

Information nodes in the rural landscape

This article critically examines digital development in order to reveal the larger impact that ICTs could have on rural economies and societies, it goes further to identify *Information Kiosks* as the most effective vehicle for digital development.



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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.ⁱ

“... 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.ⁱⁱ

“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.ⁱⁱⁱ

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 three years, 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.

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 in-



formation, 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).^{iv} 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. Although, this article begins by critically examining the problems and possibilities of digital development in order to reveal the larger impact that ICTs could have on rural economies and societies, it goes further to particularly identify *Information Kiosks* as the most effective vehicle for digital development.

Emergence of Information and Communications Sectors

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 10 million Personal Computers (PCs; Pentium I or superior), it houses the largest number of software professionals outside California, whose efforts have resulted in the export of software worth more than 10 billion dollars, much of it to the United States.

The initial euphoria surrounding India's successful software export industry has now 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 eGovernance for making the state machinery more responsive and sensitive to citizen needs at the district and panchayat level. These policies are being emulated at the national level through an 'IT for the Masses' policy statement. Neighbouring 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 3 today (compare with China at around 11). Voice over Internet Protocol (VoIP), and Wireless-in-Local-Loop (WiLL or WLL) technologies, however, now appear set to offer cheaper and lighter forms of telecom infrastructure that should improve rural access exponentially. The idea of non-elites using and benefiting from ICTs has begun to gain currency with the number of cell phone users rising to 15 million Indians. Nevertheless, the export-oriented software industry has yet to take full advantage of the opportunities presented by the newly networked home market. A new synergy be-



Kiosk set up for community narrowcasting in Pondicherry by the MS Swaminathan Research Foundation

tween the infotech and telecom sectors in India could create a profound social and economic revolution in rural communities across South Asia.

Technology driven social change 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 / software / 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 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) 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. Mesh networks could prove to be the next enabling and disruptive form of connectivity, allowing few to few interactions that would completely bypass telecom networks.

(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.

Introduction to information kiosks

Many analysts and practitioners agree that the possibilities of digital development hit the rural landscape at the site of the information kiosk. We understand the term Information Kiosk to refer to multifunctional and networked installations at rural locations in developing environments that seek to use Information and Communications Technologies (ICTs) to bring new access to content and services to rural citizen-consumers. Such installations have been variously termed Telecenters (Harris 2003), Knowledge Centers (Balaji et al 2002), Community Information Centers (HP 2002), Information Centers (Rajora 2002), and Information Kiosks (Jhunjhunwala 1999; Sood 2001).

In Jhunjhunwala's terms (2003), they 'accumulate demand,' by providing a range of services – in health, education, governance, infotainment to name a few – at a single location. Conversely, information kiosks also ensure that the same hardware

*Soochak at the Gyandoot
Soochanalaya*



Photo © CKS 2003

and connectivity costs are distributed across a large number of rural users, thereby reducing the per capita costs of such access (Sood 2002). Kiosks have the potential to transform the economics of building institutional infrastructure in rural areas of the developing world by providing remote access to institutions that may be located in larger towns nearby. They thus have the potential to transform the biggest problem of rural political economy – the distribution of small populations across large areas – by ensuring that a single resource is distributed across an increasingly large number of users. Maclay and Best (2001) have also argued that information kiosks can bring the ‘Metcalfe Effect’ to bear on the rural countryside, by increasing the connectedness of diverse parties transacting with one another over long distances. The Indian state has repeatedly asserted that such information centers can improve quality as well as access to government services. And several kiosk implementation agencies have attempted to reduce the ‘noise’ in rural markets by providing information on the pricing of agricultural commodities. The information kiosk has thus become a new *topos* for diverse discourses on rural economy, society and politics, while also emerging as the most likely site for the installation of new kinds and scales of hardware and software commodities specifically designed for non-traditional users.

Kiosks can also be used as optics to collect data about rural areas, and to monitor the delivery of goods and services to populations served by them (Sood 2003). This potential benefit of information kiosks has received much less attention, either in theory or practice. When perceived in this way, we begin to see information kiosks as a node along a larger networked landscape that collects, manages, distributes and organizes information in ways that may be visualized or represented in new ways, either within that landscape or without, for planning, monitoring, evaluation, or for the purpose of any other strategic intervention. Such management, dissemination and visualization of information or information-based services, furthermore, vastly enhances equity within the system, while also increasing transparency and accountability. In this way, rural

kiosks can become part of larger informational flows that result in virtuous cycles that can accelerate and transform the very ways in which rural societies are conceptualized, administered, and empowered. Kiosks could prove to be the touchstone that transforms an underdeveloped rural countryside into an intelligent landscape newly self-aware of its own possibilities and needs.

Critical review of secondary research

Much of the discourse surrounding telecenters remains focused on formulating appropriate public and international policy. Large hypotheses regarding their benefit to underdeveloped communities remain to be substantiated by sufficient field research data. And while an abundance of discussion on field research methodology is to be found, principally sponsored by the IDRC, more sophisticated analysis of cultural values, communicative pattern change and informational mapping remain to be conducted by new groups of researchers whose primary objectives are not merely the programmatic and pragmatics of telecenter sustainability.

Although most reports from the field take on the character of limited monographs which do not then compare experiences of one project to another (Benjamin 2001, Mayanja 1999), important exceptions may also be found. Peter Benjamin (2000), for example, provides a multisited comparative study, which focuses on Africa. Meddie Mayanja (2000) expands the concept of sustainability, bringing in training, human resources, and credit line components in Africa. Scott Robinson’s (1998) analysis of the telecenter movement in Mexico indicates that telecenters may not be readily promoted as official development programs due to political restrictions of postcolonial regimes in bringing information to public access. Proenza, Montero and Bastidas-Buch (2001) compare some of the main telecenter experiments in Latin America with particular reference to Central America and the Caribbean. Harris has written and traveled widely. R.W. Harris, A. Kumar and V. Balaji discuss financial and operational issues. Theirs is a case study approach, with particular attention being paid to how different modes of sustaina-

bility-financial, organizational, and community-acceptance, relate to each other. V. Balaji’s study of an information center project in Pondicherry attempts an assessment of technology, training, user patterns, divergent use of media, content and services, as well as gender. There is also some user need analysis. Jhunjhunwala (1999) extensively discusses cost and technology as well as operational issues, business planning, and ownership structures.

Roman and Colle (2002) make an important distinction between cybercafes and internet kiosks. Our own field experiences would strongly support this conclusion: information kiosks are delivery platforms for content and service applications that are truly needed in the rural environments. It is only through the efficient delivery of these services that the kiosk operator is actually able to earn revenue and turn profit. In order to achieve a state of providing maximal content services, it is important to establish partnerships with relevant service providers. Our research has spent many hours in the field painstakingly identifying potential partners in a project for providing locally relevant content in areas such as healthcare, livestock management, agricultural counseling, parcel delivery services and local governance. Such tie-ups would enable maximizing the provision of content services in kiosks and in turn improve their viability, sustainability and even profitability. Roman and Colle also call for a continual and multidisciplinary research attempt to benchmark information centers needs to be multidisciplinary. Analysts from fields as diverse as Right to Information, Organizational Strategy and Planning, GIS, Ethnography and Interface Design must collaborate to develop self-sustainable and self-replicating model for information centers.

Sundeeep Sahay (1997) notes a clear shift in IT research away from the functionalist perspective which believed in the seamless transferability of a given technology from one location to another, to the present acceptance of the fact of how social and institutional context must be seen as constitutive of the information center. He further elucidates the ways social space is constructed: i.e. its inflection both by its temporality as well as the social forces

of geography, location, relationships of distance, as well as relationships of domination – a variable power structure that is often not modeled into an analysis of sustainability. In this context, he also discusses GIS as misleading in its illusion of the control of mapped space.

Shirin Madon's prescient (1992), studies in detail an early program intended to increase the efficacy of decentralized administration by using computerized rural information data. The significance of her approach lies in its detailed study of the unfolding in institutional terms of what this computerization effectively means. Institutional issues of training, monitoring and evaluation, are discussed, and the thrust of her critique is that the effectivity of the program is ultimately shaped not by the intentions and processes formally laid down for the program, but rather the more prosaic difficulties of dealing with "intractable rural issues" like the lack of a methodology to, for example, i) justly identify beneficiaries ii) set reasonable targets iii) carry out an updated village or household survey. Madon's chief insight is the divide between institutional/program and extra institutional/rural field flows. This points to the need for a multi disciplinary understanding of the kiosk as existing in an organic relationship of both provider (of content and services) and interpreter/data collector of the rural world. Informal flows may be seen less as an institutional aberration and more as a lack of insight into rural praxis, and needs. This is a gap that research needs to fill in its quest to mark out the contours of the intelligent, reflexive landscape.

Types of kiosk installations

In order to create a working definition of a telecenter or information kiosk, we built on Gomez, Hunt and Lamoureux (1999), who provided the first effective typology of telecenters. The authors identify 5 types of centers: Cybercafes, Basic Telecenters, Telecenter Franchises, Civic Telecenters, and Multipurpose Community Telecenters. Cybercafes and Basic Telecenters appear very similar to one another, differing only in the extent to which a communitarian, collective, or developmental aspect is to be found in the installation, and extent to which it actually caters to unders-

erved groups. Effectively no organized content or service options are to be found therein. Telecenter Franchises operate as entrepreneurial installations tied to a central coordinating agency. No special support or content service options are assumed. Civic Telecenters are located within existing public institutions, such as libraries or universities, and may offer public access. Multipurpose Community Telecenters, on the other hand, are the most highly developed genus of the species, offering specialized services such as telemedicine and teleducation in addition to direct access.

Our own typology, however, requires only four grades: Cybercafe, Telecenter, Monologic Kiosk, and Information Kiosk. Individual entrepreneurs set up Cybercafes (CC) without any connection to a state or development agency. Communications services are the principal source of revenue, whether via voice, data, paper, fax, typing or any other means. Abundant examples of this kind already exist in urban as well as rural areas of India. Telecenters (TC), however, are tied into some kind of developmental agency, and are beholden to them for the services and activities they engage in. The M. S. Swaminathan Village Knowledge Centers, and the Dhan Foundation kiosks in Melur Madurai may be recognized as Indian exemplars of this type. Monologic Kiosks (MK) offer only one kind of service to only one kind of transaction partner, and may or may not offer Internet access to these select individuals. The Bhoomi Project installations and the various ITC installations, including E-Chaupal, Soy-Chaupal and Aqua-Chaupal all serve farmers, providing them either with land records, or online agricultural services. They do not, however, service the wider community in any way, nor provide multiple kinds of services. True Information Kiosks (IK), on the other hand, seek to offer basic communications services in addition to a range of different kinds of content and services that benefit diverse groups within the local community.

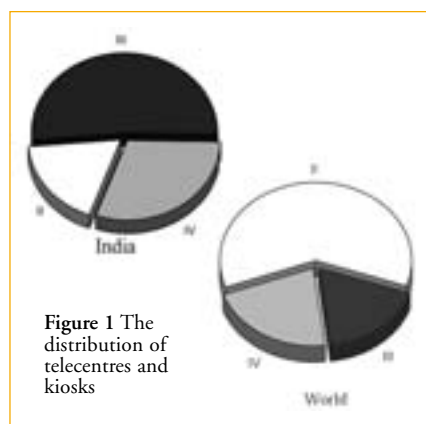


Figure 1 The distribution of telecentres and kiosks

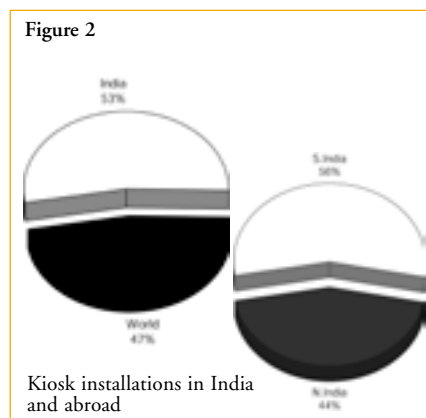
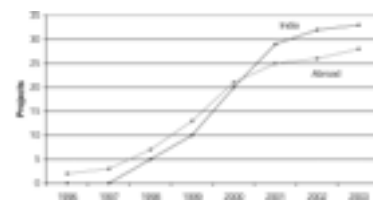
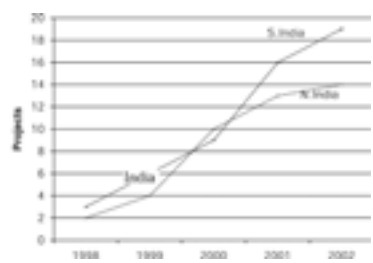


Figure 2

Kiosk installations in India and abroad



Trend of growth of kiosk installations in India and abroad



Trend of growth of kiosk installations in India

Name	Type	Short	Network Agency	Services Offerings
Cybercafe	I	CC	Individual Entrepreneur	Commercial Internet Access
Telecenter	II	TC	Developmental	Basic Communications Services
Monologic Kiosk	III	MK	Private (or) Public	One Type of Service
Information Kiosk	IV	IK	Multi-sectoral	Range of Services

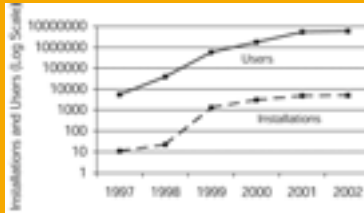


Fig 3: Trends of installations and ICT users

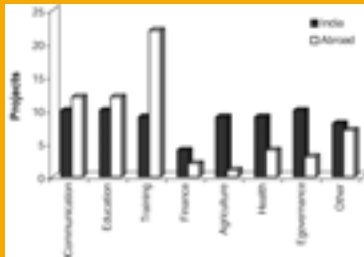


Fig 4: Focus areas of the ICT projects

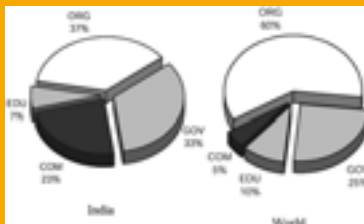


Fig 5: Role of different sectors in ICT projects

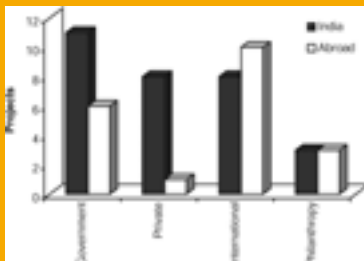


Fig 6: Role of different sectors in ICT projects

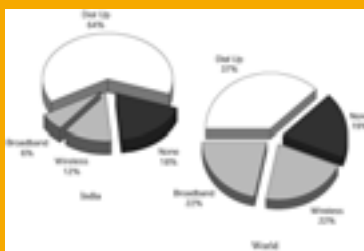


Fig 7: Distribution of various technologies used

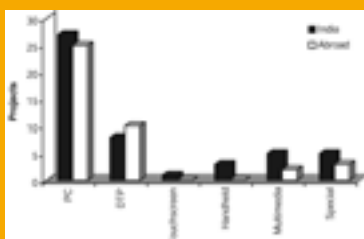


Fig 8: Usage of various hardware and peripherals in kiosks

The two pie charts in Figure 1 depict the distribution of Telecenters and Kiosks among the last three of the four typological categories that we introduced above. Whereas Monologic Kiosks are most abundant in India, they represent only a quarter of international kiosks. This also reflects the relatively poor involvement of the private sector as well as government agencies, which would actually provide such single axis services. Nevertheless, it is notable that there appear to be about a comparable proportion of true Information Kiosks in India and abroad.

Analysis of findings

As part of this research program, CKS staff conducted desk and online research on Telecenters in India and around the world. This section presents preliminary findings from 63 projects. While we have made every effort to ensure that this search is exhaustive, there may be more international projects than we have been able to document. Future research at these kiosk locations might allow us to more effectively benchmark the management and planning of kiosk installations.

Regional Findings

Over half of all kiosk initiatives are located in India, with others spread throughout other developing-country regions such as Africa, Latin America and Southeast Asia. The trend of growth, moreover, seems to indicate that kiosk installation projects are actually growing more quickly within India than in the rest of the world combined!

Even within India, CKS analysis reveals that projects are concentrated more towards South India, which includes Andhra Pradesh, Karnataka, Tamil Nadu and Kerala. The rest is sparsely distributed across north India, particularly in Maharashtra, Gujarat and Madhya Pradesh. The growth trend also indicates a quicker rise of kiosk installations in the southern states (see figure 2).

Installations and Users

We estimate that no less than 5.7 million (57 lakh) non-elite or rural citizen-consumers benefited from ICT-enabled projects actually documented within our database. Figure 3 should not be confused for an estimate of rural internet usage,

which could be smaller or larger – our statistic records rural or non-elite individuals who were actually involved in an IT-enabled transaction mediated by a computer operator, plus students of any age who might have received some on or off-line training or education with or through a computer. We record a little over five thousand such computer installations for educational, public, or developmental use across South Asia. We expect this number to grow geometrically for the remainder of the decade. We expect that this will be possible on account of a range of new connectivity solutions, coupled with new hardware created for local conditions, especially in the ‘CC’ or community computer (multiuser) mode, as well as the new availability of Indian language operating systems and applications.

Content and Services Offerings

Kiosks outside India, tend to focus on education and training, while those within India appear to offer a more diverse set of content and services (see figure 4). This too appears to indicate that India is far ahead of other developing regions in the world in terms of the networking of its rural landscape.

Implementing Agency and Funding

As shown in figure 5, India’s private sector is more aggressively involved in kiosk installations, than elsewhere. NGOs have a primary role in both cases, but govern an absolute majority of projects outside India.

From figure 6, it is notable that the Indian government has a hand in several projects, while international governments are less so.

Enabling Technology

Projects outside India appear to be using broadband and wireless technologies more than installations in India. Several international projects appear to have been set up as pilot or demonstration initiatives, which do not achieve sustainability due to high connectivity costs (see figure 7).

The final bar chart in figure 8, represents the use of special kinds of hardware and peripherals at kiosk installations. No appreciable difference between the Indian and world case is apparent.

Grounding Future Research

It would appear the installation of many new information kiosks in the rural Indian countryside should be a cause for some excitement, and we should be enthused by the fact that the Indian ICT4D climate appears to be excelling other developing country contexts. But many serious questions remain, first about the sustainability of kiosks, and second about their actual social and economic impact. Finally, we would like to know how to transfer technical as well as developmental expertise built up in India to other parts of the developing world.

If our preliminary data is correct, kiosk installations in India would appear to be more viable than those elsewhere in the world, on account of the diversity of content and service applications that are actually routed through them. This statement reflects first that there are more Type III or Monologic Kiosks, and that they offer many kinds of content and services, albeit in a distributed manner, one kind for e-governance and another for health for example. Unlike most kiosks elsewhere in the world, a majority of kiosks in India are actually designed to offer particular services to narrowly defined groups of users, a fact which enhances their viability and sustainability for the long term. At this point several scenarios may be imagined for the further growth of kiosks. For example, monologic (Type III) kiosks might evolve into multifunctional (Type IV) kiosks. Alternatively, multifunctional kiosks might grow independently of monologic kiosks. Thirdly, in areas of high connectivity multiple types of kiosks might co-exist with one another, providing a rich matrix of semi-institutionalized content-service functionalities as well as multiple points of direct online access.

At this point we are at a very preliminary stage of our ability to comprehend the complex ways in which kiosks will shape their environments, even as they are defined by their existing contexts. We believe that the collection of data organized in spatial or geographical terms can help us track these transformations, as they occur over time. At several locations in India, we therefore hope to be able to track these changes in the kiosk as well as the community over time, in order to test ex-

isting hypotheses regarding the emergence of wealth effects owing to the activities and transactions made possible by kiosk networks.

The achievements of kiosk based initiatives within India can only be brought to an international scale through the detailed documentation, research and benchmarking of existing initiatives, alongside careful social profiling and social research activities conducted at those sites. The I4D expertise, in other words, that India already enjoys in the *implementation* must be abstracted into research and strategy, so as to

guide future cycles of installation. In this way, we believe that India's early advantages in the I4D sector can be reinvested in the growth of this sector around the world.

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Footnotes

- ⁱ <http://www.microsoft.com/billgates/speeches/2000/10-18digitaldividends.asp>
- ⁱⁱ <http://itformasses.nic.in/visitformasses/page1.htm>
- ⁱⁱⁱ *Outlook Magazine, April 23, 2001*
- ^{iv} *As above*