

How To Wire Rural India?

A Survey of the Problems and Possibilities of Digital Development¹

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"The percentage of growth that an IT firm like HP [Hewlett-Packard] will get from people whose income is less than \$1 a day is not going to be that significant... we don't have a significant percentage of our future growth even coming from people who live on \$3 a day... I mean, do people have a clear view of what it means to live on \$1 a day? There's no electricity in that house, none. So is somebody creating computers that don't require electricity? ...No, there are no solar power systems for less than a dollar a day, honest... You're just buying food, you're trying to stay alive..."

– Bill Gates speaking at the Digital Dividend seminar. Text edited for interjections.³

"... there is an urgent need to examine the catalytic and enabling role to be played by the government in ensuring that IT provides new opportunities for the 40 % of the people who are living below poverty line, so that they may move above it."

– Government of India Working Group on Information Technology for Masses. Text edited for space and clarity.⁴

"Let IT remain the staple for academics and professionals. What will it mean for people in the thousands of miserable villages in this misguided nation? Please, please come out of your ivory tower and see the plight of Indian villages, sans water, sanitation and decent living. Photographs of farmers posing with PCs and fishermen analyzing computer printouts may befit a TV ad, but what are you trying to sell?"

– Letter to the editor of a leading news magazine, responding to a feature on the digital empowerment of rural India. Text re-edited for space and clarity.⁵

Introduction

The idea that the internet and related technologies might have an important role in aiding developmental efforts has captured a central place in international policy debates. Over the course of the last year, statements affirming the need to close the so-called 'digital divide' between social groups with and without access to the internet have been made through several UN agencies, at the G-8 summit, and at meetings of developmental organizations around the world. Many new websites now address this topic, and listserv hosts have moderated endless rounds of debate between digital enthusiasts and digital skeptics.

The idea of digitally-oriented development is as powerful and seductive as the technology upon which it is based. No single technological

revolution has changed the lives of current generations in the way that the internet has. No cultural-technological innovation since Television has had this kind of impact on the world's economy, its politics and its globalizing popular cultures, or even on our cultural conceptions of distance and time. The promise of digital development is that it might have the same reach as the original internet boom of the mid 1990s – only this time, the most disprivileged communities, those who had missed out on earlier waves of technology, might be able to 'leapfrog' over their more developed competitors. The greatest obstacles to rural development – large distances and inadequate infrastructure – might be obviated by instant access to virtual institutions that provide banking, education, health care, neonatal information, agricultural advice, and so forth.

But skeptics also have good reason. Bill Gates' now infamous dictum, that a computer cannot benefit someone earning less than a dollar a day, remains a serious challenge to any attempt to ameliorate social and economic disparities through Information and Communications Technologies (ICTs).⁶ In South Asia, where most rural populations lack running water and sanitation systems, where electricity is still a scarce and intermittent resource, where roads are poor and education a luxury, these technologies truly appear to be far removed from the everyday concerns of the poorest sections of the countryside. This article critically examines the problems and possibilities of digital development in order to reveal the larger impact that ICTs could have on rural economies and societies.

Emergence of the Information and Communications Sectors in India

As is well known by now, India's IT sector took off in the early 1980s with the establishment of off-shore development centers. Relatively cheap English-speaking engineering and technical talent were employed at centers in Bangalore and Chennai, then Hyderabad, and now in the suburbs of New Delhi (NOIDA). Since the liberalization of the Indian economy in the early 1990s, the Indian government has relentlessly promoted the IT sector as the harbinger of the nation's economic aspirations. Even though the country possesses only 3.7 million Personal Computers (PCs; Pentium I or superior), it houses the largest number of software professionals outside California, whose efforts might result in the export of software worth 8 billion dollars next year, much of it to the United States.

As of 2001, the initial euphoria surrounding India's successful software export industry has given way to a new introspection into the reasons why these intellectual and human resources have not driven improvements in India's public and private institutions, education systems, and infrastructure. These reasons are not hard to find: (i) the Indian software industry solves small components of larger problems for international clients; (ii) this work is usually protected by confidentiality agreements; (iii) many Indian software professionals and companies compete for the same international contracts; (iv) the opportunity costs of working for Indian versus international clients is very high; and finally (v) low teledensity, computer usage, literacy, the inadequacies of regional language software interfaces, and other obstacles

of India's developing infrastructure, coupled with regulatory hurdles have inhibited such ventures.

None of this prevented Andhra Pradesh's Chief Minister Chandrababu Naidu from crafting an aggressive state policy to attract IT-oriented investments, simultaneously claiming that this sector served the larger public interest. The constraints of electoral politics in India's largely rural society have meant that economically liberal and technologically sophisticated leaders could not afford to leave themselves open to the charge of promoting IT at the expense of rural development, and this is a fine line to walk: Even as he invited Microsoft to set up a software center in the Hyderabad's technology park, Naidu also installed a highly sophisticated network of communications systems in his home constituency of Kuppam, as a model for other regions of the state. Beginning in 1996, he was the first Indian politician to advocate E-governance for making the state machinery more responsive and sensitive to citizen needs at the district and panchayat level. As of 2000-01, these policies are being emulated at the national level through an 'IT for the Masses' policy statement, as well as a forthcoming policy statement on E-governance. Neighboring Karnataka is one among many other states of India to have issued an IT policy statement directed towards the 'common man.' Naidu's solution to the political dilemma of promoting high-tech alongside rural empowerment, therefore, long anticipated current international debates on 'digital divide.'

Despite the on-going deregulation of India's telecommunications sector, its national teledensity (telephones per hundred persons) has improved very slowly, from .06 in 1990, to almost 3 today (compare with China at around 10). Voice over Internet Protocol (VoIP), and Wireless-in-Local-Loop (WiLL or WLL) technologies, however, now appear set to offer a cheaper and lighter form of telecom infrastructure, that should improve rural access exponentially. New software and dotcom start-ups have begun targeting non-English speaking users, and the idea of non-elites using and benefiting from ICTs has begun to gain currency. Nevertheless, the export-oriented software industry has yet to take full advantage of the opportunities presented by the newly networking home market. A new synergy between the Infotech and Telecom sectors in India could create a profound social and economic revolution in rural communities across South Asia.

How is Technology-driven Social Change feasible in South Asia?

The problems and potential of ICT-driven projects in South Asia are truly enormous. This region hosts an extraordinary concentration of new technology driven companies, tech-savvy administrators and managers, a political class newly sophisticated to the possibilities of IT, social entrepreneurs and NGO institutional structures that could all come together to bring the benefits of networked technologies to rural and disprivileged groups. And yet, we must face the frustrations of intermittent, inconsistent electrical power, archaic, scarce and unreliable telephony and net-connectivity, neo-feudal politico-business consortia that hinder or hijack developmental efforts, deeply ingrained ideologies of caste-hierarchy, gender inequality, and religious-communal difference, as well as significant deprivations of basic human needs. These limitations cast grave doubt over the optimism of those attempting to use emerging technologies for developmental purposes.

A common objection to IT initiatives suggests that they are premature, or that they 'put the cart before the horse,' in as much as electricity, telephony, and connectivity are highly erratic and variable in many parts of South Asia. Moreover, more basic kinds of infrastructure including schools, healthcare centers, balanced nutrition, gender equity, employment, and transportation are lacking. Why should we consider this expensive and elitist form of infrastructure, when more fundamental developmental needs remain unmet?

This criticism assumes that there is a standard sequence and hierarchy for development: first a society must adequately manage its nutrition and healthcare, then it must address education and achieve total literacy, then it must provide electricity to all its villages, then it must install telephones, and so forth. In fact, post-colonial societies in Asia, Africa and the Americas have repeatedly shown that they can be successful in one or another dimension of human, social, and economic achievement, without necessarily replicating a normative European trajectory of industrial development. Diverse social and infrastructural needs must be addressed more or less *simultaneously* to ensure a nation's future growth and prosperity.

It is naive to imagine that electricity, telephony and connectivity in rural areas will improve if the

demand for these resources does not grow. In addition, information networks can become conduits that allow money to flow into the village through new kinds of non-discriminatory, clean and relatively unoppressive industries. Information and communications technologies can also compensate for other kinds of infrastructure limitations. For example, if online work, trade, or payment were to become available for members of a village community, the poor quality of roads to and from that village becomes less of an obstacle to earnings and employment. Finally, and most importantly, if capital were to become more readily available within a village community through such networked systems, it would then be in a better position to finance the basic infrastructure that it needs, including roads, dispensaries, water and sanitation systems.

It may be correct to say that PCs remain expensive, fragile, quickly obsolete, English-centric, complex and difficult to master, and therefore almost entirely elite in their scope and operation. Nevertheless, *networks* of human-mediated computer kiosks, shared among *multiple users* of a rural community, could in fact prove to be the most inexpensive and inclusive form of rural infrastructure possible today.

Although this kind of a public information center would require a hardware-cum-software-cum-connectivity investment of about Rs. 40,000 (appx. US\$ 850), this resource could then serve between 500 and 5,000 citizen-consumers. The technology's cost *per capita* is therefore miniscule. The M. S. Swaminathan experiment in Pondicherry, and NIIT experiment in New Delhi's slums have demonstrated that even those with limited education, literacy, or English competency can quickly master windows-based point-and-click graphical user interfaces. Moreover, the Gyandoot Project in Dhar, Madhya Pradesh, has demonstrated that rural citizen-consumers are quite willing to pay for the services of such centers, so long as these transactions make a direct and real impact on their life and livelihood. Here we may empirically disprove Bill Gates' theory that the most poor citizen-consumers will not encounter Microsoft or Wintel products: persons making less than \$1 per day have regularly come into existing information centers to seek information on regional hospitals and medical centers, to send and receive emergency messages, and to transact with the state machinery in ways that enhance their quality of life and livelihood.

Rural information networks can allow knowledge, services, money, and certain kinds of products to more easily flow from node to node across long distances. Each village node can also serve as a range of virtual institutions, such as a community center, a bank, a medical center, a government information center, a matrimonial office, a public telephone booth, a public library and educational resource center, all at a fraction of the cost of corresponding 'real' institutions. By making these resources available in villages, information centers can alleviate the asymmetry between urban and rural environments. In order to accelerate rural growth, it is essential that we learn new ways of integrating social and human infrastructure development into the installation of basic information and communications infrastructure.

Overcoming Infrastructure Bottlenecks

The three basic infrastructural requirements for rural ICT initiatives are, of course, (i) Electricity, (ii) Telephony (or its equivalent), and (iii) Network Connectivity. The problems associated with these inputs must be recognized as inherent features of the landscape, and tackled as an integral part of the implementation process.

(i) *Electricity*: In many rural areas, electrical supply may be restricted to only 6 or 8 hours a day. When electrical power is available, its voltage and frequency may vary far outside the acceptable limits of most hardware. Finally, there is often no earthing provided.

For most rural ICT projects, battery back-ups and Universal Power Supply-s (UPS-s) are mandatory. In some cases, multiple tractor batteries have been connected in parallel to create a mammoth UPS that can withstand day-long power cuts. In addition to these battery systems, circuit breakers and voltage stabilizers are also necessary. Several agencies have had to create their own earthing pits outside their village centers, by digging shallow trenches, filling them with salt, and making sure they are watered on dry sunny days. Constant maintenance of this privately constructed earthing pit is necessary to ensure that the equipment within is protected from power surges.

(ii) *Telephony*: Landline telephones are still not available in many villages in South Asia. Where they do exist they may be down for weeks at a time, and there may be other kinds of incompatibilities, which prevent data transfer.

Several different kinds of short-term solutions are possible to circumvent low teledensity in rural areas. A project in Pondicherry has implemented a wireless system for relatively slow data transfer using fax protocols. Short bursts of these wireless transmissions update the off-line content available at the village center. The various educational enterprises of Zee Interactive Learning Systems plan to rely on Very Small Aperture Terminals (V-SATs), which connect directly to their own communications satellites. The Gyandoot project in Dhar, on the other hand, initially chose its target villages on the basis of their telephone access, and their location relative to proposed Optical-Fiber Cable (OFC) routes.

Although it is possible to design rural ICT projects on the assumption that basic telephony will not be available, there is another, better, approach: Rural ICT projects may be used to test and design new kinds of telecommunications infrastructure, including, for example Wireless-in-Local-Loop (WLL or WiLL) technologies, which offer a cheaper, lighter, and more intelligent type of network. WLL systems allow simultaneous data and voice telephony across long distances (wireless), thanks to a local network of cables provided and maintained by a rural entrepreneur (local loop). Important applications of this technology have been developed at the TeNet Group at IIT-Madras.

(iii) *Connectivity*: Internet subscription is not always available in rural and underdeveloped sections of South Asia. Even when it should, in theory, be available, long distance calls to nearby towns may be required in order to achieve true connectivity. Poor telephony ensures that modem speeds are often restricted to 28.8 kbps or slower. The wireless-fax system in Pondicherry runs even slower, at under 14.4 kbps.

While WLL technologies will soon be able to provide simultaneous and continuous voice and data connectivity in local areas, computer kiosks in villages can also be designed so as to require only limited connectivity. Projects in Pondicherry and Warana, for example, allow users to access offline content, which is updated several times a day in brief bursts of data. In this way, a range of services may be continuously provided, notwithstanding narrow bandwidth, slow transfer rates, and intermittent connectivity.

Focus Areas for Developmental ICTs⁷

In the following subsections we discuss the role of ICTs in different developmental sectors. Both urban and rural citizen consumers may benefit from ICT projects by receiving: (i) enhanced access to information and communication across large distances, (ii) improved access to governmental and quasi-governmental resources and services, (iii) opportunities to trade or bank online through kiosks, (iv) opportunities to design, manufacture and market their products through internet or intranet systems, (v) education through computers or about computers or both, and (vi) superior medical advice, diagnosis or knowledge in their own locality.

This listing is by no means encyclopedic, and is intended only as a guide to the unfolding landscape. Social Investors and Social Entrepreneurs are invited to think of these resources as an incomplete tool-kit, or kit-of-parts, that may be assembled together for new and innovative applications, experiments, and project. Certain specialized application areas, including Global Information Systems (GIS), and Agri-input initiatives, for example, have been omitted for clarity and space.

Technology & Infrastructure Developments

The three major hurdles to the use of Information Technology in rural areas of South Asia have been: (i) inappropriate software (ii) expensive hardware and (iii) weak telecommunications infrastructure. In each of these fields, however, the landscape is slowly changing.

The Centre for the Development of Advanced Computing (C-DAC; www.cdacindia.com) has been working on Indian language fonts and software for over a decade. Most state-sponsored IT initiatives, as well as many rural ICT projects, now use their fontographic standards, if not their text-processing software. In another significant development, a machine language translation project based in Hyderabad called Anusaraka (www.iiit.net/anu/anu_home.html) promises to allow Indian language users translation between various Indian languages, as well as access to English language resources on the web.

As even occasional computer users will be aware, the cost of hardware is continuously falling, such that computers that were state-of-the-art 3 or 4 years ago, are now available for a fraction of their

original cost. Those computers – or, indeed, new computers configured just like them – are still good for basic text-processing, email, and browsing functions. In addition, however, new entrants into the basic computing market such as the Simputer (www.simputer.org) and the iStation (www.inablers.net) have been specifically designed for a mass market, including both urban and rural users.

As mentioned above, Wireless-in-Local-Loop and related technologies have emerged as a cheaper, smarter form of telecom infrastructure, in comparison with traditional wire telephony. The TeNet Group (tenet.res.in) at the IIT-Madras has been at the frontline in developing technology solutions designed to improve telecommunications infrastructure in rural areas. The group has incubated several companies that work up and down the value chain in this sector, including, most recently, n-Logue Communications, which is working as a rural internet service provider.

Rural Connectivity

Several projects are now attempting to provide information and services to rural citizen-consumers via human mediated intranet systems. The Village Knowledge Centers Project run by M.S. Swaminathan Research Foundation (www.mssrf.org) in Pondicherry represents an early experiment in providing information and knowledge resources to rural communities. The project uses wireless radios (CB radio; not to be confused with WLL) for data and analog voice transmissions between a semi-urban hub center and eight village centers. At each village center, offline content is updated through routine transmissions using fax protocols. Although the project displays outstanding sensitivity to context, as well as gender and social equity, and has conducted pioneering participatory experimentation and documentation, it has not developed a strong economic model to ensure the financial sustainability of the project. For this reason, it is also inhibited from scaling up its experiment to include a larger section of the countryside.

The Warana Wired Village Project (warana.nic.in) is based in and around Warananagar, on either side of the Warana river in Maharashtra. Since the 1940s, these Cooperatives have been engaged in sugar refining, dairy processing, banking and retail. The Prime Minister's Office (PMO) through the National Informatics Center (NIC) and the

Government of Maharashtra collaborated with these Cooperatives, to fund an astonishingly dense and expensive network of fibre-optic cables, V-SATs, PCs, modems and servers which is estimated to have cost over 5 crores. Although a number of different products and services were promised, this enormous infrastructural investment currently serves only as a distributed accounts system for the Warana sugarcane cooperative. Members of the cooperative may check that the tractor-loads of sugarcane they sent in were correctly credited to their accounts. Many lessons remain to be learnt from the limited returns from this project – principally the need for social research followed by a clear-headed cost-benefit evaluation of investments made into a rural ICT project.

The Gyandoot Project (www.gyandoot.net) in Dhar, M.P., on the other hand, has emerged as a benchmark for innovation in the ecommerce and e-governance services it provides, as well as its business model. The project was initiated by members of the Indian Administrative Services (IAS) in consultation with various *gram panchayat*-s, which were selected as locations for village booths. Village *panchayat*-s paid for the equipment and space for kiosks called *soochanatalaya*-s, which are operated by *soochak*-s, who were selected and trained from among the unemployed educated youth of the village. The Gyandoot team has also worked hard on providing the back-office support that is required to make these services relevant and useful for rural citizen-consumers. Future scalability will rely on the installation of WLL based internet connectivity, as well as new online educational content.

n-Logue Communications (www.n-logue.com), incubated out of the TeNet group at IIT-Madras is now providing connectivity for a series of new projects across India, including those in Madurai and Nellikuppam, T.N., and Sikar, Rajasthan. The company works on a commercial basis in partnership with various local partners, including entrepreneurs and non-governmental organizations.

TARahaat.Com (www.tarahaat.com), promoted by Delhi-based Development Alternatives, is an extremely ambitious commercial project to provide online services to a large number of rural communities in north India. One of the more innovative aspects of this project is its highly interactive and graphics-intensive interface system, which allows semi-literate and neo-literate users

enhanced access to products and services. The organization had initiated information centers in several locations in Bundelkhand, M.P., and Bhatinda, Punjab, of which the later are still functioning. While the project will provide a menu of services that is similar, in many ways, to other rural ICT projects, its current business model requires an astonishing influx of capital before it becomes self-sufficient.

The NIIT 'Hole-in-the-wall' initiatives (www.niit.com) consists of unattended point-and-click devices in urban slums. In early 1999, Sugata Mitra set up an unmanned computer with a track ball in a slum adjoining the New Delhi offices of NIIT Limited, the major software development and research company. Continuous video tape monitoring of the computer showed that young boys and girls from the settlement became highly proficient at using the graphic interface, and in surfing parts of the web, notwithstanding limitations of language and training. The social and economic returns of setting up such unattended systems are yet to be fully comprehended.

While these initiatives represent diverse approaches to the question of wiring rural India, several trends can now be observed: First, economically responsible projects are already proving more successful than charitable or free models. Second, projects that identify and cost the services they provide are also more successful. Third, an intimate understanding of the social and economic parameters of rural India gives connectivity providers a significant advantage. Fourth, WLL systems appear to be emerging as the infrastructure solution of choice.

E-Governance

The Gyandoot Project in Dhar, M.P., has developed a very important e-governance protocol, in the form of the *shikayat*, or complaint. For a fee of Rs. 10, rural citizens may select from a predetermined menu of 30 different kinds of complaints, which together cover a wide range of citizen-consumer to government interactions in rural areas. These include for example: the absence of a school teacher; the death of a head of cattle that may require a government veterinarian; the malfunction of a public hand-pump that must be repaired, and so forth. Although this project has established only about 30 village centers so far, the number of complaints and requests that come pouring in every day has put enormous pressure on the office of the zila panchayat to redesign and

to wire up its own back office systems, so as to keep pace with this demand. The lesson here is that E-Governance will be *pulled* into existence and operation through citizen-consumer demand.

The Andhra Pradesh government (www.ap-it.com) is responsible for some early initiatives that sought to use networked technologies to improve citizen services. A series of catchily-acronymed services including CARD, TWINS, FAST, etc. provide licenses and certificates, allow the registration of deeds, and various kinds of payments at a single counter, in certain urban and rural areas of the state.

'Bhoomi' (revdept.kar.nic.in) is a major Government of Karnataka initiative to computerize land records across the state. About a quarter of the state's *taluka*-s, or sub-districts, have now been computerized. At specified government offices in these districts, citizen-consumers may receive printouts of their land holdings with a schematic plan of their property on the obverse face. The computerization of these land records is an expensive, laborious and time-intensive process, as the online system must (i) aggregate several different types of traditional village record-keeping, and (ii) provide a realtime record of landholdings, so that they may have unimpeachable legal standing.

Wired Microcredit / Microfinance / Microcommerce

There is no doubt that the computerization of microfinance and microcredit records could result in savings of time and effort, and generally facilitate the maintenance of these accounts. However, the real transformative effect of this technology will be seen only once microcredit accounts come to be used for online or distance transactions amongst or within village communities at the grass-roots. This will allow rural entrepreneurs and craftspersons the same savings of time, travel, and effort, that the Internet has afforded individuals and institutions in the industrialized world. These possibilities have not yet been charted in any rural ICT project.

The Swayam Krishi Sangam (SKS; www.sksindia.org) project is recording transactional information on optical ID cards for microfinance, as well as for education and healthcare. Dr. Mohammed Yunus, Founder of the Grameen Bank of Bangladesh has notably called for the establishment of an 'International Center

for Information Technology for the Elimination of Global Poverty'. A related agency, Grameen Telecom (www.grameen.org) has attempted to provide mobile telephones to rural consumers through existing MFI / MCI networks.

IT-enabled Artisanal Industries

In addition to facilitating the flow of capital across rural areas, online financial and commercial systems could also provide the capital and infrastructure for new kinds of IT-enabled industries, in fields such as regional language data entry, Computer-Aided Design (CAD), and Computer-Aided Manufacture (CAM). These applications of information technology, of course, will only become possible on a large-scale once rural ICT projects are better established in the landscape. The Asian Center for Entrepreneurial Initiatives (AsCent; www.toeholdindia.com) has made an early attempt to introduce CAD / CAM technologies to artisans in north Karnataka, alongside online advertising and sales.

Computer Training and IT-Enabled Education

So far, computer-training and IT-enabled education has been distressingly conflated and confused in the understanding of administrators and policy makers as well as the general public. Most commercial providers, moreover, are involved in both sectors, and aggressively cross-market themselves.

Pratham (www.pratham.org), Akshara and The e-Learning Center together represent the most important attempt to create IT-enabled learning software for disprivileged children. They have developed educational games, which are now being tested in several rural areas through the Center for Knowledge Societies – Bangalore. In Karnataka, 1000 rural schools are to be computerized by private operators, including NIIT (www.niit.com). School Net India (www.schoolnetindia.org), the educational infrastructure wing of Infrastructure Leasing and Financial Services (IL&FS), is building multilingual educational content online, as well as CD-ROMs for use by teachers as a supplement to classroom education.

eGurucool (www.egurucool.com) and Zee Interactive Learning Systems (www.zils.com) represent commercial attempts to provide online educational resources coupled with products ranging from in-class instruction to interactive CD-ROMs, to cable-TV programs. These products are

predominately in English, although regional language translations could become widely available in future.

Tele-Health

Computer-based and Online expert diagnostic systems could enhance the quality of healthcare and diagnosis available to rural citizen-consumers in many remote parts of South Asia. The real benefits of these systems, however, may be the collation of more comprehensive public health information. In addition to tracking the case study of an individual patient, therefore, such systems could also collect data on the public health in a region, for further epidemiological study. The George Foundation (www.tgfworld.org) has experimented with an expert diagnostic program on a free standing PC in Dharmapuri district of Tamil Nadu. Other initiatives by privately run hospitals are in the planning stages.

Research, Advocacy and Consultancy Resources

Non-profit industry groups such as India's National Association of Software and Service Companies (www.nasscom.org) have served as advocates against policy regulations that might inhibit the growth of bandwidth and connectivity in South Asia. Their website hosts important statistics and information in the on India's internet economy, as does Inomy.Com (www.inomy.com). BytesForAll.Org (www.bytesforall.org) is a voluntary online community that shares information with other web-oriented advocates across South Asia. The NGO Voices serves as a research and capacity-building resource for community radio, and is beginning to experiment with the interface between internet and radio. Mahiti.Org (www.mahiti.org), a branch of the NGO Samuha provides IT-services for NGOs in Bangalore area. The Center for Knowledge Societies - Bangalore (www.cks-b.org) has collected socio-economic data on many of the projects mentioned above, and is also providing research and consultancy services for some of the developmental organizations and enterprises mentioned above.

Potential Impact on Rural Economies and Societies

Up until this point, ICTs have been largely understood as a new kind of media or telecommunications infrastructure, which allows

the dissemination of information, commands, or even education across distances. Developmental ICT projects, therefore, have attempted to assist rural communities by providing them news, information, advice, and knowledge which has hitherto been inaccessible to them. These kinds of inputs have allowed rural citizen-consumers to make more informed economic decisions: farmers can decide whether to sell their produce locally or transport it themselves further afield; landless laborers have been able to negotiate their daily wage more effectively; tractors, threshers, old television sets, cattle and motorcycles have all been traded across towns and villages thanks to online advertisements.

However, rural ICT projects are yet to effectively position themselves as a vehicle for online commerce and a mechanism of employment for village communities. The first step in this direction would be to put rural Self-Help Groups (SHGs) and other Micro-Credit / Micro-Finance Initiatives (MCIs / MFIs) online. This abstraction of cash money onto an online financial system would lay the groundwork for a new kind of rural e-commerce, which could prove extremely enabling for many communities, especially non-agricultural artisanal groups. Entrepreneurs and small-scale industries might then be able to regularize existing off-line trade relationships into online systems that track raw materials, designs, quality control, and delivery mechanisms. New kinds of banking and finance systems in rural areas would make capital more easily available for investment into new businesses and rural infrastructure.

While persons making less than a dollar a day might immediately benefit only by having access to a more efficient and easily accessible form of banking, in the long run unemployed and underemployed poor would experience the significant secondary benefits of actually having access to a far better developed economy and the range of education, employment, and self-empowerment opportunities available therein. These possibilities can only be actualized once significant sections of rural South Asia achieve connectivity with one another and with the world at large.

Despite the economic promise of ICTs, their social benefits may not emerge immediately. According to a preliminary estimate prepared by the Center for Knowledge Societies – Bangalore, the immediate impact of ICT projects upon their rural contexts will be far from equitable. Rather, ICT

access is likely to increase socioeconomic opportunities for dominant caste landholding elites, relatively disprivileging non-elite non-landholding artisanal communities. There are several reasons for this:

(i) *Access to Capital Resources*: Landholding groups always have access to capital in the form of land, which they can sell to start a business, move to the city, rent, etc. Even if they keep the land, their agricultural incomes will always be higher than the non-agricultural incomes of landless groups.

(ii) *Literacy and Education*: Dominant caste agricultural communities tend to have higher literacy and education levels relative to disprivileged artisanal groups. Moreover, there are many young men and women, who may have completed secondary school, or failed out of college. Members of this class are likely to be the first beneficiaries of ICT-driven rural education, training, and employment opportunities.

(iii) *Social and Educational Access*: Dominant caste landholding communities are often organized through their caste associations and other socioreligious institutions. These institutions have sometimes founded schools, hospitals, hostels, colleges and even professional schools. Non-elite rural communities lack these kinds of social networks and access to social, intellectual or financial capital, and will therefore find it more difficult to take advantage of rural ICT networks.

(iv) *Agricultural Technologies*: States like Karnataka and Andhra Pradesh are racing to develop Agri-biotech and Agri-infotech policies and projects, in order to demonstrate that emerging technologies can actually help rural communities. All of these technologies will only serve to further advantage rural elites who have significant landholdings and enjoy an agricultural surplus.

The net effect of all these factors will be that most of the new entrants into South Asia's middle classes will come from rural landowning communities. Artisanal groups, Dalits, Adivasis and other disprivileged groups will be relatively disabled from taking advantage of the opportunities offered by rural connectivity. In fact, these groups may be further discriminated against (i) directly, through harassment or impeded access to networked facilities, (ii) indirectly, on account of the cultural, institutional or otherwise embedded prejudices of the hardware, software, or services offered.

One solution is to guide market forces such that they work against direct social or communal discrimination due to neofeudal village socioeconomic relations. This possibility might be best illustrated through a counter-example: A village computer is set up in a dominant caste household. The project is designed in such a manner as to expect zero financial returns on this equipment. The family is never taught to charge visitors for telephone or computer access. They therefore begin to think of the machine as their private entitlement, and prevent Dalits from entering the center or using its facilities. In a fracas prompted by this discrimination, some of the machinery is damaged and the center is closed down. Similar examples are to be found all across the subcontinent, from Punjab to Tamil Nadu.

What do we learn from this case? (i) Setting up public access devices in private homes is a poor idea. Like temples, shrines and sacral spaces, private residences are highly gradated spaces where some social differences are immediately marked. It is far preferable that rural information centers be located in retail or market environments, where social differences are less accentuated. (ii) Charging for access and for various online transactions and services creates value for both provider and user. It allows them to enter into an economic relation such that the provider seeks to maximize computer access, allowing the profit motive to supercede hierarchy or communal difference.

Indirect social discrimination is more difficult to address, as the elite and urbane personalities who often design rural ICT Projects are likely to encounter and work with rural elites when they visit the field. This can result in a skewing of priorities in favor of rural elites and semi-elites and against artisanal and adivasi communities in the same area. In one project, members of adivasi communities rarely visited information centers, even though they comprised upto 40% of the project population. This was not only due to their relative economic impoverishment, but also because the available services were more precisely calibrated with the cultural assumptions and economic needs of local Dominant Caste and Bahujan communities.

No immediate solution presents itself for asymmetries caused by economic disprivilege. Nevertheless, it is possible first of all to ensure that these are not compounded by sociocultural discrimination, and secondly to plan for the

expanded use of rural networked resources by lowering costs as soon as economies of scale and network effects emerge from an increasing subscriber base.

It is of the utmost importance that rural ICT projects be carefully designed with a view to enabling and including the very rural non-elite non-agricultural communities which are most likely to be left out. *Information Design*, which encompasses everything from the pattern of the sweater worn by the kiosk operator, to the architectural space of the information center, to the hardware and software design, to the content, language, accent and fontography of audiovisual interfaces, to the very services which are available at the center, together make the critical difference between inclusivist, empowering projects and exclusivist, elitist information centers. Funding organizations and policy makers can encourage innovations in Information Design by stipulating that their projects routinely undergo socioeconomic impact analyses by specialist external agencies that have demonstrated their understanding of rural socioeconomic relations, and the potential impact that ICTs may have upon them.

For Future Digital Development

As indicated in the sections preceding, non-elite, rural, artisanal and adivasi communities of South Asia do not and will not use information and communication in exactly the same ways as industrialized nations elsewhere in the world. In order to find ways for emerging technologies to truly benefit these groups we must invent and innovate from the ground up, working always in partnership and dialogue with local communities. Far from replicating the online behavior of highly connected and cosmopolitan societies in North America, Europe, or South East Asia, therefore, digital development in India requires us to design products, services, and technologies that solve very local problems and ameliorate local socioeconomic conditions.

Digital development affords a new perspective from which to imagine the future direction of India's political economy. Rather than remaining locked in the paradigm of an eternally *developing nation*, it now seems possible to aspire to becoming a *knowledge society*. Should India become successful in achieving such an empirical and epistemic shift, this could eventually serve as a model for other emerging economies around the world. Before this

can begin to happen, however, mutual realignments among the major estates of society – the state, private enterprise, academia, civil society organizations and global state agencies. Moreover, public discourse and policy debate must proceed from a new perspective, which recognizes emerging technologies as a profoundly important resource for public practice.

This vision can be achieved in many ways, but most easily through the *direct perception* of the world changing around us. I recently surveyed a semi-arid district in Rajasthan, and was surprised to discover a spate of new computer training centers: NIIT, Aptech, SSI, Compucom, MAHE, MICE ...the franchised outlets seemed to go on and on. We finally guesstimated that there were about 100 computer-training institutes in this sparsely populated district, which might fall in the bottom quarter of human and social development rankings across India. All of these training centers were self-financing, and indeed, had been set up with an express profit motive. These centers reported high enrollments and placements, despite the near total absence of reliable connectivity all across the district. We also enumerated other existing institutions that could be computerized, or where information kiosks could be located: we counted 1500 sites including medical stores, village cooperatives, gram panchayat offices, mandi yards, and secondary schools, among others. There should be no doubt in any policy-maker's mind that there is a strong demand for network connectivity in rural India, and that the institutional infrastructure to make use of it already exists.

Some of the arguments against information-oriented development reflect the fears and anxieties of our own elite, not all of which is computer literate, of which only a few really understand the socioeconomic ramifications of information technology. Many recoil against the idea of digital development not only because the technology remains alien and intimidating to them, but also because they cannot abide the thought of their social inferiors achieving a literacy that they have not. While there are only a few who would openly oppose empowering information resources because of the threat to their social privilege, such hierarchical ideologies sometimes lurk under the surface of apparently utilitarian objections to information-oriented development.

These ideologies are refracted in different ways through agents in different estates of society.

Representatives of activist NGOs and peoples' movements initiated in the 1970s, for example, appear excessively suspicious of the role of private capital in driving technological development. They have not always had the opportunity pursue online cooperative models, such as internet advocacy and discussion groups, freeware, Linux and open source technology, or any of the other challenges to technological monopolies that have emerged through the network revolution. Unfortunately, it is the social expertise of the NGO sector – including their knowledge of village economics, social hierarchy and gender asymmetries – that is most needed to ensure that rural ICTs function in ways that are maximally empowering and socially equitable.

At every public conference, trade show and media opportunity, scions of major Indian corporate houses dilate on the empowering effects of IT and its role in alleviating poverty. These homilies are rarely, if ever, backed up either by profit-driven infrastructure projects in rural areas, or by indirect philanthropic contributions. India's social sector and grassroots activists will therefore be forgiven for doubting the commitment of the IT sector, and large corporates in general, to actually achieving rural development and economic empowerment. Nevertheless, by working in collaboration with academia and the NGO sector, I believe that venture capital can be invested for the creation of social infrastructure that can drive further growth. In this way, the corporate sector can serve the public good while also developing large markets for hardware, software, and connectivity in rural India. It is more and more plausible that social investment projects – which seek financial as well as social returns on their investment – are the swiftest way to create economic prosperity and social empowerment across rural India.

When I began estimating the potential impact of ICT projects in rural South Asia, I'd guessed that the three large southern states, Karnataka, Andhra and Tamil Nadu, would take the lead in bringing networked technologies to rural areas. As it has turned out, only Tamil Nadu hosts any rural ICT projects, and there too it is the non-governmental and private sectors that have initiated and driven these projects. By contrast, the state governments of Maharashtra and Madhya Pradesh have undertaken such initiatives, while Rajasthan, Chattisgarh, and Uttaranchal governments have similar plans afoot. On preliminary evidence, therefore, it appears that states with the most developed IT sector are lagging behind

governments with no local IT industry. Another indication of this divide is to be read out from between the lines of different state governments' IT policy statements: while the three southern states (alongside Delhi and Haryana) are better prepared to attract multinational investment, some of the progressive states in the Hindi belt have produced excellent policy documents that very effectively outline the governments' plans for rural connectivity, e-governance, e-education, and all round e-development. It is not all that difficult to explain this conundrum: the work profile of the IT-Secretariat, in an IT-rich state is very different from its counterpart in an IT-poor state. The former must attract investment, sell the state at road-shows in the US and Europe, liaise with CII, TIE, NASSCOM and other industry groups, plan and host tradeshows, and even promote Biotech as the next wave. The latter, on the other hand, has only one mandate for the moment: computerize the state machinery and leverage IT to the political advantage of the incumbent government.

Civil servants at every level, in my experience, are actually more curious and engaged with the possibilities of e-governance than is commonly believed. As with any other social sample, of course, particular members of the bureaucracy display far greater ability to respond and adapt to changing technology than others. Any developmental ICT project that involves the state apparatus will therefore be subject to not only to the variable aptitudes of the officers concerned, but also to the vicissitudes of cadre politics that rattles officers around into wildly disparate job descriptions without warning. The profile and prerequisites of the managing director of a state IT Public Sector Undertaking (PSU) for example, has little in common with that of a district collector.

In the mid-eighties, Rajiv Gandhi's flawed solution to the problem of computer illiteracy in the bureaucracy was to post District Information Officers (DIOs) in every district and State Information Officers (SIOs) in every state, all reporting directly to the centrally controlled National Informatics Center. This had the effect of creating a new caste of officers who are effectively outside the control of the state administration, who sometimes seek to monopolize information access within their office, rather than disseminating it more widely into the administrative machinery of their district. More often than not, the DIO is still the only government officer at the district level with an official email address.

