Information and Communications Technology As a Tool for Empowerment

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Information and communications technology (ICT) is creating economic, social, and political empowerment opportunities for poor people in the developing world.[1] Direct and independent access to information about prices and exchange rates can transform the relationship between poor producers and middlemen. Connectivity through telephones, radio, television, and the Internet can enable the voices of even the most marginal and excluded citizens to be heard, promoting greater government responsiveness. ICT can thus help to overcome poor people's powerlessness and voicelessness even while structural inequities exist in the distribution of traditional assets such as education, land, and finance.

Although most poor people are isolated from the new information revolution, shared cellular phones, telecenters,[2] and other innovative solutions are beginning to provide low-cost ways for them to access ICT (box 1). Financial sustainability is indeed one of the main challenges for ICT projects and initiatives. Rigorous monitoring, evaluation, and beneficiary impact assessments are needed to appraise whether the benefits of ICT projects outweigh the costs.

The issues of content and community participation are key to realizing the empowerment potential of ICT. To become truly relevant for poor people, ICT applications must be visual and graphic-oriented and should make content available in local languages. Before launching any ICT initiative, the information needs of a community should be thoroughly assessed, with the active involvement of the community, and software should be developed taking into account local conditions. Community participation will ensure continuity, while a top-down approach will probably lead to a waste of resources in the initial start-up of projects, endangering future sustainability. Participation itself, however, should not be introduced in a top-down, blueprint manner, and should also incorporate the local political and cultural context.[3]

This annex highlights how ICT can empower poor women and men in four broad areas:
- access to basic services
- improved governance
- support for entrepreneurship
- access to financial services

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[1] ICT is the electronic means of capturing, processing, storing, and disseminating information. Here, we apply a broader definition of ICT that includes technologies such as radio and telephone, as well as newer innovations such as computers and personal digital assistants.

[2] Telecenters are shared locations that provide access to ICT for educational, personal, social, and economic development (Reilly and Gómez 2001).

[3] See Heeks 1999; Narayan and Shah 2000; Cecchini forthcoming.

Box 1. Innovative and Creative Solutions to Bring ICT to Poor People

The **Simputer** (Simple, Inexpensive, Multilingual Computer), developed by scientists at the Indian Institute of Science and a software company in Bangalore, is a user-friendly and inexpensive handheld computing device, particularly suitable for illiterate people. The device uses locally relevant icons, touch-sensitive screens, and text-to-speech features in different Indian languages. Costing about $200 each, Simputers are designed to be shared by a local community of users. For example, a village *panchayat*, a village school, or even a shopkeeper can purchase a Simputer and rent it out to individuals for a user fee. "Smart card" technology personalizes the device by storing individual user profiles.[4]

In Kothmale, Sri Lanka, a joint project between UNESCO, the Ministry of Posts, Telecommunications, and the Media, the Sri Lanka Broadcasting Corporation, and the Sri Lanka Telecommunication Regulatory Commission uses the **radio** as an interface between rural people and the Internet. A daily one-hour live radio program, in which an announcer and a panel of resource persons browse the Internet in response to listener requests, has proved able to overcome linguistic barriers to Internet use by non-English-speakers. In addition to the live program, the Kothmale community radio station is developing a rural database, primarily by packaging public domain information often requested by listeners for off-line use. The radio station also functions as a mini–Internet service provider by offering Internet access points at two public libraries located within the radio's target area and running an Internet café at the radio station.[5]

In Tanzania, Adesemi Communications International is providing the first reliable, quality **phone service** in the country's rural areas through durable user-friendly units, capable of placing local, long-distance, and international calls. A wireless system allows the installation of pay phones where they are most needed, regardless of whether landlines exist. Users purchase Adese phone cards in denominations as small as 45 cents. Minimizing vandalism and maximizing theft protection, these cards have proven far superior to coins. Small businesses that are heavily dependent upon communications for their commercial viability have reaped tremendous benefits. The company is planning to add Internet connectivity to its phones and is expanding operations to Latin America, Southeast Asia, and elsewhere in Africa.[6]

In Uganda, a **CD-ROM** produced by the International Women's Tribune Center, "Rural Women in Africa: Ideas for Earning Money," is providing training and information to women engaged in microenterprise activities. The CD-ROM, developed both in English and in local languages, is available for use at rural telecenters. By using sound and visuals, the CD-ROM content is accessible to women with low levels of education.[7]

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[4] Mathew 2001. A smart card looks like a plastic credit card and has a microprocessor or memory chip embedded in it. The chip stores electronic data and programs that are protected by security measures enabling controlled access by appropriate users. Smart cards provide data portability, security, convenience, and transparency of financial records and transactions.

[5] Grace and others 2001.

[6] Readiness for the Networked World 2001.

[7] Available at the International Women's Tribune Center website at http://www.iwtc.org/!start.html

Access to Basic Services

The relatively low cost and wide reach of radio and television are enabling the delivery of education to isolated rural areas, and telecenters are becoming the means for the delivery of distance learning and virtual education. Customized ICT training for marginalized groups with low levels of education, from poor women in Africa and India to slum dwellers and street children in Latin America, is creating new opportunities in the job market.[8] Experience indicates that even illiterate adults and children quickly learn to use icon-based Web services.

ICT can also improve health care delivery to the poor. Telemedicine can overcome the cost and hardship of long-distance travel for medical attention and diagnosis; e-mail and medical list-serves can deliver recent medical findings at minimal cost to health workers lacking research and technological facilities;[9] and ICT is simplifying medical data collection, record management, and paper filing processes.

Education

In Brazil, the **Committee for Democracy in Information Technology** (CDI) provides computer and civics training to young people living in urban slums, or *favelas*. Founded by former teacher Rodrigo Baggio, CDI emerged from the belief that computer literacy can maximize opportunities in the job market and promote democracy and social equity. Along with training in word processing, spreadsheets, accounting programs, and Web design, CDI teaches civic participation, nonviolence, human rights, environmental awareness, health, and literacy. After a three- or four-month course, graduates typically find well-paid jobs, start microbusinesses, or become certified teachers within the organization. Some CDI graduates who had dropped out of regular or traditional school decide to go back to public school and complete their formal education. And many others put their computer skills to work in various community activities, including health education and AIDS awareness campaigns. In addition to serving the poor, the CDI model has spread the benefits and applications of ICT to indigenous communities, the blind, prisoners, and the mentally ill.

The first Information Technology and Citizenship School opened in Rio de Janeiro's Santa Maria *favela* in 1995. CDI has since established more than 200 schools in 17 states in Brazil, training more than 66,000 children and youth. Although some schools, supported by foundations, offer free computer training, most schools maintain a symbolic fee of $4 per student to cover administrative costs and pay instructors.[10] Students who cannot afford to pay have the option to volunteer in exchange for classes.

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[8] Examples include the InfoDev-sponsored Project SITA (Study of Information Technology Applications) in India, Women's Net in South Africa, and the Street Children Telecenter project in Colombia and Ecuador.

[9] HealthNet, for instance, is using a diverse array of ICT technologies (including radio and telephone-based computer networks and low-earth-orbit satellites) to allow health care workers in 30 developing countries to access medical research, exchange data on emerging epidemics, and obtain information on the use of drugs and treatments.

[10] Even with such low fees, instructors teaching just eight classes per week receive almost twice Brazil's official minimum wage.

CDI schools are created through partnerships with community organizations, NGOs, and religious groups. Communities have complete ownership of the schools, including their physical space, and are responsible for staffing, management, and maintenance. To develop a CDI partner school, a community sets up a coordinating committee to assess local demand, identify future instructors and a suitable location, and establish security measures for the computers. Over the course of three to six months, CDI trains the instructors, works with the school to obtain a hardware donation from sponsors, and helps the school install the computers. After a school has been established, CDI serves as a partner and consultant but does not manage the school activities.

CDI is funded through partnerships with the government, the private sector, and philanthropic and international organizations, as well as with individuals and local businesses that donate computer hardware and software. Microsoft has donated $5 million in software and the Gates Foundation has granted $400,000; the World Bank has earmarked $200,000 through InfoDev, and the IDB is going to provide $250,000 to help CDI expand in Brazil and other Latin American countries. Other partners include Dell, Exxon, McKinsey, SSI Server, the Starmedia Foundation, Xerox, and UNESCO. The CDI model has been exported to Japan, Mexico, Colombia, and Uruguay, countries where there is now a CDI international office, and will soon reach Chile, Guatemala, Angola, and South Africa.[11]

The World Bank Institute's **World Links for Development (WorLD)** program provides training in the use of technology in education for teachers, teacher trainers, and students in developing countries, and connects them via the Internet to counterparts in developed countries for collaborative learning. It also offers telecommunications policy advice for the education sector as well as monitoring and evaluation support. The WorLD program is currently active in 21 countries in Asia, Africa, Latin America, and the Middle East, reaching nearly 700 schools and 125,000 students. The program calls for the establishment of a network cluster, consisting of a resource center and five satellite schools, in each country. Each resource center will have 10 to 15 networked computers and a central server with an Internet connection. Satellite schools will each have one computer and a monitor to organize access for teachers and students.

An independent review of the program in 1999–2000 found that, while the contribution of computer equipment was significant, the program's most important contribution was the provision of professional development to enhance teachers' technological and pedagogical skills. Teachers reported that the program had the greatest impact on their capacity to design and prepare projects for students, learn more about their subject matter, and have students work in groups. Seventy-eight percent of WorLD teachers indicated that student knowledge about the use of computers had increased a great deal as a result of working with computers. The WorLD program has helped to cultivate pockets of innovation in schools using ICT to improve education and communication. Sixty-three percent of WorLD teachers reported that their students use computers to interact with students and teachers in other countries, compared with 9 percent of non-WorLD teachers.[12]

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[11] For more information see the CDI website at http://www.cdi.org.br/. Also see Narayan and Shah 2000.

[12] Bloome 2000; SRI International 1999; SRI International 2000; de Alcántara 2001. Also see the WorLD program website at http://www.worldbank.org/worldlinks/english/index.html

Health

In India, InfoDev and CMC Ltd., a government-owned enterprise, are working together to optimize scarce health care resources in the southern state of Andhra Pradesh through a system based on handheld computing technology. The **Information-Based Health Care Delivery** project seeks to reduce paperwork, improve data accuracy, and empower village health care workers to provide timely care and information. The impetus for the project came from the Indian government's interest in improving the effectiveness of preventive health programs in that state and alleviating the heavy burden of data collection and paperwork on health care workers.

The project, which began in 1994[13] and has been piloted in two sites in the Nalgonda district of Andhra Pradesh since June 2001, aims at increasing the efficiency of auxiliary nurse midwives (ANMs). ANMs are a small group of women who shoulder most of the responsibility for health care delivery in the vast and densely populated rural areas. Each one serves 5,000 people, typically spread among different villages and hamlets, often located several miles apart. ANMs administer immunizations, advise on family welfare, and educate people about mother-child health programs. Along with health care delivery, ANMs are also responsible for data collection and record keeping on the rural population's growth, birth rate, and immunization rate.

Handheld computers, or personal digital assistants (PDAs), are expected to facilitate data acquisition and transmission to the primary health centers, saving up to 40 percent of the ANMs' work time. Redundant entry of data prevalent in paper registers will be eliminated, and ANMs' monthly reports will be generated automatically, making data electronically available for further analysis and compilation at higher levels of the health care system.

The PDAs, whose navigation is based on icons representing villages, households, and individuals, are designed to cater to the literacy levels of the health workers. Each icon, when tapped with the PDA's pen, leads to a more specific record with information on immunization status, diseases, and other conditions. ANMs show no hesitation in using the device, taking the pen in hand, and tapping on the screen. Some had experience with keyboards and took easily to using the software version. Health workers are extensively trained in the use of the pocket computers, which can have screens translated into the local Telugu language.

Challenges to the project included delays caused by technical problems and by frequent changes in end-user requirements. For instance, the households list on the PDAs was presented in the order the ANMs typically visit their villages—house by house—but there were cases in which the ANMs administered health services by assembling all villagers in one place. This entailed searching for individuals rather than for households on the PDAs, and required substantive changes to search features.[14]

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[13] The project began as a collaborative effort between the Indian government and Apple Computers. The first pilot project was conducted in the state of Rajasthan, near the city of Ajmer, between 1994 and 1995.
[14] World Bank 2001; InfoDev 2001; Bhatnagar and Schware 2000; CMC Ltd. 2001.

ICT as a Tool to Improve Governance

E-government refers to the use of ICT by government agencies to transform relations with citizens and businesses. ICT can serve a variety of different ends for improving governance: from better delivery of government services to citizens to improved interactions with business and industry, from citizen empowerment through access to information to more efficient government management. The resulting benefits include less corruption and increased transparency. Information disclosure and the possibility of interacting with public officials can build pressure for improved government accountability at both the local and national levels.[15]

E-government can be implemented at different stages. At a first stage, departments and agencies se the Web to post information about themselves for the benefit of citizens and business partners. At a second stage, these sites become tools for two-way communication, allowing citizens to request feedback on a particular issue. At a third stage, websites allow a formal, quantifiable exchange to take place, such as renewing a license, paying a fine, or enrolling in an education course.[16] At a final stage, a portal integrates the complete range of government services and provides a path to them that is based on need and function, not on department or agency.[17]

Box 2. Enabling More Effective Participation at the Local, National, and Global Levels

In Mexico City, the NGO **Women to Women** used e-mail connections with women's groups in California to obtain information on the business practices, profit structures, and ownership of a textile company that had announced plans to build a new plant in their community. As a result, they were better prepared to negotiate in their meetings with plant officials and management and with local government.

In India, the women's rights NGO **Sakshi** faced difficulties in lobbying for sexual harassment legislation. With help from international women's networks, Sakshi was able to receive advice and technical assistance on legal issues surrounding sexual harassment. As a result, the group succeeded in convincing the Indian Supreme Court to establish sexual harassment guidelines in workplaces and brought the issue within the purview of human rights violations.[18]

Women have used the Internet for organizing and lobbying at the regional and international levels for many years, beginning most notably in 1995 with organization of the U.N. World Conference on Women in Beijing. In 1999, to prepare for Beijing+5, more than 40 women's media networks formed **WomenAction.** WomenAction has developed global and regional websites on women's issues and has also initiated workshops to train women from all regions in the construction of websites, the facilitation of regional and national dialogues, and the repackaging of information downloaded from the Internet.[19]

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15 See the World Bank's e-government website at http://www1.worldbank.org/publicsector/egov/

[16] In Brazil, Serviço de Atendimento ao Cidadão (SAC) is a system of public service assistance created by the state government of Bahia. Mobile SAC units visit remote areas and allow geographically isolated populations access to some essential services, such as the issuing of birth certificates, I.D. cards, and labor I.D. cards (World Bank 2001).

[17] Symonds 2000. One example of such a portal is Singapore's eCitizen Centre at http://www.gov.sg/

[18] World Bank 2001.

[19] Carr and Huyer 2001.

Improving Local Governance

ICT can play an important role in improving local governance, connecting poor people to local leaders, reducing transaction costs, and better connecting the poor to services.

In Madhya Pradesh, India, **Gyandoot**, a government-owned computer network, is making government easily accessible to villagers, reducing the time and money they spend trying to get to and through public officials, and giving them immediate and transparent access to local government data and documentation.

Gyandoot started in January 2000 in Dhar, a district where 60 percent of the 1.7 million inhabitants live below the poverty line. The program was launched with the installation of a low-cost rural Intranet that initially connected 20 villages and was later expanded to another 11. The district was wired for Rs. 2.5 million (about $55,000) in less than a year. The average cost incurred by the village committee (*panchayat*) in establishing a single kiosk was Rs. 75,000 (about $1,650). Information kiosks (*soochanalayas*), located in *panchayat* buildings, have been placed in villages that have block headquarters, hold weekly markets, or are located on major roads, so that each kiosk can cater to about 25 to 30 villages. The entire network of 31 kiosks thus covers more than 600 villages and reaches half a million people.

Kiosks are run by local operators along commercial lines. The operators pay an annual license fee of Rs. 5,000 to the district council (*zila panchayat*) and earn a monthly gross income between Rs. 1,000 and Rs. 5,000 from user fees. Since most villagers are barely literate and electronic financial transactions in India are not yet legal, an operator to assist users and a physical office for making payments are needed. Currently only a few kiosks have proved to be commercially viable.

Gyandoot provides the prevailing rates for prominent crops at auction centers for a charge of Rs. 5. It also furnishes information on previous rates and on the volume of incoming agricultural produce. Villagers now use Gyandoot to keep track of the cost of fruits and vegetables in the region's wholesale market. They pool their resources and catch a bus to the place offering the best deals, cutting out the middlemen traders. Sometimes this means trucking their produce 400 miles to Mumbai to earn 40 percent more than they would at home. Other times villagers decide to wait and hold on to their produce until prices are higher in local markets.

Gyandoot also provides documents on land records for a charge of Rs. 15, thus helping the poor fight fraudulent land claims. In the words of a villager: "The farmers need these land records every season to get crop loans, and the *patwari* [keeper of land records] extracts a heavy price every season. Bribe him and he will redraw your map at your neighbor's expense. Ask him for old records and he will tell you that they are lost, burnt, or damaged for good. In the digital database we can retrieve land records for Rs. 15 instead of the minimum bribe of Rs. 200 plus transport costs." As a consequence, some local politicians and the lower-level bureaucracy, perceiving a loss of power, have attempted to sink the program.

Other services offered include an online registration of applications for caste, income, and domicile certificates, a public complaint line for reporting broken pumps, unfair prices, absentee

teachers, and other problems, as well as an auction facility to trade land, agricultural machinery, equipment, and other commodities. Gyandoot also offers e-mail services in Hindi connecting village-level institutions with block and district offices.

Challenges encountered when implementing the project included problems with the dial-up connection, as most of the local rural telephone exchanges did not operate with optical fiber cable. Poor or no connectivity can reduce the economic viability of the kiosk and decrease the motivation level of the kiosk operator to be a partner in the project.

Around 40,000 people have used Gyandoot's services since the project's inception. Following the success of the initiative, the government of Madhya Pradesh has issued a tender to set up information kiosks on the lines of the Gyandoot project across the state. Drishtee.com, an Indian software company, intends to replicate the Gyandoot model nationwide and has already expanded the project in northern India, reaching Sirsa in Haryana, Shahdol and Seoni in Madhya Pradesh, and Jallandhar in Punjab. Pilot projects are to be launched soon in Gujarat and Maharashtra.[20]

Improving National Governance

ICT has the potential to improve national governance by increasing transparency and accountability; allowing greater access to information about representatives, institutions, decisions, laws, and regulations affecting poor people's lives; and providing mechanisms for contacts between poor people and leaders and decision-making bodies at the national level.

In Argentina, the **Cristal** government website, launched by the current administration, provides information to citizens so that they can exercise more effective control over their political representatives. Through the Internet, this initiative discloses and disseminates information concerning the use of public funds in the country in an easily understandable format.

The Cristal website was launched in early 2000 to fulfill the mandate of the September 1999 Fiscal Responsibility Law, which required that the state make available to its citizens information related to the administration of public funds. The website includes information on the execution of budgets to the lowest level of disaggregation; purchase orders and public contracts; payment orders submitted to the National Treasury; financial and employment data on permanent and contracted staff and those working for projects financed by multilateral organizations; an account of the public debt; inventory of plant and equipment and financial investments; outstanding tax and customs obligations of Argentine companies and individuals; and regulations governing the provision of public services.

After initial problems—at first much of the information was lacking from the site—a new version of Cristal was launched in August 2000. Since then, visits to the website have increased by about 200 percent. The website is currently organized into three thematic areas: "The State within Reach of All," which explains how public monies are redistributed between the national government and provinces; "Goals and Results," which gathers information on all national

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[20] World Bank 2001; Gyandoot 2001; Narayan and Shah 2000.

policies to evaluate their management and the manner in which public funds are allocated; and "Accountability and Representatives," which gathers information related to the fight against corruption, both in government and in the nongovernmental sector. Tutorials explain each of the themes in a clear and easy-to-grasp fashion. Users can also interact with website staff and feedback is provided within 24 hours.

This initiative is proving significant not only because it seeks to improve governmental transparency, but also because many agencies have started to improve their data gathering practices in response to Cristal's requests. Cristal is audited externally by Foro Transparencia, a coalition made up of 15 nongovernmental organizations concerned with government transparency.[21]

ICT as a Tool to Support Poor People's Entrepreneurship

Connecting people to markets, ICT can stimulate poor people's entrepreneurship and the development of businesses in underdeveloped rural areas. ICT allows poor people to access important market and business-related information in a more timely and efficient manner. For example, isolated farmers can use ICTs to access essential agricultural information such as data on crops, input prices, weather conditions, and credit facilities. Further, electronic bulletin boards and databases are allowing farmers to share innovations and technical information (see discussion of Honey Bee and the National Dairy Development Cooperative below).[22]

Commercial possibilities for micro producers in developing countries have been multiplied by the Internet, with its unparalleled capacity to connect producers directly to buyers. By cutting out layers of middlemen, e-commerce increases the income of poor producers by giving them a greater share of the final sale price, sometimes 10 times what they would get in traditional trade. Through online sales, artisans can assess which products sell better and tailor production accordingly (see PEOPLink below).[23]

Access to Markets and Business-Related Information

In Bangladesh, **Grameen Phone** provides commercial phone service in rural areas through local entrepreneurs, usually poor women, who own and operate cellular phones that typically serve an entire village.[24] Women entrepreneurs borrow about $350 at 22 percent interest from the Grameen Bank to purchase a handset. They then sell telephone services to other villagers, making a living and paying off their loan, usually within a year. This creates a self-employment opportunity in each village and provides all villagers with access to telephones.

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[21] Radics 2001; World Bank 2001.

[22] Examples include Chile's rural information service for farmers groups, as well as Agropol and Agrositio in Argentina.

[23] E-commerce websites selling handicrafts made by small artisans from developing countries include Novica.com, OneNest.com, ElSouk, African Crafts Online, and many others. See Narayan and Shah 2000.

[24] Grameen Phone was founded in 1996, when the Bangladeshi government was preparing to auction off private cell phone licenses to four companies. Grameen Phone is owned 51 percent by Telenor, a Norwegian company, and 35 percent by the Grameen Bank through its Grameen Telecom arm. The rest of the shares are owned by a Japanese trading house, Marubenu, and a group of Bangladeshi expatriates in the United States.

Grameen Phone started its operations in Dhaka in 1997 and later expanded to rural areas. As of March 2001, about 60,000 people use 4,500 village phones. Rural telephones are very profitable for Grameen Phone, bringing in revenues per phone of US$93 a month in March 2001, twice as much as Grameen Phone's urban mobile phones. However, rural phones represent less than 2 percent of the phones used on Grameen Phone's network and so bring in only 8 percent of the company's total revenue. The company's profitability thus still depends on its urban business.

Village phones, on average, serve 70 customers a month. The average income of the "phone ladies" is estimated at more than $700 a year after covering all costs, more than twice the country's annual per capita income. In larger villages, individual phone revenues can be more than $12,000 per year, although revenues are falling in areas with multiple telephones. High and, so far, secure returns have led many women to regard these telephones as their "modern cows."

Estimates show that village phones generate savings (or revenues) of between $2.70 and $10.00 per call. This is not only because phone calls would otherwise be extremely expensive, but also because very important information is exchanged: users (40 percent of them women) call relatives and friends, often overseas, to request remittances or medical help; farmers and traders call city markets to find out the prices of agricultural produce. About 50 percent of the calls are made for economic reasons, mainly by poor people. In villages with phones, eggs and poultry sell for higher prices, the cost of information is much lower (17 taka as opposed to 72 taka, the cost of a trip to town), cost of feed is lower, and diesel prices are more stable. Prices paid by traders for raw materials and crafted goods have risen because sellers have more pricing information. Exchange rates for currency from expatriates have improved. Furthermore, the phones offer the villagers additional benefits such as improved law enforcement, faster and more effective communications during disasters, and stronger kinship bonding.

The Grameen Phone experience has shattered many myths about the capabilities of poor rural women. Even illiterate women in rural areas who have never seen a telephone have mastered the skills quickly, gained confidence, and earned new status and respect in their communities as owners of a powerful and desirable asset. Telephone owners have greater freedom than before to move about the villages as they deliver messages or take the phones to users, charging a higher fee for the service. Women learn about medical information and the status of markets in Dhaka by overhearing conversations. Some have developed a sophisticated functional knowledge of international currency markets. "She used to cook for the elites," said the neighbor of one of these phone ladies. "Now she is invited by them."

Looking to the future, Grameen Telecom plans to set up cyber kiosks in rural villages. "The cell phone will be followed by the Internet, faxing, and worldwide networking," says Grameen Bank's Mohammed Yunus, who hopes that telecommunications will revolutionize the cognitive world of the villagers. In 1999, the International Finance Corporation signed an agreement to lend $16.7 million and invest $1.6 million in equity toward expanding Grameen Telecom, now the largest cellular phone operator in Bangladesh. The Asian Development Bank and the Commonwealth Corporation are providing parallel financing in the form of loan and equity investments.

APRIL 2002

Inspired by the Grameen experience, Bharati Enterprises, an initiative of the state government of Andhra Pradesh, India, has arranged for the telecom company, AirTel, to launch its cellular services network in that state. It will connect 4 million women members of 300,000 rural self-help groups to each other and to the outside world through cellular telephones and eventually through the Internet. The groups have already mobilized the equivalent of $133 million in revolving loan funds for their businesses and hope to better market their products to bidders in India and abroad.[25]

E-Commerce: Connecting Small Artisans to Markets

PEOPLink is a nonprofit corporation formed in 1995 to build a global network of trading partners that can provide services to community-based artisan producer groups. PEOPLink currently works with more than 105 trading partners—local NGOs with relationships to grassroots groups such as craft cooperatives and peasant leagues—in Africa, Asia, and Latin America. PEOPLink functions both as a business-to-consumer (B2C) business, connecting poor producers to customers through the Internet, and as a business-to-business (B2B) broker and escrow agent for wholesale opportunities, connecting producers with firms in industrial countries.

Artisans represented by the trading groups, the majority of them women, are organized into community-based producer groups. They are talented artisans who have developed their skills over generations but who have not had the resources to connect directly to the global marketplace. Traditionally, they have sold their goods through a long and complicated chain of middlemen who pay them low prices and then mark up the items many times on the way to the final consumer.

Through e-commerce, PEOPLink helps artisans improve their terms of trade. It has placed great emphasis on training and developing a set of equipment, software, and procedures that enables trading partners to work with electronic communications for improved product design and sales. Trading partners are equipped with digital cameras and trained to photograph artisan products and load them onto the PEOPLink e-commerce website. They also receive online training and product development support to build their own websites and online catalogues. PEOPLink staff usually travel to the country where the trading partner is located and do a series of demonstrations to demystify the technology to people with limited exposure to Internet applications. Additional technical support is provided in specific areas such as product design, quality control, packing, shipping, and creation of a coordinated global distribution and payment system.

Daily sales range between $50 and $500, with up to 90 percent going to artisans. Examples of PEOPLink's wide range of trading partners include the Kuna Mola Cooperative, Tiendas Camari, and the Community Crafts Association of the Philippines. Kuna Mola is a cooperative of 1,200 indigenous Kuna women living on the San Blas Islands off the Caribbean coast of Panama, who produce intricate reverse appliqués based on their traditional dress. Tiendas Camari serves 98 community producer groups representing more than 8,000 artisans in the

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[25] Burr 2000; Digital Opportunity Initiative 2001; Grameen Phone 2001; Narayan and Shah 2000.

highlands of Ecuador producing both handicrafts and foodstuffs. The Community Crafts Association of the Philippines (CCAP) serves 21 producer associations and 30 family-based groups with more than 2,000 artisans, 90 percent of whom are women. CCAP is a well-established institution with more than $700,000 in annual exports.[26]

Support to Innovators

In India, the **Honey Bee Network** is making poor people's innovations and traditional knowledge visible through a multimedia and multi-language database of solutions to local development problems. The database contains more than 10,000 innovations in text form collected from 4,000 villages and presented in seven languages, as well as 100 innovations in multimedia format. The information is disseminated both through the Honey Bee newsletter and through stalls in religious fairs, which receive more than 400 visitors per day. Soon, linkages between farmers, rural extension workers, and researchers in agricultural institutions will be strengthened by the creation of an InfoDev-sponsored knowledge network. This network will allow extension workers and researchers to transmit information by sound or picture files to facilitate communication with farmers who are illiterate and who speak various languages.

The Honey Bee Network, which was set up in 1989 and has benefited from the support of the Indian Institute of Management, Ahmedabad (IIMA), is a concrete example of the democratization of knowledge through horizontal networking. Local communities and individual innovators, even those who are illiterate, can use the network to learn from each other across large geographic distances and across cultures. Many of the innovations are extremely simple but can significantly improve the efficiency of farmworkers, small farmers, and artisans. Innovative solutions have included a tilting bullock cart, a simple device to fill nursery bags, an improved pulley for drawing water, and a gum scrapper to enable women to collect gum from thorny bushes or trees. The database also features a large number of small machineries, herbal pesticides, veterinary medicines, new plant varieties, and agronomic practices developed by small farmers.

Scouting and documenting innovations, however, is not enough. Some of the innovators actually experienced increased frustration after being featured in the database. They know that despite doing good work, they remain poor. There is therefore a need to commercialize these innovations, which in turn requires an incubator fund, a microventure capital fund, and the protection of intellectual property rights.

In 1993 Honey Bee was strengthened by the formation of a volunteer organization, the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI). Since then, Honey Bee has scaled up significantly, with the creation of a regional microventure promotion fund, the Gujarat Grassroots Innovation Augmentation Network (GIAN), and a national register for innovations, the National Innovation Foundation (NIF). SRISTI also aims at setting up a Global Innovation Foundation, an international clearinghouse for innovators, by 2002.

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[26] See the PEOPLink website at http://www.peoplink.org. Also see Digital Opportunity Initiative 2001; Narayan and Shah 2000.

GIAN was created in 1997 in collaboration with the Gujarat state government, which has so far contributed $300,000 to convert innovations from the Honey Bee database into viable enterprises. Innovators are given access to risk capital and to technical know-how to turn their innovations into a product that can be commercialized. GIAN has already incubated several innovations into products, filed nine patents on behalf of grassroots innovators, and licensed some of the innovations to entrepreneurs on a district-wide basis with the license fee going to innovators. Honey Bee intends to set up similar venture promotion funds in other states in India.

The National Innovation Foundation was set up in March 2000 to replicate the Honey Bee model all over the country, with $5 million from the Indian Department of Science and Technology at Ahmedabad. The NIF will develop a national register of inventions and innovations, link innovations, investments and enterprises, connect excellence in formal and informal sciences, set up incubators, and help in changing society's mindset to ensure respect, recognition, and reward for grassroots innovators who often face indifference or contempt. NIF recently organized a national contest for scouting innovations, and more than 1,800 proposals were received from all over India.[27]

Support to Small Farmers

The 20-year-old **National Dairy Development Cooperative** in India serves 600,000 households daily, making it one of the largest cooperatives in the world. Dairy products are marketed in 500 towns and milk is collected through 96,000 village milk collection societies in 285 districts, involving 10 million farm families. Approximately 16.5 million liters of milk are procured daily with an annual value of Rs. 780 billion (about $16 billion). Taking advantage of the robust organization of the cooperatives, the Indian Institute of Management, Ahmedabad introduced a computerized system with integrated electronic weights, electronic fat-testing machines, and plastic readers at 2,500 collection centers. This has increased transparency and led to faster processing, shorter queues, and immediate payment to farmers.

Formerly, the fat content in milk was calculated through a cumbersome measurement process hours after the milk was received. Even if they delivered milk daily, farmers were paid only every 10 days and had to trust the cooperative society staff's manual calculations of the quality and quantity of milk. Malfeasance and underpayment to farmers, although difficult to substantiate, were commonly alleged.

With the computerized system, dairy farmers now receive immediate payment and save considerable time with shorter queues at milk collection centers. Farmers delivering milk to the cooperative collection centers are given a plastic card as a form of identification. The card is dropped into an electronic reading machine that transmits the I.D. number to a personal computer. The milk is then emptied into a steel trough and the weight is instantly displayed to the farmer and communicated to a computer. A sample is also fed into a machine that determines its fat content in seconds, displaying it to the farmer and transmitting it to the computer. The computer calculates the amount due to the farmer on the basis of the milk's fat content. The total value of the milk is then printed on a payment slip and given to the farmer,

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[27] Baramati Initiatives 2001; Bhatnagar and Schware 2000; Cecchini forthcoming.

who collects the payment at an adjoining window. In many centers the entire transaction takes no more than 30 seconds. The more than 50,000 dairy farmers who use the computerized system feel empowered and benefit from a more transparent, efficient, and effective cooperative delivery system.

IIM Ahmedabad is now developing a Dairy Information System Kiosk (DISK) software package with two main components: an application with enhanced database and reporting that includes a complete history of all milch cattle owned by the farmers, and a dairy portal connected to the Internet through which producers can make business transactions, order supplies, access information and government documents, and exchange information with each other. Farmers will also be able to learn about dairy innovations through a multimedia database, the Honey Bee Network (see above). DISK has been pilot tested in two cooperative villages in the Kheda District, Gujarat.[28]

Access to Financial Services

Computerization, smart cards, and automated teller machines (ATMs) reduce costs for financial institutions, enabling them to reach clients more efficiently, thus allowing poor people and micro-businesses to access financial services.

Smart cards with an embedded microchip containing information on the clients' credit history, along with software systems that provide loan tracking, financial projections, and branch management information, help microfinance institutions (MFIs) reduce transactions costs. By lowering costs, smart cards and software systems can make MFIs financially sustainable more quickly and in a position to reach a large number of poor people.[29] Even the most efficient MFIs are in fact spending between 35 percent and 51 percent of their average loan outstanding on operating costs. And ATMs, allowing cost-effective deposits and withdrawals, can make it possible for commercial banks to extend services to poorer townships and slums.[30]

Smart Cards for Microfinance

An Indian MFI, **Swayam Krishi Sangam** (SKS), started using smart cards in August 2000 to reduce time spent on copiously recording financial transactions at group meetings. SKS was set up in 1998 by Vikram Akula, a son of Indian immigrants to the United States, who was inspired by a visit to Muhammad Yunus and the Grameen Bank. SKS targets the poorest 20 percent of the population by focusing on the poorest regions and selecting individuals through key informant interviews and village surveys. As a result, SKS clients are considerably poorer than most MFI clients.

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[28] World Bank 2001; Bhatnagar and Schware 2000. See also India's National Dairy Development Board website at http://www.nddb.org.

[29] In Africa, the financial and information service network provided by Pride Africa offers microfinance to a client base of 100,000 in five countries. The average loan size is $125 (Digital Opportunity Initiative 2001).

[30] Digital Opportunity Initiative 2001; Akula 2000.

SKS currently operates four branches in Medak District, Andhra Pradesh, and serves about 2,200 female customers. SKS provides savings and loan products designed through participatory processes and disbursed through village collectives called *sangams*. To date, total disbursement has been $165,000 with a repayment rate of 100 percent on income-generating loans (20 percent interest rate), seasonal loans, and emergency loans (0 percent interest rates). Most members take $50 general loans their first year and $100 their second, and use these funds for land and livestock-related enterprises.

At one of the four SKS branches, loan officers are piloting the smart card technology. At the branch office they download borrower information from a main computer terminal into a handheld computer before a group meeting. At the meeting, borrowers insert their smart cards into a reader in the handheld computer to review their accounts and record new transactions. Upon returning to their offices, loan officers upload information back into the main computer. A read-only handheld computer is left in the village for customers to check their balances on a regular basis. SKS plans to expand the use of the technology to all four branches.

Smart cards offer three important advantages for SKS. First, they lower the high cost of delivering financial services to the poor by reducing the time of weekly village meetings by as much as 50 percent, enabling field staff to conduct three or four village meetings per day instead of the typical two per day. Second, smart cards help SKS maintain sound financial standards and controls to prevent error and fraud. This is particularly important because microfinance involves a large number of transactions, thus leaving ample scope for error and fraud. Smart cards solve this problem by having a single data entry point on an "electronic passbook" that seamlessly links information from the village to the branch, up to the head office and even to donor and lending agencies. In addition, the smart card system enhances the ability of management to monitor operations and respond quickly to problems. Finally, smart cards promote SKS sustainability and enable the MFI to offer a wide range of flexible financial services to better meet the financial needs of the poor.[31]

Smart Cards for Small Businesses

In Swaziland, the Growth Trust Corporation, a business affiliate of **Swazi Business Growth Trust** (SBGT), with assistance from USAID and Development Alternatives, Inc., is issuing smart cards to its small business clients to allow them to get funds and make repayments at participating commercial bank branches around the country.

SBGT, acting as a "virtual bank," has provided Swaziland's four major banks and their branches in the country's two largest cities with battery-powered smart card reading terminals. SBGT maintains a line of credit with the commercial banks offering the service free of charge to its low-income clients. Transaction information, complete with cash flow analysis, is downloaded daily, enabling SBGT to accurately and easily monitor disbursements and repayments.

SBGT invested approximately $100,000 to develop its smart card technology and banking software. Smart card reading terminals cost $1,000 per unit; smart cards cost about $8 each, and

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[31] Akula 2000.

can be reprogrammed after being returned by graduated borrowers. Today the system is becoming less expensive, as the cost of smart cards is falling rapidly and a less expensive ($500) reading terminal is being developed. In the future, SBGT plans to make transactions, including savings services, available to its customers by telephone and online.

ATMs to Bring Commercial Banking to the Poor

In 1993, the **Standard Bank of South Africa** created an affiliate, E Bank, to deliver basic banking services to the urban poor through ATMs conveniently located in townships. Historically, poor South Africans have opened direct deposit accounts with the banking system in order to avoid theft. Most wage laborers have passbook savings accounts that have high transaction costs because of high transaction fees and teller time. Long payday lines of one to two hours at banking halls are expected. Due to high levels of illiteracy, banks were unable to move these low-balance high-volume accounts to card-based accounts accessible through regular ATM machines.

E Bank combines innovative technology of modified ATM services with staff trained to help clients with basic electronic banking. E Bank outlets are situated in nontraditional kiosks open to the sidewalk, conveniently located in townships, with videos for entertainment or instruction, and are decorated with vibrant colors. In addition to text, the ATMs have a simplified screen that uses graphics to illustrate usage for illiterate customers. Each kiosk is staffed by three or four assistants who speak several local languages.

E Bank offers a single savings account (no checking, no passbook) and all accounts with more than R 250 ($56) earn interest. Clients can obtain cash, deposit savings, and transfer money to relatives and others in the system around the country. Depositors with regular minimum balances become eligible for drawings and prizes and even automatically receive a modest amount (R 1,500, or $333) of life insurance coverage.

More than 150,000 customers created E Bank accounts within its first year of operation. However, running E Bank as a stand-alone entity was not profitable as the number of transactions per machine was below the break-even point. In 1996 E Bank was folded back into Standard Bank and E Bank clients were transferred to a new E Plan; facilities were renamed Auto Bank E outlets. In May 1997, Standard Bank converted 570,000 low-balance customers to the E Plan. In addition, E Plan attracted 600,000 new account holders in the 10 months between late 1996 and mid-1997. After three years in operation there are approximately 1.4 million E Plan account holders using 70 Auto Bank E outlets. In 1997 there were more than 18 million Auto Bank E transactions, which make up 24.6 percent of all Standard Bank transactions. It takes about 8,000 transactions per month to break even on the ATM machines, and the average for E Plan is now about 12,000. Forecasts for 2002 are for 50 million Auto Bank E transactions—42.5 percent of all Standard Bank of South Africa transactions.[32]

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[32] Paulson and McAndrews 1998.

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