The Blind Men and the Elephant

The Sixth no sooner had begun
About the beast to grope,
Than, seizing on the swinging tail
That fell within his scope.
"I see," quoth he, "the Elephant
Is very like a rope!"

John Godfrey Saxe's (1816-1887)
version of the famous Indian legend.

CHAPTER 7

POLICY IMPLICATIONS

Ultimately, development concerns quality of life. If national computing and networking capacity is key in explaining the effects of the global digital divide in progress in development over the last decade, then the use or non-use of these technologies will affect the progress individuals and improvements in the quality of life of individuals around the world. Whereas progress may be minimum for wealthier individuals in a post-industrial developed country[1], it is much more significant for poorer individuals in developing countries that start with very low levels of development. From a different angle, one could state that the lack of an adequate core national and computing capacity could be *the* key barrier to the development of an information society in the developing world. The statistics confirm the huge differences. Of the roughly 3 million computers in Africa in 1999, about a half are in South Africa, one sixth are in Nigeria, one sixth in North Africa and the other one sixth is scattered across the rest of Africa (RAND 2000). In 1998, there were about 17 million phone lines for 750 million people

[1] Though there is evidence of digital divides occurring within developed post-industrial societies such as the U.S. NTIA. 2000. "Falling Through the Net IV: Toward Digital Inclusion." Washington D.C.: National Telecommunication and Information Association.

(1 in 50) in all Africa, but if we consider the Sub Saharan region and exclude South Africa, there were only 3.5 million lines (1 in 200), which is less than the number of lines installed in China in 1997 alone. “Just doubling the phone lines would cost about 20 billion” (Jensen 1996b).

State owned monopolies are seen as the major cause of high prices, poor service and slow growth of the telecommunication in Africa. Findings from this study also confirm that in economies with less corruption, less non-tariff barriers to trade, less fiscal burden of government, rule of law, less regulatory burdens, less restriction on banks, less labor market regulations, and less black market activities, the effects of the digital information and communication technologies on development is increased. However, there seems to be alternative ways to growth in infrastructure. While fixed line telecommunications growth in Africa was about 10% from 1997 to 1998, mobile lines grew in 65% constituting more than 20% of the fixed network (Jensen 1996a; Jensen 1996b; Jensen 2000). Since national computing and networking infrastructure is closely tied to progress in development, then policies designed to improve this capacity bypassing traditional barriers such as state monopolies offer the promise of fostering progress-prone environments via the use of digital information and communication technologies.

The global digital divide will continue to diverge if positive feedback loops in developing countries are not initiated to increase access, adaptation and creation of knowledge via the use of digital information and communication technologies. These loops by themselves will not reverse the nature of the phenomenon, but will at least provide some alternative experiences to existing ones that may make differences in the quality of lives of individuals, communities, and eventually populations in the developing world. However, special care has to be taken when designing policies to bridge the global

digital divide, since this phenomenon is seen differently from developed and developing countries:

> In 1996 the Information Society and Development conference was held in South Africa. Representatives of both developed and developing countries shared their views on how information technology (IT) could be used to accelerate economic development.
>
> The group of seven industrialized countries argued that the leading principles of the Information Society should be to promote dynamic competition and encourage private investment, with government providing an appropriate regulatory framework.
>
> By contrast, the thirty developing countries described how IT should be applied to meet basic needs, support socio-economic development, and respect the diversity of languages and cultures in their countries. Government would promote universal access and universal service. Thus, while one group described the 'Information Highway', the other spoke of the 'Information Community.' (Shakeel 2000, p.1).

While digital information and communication technologies are viewed as powerful factors of production by industrialized countries, less developed countries and developing countries view information and communication technologies as means to achieve higher levels of human development from a "community" perspective. Sharing the use of digital technologies, such as the Internet or personal computers, is seen as a strategy in the developing world to guarantee access to populations that otherwise would not be able to have access or use these technologies. Findings from these study suggest that a national highly skilled scientific labor force is not necessary to bridge the global digital divide. Just by providing access (maybe even shared access) to digital information and communication technologies to literate populations will increase the chances of making an impact in the quality of life of individuals.

As findings from research brings us closer to understanding the causal relations and the effects of the global digital divide and development, we should also be making progress in the design and assessment of the policy implications to overcome the global digital divide. Some examples of policy initiatives to create positive feedback loops to overcome the global digital divide from the perspective of developing countries include: 1) the replication of self sustainable, solar powered, local community Telecenters based on wireless communications; 2) the use of digital libraries to solve access, adaptation and creation of local knowledge; 3) the use of non-protected software and 4) underpromising and overdelivering development projects with a component of digital information and communication technologies. Surely there are many more ways to overcome the global digital divide. The following examples of projects and programs are only a few that have produced sustainable results in the developing world.

POSITIVE FEEDBACK LOOPS: SELF SUSTAINABLE SOLAR POWERED LOCAL COMMUNITY TELECENTERS BASED ON WIRELESS COMMUNICATIONS TO SOLVE ACCESS, ADAPTATION AND CREATION OF LOCAL KNOWLEDGE

Alternative communication technologies like wireless communication technologies can be applied to telemedicine applications over live Internet videoconferencing in a way that is more cost-effective for developing countries (Kelly and Petrazzinni 1997). New broadband wireless technologies can be implemented and maintained more easily than traditional “wired” infrastructures at a fraction of the cost. This line of reasoning suggests that it is possible to use the advantages created by mobile phones which are gaining rapid penetration in developing countries. A wireless

environment may in fact become a leap ahead of developed countries into an environment where the majority of calls and transactions may be made on mobiles (Kibati and Krairit 1999). Not surprisingly in 1996, more cellular users were added in China than in any other country except the U.S. (ITU 1999). On the other hand, some capital cities in Africa lack adequate power supply and depend on power sharing if at all, whereas many rural areas in the developing world may only have power for limited periods in the evening. Hence off-grid telecommunications and energy solutions in the developing world (Jensen 1996a; Jensen 1996b; Jensen 2000) offer the possibility of becoming an alternative to state monopolies as well as being more cost-effective.

During the first decade, the global digital divide was largely explained by national differences in access to digital information and communication technologies. Expanding access in developing countries also means expanding access beyond the urban settings to the rural populations via the use of Telecenters[2] , or to urban populations[3] that cannot afford these technologies. With the very low penetration levels and limited resources of consumers in developing countries, shared multi-purpose public access facilities run by

---

[2] A Telecenter can also be defined as a "physical space that provides public access to information and communication technologies for educational, personal, social and economic development". The first Telecenter was established in the mid-1980s in a rural farming community in Sweden. Henning Albrechtsten, a writer and academic, set up the facility to provide services, training and jobs to the local community through computers and modern telecommunications equipment. It was a powerful concept to bring 'state of the market' technologies to traditionally neglected 'back of the market' communities. Telecenters were a means to equitably expand the telecommunications network and give rural communities the chance to adopt IT to their benefit, strengthen social ties within the community and economic ties with the outside world. Shakeel, Hani. 2000. "Barriers to Telecenter Implementations in Sub-Saharan Africa." Massachusetts Institute of Technology.

[3] There are cases of innovative solutions like Mitra's "hole in the wall" experiences with Indian children from slum neighborhoods in New Delhi. See Appendix Q for further information.

entrepreneurs and communities, commonly known as Telecentres can have positive effects. A Telecenter for multiple purposes is the generic term for kiosks, cybercafes and other forms of public access, which do not necessarily mean installing a new facility but can also be designed by adding personal computers to community phone-shops, schools, police stations and clinics which can share the cost of equipment access among a larger number of users. According to several studies on the implementation of Telecenters, the development of rural communications, and the provision of affordable access to new services and applications in urban environments can benefit a community (Fuchs 1997; IDRC 1999a; IDRC 1999b; Shakeel 2000). Over the last decade, development agencies such as the IDRC and the OECD have supported the use of Telecenters in the developing world. Other organizations such as the South African Universal Service Agency are supporting applications from communities for these Telecenters expecting to roll out up to 250 Telecenters in the year 2001(Jensen 1996b).

Projects that implement Telecenters put an emphasis on the role of national and local authorities, the identification of potential partners and funding opportunities, as well as on developing the business plan and/or project proposal. There is a widely held belief that the availability of local e-commerce services is expected to increase radically the demand for multi-purpose Telecenter services. This is expected to improve the centres' sustainability by providing more useful and relevant applications for rural areas, provided they can be coupled with efficient transport and delivery systems for physical goods. Evidence of such a virtuous circle type of development is achievable through the use of solutions in rural communities like those provided for example by self-contained and sustainable Telecenters designed by LINCOS and Greenstar .

LINCOS (Little Intelligent Communities) are "portable digital town centers" made out of recycled shipping containers furnished with telemedicine units, cash

machines, microcomputer schools, soil-and-environment testing labs, FM radio stations, wireless satellite links and big-screen TVs. Cost effective wireless telecommunication solutions coupled with alternative sources of power (like solar power) have also been incorporated in the design of LINCOS. Seven of these units, have already been installed in rural areas in Costa Rica were no electrical power or telephonic capacity was available. In the Dominican Republic, for example, LINCOS are being used by residents to help form agricultural cooperatives, launch e-commerce initiatives, and access education and employment information online. The costs of the LINCOS include US$1,000 for the container and hardware and materials for approximately US$25,000.

LINCOS can provide telephonic services through microwaves, IP (Internet Protocol) voice, and WLL (Wireless Local Loop) technologies with a coverage range from 3 to 5 miles from the containers. The health and environment component of LINCOS offers educational resources such as a bibliographic database, access to the Internet, access to audio and video cassettes and other multimedia materials. LINCOS' telemedicine module consists in a portable suitcase containing equipment such as an electrocardiograph, an stethoscope, and high-resolution video camera. Patients can receive "virtual treatment" via telemedicine, or access a database with information about intoxications, use of medicines, tropical illnesses, and first aid. LINCOS' water analysis module provides users with the capacity to analyze water examples for human consumption and irrigation, not only through a physical-chemical analysis but also bacteriological. LINCOS' soil module allows basic analysis of the general elements of soil mineral composition. As far as hardware, LINCOS includes at least 6 multimedia computers and one permanent internet connection. The lab also has a digital photo camera, a video camera and a group of educational applications. Finally, a group of applications with recreational elements includes interactive teleconference, educational videos, "virtual newspaper", and community radio, which for example has a small radio

transmitter of low frequency and radius coverage of approximately 5 miles. LINCOS sustainability is guaranteed through revenues provided by community services and information such as: specialized search for information (based on Internet), fax and photocopying, community office for email, banking and e-commerce based services (Aspen Institute 1999).

Like LINCOS in Costa Rica, Greenstar provides basic infrastructure tools in a solar-powered system (Telecenter) that delivers electricity, electronic commerce, pure water, education and telemedicine. Greenstar has been making investments worldwide for the last three years and plans to developed a total of 300 village partnerships globally over the next five years in about 60 countries. Greenstar partners with organizations such as GhaCLAD (Ghana Computer Literacy and Distance learning) and the Asante Akim Multipurpose Community Telecenter Committee in a commitment of infrastructural investment. Beside some of the features described in the LINCOS centers, Greenstar also has digital culture program that uses new technology to carry music story telling and other live sounds from the villages in the world. When Greenstar is installed in communities it starts by creating "digital culture" products by generating digital formats of the community's art, literature, music and more which are then marketed in the developed world sharing the proceeds with the community. Thus, Greenstar becomes sustainable by the revenues generated by the digital culture multimedia projects.

The virtue of projects like LINCOS and Greeenstar lies in the empowerment of individuals to create, adapt and access *both* global and local information and knowledge, through an infrastructure that is economically self sustainable: a description of a positive feedback loop to bridge the global digital divide.

POSITIVE FEEDBACK LOOPS: SOLVING ACCESS, ADAPTATION AND CREATION OF KNOWLEDGE USING DIGITAL LIBRARIES

Digital libraries created locally can promote human development. The use of this powerful information technology enables individuals to produce local relevant content organized in a digital library. The availability of this content increases interest in local communities in the use of information technologies to solve local problems, which in turn creates greater demand. Digital library software also allows teachers to prepare educational material that addresses specific community problems, or adapt other material to employ local examples. It also allows the creation of libraries based on medicinal knowledge of local plants by indigenous people, as well as long-acquired knowledge of the cultivation and protection of local species. Local groups can assemble information collections that describe and reflect neighborhood conditions, providing new material for socio-cultural studies, fostering cultural exchange while retaining diversity, and increasing international understanding. In sum, the development of content specific digital libraries for local communities will increase the demands for increases in the info tech infrastructure, which in turn will allow more production of local content.

The preservation and propagation of indigenous culture is also possible by the use of digital library software. Nurturing a capability for creating information collections seems to be a more effective strategy for sustained long-term human development than the dissemination of information generated in the developed world which is not necessarily context-sensitive. The advantage of using relevant indigenous information is that it is readily available locally. Information about indigenous culture takes many guises: oral history in the form of narration and interviews; artifacts in the form of images and descriptions; songs in the form of audio recordings, music transcriptions, and lyrics;

dances and ceremonies in the form of video, audio, written synopses and interpretations. Multimedia digital library software such as Greenstone allow such information to be integrated, recorded, browsed, and searched, within a uniform user interface. Because language is the vehicle of thought, communication, and cultural identity, a crucial advantage of digital libraries for culture preservation is the ability to work in local languages, thereby strengthening individual cultures, promoting diversity, and reducing the dominance of English in the global information infrastructure.

Another example in which digital library software can be used is in disaster relief. Whether for natural disasters such as earthquakes and hurricanes or man-made ones such as terrorist attacks and nuclear accidents, demands immediate and informed response in an environment where the local infrastructure may be unpredictable or severely damaged. Disaster relief situations are tackled in parallel by numerous players in a variety of organizations, presenting an overwhelming need for information— information that is tailored for the problem at hand, organized to be accessed effectively, collected and disseminated rapidly, and distributed even if the network infrastructure is crippled. Digital library technology can very quickly create organized collections of information, graced with comprehensive searching and browsing capabilities. Intelligence specific to the nature of a disaster, the geographical region, and the logistic resources available for the relief effort, can be gathered into a made-to-order digital library collection that combines targeted knowledge with general medical and sanitary information.

Digital library software also brings additional benefits such as new opportunities to enter the global marketplace. Countries such as India, Romania and the Philippines have long undertaken low-level information-processing tasks like data entry and OCR—indeed, development projects currently carried out by the Payson Center in Tulane University have had successful experience with local replication of digital library

CD-ROMs in Colombia and Pakistan, saving significant transport costs and customs charges. Dissemination of humanitarian information is a realm where traditional publishing and distribution mechanisms have failed tragically. By decoupling production and distribution costs from intellectual property charges, digital libraries offer an alternative to the payment of copyright and intellectual property. A wealth of humanitarian material is produced and placed in the public domain by NGOs and international organizations such as the UN. In principle, this information could be made freely available in the form of networked or stand-alone digital libraries.

More recent technological capabilities in digital libraries include interfaces for illiterate and semi-illiterate populations. Literacy and language barriers that hinder the use of digital information and communication technologies in the developing world are possible to overcome using solutions based on these technologies such as digital library software.

Finally, digital library technology can be used by medical schools in developing countries which on average get fewer than 100 journals (and many only a few dozen) compared with 1,000 or more in most American medical schools. An example of a worldwide project using the concept of digital libraries designed towards reducing the health information gap between rich and poor countries is carried out by six giant publishing houses and the World Health Organization (WHO). This project provides free electronic access to about 1,000 medical journals to about 600 institutions (medical schools, research laboratories and government health departments) in developing countries, principally in Africa. The medical journals are available through an Internet portal created by the WHO. The portal guarantees security and provide necessary tools, such as engines for searching the journals and libraries. Access to digital libraries sponsored by the WHO fit well with another program launched in 2000 by the UN called

the Health InterNetwork which seeks to make statistical data, peer-reviewed scientific publications, clinical guidelines and health-policy recommendations, software packages that help researchers make statistical and mathematical calculations and online training electronically available to developing countries. Another example of a similar project is carried out by the Open Society Institute, part of the charitable foundation directed by George Soros. The Open Society Institute program is concentrated on social science, economics, business and law publications, and in recent years has provided electronic journal access to 2,100 institutions in 39 countries, most of them in Eastern Europe.

The virtue of digital library projects like Greenstone, WHO and the Open Society lies in the empowerment of individuals to create, adapt and access *both* global and local information and knowledge via the use of digital information and telecommunication technologies: another description of a positive feedback loop to bridge the global digital divide.

POSITIVE FEEDBACK LOOPS: USING NON-PROTECTED INTELLECTUAL CAPITAL - FREEWARE, SHAREWARE AND OPEN SOURCE SOFTWARE

There is a great amount of non-commercial software available through collaborative efforts over the Internet. The Internet itself started as a product of cooperative, decentralized and non-protected environments as those proposed by the Uruguay Round[4]. Rejecting the tight control over software given by copyright, there are communities of programmers around the world that make software available through freeware, shareware, or open source licensing.

---

[4] See Appendix F on technology transfer and intellectual property rights.

An initiative dating back from 1984 is GNU Software which introduced the concept of copyleft (as opposed to copyright). *Copyleft* is a general method for making a program free software and requiring all modified and extended versions of the program to be free software as well. Uncopyrighted programs free in the public domain allow people to share the program and their improvements. However, uncooperative people could convert the program into proprietary software by making changes, many or few, and distribute the result as a proprietary product. People who receive the program in that modified form would not have the freedom that the original author gave them stripped away by the middleman. The GNU project aims to giving *all* users the freedom to redistribute and change GNU software. So instead of putting GNU software in the public domain, it is said to be "copylefted". Copyleft states that anyone who redistributes the software, with or without changes, must pass along the freedom to further copy and change it. Copyleft guarantees that every user has freedom and also provides an incentive for other programmers to add to free software. Important free programs such as the GNU C++ compiler exist only because of this. There are several other initiatives that promote the use of software such as the Open Source Initiative in which programmers can read, redistribute, and modify the source code for a piece of software. Open Source software includes operating systems like Linux or Apache. Apache, for example is a web server software developed communally by programmers in their spare time. In 1995, only 5% of all web servers were running Apache, but by Jun 2001 more than 60% of all web servers worldwide were running Apache. The same is true for Linux, an operating system which in May 2001 was installed on more than 29% on computers running public web sites - compared to 45% running Windows (Netcraft 2001).

Another example of a kit of distributed software is the TALM Toolkit developed by the Payson Center in Tulane University. The purpose of the TALM Toolkit is to give

users the necessary tools to build a Technology Assisted Learning Module (TALM). These tools or software applications are available on the Internet and are known as "freeware" tools. The TALM Toolkit is meant to defray the often prohibitive cost of buying these tools which can be up to US$400. Since these tools are free, they often do not include the high end features that the commercial applications may include, however as a starter toolkit, these tools have everything the author will need to create a professional looking TALM. Along with these tools, the TALM toolkit includes Tulane University's TALM authoring system, E-Class Designer designed to assist users in producing a structured computer-based course.

The virtue of projects like GNU, Open Source or the TALM toolkit lies in the empowerment of individuals to create, adapt and access *both* global and local information and knowledge using software developed by a worldwide community: another description of a positive feedback loop to bridge the global digital divide.

A WARNING:
UNDERPROMISING AND OVERDELIVERING IT PROJECTS

Finally, even though cultural values were not related to any of the aspects explored in this study of the global digital divide, they may be important to consider when designing policies to bridge the divide. For example, expectations for development changes produced by technology are higher in developing countries than developed ones[5], and yet the progress these countries can make is small compared to the distance

[5] See Appendix G on a discussion on cultural values.

that has to be covered. High levels of expectations combined with low levels of progress may explain why societies in developing countries would favor old ideas over new ideas[6]. This could be interpreted as a negative feedback loop for development processes in which failed information technology projects produce more skepticism and frustration than before they were ever implemented.

Policy implications of these findings suggest that projects with an information and communication technologies component have to "underpromise and overdeliver" if they are to be sustainable. Information technologies are technologies which are becoming increasingly easy to master by individuals, yet at the same time increasingly difficult to sustain, understand, and produce. Development projects carried out by development agencies that include an information technology component have to be careful and realistic in setting goals they can accomplish, as well as informing stakeholders that once the technology is installed and adopted, the process has only begun. Long term differences in sustainability[7] will depend on the users themselves. Unfortunately, the experience with many development projects is more of an "overpromising and underdelivering" which leads to disastrous consequences increasing levels of frustration and skepticism. If due care is not taken, community efforts to use digital information and communication technologies will not be sustainable in the long term creating frustrating experiences.

---

[6] Ibid.

[7] For example, sustainability is cited as the key difference between successful and unsuccessful Telecenter projects in Africa. Shakeel, Hani. 2000. "Barriers to Telecenter Implementations in Sub-Saharan Africa." Massachusetts Institute of Technology.