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India

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Overview

The digital economy of India during 2003–2004 was marked by an explosion in the cellular phone market, a boom in outsourcing, steady Internet growth, media convergence, growth in rural ICT initiatives, benchmarking with China, and (unfortunately) regulatory stumbling blocks. The president of India's software lobby, Kiran Karnik, was featured on the cover of *Forbes* magazine as Man of the Year for 2003; and *Business Week* ran a high-profile cover story on the rise of India, especially its ICT and outsourcing industries. Paradoxically, India still has a long way to go in making ICT widely available to its population. A number of high-profile events have focused on the importance of bringing the fruits of the ICT revolution to a wider user base, especially in rural areas, where most of India's population lives. As a benchmark of economic growth and ICT diffusion, it is becoming increasingly common to compare and contrast the domestic scenario in India with the corresponding environment in China. Unfortunately, regulatory potholes continue to hinder speedy progress on many fronts: private operator interconnectivity, VoIP, and wireless services eligibility.

In the ICT industry, the recent cuts in excise duty on computer hardware and cellular phones are expected to drive domestic demand for hardware in 2004–2005, according to projections released by the software lobby, the National Association of Software and Services Companies (NASSCOM), and the hardware lobby, the Manufacturers Association of Information Technology (MAIT). MAIT reported that PC sales in India during 2002–2003 grew 37 percent to reach 2.3 million units, compared to 1.7 million units sold in the previous year. PCs bought by businesses accounted for 81 percent of total sales and recorded an annual growth of 43 percent, while the number of PCs purchased by homes grew by 16 percent. Locally assembled PCs sold under brands such as Wipro, HCL, Vintron and Zenith garnered a market share of 26 percent (compared to 19 percent the previous year). MAIT projected that PC sales would have grown by 18–20 percent in 2003–2004 to about 2.7 million units.
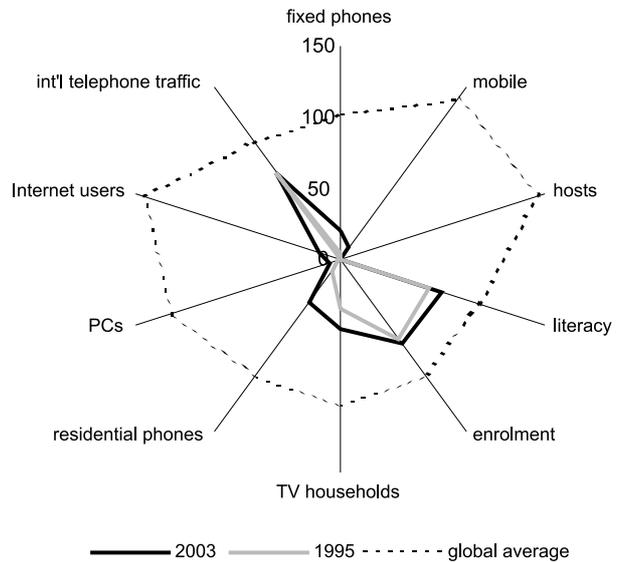
The cellular phone market has been growing steadily since the late 1990s, but in 2003 these new telephones really took off in urban areas. NASSCOM forecasted the cellular phone user base to reach 33 million in 2003–2004 and 49 million in 2005. At the same time, Internet growth has been steady, particularly among youths and business professionals. The total number of Internet users is estimated at around 30 million. The big concern is the looming shortage of international bandwidth, which NASSCOM estimates will exceed 20 Gbps by mid-2005. Prices of international bandwidth are still not on par with those of neighbouring countries. This could throw a spanner in the works for Internet usage and the outsourcing business.

India ranks 37th among the 82 countries covered in the 2003 networked readiness index prepared by the World Economic Forum in partnership with INSEAD and the Information for Development Programme of the World Bank. Finland leads in the index, followed by the USA and Singapore (Rediff.com, 2003).

Software exports exceeded US$7 billion and accounted for 16 percent of the total exports of India. The total IT industry is estimated to be worth US$15 billion and employs over 500,000 technical and managerial personnel.

Wireless explosion

Research firm Gartner projected cellular phone connections in India to touch 56 million by the end of 2004, representing a steep growth of almost 96 percent over the previous year. Driven by the introduction of full-mobility CDMA cellular services and stiff competition among GSM operators, 2004 broke all records for growth in the Indian mobile market (Rediff.com, 2004a). Volatility in the cellular market is expected to continue until at least 2006 as the main operators carve out their future market positions and some other players attempt to establish their niche positions. Samsung and LG enjoy an early mover advantage, working with local operators such as Reliance. Nokia and Motorola have started to make their presence felt in the CDMA market.

In December 2003, the total number of mobile customers exceeded 28 million across the country, according to the Cellular Operators Association of India and the Association of Basic Telecom Operators, with GSM-based operators accounting for about 22 million subscribers and private CDMA-based operators accounting for some 6 million subscribers. Key GSM players include Reliance Infocomm, Bharti, Hutch and Idea Cellular.

According to the Telecom Regulatory Authority of India (TRAI), more than 20 million new telephone subscribers (including land lines) were recorded during the calendar year 2003, bringing the total number of telephone subscribers to around 70.5 million, or a teledensity of about 7 per 100. The average monthly growth of 1.5 million mobile subscribers achieved during 2003 was about 14 times higher than the average rate recorded in the preceding eight years. The minimum effective local call charge for cellular services had declined from Rs 14.51 per minute (for 400 minutes of usage per month) in March 1995 to Rs 0.77 per minute in September 2003.

"A major shift towards mobile telephony is now apparent, where the share of cellular connections in the new connections during April–December 2002 stood at 63 per cent up from 43 per cent last year," according to a TRAI report. This growth has been largely in urban areas. The report reveals that private operators had provided only 7,123 village public telephones by December 2002, against the target of 97,806 in the first three years according to their terms of licence.

The average number of mobile operators per city is six in India, as opposed to two in China, three in Thailand, five in Malaysia and three in Indonesia. This level of competition has lowered tariffs in India, with a 300-minute package costing US$16 as against US$21 in China and US$40 in Malaysia (even with five players jostling for business), according to credit rating firm CRISIL (2003).

Revenue from value-added mobile services such as roaming and SMS had doubled from just 20 percent of the total revenue of cellular operators in March 2002 to nearly 40 percent in June 2003. Prepaid users accounted for 85 percent of the increase. Roaming tariffs are falling, but so is the average revenue per user. Some operators have already been bought out (e.g. Escotel), and further consolidation is expected.

The wireless explosion has also been accompanied by a spectacular growth in SMS-based content services (e.g. news alerts from Indian media) as well as Bollywood ring-tones, entertainment services and competitions (e.g. from Mumbai-based company Mobile2Win, which also offers mobile gaming services in China and the Philippines).

On the WiFi front, key Indian ISPs such as those owned by the Tatas, the Bharti group and Satyam Infoway (Sify) are installing WiFi hotspots in India. Sify has launched a WiFi service in the airports of New Delhi and Chennai for Rs 60 per hour; the company also has WiFi cards available for rental. The Bharti group, which already has broadband DSL offerings, will augment their service with WiFi boxes for Rs 3,000 (US$65). This package is targeted at residential users; other targets include conference and trade show venues like Pragati Maidan in New Delhi. India's version of Starbucks, the Barista café chain, has 15 WiFi-enabled locations in Mumbai and Delhi, thanks to a tie-up with Tata Teleservices, which has a stake in the coffee chain. Tata also plans to target distributor networks and warehouses.

Campuses like those of the International School of Business in Hyderabad and the Indian Institute of Information Technology in Bangalore already offer WiFi access to students. Intel has begun marketing PCs with its wireless Internet chip in India. Data Access is working on seamless migration from WiFi to GSM-based Internet coverage. Systems integrators active in the business include Tulip IT Services and Convergent Data. Some hotels in India like Le Meridien and the Taj hotels already have WiFi installations. The offices of companies like Microsoft and the Punjab National Bank are WiFi enabled.

But hotspots in India numbered at best a few hundred as of late 2003. Government rules also do not encourage wide-range WiFi deployment. And business models for revenue sharing are still being worked out. Yet, further growth is expected in 2005. Cisco expects that the fastest-growing markets in the Asia-Pacific region for WiFi will be China, India and the Philippines.

Online services

MSN India expects the overall online advertising market in India to grow to US$100 million by 2009. MSN India has over eight million users and a 60 percent reach, according to a study conducted by ACNielsen. The website has over 60 advertisers including companies like Britannia, ING Vysya, ICICI, Coca-Cola, Intel, Seagram's, Cherry Blossom, Citibank, and Cox & Kings. Its competitors include Yahoo and domestic players like IndiaTimes and Rediff. India's Department of Tourism allocated Rs 2.5 crore (US$543,000) for an Internet advertising campaign that ran until March 2004 on local and international websites.

Bangalore has turned out to be the most Net-savvy metropolitan area in the country, according to the Indian Readership Survey, with an Internet usage penetration of 9.47 percent. It is followed by Chennai (9.43 percent), Mumbai (8.12 percent) and Hyderabad (7.92 percent). An average of 3.4 percent of the population in larger cities makes use of the Internet. This figure decreases rapidly among the lower-income groups and in smaller cities, especially in rural areas. Almost half the Internet users surf from cyber cafés (Flonnet.com, 2004). The popularity of cyber cafés is increasing rapidly, according to market research firm IMRB. But profit margins for the cyber café business are low because of intense competition as well as low entry and exit barriers. Satyam I-Way and Dishnet Hub are some of the major cyber café chains operating in the market (Rediff.com, 2004b).

Sports like cricket continue to attract heavy traffic to Indian websites such as CricketNext.com. Online travel classifieds are offered by sites like Traveljini.com. On the e-commerce front, LG Electronics estimated a turnover of Rs 50 crore (US$10.9 million) from its e-commerce site LGezebuy.com in 2003, up from Rs 13 crore (US$2.8 million) in 2002. E-tail players include Fabmall.com, Baazee and IndiaTimes. Fabmall's online revenue was Rs 9.5 crore (US$2 million) for February 2001 and Rs 12 crore (US$2.6 million) in 2003, according to company sources. Online booksellers include Oxfordbookstore.com in Calcutta, FirstAndSecond.com and Rediff.

In addition to the steady growth of the Internet and the spectacular explosion of cellular phone services, notable development is also taking place in the convergence of media as players like the Reliance Group extend their operations across data communications, broadband and entertainment.

E-governance is the fastest-growing sector in the domestic IT market. A NASSCOM study conducted across ten states estimates that there has been a growth of 18 percent in this sector, which is worth Rs 1,400 crore (US$304.3 million). NASSCOM also estimates that the government can save up to Rs 500 crore (US$108.7 million) in transaction costs and increase its revenue by Rs 2,000 crore (US$434.8 million) each year through a better-managed tax collection system. E-governance is also expected to increase transparency, efficiency and accountability within the government. The government should first focus on bringing about efficiency in governance through the better use of technology and commit 3 percent of its budget to e-governance (Dqindia.com, 2004).

Industries

The growth of the Indian outsourcing industry and its perceived threat to jobs in the West has been receiving high-profile coverage in the global media ranging from *Wired* magazine and the *Wall Street Journal* to *Business Week* and the *Financial Times*. Gartner had estimated that about 1 in 10 US technology jobs would go overseas by the end of 2004. In the next 15 years, more than three million US white-collar jobs, representing US$136 billion in wages, will depart for places like India, with the IT industry leading the migration (Forrester Research, 2004). India is now the second fastest-growing economy in the world. By 2008, IT outsourcing will be an annually US$57 billion industry, responsible for 7 percent of India's GDP and employing some four million people. The top five US-based employers operating in India are GE, Hewlett-Packard, IBM, American Express and Dell, according to *Wired* magazine. Outsourced activities range from software development and medical transcription to pharmaceutical R&D and market research.

India provides a very attractive offshore environment for many IT-enabled services. NASSCOM has identified six key emerging service areas that Indian IT companies are likely

to focus on: product data management, content management, enterprise application integration, business intelligence, wireless services, and straight-through processing. A study by the market research firm IDC estimated that India had cornered 70 percent of the call-centre business by the end of 2003. India's business process outsourcing sector witnessed a growth of 70 percent in 2001–2002 and 65 percent during 2002–2003.

GE currently spends about 9 percent of its IT budget in India. Between 2001 and 2004, IBM's personnel in Indian offshore development centres increased from 2,200 to 6,500, Accenture's grew from 100 to 5,000, and EDS's from 600 to 5,000.

Key national initiatives

A number of ICT initiatives have been launched in India targeting rural areas. These include the M.S. Swaminathan Research Foundation's (MSSRF) Village InfoCentres in Tamil Nadu, the Gyandoot cyber kiosks in Madhya Pradesh, and Drishtee's information kiosks. As a lead-in to the 2003 World Summit on the Information Society, a policy makers' workshop was held on replicability and scalability issues pertaining to ICT for rural development. The policy recommendations which emerged from the workshop cover a spectrum of issues ranging from self-help groups and domestic software to virtual academies and alliance strategies, based on the following "8 Cs" framework (Rao, 2003):

- *Connectivity:* How affordable and widespread is ICT (e.g. PC, Internet access, software, community radio) for the rural citizen? What technologies are emerging and appropriate (e.g. wireless)?
- *Content:* Is there useful content (local and global) for rural citizens to use in their daily lives? Can rural citizens access and create relevant content? Does the content meet the educational, health, business and other needs of the local communities?
- *Community:* Are there online/offline forums where rural citizens can discuss ICT, community radio, applications and related issues of concern? Will decision makers take part in such forums?
- *Commerce:* Is there infrastructure (technical and legal) for e-commerce for citizens, businesses and the government? How much commerce is transacted electronically? What hybrid means of fulfilling transactions can be leveraged for G2C, B2C and B2B commerce?
- *Capacity:* Do rural citizens and organisations have the capacity or support (technical, managerial, policy and legal) to effectively harness digital tools for daily use? Can content and community activities be converted into knowledge assets?

- *Culture:* Are policy makers, businesses, educators, citizens and the media forward-looking, open and progressive towards opening up rural access to ICT and harnessing these technologies? Or are there nervousness, phobia and lethargy about ICT impacts?
- *Cooperation:* Is there adequate cooperation between citizens, businesses, academics, NGOs and policy makers to create a favourable climate for using ICT in rural areas? Can this cooperation be extended to policy initiatives at the national level?
- *Capital:* Are there enough financial resources to invest in ICT for development in rural areas? What kinds of business and operational models exist for financiers? What kind of financial and social returns can be expected from rural ICT investments? What kind of knowledge goods and capital can emerge from rural ICT initiatives?

Key challenges remain in reducing the cost of PCs, community radio, Internet access and digital peripheral devices (e.g. webcams, LCD projectors, touch-screen devices) to levels which are affordable to rural communities. High import duties and obstacles to deploying used PCs are hindering efforts to increase access to ICT. Efforts should be taken to overlap government initiatives on ICT infrastructure, as infrastructure should not be wastefully duplicated. Government departments (e.g. telecommunications, education and agriculture) should synergise ICT and content initiatives for rural areas. Open source platforms and tools should be actively embraced.

Care should be taken to avoid the "IT first" or "IT only" traps, and connectivity initiatives should be coupled with content and services. In designing access infrastructure and services, adequate attention needs to be paid to back-end integration of processes and tools, and not just the pretty front-ends. Issues related to the design of the user interface, information architecture, language of presentation, and communication of information via alternative media (e.g. community radio) should occupy a key position. Rural users should be allowed to not just access but also create content. Digitisation of crucial content (e.g. government services) should be given priority. Portal templates for content and services can be successfully leveraged, but proper evaluation of these portals and their usability is necessary.

Urgent measures are called for to standardise the representation of Indian-language fonts and keyboards; otherwise, islands of local content in various fonts will proliferate and lead to difficulty in adoption and integration. Content created for rural users should be geared to providing answers to frequently asked questions and pressing problems. Content should also be updated regularly; otherwise, the static and unchanging content will be perceived as useless and outdated.

Numerous examples exist of information services already delivered successfully to a variety of communities, such as those on agriculture (sugarcane growth patterns, soil conditions, vermiculture, horticulture, crop rotation, rice planting, afforestation, rainfall patterns, pest calendars), fishing (weather patterns) and livestock (veterinary information).

One World International and MSSRF have conducted experiments in setting up an Open Knowledge Network using WorldSpace Satellite Radio's AfriStar satellite. Subsequently, One World has carried out two more pilots in Africa. The network has provided online information on government schemes for the "untouchable" Dalit people. Content for farmers has been delivered in a timely manner via multiple media (including local loudspeaker networks). The importance of presenting content in local languages for rural users cannot be overstated.

The Honey Bee network has documented grassroots technologies in eight languages. Awards have been given to notable innovators, and support has been received from the National Innovation Foundation. The Aravind Eye Hospital is leveraging rural ICT in its effort to create a "cataract-free zone" by distributing healthcare content and enabling videoconferencing with doctors. The Watershed Technology and Management Institute has helped agriculturalists to develop water topology maps and watershed planning tools.

Community radio projects (e.g. Namma Dhwani) have successfully used radio to disseminate information on local weekly markets. OddanChatramMarket.com has even exported drumsticks worth Rs 6 million (US$130,000) to the Middle East. The Azim Premji Foundation's Young India Fellow programme provides information kiosk operators with one-third of kiosk revenues as salary. Decent revenues from such commercial activities have been reported by 10 percent of the information centres in rural areas of northeast India (which are set up by the National Informatics Centre). Drishtee has observed that setting up 5–6 kiosks a month in rural areas is a viable pace of growth. Private sector company ITC's e-Choupal is also a notable model for e-commerce, but it seems to be focused more on supporting the company's internal business model rather than the full range of village information needs. While financial sustainability of telecentres is an important issue, social sustainability is even more important for rural communities.

Self-help groups (as with the MSSRF centres) play a key role in developing skills and expertise via peer reinforcement and intermediation. Private-sector and academic support in mentoring and collaboration is also called for.

There are multiple stages in the maturation path of a rural telecentre, evolving from the provision of basic computer services to participation in full-fledged knowledge-based activities, as shown below:

- *Basic phase:* Basic computer access, web surfing, downloading forms
- *Interactive phase:* Email, customising forms

- *Publishing phase:* Creating webpages, websites, an intranet and CD-ROMs
- *Transactive phase:* E-commerce, job creation, marketing
- *Knowledge-enabled phase:* Digesting and localising knowledge assets, creating local knowledge assets
- *Integrative phase:* Integrating ICT, radio and traditional media
- *Knowledge-capitalising phase:* Leveraging intellectual capital for financial returns and gain
- *Globalising phase:* Exporting model and intellectual property to other parts of the world
- *Transformative phase:* Radical restructuring of the rural economy

Each stage requires a certain commitment in terms of material costs, human resource support, enabling alliances and policy guidance.

Care must be taken to select appropriate metrics for monitoring and assessing the growth, impact and performance of such village information centres. As noted earlier, social sustainability concerns should be given as much attention as financial sustainability issues. These centres should aim to benefit not just the better-off segments of society but also the underprivileged. Such metrics should fall into five categories: technology, process, knowledge, people and economics. Taken together, they capture the full range of infrastructure and social dynamics of a village information centre. The following are examples of the parameters for each category of metrics:

- *Technology/infrastructure metrics:* Number of machines, bandwidth, number of registered users, frequency of usage, hours and days of operation, multimedia nature of content (text/audio/video)
- *Process metrics:* Quicker access to information (e.g. market prices, healthcare), faster response to queries, fewer steps to get information (e.g. land records), key emergency services rendered, exploitative middlemen

Development is more than ICT

India's parliamentary elections in early 2004 proved to be the most electrifying in recent times, thanks to high-powered advertising blitzes around the theme "India Shining" and to the unseating of the ruling party BJP, which many experts and media analysts had predicted would win the elections. BJP was voted out, and among those who fell from the seats of power was Chandrababu Naidu, then chief minister of the state of Andhra Pradesh, who had a solid reputation as the most IT-savvy of all Indian chief ministers.

Naidu, the "laptop chief minister", was known for making speeches backed by PowerPoint presentations and often referred to himself as the CEO (chief executive officer) of the state rather than chief minister. He put the city of Hyderabad (sometimes even referred to as "Cyberabad") on the global IT map as a strong competitor to Bangalore, India's Silicon Valley. Naidu got powerful figures like Bill Clinton and Bill Gates to visit his city, and he helped to lobby companies like Dell, Oracle, Computer Associates and Google to set up a presence in Hyderabad.

But the "cyber-fixation" should not have happened at the cost of ignoring the problems of the poor, who are so severely hit by drought, debt and starvation that scores of farmers were driven to suicide. Some political analysts remarked that the state under Naidu had become growingly indebted to the World Bank and the British government's Department for International Development.

"Cyberbabu" Naidu's Telugu Desam party suffered a crushing defeat in the state elections after a nine-year reign. News headlines echoed this surprise and poked fun at the defeat: "Voters Delete India's Cyber Savvy MP", "A Reality Check on the Indian Information Superhighway", "System Failure", "Reboot in Hyderabad".

Naidu's defeat "not only dampened the mood in the country's booming information technology sector, but its shivers were felt in the spine of the Bombay Stock Exchange," according to United Press International, which noted that, in a country where many politicians cannot even spell the word *computer*, Naidu would hold video chat with his officers across the state of 75 million people.

But to be fair, *The Pioneer* daily also said that Naidu's removal was a protest vote, not a mandate against his vision of the power of IT; progress on the IT front should just not have happened at the cost of the rural agenda. The reality is that ICT for development is only one part of good government; other aspects like controlling corruption, looking after the concerns of rural as well as urban communities, and bringing the fruits of ICT to people well beyond urban constituencies are as important.

Catering to the needs of the global IT industry may endear politicians to major corporations and investors, but this should happen in tandem with local development initiatives. At the same time, it is important that policy makers not swing to the other end of the spectrum and completely ignore the potential of ICT industries and ICT for development.

removed, improved service quality in specific areas (e.g. telemedicine)

- *Knowledge metrics:* Number of ideas or innovations generated, rate of innovation, partnerships with knowledge institutions, conversion of information into knowledge, localisation of external knowledge, patents filed
- *People metrics:* Feeling of empowerment, sense of pride, feeling of ownership, satisfaction with reward or recognition, gender balance, positive impacts on the poor, number of volunteers, intensity of volunteer involvement
- *Economic metrics:* Revenues generated, number of jobs created or vacancies filled, number of companies created, number of new products or services offered, volume of exports

Government information services have been successfully delivered via information kiosks and the Internet in states like Tamil Nadu, Karnataka and Andhra Pradesh, such as issuing of encumbrance certificates for the sale of properties, High Court cause lists, application for passports and access to land records. Government agencies have helped to kindle interest in information kiosk operations in these states via government information services that can be blended with other offerings. The National Informatics Centre's local portal solutions have also been used in rural ICT initiatives by the NGO Voices. The National Bank for Agriculture and Rural Development and the State Bank of India have made notable commitments to the application of ICT in development initiatives. These include micro-credit schemes, Kisan credit card, institutional development, and rural infrastructure projects. They have funded e-government projects in Himachal Pradesh and banking schemes for ICT-enabled services in villages. They have also linked self-help groups to financing schemes. There are reportedly one million self-help groups in India, 90 percent of which are run by women. The State Bank has commercialised 80 rural information kiosks in Tamil Nadu with its technology partner, n-Logue Communications. Sustainability has been achieved via revenues from the promotion of entertainment services at kiosks. At a statewide level, Project Akshaya has brought together a state player (the Kerala government) and a private sector player (Tulip IT Services) to create an Internet backbone network for the state, which can be used as a platform to launch a number of infrastructure initiatives.

Regulatory environment

Concern, controversy and confusion continue to mark India's ICT regulatory front on issues ranging from wireless service definitions and handover rates to VoIP and cross-media convergence. For instance, cable operators are raising

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Infokiosks: Momentum picks up on ICT for development in India

Until recently, in the southern state of Karnataka, land record information was tightly controlled by government officials and middlemen like village accountants. Land deeds are crucial documents for farmers, who need to verify ownership status when applying for various loans to pay for seeds, fertilisers, insurance, medical services and the like. While they once had to pay between US$2 and $22 for a copy of the record, they now pay only 30 cents – if they avail themselves of an e-government kiosk provided by the state government.

The Karnataka state government's Bhoomi (land) programme has computerised the land records of 6.7 million farmers in 30,000 villages, featuring 20 million deeds, which are now digitally accessible in the local language, Kannada, from over 200 government-owned computer kiosks in administrative offices across the state.

In addition to cost savings, the farmers now have additional protection against the possibility of fraud perpetrated by wily landowners, who would forge documents and swindle illiterate farmers. In Karnataka alone, for instance, deed fraud used to cost poor farmers an estimated US$20 million a year, but it has almost disappeared today, according to the World Bank.

Access to these databases by property professionals is provided for a fee, thus opening up revenue streams, which in turn can help to maintain financial sustainability of the project. The Bhoomi programme is already generating US$2.6 million a year in revenue.

The challenge now is to scale up this project to make the kiosks available in more locations across the state, increase the range of services provided and extend such services to other less IT-savvy states. A key role in bridging the digital gap will be played by such kiosks, which may be made available through cyber cafés, stand-alone initiatives launched by entrepreneurs, ISP projects, supply-chain computers in villages, or NGO initiatives.

Adapted from *http://www.businessweek.com/magazine/content/04_26/b3889003.htm*.

concerns about being "wiped out" by large private telecommunications operators. At the same time, many ISPs are asking TRAI to unbundle the local loop in both the fixed and wireless arenas.

TRAI may also block domestic Internet telephony. The Internet Service Providers Association of India has complained that tariffs announced by TRAI for lower pulse rates for ISPs would have an adverse impact on the growth of the Internet, resulting in a decline in usage as well as the number of subscribers. The present rate of Rs 1.20 per 180 seconds of Internet access for subscribers is slated to go up to Rs 1.20 for 120 seconds.

The cost of Internet access through PSTN dial-up is currently around Rs 32 per hour and is slated to go up to Rs 44 per hour, which will result in a 35 percent increase in the cost of Internet access. While this means basic telecommunications operators will rake in additional revenue annually from dial-up services alone, ISPs will have to shoulder the additional burden of dealing with customer churn.

TRAI and cellular operators have also had heated exchanges on revised interconnection charges and the ensuing increases in tariffs. While many of these differences of opinion are to be expected in the turbulent world of convergence, the regulator and the operators need to display more cooperative attitudes in areas like performance levels and service tariffs.

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