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Challenging Poverty

Information and communication technologies are an important component in the generation of wealth. How can they help reduce poverty?

As the debate on whether poverty is best challenged by money or knowledge continues, efforts to improve individual lives and kick-start economies in developing countries are escalating. As in wealthy countries, where technology has transformed many lives, information and communication technologies (ICT) are part of development programs in poor countries. However, their application is very different and the implementation constraints can be overwhelming.

The World Bank, which cites its mission as "working for a world free of poverty," is a supporter of ICT for development (ICT4D). The bank has a global ICT department with three organizational groups: one offers loans and assistance for ICT projects to developing world governments; another promotes sustainable private-sector investment in developing countries; and the last acts as an ICT think tank, bringing together and disseminating best practices.

This year, the World Bank will spend approximately $7.3 billion on projects with an ICT component. Typical examples include an $8 million grant to a private sector program in Bhutan that is establishing an IT park and a $40 million loan to the government of Ghana for an e-Ghana project.

"We offer loans, grants, and technical assistance," says Randeep Sudan, lead ICT policy specialist in the World Bank's ICT department, "and we have a formal mechanism for deciding assistance strategies and working with governments to define projects and relationships. Inclusiveness and sustainability are key issues."

The World Bank collaborates with many organizations, bringing together multidisciplinary teams including academics, consultants, anthropologists, computer scientists, and economists. Projects focusing on ICT consider how technology can impact poverty through its application in areas such as education, health, agriculture, e-government, and public-sector reform.

With projects and people in place, the challenge is to overcome local constraints including a lack of ICT infrastructure, inadequate and unreliable power supplies, and a paucity of skilled, and sometimes literate, local people. Also, mind-sets need to be challenged and visionary plans created, particularly in developing countries that are limited by their own political or economic constraints.

PHOTOGRAPH BY DIPANKER DUTTA

Despite the difficulties of implementing technology, the World Bank sees ICT as an important element of transformation. "ICT has an impact in nearly every intervention we make to reduce poverty," says Sudan. "It enhances employment, pushes up incomes, increases the employment of women, creates efficiency in government services, and reduces corruption."

The European Commission also provides funds to sustain ITC4D initiatives and works in partnership with developing countries to build infrastructure. The Infrastructure Partnership with Africa, which the Commission supports, is partially funding the EASSy submarine cable that will link the countries of East Africa to the rest of the world and is due to be in place before South Africa hosts the World Cup in 2010. As well as easing the lack of connectivity in Africa, the EASSy cable will provide lower communication costs than satellite systems.

Harry De Backer, a principal administrator working in the new technologies remit of the Commission's European Development Fund, explains: "The EASSy cable will give Africa an opportunity to become part of the world economy through better communications, which will improve the export of locally produced products. EASSy will also provide backhauls into poorly connected areas of Africa, such as Kenya, Uganda, Burundi, Tanzania, and Rwanda. Ultimately, the backhaul will reach rural areas."

With some 278 million mobile phones in Africa—one in three people has a mobile phone according to the GSM Association (GSMA), a global trade group of mobile phone operators—and GSMA operators poised to invest $50 billion over the next five years, the prospect of creating a strong commercial environment is promising.

De Backer believes those living on just a few dollars a day will be included in the mobile phone community, stemming migration to congested cities and improving the lives of poor people through communication. One example of a mobile phone project is farmers who receive an SMS service telling them the consumer prices of vegetables. Armed with this information, the farmers can better negotiate prices with the middlemen who buy from the farmers and sell to consumers.

While connecting Africa is a major task, many smaller ICT projects are challenging poverty. Some have the potential to scale regionally, others could cross continents. Their proponents are experts with a desire to use ICT

to amplify what people in developing countries can do to improve their lives and eradicate poverty. Again, the task is Herculean, with the World Bank reporting that, despite a reduction in the proportion of people living in poverty in the developing world over the past 20 years from 40% to 20%, more than a billion people still struggle to survive on a dollar a day.

Improving Farmers' Lives

Successful ICT4D projects include eSagu, an IT-based personalized agricultural extension system that started in 2004 as a research project by the International Institute of Information Technology (IIIT) in Hyderabad, India and is funded by Media Lab Asia, a nonprofit organization that carries out collaborative research in developing relevant and sustainable technologies, and culturally appropriate solutions, which will improve daily life.

In India, farming is the backbone of the economy, with two-thirds of the population living in rural areas and depending on agriculture for their income. However, the farming community faces numerous problems, including a lack of timely expert advice to help farmers be more productive and competitive.

eSagu ("Sagu" means "cultivation" in the Telugu language) aims to improve farm productivity by delivering farm-specific expert advice in an opportune manner to each farmer without the farmer needing to be literate or IT competent. The system is based on a team of agricultural experts at an eSagu lab, usually in a city, supported by an agricultural information system. A small computer center, with a coordinator who is an educated and experienced farmer, covers a group of five or six villages. Every day, the coordinator visits farms to collect information and take photographs. A CD is then prepared and sent by parcel service—broadband is prohibitively expensive—to the main lab, where the experts analyze each farm's crop situation and prepare farm-specific advice. This is downloaded to the village eSagu center via a dial-up connection and the coordinator delivers the experts' advice to each farmer.

With HealthLine, women can become healthcare providers in rural villages that often have little or no health service provisions.

By closing the gap between agricultural research and practice, eSagu helps farmers improve efficiency and use pesticides and fertilizers effectively. An evaluation study showed that eSagu farms accumulated benefits worth about $89 per acre.

IIIT professor P. Krishna Reddy, who has been involved in eSagu since it started, suggests that the scalability of the system and its ability to be developed using existing infrastructure mean it could be expanded across rural India and replicated elsewhere.

"eSagu has been very successful. This year we will look at how it can be commercialized and improved further, still for the benefit of rural farmers," Reddy says.

At the Indian Institute of Technology (IIT) in Madras, professor Ashok Jhunjhunwala of the Department of Electrical Engineering, leads Tenet, a telecommunications and computer networking group that aims to bring not only telephony and Internet services to rural India, but also social improvement such as better education, agricultural development, and job creation. Jhunjhunwala also chairs a rural technology and business incubator with a mission to design, pilot, and nurture business ventures and a vision to facilitate inclusive technology and business development in rural areas.

"Everything is so different in rural areas compared to urban areas. The technology is different, connectivity is difficult and often only mobile, and the economics are different as there are a smaller number of people in a specific area with little ability to pay for services," explains Jhunjhunwala. "Each challenge is a huge learning experience and things you assume will work often don't."

While little connectivity in rural India 10 years ago meant there was no business case for commercial expansion, 60% to 70% of the rural population

Computer Science

Richard Karp Wins Kyoto Award

Richard Manning Karp was recently awarded the Kyoto Award in the category of Advanced Technology for his contributions to the theory of computational complexity, which he first developed in the early 1970s by establishing the theory of NP-completeness.

A professor of computer science and electrical engineering at the University of California, Berkeley, Karp has had an enormous influence on the principles behind the analysis and design of algorithms used in numerous scientific disciplines.

Karp's NP-completeness theory increased the efficiency of problem solving by providing a standard method of measuring the computational complexity of combinatorial problems. His NP-completeness theory classifies problems by their degree of difficulty: Class P represents problems for which polynomial-time algorithms of deterministic solutions exist and Class NP represents problems for which polynomial-time algorithms of non-deterministic solutions exist, including the sub-class NP-Complete, the most difficult-to-solve problems. By developing a standard methodology for this process, Karp significantly advanced the theory of computation and algorithms that now support the field of computer science.

Karp is the recipient of the 1985 ACM A.M. Turing Award, the National Medal of Science, and the Benjamin Franklin Medal in Computer and Cognitive Science, among other awards. He will be presented with the Kyoto Award and a $460,000 prize from the Inamori Foundation at an awards ceremony in Kyoto, Japan, in November.

is now connected, making it more feasible for telecomm operators to move into rural India.

The business case around services based on connectivity remains weak, however, because the question of who will pay is unanswered. But Tenet and the IIT incubator are experimenting with a number of technology and application options, developing ideas that could scale to become commercial.

Jhunjhunwala forecasts that mobile communication will reach 97% of India's rural population in the next few years and that every village will have broadband in five or six years. However, he says, "we are also concerned about sustainable development and world issues such as climate change. Creating a better life for those in rural areas will challenge the poverty trap of moving to overcrowded urban areas and reduce climate damage."

Rural Healthcare

In Pakistan, ICT4D programs include a speech and language technology development research project led by Carnegie Mellon University and Aga Khan University, and initially funded by Microsoft's Digital Inclusion initiative. Called HealthLine, the project seeks to overcome a lack of healthcare information in rural areas by giving members of the healthcare community access to medical information. Healthcare workers, mostly village women chosen by the government for two months of basic training, use a toll-free number to call and ask questions of an automated health information system. The system overcomes literacy problems and barriers to information access, allowing the women to act as frontline healthcare providers in villages that often have little or no health service provision.

Jahanzeb Sherwani, an undergraduate from Lahore and a doctoral student at Carnegie Mellon, is working on the project in Karachi, talking to healthcare providers about their needs and considering how technology can be adapted for populations with a low level of literacy. The system is being tested and, if it is successful, could be scaled to cover the 100,000 rural healthcare workers in Pakistan. The economics of the system are good as health workers need only access to a phone and the health information is held on a PC server in Karachi.

Roni Rosenfeld, professor of computer science at Carnegie Mellon, hopes the Pakistani government will fund a large-scale version of the project, but also envisions a business model that requires people to pay a small fee for information they want, making the project self sustaining if it is not government funded.

Are such projects sustainable? "Absolutely," says Rosenfeld. "Although it is hard to predict sustainability for any one ITC4D project, overall sustainable projects are sure to emerge. We need expertise in IT, economics, social policy, different cultures, and business, and we need to try out as many ideas and solutions as possible. Some will fail, but some will succeed."

It is not just academic projects that are reaching the poorest people on the planet. Commercial companies are also playing a part. While cynics suggest their interest is in cornering emerging markets, corporations such as Microsoft take a more balanced view. Kentaro Toyama, a leader in Microsoft's Technology for Emerging Markets group at Microsoft Research India, acknowledges the business potential of new markets, but also points to the company's responsibility to help people get the most out of computers, particularly in places that have previously lacked access to technology.

In terms of ICT4D projects, Microsoft runs many, funding research budgets and collaborating with development partners such as the World Bank. Its projects include Digital Green, which disseminates agricultural education to small farmers through digital video, and text-free user interfaces, which allow nonliterate groups to access computers.

While the answer to the question of whether the end of poverty will be achieved by money or knowledge is probably both, Toyama adds the need for human interest. "The problems of developing countries are huge and dire," he says. "We have to do as much as we can to help by harnessing the energy of people in developed countries. ICT4D is sustainable and can be successful as long as it attracts human interest." C

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Patent Applications

Patent Filings Increase in China

More patent applications were filed in China than any other country last year, according to China's State Intellectual Property Office, which received 694,000 applications in 2007. The U.S. had the second most applications, with 484,955, followed by Japan with 443,150.

Three types of patents are granted in China: invention patents, which are valid for 20 years from the date of filing, and utility patents and design patents, both of which are valid for 10 years. In terms of invention patents, China is ranked third in the world, behind the U.S. and Japan. If China's number of patent applications continues at its current rate, it will lead the world in invention patent applications by 2012.

Approximately one-third of the invention patent applications filed in China are made by foreign businesses, "which clearly suggests that filing in China has become an intrinsic part of most multinational company's [intellectual property] strategies," according to Evalueserve, a market and business research company.