.in

India

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Total population	1,134.4 million
Literacy rate	61% (male = 73%; female = 48%)
GDP per capita PPP (in USD)	USD 2,700 (2007)
Computers per 100 inhabitants	2.76
Mobile phone subscribers per 100 inhabitants	19.98
Internet users per 100 inhabitants	17.11
Domain names registered	200,000 (as of December 2007)
Broadband subscribers per 100 inhabitants	0.22
Internet domestic bandwidth	19–20 Tb total installed bandwidth capacity and 500–700 Gb lit-up capacity
Internet international bandwidth	27,000 Mbps (2006)

(Sources: OpenNet Initiative 2007; TRAI 2007; UNDP 2007)

OVERVIEW

India continues to extend the reach of digital technologies across the country and its performance in information and communication technology (ICT)-related fields. Information technology (IT) is a core indicator of national growth, while ICT has become an important tool in community-oriented development programs. The most impressive news to date is the 2009 launch of the '100,000 Common Service Centres' project in more than 600,000 Indian villages. The project aims to deliver basic information and digital content-based products and services to local populations.

There are now over 100 million PCs in the country, which translates to a PC penetration rate of 3 percent. According to International Telecommunication Union (ITU) estimates, India is set to surpass higher telecom targets within the next 4–5 years.

The domestic ICT market continues to expand. For instance, the aggregate revenue of the IT business process outsourcing (BPO) sector is expected to grow more than 33 percent to touch the USD 64 billion mark in 2008. The IT and IT Enabled services (ITES) sector has increased its contribution to the country's Gross Domestic Product (GDP). There has also been a spurt in investment and manufacturing activities with major IT entities like Ericsson setting up a Global System for Mobile communications (GSM) Radio Base Station manufacturing facility in Jaipur. In addition, Google has launched short message service (SMS) Search in India, allowing mobile users to get search results by sending text messages to the company.

The government spurs ICT development through various policy instruments, including the National e-Governance Plan (NeGP). There is a special focus on ICTs in education, with two rounds of inter-ministerial meets held to discuss a national ICT in education policy. Furthermore, the demand for local content in local languages is on the rise. Media content in 18 Indian languages is now available and special measures like international domain names in Hindi, Tamil, Malayalam, and other Indian languages have been launched. A major breakthrough is the Community Radio Policy framework announced in November 2006 permitting non-government organizations (NGOs) and other civil society organizations to own and operate community radio stations. About 6,000 community radio licences will be on offer across India by 2012.

However, various challenges remain for IT and ICT development in India. In the 2007 World Economic Forum (WEF) ranking of most networked economies, India ranked 50th, four places below its previous ranking. There are enormous geographic and demographic divides in ICT spread and usage, as well as lack of a strong and sustainable ICT infrastructure and weaknesses in the legal and regulatory environment for ICTs.

TECHNOLOGY INFRASTRUCTURE

According to the Telecom Regulatory Authority of India, the total number of wireline and wireless telephone connections reached 316.97 million at the end of May 2008, from 218.05 million in May 2007. The overall teledensity as of May 2008 was 27.59 percent. Also as of May 2008, the mobile/wireless penetration had reached 277.9 million. Broadband subscription reached 4.5 million, almost double the 2.46 million in May 2007.

In broadcasting and cable services, the maximum number of free-to-air (FTA) and pay channels being carried on the cable networks is 103 and 95, respectively. Apart from All India Radio,

there were 177 FM radio stations in operation as of 31 December 2007. Twenty-eight community radio stations were in operation out of 47 licencees at the end of March 2008.

The 11th Five Year Plan (2007–2012) lists several telecom infrastructure targets, as follows:

- a telecom subscriber base of 575 million, with one phone for every two rural households by 2010, to reach a rural teledensity rate of 10 percent from the present 1.9 percent;
- twenty million broadband connections and 40 million Internet connections by 2010;
- broadband connection on demand across the country by 2012;
- 3G services in all cities/towns with a population of more than 100,000; and
- broadband connectivity for every school, health centre; and Gram Panchayat (a local unit of government).

KEY ICT INSTITUTIONS AND ORGANIZATIONS

There are nationwide initiatives from government, private, and civil society organizations to reach the masses using ICTs. Many government departments and ministries, like the Department of Information Technology (DIT) at the federal level and in states like Jharkhand, Bihar, Kerala, Uttarakhand, and Gujarat have created independent organizations and companies to ensure the smooth implementation of ICT projects in partnership with private companies and local civil society organizations. On the other hand, companies like Tata, Intel, Microsoft, IBM, Wipro, AirTel, Hughes, Vodafone, and Infrastructure Leasing and Financial Services Limited (IL&FS) have gone pan India to offer content and services in education and governance. Many big companies are investing heavily in the social sector through the creation of not-for-profit organizations that bid for and implement government-funded projects. Some government, private sector, civil society, and international organizations engaged in ICT initiatives are mentioned below.

Media Lab Asia (www.medialabasia.org) is a not-for-profit company promoted by the Ministry of Communications and Information Technology. It spearheads ICT for development (ICTD) projects, the latest of which is Punarbhava.in, an interactive Web portal for the disabled. Underpinned by a vision for digital inclusion, the portal enables persons with disabilities to locate information, aids and appliances; engage in research; discuss issues; network with others; and scout for jobs. Another Media Lab Asia initiative is Gyanpedia (http://www.gyanpedia.in), a collaborative and interactive portal for learning communities. A joint effort with the Digital Empowerment

Foundation (see the following paragraph), the portal provides an open Web platform for learners through which they can share multimedia content in various learning areas (e.g. biology, chemistry, mathematics) using a bottom-up framework.

The National Knowledge Commission (NKC, http://knowledgecommission.gov.in) was established by the prime minister of India in 2005 as a think-tank focused on policies to sharpen India's comparative advantage in the knowledge-intensive service sectors. It advises the Office of the Prime Minister on policy and reforms related to education, research institutes, and intellectual property legislation, as well as the development of appropriate institutional frameworks to enhance governance and improve connectivity.

The Centre for Development of Advanced Computing (C-DAC) facilitates high-end research in science and engineering of high performance computing support to users. It also builds capability in emerging applications of grid infrastructure for global competitiveness.

The Controller of Certifying Authorities (CCA) continues to promote the growth of e-commerce and e-governance through the use of digital signatures. The number of digital signature certificates issued is expected to increase significantly with the launch of e-governance programs.

The Cyber Regulatory Appellate Tribunal (CRAT) enacted under the Information Technology Act 2000 has commenced operations. It hears appeals by persons aggrieved by an order from the CCA or by an adjudicating officer under the IT Act.

Infrastructure initiatives are being pursued by several private organizations. Intel for example launched in August 2008 a partnership-based initiative called Connected Indians (http://www.connectedindians.com/). HughesNet has created a network of more than 24,000 ICT-enabled kiosks across the length and breadth of the country to deliver various services to citizens. Companies like Bharat Sanchar Nigam Limited, Vodafone, AirTel, Reliance, and Tata have created a General Packet Radio Service (GPRS)-enabled wireless network providing not only telephone connectivity but also Internet access to the rural areas of India. Companies like Educomp, Edurite, IBM, Designmate, IL&FS Education and Technology Services, and CORE Technologies are also playing a role in ICT-enabled education in government schools.

Among the civil society organizations, Byrraju Foundation is notable for its rural BPO initiative GramIT, which is generating employment for the youth of the state of Andhra Pradesh. The American India Foundation has been working with more than 5,000 schools across 14 states to run ICT labs in government schools. Azim Premji Foundation is a non-profit organization working with more than 14 state governments to integrate ICT at all levels of education.

The Digital Empowerment Foundation (DEF, http://www.defindia.net) aims to promote digital content infrastructure across the board. Some of its initiatives, such as NeerJaal.Org (see 'Digital Content' in this chapter) and Gyanpedia.org (with Media Lab Asia), have been lauded nationally for their bottom-up approach.

Among the international organizations, the United Nations Development Programme (UNDP) and United Nations Educational, Scientific and Cultural Organization (UNESCO) are spearheading the UN Solution Exchange, an online community focusing on development issues and where members try to formulate actionable agendas. As of July 2008 the network had more than 1,400 members. Among the issues discussed are the Common Service Centre scheme, use of ICT in literacy programs, ICT and livelihoods, remote sensing in agriculture, setting up and running community radio stations, e-governance, and the role of ICT in local content creation.

ICT AND ICT-RELATED INDUSTRIES

IDC India reports that India's PC shipment grew by 20 percent from 5.4 million PCs in 2006 to almost 6.5 million PCs in 2007. Of the 2007 total, 1.8 million (27 percent) were notebook PCs. IDC analysts consider this to be an indicator of a maturing IT market in India.

A 2007 National Association of Software and Services Companies (NASSCOM) survey reports that the Indian IT and ITES industry recorded an overall growth of 30.7 percent in 2006–2007, with a total revenue of USD 39.6 billion. The software and services exports segment grew by 33 percent to register a total revenue of USD 31.4 billion in 2006–2007. The industry continued to be among the largest employers in India, directly employing more than 1.6 million and indirectly creating employment opportunities for an additional six million people in related industries. The industry also significantly impacts socio-economic development by contributing 5.2 percent to GDP. The NASSCOM survey projects that the overall IT software and services sector will grow by 24–27 percent and earn revenues of USD 49–50 billion in 2008.

There has also been a spurt in investment and manufacturing activities. Nokia has set up its manufacturing plant in Chennai, LG Electronics has set up a plant manufacturing GSM mobile phones near Pune, and Ericsson has launched its research and development (R&D) centre in Chennai. Microsoft Corp is investing USD 1.7 billion in India over four years, while Intel has announced an investment plan of more than USD 1 billion in five years.

The telecom and IT sector is expected to attract USD 10–11 billion in investments in the next two to three years. About USD 1.5–2 billion of this is expected to go into the telecom manufacturing sector and USD 2–3 billion to the telecom services sector.

The UNCTAD Information Economy Report 2007 notes that world export of information and communication goods is led by China and India. While China tops manufacturing, India leads in software, call centres, and related services.

ICT POLICIES AND PROGRAMS

The National Broadband Policy of 2004 facilitated the adoption of broadband technologies in India.

More recently, in late 2007, the Ministry of Information and Broadcasting issued the Community Radio Policy that allows community radio to be aired on FM radio lines and community radio licences to be issued to any legally recognized voluntary organization that have been operational for at least three years. To date there are more than 100 applications for licences and government and advocacy-based NGOs are looking at 6,000 community radio stations in the next two to three years. For the education sector and the civil society network, the policy coupled with the Right to Information Act is a major step toward empowerment of the masses (see 'Jamsavad Facilitates Governance').

The NeGP formulated by the DIT includes 20 major e-governance projects across eight support components at the central, state, and local government levels. One of the 20 NeGP projects is the Common Service Centres (CSC) project which aims to set up 100,000 CSCs in 600,000 villages to serve not only as the frontend for most government services, but also as a means to connect the citizens of rural India to the World Wide Web.

Another recent major policy initiative was the re-launching of the .IN Registry in January 2005 by the DIT and the National Internet Exchange of India (NIXI). The .IN Internet domain name registration crossed 200,000 in December 2007. Four Internet exchange nodes were set up and made operational at Noida (Delhi), Mumbai, Chennai, and Kolkata.

The Mobile Grameen Sanchar Sewak (Mobile Rural Network Service) Scheme is placing telephones at the doorstep of villagers in about 12,000 villages. As a result, more than 56,400,000 villages now have Village Public Telephones. There are also efforts under the Universal Service Obligation Fund (USOF) to provide support for the setting up of wireless networks in rural and remote areas.

The DIT has also launched a Special Incentive Package Scheme to encourage investments in setting up semiconductor fabrication and other micro and nano technology manufacturing industries in India.

Jansamvad Facilitates Governance

Jansamvad is a weekly radio program used in the Sagar district of Madhya Pradesh as a public grievance redressal mechanism. The program, which is also available on the Web, enables citizens to directly address the government with their grievances and queries. It also gives information about schemes run by the state or central government.

The program was started in December 2004 when the district collector and chosen heads of the district administration participated in a live phone-in dialogue with people of the district. The interactive segment was subsequently scheduled every Monday for one hour on All India Radio. As the grievances aired in the program are sorted out within a stipulated timeframe, the program has become popular among people from all walks of life. The district administration claims that about 90 percent of citizens' complaints through the program have been resolved. Indeed, the program is credited with helping the Sagar district to rank first in the implementation of the national Total Sanitation Campaign.

More information about the Jansamvad program is available at www.sagar.nic.in.

LEGAL FRAMEWORK FOR ICT DEVELOPMENT

The Information Technology Act 2000 (IT Act 2000) is the sole cyber law of India at present. The Act provides for the legal recognition of transactions carried out by means of electronic data interchange and other means of electronic communication — in short, electronic commerce. The Act also provides for the legal recognition of digital signatures.

The draft Communication Convergence Bill 2000 (the 'Convergence Bill') is still being debated. The Bill proposes to establish a new 'converged' regulatory framework to promote and develop the communications sector, including broadcasting, telecommunications, and 'multimedia'. Until the Bill is enacted, however, the Telecom Regulatory Authority of India (TRAI, www.trai.gov.in) continues to be the prime regulatory agency dealing with the legal aspects of telecommunications issues.

A proposed Broadcasting Services Regulation Bill, 2007 seeks to promote, facilitate, and systematically develop the carriage and content of broadcasting to ensure that a wide variety of entertainment, news, views, and information is provided in a fair, objective, and competitive manner.

Meanwhile, the Reserve Bank of India has set guidelines for Internet banking and reviews them at periodic intervals.

DIGITAL CONTENT AND LOCAL LANGUAGE TECHNOLOGY PLATFORMS

The launching of international domain names in Hindi, Tamil, Malayalam, and other Indian languages is boosting the development of digital content in the local languages. Fonts and software to enable development of websites in local languages are being distributed free of charge. At the policy level, government stakeholders have displayed a lot of interest in developing the content required for public services, especially digital content that can be delivered via mobile phones.

The annual Manthan Award (http://www.manthanaward.org) organized by the DEF continues to promote and recognize digital content in the critical areas of health, education, livelihood, community broadcasting, and e-commerce. Beginning 2008, the Award has been expanded to other South Asian countries. When the nominations closed, Manthan Award South Asia 2008 had accumulated 284 nominations. Among the 33 winners across 12 categories, Sri Lanka and Bangladesh snatched at least seven awards. The Manthan Award boasts a network of more than 1,000 organizations from eight countries that are actively involved in digital content and services for the masses. Among recent local content initiatives that have received the Manthan Award are:

- SMSOne (www.SMSOne.in), a social entrepreneurship project involving high school and college dropouts in developing short message service (SMS) as media for communicating public service and community development messages;
- www.odisha.com, the world's first news portal in Oriya, the official language of the Indian state of Orissa;
- Puzha.com (www.puzha.com), an interactive website dedicated to the advancement of the Malayalam language and literature, the development of language tools, and the archiving and preservation of the local (traditional and to some extent tribal) knowledge base and folklore of the southern Indian state of Kerala; and
- www.Raftaar.com, the world's first integrated search engine in the Hindi language, with the largest set of searchable Hindi pages.

Other notable digital content initiatives are:

● the HIV/AIDS electronic helpline managed by the Jaipur-based Health and Social Development Research Centre;

● www.indianblooddonors.com, a Web-based helpline for patients who need blood in an emergency;

● www.bhojpuria.com, an online communication and net-working platform for the Bhojpuri language community, mostly found in Bihar;

● DesiCrew Solutions (www.desicrew.in), which takes BPO job opportunities to the rural masses in Tamil Nadu, thereby introducing livelihood opportunities using computers in villages; and

● www.toeholdindia.com, an e-commerce portal established by ToeHold Artisans Collaborative (TAC) to promote an export-oriented group enterprise owned and governed by artisans in 11 women's self-help groups.

The localization of the India national portal (http://india.gov.in/) is ongoing. The Hindi version of the national portal is already available. However, it is recognized that information or services will have to come from individual websites in the local languages and there are very few of these websites at the moment. Meanwhile, Google.co.in continues to offer content platforms in Hindi, Bengali, Telugu, Marathi, and Tamil.

Neerjaal.org and Local Area Portal (localareaportal.org/) are key community-oriented content projects of the DEF. Neerjaal provides Web-based multilingual information about community management of water resources, while Local Area Portal deals with diverse aspects of community life with the community itself being responsible for generating, uploading, and updating local content for local and global audiences.

ONLINE SERVICES

The biggest success story to date among online services in India is the online sale of almost 5,000 million train tickets in August 2008 by the Indian Railway Catering & Tourism Corporation Limited (IRCTC, http://irctc.co.in/).

The Income Tax Department has successfully allowed tax return filing online for individuals and organizations, while the Ministry of Corporate Affairs (http://www.mca.gov.in/) has gone fully online with the MCA-21, which is envisioned to provide 'anywhere and anytime services to businesses'.

Several new local e-government initiatives have been launched, such as the Government of Chattisgarh's Department of Food Online Paddy Procurement project; Karnataka's Nemmadi e-Governance Secretariat and e-filing of income tax returns; the Nagaland Government's e-Modop (www.emodop.com), a portal and online public grievance redress system; and the cost-effective SMS-based reporting system for tracking livestock health and breeding services of the Orissa government's Animal Husbandry and Veterinary Department.

According to the first comprehensive consumer e-commerce survey conducted jointly by the Internet and Mobile Association of India (IAMAI) and IMRB International, the consumer Internet market would reach an estimated INR 92,100 million (about USD 1,861 million). At the end of March 2007, this segment was estimated to be worth INR 70,800 million, with an average rate of growth of about 30 percent. Convenience and accessibility, as well as improvements in logistics and delivery mechanisms, have also fuelled the e-commerce trend.

Key banks have expanded their online banking operations. While the State Bank leads public sector banks, the ICICI Bank is leading the Internet banking network in the private sector. IDC estimates that there are over two million registered users of Internet banking in India. Although this constitutes only 0.096 percent of the total population, it represents 15 percent of India's Internet user population.

Online services are also provided by naukri.com, rediff.com, sify.com, and indiatimes.com, among others. Whereas naukri.com is about jobs, rediff.com, sify.com, and indiatimes.com are online portals for transactional e-commerce-enabled service providers.

ICT IN EDUCATION AND CAPACITY-BUILDING PROGRAMS

The Information and Communication Technology @ Schools Scheme launched by the Department of School Education and Literacy in 2004 has been extended in the 11th Five Year Plan (2007–2012) to include all government and government-aided schools.

At the state level, the computer-aided learning (CAL) project initiated in mid-2004 in Andhra Pradesh, in collaboration with the Azim Premji Foundation (www.azimpremjifoundation.org) is linked to the '1,000 schools computerization project', a five-year project of the government of Andhra Pradesh. Under the Sarva Shiksha Abhiyan scheme (Literacy for All scheme), the government gives each district INR 5,000,000 to establish CAL centres.

In south India, the Kerala government is revising e-governance and e-literacy efforts through knowledge trans-fer and train-the-trainer programmes. The Government of

Puducherry, for its part, has decided to launch an e-learning program in schools through a project called Smart School System.

The Global e-Schools and Communities Initiatives (GeSCI, http://www.gesci.org), Quest Alliance, Azim Premji Foundation, DEF, and American India Foundation (http://www.aifoundation.org) are the key national-level organizations working in the ICT in education sector. The DEF's Gyanpedia interactive and collaborative portal with Media Lab Asia is a comprehensive, multilingual, dynamic virtual platform for countrywide content exchange among schoolchildren and teachers. The GeSCI is implementing the Rajasthan Education Initiative (REI).

In November 2007, NIIT Technologies, one of the biggest Indian IT companies offering IT education nationally and internationally, announced its strategic alliance with US-based NComputing to help reduce the cost of computing in schools by 50 percent to enable schools across India's cities, towns, and villages to offer computer education to its students at a fraction of the cost.

With the help of US-based IT training community New Horizons and with funding from the North Eastern Council, the Mizoram government in north-eastern India plans to develop the ICT skills of 200 educated but unemployed youth in the coming months. Meanwhile, under its Khulja Sim Sim program, the Delhi government aims to set up touch screen and computer kiosks bundled with relevant content to entice out-of-school children to go back to school. The Confederation of Indian Industry (CII) has urged the state governments and education institutions in India to offer courses in e-publishing.

India's biggest problem is how to provide education to the masses both at the school and vocational and higher education levels. Two government institutions that are leveraging ICTs to solve this problem are the National Institute of Open Schooling (NIOS) and the Indira Gandhi National Open University (IGNOU). The NIOS (www.nos.org) caters mainly to out-of-school children, school dropouts, and the socially and economically backward sector of the learner population. IGNOU (www.ignou.ac.in) is the National Resource Centre for Open and Distance Learning offering sustainable and learner-centric tertiary-level programs as well as skills upgrading and training. Aside from offering online courses, both institutions have put their entire curriculum online.

In a significant move, the second Inter-Ministerial National Consultation on the drafting of the national policy on ICT in school education was held on 12 March 2008 under the aegis of the Ministry of Human Resource Development. The consultation sought to involve various government departments and other stakeholders, including educational institutions, the private sector, experts, State representatives, and civil society, in the drafting of the policy.

OPEN SOURCE/OPEN CONTENT INITIATIVES

Free and open source software (FOSS) is being endorsed for e-governance and digital service offerings by both the government and private service providers in India. The Computer Society of India, a FOSS advocate, has noted that early initiatives in e-governance used multiple technology platforms, resulting in high development costs, maintenance difficulties, lack of interoperability, and lack of sustainability after the original innovator left the project. Thus, state governments and government agencies are shifting to open source. For example, the Kerala Government's IT Policy draft has identified FOSS as a major strategic component in its efforts to build an inclusive information society. Open standards like Open Document Format (ODF), which ensure the accessibility of government data, are also being adopted (see 'Draft National Policy on Open Standards for e-Governance'). However, there is an ongoing debate about ODF in online discussion forums.

In general, the use of open source is gradually changing the dynamics of knowledge creation and distribution in India. For example, Wikipedia has been providing options for open source content in the regional languages. And in a significant move the Council of Scientific and Industrial Research (CSIR) has called for an open source collaborative effort to create medicines for tuberculosis and other diseases so that more affordable drugs can be delivered to the poor.

The latest discussion is to make open source a part of the curriculum in schools and colleges. In the tertiary education sector, the Indian Institute of Technology Kanpur has launched its own learning management system, called Brihaspati, using an open source framework to build e-learning courses and deliver them across wide area networks. The Brihaspati Virtual Classroom is an open platform for learning, based on the java servlets content delivery system.

As part of continuing efforts to develop cutting-edge FOSS, Red Hat India recently announced a Linux Automation Strategy that allows an application certified on Red Hat, which is based on a wide variety of architectures, to run right from x86 to the IBM Z series to the emerging 'cloud computing' platform.

Draft National Policy on Open Standards for e-Governance

The draft National Policy on Open Standards initiated by the Department of Information Technology (DIT) in June 2008 aims to augment e-governance solutions across India by ensuring seamless interoperability of various solutions developed by multiple agencies in this field. The policy requires all new e-government infrastructure and government-to-public systems to conform to open standards that are freely implementable, that conform to domestic laws, and that support localization. Thus the draft policy targets reliable long-term accessibility of public documents and information.

The policy is being commended for being progressive and forward-looking, as it addresses many notions of openness — freely accessible, at zero cost, non-discriminatory, extensible, and without any legal hindrances — thus preventing vendor lock-in. However, it has been suggested that the policy should make explicit that there can be no restraint on use or implementation of the standards. In addition, provisions safeguarding against private companies interfering with the standardization process can be better clarified.

The draft policy is available at http://mit.gov.in/download/Policyonopensandards.pdf.

ICT RESEARCH AND DEVELOPMENT

A number of key R&D efforts in telecoms and IT are taking place in the public and private domains.

A national facility for electromagnetic interference (EMI) and electromagnetic compatibility (EMC) evaluation of electronic equipment and systems has been set up at Chennai. This is the first of its kind in India and the third in South Asia. Moreover, the government has approved a joint project for setting up Nanoelectronics Centres at the Indian Institute of Science in Bangalore and the Indian Institute of Technology. With support from the Development Gateway Foundation of the World Bank, the government is also setting up a research and training (R&T) centre in Bangalore.

Yahoo Inc. has announced a decision to open an R&D lab in India soon. Similarly, Sony Ericsson is launching a new R&D centre in Chennai. Intel has announced an alliance with 16 companies in India to expand its efforts to provide people in developing countries with the benefits of technology through its World Ahead Program in areas like health, education, and rural empowerment. Nokia has also announced fresh investments of USD 75 million in its manufacturing plant in Sriperumbudur, Chennai.

The DIT has decided to set up a Telecom Testing and Security Certification Centre (TETC) for communication security, research, and monitoring.

Media Lab Asia is also engaged in R&D to broaden access to ICT for the masses through such projects as '[Wireless Fidelity] WiFi for Rural Areas', 'Telemedicine', 'ICT for Disabilities', and 'ICTs in Education'. It received the Nasscom Innovation Award 2007 for 'Sanyog', a multilingual (English, Hindi, and Bengali) augmentative communication system for the empowerment of persons with disabilities.

CHALLENGES AND OPPORTUNITIES

India's march toward becoming a powerhouse in ICT is fraught with challenges. There is a perception that the Indian economy as a whole has not benefited from the ICT industry because of the high regional concentration of ICT activity and low diffusion of ICT to other sectors of the economy. The IT and ICT boom is visible only in special regions and locations mostly in southern India, and the concentration of skilled human resources in the IT and ICT sectors is adversely affecting other sectors of the economy. Moreover, there are questions about whether an export-led ICT strategy will enable the fruits of ICT-led development to reach the marginalized. While India needs to tackle last-mile connectivity issues, funding ICT projects outside of the IT sector is a challenge.

There are also cultural and political challenges. Studies show that a purely technocratic approach to development is having a perilous impact on local cultures and ecosystems. It is necessary to ensure equality of access to local content in different places and to enable communication and interaction at the grassroots (see 'CICs Not Living Up to Expectations'). Content creation and delivery is a hurdle. The challenge is how to use ICT tools like mobile applications in service delivery. The language and broadband issues are significant, and the impact of community radio operations will not be apparent until two to three years hence.

The standardization of ICT projects is another major challenge. There is disparity in technology selection, duplication

CICs Not Living Up to Expectations

The Community Information Centre (CIC) program (http://www.cic.nic.in/) was initiated at the behest of the DIT in 2002 for the citizens of eight north-eastern states of India, as a holistic scheme to provide various government, educational, and commercial services like access to computers, Internet and email access, telephone and fax services. Each CIC is a kiosk with 4–5 connected computers, a scanner, a fax machine, a printer, and in some cases, even video-conferencing facilities.

However, a field survey by the authors of this chapter found that most of the 457 CICs are either unused or scarcely used. The CICs are inaccessible to the masses because of their urban location and non-availability of appropriate governance and educational services. In addition, because the CIC coordinators are paid employees, they lack the initiative to entice users to avail themselves of CIC services.

of efforts, and lack of economies of scale. Moreover, there appears to be a lack of interest on the part of policymakers in scaling up successful projects.

Last but not least is the persistent need for adequate ICT infrastructure deployment across the country, especially in remote and underprivileged areas. And education and literacy for millions is critical in ensuring the success of ICT initiatives in the country.

On the other hand, opportunities and the scope to deploy ICT for holistic growth in India are equally apparent. Since most ICTD interventions are still at the pilot phase, attention can be given to their scalability and replication at a higher level. The ground-level success of ICT deployment hinges on continuous innovation, particularly to increase the efficiency and effectiveness of development processes serving the rural economy and society as well as underdeveloped communities. These ICT processes are critical in providing basic information and communication services to the public, improving the efficiency of service delivery, ensuring higher levels of transparency in government, ensuring better and fair prices for produce, serving health and education needs, and enabling people's participation in governance.

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