Convergence opportunities and factors influencing the use of internet and telephony by rural women in South Africa and India towards empowerment

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Abstract. Access to Information and Communication Technologies (ICTs) can have dramatic impact on poverty alleviation for rural women and for achieving socio economic development goals. Rural women need to treat ICTs as an empowerment tool and a means to a living. The use of mobile communication devices and internet are changing the way agricultural activities are managed by farmers nowadays. Rural women's lack of mobility and less hands-on computer experience might hinder women's welfare and empowerment. This paper analyses how use of the telephony (both cellular and land line), internet and other ICTs can benefit rural women in educational, business and economic sector. Women in rural India and rural South Africa were marginalized partly due to their lack of ability in being vocal when it comes to empowering themselves using ICTs due to cultural norms in India, and apartheid in South Africa. Over the years, unlike other developing countries, the above-mentioned countries have its unique ICT projects meant for empowering rural women. This paper is driven from the authors' commitment for rural development and rural women empowerment. It highlights different low-cost ICT initiatives and strategies taken by women's organizations, various companies and other non-governmental organizations (NGOs) for rural women empowerment. The paper also highlights various factors influencing use of internet and mobile phone adoption by rural women. Various bottlenecks for the community projects, factors de-motivating the use of mobile phones and internet by rural women and possible solutions for these are also mentioned.

1. Introduction

The term "rural women" refers to women living in an under-serviced or rural area. In these areas water, sanitation, drainage and electricity are scarce and rural women are afflicted with unemployment. The mortality rates are predominantly high amongst children. Although there are limited services offered by government fire station and police station to people living in rural areas, these places often lack public waste management system, public transport and people mostly depend on agriculture or fisheries for a living.

The way information and communication technologies are accessed by rural women is widely debated. "Gender is an issue because access to and use of ICTs are influenced by the cultural and institutional contexts in which they are applied" [1]. ICTs have the potential to alleviate the constraints that rural women currently face. Although rural women's indigenous knowledge should not be underestimated they experience a less equitable environment in accessing ICTs. Internet, e-mail and telephony remain the most widely used form of communication devices for women empowerment in developing countries. As internet and telephony top the list of tools that can empower rural women, this paper gives special focus on these sectors.

The authors look at how various NGOs use ICTs for content generation and capacity building using the internet. The authors have selected a few NGOs and companies in South Africa and India for field study taking into account how rural women benefit by using internet, telephony (both cellular and land lines) and video cameras. Other community projects specifically highlighting women's use of internet and mobile phones from different countries are also included. There are three reasons why authors focused on these countries.

Firstly it is due to the increasing deployment of mobile and rural telecommunications infrastructure in India in recent years. Secondly it is due to the innovative ways of South African women's organizations, various companies and NGOs bring communications via internet and cellular phones to rural women. The third reason why we focused on these countries for research is due to its unique way of empowering rural women through 3G and internet.

71.8% of the almost 1 billion Indian people still reside in villages (rural areas) and most of rural people did not have telephone connection. ICT penetration and teledensity in rural India and rural areas of South Africa is very low. For the above-mentioned population, India has 16 million Internet connection and 74 million telephone connections - most of which are confined in and around cities. Table 1 and Table 2 give a clear picture of internet penetration and mobile penetration in India and South Africa. The Indian government forecast that by 2010 India will have more than 500 million mobile subscribers [2].

Women are more likely to be involved in agriculture-related activity than men. India's 66% of the workforce are still employed in agricultural sector. But research has indicated they have found a means for living through other sectors as well.

Table 1: Comparison of internet and mobile penetration in India [3]

2003 Life expectancy at birth (years)	63.3
2005 Population	1.1 Billion
2005 GDP per capita	US $685
2005 Internet penetration	4.3%
2006 Mobile penetration	11%

Table 2: Comparison of internet and mobile penetration in South Africa [3]

2003 Life expectancy at birth (years)	48.4
2005 Population	44.8 Million
2005 GDP per capita	US $5,290
2005 Internet penetration	10.7%
2006 Mobile penetration	61%

The objectives of this paper are:

1.   To raise awareness of gendered digital divide.
2.   To learn more about the ICTs like mobile technology and internet and video that can benefit rural women.
3.   To find out the critical factors for the successful empowerment of women through internet and telecommunications (including mobile phones).
4.   To find out the bottlenecks and factors that hinder rural women from using ICTs and innovative ways by which they can be motivated.

Field study could be conducted only in a few organizations in South Africa for data gathering. Relevant information about various community projects especially in the Indian context was collected from databases such as Engineering Village and other peer-reviewed journals. In addition various publications and reports from World Bank and United Nations provided a good source of information.

Conceptual literature survey conducted from books and peer-reviewed articles by experts where they expressed opinions, experiences, theories and ideas about a problem area. It helped the authors to understand the validity or correctness of data and illuminated strong points which they could follow up.

Research literature conducted included reporting in respect of research that had been undertaken previously in the specific field and gave the authors a good indication of bottlenecks in respect of research, design and techniques in connection with the field.

Semi-structured interviews were conducted with various people in women's organizations in India and South Africa, to find out more on how rural women access ICTs. Some oral sources were organized interviews that were conducted with managers working in South African NGOs and other companies in India. Some of these organizations were kind enough to provide a brief description of their community projects.

2. Gender-related imbalances in the use of ICT- Is technology making things better?

According to a speech by Indian President Mr. APJ Abdul Kalam to SEWA (Self Employed Women's Association) members in India, "Children are the most precious properties. Male and female children are to be given equal importance in providing education and rights for growth of our society. Girl child education is the most important need to empower families"[4].

As the 2002 Rural Poverty Report of the International Fund for Agricultural Development indicates, in rural areas of developing countries there is no question that women are more likely to be resource poor, isolated, and less educated relative to men. "People lack many things: jobs, shelter, food, healthcare and drinkable water. Today, being cut off from basic telecommunications services is a hardship almost as acute as these other deprivations, and may indeed reduce the chances of finding remedies to them"[5]. Gender roles are society specific because there are socially constructed relations between men and women in society. In Cajamarca, Peru, when women undertook information technology training with men, the men mocked them saying that computers are for men, not women [6].

2.1. Convergence opportunities: Second Generation (2G) to Third generation (3G) mobile phones

One of the main objectives of the ICT companies today for service delivery is convergence. Convergence will allow customers to access multiple services via multiple interfaces which are translated into convenient services that are easy to use and access. Telecommunication companies like Vodacom, Telkom and Siemens Communications have realized the need for converged communication and ICT skills in rural community and established a Convergence Lab at University of Witwatersrand, South Africa.

The 2G technologies like GSM (Global System for Mobile communications) are still the most popular for mobile communications. It allows mobile phones to connect to it by searching for cells in the immediate vicinity. But research has shown third generation (3G) technology is slowly taking over 2G even for rural broadband connectivity.

3G is based on an International Telecommunication Union (ITU) initiative for a single global wireless standard called International Mobile Telecommunications-2000 (IMT-2000). This concept of a single standard evolved into a family of five 3G wireless standards. 3G is an appropriate technology to provide affordable voice and data access to people in rural areas. These areas have limited landline access. So 3G is a way to provide high-speed internet connectivity, education, public safety, healthcare, governance and environmental conservation in a sustainable, efficient and cost effective manner.

Code Division Multiple Access (CDMA) is a digital wireless technology that works by converting analog information, such as speech, into digital information, which is then transmitted as a radio signal over a wireless network. CDMA uses spread-spectrum technology, decreasing potential interference while achieving privacy. CDMA technology is the basis for 3G wireless, which offers increased voice capacity and provides higher data rates than 2G and 2.5G. Development of cell phones based on this technology was dominated by QUALCOMM Inc.

WCDMA is (Wideband Code Division Multiple Access), developed by NTTDoCoMo is a 3G cellular network whose key feature is radio channels that are 5MHz wide. High-Speed Downlink Packet Access (HSDPA) is a 3G technology that would bridge the gap between 3G and internet. High-Speed Uplink Packet Access (HSUPA) provides packet based uplink data transmission to WCDMA (Universal Mobile Telecommunication System). HSUPA and HSDPA can support an entire range of broadband applications that would deliver a complete wireless system. Other than using it for downloading graphics heavy website one may use it for viewing television and for video telephony.

Of the five wireless standards evolved, the most widely adopted are CDMA2000 and WCDMA (UMTS). CDMA2000 (also known as CDMA2000 1X) is a family of 3G standards that offers enhanced voice and data capacity and higher data rates than previous, second generation wireless standards. The CDMA2000 family of standards include CDMA2000 1X and CDMA2000 1xEV-DO (CDMA2000 1X Evolution Data Optimized).CDMA2000 is a direct evolution of the cdmaOne® standard. CDMA2000 enables both voice and data and is best suited to provide comprehensive connectivity to rural India and will enable inclusive growth and development for the benefit of these underserved citizens.

3G has accelerated the convergence of mobile communication devices with consumer electronic devices. 3G mobile phones will offer rural women facilities like video telephony, television viewing, digital camera, MP3 music players. It can provide high-speed broadband data connectivity (upto 14 Mbps) compared to DSL internet and /or cable modem internet in a mobile setting.

Both internet and latest telephony techniques have provided various forms of communication for rural women to e-mail, chat, and keep abreast with global market for trading. The authors have focused on internet and mobile phones and telephone usage by various NGOs and multi-national companies due to the convergence opportunities provided by them for women empowerment.

3. Current ICT initiatives for rural women empowerment

Women are actively learning about ICT through community telecentres and women's groups. But illiteracy and language barriers remain the grave concern for women while accessing ICT. Women's organizations aims to empower rural women by providing gender-sensitive training to use ICTs, by facilitating the dissemination of information

in formats accessible to women, making technology accessible to historically disadvantaged, and creating a platform for women's voices.

Southern African NGO network (SANGONet) is one of the few NGOs involved in customising its ICT services to the specific needs of the NGO sector, improving its interaction, relationship and response to the needs of current and potential NGO clients. SANGONet is an information portal that allows community based organizations (mainly NGOs) to communicate with each other.

SANGONet (http://www.sangonet.org.za) is responsible for co-ordinating the collection and collation of inputs on rural women and development projects to the Dimitra database. The Southern African countries targeted by SANGONet include Angola, Botswana, Lesotho, Namibia, South Africa and Swaziland. Dimitra database showcases the profiles, development trends and description of various projects and programmes involving rural women and development in Africa, Europe and the Near East. This database aimed at empowering rural women, is updated every three years. Dimitra networks' goals include dissemination of information regarding achievements, contributions and challenges of rural women.

SANGONet's Dimitra Project shares information about the NGOs activities through PRODDER Directory. PRODDER is an online directory. It is the most comprehensive free on-line database of NGO and development organizations in South Africa. The participant organizations will receive bi-annual newsletters that provide more information on activities of the projects and will be given an opportunity to participate in local and regional networking opportunities.

Women'sNet was born out of a desire to develop a network that would facilitate the promotion of gender equality in South Africa by using various Information and Communication Technologies (ICTs). Women'sNet is an independent Non-Govermental Organisation that was initiated as a joint initiative of South African Non-Governmental Organization Network (SANGONeT) and the Commission on Gender Equality (CGE) was launched in 1998. Women'sNet is a member of the Association for Progressive Communications (APC) and the APC Women's Networking Support Programme (WNSP). Women'sNet aims to empower South African women by providing gender-sensitive training to use ICTs, by facilitating the dissemination of information in formats accessible to women, making technology accessible to historically disadvantaged, and creating a platform for women's voices.

Women'sNet uses ICT as a gendered tool and works to address gender imbalances in access by providing ICT training, gender awareness programmes and facilitating content dissemination. The contents created supports girls, women and women's organization to manage content and use ICT. It helps builds women's organizational capacity to use technology to find the people, resources, tools and content they need for social action. There are various networking support programmes designed to enable to use the Internet and other relevant ICTs to find the people, issues, resources and tools needed for women's social activism and empowerment.

The Women'sNet model which rests on, information/content generation linked to networking and capacity building ensures sustainability of South African women's organizations. Women'sNet has maintained its authenticity and uniqueness by

facilitating participation in content generation of various women's organizations. It promotes use of ICT for social development and gender participation and its profile rests on capacity development through networking and ICT advocacy through its membership with APC Africa Women. The other projects include the work done in preparation of the Violence Against Women site, the human rights site, the governance site and work done for gender sensitive areas for information society in African context.

Women'sNet strategic priorities : Women'sNet's objectives include making ICT accessible to disadvantaged women, providing gender-sensitive training, creating a platform for women's voices through contents in Women'sNet website, disseminating information in formats accessible to women (not linked to net), facilitating in planning of website development for other women's networks, helps women to use Internet strategically to achieve goals, facilitating women empowerment through networking and special projects and raising awareness of FOSS.

Women's Net offers a number of services to NGOs and other institutions on using ICTs strategically to achieve their goals which include services like:

- Technology Planning: Many Women's organizations' very important work is undermined by their lack of information, structures and support with regard to ICTs. They are unable to communicate with each other, with policy makers and with global movements as well as their constituencies. Women'sNet advises NGOs to assist them in making strategic technology decisions to support their goals and activities. This includes activities to create awareness of free and open source software solutions (FOSS).

- Training: Women'sNet facilitators have conducted training on producing audio files for community radio and the internet, on using the internet and email effectively, on advocacy and lobbying online and other tailor made courses. Its first workshop on Free and Open Source Software (FOSS solutions) was on 2004. Its Women's Technology Training Center in Newtown, Johannesburg has 18 computers using FOSS.

- Website Planning and Development: Women'sNet assists other NGOs to design and maintain their websites, with regards to content and maintenance, making the website work. They also help organizations to revive older websites.

- Communication and Networking Support: Women'sNet's quarterly newsletter - Intersections has emphasized women's organizations should engage in ICT planning. Women'sNet helps organization's to make the best use of technology by advising on managing and facilitating email lists, buying technology tools, which software is most appropriate for your needs, using internet tools for advocacy and much more.

- (S)he-bytes project: (S)he-bytes project website helped training girls to record radio content about gender issues that impact their lives. It was funded by Open Society Foundation, called Recording Women's Voices. Although this

project came to an end in 2005, (S)he-bytes continue to facilitate the production of topical, thought-provoking audio content by amplifying the issues of women/girls and poor marginalized communities in the form of "sound portraits". It will continue to dissemminate women empowerment issues through radio magazines and discussion programs.

- Digital stories: Women's Net held two Digital Story Telling Workshops at Technical Training Center in NewTown, Johannesburg. The inexperienced women produced a movie with their own words, text using computers and other devices like scanners, digital cameras and audio recorders. They talked about their survival strategies, gender discrimination, poverty, violence, HIV/AIDS illness, etc. Women'sNet will provide CD that will be shared by other NGOs for training in collecting, capturing and dissemination of local knowledge.

QUALCOMM Incorporated [3] is a leader in developing and delivering innovative digital wireless communications products and services based on CDMA and other advanced technologies. QUALCOMM launched the Wireless Reach™ [3] initiative to empower rural communities across the world through the use of 3G wireless technologies to strengthen economic and social development with a focus on education, governance, healthcare, the environment and emergency response services. Wireless Reach™ initiative achieves this by creating sustainable 3G projects through partnerships with non-government organizations, universities, government institutions, development agencies and other private sector companies.

Due to a huge disparity between urban and rural connectivity the government of India and several state governments, civil society organizations, industry partners and donor agencies have created an initiative, named Mission 2007. Its objective was to facilitate and accelerate through multi-stakeholder collaborations, the provision of Village Resource Centers in each of India's 600,000 villages by August 15, 2007 when it celebrates its 60 years of independence.

Village Resource Centers provide a central meeting point for knowledge-based livelihoods and income-generating opportunities for farming communities and all poor rural men and women. QUALCOMM has formed an alliance (on 28th July 2006) with the NASSCOM Foundation and Tata Teleservices to support of India's Mission 2007 initiative. This alliance launched QUALCOMM's first Wireless Reach™ initiative in India to provide CDMA2000 wireless connectivity solutions to 65 Village Resource Centers in India. This initiative was under NASSCOM's Rural Knowledge Network Program.

The initiative aims to empower communities that have limited or no telecommunications access through the use of 3G technologies, which will help contribute to long-term socio-economic development. Under the scope of this alliance, NASSCOM and QUALCOMM will provide connectivity and content to Village Resource Centres in the states of West Bengal; Orissa; Maharashtra; Andhra Pradesh; Karnataka; Tamil Nadu; Goa; Gujarat; and Kerala. QUALCOMM, as NASSCOM's

technology supporter, will provide Internet connectivity through CDMA2000 fixed wireless terminals to the Centres.

QUALCOMM's Wireless Reach™ initiative has partnered with wireless operator MTN to provide 3G high-speed Internet connectivity to entrepreneur-run centers in the township of Alexandra, north of Johannesburg, South Africa. This township is an under-serviced area which lacks affordable fixedline connections. QUALCOMM donated HSDPA data cards and laptops to this MTN-led pilot project, called MTN@ccess, providing Internet connectivity using the latest 3G standard, HSDPA, to payphone shops in Alexandra, South Africa.

The primary MTN@ccess initiative is to provide opportunities within communities for education, enterprise, economic empowerment, governance, Internet connectivity, and business development through connectivity to data and business tools such as the Internet, email, payphones and fax services. These pay phone shops are the world's first Internet cafes to use HSDPA.With MTN's HSDPA technology, which currently provides data rates of up to 1.8 megabits per second, users connect to the Internet via a specially designed MTN portal. This portal features direct links to recruitment services, email services, universities, government departments and many more useful web sites.

The Biamba Marie Mutombo Hospital and Research Center is the first hospital built in the Congo in nearly 40 years and an integral part of achieving the goals of the Dikembe Mutombo Foundation. QUALCOMM has made a commitment to provide a cash donation, 3G devices and medical software to this hospital and research center located in Kinshasa. 3G will allow doctors to have instant access to patient information, such as X-rays and CAT scans, and enable doctors to be notified immediately in case of an emergency. In addition, 3G offers the ability to diagnose patients remotely and instantly through electronic access to patient information.

On 13 Nov 2006 QUALCOMM Incorporated (Nasdaq: QCOM), announced an expansion to its QUALCOMM Single Chip™ (QSC™) family to include support for UMTS. This is the world's first solution to integrate a monolithic die - with integrated radio transceiver, baseband modem and multimedia processor - together with power management functionality into a single chip for WCDMA (UMTS) and HSDPA handsets. The cost and time-to-market advantages of the single-chip solutions will help drive wireless broadband and 3G adoption in mass markets around the world.

SEWA [7], founded in 1972 in Gujarat (India), is an organization for poor self-employed women workers. With 700000 members (includes 530000 women members) its goal is every family gets full employment. Almost 70% of these women are illiterate. The other objectives include capacity building, collaborating with government rural programme, increasing bargaining power of women, make women self-reliant and providing food and social security.

It has technology information centers based on satellite-based communication networks and distance learning classrooms. It's various IT- programs and rural Community Learning Centers presents poor self-employed women with ways to improve lives and apply those experiences in business related to village enterprises. "Anasooya" (means without hatred) is a fortnightly e-newsletter from SEWA which

includes articles on dowry, working women problems, problems of children and their rights and on child labour.

SEWA Trade Facilitation Centre (STFC) uses innovative ways to empower women through traditional skills. The STFC, promoted by the Kutch Craft, The Banaskantha DWCRA Mahila SEWA Association has a planned turnover of USD 27,000 million. The 15000 women artisans are the shareholders/owners and suppliers of hand embriodred products. The types of work done by women include patch-work, jat, suf, tie and dye, mutava and mochi embroidery.

STFC has ensured a wage of Rs. 1500 (1USD = Rs. 46) to each artisan. STFC goals include capacity building of artisans, product development and increased access to local, regional and global markets. In fact most of the Indian homes in urban and rural areas have bags, cushion covers, bedspreads or wall hangings made by SEWA women. SEWA uses a website to market its products in global market.

Video SEWA had head-loaders and vegetable vendors who were given video equipment training to produce informative programmes on self-employed women's existence and contribution to society. These video tapes have reached policy makers in Washington and Delhi and the slum dwellers in Gujarat. SEWA has recognized the need for communication amongst groups of self employed women on issues like health, legal, existing government and non-government programmes and policies. SEWA Academy's trainers provide income-generating training on salt farming, crafts and diary farming. It also facilitates Advanced Leadership (Kadam) Training and research training and healthcare training

N-Logue Communications (P) Ltd. (India) [8] has used a franchise based business model to provide connectivity to rural people in India. This project has benefited both rural men and women in remote villages. With n-Logue and a Local Service Provider and Information Kiosk Operator, it has essentially provided rural internet cafes and pay phone booths in rural villages. N-Logue a pilot project (better known as SARI (Sustainable Access to Rural India) started in 2001, with an aim to provide communication services at low cost. The n-Logue uses Wireless Local Loop (WLL) to provide voice and data. This is a CorDect Technology (based on European Telecommunication Standards Institute Dect air interface) that uses radio frequency instead of wires.

CorDect provides voice, voice band FAX/DATA transfer and internet connectivity at 35-70 kbps to 1gbps when digitized. CorDect air interface can support to a maximum of 25kms of line-of sight connectivity. The internet connectivity is provided at a per-line access cost of Rs. 8000.Services offered by village information kiosk provided by N-Logue include giving online agricultural query, providing marketing prices, giving computer education and training, astrology, e-governance, online appointment with doctor, online registration for eye checkups and operation, movie shows for villagers, DTP work and to provide cartoon shows for village kiosks.

Vodacom [9] is a market leader in cellular communications providing GSM service to 21.5 million customers in Pan-African countries (South Africa, DRC, Tanzania, Mozambique and Lesotho). It launched its first 3G network in South Africa in 2004 and 3G HSDPA (offers internet connectivity at 1.8 Mbps) network in March 2006.The

post-apartheid government under the President Nelson Mandela revised terms of license to provide under-serviced areas with cellular communications at low cost. With its unique community services and other activities Vodacom has served over 8 million subscribers and 4300 employees in urban and rural areas.

Vodacom Community Services phone franchise concept provides services in under-serviced, disadvantaged community. At a very low cost the prospective owner can start a franchise to operate multiple cellular lines in a pre-approved location. Most owners only operate one or two shops located in shipping containers. The consumer can make a phone call for 90 cents per minute. Although phone shops cannot receive calls due to the logistics of calculating pre-payments, individuals use it to pay bills, to call doctor, seek medical advice, to report service (electricity and water) outages, empowerment of women in townships by increasing the number of individuals who use cell phones and rely on phone shops to conduct business.

Another initiative in South Africa, UmNyango Project [10] has enabled rural women to report incidences of violence against women and children by using text messaging. This ongoing project will also allow women to produce their own radio programmes and allow them to distribute it via community radio. The other option is to distribute over the net as 'podcasts'. UmNyano project was established by Fahamu, an organization that supports the struggle of human rights and social justice in Africa. Fahamu publishes its prize-winning e-newsletter Pambazuka News (Pambazuka means arise or awaken in Kiswahili).

It is a tool for progressive social change in Africa. Its website www.pambazuka.org is updated every Thursday and consists of the latest news, commentary and analysis relevant to human rights and social justice organizations in Africa. Fahamu South Africa is one of the 10 winners of the Gender and Agriculture in the Information Society (GenARDIS) 2005 Award.

GrameenPhone [11] is a phone programme of Bangladesh's largest non-governmental organization, Grameen Bank. Low cost loans are only given to women to set up mobile phone exchanges in villages. Grameenphone ladies have set up these exchanges in locations where there are very few landines. It allows villagers to talk to their relatives abroad and provide vital link to hospitals.

GrameenPhone(GP) is a successful phone programme that introduces mobile technology to the rural women. Villagers flock to make calls at these exchanges and calls are charged per minute. It has helped rural women to alleviate poverty by earning US$1000 a year. GP's HealthLine service won the GSM Association's Global Mobile Award for Best use of Mobile for Social and Economic development. It is an interactive teleconference between the GP caller and a local physician. Health related information and medical advice are exchanged through out the day.

PEOPlink [12] is a non-profit organization that provides training and help to artisans to market their handmade items over the Internet. It equips grassroots artisan organizations and its talented producers in 22 developing countries to market their products online.

"CatGen.com" is a PEOPLink initiative that allows artisans and small and medium enterprises to use digital cameras and internet to market their products and showcase

the services. Internet has enabled artisans mostly women to raise their sales, earning USD1-2 per day. The UNDP report "indicated that since 2004, 6756 artisans-jobs have been created through the use of CatGen in Nepal out of which 74% are women"[12]. Nepal's artisan's are currently marketing and selling their products online. Other countries using PEOPLink are Bangladesh, Kenya and other Asian and African countries.

Based on the various ICT initiatives discussed in this paper, for rural women in developing countries, the authors have derived Table 3. It gives insight on various opportunities that mobile technology and internet provide for successful empowerment of rural women.

The community projects discussed here shows that rural women may use mobile phone to increase local ties and for networking. Mobile phones would give them an opportunity to share their views and increase physical security. Sharing mobile phones with other community members helps to create a bond amongst rural women.

Table 3: Comparison of internet and mobile phones opportunities for rural women

General Opportunities for rural women	Internet	Mobile phone	Opportunities to improve social and community skills
Set reminder	*	x	
Appointment management	*	x	
Calendaring and scheduling	*	x	
Receive alerts	*	x	
Electronic document delivery	x	*	
Make long distance calls or local calls	*	x	
SMS and MMS (Multimedia message service)	*	x	
Spreadsheets	x	x	
Web content generation and surfing the net	x	*	
Access weather report or any agricultural information	x	x	
Exchange Email	x	x	
News update	x	x	
Provide ICT training	x	x	
Telemedicine	x	x	
For small business development	x	x	
Marketing products	x	x	
Web, video and audio conferencing	x	x	
Data Entry	x	x	
Instant messaging	x	x	

Table 3 (continued): Comparison of internet and mobile phones opportunities for rural women

General Opportunities for rural women	Internet	Mobile phone	Opportunities to improve social and community skills
Web discussions	x	*	
To exchange multimedia and graphics	x	x	
To report violence against women	x	x	
MP3 player	x	x	
Presentation applications	x	x	
Advertising products	x	x	
	x	x	Access community radio
	x	x	Improve participatory learning and communication
	x	x	Market Rural sports events
	*	x	Improve community bonds
	*	x	Increase physical security
	*	x	Improve speaker's confidence
	x	x	Rural appraisal
	x	*	Improve community trading

A '' in column "internet" and "x" in column "mobile phone" denotes with current technology limitations, rural women could use internet for the specific purpose only to a certain extent.. The "x" in both columns - "internet" and "mobile phone", denotes it is possible to use both internet and mobile phone for the given purpose.*

Table 3 further illustrates the possible social skills that rural women can improve by means of mobile phones and internet. 3G camera phones and internet will enable rural women to share and show pictures, access internet and exchange mails. Research has indicated how project team members in South Africa "successfully tested the use of SMS technology for rural women farmers in KwaZulu Natal to access agricultural extension information" [10]. Electronic communication via internet or mobile phones allows rural women to share their problems and enhance relationship with other community members. Mobile phones have helped them to be anonymous while reporting violence against women.

Rural population is scattered in wide geographical locations. So mobile phones would help their family to maintain contact with them while away at work in farms or while fetching water. Apart from providing physical security mobile technology has helped to improve rural women's confidence while speaking. Apart from this it allows them to conduct business more efficiently even with their international counterparts.

Telemedicine is the transmission of health related information. Infant mortality is relatively high in rural areas. This could be reduced by further knowledge on child bearing and health assistance during delivery. Telemedicine provides rural women support sessions that provide assistance to detect breast cancer, psychiatry assessment and treatment, to treat skin diseases etc.

For the successful empowerment of rural women using ICTs one needs to take into account how the ICT services are marketed amongst the women community, what kind of training is provided to rural women, affordability of services offered, competitiveness, relevance to rural women and service availability.

4. Critical factors for successful empowerment of rural women through internet and mobile phones

Critical analyses of various community projects discussed in this paper gives further insight on factors motivating and de-motivating rural women to use internet and mobile phones and possible solutions. These factors are explained below.

Marketing practices to promote ICT awareness: Good marketing practices are crucial for the growth of any business and to make ICT services popular amongst rural women. Product promotions and remuneration for using services are required to make women aware of services and benefits of ICTs. For example N-logue gives a gift for the winner of the lucky draw involving rural people who used their village information kiosk for a fixed duration. Other forms of advertising by N-logue include conducting autoshows about the kiosks in the village, door to door campaign, providing T-shirts to students with Chirag (N-logue's logo).

Training: It is very important to train the trainers. The trainer (women prefer women trainers) for an internet kiosk or community center must be trained so that they can provide further assistance. SEWA has its unique Training of Trainers (ToT) programmes that train the women trainers on practical experiences on role of trainers and in leading and training work groups. Another example is how company trainers from Vodacom travel nation wide and provide business, financial and HR training to the people who own phone shops.

Choupal: The concept of a community gathering (choupal) is very significant for any rural community's socio-economic development. GrameenPhone has reached the rural women community through the local champion in the community who encourages and influences other members (during choupal) of the community to access ICT.

Relevance to the community: Any ICT initiative provided by government or NGOs should focus on empowerment of community and target group (women) in particular. Installation of phone shops by Vodacom, Women'sNet Digital Story Telling Workshop, SEWA'S salt training and embroidery training and marketing craft products online – all these were successful due to the fact that they targeted on how relevant the ICT services provided benefited the community.

Use of global language for content generation: Language would not be a barrier while using internet for surfing, to a certain extent. Although English is one of the medium for on-line communication (especially via net), when it comes to training how to use the web-site, the trainers often communicate in local language. In most cases only the trainer would know this global language used for international communication. One needs to note how rural women were able to overcome the language barrier and use internet for surfing on artisan information and marketing products via PEOPLink website. Nowadays the web content is also generated in local languages for effective use of web portal by rural community. The manufacturers of mobile phones have included facilities to access contents in local languages. The other option would be 'local language to English' translation software. This would cater for communication via a global language and international trading. Anusaraka (www.iiit.net/anu/anu_home.html) is a machine translation project that allows users to translate web resources between various Indian languages and also access English language resources.

Low cost ICT: ICTs provided to rural women should be of low cost. Affordability is an issue when it comes to accessing internet and telephony. Most of the organizations discussed here have gone the low cost route. Lessons from Women'sNet's technology planning programmes shows how women's organizations make use of FOSS and hence provide low cost training. Linux is free and open source software and is the popular one used amongst women's organizations in South Africa for training. With the help of SANGONet, about 50 South African NGOs signed a petition to Minister for Public Service and Administration to encourage government to proactively drive change toward adoption of an open source policy. FOSS is free and open and if used, makes it is easy to create a local support capacity. N-logue used low investment low cost technology to cover communication needs of rural people.

Encouraging competitive market: The ease to which the business enters and exits the rural community should be taken into account. MTN another cell phone provider in South Africa has its yellow shipping containers with phone shops as close as possible to Vodacom's green shipping containers. Both cell phone providers target on the same under-serviced community and provide the same facility in phone shops. Women's organizations should help in buying and selling some of the products made by rural women and give a higher price based on quality.

Written Communication: SEWA's Anasooya, Vodacom's Ringer, SANGONet's NGO-Pulse and Women'sNet's Intersections e-newsletter all share experiences of the way rural women and women's organizations empower themselves by accessing ICTs. These newsletters are periodicals which provides useful information for other women and women's organisations to learn how to empower themselves using ICTs.

Connectivity: Internet connectivity should be provided in village information kiosk or a community center, for rural women to communicate with the world. Research shows all the organizations discussed here have a web portal and most of them have e-newletter. N-Logue's WLL systems are running across rural using radio link installations India operating on the 802.11 wireless protocol. SEWA has all its embroidered products online to compete with the global market. Women'sNet has

conducted its Digital Story Telling Workshop to help women to talk about their survival strategies, gender discrimination, poverty, violence, HIV/AIDS illness.

Creativity: Video and still photography would be a creative medium to allow women to be vocal about their issues. Creativity is necessary for any form of communication. Note how SEWA members used video cameras to show their protest to municipal Commissioner for not allowing the use of market places for selling vegetables. This tape was a turning point for constructive negotiations. Another initiative is Women's Voices Kenya (Practical Action project) that used video camera to show unrest in settlements, HIV Aids issues etc.

Service availability and reliability: When the services are unavailable for a long time women may loose interest in ICT adoption. It is important to keep track of frequency of usage of the service provided for rural women. For example women would not want to waste their time trying to get connected. Although, at this stage it is something to dream about for under-serviced communities in most developing countries, mobile phones with HSDPA data cards (offers internet connectivity at 1.8 Mbps) would be an advantage to rural connectivity in near future. QUALCOMM Inc.'s Wireless Reach initiative discussed in this paper shows how it partnered with MTN to provide 3G high-speed internet connectivity to pay-phone shops in Alexandra (an under-serviced township in South Africa).

Human Computer Interaction: The physical user interfaces for outputting and inputting information using a mobile phone should be taken into consideration when designing interfaces for mobile phones. These graphical user interfaces should vary for urban and their rural counterparts, depending on their needs, interest and cultural values. Nowadays mobile phone companies pay more attention on the design of the hardware than the physical user interfaces for targeted group. The internet should be a tool for assisting rural women to communicate with their international counterparts and the interfaces created should cater for hand gestures and facial expressions.

Participatory technical development: Experts and researchers should brief local people about the specific technology to be developed for rural women. Rural women's participation in research and technical development is crucial for their empowerment and would take their needs into consideration. Participatory learning and action research allow mutual learning between rural people and researcher. It would also cater to decentralize and transfer the decision making power to rural women.

Documenting rural women's achievements while using ICT: We need to document the wonderful stories on how rural women use innovative ways for empowerment using ICTs despite all odds. For example not many people are aware that rural women use SMS technology to report violence against them, or to market their small business. Apart from creating avenues for sharing own experiences, these reports and documentation would make other rural women in community aware, how powerful internet and mobile phones are for their empowerment.

4.1 Bottlenecks, factors de-motivating rural women to use ICTs and solutions

Electronic communication via SMS or internet and e-mail often lack the aspect of face-to-face communication. This is one of important bottlenecks while introducing rural women to mobile technology. Rural women are so used to face-to-face conversations in community gatherings. To an extent video-conferencing would allow such conversations with other community members.

Electronic relationships hinder people's ability to show their emotions. Somehow rural women tend to be more emotional and loud than their urban counterparts. The use of mobile phones inhibits rural women to show emotions more freely. To an extent being anonymous would help rural women to report violence or incidents of unrest in settlements. Another important threat of electronic communication is deception, especially while exchanging ideas over the net.

Another de-motivating factor that hinders use of mobile phones is the prevalent health threats related to its usage. The use of mobile phones will expose the person using it to heat generated when radio frequency (RF) energy is absorbed into the body. Studies are underway to find whether exposure to such low RF fields will cause diseases. The "speaker phone" option allows people to hold handset a little away from body, and thus reducing the RF exposure to a bare minimum.

Prolonged use of computers and mobile phones may affect sleeping patterns, and reaction times. Using mobile phones while driving may cause accidents. This can be avoided by using hands-free device. The prolonged use of computers may cause backache and headache. Proximity to medical devices while using mobile phones may cause electromagnetic interference as well.

African women have the lowest participation rates in use of Information and communication technologies. Some of the challenges faced by rural women in ICT adoption are:

- Lack of internet access other than through local institutions, governments and some health centers or even churches.
- Lack of effective dissemination medium (street theatre / radio) which demonstrates full potential of internet and mobile phones.
- Not focusing on the sectors in which ICTs will be of most use to women.
- Language barrier (not always)
- Geographical location of the internet kiosk
- Social and cultural norms
- Lack of access to resources like computer
- Lack of education and computer literacy among rural women
- Lack of telecenters in some local communities
- Lack of interest in technology adoption
- Lack of participation in meetings or themes which focus on ICT for development

As James mentions about the information on internet there is very little that "*..rural people in developing countries can understand and use*" [13]. If the gendered digital

divide is to be closed the countervailing ICT policies should incorporate ICT services at low cost and take into account the needs of rural women.

Robert Chambers amongst others has criticized that the knowledge of rural poor often is quite advanced and innovative, more so than most professionals would think [14]. So the ICT projects or initiatives in developing world should take into account the needs and the knowledge of rural men and women. Women targeted programs to create ICT awareness will give females full realization of the opportunities ICT can present for women. There is a need to integrate ICTs' into girls' education and expose them to new technologies, as women are less confident in their skills.

Some of the projects done by SEWA and Women'sNet have become role models in providing ICT training to meet the needs of rural women.There should be a provision to create and encourage business friendly environment for women while using technologies. The rural women should be given local training in ICT skills through women's organizations which reduces high cost of expatriate skills. Internet access should be affordable to rural women.

5. Conclusion

Information and communication technology is highly fragmented and difficult to access especially for rural women. The purpose of this paper is to attract attention of NGO's, policy makers and researchers to categorize the priority areas for gender equity and to find the success factors influencing use of internet and mobile phones by rural women for empowerment.

In future affordable wireless service will reach under-serviced market and the rural women in these areas will use mobile solutions for broadband connectivity.

Research has found a technical mix of telecommunications systems will benefit rural women for empowerment. Community projects described in this paper gives a clear indication of how rural women were able to overcome language barrier, lack of mobility, social and cultural norms and used internet and mobile phones for empowerment. It was clear that if NGO's and women's organizations used a low-cost innovative ICT it would motivate women to use it. A lack of interest in ICT adoption and location of internet kiosks sometimes de-motivated them to use internet.

A full understanding of gendered digital divide requires more qualitative and participatory action research. There is a scope for future research on participatory learning and technical development and find out innovative ways of rural women appraisal. Rural women's participation in research and development is very important to develop any ICT that they might use. They play an important role in producing much of the subsistence food crops. ICTs play an important role in food production and natural resource management. There is scope for future research on how rural women use mobile technology and internet for accessing agricultural information.

The deployment of Information and Communication Technologies (ICTs) in developing countries has become a key strategy of the international development community to support poverty reduction strategies [15].The ICT awareness and ICT

project handling skills of rural women in developing countries - one of the factors affecting gender equity need to be monitored. There is a need to monitor and evaluate ICT policies for women in the least developed countries.

6. Acknowledgements

7. References

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