Chapter 6

Including Everybody

The Internet is a tool like the telephone; it also is a social movement that embodies a drive for human connections. Both aspects are joined in a concern to eliminate digital divides. There are differences in Internet access between different income levels in the United States; and between citizens in the developed world and the world s poorest nations who, it is believed, will be left even further behind.[1] This chapter discusses a package of solutions to the problem of access, including a global purchasing cooperative and other elements of a start-up package to bring benefits to the village level of the Third World.

To develop a solution, we must recalibrate old images of darkest Africa and the most remote villages of India. Unexpectedly, the long-distance capacity to linkup these sites has already arrived. The new satellite capacities above Africa and India are sufficient to downlink the books in the Library of Congress to each village before breakfast (and they provide a menu of cable television channels similar to those received by subscribers in the US). Fiber optic submarine cables already circumnavigate the African continent and the most recent DWDM-enhanced cable that links the West and East coasts of India to Singapore s hub of global Internet backbones adds 8.4 terabits/second (Tbps), enough for 230 million simultaneously dial-

[1] For an overview: Pippa Norris, *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*, ed. W. Lance Bennett and Robert M. Entman, *Communication, Society and Politics* (New York: Cambridge University Press, 2001).

up Internet connections.[2] By April 2002, the Chinese S curve of home Internet connections was accelerating, growing at 5% - 6% per month: more people in China (57 million) already have home access to the Internet than in any other country outside the US (Japan was third, with 51 million; followed by Germany, 32 million and the UK, 29 million.)[3] There is much work to be done in the Third World, especially to reduce costs and help with the village-level linkups. Yet the greater challenge is to identify and organize the online resources that can use this windfall of technology to best advantage for development.

I. Introduction

A. Digital Divides in America

In America, Internet access is commonly defined as an Internet connection in each home. This definition of the problem has probably been accepted because the United States is a highly individualistic country, wealthy (most households below the poverty line own a color television), and many people place a high value on saving time.

However, using community facilities can be more efficient: public libraries can assure basic public access to information, including the Internet. In America, this step was taken quickly: about 95% of libraries were online by the spring of 2000; even US public libraries with more than 40% of their service area below the poverty line had

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[2] PR Newswire, "Bharti and Singtel Celebrate Completion of I2i Cable Network," *FT.com*, April 11 2002.

[3] BBC News, *China's Home Web Use Soars* (Online) (BBC News Online, April 23, 7:21 GMT 2002 [cited April 28 2002]).

an average of 7.2 workstations for the public.[4]

In America, all public secondary schools also had Internet access by 2000. And 97% of public elementary schools, including 96% of those with 50% or greater minority enrollment and 94% of the elementary schools with 75% or more of their students eligible to receive free or reduced-price lunches. And the typical American high school also had 79% of its instructional classrooms with Internet access (76% of elementary school instructional classrooms) and an average ratio of five (secondary school) to eight (elementary school) students per instructional computer.[5]

B. For the Third World: Community Resources as a Basic Investment

Similarly, community systems (e.g., at a public library or community center; and a basic facility at public schools) are a good, basic step for the information age in most Third World countries. Upgrades can be acquired as demand and economic growth increase. This also was the historic sequence in America: The first step in providing public telephone service was to install pay telephones along city streets. Pay telephones also were installed in the lobbies of hotels and apartment houses, and in barber shops and bars, and other public locations. College dormitories installed

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[4] U. S. Census Bureau, *Statistical Abstract of the United States: 2001*, 121 ed. (Austin, TX: Hoover's Business Press, 2002) 718.

[5] Ibid.,, 155. There may be a case for more investment in public education hardware, but most educators probably feel that they have enough computers and Internet connections to integrate the technology into standard school subjects. And that the (next) basic need is for on-line resources that increase the value of the current investment.

hallway telephones and systems of buzzers to individual rooms to send a notice of a call. Later, in rural areas and the suburbs, residents initially shared party lines.

By the same sequence of appropriate technology, small telephone/e-mail kiosks in each village or neighborhood would be a good first step to serve the public. They could be privately owned, although accessible to everybody; or a cooperative.[6] The cost of a satellite or other wireless connection would be widely shared among many users. If desirable, the facilities could be used for several purposes, at different periods of the day, and with much greater efficiency than in the United States. They can be near a school, health clinic, and/or community center library where they can receive additional use during daylight and evening hours.[7] Satellite-linked entertainment to village television sets in the evening and weekends can underwrite other uses during the working day.

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[6] For discussions of research and initial projects: Peter Benjamin, "African Experience with Telecenters," *e-OTI: OnTheInternet*, October 2000.
National Telephone Cooperative Association, *Initial Lessons Learned About Private Sector Participation in Telecentre Development: A Guide for Policy Makers in Developing Appropriate Regulatory Frameworks* (Arlington, VA: National Telephone Cooperative Association, 2002).
Larry Press, "A Client-Centered Networking Project in Rural India," *OnTheInternet* 5, no. 2 (January/February) (1999).

[7] The American public library movement began in the 1840s; at first, for efficiency, the new public libraries often were tied to schools: Steven Lubar, *Infoculture: The Smithsonian Book of Information Age Inventions* (New York: Houghton Mifflin, 1993) 27.

C. Satellite Links and Digital Divides in the Developing World

The Third World is a moving target. Table 6-1 shows the extraordinary recent growth of the world s geosynchronous communication satellite links: there has been about a 30% increase in capacity since 1999, most of it for data (e.g., from local Internet service providers direct to fiber optic backbones) and television. By now, about half of the world s satellite communications capacity is used outside North America and Europe, a trend that especially reflects major investments in services for China and India. (And this investment, in turn, changes the future for the 1/3 of humanity, 2+ billion people, who live in China and India.)

Table 6-1
Global Commercial Communications Satellite (GEO) Capacity[8]

Year	Capacity*
1999	5,493
2000	6,462
2001	6,847
2002 (1st quarter)	7,193

[8] Source: Futron Corp., *Futron Satellite Telecommunications Report. April 2002* (Bethesda, MD: Futron Corporation, 2002).
Futron Corp., *Futron Satellite Telecommunications Report. January 2002* (Bethesda, MD: Futron Corporation, 2002).
Futron Corp., *Global Analysis of Transponder Usage and Coverage, November 15, 2001* (Bethesda, MD: Futron Corporation, 2001).

* In 36 MHz transponder equivalents

(To explain the technical terms: Commercial communication satellites operate in assigned ranges of the radio-frequency spectrum.[9] Within each range, each satellite is allocated a band of frequencies. The satellites use transponders that receive signals, amplify them, and then repeat/rebroadcast them (using beams of different configurations) back to earth. Transponders come in different capacities; a standard measuring unit is a 36-MHz transponder equivalent. The conversion of this capacity to a digital equivalent depends upon several technical issues, but 45 Mbps is a serviceable approximation.[10]

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[9] C-band, Ku-band, and Ka-band. C-band uses lower frequencies that require large and more expensive dish antennas. C-band works much better in climates with heavy rainfall, as the higher (Ku and Ka) frequencies are attenuated by rain.

[10] Assuming ideal conditions, the Advanced Television Systems Committee has identified options for 2, 3, and 4 high-definition television (HDTV) channels to share a 36 MHz transponder. See Table B.5: Examples of Multiple 19.39 Mbps data streams in a 36 MHz transponder: Advanced Television Systems Committee, "Modulation and Coding Requirements for Digital TV (DTV) Applications over Satellites. ATSC Standard.,", (Washington, DC: Advanced Television Systems Committee, 1999), 31.. Available online at www.atsc.org/standards.html. The 45 Mbps conversion is a mid-range estimate (about 3 HDTV channel equivalents) and the rate appears easy to obtain in normal operations: Via Satellite, *Satellites - the Best Bet for Broadcasters* (Online at http://www.telecomweb.com/satellite/feature.htm) (Telecomweb Satellite, April 2002 [cited April 19 2002]).. For additional technical

Of this capacity, about 10% of the satellite transponders are used for Africa/Middle East, 15% for Asia-South Asia, 14% cover Asia and the Pacific, and 12% cover Latin America (North America is 28%, Europe 22%).[11]

Today, we need to update our images. There is an abundance of satellite capacity, even over Third World countries. India now receives about 150 television channels from 18 satellites, in 14 languages. These include many cable channels familiar to US viewers: CNN, Animal Planet-India, Discovery Channel-India, National Geographic-Asia, CNN, MTV-Asia, CNBC, Cartoon Network, a Fashion Channel from France, and ESPN; and also many Indian channels, including downlinks from the Indian film industry, which produces more films each year than any other country in the world. Subscriptions to basic cable packages cost about 1/10 of the charges in North America.[12]

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issues see: Advanced Television Systems Committee, "ATSC Standard: Delivery of IP Multicast Sessions over ATSC Data Broadcast,", (Washington, DC: Advanced Television Systems Committee, 2002).

[11] Futron Corp., *Global Analysis of Transponder Usage and Coverage, November 15, 2001* 8.

[12] Data from www.indiantelevision.com. Cable rates from villages south of Madras: Press, "A Client-Centered Networking Project in Rural India,". Re film: The Indian film industry . . . . continues to be the world's largest producer of low-quality films for domestic consumption, releasing 700 features per year in 16 languages : Encyclopedia Britannica, *Motion Picture, History Of* (Online) (Encyclopedia Britannica online, 2002 [cited April 29 2002]).

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Black Africa receives television from 31 satellites (18 for Eastern Africa and 13 for Western Africa). Fewer native languages are available than in India (primarily English and French): about 100 English-language channels are available. If we explore the question (chapter 4) of universals in human nature, there are no surprises. There are national channels (Tanzania, Botswana, Nigeria, Uganda, Nile International, etc.) but (like India) other channels are in categories that are familiar to US cable subscribers: eight movie channels (including Turner Classic Movies), eight infotainment channels (including Discovery Channel and National Geographic), twelve news channels (including CNN, and CNN Financial, BBC, CNBC-Europe, Bloomberg Television), fifteen sports channels (including horse racing, not readily available in the US), two children s networks (including the Cartoon Network), five music channels (including MTV-UK), four religious channels, and a new niche-market channel, Club (*Club is a girl s thing. The channel is specifically designed for women, celebrating the uniqueness of being a woman in the 21st century. Whether forging careers, playing the dating game or raising a family, Club empowers women to have it all.*) which offers US talk shows like Oprah and The Rosanne Show with Rosanne Barr.[13] If you live in Windhoek, Namibia, you can see Sesame Street and Baywatch.[14]

D. We Can Do Anything

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[13] African data are from www.kallbaskafrica.com/tv/english and www.kallbackafrica.com/tv/details.html.

[14] William Wresch, *Disconnected: Haves and Have-Nots in the Information Age* (New Brunswick, NY: Rutgers University Press, 1996) 23. Wresch s analysis of different types of information is a valuable contribution.

We are at a point where, if it is truly beneficial to do so, we can transmit any available information to anybody in the world at an affordable cost (i.e., affordable to donors in advanced countries.) And newly-changed capacities and costs of hard disks permit high-use Websites to be mirrored to local or regional servers; and overnight (1 AM - 5 AM) or off-peak use of the transponders of entertainment television would permit updates or copious transfers of new material for later viewing to a public facility in each village.[15] The purchase and use of under-used capacity on the orbiting entertainment-supported satellite transponders (discussed below) could become a major part of the Third World telecommunications backbone, especially for any type of communications that can use a store-and-forward design.[16]

E. Two Cautions

> If we do not do something to change our leadership style, we will eventually have enormous resentment across the planet. Because the style we came out of World War II with, was to be dominant. . . . And one of the great challenges we face is that we are so large relative to the rest of the world - not in population, but in wealth and in military power and prestige - we re so large than unless

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[15] Summed across transponders this amounts, in principle. to about 30 Gbps for Africa, vastly more than enough (30 Gbps x 3600 seconds/hour x 4 hours) to transmit anything in the public interest. Assume 700 transponder equivalents at 45 Mbps per transponder.

[16] The US government has a global 24 x 7 satellite television channel, WorldNet, with abundant capacity and virtually no audiences, especially at these hours.

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> we adopt a more careful and more learning oriented and listening oriented style, we re going to truly alienate a lot of allies. . . . [I]f we don t modify our ability to knit together our friends, and to listen to our friends and to work across the planet, we will some day have an anti-American coalition that is large and real and that will bond itself together just from the idea that at least we aren t the Americans.
>
> - Newt Gingrich[17]

Two cautions, before proceeding.

First, the early Western experience (the printing press) was that new communications technology is liberating and politically progressive. But later experience underscores that the religious and political Right also will use these new technologies: the unexpected rise of the Christian Coalition (chapter three) followed from the new ability to organize geographically dispersed groups behind charismatic leaders, and secure new sources of funds. While the US government has complained about Islamic fundamentalism/anti-Israel/anti-American programming on state-run television in Arab countries, this is a self-deceptive argument. The less regulated television in the Arab world has been even more critical of the ineffectiveness of Arab governments in pressuring the United States on behalf of the Palestinian cause; and they have used new technology to show the Palestinian Intifada graphically and live.[18]

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[17]Newt Gingrich, "Remarks on Diplomacy in the Information Age,", (Washington, DC: Georgetown University, 1997).

[18] Abbas El Tounsy, "Reflections on the Arab Satellites, the Palestinian Intifada, and the Israeli War," *Transnational Broadcasting*

The addition of new and freer communications technologies accelerates the political process; it does not guarantee that better-informed adult or youth audiences in the Arab world will support American foreign policy.

Second, as Newt Gingrich emphases, anti-Americanism can be an attractive rallying point for the disadvantaged. It is going to be important for the US to have a *political* program that commits its leadership to the global use of new technologies of the information age, on behalf of ordinary men and women in all countries. If there is a perception that the American people, or Republican members of Congress, etc. don t care, America s capacity to organize democratic power for its own vision of progress may fail.

F. What s Next?

Against this background, I want to address two questions. Yes - individuals and institutions in developed countries could simply pay for connections to communication services in the Third World - and for the many people who barely subsist on less than $1/day (about

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Studies 8, no. Spring-Summer (2002).

Mohammed El-Nawawy and Adel Iskandar Faraq, *Al Jazeera: How the Free Arab News Network Scooped the World and Changed the Middle East* (Boulder, CO: Westview Press, 2002) 56. This biannual journal (from the Abdallah Center for Television Journalism at the American University in Cairo) is a good source for recent developments. For a history of satellite-delivered newspapers and television in the Arab Middle East a useful overview is: S. Abdallah Schleifer, "Media Explosion in the Arab World: The Pan-Arab Satellite Broadcasters," *Transnational Broadcasting Studies* 1, no. Fall (1998).

1.2 billion) or less than $3/day, anything that is free is a gift.[19] However are there: 1.) Strategic uses of these capabilities that can be unique catalysts to development? And (perhaps more important) are there 2.) New information resources that could be organized to accelerate the development process?

II. Purchasing Cooperatives

> Proposal: A global purchasing cooperative for new communications technology in UDCs, to be organized by the World Bank in partnership with leading NGOs and development agencies.

Only the poor and unorganized pay list price.[20]

There are several benefits from a bold and strategic use of the global Internet to organize a purchasing cooperative: 1.) Organizing for Moore s Law purchasing; 2.) the ability to bargain collectively with owners of LEO, MEO, and GEO satellite systems; and 3.) leveraging purchasing power, including the added benefits of online

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[19] World Bank Group, *World Development Indicators 2002* (Washington, DC: World Bank, 2002).

[20] Online purchasing systems also could include participation by national or regional providers in Third World countries, who might lack the clout and resources to advertise globally. Sears, Roebuck was the amazon.com of its day, using its giant catalog to extend markets to Americans without ready access to urban stores. A Third World purchasing cooperative could use Web pages to provide virtual catalogues.

global auctions; 4.) the ability to organize startup packages that will accelerate the benefits of new investment.

A. The Benefit of Moore s Law

Moore s Law (chapter one) identifies an important benefit for the Third World. Since the next generation of microchip will arrive within three years, today s new technologies are (in a sense) always over-priced: They must recover their R&D cost, manufacture and marketing costs, and total profit within three years. Prices are reduced during each product cycle: on average, the marginal cost to manufacture the newest technology will be only about 15% - 25% of retail. (For example, Intel s new 2.2 Ghz Pentium 4 chip, introduced in early 2002, initially sold for $562 and cost about $55 to make.)[21] The old generation of chips is quickly discontinued in advanced industrial countries.

Yet for the Third World these manufacturing plants, with costs already amortized by purchasers in the world s advanced countries, can provide large supplies of powerful and inexpensive chips that already, by the late 1990s (chapter one), had crossed the thresholds to run all of the key broadband applications for education, health, and business.

No major company expects to make a significant fraction of its profits by selling the latest computers to villages in the world s 117 poorest countries (designated as low, or low-middle by the World Bank). Thus, if a global purchasing cooperative can segment part of the UDC market, and buy in sufficiently large quantities to keep old plants in operation for x months, a new capability to do Moore s

[21] Michael Kanellos, *New Pentium 4 to Alter Competitive Map* (2 PM, EST) (CNET news.com, 2002 [cited January 3 2002]).

B. Satellite Capacity

We have already seen that the falling prices and increased capacities of hard disks will allow GEO satellites above the Third World to be used more efficiently. Low prices for satellite links (and the organization of off-peak, non-entertainment uses) may not be negotiable by individuals or villages, but a purchasing cooperative with a wide purview might benefit entire continents.[22]

The greatest benefit to large-scale cooperative purchasing of satellite capacity will occur for mid-earth-orbit (MEO) and low-earth-orbit (LEO) satellites. Rather than remain in high, fixed orbits, these satellite networks rotate as a shell above the earth. They are equipped to meet peak-load demand over advanced industrial countries - and yet the same capacity also rotates above the Third World, providing almost no revenue. The marginal costs to use the MEO and LEO satellite capacity for UDC broadband should be about zero.[23] Being much closer to earth, the satellites also benefit from the inverse-square law and can operate with much smaller (and less expensive) antennas and, rotating across the sky, they are freed of the requirement for an unobstructed view toward the equator. There

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[22] And provide additional revenue to owners of transponders whose entertainment applications generate little or no revenue during part of each 24 hour cycle.

[23] Within villages (and perhaps between them) many other technologies can be used. For example, wireless modems or new Wi-Fi wireless networks. Or the new 3G cellular telephone technology. One of the benefits for UDCs is that so much of their radio frequency spectrum is unassigned.

is a mutual benefit if a global cooperative can make large wholesale, steeply discounted purchases of this capacity for a segmented market of education, health, science, and nonprofit public facilities in UDCs.

The higher end broadband uses, however, should not distract from the importance of uses at the lower end. Email (or even digital voicemail), for example, is a remarkably efficient solution for Third World countries, especially when satellites do the village-to-village linkups without the requirement of twisted-pair copper wire telephone networks.

C. Online Purchasing Services and Auctions

As we have seen (chapter two) the Internet improves competitive markets. Private and more efficient online purchasing networks are becoming common for large companies. In early 2002, Wal-Mart had 30,000 suppliers on-line; Covisint.com (a joint venture of Ford, General Motors, and DaimlerChrysler, with participation by eight other international automobile manufacturers) had 5,000 suppliers online and participating in competitive auctions, with $50 billion of orders for vehicle parts in 2001.[24] There can be savings for all parties, from the reductions in price, and from the savings in time and paperwork for bids and contracting. Auctions are popular across industries - the basic rule of thumb, according to a recent review, is that you can dicker any price above $100 - often effecting an extra 15% - 20% reduction, even for the largest purchasers in already competitive markets.[25] [26]

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[24] John Blau, "Intense Auto Competition Allows for No Mistakes," *Financial Times*, March 13 2002.

[25] Robert E. Hall, *Digital Dealing: How E-Markets Are*

A global purchasing cooperative could be created (online) quickly if the international automobile industry (which does business in every country) were to open its online network to a cooperative organized by the World Bank, in partnership with UN agencies, NGOs engaged in Third World activities, and governments involved in aid to the Third World.

III. Startup Package

Today, the S curve of major Internet linkups for most of the Third World still requires several elements (chapter two) to gain momentum. These include: 1.) Big Hop long-distance capability at an affordable price; 2.) a critical mass of Internet terminals, wireless where appropriate, to access the global Internet; and 3.) resources on the Internet that are of sufficient value to justify the expense of the startup package.

- The first (Big Hop) requirement can be solved by the purchasing cooperative.

- The second requirement for a critical mass of downlink capacity can be solved if the members of the cooperative also jump-start a development package by securing 100,00 basic Internet terminals for science education and health in the world s 117 poorest countries. And make a commitment to complete a link-up of all clinics and public schools (for science education) in these countries on a fast timetable.

Transforming the Economy (New York: W. W. Norton, 2001) 10, 100.

[26] Stephen Pritchard, "Streamlined Benefits for Buyers and Sellers," *Financial Times*, March 13 2002.

- The third requirement can be solved by creating a package of must have applications for development - i.e., resources that are so useful that, once they were created, everybody will want to have available.)

A. 100,000 education and health linkups

Concerning the 100,000 terminals (wireless, where appropriate): The purchasing cooperative would seek competitive bids for an initial Moore s Law purchase of 100,000 basic Internet terminals for schools (science education) and health clinics in the Third World. We cannot know the best price that can be achieved at the time this book is published, but let us make a high estimate of about $150 - $200 per terminal - i.e., $15 million - $20 million. (We can refine the package to 117,000 purchases - 1,000 linkups for each of the 117 countries listed by the World Bank as low or low-middle in GDP/capita. It is a bold first-year investment that is large enough that new investments in online Internet applications for development can begin to be available throughout the Third World.)

As donors pledge additional funds, the linkups will expand, to complete the initial investment for education and health; subsequent expansions (e.g,, for village-level telecenters) will evolve from the purchases of members through the cooperative. (Even at $15 million - $20 million/year and 100,000 terminals each year, a lot could be accomplished quickly. For example, if we wish to provide one basic link in each school in the world s poorest countries to support science education teachers: Of the ten countries in sub-Saharan Africa reporting their number of primary

schools to UNESCO, the total is only 36,766.[27] [28] Painfully, the most serious deficit in the world s poorest countries is the lack of schools for primary education (and a much smaller percentage of the population is served by secondary schools.)[29] However, what can be done via technology is at least to make the curriculum resources of the schools that are available, equal to the best anywhere.)

The requirements at the time this book appears will need to be estimated. (There are about 640,000 villages in India; however India has been opening its telephone and satellite industry to competition and a combination for private and government investment may meet part of the need.)[30]

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[27] Data from www.unesco.org from 1997.

[28] A United Nations working group, now underway, may be ready to help, for example by securing funds for 10,000 terminals in the poorest Third World countries for health. There also are broader discussions underway, including a purchasing cooperative. See the www.unicttaskforce.org Web page; and for an early submission concerning a purchasing cooperative, www.policyscience.net.

[29] World Bank Group, *World Development Indicators 2001* (Washington, DC: World Bank, 2001) 88. See also the appendix concerning unreliability in official data.

[30] China and India have advanced sectors and large internal markets. The Chinese government has made a major commitment to spend $120 billion for telecommunications and information technology over the next five years; and also has formed partnerships with leading Japanese companies to develop new technologies: BBC News, *China's Home Web Use Soars* ([cited). Yomiuri Shimbun/Daily Yomiuri, *Japan, China Plan to Team up on*

I would suggest that the startup package include at least three high-priority areas where Internet links could make a major difference: science education, health, and specific development-related knowledge.

B. A Startup Package of Resources for Education, Health, and Development

1.) Science Education Resources

> Today, practically all office workers know word processing. Most learned it late in life, well past age eighteen. But some subjects, while easy for a child to learn, are impossible for adults . . . languages, for instance. The earlier you start, the easier to become fluent. Same with playing a musical instrument. Or

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Big Net Research Project (April 25) [Online] (FT.com online, April 25 2002 [cited April 28 2002]).

In India, there is rapid growth in village-level links and shifts to Internet-based telephone. For example: Tina Chopra Karkhanis, "Competitive Growth Ahead for VSAT Market," *Times of India*, April 16 2001.

M. Rajeev, "Computer Education in 1,000 Govt. Schools," *Times of India*, April 9 2002.

Times of India, "Telephone Networks to Be Upgraded," *Times of India online*, April 26 2002.. The latest undersea fiber optic cable between India and Singapore, discussed earlier, was completed in April, 2002 with a capacity of 8.4 Tbps, is designed to handle 130 million Internet dial-up connections simultaneously and connects to both the East and West coasts of India: PR Newswire, "Bharti and Singtel Celebrate Completion of I2i Cable Network,".

> drawing. Or public speaking. Gymnastics. Plenty of people wish they d learned a musical instrument or a foreign language as a child. But I ve never heard anyone complain that they were deprived because they weren t exposed enough to computers or television as a kid. . . . I d rather read a sixth grader s composition on butterflies written after watching a monarch chrysalis in a field of milkweed than view a multimedia display referencing the latest entomological research downloaded from the Internet.
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> - Clifford Stoll[31]

Students in Third World countries will have much of their lifetimes to use computers and the Internet and to watch television. Rather than provide computers for their own sake, one of the wisest investments will be an online package that supports the basic science curriculum in local schools. Leading foundations, scientific, engineering, and mathematical societies could place online at least one outstanding textbook for their fields for primary and secondary schools. If necessary, translations could be provided. Teachers and students worldwide would have access to at least one outstanding text, equal to the best of what is available to students in advanced countries.[32] Additional resources for teachers and student projects

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[31] Clifford Stoll, *High-Tech Heretic: Reflections of a Computer Contrarian* (New York: Anchor Books, 1999) 7.

[32] As the text would be unlikely to have any market in UDCs, rights might be obtained inexpensively. It also would be an honor to have a text selected by an distinguished jury as an outstanding text recognized for international excellence, and might increase sales in advanced countries. A simple password system could help to assure

also could be provided. The Annenberg Foundation (www.learner.org) has already created a broadcast channel and Website to support upgrades in US teaching in grades K-12 and its remarkable resources also could be available to Third World teachers.

Science education can benefit greatly by providing online support for teachers: in environmental studies, data about the students own nations can be more available via the Internet than from their own governments. For students interested in computers, computer languages, and creating Web sites, a package of online resources for science teachers or science and mathematics clubs would open a rich and exciting universe. And we know that there will be a flow of new developments in biology that can help students in Third World countries who want to become doctors and health professionals.

I emphasize a modest technology investment for each school because I agree with Stoll (quoted, above). The primary work of education is not learning to use a computer or look-up information on the Internet. The first step is to provide resources that support the work of teachers.

A strong startup package in science also can help to capture imaginations and shape identities. At a basic level, the geopolitical contest for the future of the world is a battle for the imaginations, passions, and future loyalties of today s young people.[33] At one

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that the online version was only available to legitimate users.

[33] About 30% of the world s population is currently below 15, so whatever can be done to connect to schools can larger numbers than might be imagined from observing age distributions in the

level, the early skirmishes for the future of world politics (including anti-American terrorism) are already being fought between MTV and Islamic suicide bombers.[34] On the American side, it would be wise to move quickly to assure that science, including biology - healing, idealism, the emerging global Internet, intellectual challenge and excitement, and a future of contribution (including, by women) become part of the options associated with the US.

2). Health

Concerning health resources: chapter 8 will outline an American startup that can be available to Third World countries. With so many deprivations in the Third World, there is an obvious question of whether Internet linkages for health are misplaced enthusiasms. Box 6-1 is a statement by Dr. George Gellert that addresses this issue. It was written in support of a coalition of organizations supporting a plan by Secretary-General Kofi Annan to secure 10,000 Internet health linkups for the world s 100 poorest countries.

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developed world. In some African nations, more than 50% of the population is below 16: John W. Wright, ed., *The New York Times Almanac 2002* (New York: Penguin, 2001) 472.

[34] Re MTV vs. Jihad; see also the phrasings of Barber and Friedman: Benjamin Barber, *Jihad Vs Mcworld* (New York: Ballantine, 1996).
Thomas L. Friedman, *The Lexus and the Olive Tree: Understanding Globalization* (New York: Farrar, Straus, Giroux, 1999).

Box 6 -1
The United Nations Health/Internet Initiative

Ignorance. Indifference. Inaction. In a world where infectious disease epidemics, malnutrition, and poverty are commonplace, why bother with the Internet? In a world where there are insufficient hospitals, clinics, public health centers, well trained doctors and nurses, clean water and sterile syringes, a safe place and care for a mother to birth her baby, and inadequate food, drugs, or even livable space, is the Internet really relevant? When the bricks and mortar health care needs of much of the world s people have been shamefully neglected for decades, is not connectivity to the health Internet an inappropriate band aid at best - and a naïve, arrogant pretense at worst? With global population growth out of control, and with 80% of all new population increases expected in the poorest fifth of humanity - most of whom will likely not even be able to read, does a global network of interacting computers, content, and functionality offer any meaningful value?

There can be no reasonable refutation of the facts which underlie these questions. Of course there are food, health care, clean water, literacy, and bricks and mortar needs in the developing world that are utterly and absolutely compelling, and of course, filling these needs must remain paramount in bridging the grotesque inequities that characterize our world at the beginning of this new millennium. Connecting the doctors, nurses, and public health workers serving the world s poorest people to the health Internet is no substitute for meeting the more elemental and fundamental needs of the world s poorest two-fifths.

But let us make no mistake about it - ignorance kills. It is the same world of inadequate bricks and mortar where people die or fall ill regularly from actions and behaviors which, if avoided, could prevent or lessen the severity of disease. This is true not just of illnesses where behaviors contribute to disease, such as smoking and AIDS, but others where personal behaviors are not the issue, such as prevention of insect-borne diseases through effective use of protective nets, micronutrient diseases through use of vitamin supplements, or of water-borne disease through improved water filtration and sanitation. It is even true of injuries (motor vehicle, home and work-related), perhaps the biggest killer in the world. For all of these public health problems, a knowledge-based system of intervention to change behavior, including and mediated through the Internet, could prove extremely valuable in terms of saving lives and reducing human misery.

- Dr. George Gellert[35]

He passionately emphasizes that information is only one of the extraordinary needs - and, obviously the more that can be done to use these new technologies to build relationships and collaboration, rather than only a flow of information, the more powerful the contribution to the work of each clinic.

3. Development-related information

Including high-priority information that can accelerate development would be helpful. The World Bank has announced a commitment to play a leading role in global knowledge management for development; it could take the lead to organize such resources.

> Proposal: The World Bank, based on competition, will provide grants to existing libraries and research centers to become Resource Centers in each field of interest for development (e.g., Renewable Energy; Desert Agriculture; Micro-Enterprise Projects; Environmental Management). The grants will add resources for personnel, equipment, and expanded library holdings to give the new Resource Centers the capacity to serve a global role effectively. Grants will be renewable through a competitive process every three years.[36]

The World Bank has been famous for being a large bureaucracy.

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[35] George Gellert MD, "Why Global Health Connectivity?,", (Atlanta, GA: WebMD Foundation, 2000).

[36] For further technical discussion see a longer version of this section, online at www.policyscience.net

The proposal (and the principles that follow) are intended to recognize that the best practices to use the Internet for development probably run counter to bureaucratic instincts: For example, the creation of a decentralized network that supports institutions already engaged in research frontiers and knowledge management, rather than building a staff and large library in Washington, D.C. Also in creating on-line catalogs and indexing aids, each Center will be able to add identifiers to a common system, and organize its reference material and knowledge in a variety of ways (some of them experimental or provisional) that assist its own purposes and users, I.e., centrally-imposed uniformity in the organization and storing of knowledge is unnecessary and should not be imposed.

- World Bank grants also should include funds to establish First Contact desks, an elite professional cadre who can facilitate the use and professional growth of the global networks of World Bank Resource Centers. And there should be funds so that these First Contact officers are backed by networks of experts who have agreed, for a fee, to respond to a limited number of queries and to have their answers be circulated by the Center. [37] [38]

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[37] I am indebted to Lynn Etheredge for a discussion of these issues.

[38] The working relationships developed by the First Contact Officers will be essential to the success of the initiative. For most people, change is not simply a process of obtaining information; rather the information is mediated through social and organization processes - and this may be a good idea, especially for people who have no independent way to verify that the information they receive is reliable. It also will help to work through intermediaries as the World Bank and its academic economists typically have been

First Contact Officers will be important because Third World users are not academics and will not know how knowledge of the world s experience is stored. Refining questions, often, should occur before it is clear what knowledge is needed. A government official who asks for copies of international agreements concerning water rights may really want this information. Yet he may be engaging in a project in which he really wants to know how to bring disputing parties into a process that eventually results in lasting agreement.

Too, many challenges related to sustainable development require knowledge of best practices and current projects. The First Contact Officers should be prepared, based on experience with users, to support the work of NGOs and local users with relevant knowledge of current projects, in addition to providing assessments of scientific literature. (Young college graduates from developing countries, with NGO experience in Third World countries, would be ideal: they understand the technology, would network automatically, and bring the village-level experience and enthusiasm to make the project a success.) [39]

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ineffective or harmful, across forty years, the periodic vows that this time the new idea du jour is the right idea. See: William Easterly, *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics* (Cambridge, MA: MIT Press, 2001). For an early exploration of international knowledge transfer see: William Foote Whyte, *Social Theory for Action: How Individuals and Organizations Learn to Change* (Newbury Park, CA: Sage Publications, 1991) 66-76. Also the discussion of opinion leadership and the broader review by Rogers: Everett M. Rogers, *Diffusion of Innovations*, Fourth ed. (New York: Free Press, 1995).

[39] See also the discussion of the need for, and skills of,

The First Contact Officers can be especially helpful if we assume that one of the good village-level questions will be How Can I Make Money? That is, the World Bank has given decades of advice about such topics as dams, roads, and electric power plants. Yet one of its most important functions for knowledge management and development will be to broker business advice, helping to direct people who want to assess local circumstances, crossbreed ideas, and increase economic growth beginning at their village. From the experience of these questions, the Centers might develop innovative programs, like a Charles Kurault On the Road show that visits the sites of local projects and - potentially life-changing knowledge - permits viewers to identify with the different participants and hear their stories, alongside knowing the abstract advice from the Centers databases about the successful next step businesses that typically have developed in villages at their level.

I emphasize the First Contact officer cadre as an explicit counterweight - because, in the usual way of bureaucracies, the people who have contact with ordinary users tend to be of lower status, and to be lower paid - the greater rewards being at administrative levels. Yet when a user from the Third World asks a question, the right response is not going to be Have you looked in the card catalog? What the right response should be, however, is a new level of inquiry that will require unusual and gifted people, in whose hands will be the real success of the project.[40]

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knowledge activists in: Georg Von Krogh, Kazuo Ichijo, and Ikujiro Nonaka, *Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation* (New York: Oxford University Press, 2000) 147-75.

[40] For the perspective and a suggestion from an early leader in

- The World Bank Centers also can use the emerging Internet capacity to be more engaged than a traditional library. Each should have an advisory panel that commissions, subjects to peer review, and issues updates whenever the current cognitive maps or existing stock of conventional wisdom needs to be revised about important issues. Each Center also might experiment with Internet multicasting of weekly 30-minute programs in its area, to a growing global niche audience in the developing world (e.g., a Washington Week in Review roundtable for Desert Agriculture; or for biotechnology and development.)[41]

IV. Four Questions

1.) Is organizing on this scale politically acceptable?

Purchasing cooperatives have widespread support across the ideological spectrum. They also are pro-market: they promote competition and dissolve when they no longer provide an economic advantage beyond what a competitive market offers. The use of market clout to secure lower prices is already an established practice of governments themselves: The US government requires that the prices it is charged be at least as good as the lowest prices that its suppliers charge their best customers. Other organizations also operate purchasing cooperatives or buying services for members: for example, Citibank and American Express have organized an online buying service for one million members that

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the World Bank s reorganization: Stephen Denning, *The Springboard: How Story-Telling Ignites Action in Knowledge-Era Organizations* (Boston, MA: Butterworth Heinemann, 2000).

[41] For a more extended discussion of five intellectual tasks, see an online version of this section on www.policyscience.net

negotiates prices and guarantees the lowest available prices on hundreds of thousands of consumer items.[42]

Any concern that institutions like the World Bank or UN agencies are being overly-bold by organizing on a global scale might be resolved by a contract to the online purchasing cooperative of the international automobile industry, which has already done the organizing.

2,) How do we know this investment will be well-used?

The money for most village-level purchases probably will come from NGOs and government agencies in support of their own programs. Their investment also makes it likely that they will develop useful Internet-based content for development.

3.) Aside from a village/school/clinic telecenter, do people in the Third World really need the Internet?

Henry David Thoreau (chapter two) asked this question about the telegraph in 1854 (Do Maine and Texas really need a technology for communication between them?) Unless human nature has changed, the answer is likely to be the same: In the long-run, people in the Third World will use the new Internet extensively and will create many values alongside wealth, and use it more widely than just to read Web pages. They will use it like people everywhere use communications technology - to talk (in part, in Lasswell s terms, for affiliation).[43] Compared with the US, digital Internet telephone is

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[42] The ValueClub also provides extended two-year warranties

[43] People like to talk; although the production of communications rises faster than its consumption. Re measurements across media: Ithiel de Sola Pool, "Tracking the Flow

likely to takeoff, especially if fueled by Moore s Law purchasing of early 21st century relics of Nokia cellular telephones. With their lower costs, these wireless devices of the expanding technologies of the walk-around Internet are likely to sell more quickly than home PCs. And the Third World economy may develop efficient markets quickly via the Internet: Sears, Roebuck was the amazon.com of its day and its mail order catalog created new markets to rural America that lacked access to large stores. Saving the costs of paper and postage, the Sears, Roebucks of Third World development may use online catalogs and Internet technology at village centers.

4.) How Much Can This Reduce Costs?

We will not know until the coalition for the global purchasing cooperative is assembled and competition and negotiations get underway. A useful expectation is that engineers and large-scale Moore s Law (last generation) purchasing should be able to reduce the cost of technology like personal computers or basic Internet appliances (terminals) to 25% or less of US retail. In the fall of 2001, one of Brazil s leading technical universities and the Brazilian government announced plans, developed with major computer companies, to sell a basic PC in Brazil (retailing for about $1,000 in the US) at $200 - $250 (with a 500 MHz processor, 56K modem, 64 Mb of memory and the free Linux operating system.[44] If the new,

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of Information (1983)," in *Politics in Wired Nations: Selected Writings of Ithiel de Sola Pool*, ed. Lloyd S. Etheredge (New Brunswick, NJ: Transaction Publishers, 1998). Ithiel de Sola Pool et al., *Communication Flows: A Census in the United States and Japan* (Tokyo: University of Tokyo Press, 1984).

[44] Rowena DasGupta, "Cheap Computers Bridge Brazil's Digital Divide," *eCountries*, February 5 2001.

small device Internet is building inexpensive Internet-on-a-chip sensors to install in vending machines to make wireless contact with a central office, a Third World telephone can be made the same size from the same technology, with a plug-in for a headset and online voice recognition for telephone numbers, without the expense of a keypad.

For satellite links, even at retail cost, the prices seem affordable. It is already clear that the new LEO and MEO Internet-in-the-sky satellites must charge rates that are competitive for advanced countries (e.g., $19.95/month for a 56Kbps Internet connection; a basic linkup for each science teacher in the 117 poorest countries would cost no more than, and might cost only a small fraction of, these familiar rates. If many institutions are donating for a strong startup package - including the purchase of terminals and high-value content for development - it might be possible to secure a donation of satellite capacity for an initial period of five years.

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