

Ethnographic Examination for Studying Information Sharing Practices in Rural South Africa

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Abstract— This progress paper describes a study plan and research theme with the focus on information sharing practices, social habits and behavioral access patterns in the context of the mobile phone and ICT usage of rural users in the emerging economies such as South Africa. The aim is to design new solutions to support rural users and their economic existence. An ethnographic field study was performed in order to understand the living conditions of rural communities and the related problems and opportunities in the field of mobile phone and ICT usage. A variety of qualitative measures such as contextual inquiry, participant observation, design exercises, focus and individual interviews were used during the field. However, only preliminary results from field studies are described in this paper. In our study, we found that needs and expectations of the users dwelling in rural context of different emerging economies are very much different from that of developed world. Product designers must consider these needs in order to deliver successful ICT and mobile-based services.

Keywords—Emerging markets; ethnography; information sharing; oral culture; rural users.

I. INTRODUCTION

Telecom sector has witnessed unprecedented growth in the last decade due to which mobile phones have penetrated deep inside our everyday life. Mobile phones have now turned into a commodity item that was considered an element of luxury, a decade ago. Majority of the mobile phones are now owned and used by people dwelling in resource constraint rural communities of emerging markets. Emerging markets are defined as nations holding low to middle income earning people for example India, China and South Africa [1]. According to an estimate, 80% of world's total population is living in these emerging markets and they account for 20% of worlds' economy [2]. World economists have predicted that emerging markets will continue to show twice growth rates as compared to developed nations [2]. This has resulted in ever-growing interest in exploring and investing in these emerging markets. Technology and related infrastructure have been special area of interest. However, we believe that low income, illiterate and resource constraint communities dwelling in different emerging markets are understudied. Hence, use of Information and Communication Technologies (ICT) and mobile phones in business and daily routines by these resource constraint communities is still a young field of research. Our study is concerned with the examination of

the issues involved in the development of interactive technologies for rural environments. The rural environment studied in this paper is actually the remote region of the development world.

After the invention of mobile phones, scientists considered mobile phones as new mediums for communication and connectivity. But, with the emergence of mobile services such as text messaging and multimedia have transformed this notion. In resource constraint regions of different emerging markets, mobile phones are used for micro-financing and sound medium for carrying out different business activities [3][19]. Mobile phone is now increasingly used for accessing information pertaining to health, education, e-services, government welfare schemes and most importantly farming and related practices. According to a recent estimate, only India and China account for more than 2 billion mobile phone users [4]. Mobile phones are not only portable but also they are easy to use, cost effective and above all, they have become very much affordable. Mobile phones are seen as tools for bridging the existing digital divide between developed and developing world. Previous work on ICT and development argues that under utilization of the ICT infrastructure is one of the main reasons behind this increasing digital divide. We see ICT as an essential catalyst that can potentially help local indigenous markets to expand and develop beyond the local borders.

So far, the users dwelling in resource constraint rural communities of emerging markets are understudied. There are not many studies on developing ICT solutions for resource constrained, low income and digitally unstable communities [17][18][19][20][21][24][25][26][27][28]. We argue that these users are having different needs, expectations and requirements from ICT use. These needs are different from that of users living in developed world. Hence, product developers and ICT designers must understand and examine these different needs in order to manufacture successful ICT adoption in these emerging markets. In our study, we have also emphasized on studying local needs, social habits and behavior patterns of users dwelling in rural communities that are also resource constraint.

The rural areas of emerging markets such as South Africa and India suffer from a lack of economic activity due to which the problem of poverty is further exacerbated.

Rural communities possess a huge potential in developing opportunities for agriculture and other small enterprises, but due to limited or inefficient markets and marginalized basic infrastructure, these communities are not strong enough to tackle poverty and improve rural living. Mobile phone services and ICT possess the required potential for opening these rural markets to the outside world.

In our research, we are seeking to better understand the living conditions of rural residents in India and South Africa so that later, based on the study results, we can propose and develop innovative solutions for improving rural life. Through the ethnography field study we want to identify the existing problems, opportunities and their possible solutions. Our goal of designing new solutions for the rural users in India and South Africa will be achieved through a cross-cultural ethnographic study of rural communities in both these countries. However, in this paper, we have only reported our ethnography field study and its results from two rural communities in South Africa. In this study, we accomplished two main objectives - First, we studied the information-sharing practices in the rural regions of South Africa in order to understand if and how new mobile phone design and ICT solutions can improve their lives. Second, we have cross-examined the findings and understanding present in the existing literature on ICT and development from India and China in context to South Africa. So, in a way, our empirical study is partially cross-cultural by nature.

The rest of the paper is organized as follows. Section II outlines the description of our field sites. Section III briefly describes the related work to our topic. Section IV describes study methodology by explaining the used research methods, study participants and the process of data collection and analysis. Section V presents the themes under investigation in our study and Section VI outlines the results of our ethnography study. Finally, our paper ends with presenting study conclusion and future works.

II. FIELD SITES

Our study is based on understanding the information sharing practices, ICT use and ownership in resource constraint rural communities of emerging markets where low literate and low income users dwell. In this direction, we have selected two rural but resource constraint communities in South Africa. Our ethnography study is based on the two rural communities located in the Eastern Cape of South Africa, i.e., Alice and Dwesa rural communities. University of Fort Hare is located within Alice while Dwesa rural community is located on the south-eastern coast of South Africa that comprises of an area spread over 235 square Km. The closest town to Dwesa is 50 km away. Dwesa suffers from a low human development index i.e., 0.41 [5], far below the national average of 0.61 [6]. Dwesa also has a low literacy rate at 44.24% against the national rate of 68.5% [7], an unemployment rate of around 78%, and increasing dependence on agriculture, state grants and remittances from urban areas [5]. The working

population of this region is mainly involved in farming related practices, while marginal numbers are dependent on art and craft for their subsistence. Due to the high percentage of youth migration to urban areas, Dwesa is left with mostly elderly people and children below 20 years of age [8][9][10][11]. Dwesa and Alice differ in socio-economic status as Alice is more advanced compared to Dwesa in terms of technology use because the Alice rural community lies in the vicinity of bigger towns and people dwelling here are having higher penetration of ICT and mobile phones compared to Dwesa.

III. RELATED WORK

Given our focus on the day to day practices in rural settings, we concentrated on three aspects of rural living: oral cultures and their mobile phone usage, existing information sharing practices, and the role of ICT and mobile services in farming and other professions in rural settings. First we referred to the existing work in the Alice and Dwesa rural communities in order to get a basic understanding of the current use and ownership of mobile phones and ICT in these communities [7][8][9][10][11][22]. After this we looked at the existing research in the Human-Computer Interaction for Development (HCID) literature [12]. HCID practitioners have recommended focusing on community-centered design rather than user-centered design when development related issues are the main reasons for the research [12]. Similarly to research on Chinese immigrant workers and ICT [9][10][11] our research also turned to family centered design as the majority of the people in the Dwesa rural community have migrated to urban areas, and they are the ones who provide urban resources to the rural families.

Similar to our argument, i.e., users dwelling in resource constraint communities of emerging markets have different needs, expectations and requirements. Winschiers and Fendler [13] also emphasized this difference in their study as they found western usability notions failed desperately in Nigeria. It was found that western world's notion for evaluating usability i.e., learnability, speed and memorability do not sell as criteria's for usability in Nigeria because Nigerians considered other criteria for considering any software successful. Sukuraman et al. [20] argued that findings from the developed nations are not directly applicable in context to emerging markets due to different needs and requirements. They found that the users in resource constraints communities do not have a pressing need for security and privacy in ICT use unlike developed markets. Sherwani et al. [17] presented the concept of oral and literate culture in order to understand the preference for face-to-face information exchanges in both oral and literate cultures. "Intermediated technology use" is recognized as an important research area in HCID research. Intermediated technology use refers to the situation where users cannot use mobile phone services, ICT or other related technologies on their own due to any one of several reasons like poverty, illiteracy, and lack of accessibility or sufficient skills

required for independent use. In such cases, users often become dependent on others or rely on third parties [18] [19][20]. India has been a testing platform for intermediated technology use [18][19][20][24] and these findings can also be applicable to South Africa for the following reasons: Both countries have a high level of illiteracy and unstable development in infrastructure. Both are also emerging economies that are facing a vast rural and semi-skilled population, poor quality of education, uneven economic development and inefficiency in their local markets. Smyth et al. [25] studied the media sharing through mobile phones in India in order to understand the mobile phone use, ownership and adoption in emerging market context. In this study, we found that if a user is highly motivated then existing hurdles in ICT use and adoption are easily crossed. These hurdles are – cost of Internet use, privacy, complex user interfaces, software virus, legal issues and limited Internet and network connectivity. But users due motivation for entertainment overcomes these challenges. However one of the notable findings from this study was that emerging markets are not yet ready for the advanced ICT development.

In the exiting literature on ICT and development world, there are different research agendas for example; ICT4D, HCI4D and recent of all UbiComp4D, all these platforms have more or less one common objective i.e., focus on the needs and requirements of development world. ICT4D refers to ICT for development where the primary focus is on “how technology can solve challenges faced in global development”. UbiComp4D refers to Ubiquitous computing (UbiComp) for development that strives for the integration of development of resource constraint communities and UbiComp research agendas. Similarly HCI4D stands for Human Computer Interaction (HCI) for development that argues for developing new methods and organizing studies for the development of digitally unstable communities. HCI4D came into limelight as a mechanism for countering the challenges faced in applying traditional HCI research methods when contributing to global IT development. All these three different terms have common agenda i.e., to eradicate poverty from neglected socio-economic contexts [17][18][19][20][21][24][25][26][27][28]. In this direction, some of the notable initiatives are GlobiComp, workshop organized on “*Taking UbiComp beyond developed worlds*” at UbiComp 2009 [26]. “Transnational times” workshop at UbiComp 2010 [27] and workshop titled “*Transnational HCI*” organized at CHI 2011 [28]. All these different initiatives emphasized the need for understanding social, economic and cultural practices in emerging markets for potential ICT development.

IV. STUDY METHODOLOGY

The ethnographic study was performed in three different phases where the first phase was exploratory in nature. At this stage, we emphasized gathering information on social habits, access patterns in regard to mobile phone and ICT usage, information sharing and exchanges in rural settings.

In the second phase, the information gained from the first phase was validated using the same research methods and study methodology, but with more systematic sampling of participants. In third phase, we performed a cross-cultural study where findings and results available in the existing literature but from different continent were cross examined with the learning and results obtained through our ethnography study

The first phase of our ethnography study was completed in course of a 5-week ethnography study during May-July 2011 in both Alice and Dwesa Communities. The data collected from the first of the study was analyzed using thematic analysis approach [23]. Based on the study findings, we made some adjustments to our study. Some questions were modified and added in order to know more about the unclear facts. Second study was organized with modified questions between September-October, 2011 in course of 5-week ethnography.

The entire ethnography study was carried twice in the course of 6 months. Three researchers from University of Fort Hare organized and performed the ethnography studies. The researchers made six visits to Dwesa and Alice where they stayed for four to five consecutive days on each visit. They stayed with the local residents and followed a daily routine of visiting common meeting places, social gathering, schools, and adult learning centers, farming sites and shopping places. Before conducting the first phase of this study, we took certain steps to ensure that the results of the study were correct and genuine. For example, three researchers were picked who were already familiar with both communities in order to establish trust and a certain degree of comfort with the study participants. This ensured the easy availability and accessibility of the subjects involved. Second, well-known people from both the communities were taken into confidence so that the subjects participated in our study in a motivated and willing fashion. For example, the respective heads of the communities and principals of the adult learning and training centers located at Dwesa and Alice.

A. Research Methods

Mixed method research was practiced during our ethnography study i.e., combination of different qualitative research methods such as contextual inquiry, participant observation, design exercises; focus and individual interviews were used for gaining rich user data. We employed the triangulation research principle in the data collection where findings from every research method complemented the other methods. Tables 1 and 2 present the classification of participants based on gender in different user groups. Table 1 presents the classification in first field study while Table 2 represents second field study.

TABLE I. CLASSIFICATION OF PARTICIPANTS IN FIRST STUDY

User Group	Dwesa	Alice
Youth	11 males 17 females	16 males 13 females
Women	14 females	28 females
Farmers	10 males 2 females	5 males 3 females
Old People	6 males 8 females	11 males 6 females
Teachers/ Workers	3 males 8 females	6 males 8 females

TABLE II. CLASSIFICATION OF PARTICIPANTS IN SECOND STUDY

User Group	Dwesa	Alice
Youth	15 males 15 females	11 males 10 females
Women	15 females	15 females
Farmers	8 males 5 females	8 males 2 females
Old People	7 males 8 females	7 males 7 females
Teachers/ Workers	5 males 10 females	6 males 9 females

B. Study Participants

In our study, we tried to involve different stakeholders from the both rural communities. This includes youth (below 25 and not working), women (mostly staying at home, married and from all age groups), farmers (all age groups), older people (above 55 years of age), and professionals involved in other than farming (teachers, craftsmen from all age groups). Our user group contains both illiterate and literate participants who either do or do not possess mobile phones.

In both communities, youth was classified into a primary school group (8-12 years) and a secondary school youth (13-30 years). The youngsters interviewed at Dwesa were between 7-20 years of age due to rural to urban migration, as those above 20 years of age had already left the community. The youngsters interviewed at Alice were more technologically savvy compared to the youngsters at Dwesa. The majority of the interviewed youngsters at Alice had mobile phones while in Dwesa few possessed their own mobile phones. As Alice is closer to towns, there are high numbers of children who are the victims of theft. As a result, parents at Alice preferred their children to have mobile phones so that their children could call them in case of emergency. Furthermore, it was found that the youth at Alice play indoor games such as Sudoku and snakes and ladders; while at Dwesa the children rely on traditional outdoor games in groups.

Farming is more common in Dwesa than Alice, and more farmers were available in Dwesa for this reason. Almost all the interviewed farmers both at Alice and Dwesa

possess mobile phones. In both Alice and Dwesa, we found that a large number of subjects joined in discussions but only few of them were active in answering the interview questions. We cannot restrict or eliminate such people from our discussions as it was against social rules in African society so we allowed everyone to join at their own will. In Tables 1 and 2, we mentioned number of only those users who have participated actively in the discussions. Almost all the focus group discussions organized at Alice were informal in nature because in Alice people are either busy doing their work or travel to the nearest big city to seek employment: hence we met most of our subjects at a community hall except for farmers and older people who were interviewed at farming sites and their homes. Figures 1, 2 and 3 presents an overview of different types of discussions organized by researchers in Alice and Dwesa communities.



Figure 1. Researchers organizing focus group discussions at Alice community



Figure 2. Researchers interviewing youth in a local school



Figure 3. Focus discussions with working user group

C. Data Collection and Analysis

All the qualitative measures were performed in the native language of that region, for example, in Dwesa and Alice rural communities isiXhosa language is widely spoken and written; so, all our qualitative and design methods were practiced in isiXhosa language. Three researchers from University of Fort Hare are fluent in written and spoken isiXhosa, so all observations and conversations were carried in isiXhosa. The data was collected in the form of audio recordings and written field notes while practicing different qualitative measures in the ethnographic field study. The participating researchers transcribed the recordings first in isiXhosa and later translated them into English. The field researchers crosschecked the translations in order to avoid any incorrect translation of the original text and the associated meanings. The collected data was analyzed using thematic analysis approach where common themes and meanings were obtained after objective and systematic process of data analysis [18]. The whole process ends with higher abstraction levels that were carved from the original data.

V. THEMES UNDER INVESTIGATION

We have identified three themes for investigation under this study that are listed below:

A. Oral cultures and Mobile phone usage

Both the Alice and Dwesa rural communities possess large numbers of people who represent oral culture, i.e., illiterate people. We wanted to investigate the different mobile phone features used by oral and literate users. Our two main objectives under this theme are:

1. How do oral users make use of different features in their mobile phones? For example, how do oral users save contacts on their mobile phones? Do they seek help from friends and family? Or have they become familiar with the process of saving contacts in the phone address book? In some of the earlier studies [19], it was found that oral cultures use paper diaries for storing contacts, so we also wanted to examine the possible reasons behind this behavior. In what way do oral users save contacts in their mobile phones and their paper diaries? What is the basis, for instance, for indexing and searching for saved contacts in the paper diaries?
2. Investigating the kind of problems faced by oral users in mobile phone use. Our hypothesis on mobile phone use is that oral users make use of only few mobile phone features. There are many such never used functionalities such as organizing contacts to family, friends and office, the speed dial option as a shortcut for calling someone by pressing a single key, and associating icons or colors with contacts. The question

is do oral users really use such functionalities in their daily routine?

B. Information sharing practices in rural regions

Under this theme, we are investigating the role of face-to-face or oral information exchange in the daily routine of different user groups. How do different user groups receive the updated information related to the product they want to purchase or sell their produce on the market? We are interested in exploring the access pattern of such information exchanges. We believe that ICT should support the existing information sharing practices that are currently based on social habits. We are also examining the access patterns and different channels through which information flows in rural settings. For example, how do different user groups receive national and international news and updated information on new products they want to purchase. How do they perceive information sharing through computers and Internet? Different state owned TV and radio programs are aired, but what is their overall usefulness to different professions such as farmers, shop owners and small business owners? Furthermore, we are interesting in understanding the role of the different education and health oriented programs owned by the respective state governments for our user group.

C. Role of Mobile phones and ICT in farming related practices

In this topic, we are studying the role of ICT and mobile phone usage in facilitating different farming related practices such as seed selection, sowing, fertilization and disease management, harvesting and selling agricultural purchase on the market. Our three main objectives under this theme are -

1. Investigating the role of text messages and other mobile phone services in different farming related practices. We want to understand the attitude of farmers to different mobile services, and their associated benefits and risks. How do farmers, for example, sell their produce in market? Do they sell locally or in other big cities? How do they get updated information about their crops? Do they have long-standing relationships with the buyers?
2. Examining the role of state owned infotainment media, i.e., radio and TV programs in the daily routines of different user groups such as information related to markets, to weather forecasts, and also to government policies related to their profession. We are interested in examining “*how farmers perceive these informing sharing programs*”.
3. Other farming specific questions under investigation are different crop diversification programs and their usefulness. Crop diversification programs are promoted by the state government so that farmers can earn more

profits, but do farmers agree and see crop diversification as useful?

VI. PRILIMINARY RESULTS

Our presented study is still in progress and this paper is also a work in progress contribution; so, we also only outlined some of the preliminary findings here that are crucial findings as per already defined themes of investigations.

A. *Oral cultures and Information sharing practices*

Similar to the existing studies in emerging markets [15,16], we found that in both rural communities, oral or face-to-face communications are most preferred medium for sharing information. Majority of the interviewed participants in Dwesa community had strong affection for oral way of communication as they consider it to be more relaxing, helps in socializing better and free from miscommunication that frequently happen if communication happens through mobile phones. Information sharing in both rural regions is highly unstructured and people consider technology such as mobile phones and Internet as expensive and un-necessary for delivering non-urgent information for example discussing normal daily routine, gossips and other local news. Youth as well as business professional such as farmers and other employed people excessively use mobile phones. Old people make use of mobile phones mostly for receiving phone call. In both Alice and Dwesa communities, it was found that majority of the people have strong opinion that in future technology can never completely replace the oral or face to face communications. This can be interpreted as people in rural communities are not as addicted as are urban users. Furthermore, technology use is still considered expensive while oral or face-to-face communications are considered effortless.

B. *Role of Mobile phones and ICT in farming related practices*

In Dwesa community, we found that almost all the interviewed farmers are dissatisfied with the government initiatives related to farming practices. Farmers in Dwesa mentioned that crucial information related to farming practices such as seed selection, sowing, weather forecast, insecticide and pesticide selection could be easily provided using mobile phones. Mobile phones are universally and huge number of farmers possesses feature phones, which support text message facility. However, ICT is underutilized like earlier studies in other emerging countries like China [15][16]. A farmer in Dwesa community is depending upon local school and community centers for getting farming related advice. Some farmers even expressed that main reason for agriculture related losses such as bad yield is due to improper information sharing. In Alice community, farmers are in better position compared to Dwesa because Alice is close to bigger towns so farmers have easy accessibility to farming related equipments unlike Dwesa. In

both the communities, we found that mobile phones are excessively owned and used by the farmers for example, informing neighboring farmers about farming and weather updates, getting updates about the yield price from the local markets. Overall, we got the impression that mobile phones and ICT in general are owned and used in high numbers however; ICT is underutilized due to poor government initiatives. Unlike other researchers [21] who believe that emerging markets are not yet ready for the advanced developed, we hold a different opinion on this matter. In both Alice and Dwesa communities, infrastructure is already present in form of mobile phones; so, any kind of text or voice based services can be easily launched and provided to local community.

VII. CONCLUSION AND FUTURE WORK

This paper described the design of an ethnographic field study, which aims to investigate mobile phone and ICT usage patterns of rural users in developing countries. The goal is then to identify opportunities for mobile phone and ICT usage based on the results of this study. We believe that bringing ICT to remote environments is growing area of interest in various research communities, and thus our study of the relevant practical and cultural issues is very timely. The paper has been structured in a way that its content not only remains interesting for its readers but also thought provoking. In future, we plan to organize similar ethnographic studies in other emerging markets such as India, China and countries in Middle East. We aim to repeat our existing study in India and China. In this direction, we will locate two similar rural communities as we had in South Africa and apply similar research methods so as to perform cross-cultural analysis of the results. This kind of comparison will enable us in deriving important design drivers that will lead to possible innovative designs for different rural communities that are also resource constraint in nature.

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REFERENCE

- [1] What Is An Emerging Market Economy? August, 2009. <http://www.investopedia.com/articles/03/073003.asp#axzz1diEas23D> (retrieved: January, 2012)
- [2] Emerging Market Growth Poles are Redefining Global Economic Structure, Says World Bank Report, 17 May, 2011 (retrieved: January, 2012)
- [3] N. Rangaswamy and N. Sambasivan. Cutting Chai, Jugaad, and Here Pheri: towards UbiComp for global community. *Personal Ubiquitous Computing*. 15, 6 (August 2011), pp. 553-564.
- [4] Global mobile statistics 2011, <http://mobithinking.com/mobile-marketing-tools/latest-mobile-stats> (retrieved: January, 2012)
- [5] M. McCann. District Profile Eastern Cape Amathole District Municipality (DC12), Programme of Support to Local Economic Development in the Eastern Cape, Eastern Cape Competitive Advantage Assessment And Training Support Project, European Consultants Organisation, 2006. (retrieved: January, 2012) <http://www.thinasinako.co.za/files/documents/290806175552.pdf>
- [6] UNDP. "Human Development Report 2007/2008 - Country Fact Sheets- South Africa," 2007. (retrieved: January, 2012) http://hdrstats.undp.org/countries/country_fact_sheets/cty_fs_ZAF.html
- [7] Statistics South Africa, Provincial Profile 2004: <http://www.statssa.gov.za/publications/Report-00-91-09/Report-00-91-092004.pdf> (retrieved: January, 2012)
- [8] L. Dalvit, H. Muyingi, A. Terzoli, and M. Thinyane. The Deployment of an e-Commerce Platform and Related Projects in a Rural Area in South Africa, *International journal of Computing and ICT Research*, Vol. 1, No. 1, pp. 9-18.
- [9] C. Pade-Khene, R. Palmer, and M. Kavha. A baseline study of a Dwesa rural community for the Siyakhula Information and Communication Technology for Development project: understanding the reality on the ground. *Information Development*. Information Development Journal November 2010 vol. 26 no. 4, pp. 265-288.
- [10] G. N. Sicelo, Implementation of a Virtual shopping mall for Dwesa, a rural area in the Eastern Cape, South Africa. MSC thesis, Department of Computer Science, University of Fort Hare, South Africa.
- [11] Dwesa Village Connection Business Modelling, Feasibility Analysis, October 2008 (retrieved: January, 2012) http://www.ungana-afrika.org/sites/default/files/documents/dwesa_business_modelling_report.pdf
- [12] A. Dearden, User-centered design considered harmful. *Information Technologies and International Development* 4, 3 (2008), pp. 7-12.
- [13] M. Friedewald and O. Raabe, Ubiquitous computing: An overview of technology impacts, *Telematics and Informatics*, Volume 28, Issue 2, May 2011, pp. 55-65.
- [14] X. Lang, E. Oreglia, and S. Thomas. Social practices and mobile phone use of young migrant workers. In *Proc. MobileHCI2010*, ACM Press (2010), pp. 59-62.
- [15] X. Liu, J. Liu, J. Cai, Y. Liu, and X. Wang. Design for China's migrant workers: A case of user research and mobile product concepts development. In *Proc. HCD09*, Springer-Verlag, Berlin, Heidelberg, pp. 482-491.
- [16] E. Oreglia, Y. Liu, and W. Zhao. Designing for emerging rural users: experiences from China. In *Proceedings of the 2011 annual conference on Human factors in computing systems (CHI '11)*. ACM, New York, NY, USA, pp. 1433-1436.
- [17] J. Sherwani, N. Ali, C. P. Rosé and R. Rosenfeld, Orality-Grounded HCID: Understanding the Oral User, *Information Technologies and International Development*, vol. 5, Dec 16 2009, pp. 37-49
- [18] T. Parikh and K. Ghosh. Understanding and designing for intermediated information tasks in India. *IEEE Pervasive Computing* 5, 2 (2006), pp. 32-39.
- [19] N. Sambasivan, E. Cutrell, K. Toyama, and B. Nardi. Intermediated technology use in developing communities. In *Proc. CHI2010*, ACM Press (2010), pp. 2583-2592.
- [20] A. Sukumaran, S. Ramlal, E. Ophir, V. R. Kumar, G. Mishra, V. Evers, V. Balaji, and C. Nass. Intermediated technology interaction in rural contexts. In *Ext Abstracts CHI 2009*, ACM Press (2009), pp. 3817-3822.
- [21] E. Brewer, M. Demmer, M. Ho, R. J. Honicky, J. Pal, M. Plaque, and S. Surana. The challenges of technology research for developing regions. *IEEE Pervasive Computing* 5, 2 (2006), pp.15-23.
- [22] E. A. Emmanuel and H. N. Muyingi. A mobile commerce application for rural economy development: a case study for Dwesa. In *Proceedings of the 2010 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT '10)*. ACM, New York, NY, USA, pp. 58-66.
- [23] L. Rourke, T. Anderson, D. R. Garrison, and W. Archer. Methodological Issues in the Content Analysis of Computer Conference Transcripts. *International Journal of Artificial Intelligence in Education* 12 (2000), pp. 8-22.
- [24] A. Joshi, N. Welankar, N. BL, K. Kanitkar, and R. Sheikh, Rangoli: a visual phonebook for low-literate users. In *Proceedings of the 10th international conference on Human computer interaction with mobile devices and services (MobileHCI '08)*. ACM, New York, NY, USA, pp. 217-223.
- [25] T. N. Smyth, S. Kumar, I. Medhi, and K. Toyama. Where there's a will there's a way: mobile media sharing in urban india. In *Proceedings of the 28th international conference on Human factors in computing systems (CHI '10)*. ACM, New York, NY, USA, pp. 753-762.
- [26] Globicomp: Taking UbiComp beyond developed worlds. <http://www.cs.swan.ac.uk/globicomp2009/>, UbiComp 2009 Workshop, 30 September, 2009 (retrieved: January, 2012)
- [27] I. Shklovski, S. Lindtner, J. Vertesi, and P. Dourish, Transnational Times: Locality, Globality and Mobility in Technology Design and Use. *Ext. Abst. UbiComp 2010*, ACM Press (2010), pp. 515-518.
- [28] J. Vertesi, S. Lindtner, and I. Shklovski, Transnational HCI: humans, computers, and interactions in transnational contexts. *Proceedings of the 2011 annual conference extended abstracts on Human factors in computing systems (CHI EA '11)*. ACM, New York, USA, pp. 61-64.