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Rural Development through Village Knowledge Centers in India

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ABSTRACT

Information and Communications technologies (ICTs) have played a major role in the development of societies. For the past several years, India has experimented with extending the reach of ICTs to rural areas with a view to bringing development to these areas. Several projects are currently underway. This paper examines the implementation of Village knowledge Centers in rural Southern India. We first describe the developmental disparity that exists between urban and rural areas in India, and justify the implementation of rural projects that extend ICTs to rural areas. We examine prior work, and then describe in detail the Village knowledge Center Project, conceived, developed and implemented by the M. S. Swaminathan Research Foundation (MSSRF), a Non-Governmental Organization (NGO) located in Chennai, India. We describe our field visits and observations, and conclude with an analysis of the role and benefits of such projects, unresolved questions and issues, and possible directions for future work in this area.

INTRODUCTION: TALE OF TWO INDIAS

Urban India

India is currently a U.S. $1 trillion economy (The Economist, 2008a). It is one of the few countries experiencing economic growth despite the current global economic downturn. From 2003 to 2008, India's GDP has registered a 9% average annual growth (The Economist, 2008b). While the growth rate is expected to diminish to 6% - 7% during 2008-2009, many analysts predict that India's growth is likely to continue into the future with an average annual rate of 6.3% from 2008 to 2030. Much of India's growth has been led by the service and manufacturing sectors, which is expected to grow at 10.7% and 9.4% growth, respectively in 2008-2009 according to India's Finance Minister, P. Chidambaram, as stated in his 2008-2009 union budget address (Chidambaram, 2008). The contribution of various sectors to the GDP is as follows: services 60%, manufacturing about 22% and agriculture about 18%. The services sector is dominated by IT and IT-enabled services industries.

India's IT sector has contributed heavily to the India Growth Story. The IT industry employs nearly 2 million people, according to Nasscom, India's software industry trade association (Nasscom, 2008). According to a Nasscom-McKinsey Report (McKinsey, 2005), the IT-ITeS sector is estimated to have helped create an additional 3 million job opportunities through indirect and induced employment in telecommunications, power, construction, facility

management, transportation, catering and other services. Nasscom's "Indian IT industry fact sheet" predicts that the Indian IT-BPO industry will grow by 33% and reach U.S. $ 64 billion in FY 2008 (Nasscom, 2008). Of this, IT exports are expected to cross U.S. $ 40.8 billion in FY 2008, an increase of 28 percent over FY 2007. In fact, every sub-sector of India's IT industry has experienced accelerated growth rates since 2004, as attested by the graph in Figure 1. The variety and share of IT service offerings are provided in Figure 2. Analysts and researchers have attributed India's IT-sector growth to factors such as the availability of a vast, well educated, English-speaking IT workforce, cost advantage, globalization and opening-up of the Indian economy starting from 1984 onwards. The economic liberalization policies set in motion in 1984 have enabled the gradual increase in foreign direct investments (FDIs), brought new technology, and have facilitated IT services at lower costs to Indian consumers. Entry of the private sector in key areas such as telecommunications, coupled with private and public sector investments have enabled development of critical IT infrastructure. Today, the results of more than ten years of sustained growth are becoming visible. Indian cities are bustling with commerce, and middle-class Indians are experiencing rise in wages in all sectors. The wage increases have generally occurred in urban areas, especially in the IT and services industries. With rapid income growth, the vast Indian middle class (numbering approximately 400 million) is becoming one of the fastest, and largest growing consumer societies and marketplaces coveted by much of the developed world's marketers. Indian cities are experiencing a construction boom with new western-style skyscrapers, shopping malls, entertainment complexes and upscale restaurants – all thronging with eager shoppers and patrons. The mobile telephone is ubiquitous even among the lowest of wage earners. In fact, as Edward Luce points out, there is an air of optimism and confidence in today's India which did not exist even a decade ago (Luce, 2007).

Figure 1: Sector-wise breakup of IT industry.

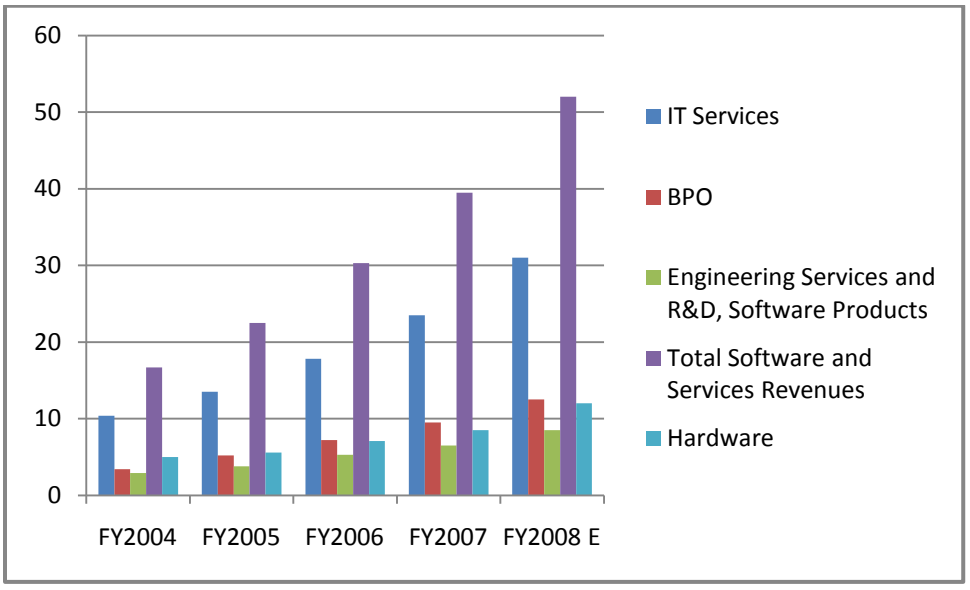
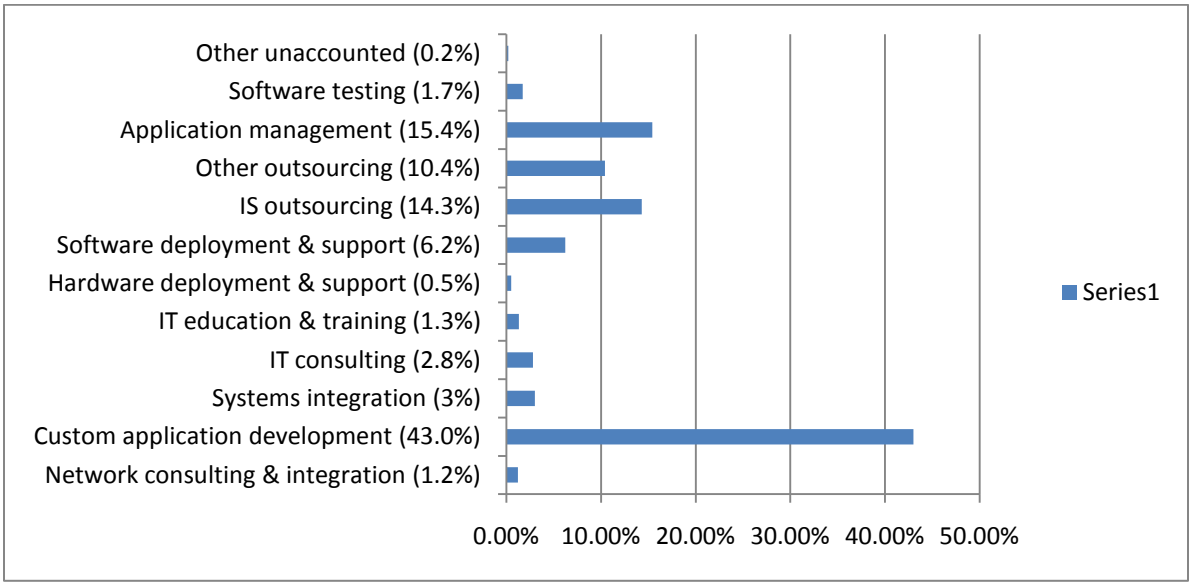


Figure 2: Spread of ITeS service offerings (adapted from Nasscom, 2008).



Rural India

Yet, despite these developments, India still lags far behind in the sphere of human development. India's population, which is around 1.2 billion, is expected to surpass China's by the year 2030. The 2007-2008 Human Development Report published by the United Nations Development Program (UNDP) gives India a Human Development Index (HDI) score of 0.619, which places it in the 128th position among 177 countries. The adult literacy rate of India in 2005 (as reported in HDR 2007-2008) was 61%, behind countries like Namibia, Morocco and Equatorial Guinea. It is clear that the physical and social infrastructure required for enabling a higher quality of living and development has not kept pace with the country's economic growth. While cities and urban areas have benefited from the economic growth, vast tracts of rural India are still largely underdeveloped and untouched by technology developments in urban areas. More than 700 million Indians live in rural areas and far-flung villages that do not yet have basic services such as electricity, sanitation and water, much less knowledge-enhancing technologies such as telecommunication services. According to a new World Bank calculation (which puts any person earning less than U.S. $ 1.26 per day as living in poverty), approximately 456 million people in India lived below the poverty line by the end of 2005. [It should be noted here that the Indian Planning Commission computes poverty level at U.S. $ 1.02, which reduces World Bank's poverty figures by about 200 million] (Rao & Shukla, 2008). The importance of the access to knowledge as a measure of human development has been clearly stated by many development experts. The UNDP's Human Development Report (2006) lists three essential elements for human development: long and healthy life, knowledge, and a decent standard of living (UNDP, 2006). The term "knowledge economy" is increasingly being used in discussions and planning related to development. A knowledge economy "creates, disseminates and uses knowledge to enhance its growth and development (Dahlman & Utz, 2005)". Enhancing the knowledge economy involves developing educated and skilled workers, creating an efficient innovation system, and building a dynamic information infrastructure (Dahlman & Utz, 2005 p. xvii). Thus,

for the fruits of India's economic growth to truly reach a majority of its people, access to knowledge is critical.

Indeed, India's low HDI rating has led many intelligentsia in India to publicly express concern that the much trumpeted growth story of the past 17 years has not permeated to much of Indian society, a majority of which (approximately two-thirds of the population) lives in rural areas untouched by developments in urban areas. In fact, approximately 70% of the entire Indian workforce is engaged in some form of agricultural endeavor, far removed from the development and technologies that are visible in urban India. Many in India have argued in recent times that unless technology developments that have enriched urban India are made accessible to those in rural India, wide disparities in income and quality of life would escalate, making the current growth unsustainable, which would at worst, result in unrest and chaos.

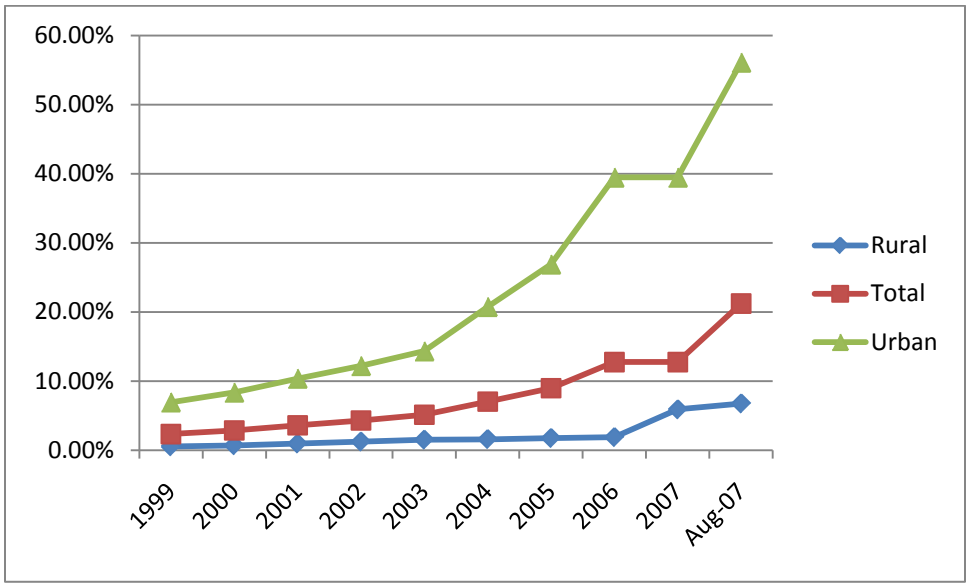
Causes for the disparity

Many reasons could be given explain the lack of knowledge-enhancing technologies in rural India. One important reason is the prohibitive cost of connecting India's vast rural areas with telecommunications. The country is vast, with geographical characteristics that range from tropical forests to alpine mountains, from deserts to flood plains. Several parts of the country are not easily accessible even now due to lack of roads. The enormous cost of developing infrastructure in rural India, coupled with the rural populace's low level of economic development, which severely undercut such a population's ability to pay for telecommunications service. As suggested by Souter (Souter, 1999), the economic development of rural areas depends on telecommunication infrastructure and related services. But such infrastructure and services cannot occur unless the rural population has enough disposable income to purchase telecom services. As noted by Jain and Sridhar (Jain & Sridhar, 2003), the level of investment required for rural telecommunications development cannot be practically borne by just a government-run monopoly – infusion of capital from the private sector is very important. However, that was not possible under the Indian regulatory conditions.

A second reason is the non-availability of appropriate, cost-effective technologies that work in remote rural areas. The Government of India (GOI) has long been interested in rural development, and has actively tried to influence and engineer rural development through technology policy ever since India gained independence in 1947. However, until the last two decades of the twentieth century, those efforts have been stymied by ineffective economic policies, poor implementation and corruption at various levels of the government. The socialist model adopted by the government emphasized central planning. Self-sufficiency was the "mantra." Large public-sector companies were created, that were monopolies with little incentive to innovate and adopt new technologies. New technologies, especially those emanating from abroad, were strictly controlled through very restrictive licensing systems that dissuaded the private sector from entering areas such as telecommunications. In fact, telecommunications was not considered critical for development. As stated by Bella Mody (Mody, 1995), unlike other industry sectors deemed critical for national development and security (i.e. energy, manufacturing, nuclear technology, etc.), telecommunications did not have any champions. Research and development in the govern-run telecommunications sector was non-existent. The connection between development, access to knowledge and telecommunications started

becoming apparent to the Indian government only in the early 1980s. As can be seen from Figure 3 below, in the year 2000, India's rural teledensity (number of telephone lines per 100 people) was only 0.68 (Subramanian, 2008).

Figure 3: Rural and urban teledensity chart (adapted from Kaushal, 2007).



A third, and perhaps most important reason for the continuing disparity pertains to the social and cultural milieu that is more apparent in rural India, and less so in urban India. Many researchers have recognized this as the most critical reason for the urban-rural disparity in access to technology and enhanced human development. India has been for long a class-based society, where class was strictly determined by which caste one was born into. While the caste system has been legally abolished in 1950 by the Constitution of India, it still persists in rural India. Often, people belonging to one caste are not welcome in establishments run by another caste, which causes serious impediments to the notion of equal access to education, technology and knowledge, among other things. Many researchers have studied the effects and consequences of the social and cultural milieu in India (as well as other countries). Some of these studies are listed in the Section "Prior work" later in the paper.

ICT FOR DEVELOPMENT: POLICIES AND PRJECTS TAKE ROOT

Since 1984, developmental efforts have gained much stronger focus, coinciding with the gradual liberalization of India's economy coupled with the above-mentioned growth of India's IT sector. Today there is increasing emphasis on narrowing the "digital divide" by bringing IT developments, especially telecommunications and the Internet to rural areas. Telecommunications technology is considered to be a vehicle to bring economic development to rural India, which in turn would enable further telecommunications use and development. Currently the issue of rural telecommunications is being addressed at several levels: The governmental level, non-governmental level (NGOs), private-enterprise level and the scientific/research level (at academic and research institutions). New telecommunications

policies that more clearly reflect the new economic, political and technological realities that have emerged in the last decade of the twentieth century were announced in 1994 as the "National Telecom Policy," and revised in 1999. One of the objectives of the new National Telecom Policy (1999) was the provision of universal service to all uncovered areas, including rural areas (Subramanian, 2008).

Several local NGOs have since undertaken rural networking projects with the help of international aid agencies. New policies have opened up the telecommunications arena to private enterprises, and this has led to the development of greater telecommunications infrastructure in the country. At the end of 2007, India's rural teledensity stood at 7 (Kaushal, 2007).

Several "access to knowledge" projects are currently underway in rural India. The projects are varied in nature. Some are sponsored by governmental agencies, while others are run by NGOs. Some of them focus on the technological aspects, i.e. improvements to telecommunications and Internet technologies to bring information technology to rural India, whereas others focus on the accessibility and informational aspects (i.e. form and content). The projects also use different approaches or models, with some focusing on sustainability through social entrepreneurship, and others focusing purely on community development through information dissemination, without specific business models. Many of these projects have been studied, or are currently being studied by researchers. However, as noted in *The Economist* (2005), it is often very difficult to study the real usefulness of these projects. In fact, there seems to be no effective data collection methodology to study the efficacy of these projects. In such a situation, it would be best, as suggested by the Economist article, to simply ask the villagers themselves on how useful they see these attempts to be (The Economist, 2005) – i.e. a qualitative approach.

METHODOLOGY

This was a combination of a qualitative study and one based on a survey of prior work in the area. We conducted a literature review, and analyzed the advances and adaptations that have been made to wireless Internetworking technology in the Indian context. We identified key scientists in research centers in India, especially in Tamil Nadu, who are currently involved in various rural connectivity projects. We interviewed them in India with a view to learning more about the pilot projects and implementation details. We also visited many of the rural areas where Internetworking projects are underway, and qualitatively studied the nature and uses of the applications, along with some specific economical and social indicators that can be correlated to the use of Internetworking technology. This was done using a combination of long interviews and published data. We conducted long interviews of rural women in order to learn and understand more about their views of democratization, as well as their views on the emerging role of rural women in commerce, entrepreneurship and technology. (A "long interview" is "a sharply focused, rapid, highly intensive interview process that seeks to diminish the indeterminacy and redundancy that attends more unstructured research processes. The long interview calls for special kinds of preparation and structure, including the use of an open-ended questionnaire, so that the investigator can maximize the value of the time spent with the respondent (McCracken, 1998)." According to McCracken, the long interview process enables the researcher to delve deep into the mind of the subject and learn more about the world as it is

perceived by the subject. This type of data collection method also provides a subject's critical interpretation of an event or development as experienced by him/her.)

PRIOR WORK

A number of studies have been done on the application of ICT in rural areas by government, NGOs, academic, and non-academic institutions. Hollifield and Donnermeyer (2003) studied factors that influenced individual level adoption of new communication technology among the residents of four rural Midwest communities in US. They examined demographic, community, and employment influences on the adoption of Internet technology and use of e-mail. Their study revealed that more than 50 % of the respondents used e-mail and 60% used the World Wide Web. The study also revealed that adoption of new technology was influenced by age, gender, economic and education variables. The study also suggested that demand for information technology would increase if locally owned businesses were encouraged to adopt technology. Finally, the study concluded that policy makers and rural development experts need to recognize the complexity of rural social networks and the advantages of using multiple starting points to encourage the diffusion of new information technology. The findings of Hollifield and Donnermeyer parallel that of Srinivas (2004), who identified factors like language, workload, caste, and geographical location of the people and their correlation to technology adoption and use in rural India. Cecchini and Scott (2003) described various issues with ICT projects in rural India, such as the cost of information infrastructure, inadequate or absent connectivity, unstable power supply, role of small entrepreneurs in sustainability of ICT in rural areas, accessibility of ICT by rural women and poor and disparities between gender, and caste of the ICT operators and trainers.

A case study undertaken by Gurumurthy, Singh, and Kasinathan (2005) concerning TeNeT[i], n–Logue[ii] and DHAN Foundation (an NGO focused on rural development in south India, located in the city of Madurai) explored the appropriate ownership models for rural pro-poor ICT initiatives in the Melur area near Madurai in Tamilnadu. They felt that the community based model, which focused on providing community service through ICT is more effective in the rural areas than other business models (such as the social entrepreneurship model promoted by TeNeT.)

T.T. Sreekumar in his study of the Gyandoot ICT project (Dhar district of Madhya Pradesh) and TARAhaat kiosks project (Madhya Pradesh) highlighted the role of gender in rural ICT projects. He states: "In the Indian context, the analysis of the patterns of inclusion in rural cyber kiosks shows that non-participation, particularly by women, is an important drawback in ICT-based projects. Contrary to popular belief, these social enterprises are not inclusive enough, and the social factors that perpetuate inequalities in rural areas are in fact reinforced by the projects rather than eliminated. The participation of women and the underprivileged in these projects is abysmally low and this is strikingly in contrast to the projected image of these initiatives as being overtly sensitive to issues of gender and social divisions" (Sreekumar, 2007). The TARAhaat established kiosks were found to be overly dependent on the support of the local elite class. These elite people controlled the social milieu in the domain of activities often offered by the kiosk. Sreekumar suggests that in order for the tele-centers to function in this environment they have to invariably accept the traditional social divides including the gender divide instead of striving to transform them.

The literature reveals certain recurring themes, such as the influence of social liabilities such as class, caste, economic background, education, geographic location, etc., *in addition to* the availability and accessibility of the technology itself. Not surprisingly, a sizable volume of the literature pertaining to studies in India emanating from internal project personnel take the view that most of the projects are very successful, which conflict with other externally conducted research results.

Our study seeks to provide an independent perspective. In this study, (which is part of a much larger study of several rural ICT4D projects employing different models) we focus on one such ongoing project at a micro level, focusing on specific individuals in the affected communities. The project we study is the "Village Knowledge Centers" project initiated by the M.S. Swaminathan Research Foundation (MSSRF) – Chennai, India.

In what follows, we discuss the project under the following themes:

1. Brief history, description, and the project's objectives,
2. Implementation of the project (including technologies used for telecommunication, knowledge collection and storage, and knowledge dissemination),
3. The data and evidence collected during field visits, and
4. Our analysis.

MSSRF'S VILLAGE KNOWLEDGE CENTERS

The M.S. Swaminathan Research Foundation (MSSRF) is a non-profit organization founded by the noted Indian Food and Agricultural scientist, Dr. M.S. Swaminathan. The foundation was registered in 1988 to research, advance and promote coastal systems, biotechnology, biodiversity, eco technology, food security and information, education and communication in developing countries, with a specific focus on India. In 1998, the foundation started the "Village Knowledge Centers" project. The idea was to select villages in rural Tamil Nadu and the Union Territory of Pondicherry (both in southern India), and provide adequate telecommunications infrastructure that would enable the dissemination of appropriate information regarding farming, education, health, weather, governmental news, job, loans and aid opportunities. The objectives were to reduce the digital gap and gender divide in rural India using technology – especially telecommunications technology. Each Village Knowledge Center (VKC) would serve one or more villages and would act as the knowledge repository for the villages it served. Pertinent information was stored in databases in these sites, with appropriate technology for easy access and dissemination of this knowledge to persons seeking them. The long term objective was to eventually set up VKCs in each of the approximately 638, 000 villages in India, thus creating a nation-wide rural knowledge repository.

VKC Implementation

The VKC project was started at Villianur, a village in Pondicherry. This location was chosen because of MSSRF's experience and knowledge of the village, which also was the center for its "Bio-village" project. The Bio-village project was started in 1991. Its mission was to provide the above-mentioned services with a specific "pro-poor, pro-women and pro-nature" foci. The VKC

project is purely developmental in nature. The cost of setting up a VKC is Rs. 200,000 (USD 4,500) approximately. This cost is completely borne by MSSRF, which in turn receives aid from international aid agencies such as the International Development Research Center (IRDC), Canada, and Japanese aid agencies for implementing the project.

Typically, MSSRF field officers identify a village to set up a VKC. They identify and train project associates, and create a core group of associates who then canvass the idea of setting up a VKC with village leaders, politicians and land owners. Public meetings are held to "sell" the benefits of VKCs to the villagers. Here, the role of women's "self help groups" is invaluable. Women's self help groups (SHG) were initiated by NGOs in India. The first SHGs were started in 1985 by the Mysore Resettlement and Development Agency (MYRADA), an NGO located in Mysore in the State of Karnataka (Fernandez, 2007).

In 1990 the state government-run Tamil Nadu Women's Development Corporation started implementing an NGO-supported project to empower women in the state. The women's SHGs purport to help socially and economically disadvantaged women by providing them with training, micro-loans and ways to organize in small groups. Each SHG consists of about fifteen women in a village. Women belonging to these SHGs are the first point of contact to MSSRF field officers, and are highly effective in gaining a familiarity and foothold in the villages.

Once the initial contact is made, and the idea of the VKC is "sold," MSSRF sets certain conditions that are required to be met by the village in question:

- The village must provide a room that is open to and accessible by all members of the community. This condition is very important, because as noted earlier, India's villages are still mired in the class and caste system, which inhibits certain castes and classes from using such centers.
- The village must also pay for the cost of electricity and telephone connection to the VKC.

  Once the villagers agree to the idea and the conditions, MSSRF sets up the VKC. A local is identified and selected to be the VKC's volunteer operator. This individual, mostly a woman from the village with at least high school education (even though there have been some exceptions to this rule based on an individual's ability), is then trained by MSSRF on basic computer operations and applications. The volunteer is given training in Windows O/S, MS Office Suite, Adobe PageMaker and Photoshop, Visual Basic, Visual C++, HTML, voice recording, Zip and Unzip utilities and voice and data transmission in a wireless infrastructure. The selected person also receives a small honorarium of Rs. 1200 (approximately $28) per month.

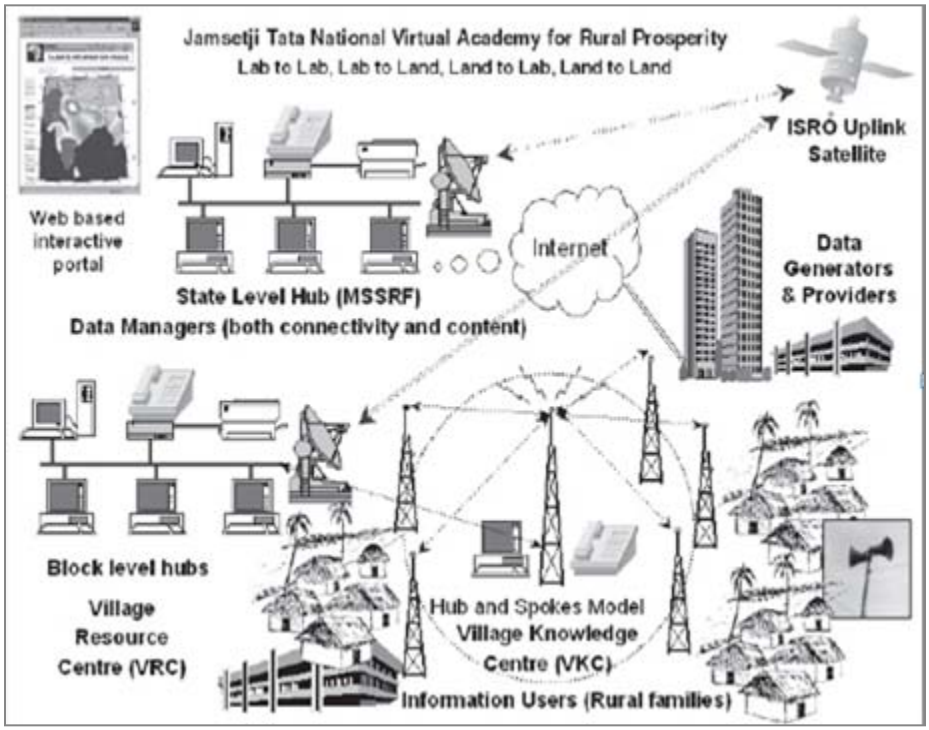
The Hub and Spokes Model

The VKC project uses a Hub and Spokes model. The hub is a "Village Resource Center (VRC)," which is typically connected to 20-30 VKCs spread over a 60Km radius. The VRC is designed to act as a rural library and technology resource center. Each VRC consists of at least three networked computers, one scanner, two web cameras, Internet access, one printer, one digital camera, solar backup facility, and training rooms.

Each VRC is in turn connected to the VKCs (and VKCs to other VKCs) using Motorola very high frequency (VHF) radios for voice and data transmission. However, in actual practice, it was noted that this technology posed restrictions on transmission speeds as well as the size of the files transmitted. As a result, starting in 2001, spread spectrum wireless technology was introduced for VRC-VKC and VKC-VKC communications (Senthilkumaran & Arunachalam, 2002). Each VRC was also connected to other VRCs and the MSSRF headquarters in Chennai through satellite link-ups, in collaboration with the Indian Space Research Organization (ISRO). The ISRO-MSSRF network used one of the Extended C-band transponders of ISRO's satellite INSAT-3A. Users at each VRC and at the headquarters in Chennai could communicate through video and audio links provided by the satellite connection (ISRO, 2004).

As can be seen in Figure 4, the State-level hub at the MSSRF headquarters (top left quadrant of the figure) is connected to the Internet through Internet Service Providers (ISPs), and to the ISRO up-link satellite through a Very Small Aperture Terminal (VSAT) antenna. The Village Resource Centers at various rural locations are also connected to the ISRO satellite through VSAT. Internet connectivity to the various VRCs is achieved through the ISRO-MSSRF network. The VRCs in turn provide network connectivity to the VKCs.

Figure 4: Architecture of MSSRF



Components of a typical VKC

Each VKC has one or more desktop computers, at least one printer, radio communications equipment, a wireless tower antenna mounted on top of the building, and in some cases, a video kiosk. These are maintained by the villagers. According to Senthilkumaran & Arunachalam (2002), the villagers fully understand the importance of the VKC – "Even in times of clashes

between different groups (common in Indian villages), the VKC and its equipment are not damaged."

The videos enable visitors to play and watch video-tutorials on farming, health and other topics. The computers have Microsoft Office, Net Meeting, games, publishing software, databases containing information pertaining to health, education, agriculture, commodity prices, government job vacancies, etc. The information in the databases are updated at regular intervals (sometimes daily) by downloading the updates from the VRC servicing the VKC. Each VKC also has a public address system using which the VKC volunteer is quickly able to disseminate critical and useful information to the homes in the village. In addition, each VRC and VKC has complete training videos and CDs for the "Microsoft Unlimited Potential Program (MUPP). This is a program from Microsoft to "provide nonprofit organizations with funding to support technology training programs ranging from learning basic computer skills to using advanced business productivity applications (Microsoft Corporation, 2008).

Each VKC selects and helps promising youth to undergo various types of computer skills training. The training sessions are held at the appropriate VRC. Additional on-line, video and CD-based training materials and exam practice materials are available for use by the trainees at the local villages through the VKCs.

Operations at the VRC

As noted above, the VRC forms the hub of activities for a cluster of VKCs. Local project staff maintain the systems at the hub. The wireless system and web server administration are taken care of by the Informatics Center of MSSRF in Chennai. The VRC creates and maintains numerous databases pertaining to agriculture, commodity prices, livestock health and welfare, medical data, governmental data, grants and aid availability from various agencies of the government, women's welfare-related data, etc. Each VRC has a fully equipped library containing magazines and other publications in local languages. The VRC also develops and maintains web portals in Tamil, the local language, to disseminate information on the above-mentioned issues. Each VRC also uses DTP tools to publish a Tamil-language newspaper "Namma Oor Saidhi," which translates to "Our town's news." This paper contains news and events of interest to villages served by the VRC. As can be seen, a key aspect of the VRC concerns the creation and updating of relevant content to suit local needs. The VRC plays the role of a "value addition center." The VRC at Villianur (which has subsequently been relocated to Pillayarkuppam) has generated around one hundred data bases to fulfill the specific information needs of the local communities. Most data bases are updated on a daily basis. A considerable amount of information is accessed from local sources. Many of the data bases are in multimedia form for the benefit of illiterate people Senthilkumaran and Arunachalam (2002).

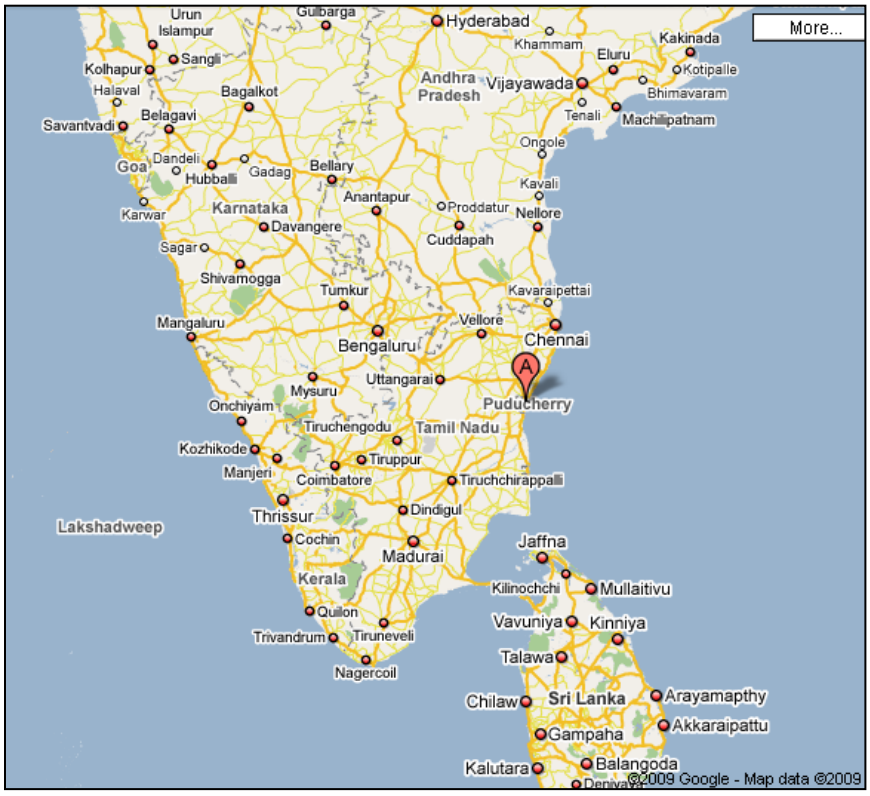
IELD VISITS AND OBSERVATIONS

We undertook several field trips to observe the actual operations of the Village Resource Centers and Village Knowledge Centers. The interviews and field trips took place between August, 2007 and February, 2008. We interviewed villagers (including school-going children), technicians

associated with the centers, the kiosk owners and VKC volunteers. In the following paragraphs we summarize our observations.

The MSSRF VRCs and VKCs that we visited are located in the Union Territory of Pondicherry (see Figure 5), located about 100Kms south of Chennai, a major metropolis in southern India. Pondicherry is generally more developed than Tamil Nadu, the State that lies adjacent to it. The literacy rate in urban areas is 82%, whereas the literacy rate in rural areas is 54%. The villages that we visited were all within one hour's bus journey from the city of Pondicherry (the capital city of the Union Territory of Pondicherry). However, we observed that the transformation from an urban to a rural setting occurs quite drastically. Within a few miles outside of the city, the land is covered with farmlands and villages where many of the city services (i.e. indoor plumbing, reliable water supply, reliable supply of electricity, public sanitation, etc) are significantly less prevalent.

Figure 5: Pondicherry (new name Puducherry) in southern India.



Pillayarkuppam

Pillayarkuppam is a village of about 4500 people located about forty-five minutes from Pondicherry by road. The VRC at Pillayarkuppam consists of a modern building complex equipped with a VSAT antenna, computers, printers, battery packs, training rooms and even a small radio station. The VRC's VSAT antenna dish rises prominently from the surrounding farmlands. The coordinator of the Pillayarkuppam is a retired veterinary doctor, Dr. A.K. Thiagarajan. Dr. Thiagarajan explained that the MSSRF VKC project originated from an earlier, "bio-village" project, started in the village of Villianur in 1991. MSSRF noticed a preponderance

of local traditional knowledge which it wanted to collect, store and disseminate to the local population. This led to the birth of a Village Knowledge Center. MSSRF project officers insist on the term "Village Knowledge Center" rather than "Information kiosk" or "Internet kiosk."

During the interview, Dr. Thiagarajan explained that MSSRF's founder, Dr. M.S. Swaminathan, felt that the term "kiosk" implied a commerce-oriented business center, which is very different from the purely community-development philosophy of MSSRF projects. Dr. Swaminathan did not want the VKCs to be just a commercial enterprise, but wanted to bring in the idea of a shared "commons" - which is perhaps a layover from the ideals of socialism engendered by India's first Prime Minister, Jawaharlal Nehru. Dr. Thiagarajan also repeated the claim that MSSRF's projects were aimed towards being "pro poor, pro women and pro nature." Villianur was soon connected to several VKCs and became a hub, or Village Resource Center. In 2005, the VRC was shifted to a more spacious location at another nearby village, Pillayarkuppam. In the following sections, we describe our observations of a village resource center (VRC) and an village knowledge center (VKC).

Figure 6: Lab at the Pillayarkuppam VRC (Bhagyalakshmi on the left).

The VRC houses spacious and clean administrative offices with three computers, a scanner, books, magazines and newspapers. The training rooms contain computers, multi-media and projection equipment. There is a computer lab which consists of several computers and the appropriate software applications. We observed a group of women working on editing the VRC's information web site and using office publishing software to publish the VRC's newspaper (Figure 6).

The Pillayarkuppam VRC controls fourteen villages by being the hub of info-tech services. The VRC disseminates various information using a combination of wireless (satellite and short wave radio transmission, as well as wired telecommunications infrastructure for connecting to the

Internet . The information disseminated include: government schemes, commodity prices, information and education on health and hygiene, results of examinations, computer training, women's health issues, government loan schemes (i.e. loans for purchasing motors and other farm equipment), government issued certificates (such as birth and marriage certificates).

Additionally, the VRC also serves as a resource center offering training in dairy improvement projects such as clean milk production in association with Ponlait, the milk cooperative that supplies milk to much of the Union Territory., It also publishes the news paper "Namma Oor Seidhi" for the surrounding villages (ninety-eight in number at the end of 2007). Dr. Thiagarajan showed us the VRC's library and a bio-lab which collected and categorized native herbs and other flora. The VRC also provided training in animal husbandry and maintained a "sperm bank" for artificial insemination of cows. The sperm bank contains numerous temperature controlled flasks for transporting the sperm to the farms. The VRC imparted training in artificial insemination techniques to local farmers.

The ICT side of the VRC is managed by project associates and technical staff – all recruited and trained from the villages that the VRC serves. One of the project associates working at the VRC is Bhagyalakshmi. She revealed that she had originally worked as a volunteer at another village VKC, located in Kizhur. She had been "promoted" to her current position because of her interest, enthusiasm and ability to pick up the necessary skills. Prior to that she had been involved with a women's self help group in her village. She also revealed that even though she hailed from a village that did not have any private school, she had moved closer to the VRC location in order to send her children to a good private school. She was knowledgeable in basic computer skills and was able to train others.

During our visit we met a group of fifty local farmers who had been brought there for training in livestock care. They were shown audio-visual presentations and lectures by a veterinarian. The audio-visual presentations had been downloaded earlier using the satellite link up with the Chennai headquarters. We also observed a group of youth attending classes in Microsoft Access (database) software in preparation for taking a Microsoft Certification exam. The training was imparted through a grant form the Microsoft Unlimited Potential Program (MUPP). The trainers were either external experts or those trained by MSSRF earlier. [It is interesting to note here that the rural students were taught material that was almost similar in content to that used at the elite Indian Institute of Technology's Information Systems course, where I taught during the Fulbright Grant period. Only the language of instruction was different.]

The project associate, Ms. Bhagyalakshmi opined that the whole VRC concept was very empowering to the women in villages, as they not only gained information on various issues related to health and women's issues, but also were often selected to run the VRCs themselves, earning a small honorarium of Rs. 1500. She also noted that women were not given any preference, either is access to the VRC or in employment and training opportunities. Despite this, the preponderance of women working in the VRCs led us to believe that the VRC concept was indeed a vehicle for the enhancement and education of village women.

Embalam

Embalam is a town of 4000 people, located about forty minutes from Pondicherry. It is served by a Village Knowledge Center (VKC), which is connected to the regional VRC at Pillayarkuppam. The VKC is operated by two women, Malathi and Indira Gandhi (Figure 7). Both have

completed high school and have completed the Microsoft Unlimited Potential Project training program.

The VKC is located within a small village temple's premises. It is equipped with a computer, printer, a video kiosk and a public address system. The VKC is connected to the VRC by a microwave link. The antenna is located on the roof of the building. The interior of the VKC is very basic and spartan, in comparison to the much more up-to-date facilities of the Pillayarkuppam VRC. The computer has applications such as Microsoft Office, desk top publishing and e-conferencing software. The VKC downloads current information such as weather updates, coastal tide information, commodity procurement prices, high school examination results and other information pertaining to farmers as well as women and health information from the VRC's databases. Important weather-related information and the arrival of examination results are broadcast to the entire village using the public address system.

The VKC maintained two-way audio-conferencing with the VRC. When a problem occurred with any of the computing, the local associate trouble-shot, and then requested pertinent information via the audio-conferencing tool to the VRC if further help was required. During our visit we observed an e-conference (video conference using Microsoft Net Meeting application software) in progress with another VKC located nearby. Since the power supply in this village was spotty, uninterrupted supply of power was ensured through a bank of batteries.

The project associates informed us that the VKC was mostly used by children and women. Occasionally men used the VKC for preparing and printing letters. We interviewed school children, who all seemed aware of the VKC and its functions. The village children were very comfortable using the VKC, and visited it for checking examination results, for on-line or CD-based MUPP training, to play computer games, to check the on-line newspapers and for CD-based science lessons. Women visited the VKC for health and reproductive health information. The men that we interviewed informed us that some of them used the VKC for information on the weather and commodity prices. It was interesting to note that most of them indicated that much of the information that they needed was available on cell phones, which almost all village farmers possessed. This was an interesting fact and was proof of the prevalence and rapid spread of cellular phones in even rural areas of India.

In addition to the honorarium that they receive, the project associates operating the VKC are allowed to charge nominal amounts for services such as preparation of letters, loan applications, and printing.

Figure 7: Embalam VKC, with Malathi (left) and Indira Gandhi (right).

Overall, our observations led us to conclude that the Embalam VKC is a successful project and had proved its worth to the villagers it served. Through our interviews with the various village people we learned that the VKC was viewed as a symbol of prestige to the village. In fact, its success had prompted the heads of nearby villages to request MSSRF to set up such centers in their villages. The women who worked in the VKC seemed empowered and confident. One of them even had an opportunity to travel to Tunisia for the World Summit on the Information Society (WSIS) in 2005 as a Jamsetji Tata National Virtual Academy Fellow (NVA). The NVA, set up in 2003, is endowed by a grant from the Tata Education Trust, a charitable organization, and supports MSSRF's ideals.

ANALYSIS AND CONCLUSIONS

The previous sections provide a sample of our many field visits. We visited many more locations and interviewed a variety of people. We also studied other models employed by a variety of rural Internet projects. This paper is thus a part of a larger study. However, the samples above provide a very good representation of the MSSRF "Village Knowledge Center" project, and help provide a window into the facts on the ground as they pertain to the spread and effects of Internet technologies in rural India.

Based on the "data" obtained through this study, we believe that the effects of the spread of the Internet to rural areas in India has generally been very successful in empowering women and providing them with appropriate information on various health, hygiene and reproductive issues. As seen from the sections above, the training programs offered through the MSSRF VKC project has enabled women to learn more about computers and the Internet, and has even provided them with meaningful job opportunities as well as opportunities to lead in the areas of education and health. As noted earlier, one of the project associates we interviewed was empowered enough to

move her family from her (remote) village to one that was closer to a better school, in order to afford her children with better educational opportunities. All the MSSRF project associates that we interviewed or observed were women. They were confident and knowledgeable about their environment and the world outside their villages. They were leaders in their villages, and would, we believe, be good role models to female children in their villages. The VKCs also provided opportunities for the associates to engage in entrepreneurship, by offering for-payment services such as letter writing, loan preparation and document printing services.

The VRCs, with their bigger and more developed technical infrastructure, seem to offer more services that are relevant to the farmers (i.e. men). The men seemed to take advantage of the training facilities at the VRC level, and used the VKCs to get weather reports and market price information. The villagers value the newspaper produced by the VRC and depend on these traditional forms of news dissemination to learn about the news and government sponsored schemes. During our visit to the Pillayarkuppam VRC we even observed one villager who had walked several miles in order to inquire about the non-delivery of that month's newspaper. The children that we interviewed in the villages were all very aware of the VKC and appreciated its role as a venue to get on-line examination results, and learn more about subjects such as computers and science.

Another area that we tried to study was the role that caste played in the success of VKCs in a village. Unfortunately, we could not gain much information that could lead us to any definitive conclusions. Most of the associates that we observed and interviewed indicated that caste did not play any role in the functioning of the VKC. However, at a VKC in one village populated predominantly by members of a lower-order caste, the project associates mentioned that people from a neighboring village of higher-caste people avoided using the VKC, even though it provided valuable services. This shows the extent to which caste plays a role in the utility of the VKCs – even when is a clearly perceived utility, certain caste members avoid using a VKC purely because it is located in the "wrong" village. We plan to investigate the role of caste in attracting or detracting the use of a VKC in a particular village in a future study.

Based on these observations, we have developed a list of questions around which we plan to develop hypotheses to test in future studies:

1. Have VKCs impacted only women aged 15-30 in the villages, or have they impacted all women?
2. Have VKCs helped in the democratization process of those who live in rural areas of India?
3. Have VKCs impacted the economy and sustainability of rural areas in India?
4. Have VKCs made any impact or difference to a village child's world-view?
5. Are the current technologies and information offered by the VKCs being rendered superfluous by the growth of cell phones in rural India?

Other issues of interest in this area are:

1. How rural development projects keep up with the exponential developments in technology?
2. How to compare the effectiveness of the different models adopted by rural ICT projects?

3. How sustainable are the "community-oriented" projects, especially when funding from international aid agencies dry out?
4. What are the factors to use in comparing MSSRF VKCs with other projects using different models (i.e. for-profit entrepreneurship models?)
5. What are the real costs and benefits to society at large from rural development projects, and how to quantify them?
6. What are the limitations of such projects, and what could be the reasons for the same?

We hope that our study and the questions we pose will provide the basis for further research in this field.

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[i] TeNeT is the Telecommunications and Computer Networking Group in the Department of Electrical Engineering at the Indian Institute of Technology Madras (IITM). The TeNsT group's vision is to develop "world class technology at an affordable price." TeNeT has incubated numerous ICT4D projects.

[ii] n-Logue is a start-up incubated by the TeNeT group. Its business model is to use WLL (wireless local loop) technologies from Midas Telecommunications (another startup incubated at TeNeT) to set up a series of wireless transmission towers at district headquarters to connect villages.