India online

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Home computers: a range of technological projects aims to bring the Internet revolution to India's poor rural communities.

A limited telephone network and low levels of literacy make it difficult to get information technology into India's rural areas. But as K. S. Jayaraman finds out, the country's engineers have developed some innovative solutions.

Bangalore may be the hub of a burgeoning information-technology industry, but the information superhighway peters out long before it reaches the villages of rural India. More than 80% of Indian villages have no telephone connection. Few villagers can afford computers where connections do exist, and low levels of literacy prevent many from using any machines they may have access to.

This is unfortunate, as villages have much to gain from the information revolution. Affordable Internet access could transform the way local farmers deal with wholesalers, or could supply health workers with reliable, up-to-date information. But because such ventures generate little or no profit, the big telecommunications operators and computer firms are unwilling to invest in them.

But India's problems are prompting Indian solutions. Engineers at one of the country's top research institutes are using radio links to get villages online. Others have developed an affordable computer that operates in three of India's most widely spoken languages. And both systems are designed to be attractive to local entrepreneurs and community organizations, thus bypassing the need for external investment.

"The big telecoms companies are ignoring the rural areas where 70% of Indians live," says P. G. Ponnapa, chief executive of telecoms company n-Logue, based in Chennai (formerly Madras). "Our aim is to bridge this digital divide."

It is easy to see why telecoms operators are reluctant to invest. New connections typically cost around US$800 to install, and companies need a certain monthly return to justify such an investment. "Telecom networks are designed for people who can afford a $30–40 monthly bill. Only 1.6% of Indians can pay this much," says Ashok Jhunjhunwala, head of an electrical-engineering group at the Indian Institute of Technology (IIT) in Chennai.

The extra mile

For around a decade, Jhunjhunwala's group has been working on cheaper systems, focusing on alternatives for the 'last-mile' connections between local exchanges and individual homes. Conventional networks use copper wires, which are expensive to install and maintain, and account for around three-quarters of the cost of the entire network.

In conjunction with Analog Devices, a signal-processing company based in Norwood, Massachusetts, Jhunjhunwala's team has developed a wireless alternative, known as corDECT, which uses radio waves to link exchanges with homes. Existing telephone networks are used to carry signals over long distances. Once they reach the local exchange, however, the signals are digitized and beamed to homes and businesses, where a small, wall-mounted device is used to receive them. By splitting voice and Internet traffic at the local exchange, the system provides a separate phone line with each Internet connection.

The system can reach subscribers in a 10-kilometre radius of the transmitter, or up to 25 km with the help of a solar-powered relay station. IIT researchers are looking at taking the system into areas where there is no nearby exchange by sending signals along the copper wires that run alongside the tracks of India's vast railway network. The system is normally used for voice communications, but includes spare wires that have not yet been used.

Several Indian companies, including n-Logue, a spin-off from the IIT, are already producing corDECT systems with connection speeds of 70 kilobits per second (kbps)—faster than most home connections in richer countries. Another manufacturer, Midas Communication Technologies of Chennai, says it will soon offer 380-kbps connections.

The technology is well-established, and is also being considered for use in Europe and the United States. But unlike in developed countries, its success will depend on small firms rather than big ones. Cable television, for example, has expanded rapidly thanks to local entrepreneurs. Broadcasters sell satel-

Ashok Jhunjhunwala has pioneered a cheap way to link homes to local telephone exchanges.

lite dishes to local businesses and leave the distribution — usually by cables slung between poles and trees — to local operators.

"We were inspired by the success of cable TV in India," says Ponnapa. "In 1992 there were no cable TV connections. Today 50 million households have cable TV because of local people's involvement." A similar system helped to seed the growth of private telephone kiosks, 650,000 of which have sprung up since 1987. In both cases, revenue is split between national companies and local operators.

A corDECT system typically consists of a central unit, based at the exchange, and around 20 transmitters. At a combined cost of around $25,000, the system should be within the reach of local businesspeople. Ponnapa predicts that most operators — known as local service providers (LSPs) — will find 500–700 subscribers within a 25-km radius, making the investment worthwhile. So far, progress is good: n-Logue is currently signing up two to three new LSPs per month.

Besides this, n-Logue also works with local companies that are keen to provide Internet access to the surrounding population. In one project, a sugar factory in Nellikuppam in the southern state of Tamil Nadu has helped to fund 65 local connections. Sugar-cane farmers who supply the company can check their account details online, as well as accessing information on fertilizer and pesticide prices. What previously took the farmer a bus ride to the factory is now just a mouse click away.

corDECT is also being deployed by Media Lab Asia at the IIT campus, an Indian offshoot of the successful Media Lab at the Massachusetts Institute of Technology. The project will provide 1,000 connections and aims to show that villagers can make sustainable economic use of the technology. Ponnapa cites the example of a businessman in the state of Rajasthan who used a corDECT connection and a $50 web camera to become the first professional photographer in his village.

In the large central-Indian state of Madhya Pradesh, local government is also using the technology. Five hundred villages already use government-funded connections to access land records or commodity prices, and to send complaints to regional officials.

N-LOGUE COMMUNICATIONS (P) LTD

In the state of Tamil Nadu, local businesses are helping to fund public Internet facilities.

N-LOGUE COMMUNICATIONS (P) LTD

Touching base: transmitters connect corDECT users up to 25 kilometres away to the central unit.

Despite corDECT's potential, one major barrier — poor literacy — could still prevent millions of Indians from accessing the Internet. India has 18 officially recognized languages and 10 different scripts. As less than 0.5% of the rural population can read and write English, special software is needed to adapt keyboards to the different scripts. Even so, around 48% of India's population cannot read or write their native language.

Writing wrongs

A pocketbook-sized machine dubbed the 'Simputer' could be the answer. Developed at the Indian Institute of Science (IISc) in Bangalore, the Simputer can be used to play sound files, send and receive e-mails and browse the Internet. A stylus and touch-sensitive screen are used to input information and an Internet connection can be provided through a modem or a corDECT digital receiver — although the Simputer can only read web pages written specially for it.

Unlike rival machines, the Simputer can be used by those who cannot read or write. Speech-synthesis software developed at the IISc converts text in downloaded pages into spoken words in three Indian languages — Hindi, Kannada and Tamil. Commands can be inputted by tapping icons on the screen and listening to the Simputer.

The driving force behind the Simputer is a desire to get reliable and affordable information-technology hardware into rural areas. "We gave our time for free," says Swami Manohar, an IISc scientist who worked on the project. "The aim was to promote the Simputer not as an end-product but as an evolving platform for social change."

Costs have been kept down by using the 'open-source' Linux operating system and inexpensive memory units and processors. When mass-produced, the Simputer should sell for around $200. This is still too much for many rural people, but machines can be shared by several users, each of whom can use a smart card to save their personal settings.

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Hands on: getting to grips with the Simputer, which does not require users to read or write.

The developers hope that rural communities will buy one or more Simputers and make them available to local people in schools or community centres. They envisage health workers using the devices to look up medical information, and local people using it to communicate by e-mail. Midas director Shirish Purohit suggests that Simputers could also be used in place of conventional computers in Internet kiosks.

PicoPeta Simputers, a Bangalore-based company formed to manufacture the devices, says it should have a marketable product within a few months. Before then, the Simputer will be tested by schoolchildren in the central-Indian state of Chhattisgarh, who will use educational software beamed directly from a satellite above India. If it is successful, the project could be repeated in other countries in the region, say the project's organizers, the South Asia Foundation, a Paris-based charity.

Meanwhile, corDECT is expanding beyond India's villages. Two national operators are deploying the technology in Indian cities. And late last year, the first of 1,000 subscribers in the Paragomina municipality in the Brazilian Amazon went online. Companies in countries from Fiji to Iran are also importing the technology. "A total of 100,000 corDECT lines are in operation," says Purohit. "Multinational companies will take note of us very soon." The technology could be used anywhere, but Ponnapa says that it offers the biggest advantages in countries with poorly developed telecoms infrastructure.

Whether or not corDECT gains international acceptance, India's rural population looks set to benefit from it. Factor in the Simputer, and the dream of giving rural people access to reliable, affordable information technology looks realistic. The engineers-turned-entrepreneurs who have pioneered the new technologies certainly think so. "The Internet revolution," says Jhunjhunwala, "will hopefully be one that rural India will not be condemned to stand by and watch." ■

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- **www.tenet.res.in/cordect/cordect.html**
- **www.simputer.org**
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