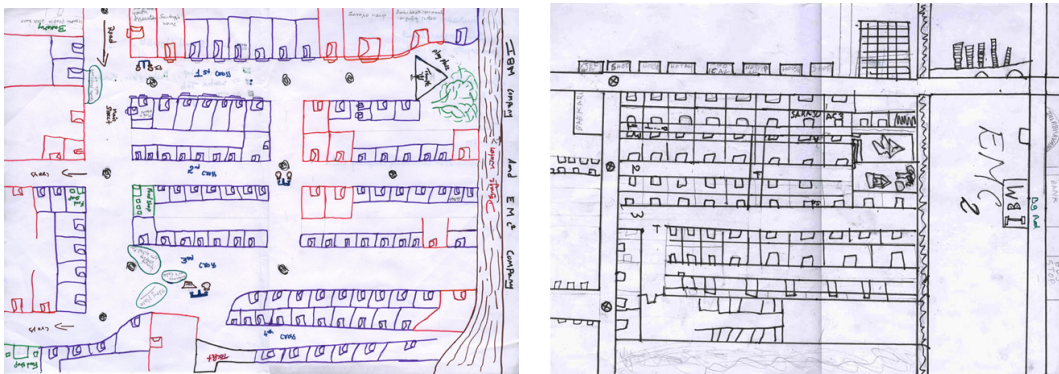


Figure A.1 Social Map drawn by AC3 Members

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