By Mark Warschauer

Demystifying the Digital Divide

The simple binary notion of technology haves and have-nots doesn't quite compute

For much of the past decade, policy leaders and social scientists have grown increasingly concerned about a societal split between those with and those without access to computers and the Internet. The U.S. National Telecommunications and Information Administration popularized a term for this situation in the mid-1990s: the "digital divide." The phrase soon became used in an international context as well, to describe the status of information technology from country to country.

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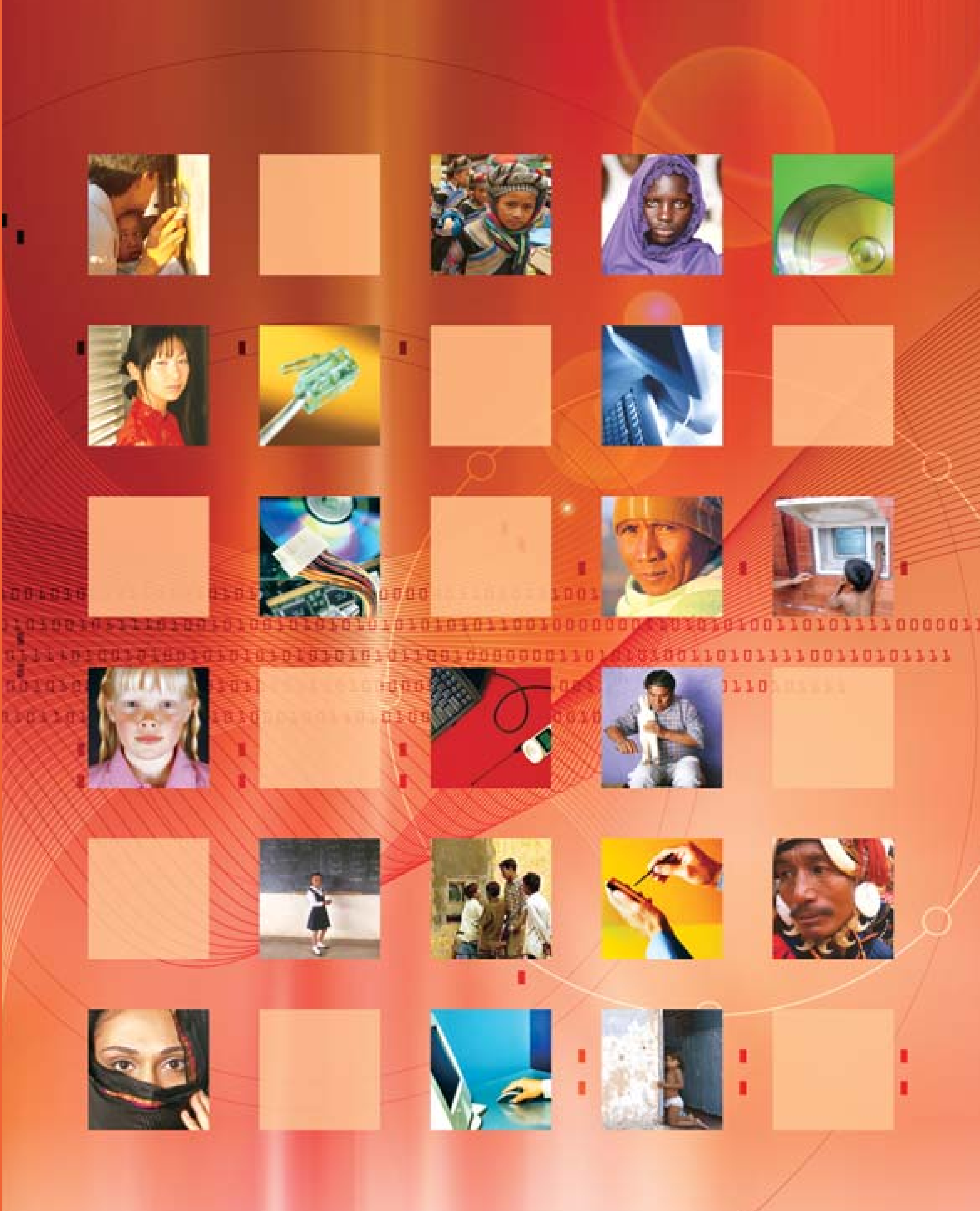

LEFT TO RIGHT: NATIONAL INSTITUTE OF INFORMATION TECHNOLOGY, DAVID GREEDY, PHOTODISC, PHOTODISC (*top row*); PHOTODISC (*all photographs in second row*); PHOTODISC, PHOTODISC, MARK WARSCHAUER (*third row*); PHOTODISC, PHOTODISC, KEITH DANNEMILLER *Corbis/SABA* (*fourth row*); KEITH DANNEMILLER *Corbis/SABA,* NATIONAL INSTITUTE OF INFORMATION TECHNOLOGY, PHOTODISC, PHOTODISC (*fifth row*); PHOTODISC, PHOTODISC, VIVIAN MOOS *Corbis* (*bottom row*)

Underlying disparities are real, both within and among countries. The Benton Foundation, which promotes the public-interest use of communications technology, reports that by late 2001, 80 percent of American families with annual household income greater than $75,000 were online, compared with 25 percent of the poorest U.S. families. Total home Internet access was 55 percent for whites, 31 percent for African-Americans and 32 percent for Hispanics. Looking at the international picture, in most African countries less than 1 percent of the population is online. Not surprisingly, such disparity correlates highly with other measures of social and economic inequality.

Yet the simple binary description of a divide fails to do justice to the complex reality of various people's differing access and usage of digital technology. An American who surfs the Internet on a computer at a local library once a month might be considered to be a digital "have-not," whereas someone in a developing country with the same profile would be a "have." Indeed, couching the condition in black-and-white terminology can lead those attempting to deal with technological inequities down the wrong path. The late Rob Kling, who directed the Center for Social Informatics at Indiana University, put it well: "[The] big problem with the 'digital divide' framing is that it tends to connote 'digital solutions,'" that is, "computers and telecommunications," without a consideration of the context into which that hardware would be put.

This line of reasoning led some to assume that the dearth of digital access of nations, communities and individuals could be easily tackled by an infusion of computers and Internet connections. Former Speaker of the U.S. House of Representatives Newt Gingrich has talked about the virtues of giving every child a laptop computer, without offering a solid plan for using the devices. And Bill Gates donated computers to small-town libraries across America, believing that Internet connections would help stem the exodus from rural areas. Although Internet connection through small-town libraries has improved people's lives by allowing them to stay in touch with friends and relatives, it has not stemmed the exodus—which largely depends on broader factors, such as employment availability—and may even have contributed to it by allowing people to search for jobs in cities. (To Gates's and Gingrich's credit, they at least had the issue of technology access on their radar screens. Gates, recognizing the limitations of computer technology in solving social ills, has since gone on to donate billions of dollars to broader health and education campaigns around the world.)

This perspective is known in academic circles as technological determinism, the idea that the mere presence of technology leads to familiar and standard applications of that technology, which in turn bring about social change. The Harvard Graduate School of Education's Christopher Dede has termed this the "fire" model, with its implication that a computer, by its mere presence, will generate learning or development, just as a fire generates warmth. Governments, the private sector, foundations and charities have thus spent hundreds of millions of dollars to bridge the perceived digital divide by providing computers and Internet lines to those in need, often without sufficient attention to the social contexts in which these technologies might be used. (Dede notes that a better model than fire might be clothing, which also keeps one warm yet is tailored for individual fit and use.)

How does this application based on the assumption of technological determinism turn out in practice? Over the past few years, I have traveled around the world to study community technology programs in both developed and developing countries. I have observed scores of diverse programs and have interviewed hundreds of participants and organizers. As the following case studies show, two basics became apparent: well-intentioned programs often lead in unexpected directions, and the worst failures occur when people attempt to address complex social problems with a narrow focus on provision of equipment.

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Overview/*Technologic Logic*

- The concept of a "digital divide" separating those with access to computers and communications technology from those without is simplistic and can lead to well-meaning but incomplete attempts at a solution based on merely adding technology to a given circumstance.
- In fact, people have widely varying opportunities for access to computers and communications technology and disparate reasons for wanting the level of access they may desire.
- A consideration of how people can use computers and the Internet to further the process of social inclusion is paramount in any effort to install new technology into an environment lacking it.

A Minimalist Approach

IN 1999 THE MUNICIPAL government of New Delhi, in collaboration with an Indian company called the National Institute of Information Technology,

NEW DELHI CHILDREN experiment with what is literally a hole-in-the-wall computer in 2000. The minimally invasive education project was designed to insert technology into the environment so that the children would learn to use the computer without guidance. Without direction, however, the computer proved for the most part to be merely a high-tech toy.

launched an experiment to provide computer access to children in one of the city's poorest areas. Government officials and representatives of the company set up an outdoor kiosk with several computer stations. The computers, with dial-up Internet access, were inside a locked booth, but the monitors, joysticks and buttons stuck out through holes and were accessible. In line with a concept known as minimally invasive education, the test included no teachers or instructors. The idea was to allow the children unfettered daily access so they could learn at their own pace rather than through the directives of adults.

The program was hailed by its organizers as a groundbreaking model for how to bring information technology to the world's urban poor. Inspiring stories circulated on the Internet about how illiterate children taught themselves to use computers and thus crashed the barriers to the information age. These accounts led to additional kiosks being set up in other locations.

My visit to one of the New Delhi kiosks, however, revealed a different picture. The Internet connection seldom functioned. The architecture of the kiosk—based on a wall instead of a room—made instruction or collaboration difficult. Most poor communities in New Delhi already have organizations that work with children and that could have set up educational training at a different kind of computer center, but their participation was neither solicited nor welcomed. Over the nine-month duration of the experiment, the youngsters did indeed learn how to manipulate the joystick and buttons. But without educational programs and with the content primarily in English rather than Hindi, they mostly did what you might expect: played games and used paint programs to draw.

Neighborhood parents felt ambivalent. Several embraced the initiative, but most expressed concern about the lack of organized instruction. Some even complained that the computer was detrimental. "My son used to be doing very well in school," one parent said, "but now he spends all his free time playing computer games at the kiosk, and his schoolwork is suffering." In short, the community came to realize that minimally invasive education was, in practice, minimally effective education.

Nevertheless, an overemphasis on hardware with scant attention paid to the pedagogical and curricular frameworks that shape how the computers are used is common in educational technology projects throughout the world. But such technological determinism has been challenged in the academic arena by a concept called social informatics, which argues that technology must be considered within a specific context that includes hardware, software, support resources, infrastructure, as well as people in various roles and relationships with one another and with other elements of the system. And the technology and social system continuously shape each other, like a biological community and its environment.

Although grassroots teachers, parents or aid workers may be unfamiliar with the academic term "social informatics," many already appreciate the implications of an interwoven relationship of technology and public organizations. Social informatics has recently given birth to "community informatics," which also considers unique aspects of the particular culture into which technology is placed, so that communities can most effectively use that technology to achieve social, economic, political or cultural goals.

A More Integrated Attempt

ONE EXAMPLE of a program based on a community informatics approach is the Gyandoot (which translates to "purveyor of knowledge") project in India. In 2000 in the southwest corner of Madhya Pradesh, one of India's poorest states, the government established this digital effort

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to bring more economic and political power to the rural population, nearly two thirds of whom are undernourished and illiterate. Each village received a computer kiosk, which is connected to the others in a network. Local entrepreneurs service the machines, and a small team hired by the government creates content for the Gyandoot intranet, based on an analysis of the people's social and economic needs.

This content includes updated prices of popular crops at the district, regional and national markets, so that small farmers can decide whether to harvest their crop and where to sell it, without wasting a day traveling to the district capital for price checks. A complaint service lets villagers report local problems, such as malfunctioning hand pumps or teachers failing to show up at schools. With villagers quickly able to voice such concerns digitally, government services have started to improve.

Local kiosk managers operate the computers, thus making the service, which costs a few cents per use, accessible even to the illiterate. Kiosk managers also offer computer training to village children for a small fee, thereby upping the collective computer skills of the community while affording additional income to the managers. And Gyandoot is used to connect with the area's broad socioeconomic initiatives, such as a "healthiest child" campaign, which provides information about vaccinations and nutrition.

Gyandoot was inexpensive to launch, because it involves only one computer per village, and it is partly self-sustaining, because kiosk operators are able to recover some of their costs through small fees to users. With its emphasis on meeting user needs through small-scale, locally run services, it has much in common with the earlier model of telephone kiosks that helped to extend phone access throughout much of India. In the nine months beginning in October 2001, the Gyandoot kiosks had some 21,300 users, 80 percent of whom had annual incomes of less than $300. The number of users is a small percentage of the population, but the benefits of the project, such as improved government services, eventually ripple outward to friends, families and co-workers.

The magnitude of the Gyandoot success story remains to be determined. But the underlying approach—a combination of well-planned and low-cost infusions of technology with content development and educational campaigns targeted to social development—is surely a healthy alternative to projects that rely on planting computers and waiting for something to grow.

The key issue is not unequal access to computers but rather the unequal ways that computers are used.

Fine-Tuning in California

A DOMESTIC CASE, which I investigated with doctoral candidate Jodie Wales, also shows the importance of the community informatics approach. California high schools offer Advanced Placement (AP) courses that give students college credit and facilitate their admission to the best universities. These courses are available in dramatically unequal numbers, however, largely in relation to the socioeconomic status and ethnicity of student populations. For example, in 1999 Beverly Hills High School, which is 9 percent African-American and Hispanic, offered 45 AP classes. Inglewood High School, in a different part of the same metropolitan area and with 97 percent black and Hispanic students, offered only three such courses.

To address this problem, in 2000 the University of California Office of the President and the university's College Preparatory Initiative engaged in a collaboration with the Anaheim Union High School District, which has a large Hispanic population. The first effort was an online AP course in macroeconomics, because many of their students, even the poorer of them, had some access to computers and the Internet outside of school. Attendees of several schools enrolled in the courses, thus potentially overcoming the problem of small and dispersed populations of advanced students. The result: only six of 22 students completed the course. Some reasons became clear through student surveys and interviews. The online instructional format—with students completing work independently from their home computers—lacked sufficient structure, teacher contact and peer interaction to maintain students' motivation to cope with the challenging material. The Hispanic students commented most frequently that they preferred these types of social support.

Still, the failure was fruitful. A revised program the next year brought students from several schools to a computer laboratory at a central location, this time to take an honors course, "Introduction to Computer Science and the C Programming Language." Although the class was still taught online to take advantage of the distant expert instructor and the computer-based curriculum, a local teacher joined the students to answer questions and provide general assistance. The combination of online expert instruction and face-to-face teacher and peer interaction proved much more effective: 56 of 65 students completed the course. Based on these results, the University of California College Preparatory Initiative abandoned the previous model of pure online instruction in exchange for the combined online and face-to-face model. (Of course, students may find an honors computer class somewhat more accessible than an AP macroeconomics course, or the former might be better suited for the online setting. Such points must also be considered

FARMERS ACCESS the Gyandoot intranet at a community computer facility in central India's Dhar district, where 60 percent of the 1.7 million residents live below the poverty line. The intranet provides crop prices, official application forms, and a place to hold village auctions and to air public grievances.

when devising the mode of instruction.)

More and more evidence points to the need for a careful consideration of all potential ramifications before applying technology as an educational Band-Aid. In fact, my research—together with that of other educational investigators such as Henry J. Becker of the University of California at Irvine, Harold Wenglinsky of the City University of New York and Janet Schofield of the University of Pittsburgh—shows that computer use in schools is as likely to exacerbate inequality as lessen it. The key issue is not unequal access to computers but rather the unequal ways that computers are used. Our studies note that kindergarten through 12th grade students who enjoy a high socioeconomic status more frequently use computers for experimentation, research and critical inquiry, whereas poor students engage in less challenging drills and exercises that do not take full advantage of computer technology. In mathematics and English classes, where such drills are common, poor students actually have more access to computers than do more affluent ones. Only in science classes, which rely on experiments and simulations, do wealthy students use computers more. Once again, a "digital divide" framework that focuses on access issues alone fails to face these broader inequalities in technology use and learning.

Changing the Mind-set

PEOPLE ACCESS digital information in a wide variety of ways and usually as part of social networks involving relatives, friends and co-workers. Literacy provides a good analogy. Literacy does not exist in a bipolar divide between those who absolutely can and cannot read. There are levels of literacy for functional, vocational, civic, literary and scholarly purposes. And people become literate not just through physical access to books but through education, communication, work connections, family support and assistance from social networks. Similarly, technology can be well implemented to augment and improve existing social efforts and programs.

The bottom line is that there is no binary digital divide and no single overriding factor for determining—or closing—such a divide. Technology does not exist as an external variable to be injected from the outside to bring about certain results. It is woven into social systems and processes. And from a policy standpoint, the goal of bringing technology to marginalized groups is not merely to overcome a technological divide but instead to further a process of social inclusion. Realizing this objective involves not only providing computers and Internet links or shifting to online platforms but also developing relevant content in diverse languages, promoting literacy and education, and mobilizing community and institutional support toward achieving community goals. Technology then becomes a means, and often a powerful one, rather than an end in itself.

It is important to note that the Bush administration is cutting funding of programs that foster access to technology. Some might argue that such cuts are appropriate if there is no digital divide, but that reasoning is as specious as simplistic solutions based on the notion of a divide. The opposite of divide is *multiply*. Policy planners should stop thinking in terms of divides to be bridged. The combination of carefully planned infusions of technology with relevant content, improved education and enhanced social support can multiply those assets that communities already have. SA

MORE TO EXPLORE

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Athena Alliance: **www.athenaalliance.org/**

Center for Social Informatics: **www.slis.indiana.edu/CSI/**

Community Informatics Research and Applications Unit: **www.cira.org.uk/**

Community Technology Centers Network: **www.ctcnet.org**

Digital Divide Network: **www.digitaldividenetwork.org/**

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