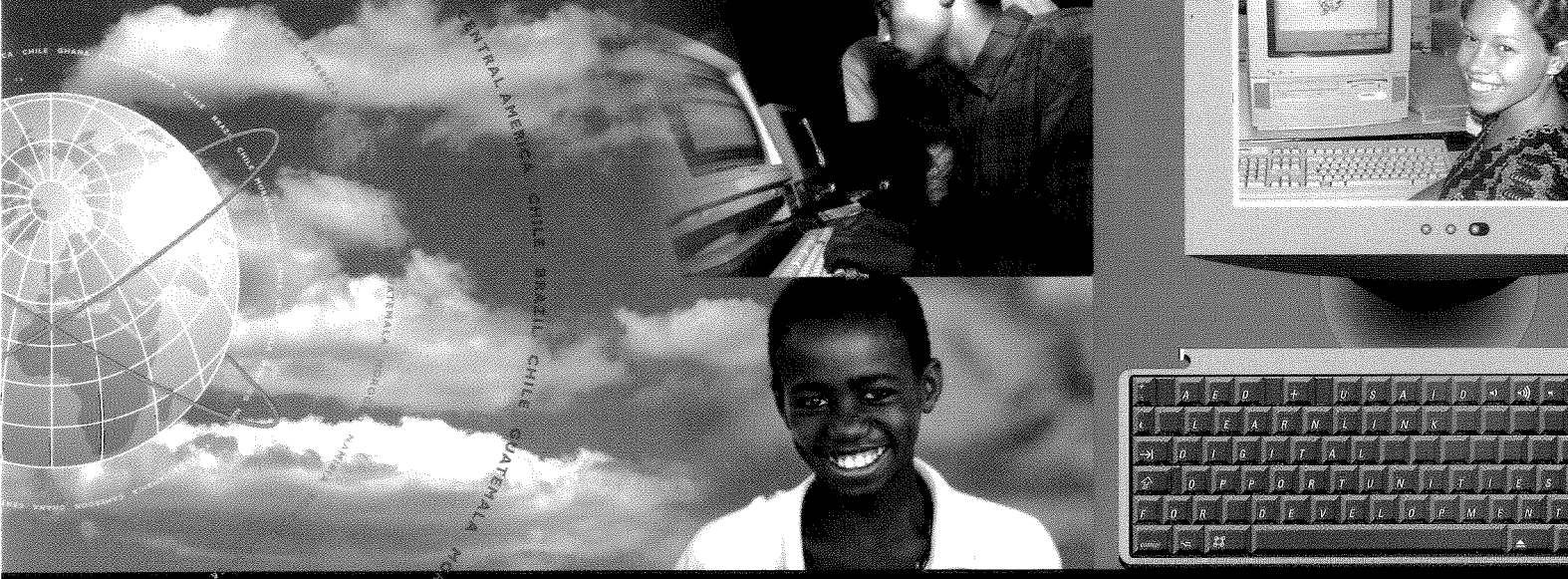

Learn Link

Digital Opportunities for Development

A Sourcebook on Access and Applications

Digital Opportunities for Development

A Sourcebook on Access and Applications

AED

Acknowledgements

The LearnLink Sourcebook reflects the efforts not only of those who wrote and produced it but also those who designed, implemented, and managed the LearnLink projects on which the book is based.

For over six years, the Academy for Educational Development (AED), the US Agency for International Development (USAID), and local partners worked together to bring under-served communities around the world access to information and communication technologies (ICTs). Beyond access, LearnLink's activities also provided opportunities for thousands of people to acquire skills and produce applications relevant to local contexts. The process of development has been enhanced and accelerated as a result.

With activities in nearly 20 countries on three continents, the LearnLink management and administration team somehow kept it all together. Special recognition is due to Dennis Foote, Director of the LearnLink Project, and Steven Dorsey, Deputy Director, for encouraging and designing innovative field activities in cooperation with USAID Missions and local partners. Linda Leonard, overseeing LearnLink at-large and, later, serving as its Director, ensured proper management and positive relations among headquarters in Washington, DC, field offices, and USAID Missions. Doug Boudreau managed many financial accounts with accuracy and timeliness, and Peter Spain ensured that LearnLink staff were linked and working as a unified whole. Eric Rusten kept the team aware of new technological innovations, Margie Joyce kept the machines and the LearnLink web site up to speed, and Eduardo Contreras-Budge contributed valuable evaluation expertise. Collecting, synthesizing, and documenting information about the work, Mary Fontaine, along with Sabina Behague and Rosemary Peternel, shared LearnLink's lessons and insights through dissemination of print and electronic materials. Matilda Macklin and Kia Matthews supported everyone's work.

LearnLink program staff, both in Washington and around the world, handled daily operations, overcame formidable challenges, and performed daily miracles to ensure the success and sustainability of field activities. Too numerous to mention here, they included dedicated individuals working on activities in Benin, Brazil, Bulgaria, Central America, Ecuador, Egypt, Ghana, Guatemala, Haiti, Jamaica, Morocco, Namibia, Paraguay, Romania, and Uganda.

At USAID in Washington, Tony Meyer's vision, Luis Rodriguez's inspiration, and Stephen Tournas' keen observations kept LearnLink working at the cutting edge, while USAID Missions brought valuable context and direction.

Most of all, local partners around the world proved once again that almost anything can be accomplished through good, hard work.

Every document in the LearnLink Sourcebook was written by a staff member closely involved with the effort described, and their contributions reflect the many lessons emanating from LearnLink's experiences. Responsible for conceptualizing, organizing, and producing the book, Linda Leonard, Mary Fontaine, and Rosemary Peternel—have added value to LearnLink's field work by documenting its insights for the development community. They produced this Sourcebook to share those insights, as well as contribute to the literature on ICTs and development globally, and they have done so with a little wit and a considerable amount of wisdom.

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Foreword

USAID's Bureau for Economic Growth, Agriculture & Trade, in its dedication to reducing poverty and promoting prosperity in developing and transition countries, has taken up the challenge to foster cutting-edge applications for the first-generation of digital technology users. The Agency's Education goal, added in 1997, addressed head-on the need to include in its programs primary education, secondary education, teacher training, adult literacy, and early childhood development, in both formal and non-formal settings. Information and communication technology (ICT) applications funded by the Bureau's Office of Education, through the LearnLink project, have advanced pioneering approaches to solutions in nearly all of these learning environments. LearnLink's ICT applications have also built on the Agency's crosscutting theme of information and communication technology as a vital development tool that is transforming the way we live, learn and work.

USAID success and innovation with ICT for learning builds on decades of applications of distance learning through radio, social marketing to support population, health and environmental objectives, and participation in a growing number of global data sharing networks. The Learnlink project was designed to increase digital access, usage, and opportunity in developing and transition countries. This final project publication presents models and case studies based on LearnLink experiences that focused on using ICT to equip institutions and people with the knowledge and skills to build equitable and sustainable economies and societies.

While ICT sectors are growing at double the rate of the overall U.S. economy, developing countries are also increasingly able to take advantage of ICT applications across

many sectors. These applications promote not only education and professional development training through computer-assisted learning, for example, but also promote transparency through e-government, economic growth through e-commerce, and global health using tele-medicine and communications programs. Collectively, these focus areas represent the strategy behind the pillar bureaus of USAID as well as the deployment of ICT-based strategies for development that especially target women and rural and under-served populations.

In 1993, three million people worldwide were connected to the Internet, but less than ten years later over 600 million people were on-line.[1] The number of women using the Internet worldwide will have exceeded 96 million or 45 percent of the world's Internet users in 2001.[2] Countries struggling with inadequate education budgets and the impacts of HIV/AIDS on all sectors, not just that of education, see immense progress in addressing issues of cost and access through technology-mediated learning while improving education quality. USAID has been a leader in promoting an increase in usage rates of the full range of learning technologies, from radio to the Internet, so that leveraging of newer capabilities can gather momentum and lead to new institutions for national sustainable learning strategies.

Donald "Buff" Mackenzie
Director, Office of Education
Associate Assistant Administrator
U.S. Agency for International Development

[1] http://www.nua.ie/surveys/how_many_online/index.html
[2] http://www.internetindicators.com/facts.html

Preface

"At the heart of all our [AED's] programs is an emphasis on generating and applying knowledge to improve people's lives. We have successfully broadened the definition of education to include not only formal schooling but training, information distribution, exchange programs, behavior change strategies, communication and social marketing as well."

Stephen F. Moseley, President

Academy for Educational Development

As I sit writing this in Uganda, where LearnLink has the Connect-ED project, I am reflecting on how the LearnLink project, through the use of technology, has created opportunities to generate and apply knowledge to improve people's lives.

Eight computer centers have been created in Primary Teachers Colleges throughout Uganda. Current teachers and future teachers are learning how the computer and the Internet can enable them to be better educators. Not only are they broadening their world by being exposed to new ideas and information, but they will in turn broaden their students' world. How they use information and turn it into knowledge and social change is the challenge of the next phase of the information revolution.

Through out the life of LearnLink, we have taken care to insure that girls and women have been intimately involved in our projects so they can be key players in the future. In reading the case studies you will note many places where women and girls have demonstrated leadership and success in use of these new tools. In Morocco, the LearnLink project, Computer Assisted Teacher Training (CATT), made dramatic progress in power, gender and role swapping, providing advancement

opportunities for women in the education system. Particularly in developing countries, where women are already challenged by their environments, it is especially important that they not be further removed from the information age. As clearly stated in LearnLink's publication *Gender, Information Technology, and Developing Countries*, as access and use of information technologies are being directly linked to social and economic development, it becomes more and more important that women in developing countries understand the significance of these technologies and use them.

Many practitioners in developing countries using technology have found amazing solutions to overcome technical and social barriers. I continue to be in awe of what they can accomplish with few resources and many, many problems. We hope that the knowledge and experience collected in this book will provide a spark that will continue to generate innovative solutions.

At the end of LearnLink's six years we hope that what we have learned will be useful to those who are moving into the next chapter of this revolution. Access to information through technology levels the playing field; it gives the resource poor a chance to use resources they never had. As access and information become more readily available, the challenge will be to accelerate their progression into knowledge and action.

Linda Leonard
Vice President
LearnLink
Academy for Educational Development

Introduction

The Learnlink Project was designed to extend the benefits of information and communication technology (ICT) in developing countries. In collaboration with local and international partners, and with U.S. Agency for International Development (USAID) support, the Project pioneered interventions for public ICT access, created opportunities for under-served populations to acquire ICT skills, and devised ICT applications tailored to local needs. Each activity increased opportunities for communication, networking, and capacity building for individuals and groups from diverse sectors, fields, and regions.

The scope of LearnLink's work was geographically and sectorally broad. Between 1996 and 2003, Learnlink implemented nearly 20 ICT-driven activities in 17 countries, most focusing on basic education, teacher training, professional development, lifelong learning, economic development, municipal networking, and organizational strengthening. The Project created affordable "digital" opportunities for tens of thousands of educators, NGOs, entrepreneurs, civil servants and public sector officials, health workers, women's groups, farmers, students, and communities around the world.

Most activities were pilots with a duration of two-three years, designed to assess approaches and applications, inform USAID's future ICT work, and advance the global ICT agenda. To ensure sustainability, each activity also developed a business plan to achieve self-sufficiency. Nearly all of LearnLink's activities continued operating after their pilot phase, some institutionalized as new organizations, adapting to new socio-economic conditions, and evolving to meet changing information and communication needs.

During its seven years of operation, LearnLink monitored the approaches, processes, and impact of its work, analyzing information from each activity and synthesizing and disseminating the insights that emerged. The project's lessons have helped inform USAID's use of ICTs as tools for development and serve as a valuable reference for future ICT activities in developing countries.

This sourcebook presents LearnLink's key lessons and results. Its purpose is to share the Project's experiences and insights broadly with development partners, planners and practitioners and with USAID and other donors around the world. The sourcebook includes six chapters corresponding to six "models of ICT use" that LearnLink developed from field experience. Supported by guidelines for assessing readiness and strategies for designing, implementing, and sustaining ICT interventions, the models-of-use also showcase ICT innovations and highlight illustrative examples within each model.

The six models are:

1. Community Learning Centers
2. ICTs for Institutional Strengthening
3. Computer-Mediated Professional Development
4. Computers in Schools
5. Foundations of E-Commerce
6. Orientation to E-Government

LearnLink's experience in the first four areas was extensive, spanning six years, and the models reflect that level of maturity. The final two chapters provide preliminary insights into E-Commerce and E-Governance, which represent highly promising arenas for ICTs in the future.

Chapters also include selected case studies[1] that illuminate key features of the models-of-use. Each case study shares lessons from specific contexts as well as suggesting broader insights of global relevance. In addition, they describe important design, implementation, and sustainability approaches and identify issues that promote or constrain activities. Finally, the case studies add an important dimension to the models-of-use, describing what, specifically, happens when ICT applications become available to under-served communities in different regions of the world.

Authored by project implementers, the models and case studies speak with multiple voices, reflecting a range of perspectives and styles as well as the diversity of partners and field experiences that characterized LearnLink. As the models and case studies demonstrate, however, authors from ten countries on three continents highlight remarkably similar lessons.

This sourcebook was produced so that new ICT activities could benefit from the lessons derived from LearnLink's experiences. Offering practical guidance for designing and implementing ICT interventions, the book is intended to inform future efforts in the areas of ICT access, usage, and applications. It is hoped that the sourcebook will contribute to improved ICT-based strategies for development and continue to help under-served communities around the world gain access to digital opportunities.[2]

[1] Details on all LearnLink activities, most in English, French, and Spanish, are available at http://learnlink.aed.org

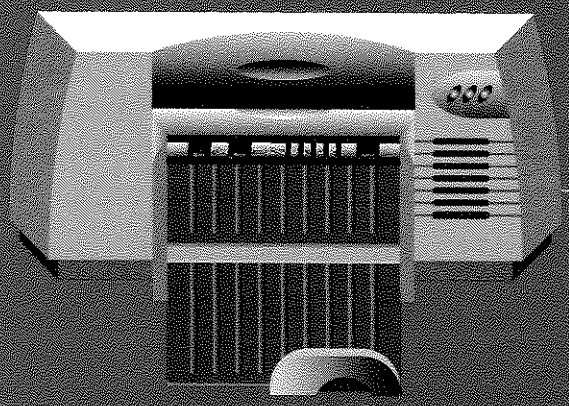
[2] *Digital Opportunities for Development* is available on CD-ROM and at http://learnlink.aed.org Additional print and electronic versions can be ordered from the AED and from the USAID Development Clearinghouse (CDIE) at http://www.usaid.gov.

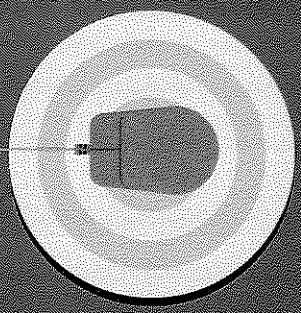
Community Learning Centers

1

1

Community
Learning
Centers





Model-of-Use
Increasing Access to Information and Communications Technology (ICT)

1 Community Learning Centers

Steve Dorsey
Steve Dorsey was managing director of the LearnLink project.

At no time in history has the role of information and communication been more important to global economic, social, and political development. Talk of the "information age" and "communication revolution" pervades much of the world's media. International donors such as The World Bank are sponsoring conferences and issuing landmark studies on the "global knowledge society." Around the world, nations are experimenting with information and communication technology (ICT) applications to help make education and training more effective, build more vibrant economies, improve health care delivery and other social services, and strengthen democratic processes. Though long-term results are not available, countries are paying increasing attention to the potential of ICTs as development tools.

In 1994, for the first time ever, more personal computers than television sets were purchased in the United States. The computer, a device formerly used only by scientists and academics, had become a consumer appliance. Computers (essentially data storage and processing machines) and telecommunications technologies (essentially data transfer tools, such as satellites, fiber optics, increased capacity copper wiring, and networking software and hardware) are heralded as the cornerstones of the new Information Age. There is much discussion in schools, communities, and workplaces about how access to these technologies has created a fundamental shift in the ways people learn, communicate, and do business.

In developed economies, the "access model" that has enabled a vast segment of the population to participate in and benefit from this information and communications phenomenon is based largely on personal acquisition, ownership, and individualized access in the workplace. Largely due to widespread public access

CLC clients.

An IDRC rendering of a telecenter.

of telephony at the turn of the century, the norm is for individual households to have telephone lines, cable television, satellite dishes, and personal computers. Where individual ownership is not yet attainable, access to the technologies is provided in schools and workplaces, libraries, business service centers, and at community technology centers. Further, recent dramatic drops in the costs of technologies relative to the average household income has enabled a vast segment of the population to participate in and benefit from the current information and communications phenomenon.

In developing countries those in the elite segment of society may have a high rate of technology ownership and Internet use, but the vast majority of the inhabitants do not. Low household income and inadequate infrastructure capacities (i.e., electricity and telephone lines) preclude personal ownership. Moreover, libraries and schools in developing countries tend to suffer from chronic under-funding and poor physical facilities.

The challenge becomes how to bring the potential benefits of the information and communication age to the developing world. How can the barriers that prevent the majority of people in the world from accessing ICTs be overcome?

A number of approaches can be considered. By adopting a hands-off mentality and trusting in the forces of change (still lower costs of technologies and gradually improving infrastructures), access might eventually trickle down to developing countries. Relying on the market to solve these problems, however, seems an untenable solution for those in the "development business." Conditions favorable for participation are improving in many parts of the developing world. Yet, the pace of this improvement means that most developing countries will see several more generations pass before any significant portions of their populations will be able to participate fully in a global information- and communication-based society and economy.

On the other hand, the goal of a computer in every home or every classroom in developing countries is untenable because there are such significant, large-scale barriers, including infrastructure, human resource capacity, and cost. Unless equipment drops in price to that of a small transistor radio, such an ambitious undertaking is implausible.

Is there a middle ground? Is there some workable model for providing access and learning opportunities to communities and individuals that is sound in development terms (equitable, benefiting the under-served, culturally appropriate, affordable, and sustainable)? This paper claims that such a model does exist—that Community Learning Centers (CLCs) are helping to bridge the digital divide within and between countries and providing opportunities for public access to ICTs in the developing world.

The Community Learning Center model is viable for meeting critical access and learning needs in the developing world. This paper describes and illustrates the CLC model including philosophy, primary audiences, key capabilities, and functional requirements. Examples are provided from pilot CLC experiences funded by USAID through the LearnLink project and selected experiences of CLCs supported by other international donors or communities. The chapter also discusses the critical issues of CLC evaluation and sustainability and reasons why further investments in this public access model are warranted.

The Community Learning Center Concept

The CLC concept has its roots in community service points. Post offices and telegraph and telephone company offices served as central service points for information access and communication in communities. The proliferation of libraries and postal, telephone, and now computer[1] and Internet technologies has created more individualized ways of meeting information and communication needs. In many parts of the developed and developing world where these services have not penetrated, business centers offering services such as typing, telephoning, faxing, word processing, printing, and photocopying have emerged to meet the needs of individuals and the business community. Some of these centers also offer computer networking services such as email and Internet access, giving rise to a new form of telecenter, telecottage, cyber café, or community technology center. In these centers, the traditional focus is on providing basic services to meet the productivity and communication needs of clients who otherwise would not have access to such tools in their offices, schools, or homes.

The CLC concept builds on business or technology center services but emphasizes the learning function of the technologies and services that are made available. Providing them at the community level will increase access to ICT-supported education and socio-economic development opportunities for individuals, groups, and organizations in developing countries. Some of the tools and services available in a CLC include:

- Basic training in computer literacy
- Basic computer applications software and training (i.e., word processing and spread sheet)
- Internet point of presence
- Email accounts to allow in-country and international linkages
- Access to the World Wide Web
- Technical assistance to establish a web site
- CD-ROM libraries
- Multi-media and interactive learning products for a broad spectrum of audiences, including disadvantaged and nontraditional learners
- Internet and database research and reference services

At Community Learning Centers, facilitators can help familiarize clients with the technologies, resources, and services offered and structure the learning experience so it is tailored to clients' specific information, communication, and learning objectives. Ideally, such a center is housed in an easily accessible, public setting with adequate infrastructure and security. The setting could be a community school, municipal center, or other public building. In some cases, a CLC could be housed within a nonprofit organization or even in conjunction with a private, for-profit enterprise. Adequate infrastructure includes a reliable supply of electricity, either from the electrical grid or provided through generators or solar sources, and an environment that can be regulated to moderate the effects of dust and heat on equipment. Finally, adequate security is important to ensure that valuable equipment is safeguarded against theft or vandalism.

In terms of financial viability, one type of CLC is operated as a nonprofit venture with a fee-for-services structure that enables recovery of operating expenses, payment of staff, and augmentation of resources and services over time. Short- and long-range cost projections based on necessary, recurrent inputs (i.e., salaries, supplies, facilities and equipment maintenance and upgrades, and resource expansion) can be made to help estimate the necessary level of fees to establish cost recovery. Innovative public/private partnerships also can be explored whereby the private sector may provide subsidies for equipment and supplies in exchange for lower fees or the rights to advertise in the center.

Busy LearnLink CLC in Porto Novo, Benin.

A training program at CEDECOM in Cape Coast, Ghana

Students take advantage of a CLC in Asunción, Paraguay.

School children are introduced to computers at the Songhai Center CLC in Savalou, Benin.

Another type of CLC may operate as a profit-making venture with "a social conscience." In this scenario local entrepreneurs operate the CLC and provide services at reduced prices for social change agents, such as educators, health practitioners, and agricultural extension agents, as well as students, members of NGOs, and others.

Regardless of the type of financial structure adopted, CLC staff direct the administration of the center in conjunction with the sponsoring institution including: setting hours of operation, staffing the center, maintaining the equipment, training users; overseeing center finances; fundraising, advertising and outreach to disadvantaged and nontraditional learners, and building a library of additional resources.

CLC staff members find that they must act frequently as technology intermediaries for significant portions of their clientele. Illiteracy and/or unfamiliarity with ICTs may cause some clients to feel uncomfortable or to perceive the center as irrelevant to their needs. In these communities, center staff has a special responsibility to publicize the services of the center among target populations, promote community awareness of and interest in the resources, and draw in the disadvantaged and nontraditional communities.

Where more than one CLC exists in a confined geographic area, a networking relationship can be established between the centers to share resources under an interlibrary loan model. Especially as regards Internet access, if a CLC is established in an area where infrastructure is inadequate to support connectivity, one or more of the centers with the facility for connectivity can be designated as online CLCs while those without connectivity would be offline CLCs. The online CLCs could set up a diskette or CD-ROM service to provide the offline CLCs with remote offline access to valuable online resources. Finally, in a CLC network, center staff can be brought together for periodic training sessions.

In the developing world, telecottages or cyber cafés typically are established in well-serviced urban centers, such as capital cities, not in remote or rural areas. While it is true that the infrastructure in primary urban centers is more conducive to the establishment of such services, and a certain concentration of population is necessary to maintain a financially viable center, it is also true that secondary and tertiary urban centers, precisely because they lack the support available in capital cities, may have more pressing need for the services. In the case of Internet connectivity in Africa, for example, the political capitals were the focus of early efforts at connectivity while secondary or tertiary urban centers are under-serviced or not serviced at all. It is important that this tendency to concentrate new resources in areas already relatively well served be addressed through an effort to extend valuable learning services in secondary and tertiary urban areas as well.

Ideally, CLCs distinguish themselves from cyber cafés by focusing on ICT training for community members, as well as affordability. In this regard, the primary CLC audience may be the under-served, or those for whom even private sector telecenter or cyber café fees are beyond their means.

The Community Learning Center Model-of-Use

The telecenter movement is preoccupied with spreading and sharing new tools and capacities for living, working, and learning. It is a fundamentally distributive, as opposed to an acquisitive, institution and process. It relies upon common-use access to

new information and communications technologies within an organizational culture where informal learning, cross-coaching, and skill fusion are the rule, not the exception. The driving force behind community learning centers is to spread the benefit of empowering new technologies (Fuchs 1997).

Two overarching objectives frame the strategic mission of a CLC:

- Provide public access to information, educational, and communications technologies where they are not available; and
- Provide learning services to patrons.

This CLC model applies to a range of facilities and includes

- a commitment to supporting formal and informal educational opportunities within the community and cross-sectoral learning
- services to support diverse social development needs
- a commitment to enhancing the political enfranchisement of the community
- provision of a publicly accessible site with computer services and, if possible, telephony
- adequate security
- an informal, welcoming environment
- friendly, knowledgeable staff and/or volunteers
- well-maintained, reliable computer equipment and peripherals
- supported by a sound business plan, including strategies for private sector partnerships and a pricing structure tailored to clients' ability to pay and adequate for cost recovery (if intended to be self-sustaining)
- a variety of training programs and services
- community outreach (advertising) strategies
- accurate record keeping and accounting

From 1996 to 2003, USAID funded the LearnLink Project to help initiate CLCs in municipal offices, NGOs, schools, and libraries in selected target countries. Community Learning Centers can be housed in any number of settings, including stand-alone or private sector sites. The locale is not nearly as critical as the philosophy of the operating institution. As long as the features listed above are represented, a CLC has the potential to provide valuable services to its community.

Primary CLC Audiences

A CLC serves a variety of audiences and needs. The beauty of the technologies provided via CLCs is that they are multi-purposed and user-defined. For example, typically a computer is not designed to serve only a particular audience, such as K–6 school age children. The user is expected to define the use for the computer by loading specific content or software and hardware capabilities. Any single computer can be tailored to meet the needs of multiple users. In this same respect, the CLC model is flexible in that it may serve a variety of audiences. The discussion below describes how several primary audience groups can benefit from access to a CLC.

Educational Organizations

A fundamental benefit of a Community Learning Center is its educational offerings and the ability of the center to change the way in which community members see the world and their place in it.

The impact of access to medical databases on CD-ROM, for example, was described by Helga Patrikios, Deputy University Librarian, at the University of Zimbabwe:

Unquestionably CD-ROM databases…have brought about a rapid change in the information-seeking behavior of our users; unprecedented rapid and easy access to current and archival journal literature; and an increased awareness and documented increased use of the journal literature. We believe, however, that the most significant and valuable outcome of this service has been the growing awareness in its users of a range, literally a world of otherwise unknown information sources. It has been by far the greatest force for progress in information access that our users have experienced (Patrikios, 1996).

A CLC that functions as a central learning resource will evaluate its success in promoting increased learning within the community. To that end, CLCs offer services to support formal, informal, and nonformal learning for individuals of all ages and provide a place where:

- individuals are introduced to computer technologies as a first step toward full participation in the global information and communication age;
- individuals participate in distance learning opportunities from local, national, or even global sources;
- the community can access educational resources—primary, secondary, and tertiary—available through the Internet;
- external experts "visit" the community via a range of technologies, from telephone and fax to email and low-end videoconferencing;
- educators and administrators can connect to dispersed administrative offices more efficiently;
- teachers, students and administrators can participate in regional, national, and international projects, such as school-to-school initiatives;
- educational NGOs can learn about funding opportunities;
- educators can receive technology training and participate in professional development opportunities;
- educators can create materials to supplement limited instructional aids;
- students can access resources to support in-class learning or extracurricular interests;
- students can acquire skills to help run CLCs and even instruct less-experienced teachers;
- and a library of on-site educational materials (electronic and traditional) can be provided.

At LearnLink-supported CLCs in Asunción, Paraguay, for example, students and teachers were frequent patrons and made extensive use of Spanish-language learning tools such as multimedia encyclopedias and science reference programs. In Bulgaria, at LearnLink's Public Communication and Computer Centers (PC3s), more than 4,000 community members received computer training in the first six months of operation, and over a two-year period, three LearnLink CLCs in Ghana provided ICT training to 10,000 patrons from a variety of sectors. In Nakaseke, Uganda, an IDRC-funded CLC/Telecenter provided support to the local primary and secondary teachers' educational "cluster," which enabled teachers to obtain resources such as color printouts of maps for use in classroom geography instruction.

To some extent, the role of a Community Learning Center can be viewed as an extension of the traditional role of the public library. Public libraries are places where individuals can gather to access a wealth of resources. In this sense, libraries are informal educational institutions, or, as Andrew Carnegie called them, "the poor man's university." In the United States, government policy and a massive program by the Gates Foundation have established libraries as key players in the effort to make available computers and Internet access to those who cannot afford to pay for personal access. In the developing world, CLCs can fill this role as a communal resource, serving as meeting place, information exchange center, and professional development site.

CLCs for lifelong learning.

Because the CLC is a community resource, the target educational community is quite broad. Extensive learning needs exist in all communities beyond the structure of the formal education system. For example, community health educators need ideas for campaigns, or local farmers need to know what nontraditional crops are in demand in other parts of the country or in international markets.

Lifelong learning is one of those commonsense concepts frequently taken for granted. The need to learn does not stop when formal schooling stops. The health educator and

the farmer are knowledgeable, but they need information and learning beyond the realm of their past experience. Community Learning Centers can help meet need to keep up with changes in a profession or craft.

According to The National Institute on Postsecondary Education, Libraries, and Lifelong Learning, a CLC should use the following questions as a tool by which to set its standards (Humes 1996):

- What does a lifelong learning community look like?
- Who is involved?
- Will today's lifelong learning community differ from that of the future?
- Which are we planning for?
- How does the societal climate for learning differ among communities?
- How do communities view their learning opportunities beyond those provided by traditional schooling (K–12 institutions and postsecondary colleges and universities)?
- What are the enablers and barriers to the development of lifelong learning communities?
- What community coordination and cooperation is needed to stimulate and enhance lifelong learning?
- What training and education is needed for community leaders to understand the economic, social, political, and personal benefits of investing in lifelong learning opportunities?
- What will it mean (financially, economically, and socially) for the community to increase the number of adults engaging in lifelong learning?
- What does a virtual (electronic) community look like, and what is the role of the Community Learning Center in its creation and existence?

For the Community Learning Center to serve as a lifelong learning facility, it must find ways to broaden the community's awareness of the resources and services offered and increase the community's interest in visiting the CLC to explore learning opportunities. Particularly with adults who have had no prior exposure to the technologies, CLCs will grapple with questions of relevancy and "technophobia." Programs must be put in place to raise awareness of the CLC's role in support of community learning.

The Centre for the Development of People (CEDEP) in Kumasi, which has been operating a CLC (with LearnLink assistance during 1998-2000) since 1999, increased community awareness through a traditional bulletin board, open houses, and special programs for targeted audiences. A large bulletin board just outside the door of the CLC displayed printouts of current information taken from the Internet. This information is relevant to the community and illustrates the types of resources available inside. In addition, CEDEP staged a series of special weeks for targeted groups, such as women's NGOs, health educators, and small entrepreneurs. Special invitations were issued to targeted community members to visit the CLC for tailored orientation and training programs, and special offers were available, based on already very economical fees.

These and other efforts resulted in increased demand for CLC services, requiring CEDEP to expand its original CLC space to accommodate additional workstations and patrons.

Oasis Trust in the United Kingdom runs a project called Wire the World, where e-Academies have been established in Mumbai and Bangalore, India, and are expanding in South Africa and Brazil. The centers are run with fees generated from the technical classes each offers. The center of ICT activity in India, Bangalore's users demand more challenging curriculum than just keyboarding and word processing, so this CLC offers advanced courses in programming languages, similar to those more frequently found in universities and business institutes.

In Asunción, Paraguay, a CLC, established and supported by Learnlink during 1997-1999, was located in the main bus station, which is run by the municipality of Asunción. At an early meeting with the neighbors who lived near the bus station, a city administrator announced that the CLC would be a "free school," and this function stayed with the center notwithstanding its primary goal of providing municipal services to citizens.

Nonprofits, NGOs

Community Learning Centers provide communication capacity-building services to nonprofit and non-governmental organizations,

which generally operate with minimal resources. A majority of NGOs in developing countries do not have the resources to secure the infrastructure, computer hardware and software, and human resources required to support their full participation in the global knowledge society. Many even lack the budget for other basic services such as fax and photocopying. In this climate, there is little hope that NGOs in the developing world will reap the potential benefits of the information and communications age anytime soon.

Given their close relationship to the community, small size, and corresponding need to network and communicate, as well as the information intensity of their work, many NGOs are prime targets for the successful adoption and subsequent diffusion of ICTs. However, NGOs often are least capable of maintaining the ongoing capital reinvestment and operating costs associated with the type of service that can enhance their capabilities considerably. Also, the proliferation of NGOs makes it difficult for the international donor community to address this need on an individualized basis. At best, donors select a few key NGO partners and provide them with ICT resources. There are many other worthwhile, community-based NGOs, however, that could benefit tremendously from some level of ICT access and training. Community Learning Centers allow NGOs to:

- become aware of and participate in international initiatives;
- forge partnerships with other local, regional, national, and international organizations;
- keep abreast of issues and approaches in their sector(s) of concern;
- create and distribute more widely effective outreach and fund-raising materials;
- access professional development opportunities;
- and increase operational efficiencies.

CLCs must make a conscious effort to draw in NGOs and demonstrate how the available ICTs and services can help build their capacity to achieve their missions. Often NGOs—especially small, community-based NGOs—will not be aware of the potential benefits technologies can bring. On the other hand, once they are exposed to the technologies and related services via a CLC, NGOs often respond enthusiastically and become innovative users of the services accessible to them. In Uganda, for example, NGOs account for more than 40 percent of the use of the Kampala-based MUKLA electronic network. NGOs are often among the founding partners in creating a telecenter, either as an individual, local initiative or as part of a broader, global project.

The Center for the Development of People (CEDEP), a long-standing, community-based NGO in Ghana, had only limited exposure to ICTs prior to the launching of the CLC initiative. Yet CEDEP embraced the activity with vigor and was soon running a vibrant center. Because CEDEP had forged partnerships with many other NGOs over the years, it focused the first few months of CLC operations on informing partners about the activity and providing them with orientation and training on a preferred schedule and/or free of charge. After this initial investment in outreach to its NGO partners, CEDEP continues to draw in NGOs by making frequent on-site presentations and offering NGOs significantly discounted rates for access and training.

Commercial Interests

What distinguishes the CLC/telecenter model from other types of ICT introductions is the approach it takes to horizontal rather than vertical markets in the developing world. In fact, one of the model's most compelling impacts, when it succeeds, is that it is a market maker or accelerator in places where ICTs, when they are available at all, can be accessed by only a privileged few.

From the very first European CLC/telecenter in Velmdalen, Sweden in 1985, to the adoption and modification of this model in many parts of the world today, a compelling CLC legacy is the acceleration of participation in the information economy among a broad cross-section of the community. In the pre-market circumstance, which characterizes almost all rural areas and large segments of urban populations in the developing world, the entry point for ICT use is still many years away, especially if market forces alone are expected to generate the demand. Lester Thurow, Professor Emeritus of Economics at the Massachusetts Institute of Technology, put it this way:

Capitalist infrastructure can only be built behind or slightly ahead of the market… The Internet could not have been privately financed, the usage wasn't there, would take twenty years to develop… But, in the end, a social investment in infrastructure provided the means for developing an exciting set of new private industries. (Thurow, 1998)

The CLC model represents a social investment to create a "diffusion effect" for the adoption of ICTs in a horizontal cross-section of "pre-markets" or audiences in a particular community or region. The purpose of the model is not necessarily to build a business of the services it offers, though this, too, can be done. Its purpose is to generate demand and diffuse skills sufficient for small business, local government, and the education and NGO sectors to become self-directed and self-sustaining in the information economy.

The Chasm Group's Geoffrey Moore, one of the world's most successful technology-related marketing consultants, spoke at a conference about how technology firms should market to segments of the marketplace. He said, "Forget the late adopters and laggards" (Moore 1998).

What Moore is asserting doubtless makes good business sense. Providing access, raising awareness, and undertaking campaigns for diffusion can be time-consuming and expensive. Yet it is not fair to characterize most of the developing world market as laggards since there truly has not been sufficient opportunity for these markets to choose early adoption versus late adoption. Still, it may be that most of Africa and much of Asia will not be able to enjoy the social and economic benefits of the information economy for some time because their technology adoption circumstance is at the back of the innovation curve. However, as costs dropped on personal computers in the United States, people with lower incomes bought computers for home use. In South Africa, the use of the pre-paid phone card generated a great deal of business in low income areas that had previously been dismissed as not part of the market. The subscription model in the Peruvian *Cabinas Publicas* pioneered by *Red Científica Peruana* allowed lower middle class adults and many students ICT access when ownership was not possible. The combination of falling prices, innovative promotion, and spreading awareness of the benefits will bring in new users, even if they are not always owners or Internet service subscribers.

In the Bulgarian Public Computer and Communication Center (PC3) network supported by LearnLink during 2000-2002, one of the most innovative ways they promoted interest was to distribute vouchers for pre-paid Internet access. Social change agents (the advocates and users in need of affordable access in the small towns where PC3s were located) used the vouchers as early adopters. This kick-started the businesses and also served as data collection devices for some of the evaluation reports.

The social investment prescription favored by Thurow seeks to trigger market demand, entrepreneurial familiarity, and institutional adoption of ICT. This is exactly the effect of the successful CLC model in "back-of-the-market" communities.

Small Business and the ICT hierarchy of needs:

While many projects assume that the Internet should be the lead service when introducing ICTs, small businesses generally need to progress through several less sophisticated stages, coined by Fuchs as a "hierarchy of needs," before they can even consider the use of network technologies.

While not all businesses must or do migrate through all four of these hierarchical steps, Fuchs and others have observed the progression with hundreds of small business people. The "hierarchy of needs" for the diffusion of ICT in the small-business sector includes the following items:

Access to facilities: In many "back-of-the-market" communities, most small businesses have never used a computer. The very first step is to arouse their curiosity about the technology and facilities. This could be done by producing a sign for the weekly specials at the local store, drafting the first spreadsheet of sales for the month, or producing letterhead stationery with desktop publishing software--even typing a letter or sending a fax.

Using information: Many businesses, and not just those in the developing world, seldom engage in "information-seeking behavior" using electronic or print information. They rely on people such as

relatives, bankers, and sales agents to help them form judgments about what they might do or how they might change their enterprise. Before using network technologies, businesses first need to learn the advantages of using ICTs in their everyday business decision making and how it can supplement the human networks that will remain central but will be expanded.

Network services: Once the business person develops a basic understanding of how to use the facilities and has become acquainted with use of information, he/she is now ready to be introduced to the use of network tools such as email, the Internet, and the World Wide Web.

ICT business startups: Having progressed through the first three steps associated with a hierarchy of needs, some businesses will start ICT enterprises themselves—an important sign of success for the CLC. Once this occurs, the CLC needs to ensure that it is enabling and supporting the new enterprise rather than competing with it.

Community Learning Centers are a natural stimulus for the creation of information-based businesses.[2] For example, several of the National Service Volunteers working in CLCs in Ghana reported that, with this experience, they hoped to launch their own ICT ventures when their service was up. Among the likeliest ventures to be stimulated by CLCs are:

- import of information products;
- local word and data processing;
- database creation and management;
- travel services;
- financial management and investment; and
- news/press services.

The majority of technology-based businesses have a longer trajectory for reaching financial stability and profitability because demand for their services may have to be created within a community that is unfamiliar with the services. Whereas traditional businesses realize the efficiencies offered by the new ICTs immediately, information-based companies initially must invest greater resources in building a market by introducing prospective clients to the benefits of ICT products and services.

Municipalities

Community Learning Centers support democracy-building efforts by strengthening the way municipalities distribute information and provide services. Municipalities use the centers to

- distribute information and forms for routine functions such as licensing and registration;
- distribute information about electoral candidates and provide a forum for community discussion;
- provide broader access to municipal officials via email or online discussions;
- promote greater transparency and improved accountability in local government services;
- increase the efficiency of interagency communication;
- distribute information electronically to a community's Diaspora; and
- receive and send information from small communities to regional and national offices.

In the industrialized world, there are numerous examples of municipalities that have established strong community networks, accessible both within and outside the community. This includes the Santa Monica, California Public Electronic Network, the Tallahassee, Florida Free-Net, and Iperbole in Bologna, Italy. In addition, many citizen initiatives—such as the Seattle Community Network, *Rete Civiche* in Milan, Italy, and the Barcelona *Xarxa Ciutadana* in Spain—sought links with their towns as municipal networks.

In Asunción, Paraguay, LearnLink helped establish a CLC in each of the municipality's 12 districts. In addition to providing learning opportunities to their communities, these CLCs facilitated communication between municipal staff and provided citizens with access to the mayor or other municipal officials through email and online chat.

Individuals

Individual use of learning centers spans the full range of services, from basic introductions to computing, teleworking, lifelong learning, and simply connecting with distant family members. The extent to which a Community Learning Center focuses on providing services to individuals, as opposed to organizations, is a function of its charter, stated goals, hardware and software

inventory, price structure, and staff resources. In many facilities, some individuals become regulars and may begin to function as auxiliary staff. Given the limited resources available to most centers, this is a valuable source of support. In some cases, volunteers or interns from local universities or the private sector also may lend support.

One of the interesting challenges is to keep a CLC from catering to a single group of enthusiastic users. In Santa Monica, California, the homeless dominated the free machines located in all the library branches. In other places, students comprise most of the users. Break Away Techknologies, an inner city community technology center in Los Angeles, California, is housed in a former commercial building with many rooms, a stage, private offices, and room for storage. This allows many different groups to use the facility at the same time. Older adults may feel more comfortable working with each other while children respond better in a different environment. Classes range from beginning keyboarding to advanced video production, and the facility also provides space for public events. While some CLCs have sufficient space for several activities at once, however, most CLCs are in a single room, and some are quite small.

While young students quickly find their way to CLCs in every country, the center staff needs to reach out to different age groups, women and girls, teachers, and different sectors of the business world. The LearnLink CLCs in Ghana, Benin, Paraguay, and Bulgaria used publicity and a wide variety of different methods to reach all the different kinds of potential users in their communities. Ghanaian CLCs used "Open Weeks" for target groups, for example, plus seminars for business professionals, teachers, and market women. In Paraguay, inaugurations were gala affairs, accompanied by singing and dancing, while even the Town Crier announced the opening of the CLCs in Cotonou, Benin.

International and National Organizations as Benefactors and Beneficiaries

Currently, the number of communications-based initiatives launched by international organizations is increasing exponentially. Multilateral funding organizations such as The World Bank, UNESCO, the Inter-American Development Bank, the United Nations Development Programme, and the European Community have made long-term commitments to major programs that target directly or rely indirectly on information and communication technologies. National bilateral funding agencies such as USAID and JICA (Japan) likewise have established telecommunications and technology assistance as an organizational priority.

Among the long-term initiatives that have been established to promote information access within the developing world are Canada's International Development Research Centre's Acacia program and Pan Asian Networking (PAN) initiative; USAID's Leland Initiative, LearnLink Project, the DOT-COM Program;[3] The World Bank's InfoDev and World Links for Development Projects; and the United Nations' Sustainable Development Networking Programme (SDNP). The G8 Digital Opportunity Task Force brought together governments, business, and non-profits in an effort to chart multiple efforts to bring connectivity and access to ICTs in developing countries. After meetings and consultations, the DOT Force issued a final report in June 2002, and working groups have continued the effort. One project will bring CLCs to Francophone Africa, and the Telecenter Infomediary and Helpdesk project plans to offer remote support and on site assistance to CLCs around the world. Various Latin American nations have rewritten their regulations governing universal access and have undertaken large public-private partnerships to build telecenters and other CLCs in Brazil, Argentina, Ecuador, Colombia, and Mexico.

In the past decade, many governments and national and international organizations have sought to alter the balance of resources and power between the state, provincial, and local levels, as well as between the national and international levels. Community Learning Centers support this process of devolution by making states, provinces, and localities less dependent on central, national, and international agencies for information dissemination and operational coordination. The ICTs made available through the centers empower communities to seek, generate, and share information and resources on a far more independent basis.

In the case of development projects, learning centers can enable national and international agencies to communicate directly with local project personnel. They can send and receive reports, organize meeting and visitation logistics, make remotely located experts available, and link related projects for collaborative support. While it can take some time for local personnel to accustom themselves to such direct access, it is ultimately in the best interest of the project.

Key Capabilities of a Community Learning Center

CLCs are organized to provide facilities and access to information, communication, and informal coaching and training. CLCs typically include the following services.

Computer-Based Services

A Community Learning Center's inventory of computers may range from two or three to 20 to 25 or more. A typical Nordic telecottage has between two and five computers, and Canada's NCDC Technology Center began with only two computers for public use (Campbell, Part 6). LearnLink-supported CLCs in Paraguay, Ghana, and Benin range from three to ten computers available for public access, while the technology center in a rural library in Elsa, Texas, has more than 20 work stations. The computers may be connected by a local area network so that users can share materials stored on a central server, or they may function independently, with programs limited to what can be stored on an individual hard disk drive or CD-ROM.

The types of applications provided range from word processing and desktop publishing to interactive educational programs. Because so many people have never used a computer, keyboarding training and practice remains a very popular activity, even if there is no Internet connection. Community Learning Centers that serve as distance learning sites may maintain student records in a secure database, while individuals using the CLC for business purposes may keep proprietary records on their own diskettes, which remain in their control.

When a Community Learning Center is established in connection with an existing institution, it is important to select hardware and software that is compatible with the existing infrastructure. Planners should invest in equipment that has proven its worth in a particular climate and under conditions similar to those in which it will have to function. While used equipment can serve a center without problems, recipients should be cautious in what they accept from a well-meaning donor, because the costs and delays associated with unreliable and old equipment can frustrate staff as well as users. The availability of local service and support for equipment is also an important consideration. Certain government donors require the grantees to purchase equipment and software from the donor country instead of from local suppliers. This can cause delays in supply and repair, but other countries are unbundling their aid so that projects can acquire whatever equipment is available in-country.

Non-Electronic Resources

While much of the excitement engendered by CLCs is based on their ability to offer communities access to new information and communications technologies, a multifunctional center will provide a range of traditional, non-electronic resources as well. Community members may value a well-stocked library of books, periodicals, reports, and videotapes, which can be the "hook" that draws them in. While the Internet is a great source of information, in many cases print may be the only source for some material that is not online. PROBIGUA, a community project in Guatemala, started popular reading libraries in rural areas, and after receiving an award from the Gates Foundation, offered Internet access and training in many of the same libraries.

Traditional materials are critical components of distance learning programs and offer a range of opportunities for informal, lifelong learning. Videotapes continue to provide excellent simulation training, and print materials may be circulated on a library loan basis. Community Learning Centers with copy machines can reproduce traditional print offerings and items printed from the Internet for patrons to take home, where floppy disks and CD-ROMs would be of little use.

The digital camera and color printer provide an opportunity for teachers, community

organizations, and even local historians to prepare new media using graphics, pictures, and images. Newsletters, curricula, books, signs, and reports can be prepared in local languages. The wisdom of elders that was formally only available through the oral culture can be disseminated using the digital world. In addition, the immediacy of an image in a digital camera is a quick way to attract the attention of anyone with a curiosity about new technologies. Taking a picture of a family member and then displaying it on a computer is an easy method of engaging a general audience.

Community Learning Centers also serve as a venue for lectures and seminars, providing needed space and equipment support. The telecenter in Papallacta, Ecuador is not connected to the Internet. But it provides access to encyclopedias and other information and also serves as an ecology center where school classes and individual visitors start nature hikes and come to learn about the high Andean region where it is situated. CLCs can serve as lightning rods, drawing speakers who might otherwise not address the community.

Telephony Services

The concept of a central office where people can make telephone calls on a pay-per-use basis is more familiar to those in the developing world than in societies accustomed to near-universal home-based telephone access. CLCs expand traditional telephony services to include fax services and dial-up access to the Internet.

Of course, the reliability of center services is tied to the dependability of the region's communications systems. Some of those involved in CLC development have noted that centers place pressure on telephone companies to provide service for which there is not yet sufficient consumer demand. This is an unavoidable problem during the early years of a country's emergence into the information age.

Along with providing communications services in support of social and economic development, CLCs help to make the market for traditional and new communications products and services. They also serve in a "tortoise and hare" research and development relationship with traditional and established telecommunications providers. Because new forms of telephony and communications are so fundamental to their success, they can help traditional telecommunications companies develop new ways of finding solutions to long-term telecommunications problems. In addition, they help to build community support for innovations in telecommunications and to aggregate demand, which directly and indirectly provides incentives and helps the telecommunications providers respond to the new demands that have been created.

Voice over Internet services (VoIP) would seem a natural application for a CLC. But in many countries, especially those where government telephone monopolies earn large payments for overseas calls, such services have been banned. In places where competition offers a number of choices in fixed lines, cell services, and Internet providers, the VoIP services are very popular. In fact, there are many CLCs that realize the ban on VoIP is not serious, and they offer it without fear of reprisal. CLCs should not underestimate the popularity of telephony and provide it if possible. In countries from Laos to South Africa, the demand at the grass roots level for telephone service is great, even though more attention has been focused on computer and Internet services.

Online Services

The online services provided by CLCs include access to email, listservs, file transfers, chat, World Wide Web browsing, synchronous and asynchronous conferencing, and audio and video streaming. Which of these services a CLC can offer, and with what speed and reliability depends on the technological infrastructure and equipment to which it has access. Simple email is at the low end of the technological spectrum, while synchronous videoconferencing through video streaming occupies the high end. To provide high-end services, centers must have access to powerful computers and broad communications bandwidth. The latency or delay in video and audio signals transmitted by satellite connections may render synchronous communications difficult. Spam or junk email is a growing problem for everyone, but for centers that must pay for connections by the minute or by amount of data transferred, this is more than a nuisance; it is an extra cost.

The extent to which community members will use online services depends on the center's pricing

Table 1 **Cost-Effectiveness of Email**

Medium	Average KB/min.	Cost/KB	Cost ratio to a fax
Fax	40	0.18	1:1
Email using 14.4 modem	237	0.0093	1:19
Email using 28.8 modem	355	0.0062	1:29

structure and the success of its efforts to spread awareness about potential benefits. It depends as well on the center's ability to provide relevant training and staff support for individuals attempting to use the unfamiliar equipment and software. Staff at LearnLink-supported CLCs often found themselves serving as technology intermediaries and one-on-one trainers, particularly for new users. At school Internet Learning Centers in Uganda, staff members receive a portion of their income from fees paid by the users of the facilities, which is a strong incentive.

A recent analysis of the impact of electronic networking on the research community in Ethiopia credited email access for facilitating participation in international seminars, joint conduct of research and authorship of papers, and the introduction of standard computer operating systems. It also facilitated a switch from a time-consuming and hierarchical reporting structure to a flatter, more democratic means of communicating, both nationally and internationally. The study further illustrates the cost-effectiveness of email compared to sending faxes, the previous alternative (Lishan 1996).

A study of networking in Malawi similarly found that "the cost of sending…text messages internationally by email is…about 20 times cheaper than faxing similar messages…" (Nyirenda 1996). It is sometimes difficult to remember that the revolution in telecommunications that is part of the Internet Protocol (IP) is only six years old in North America and has yet to be found throughout most of the developing world, especially in rural areas. Accordingly, the cost-performance-content relationships that are now becoming evident in more mature Internet markets in the developed world have yet to establish either a presence or a price point in developing nations.

Training Services

CLCs will find that demand for orientation and training services is constant and grows steadily. In many cases, especially in their early periods of operation, CLCs provide the first exposure to ICT in communities. Depending on experience and intended uses, center clients will require orientation and training in the areas listed below.

- Keyboarding skills
- Mouse skills
- Basic computer navigation skills
- Productivity software, including word processing, spreadsheet, and presentations
- software
- Desktop publishing
- Database creation and use
- Interactive multimedia programs
- Email
- World Wide Web browsing
- World Wide Web research
- Web site development
- Computer programming
- Certification for ICT jobs that require proficiency in Microsoft networking, Cisco, or Novell systems.

CLCs should develop training programs and supporting materials to provide consistency and quality control in training and resources for self-directed and self-paced training. Many "off-the-shelf" resources are available to assist in this effort, and every CLC should establish at least a modest training library for patrons' use.

CLCs typically offer group training programs to minimize the demand on individual staff time. If this approach is successful, staff can spend most of their time during normal hours of operation answering questions and providing "coaching" rather than intensive instruction on an individual basis.

Functional Requirements and CLC "Models"

The functional requirements of a Community Learning Center are driven by the level of services provided. The requirements discussed below represent the options available to the majority of communities. In developing countries and in rural communities in the developed world, organizers rarely have the financial and staffing resources or the technological infrastructure to provide the high end of the spectrum.

Three models for the introduction of CLCs are described below.

The *"stand-alone"* model — This model is based almost entirely on the operating revenues generated by the CLC, with non- or partially-recoverable start-up investments from community, national, and international organizations. The Sengerema Telecenter in Tanzania was planned on this basis. With volunteer labor and donated land, the purpose is to create a new, stand-alone CLC service right across the lane from the local Tanzania Telecom and Communications Ltd. service location. A variation of this model also has been tested in Asunción, Paraguay. There, most of the 12 CLCs established occupy re-purposed municipal buildings. However, at least one of the last few established was built by the community with local resources. LearnLink also assisted initiatives in Bulgaria and Haiti to establish stand-alone centers in collaboration with private sector entrepreneurs. All 10 centers in Bulgaria are still running; there are plans to start new ones, and the telecenter operators have formed an NGO to enable ongoing collaboration. The Amic@s in Paraguay lacked the ongoing resources to keep them all running after USAID support ended, but 11 of the 12 were still in operation in 2002.

The *"adoption"* model — In the adoption model, a CLC is hosted within an existing institution, where many of the costs for space, administration, and general operations are integrated into the expanded services of the host organization. While the service is adopted for the entire community, it is located in an established institution such as an NGO, college or school, local government office, or church organization. Situated in an existing library building that is owned by the local regional government, the telecenter in Nakaseke, Uganda, follows this model, as do the LearnLink CLCs in Paraguay, Ghana, and Benin. The Gates Foundation has offered support for more than 300 libraries in Chile to offer Internet access, and the Chilean government has more than matched the $9 million donated in 2001.

The *"companion"* model — Rather than being focused squarely on access to the entire community, this approach aims to enhance the existing special interest services of an established institution that, over time, can grow to meet more general community needs. For example, an investment can be made to enhance ICTs within a college, hospital, or community organization that eventually can migrate into broader public access as a "companion" service. The Indonesian PEPs (People's Economic Posts) follow this model, and LearnLink is implementing it in teacher training institutions in Guatemala, Morocco, Namibia, and Uganda. Enlace *Quiché* in rural Guatemala began as a program to help young teachers utilize ICTs to learn and then teach children to read and write Mayan languages. Many CLCs in the United States are part of other types of organizations such as residences for older citizens, literacy centers, and public housing projects.

Each of the foregoing models has strengths and weaknesses, and in the context of the LearnLink initiative, these models have been field tested and assessed to understand which approach performs most successfully in offering services, achieving sustainability, and reaching target segments of the community in particular settings. See the case studies at the end of this model for more information on specific contexts.

Recently, many governments have announced widespread connectivity plans that sometimes include establishing public access centers as part of national programs. Among other regions, nearly all Latin American governments are taking steps to offer access to digital technologies, and doing so on a mass scale. Programs such as E-Mexico (Mexico), *InfoCentros* (El Salvador, Venezuela), *Compartel Comunitarios* (Argentina), *Telecentros Polivalentes* (Ecuador), *Compartel*

(Columbia), and Costarricense.com (Costa Rica) often work in concert with NGOs, community centers, libraries, or local government offices, where the public access centers are housed. In addition to providing access to official government information and perhaps services, the centers also make a range of ICTs available to the public and often provide usage training at affordable costs. Long term results from this new type of public access model are not yet available, but the impact of the undertaking on a national scale will be interesting for ICT advocates who often call for governmental efforts to help extend ICT access.

People First

While the role of ICTs in development assistance is achieving more and more emphasis, it is important to remember that it is people with skills who make ICTs work. Many successful ICT initiatives follow a "core user" or Train-the-Trainer approach to human resource development, which begins with intensive training among early adopters within community institutions that use the CLC. Over time, the CLC comes to serve as a support mechanism for these users as they market and "socialize" the ICTs within community institutions.

A second fundamental principal is that CLCs must be demonstration projects and not just service provision activities. Unless plans are made for those with key metropolitan institutions to learn and benefit from the investment in CLCs, they generally will find reasons to dismiss or ignore the benefits generated by the innovation. Accordingly, capacity-building plans and programs need to be developed to ensure that those who are presented with CLC access come to understand the benefits of ICTs and appreciate the opportunity to learn to use them.

Access-Awareness-Diffusion

The Internet has many cheerleaders who want to share the enabling effects they discover by using this powerful new tool. But ICTs in development includes more than just the Internet. It is important to determine how the technologies are to be made available and whom they are intended to assist. There are three models for this type of assistance:

Access: Access refers to the relatively straightforward task of making Internet, computing, and telecommunications tools available where they did not exist previously. Once the technical issues have been resolved, those who already know and understand the advantages of using the Internet will take advantage of it. With access, a relatively small segment of the community is assisted while the costs associated with entry and start-up are the lowest among the three options.

Awareness: the awareness model involves building orientation, familiarization, and demonstration programs on top of the new access that has been provided. This takes time, financial resources, and planning, but it reaches beyond the technical elite to those early adopters who, when given the opportunity, take the time to learn and integrate ICTs into their professional and personal lives.

Diffusion: the diffusion of ICTs and the skills necessary for their use among both early and late adopters in developing societies is a time-consuming, resource-intensive, "body contact" activity. This is, however, how real markets are created for self-sustaining ICT products and services.

In a sector where language often can be imprecise, where no taxonomy exists for impact and objectives, and where there is considerable growth and development, it is important to differentiate among the three foregoing types of interventions to determine which are appropriate for the introduction of a CLC.

Connectivity Options

Often the greatest challenge in a CLC is connectivity. Infrastructure and telecommunications pricing structures often make connectivity technically difficult and prohibitively expensive. As mentioned earlier, connectivity is not an essential feature of a CLC, though it is a preferred one. In planning for connectivity, it is important to be aware of the technological options for levels of connectivity in Community Learning Centers, including the following:

- Land-based fiber optics, which provide rapid, broadband access to the Internet but are expensive and do not currently exist in most

places. In others, the fiber passes through a town, but there is no connection to it for local service provision.

- Dial-up service over standard telephone lines, which offers slower, more limited capability but has the benefit of using existing telephone lines.
- ISDN (integrated services digital network), an older technology, and DSL (Digital Subscriber Line) offer high speeds for those living near the telephone company central offices.
- Digital cable modem services usually delivered with home television programming.
- Frame Relay is a telephone company technology that enables interconnection of local area networks. It is available in more than 100 countries and may be an option for a network of CLCs in a region.
- Asymmetrical services involving high-speed downlink and outgoing transmission using existing terrestrial systems has been used extensively in rural Canada to support SchoolNet programs. This is a cost-efficient, low-maintenance, transitional technology that is worthy of consideration.
- Satellite technologies include traditional C and Ku bands, VSATs (very small aperture terminals), DBSs (direct broadcast satellites), and LEOs (low-earth orbiting satellites). Two-way VSATs have proven to be useful for CLCs in Uganda, Colombia, rural Canada, and the United States.
- Wireless technologies, including cellular mobile communications, broadband, radio, and microwave. The popularity of 802.11b (Wi-Fi) networks[4] is growing at a time when other telecommunications services are static. Intel predicts that soon every laptop will be sold with a wireless capability.

There is no best solution across the board. Some communities make use of several options to have back up connections or reach a distant telecommunications hub from an isolated region. Each nation, city, region, and locality exists within its own envelope of pre-existing costs, regulations, available technology, and infrastructure. Those conditions determine the best solution for a specific community.

Hardware and Software Needs

Planners are often faced with a dilemma as they make hardware and software investment choices. On the one hand, they want to support burgeoning national hardware and software industries. On the other, they want to minimize potential problems by investing in proven, name-brand products, which often means using imports from the United States and Europe.

At present, a reasonable compromise seems to be to support local hardware importers, systems integrators, tech support services, and trainers, while investing in equipment from well-established corporations. Likewise, the most robust productivity software, including office suites that feature word processing, database management, and spreadsheet manipulation, comes from industrialized countries. However, educational programs that require sensitivity to local culture and language are best developed within a nation's borders.

The issue of compatibility, once significant, no longer poses a huge problem. The field has "shaken out," so that a number of proprietary, non-compatible systems are no longer being marketed. The remaining manufacturers have adopted a range of international standards that, while not entirely eliminating the need to address compatibility issues, has greatly reduced it.

Application software programs relevant to Community Learning Center needs fall into several categories: personal and business productivity, instructional management, and education. Personal and business productivity tools include programs for word processing, spreadsheets and databases, email, budget management, scheduling, file maintenance, desktop publishing, and the creation of electronic products for market. Instructional management programs help educators prepare for instruction and keep records. The range of educational applications includes drill and practice programs, often used for math and foreign languages; reading comprehension programs; simulation programs, often used for science and geography instruction; reference materials, often hyperlinked for ease in cross-referencing; collaborative learning programs, designed to develop group decision-making skills and professional networks; and workplace skills, focusing on both content and subject matter acquisition and introductions to new pedagogy.

Those responsible for selecting software and program applications often lack the criteria needed to make the selection. The criteria recommended by the Academy for Educational Development's Technology Center focuses on the intuitiveness of the user interface—the controls and screen presentation the user sees and the degree of control they offer, such as the ability to pause and review material, move quickly to and from narrowly defined segments of information, and otherwise not be "held hostage" by the program.

In addition, buyers should consider the program's compatibility with other software and hardware platforms, as well as the speed of company upgrades and maintenance of the product line. Educational programs should be designed in a manner that includes linear versus non-linear organization, assessment and remediation strands, an intelligent "tutor" or facilitator, hyper linking of resources and themes, credibility, and objectivity of source material.

Production value also should be considered, such as the clarity of the audio and video, professionalism of appearance (including screen design, color, and fonts), incorporation of multiple languages in a single application or availability of the same product in multiple languages, cultural relevance, and affordable cost.

The LearnLink project in Guatemala, *Enlace Quiché*, produced a range of local materials for teaching Mayan languages to teachers and enabling teachers to instruct children in reading and writing the Mayan language they speak at home. The materials include CD-ROMs enhanced by Mayan art, language games, and pedagogical material, and the printed matter includes dictionaries translated into both Spanish and Mayan languages.

In government, commercial, and social sectors, there is growing interest in open source software. A working group in Latin America, *Los Tigres de Linux*, has assembled a turn-key, open source system for administering a telecenter. This is due to the growing maturity of Linux software and a desire to have an alternative to the more expensive Microsoft products, which remain the most popular, if not standard, application for CLCs. There are many political and philosophical reasons for support of alternatives to Microsoft, yet all of these solutions need to inter-operate with the dominant system. CLCs engaged in training may need to provide Microsoft products because prospective employers usually require proficiency with Microsoft programs.

Staffing

There is little question that the most important decision that will be made in the operating life of a CLC is the selection of the skills, experiences, and qualities in the person(s) who will manage the center. Especially at the onset, the characteristics of such persons are critical predictors for the success or failure of a CLC.

Decisions about whether a Community Learning Center requires one staff member or five, full-time or part-time, usually are driven by the services it offers and the demand it develops. More important than the number is the type of staff member most likely to ensure the center's success.

Technical sophistication may be less important than the ability to work with the community. Staff can be trained to operate hardware and software, but the necessary people skills that will successfully integrate the center are much more difficult to teach. Successful centers have worked because of the personal ability of one or two individuals to rally the community around the new endeavor, with its seemingly exotic and sometimes out-of-place appearance and functions. Staff must maintain their enthusiasm and conviction despite initial slow acceptance and use. They must be able to infuse the community with enthusiasm to use and embrace the facilities and training and engender ongoing support.

The majority of developing country centers to date have not had the luxury of diversified staffing. Most have been limited to a single director who may be able to draft volunteers and students to provide additional help. Ideally, however, a CLC should have the following:

- a director who provides strategic planning, marshals community support, seeks funding, interacts with donors and other stakeholders, and supervises daily operations;
- a technician who maintains and services the hardware, loads and manages software, conducts

training classes, and provides daily technical support to users; and
- an administrative assistant responsible for scheduling center use, maintaining center
- records, supervising the library, and providing operational support to the director.

Planning and Implementation

Assessing the Environment

A critical element in the establishment of a Community Learning Center is the initial assessment, done in part to determine whether a CLC is appropriate for a given community. A typical assessment to study the feasibility of a CLC in a given area will look at several important aspects of the environment: community learning needs and interest; technical infrastructure; institutional capacity; human resource capacity and financial feasibility.

Community Learning Needs and Interests

Assessing potential community support may be difficult because a community cannot support what it doesn't understand, and ICTs are not easy to explain. To gauge potential community support, planners may choose to view the area's record of support for new initiatives that address economic, educational, social, and democracy-building needs. They also may consider the community's history of working with multilateral, bilateral, and national funding agencies, its base of potential trainees, and the regional telecommunications infrastructure.

It is best to focus the assessment on existing learning needs, broadly defined within a community. Interviews with a cross-section of community leaders and members can highlight community perceptions of learning and educational needs.

Once initial learning needs are identified, those doing the assessment can begin matching technology-aided solutions, such as computer-assisted instruction and distance learning, to the indicated problems. The assessment of technical infrastructure will come into play here because it is important not to propose an impractical solution at the outset or to force a match.

At this point, the assessment of community interest should include some community demonstration, if possible, of technologies that would be provided via a CLC. The demonstration should be rooted in the earlier problem identification. This is important because community leaders and members are most likely uninformed about the technologies and their potential benefits, and talk about such matters is usually inadequate—people need to actually see how these tools can help meet some of their priority learning needs. Multimedia notebook computers, Internet content captured to a hard disk or CD-ROM (to avoid the need for remote connectivity during demonstrations), and portable projectors can aid the demonstration effort. The objective of this stage of the assessment is to garner community "buy-in" for the effort.

Technical Infrastructure

Several elements of the technical infrastructure should be examined at the assessment stage, including:
- local availability of hardware, software, and maintenance services;
- local availability of technicians;
- capabilities and limitations of the electrical grid and telecommunications network; and
- national and local attitudes toward telecommunications regulation and emerging private sector competition.

This component of the assessment will help determine what possible technology mix might be reliably employed at a CLC and will indicate what deficiencies might have to be addressed before a CLC can be established, such as provision of a generator or extension of telephone lines to a site.

Institutional Capacity

When a CLC will be established in collaboration with an existing institution, it is important during the assessment stage to examine the institution's capacity to carry the effort forward. This involves a close look at the institution's mission statement or founding objectives to ensure a proper fit for the CLC effort. It also involves the institution's experience with implementation and management of innovative activities—in other words, the institution's history of creativity in program or project implementation. An institution's experience with community outreach and community services is critical, especially if this is to be a principal aim of the proposed CLC.

Human Resource Capacity

Regardless of who will be implementing the CLC, it is important to assess the capacity of the existing human resource base. As mentioned earlier, whether they are municipal staff, NGO employees, or volunteers, CLC staff must offer a good blend of people and technical skills to be successful. It is important to determine the specific training these individuals need and train them adequately in the early stages of CLC development.

In the same vein, a general description of the community's human resource capacity is also warranted. This would address the most likely training needs of community members, from instruction in computer basics upward, based on the assessment of community learning needs and interest. This assessment of human resource capacity will help guide the development and tailor training materials suited to the needs of target CLC users.

Financial Feasibility

As one recent study summarizes, "the rules governing [CLC] economics are not complex, but they are unforgiving."

If a telecenter revenue inflow does not cover expenses and generate a surplus to replace equipment-- if it cannot achieve full financial viability--inevitable equipment breakdowns and obsolescence will eventually force the telecenter to shut down. If the telecenter does not generate sufficient income to cover operation and maintenance costs—operational viability—the telecenter may have to shut down even sooner.[5]

There are different financial models for the establishment of CLCs. These can range from full donor support for setting up and running the CLC for a period of time (usually one to three years) to cost-sharing arrangements where the local implementing partner donates space and perhaps staff in exchange for initial equipment, supplies, and technical assistance. (The latter model benefits from local partner buy-in and investment, perhaps resulting in a greater sense of local ownership.) Regardless of the initial financial model chosen for setting up the CLC, an assessment of financial feasibility is important, particularly the following questions:

- What type of short-term financing is required (site preparation, equipment, materials production, staffing costs, etc.)?
- What are the various partners and donors expected to contribute?
- What are the likely long-term financial needs (i.e., for equipment maintenance, upgrading and replacement, telecommunications costs, utilities, salaries, etc.)?
- What is the local implementing institution's record of managing donor resources?
- What is the capacity of the implementing institution to run a CLC on a cost-recovery basis (i.e., can the institution charge fees and manage revenues)?
- What level of fees might be considered "reasonable" for a pricing structure designed for cost recovery, not necessarily profit?
- What level of community demand can be anticipated?
- What is the local community's ability to pay for services?

One of the difficulties in devising sustainability plans for CLCs is that targeting the under-served and the poor requires sources of revenue beyond client fees, unless sliding fee scales enable higher income groups to subsidize the lower. The risk is that the poor will lose out to those better able to pay, thus jeopardizing the CLC's "public good" potential.

While some stress the purity of the CLC mission, others argue for more entrepreneurism and attention to market forces in CLCs. For example, one study of community access initiatives in rural areas identified the factors most critical for CLC sustainability (i.e. costs, revenues, business models, policy, and capacity) and described a variety of ways in which such centers can improve financial prospects. Some of these include

- Keeping costs low (reducing capital costs with new devices and wireless, using appropriate technologies to reduce recurrent costs)
- Generating revenue from diverse fees and services (focusing first on core communication applications, promoting gradual growth of other revenue sources, creating jobs and revenue with remote ICT-enabled services)

- Benefiting from network effects, scope, and scale (aggregating markets, exploiting economies of scale and scope, designing rural service providers, adding telecenters to existing businesses, adding businesses to telecenters, promoting rural-urban cooperation)
- Supporting rural access with policy (adapting to dynamics of rural markets and limited ompetition, removing regulatory barriers to rural service, promoting universal access policies and supporting incentives).

A variety of CLC models are operating today, yielding new insights into appropriate sustainability approaches for particular contexts. In the meantime, a continuing focus on the stated purpose of a CLC, plus attention to local conditions and financial feasibility options, can help ensure that target groups and needs are addressed while financial sustainability is achieved.

Monitoring and Evaluation

At the minimum, CLCs should track 1) the number of users; 2) user demographics; 3) the number of transactions; 4) the nature of each transaction; 5) the duration of user sessions; and 6) patterns of use by day, week, month, and year.

To the extent possible, computer-tracking software should be used to facilitate record keeping. All users should be asked to register the first time they use the CLC and perhaps complete a personal profile. Confidential personal profiles that record gender, educational levels, income levels, and other demographic data can help CLC operators determine if special efforts need to be made to ensure equitable access to traditionally neglected groups of users, such as girls and women, the less educated, and the poor. Each user should sign in and out at each session and note the time. Users should be given the opportunity to comment on the quality of training, facilities, equipment, services, and staff. This usually can be accomplished through feedback forms that users can complete after training sessions or at subsequent visits to the CLC. A suggestion box is often a useful tool for soliciting informal comments from users.

Some of the most challenging yet most revealing types of data to collect are user impressions of the impact of the CLC on their lives. To collect these data, user feedback forms can include specific questions about how access to CLC resources is helping users, who can be encouraged to give specific responses about whether and how they feel the CLC is benefiting them.

The design of both formative and summative evaluations at the outset will clarify the types of data the center needs to collect. Donors often have specific measures they expect or require from activities they fund, and these should be clarified up front with the local implementing institution so that the monitoring and evaluation system can be designed to meet everyone's needs.

Governance

A range of ownership and governance options exists for a CLC activity. No one model has proven more effective across all venues. Community Learning Centers may be owned by community cooperatives, local NGOs, state agencies, or individuals, either singly or in partnership. They may have governing and/or advisory boards, or they may simply report to their sponsors.

Developing country pilot projects established by national or international agencies may be funded for specific periods, with the expectation that ownership will be transferred to a local group or organization after the pilot phase. Transfer of ownership and control often comes with a cessation or cutback in funding so that the center faces governance and economic challenges simultaneously. However, if the CLC is to be a replicable model, the center will have a management committee of representatives of national and international agencies who contribute to the investment to initiate the service. Also, there will be a local steering committee made up of leaders from those agencies that stand to benefit from the service and have helped identify "core users" to participate in the early training provided by the CLC.

Policy Issues

Among the issues that CLC founders must address are telecommunications regulations, national attitudes toward access to information, protection of user-specific data, and intellectual property rights (copyright) protection. Lack of attention to any of these issues in the short term may result in

long-term problems. The governing documents created for a center should include clear guidelines and policies in each area.

Some policy issues are susceptible to technology-based solutions. For example, as encryption technology continues to evolve, data integrity, security, and personal information about users will be less susceptible to tampering and theft. Likewise, when it becomes commonplace for all users and individual pieces of information to carry encoded digital "thumbprints," it will be easier to track violations of copyright and commission of other online crimes. Unfortunately, the use of such digital tracking measures increases the potential abuse of personal privacy by the government and the private sector. In some cases, societies will have to decide at the legislative and regulatory levels whether the cure is worse than the disease.

In many countries, access to ICTs remains hampered by government control of the telecommunications sector. To become full participants in the information age, these countries will have to reform their systems, ceding a greater role to a competitive private sector. Moving beyond pilot ICT projects toward a strong national system will require an enormous infusion of capital, the type of investment that has traditionally come from private corporations that operate within a stable regulatory environment. State monopolies have resisted giving up control of basic services, which has slowed partially telecommunication reform efforts in some developing countries.

Those championing the CLC in their jurisdiction will come to understand how national telecommunications regulation, infrastructure, and services require change. As ICT innovators, CLC actors can help inform, sensitize, and mobilize national resources and institutions to accelerate their entry into the information economy. It is critical that international and national organizations involved in CLC sponsorship engage in capacity-building initiatives to help the dominant and influential national regulatory, governing, and licensing agencies understand and experience the benefits of ICT adoption. *Fundación Chasquinet* in Ecuador has been providing input on a national strategy for universal service so that community needs will be considered in the strategic plan.

Strategies for Success

While Community Learning Center experiences differ based on purpose, location, size, funding, community support, and a number of other variables, there is common agreement on a number of strategies for success.

Secure support from senior policy makers. Communities accept technological interventions much more rapidly and fully when it is clear that there is support from the top.

To the extent possible, *get the community involved* before establishing the center. Identify key community leaders and involve them in planning-stage decision making.

Find and employ a "champion." Centers with the greatest success and staying power have benefited from the untiring efforts of a single individual who was committed to the cause. The "champion" is generally someone with excellent social outreach skills who is respected in the community.

Conduct proactive outreach to the community. Do not wait for them to come to you. Instead, target organizations in the community and bring them in for demonstrations, free tutorials, receptions, and other introductory events.

Get a "nose under the tent." Offer physical space for meetings even if no electronic services are involved.

Conduct ongoing training classes (beyond the introductory sessions) *to help community members* become comfortable and increasingly skilled with ICT/CLC hardware and software.

Provide ongoing training to CLC personnel so that they remain current with evolving technology and are able to support CLC development while serving as a valuable resource to the community.

Connect with other centers to provide mutual support, share lessons learned, create buying collectives, and otherwise create strength in numbers.

Publicize early successes within the community. Sometimes this must be handled carefully to avoid engendering resentment among traditional power bases. Share the credit for success, even when that involves creative reporting.

Invest in resources that can build on each other. Create a plan for increasing capabilities and add only the hardware, software, and applications that support the plan. Avoid short-term, equipment with no track record for service, and applications with incompatible or inappropriate languages and cultural references. Adopt "state of the market" technologies that are proven, have an established service record, and that many people already know how to use.

Look beyond the pilot funding phase. Plan early for financial sustainability. Draft a proposed fee-for-service plan and solicit feedback from community members. Enlist their support in proposed fund-raising initiatives. Understand that the entry-level pricing will necessarily be different from the prices charged when the center is self-sustaining.

Use the center's online presence to bring the community into the international eye. Most communities appreciate the enhanced visibility, which can bring economic development opportunities and foreign investment.

Potential Problems, Pitfalls and Potholes

As with any new, technology-rich intervention, Community Learning Centers may fall victim to theft, vandalism, accidents, and natural disasters. To some extent, planning and vigilance can reduce these risks. The ultimate key lies in the extent to which center "champions" succeed in garnering community-wide support for the new venture. When successful, CLC staff has found that communities will not tolerate threats to the new resource.

Less tangible threats may come from organizational sources often outside the community. LearnLink consultant Richard Fuchs describes one such problem in Uganda and his recommended solution:

- Metropolitan institutions don't appreciate it when the "outback" has better tools, skills and resources than they do. In the words of one of our Kampala collaborators, "We shouldn't do that. Then the people of Nakaseke will know more about it than we do." This natural disposition of metropolitan institutions has to be acknowledged and respected. It shouldn't, however, be successful in dominating how resources get deployed as they will tend to consume most of the benefits directly. Metropolitan institutions do, however, need to be accommodated.
- Our solution was to introduce what we called "capacitation programs" that would link the Nakaseke telecenter to these Kampala-based metropolitan agencies. This way they could benefit from training and access to the new technology. Additionally, we proposed linking some of the more well-endowed international agencies in Kampala with both their later adopting national counterparts and the rural telecenter. (Fuchs, 1997)

A related problem is the tendency for certain users or sectors to dominate Community Learning Center services, narrowing the center's overall utility to the community. It is difficult for CLCs struggling for economic sustainability to resist catering to the demands of users or a particular sector that provides consistent business. However, Community Learning Centers with mandates to strengthen educational resources or to provide enhanced services and information must stay focused on their primary agendas.

While they should remain flexible in supporting a range of services, they should not allow narrow business or gender interests to prevail over the greater good of the community. Nor should they compete with private sector initiatives that arise because of the awareness and diffusion impacts of the CLC in the community. One of the CLCs LearnLink helped to establish in Ghana noticed, after several months of operation, that its client base was made up of predominantly young males. To reach other community segments to which the NGO operating the CLC felt an obligation, CLC staff arranged special weeks for targeted outreach to special community segments. For example, a Women's Week was held to draw in women's groups and gender-focused NGO partners. A Teachers' Week appealed to public and private school teacher to learn more about how ICTs could benefit their students and teaching. A

Health Care Workers' Week focused on this important segment of the community, and so on.

The vast majority of clients in nearly 30 Learnlink CLCs in five countries belonged to the target groups—NGOs, health workers, small businesspeople, farmers, public servants, educators and, of course, students. Initially, youth tend to lead the way. However, in every case, the larger community followed, especially after effective marketing, outreach, and opportunities for orientation.

Sustainability Guidelines for the Community Learning Center

The issue of sustainability is one of the most challenging dimensions of CLC investment, start-up, and "grow-out" and there are several models are indicated below.

The Medium-Term Market Maker: The CLC is seen as only a short-medium-term mechanism to trigger accelerated innovation in the information economy with "back-of-the-market" communities. In this case, the CLC is enhancing ICT awareness and skills throughout community organizations and businesses so they can develop and maintain capacity to innovate and adopt ICTs. In this model, the CLC is a social and economic development project focused on helping to create a market for local ICT services because of the diffusion effect of the CLC in the community.

The Service Extension: The CLC becomes an integral part of one of the initial sponsoring organizations. This could be a school, local government, cooperative, hospital, chamber of commerce, or economic development agency. After the initial investment, the CLC is financed by one of the initial sponsors.

The CLC "Business:" The CLC becomes a financially self-sustaining business entity, whether on a profit or "not-for-profit" basis. The initial pricing strategies need to reflect an attractive "entry cost," and the demand for services needs to be anchored in several markets within the community.

Whichever model is adopted—and they can change over time—the start-up CLC or telecenter will have to incorporate the following into its initial operations plan:

- A strategic plan
- Identified potential funding sources
- Diversified funding sources
- A fee schedule acceptable to the community and based on real costs
- An understanding of the political and economic climate
- A working model of organizational collaboration
- Quality assurance techniques

Selected USAID Telecenter Experience

1. *USAID-funded Community Learning Centers,* one of the intervention models identified by the LearnLink project, in Paraguay and Haiti, plus Benin, Bulgaria, and Ghana. See case studies at the end of this chapter on telecenters in Benin, Ghana, and Bulgaria. Other information on CLCs is located in the endnotes to the case studies for Benin, Bulgaria, and Ghana.

In Paraguay, the first of 12 pilot centers established in Asunción opened in January 1998. These centers are known as *aulas municipales de comunicación, información y aprendizaje,* or amic@s, which, loosely translated, means "municipal communication, information, and learning centers." In addition, a range of learning tools, including interactive educational programs on CD-ROM and vocational instruction materials, were provided. The amic@s provided Internet access, free email services, and free orientation sessions to introduce the computers, systems, and services available. LearnLink assisted the municipality in monitoring the use of the centers and evaluating their impact on the community during this pilot project.

The Paraguay amic@s identified and employed a local champion who was energetic and persistent in his efforts to publicize the amic@s and to involve influential members of the community in introductory events. He had excellent contacts with high technology firms as well as social organizations in each neighborhood. The emphasis of the amic@s was on strengthening formal and informal learning, so early activities focused on engaging those concerned with education in

Asunción. Many of the users were students who did not have access to computers in school or at home. The CLCs opened at a time of political and financial instability for the country. The municipality planned to automate many of its municipal services, and the centers were designed to provide access to these services, though this was achieved to only a limited extent. Nevertheless, there was a strong demand for computer and Internet access, and at least 11 of the 12 CLCs are still running though the project ended in 2001.

In Haiti, the LearnLink project with its partners focused on three main activities. First, the project helped Haitian Internet Service Providers (ISPs) improve their operational capabilities by recommending strategies for strengthening their networks and offering new value-added services to their consumers. Second, the project contributed to the creation of a national **.ht** domain name in Haiti by delivering equipment, training, and technical assistance to a Haitian consortium assigned responsibility for the task. Finally, the project helped establish two public access telecenters in the secondary cities of Jacmel and Les Cayes, selected a Haitian organization to manage the telecenters, procured computer equipment for the centers, and provided business and technical training to telecenter staff. The telecenter in Les Cayes, in particular, has been extremely successful, offering a wide range of training programs and ICT services to surrounding schools, local businesses and other local beneficiaries.

2. *ITU/UNESCO/IDRC Multipurpose Community Telecenter Project in Africa*. The International Telecommunications Union (ITU), UNESCO, and the International Development Research Centre (IDRC) joined together to develop five African Multipurpose Community Telecenters on a pilot basis. The purpose was to explore and refine telecenter models, disseminate information about the process, and create a partnership model of collaboration among international, national, and local organizations.

The first of the centers was launched in early 1998 in Nakaseke, Uganda. The telecenter was owned by Local Council 3 of the Lowero District but also received support from the Uganda Post and Telecommunications Corporation.

Organizers targeted educators, health workers, and public administrators in Nakaseke believing that innovators in each sector would draw in their colleagues. For example, one potential user would be the Primary Teachers' College, which delivers continuing education to primary school teachers in five regional districts, through 31 regional coordinators. By offering the coordinators access to email and other Internet-based services, the quality of the educational training could be improved.

After serving as a high profile telecenter for several years, a fire in June, 2001, destroyed much of the telecenter and part of the print library housed in the center. Because it had become such a central service in the town, within days a fundraising event raised money from local donors and some international agencies to begin repairing and then rebuilding the center. In-kind donations of services from builders, welders, and artisans helped the effort to restore service. With the assistance of the Belgian government, Nakaseke is now becoming the hub in a network of Community Multimedia Centres (as they currently are called).

4. *In Sweden and the United Kingdom*, the telecenter emphasis has been on providing facilities to enable telecommuting, or telework, while often incorporating a community action social agenda. In Newfoundland and Labrador, Canada, and Australia, the emphasis has been on reaching remote, rural communities to enable them to access otherwise unavailable services and to build local capacity.

5. *In Newfoundland and Labrador,* for example, the Remote Community Service Telecentres http://www.col.org/telecentres/Telecentres_complete.pdf (project description) or www.rcst.net/flash/model.htm, a second generation of wireless telecenters, was established using two-way VSAT telecommunications organized around affordable "bandwidth-on-demand." Medical, education, small business, and government information services were integrated into a common facility that divided the cost of the telecom capability among the entire community. This is an example of the way the model CLC can evolve into a community network that serves even those who do not physically enter the facility.

6. *In the United States,* the Community Technology Center network (CTCNet) began as a group of urban CLCs that served low income populations in central cities. It has expanded to include more than 700 centers located in small towns and rural areas as well. Many of the centers are located in community-based organizations, but a new program has opened centers in public schools, where the facilities can be used after hours by young people and adults. Very few of these CLCs operate with funds exclusively from the local community. Most depend on outside grants or allocations from government funding and the sale of services.

As CLCs proliferate around the world, the suite of services tends to increase. In other cases, organizations are providing access and training to ICT as just one of many services, some of which are not focused on technology. Provision of ICTs to clients is necessary but not central. Some centers continue to offer basic computer and Internet services and introductory training, while others specialize on courses and services that attract the most paying users. In many developed countries, government supports the centers as part of a safety net of services for those who cannot afford them but many developing countries do not have tax revenues to sustain a CLC. Most CLCs begin with the goal of serving the underserved, and this sometimes results in tension when the need for paying clientele becomes more important than the original goal of helping those who cannot afford access.

7. *Somos@telecentros* Organizing existing CLCs or telecenters into national and regional support networks is a trend that began in the late 1990's. There are CLC associations in Australia, the United States, Hungary, and several in Latin America. Somos@telecentros is a regional consortium of CLCs and national networks located in Latin America and the Caribbean—and the largest regional organization founded to link up telecenter practitioners. Located in 14 countries, primarily Spanish and Portuguese-speaking areas, the consortium is based in Quito, Ecuador and supported by *Fundación Chaquinet*. The group runs a listserv and collects and provides access to a clearinghouse of papers, telecenter stories, business plans, photographs, and personal accounts. It has organized national conferences in several countries and in August 2001, convened a meeting of regional telecenter workers for training and personal networking. Many of the attendees had never left their country, and the training sessions helped them understand there were others around the region with some of the same problems and experiences.

This national and regional capacity building, especially among people with a common language, is a powerful force for strengthening a virtual organization. They have worked online on governance issues for the consortium and learned how to become a legal entity. Clarifying goals and ways to run a regional organization helps individual workers plan for the future of their own CLC. This model of cooperation helped inspire UNESCO to convene a meeting of telecenter leaders to form a global help desk where problems not easily solved at a local or national level could be referred elsewhere for resolution.

International Portals

As the number of organizations, companies, and governments establishing CLCs has grown, several efforts to track the activity have developed independent of each other. In mid-2002, for example, UNESCO's Information Society Division began building the International Telecentres Resources Site (www.unesco.org/webworld/build_info/gct/index.shtml) that collects project and technology information with links to many local organizations involved in these initiatives. The International Development Research Centre (IDRC) in Canada hosts a site with information about its projects in Asia, Latin America, and Africa through 2001 (www.idrc.ca/pan/telecentres.html), and the United Nations Development Programme's Info21 project maintains an up-to-date site (www.undp.org/info21/index5.htm) that collects news and project information from local sources. In the United States, Community Technology Center Networks (CTCs) tracks CLC activity in its more than 650 member projects as well as in the America Connects Consortium and Neighborhood Networks. In 2002, the Bill and Melinda Gates Foundation awarded a large grant to the Online Computer Library Center (OCLC) and its partners to establish a portal dedicated to supporting the public library and other access projects.

Looking Ahead

NUA, the world's leading source for Internet statistics, estimates that in May 2002, there were 580 million people online out of a total population of 6.2 billion. With less than 10 per cent of the world online, there still exists a strong demand for ways to bring access, training, and relevant content to the rest of the world. The cost of hardware continues to drop, and several efforts to produce low cost devices for use in developing markets have been publicized. These include the Indian Simputer, the Brazilian *volkscomputer*, and the Jhai Foundation's solid state, low power Linux PC for use in rural Laos. Others have adapted powerful game machines like the X-box and PlayStation for Internet use. Connectivity options have increased from a technology perspective, but the current telecommunications industry is in a depression since and this is likely to slow down deployment of lower cost Internet services in many areas of the developed and developing world.

The rise of the open source software movement, and especially that of Linux, has provided both a challenge and a hope for the CLC movement. Many CLCs provide classes in popular business software such as Microsoft office. Open source solutions or software such as Sun Microsystems' Star Office allow CLCs to use less expensive but compatible software, but this does not meet the training needs where job applicants need to show proficiency in Microsoft Office. At the administrative level, open source software is being used for turnkey operations in some telecenters. A group of programmers in Latin America known as the Linux Tigers *(los Tigres de Linux)* is perfecting this software and documenting it in Spanish.

It is clear that the Community Learning Center remains a viable and flexible model, adaptable to specific community needs and resources. It faces challenging but not insurmountable operational issues, from size to governance to range of services. It addresses both the problems of technological access and equitable access in tandem, and it is a growth rather than static model. As the number of centers has grown, there has been an increase in the organizations that are operating CLCs, not as the only focus but as part of a suite of services. Connectivity and ICT access become part of the basic infrastructure, similar to plumbing and electricity, that a service organization needs to compete and function efficiently.

International experiences with the Community Learning Center model have not been thoroughly evaluated, and lessons learned from pilots are beginning to be disseminated worldwide. It is critical that sound evaluation criteria be built into a CLC model at the outset. Valuable data will be lost if planners do not establish the qualitative and quantitative information that must be collected, beginning in the planning phase. In 2001, for example, community technology centers funded by the United States Department of Education expanded the number of U.S. CTCs. By 2002 officials in the Department were pressing for better data from the centers if they expected to receive further support.

To achieve certain measures of success, communities will depend on elements they cannot readily control. For instance, the utility of computer-assisted applications for education will be driven by the extent to which they are developed in local languages and are compatible with local values, curricula, and needs for lifelong learning, learning to know, active learning, and cooperative learning.

Success in one domain may come at the expense of success in another. If one set of users comes to dominate a Community Learning Center's resources, other segments of the community, with other priorities, will continue to be denied access. Planning must be done at the outset to avoid such an eventuality and to give center staff clear guidelines for allocating resources.

In the end, the outlook is positive for the Community Learning Center model because of declining technology costs, the promulgation of international standards, the establishment of long-term technology initiatives by every major international funding organization, increased technological awareness and sophistication within the urban centers of developing countries, and the growth of a technology-literate cadre of development professionals.

The Community Learning Center model focuses on access. Ultimately, it is how community members use it. The economic, educational, and social impact of the CLC model will depend on those who not only plan but also implement the model.

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Footnotes

[1] As used in this paper, computers usually include a complement of related educational, communications, multimedia, networking, publishing, and software technologies

[2] For more information on technological infrastructure see article by Rusten in TechKnowlogia, Jan-Mar. 2002.

[3] DOT-COM Alliance is a partnership with the US Agency for International Development and its cooperative agreements with dot-Gov, dot-ORG, and dot-EDU and their partners, with its web site at www.dot-com-alliance.org

[4] Schools Online http://www.schoolsonline.org/resources has published a guide to connectivity options in developing countries. It helps non-technical people understand some of the choices when sharing a network like the Internet.

[5] Best, Michael L., and Maclay, Colin M., "Community Internet Access in Rural Areas: Solving the Economic Sustainability Puzzle", in Global Information Technology Report 2001-2002, http://www.cid.harvard.edu/cr/pdf/gitrr2002_ch08.pdf

Case Study

Benin

Power to the People

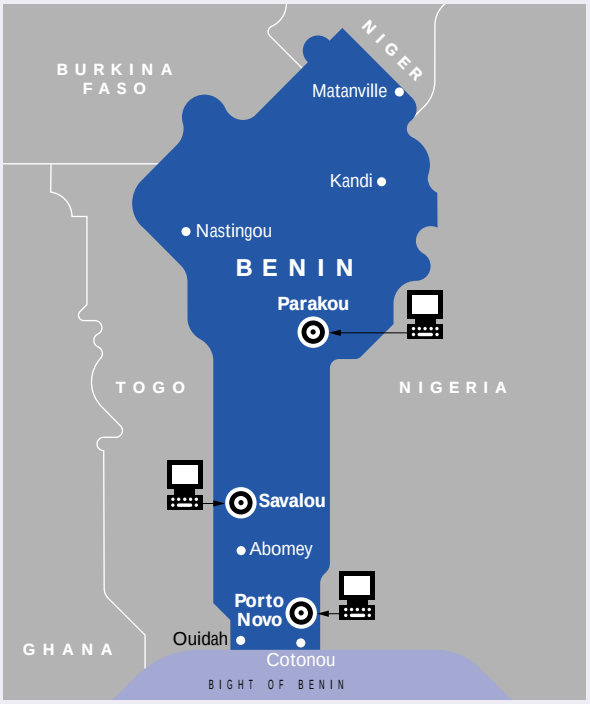
Entering the information age[1]

Mary Fontaine
Mary Fontaine was the Director of Synthesis and Dissemination for LearnLink and project officer for the Benin project.

In 1996, a team from the Leland Initiative[2] landed in Cotonou to conduct an assessment. Their mission was to explore the possibility of achieving a key Leland objective in Benin—the widespread use of information and communication technologies (ICTs) among USAID's development partners to promote sustainable development. Under review were key considerations indicative of readiness and potential success, ranging from national telecommunications policies to available infrastructure to current and future demand for Internet access.

Two years later, a recommendation emanating from that visit led the staff of USAID/Cotonou to speak with LearnLink about implementing a modern technology activity in Benin. The conversation concerned the country's potential to serve as a pilot site in Francophone Africa for community learning centers (CLCs)[3] —aka telecenters—to serve local people largely unfamiliar with ICT uses and benefits. Could such an activity provide a broad constituency in Benin with valuable educational and communication services? Could it generate important lessons for African institutions and other USAID Missions working to support the continent's entry into the information age? Should it command limited resources in light of urgent basic needs in Benin? The decision to proceed was not made lightly.

This is the story of the Community Networking Service (CNS) Centers in Benin. Though the actual activity is over, the story has just begun. Told with the benefit of hindsight, it is not so much about the past but speaks instead to the future, seeking to share noteworthy lessons and useful insights for the people, projects, and progress to come.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BIGHT OF BENIN

telecel

Benin: Country Context

Most of Benin's 6.5 million people survive through subsistence agriculture or work in the service sector. Poor but picturesque villages, reached by footpaths winding through lush terrain from main roads, are dotted with thatched houses surrounding small courtyards. Just 20 percent of the country's roads are paved, and most villagers live without electricity or running water. In many parts of the country, villages have not changed much in centuries—and in some respects, villagers have not changed much, either. Women still pound yams in wooden buckets and carry produce on their heads, walking miles each day to fields and roadside markets, children and infants in tow, and then back home again as night falls. Women have about six children during the childbearing years, and infant mortality is high. Over half the population is illiterate, and life expectancy is a mere 54 years.

Benin is ranked 147th of 162 countries in the Human Development Index,[4] listed below the marginalized in an "other" category on the Technical Achievement Index of 72 countries.[5]

Socioeconomic conditions are exacerbated by minimal infrastructure. With one of the lowest teledensity rates (people per phone line) in the world, just seven telephone lines served each 1,000 people, and fewer than 39,000 telephones were available nationwide.[6] In 1999, only 1.5 per 1,000 people had a personal computer, and Internet users numbered a mere 10 per 1,000.[7]

From a development perspective, Benin's needs are great—for better educational opportunities, health care, economic development. Basic needs are the priority.

Time still moves slowly in villages and on farms, trends nationwide suggest that a transformation is underway. Population is shifting, and education is improving. Half of Benin's population is under the age of 15, and over 80% of children are enrolled in primary school. While the gap between girls and boys remains high—in 1999, school age girls were almost 40% of the total enrolled in primary school—it is decreasing. And though 40% of children who enroll in primary school drop out before completing the sixth year, more young people are receiving some education than ever before. At the same time, many have started to leave the villages, flocking to the congestion and pollution of Cotonou, the country's largest city, in search of new opportunities. Over 40% of the population lived in urban areas in 2000, and that is expected to increase to 53% by 2015.[8]

In this context, the Community Networking Service (CNS) Center activity was launched. No doubt critics opposed it as unnecessary, unrealistic, or simply not the priority in light of more compelling and competing needs. Development, many say, should deal with basic needs first, particularly in a country like Benin.

One of the first lessons emerging from ICT experience worldwide, however, is that such activities are not in opposition to "basic needs" programming. The choice is not between one and the other. Indeed, ICTs can be highly effective tools for meeting basic needs, not only strengthening traditional development approaches but providing access to resources that can help lead disadvantaged populations out of poverty. Moreover, ignoring the role of ICTs in the world today can put those on the other side of the digital divide even further at risk, marginalizing them even more from mainstream social and economic development both within their own nations and in the world at large.

Determining Readiness for ICT Activities

Despite Benin's social and economic challenges, one of the country's strengths is its relative political stability, which provides a justification for attempting an ambitious activity like the CNS Centers.[9] The USAID/Cotonou web site summarizes Benin's political climate as follows:

Benin is one the few French speaking West African states considered a model of democracy. It has successfully established a democratic political system based on consensus. Since the National Conference of 1990, democracy in Benin has experienced significant progress and remarkable development. Benin is engaged in an important legal, institutional, and regulatory reform to establish a more favorable, enabling environment for private initiatives. It is believed that, at term, these efforts should boost the economy by attracting foreign and domestic investment. Despite its status as a nascent democracy, the Government as well as the people of Benin are taking important steps towards laying the foundation for rule of law by establishing stable political institutions that have withstood the test of time. (http://www.usaid.gov/bj/democracy/index.html).

Other criteria also prove critical when assessing readiness for ICT activities—or "e-readiness." According to the Leland Initiative, the first step is to determine readiness at the country level by assessing (a) telecommunications policy, (b) technology, especially Internet infrastructure and the Internet Service Provider (ISP) industry, and (c) Internet end user applications. Assuming no insurmountable obstacles in those areas, the second step, used to identify local partners with whom to work, involves six indicators to measure an institution's readiness for effective use of ICTs and the Internet. These include:

- Whether or not the organization has in place an institutional information/communication strategy;
- The extent to which the institution is producing and using publications and databases;
- Whether or not the institution recognizes the potential contribution of the Internet to its organizational mission;
- If there is an individual in the institution who could serve as an Internet "champion" or catalyst;
- The status of the institution's telecommunications and computer infrastructure; and
- The potential for sustainability.

Centre Songhai: Providing Leadership and Vision

Perhaps the most important reason for proceeding with the CNS Center project was Father Nzamujo Godfrey Ugwuegmulam. Director of Centre Songhai, Father Nzamujo is not only a microbiologist, rural development specialist, and renowned agriculturalist—the Centre's core business—but also a highly trained computer scientist, a rare combination and an invaluable asset in the telecenter business. Under his leadership, Centre Songhai promised to bring the necessary vision as well as the needed technical competence to the task. Indeed, Father Nzamujo's commitment to "turning the lights on in Africa" is matched only by his dedication to ending hunger on the continent. True to his word, he integrated "CyberSonghai,"—the activity's unofficial title—into Songhai's primary agricultural sustainability mission with a passion. Adopting the telecenters as a primary personal and professional goal, he brought to the project insights and experience that moved it forward in the face of formidable obstacles.

As envisioned in the project document, locating the telecenters within an existing and well established local institution provided them with valuable additional inputs and support and contributed to their success and sustainability. The methodology is known as the "adoption model," in which an existing group integrates the activity into its ongoing operations. In the case of the Songhai Center, the activity was able to rely on a well established NGO with mature administrative and budgetary systems and a good reputation in the community as it introduced its telecenter services. The telecenters did not have to be "invented" as new entities lacking history, context, or local trust. The Songhai Center also was able to focus its initial outreach and marketing efforts on current staff, clients, and constituents, all of which provided an early and important foundation for sustainability. In addition, inputs not anticipated in the original design or budget were needed, Songhai was able to draw on its own resources to provide them. Working with Songhai also had a multiplier effect by enabling the introduction of ICTs to groups with whom the organization already had relations. In short, the Songhai Center's role as the telecenter host was a major and mission critical factor leading to the success of the CyberSonghai telecenter activity.

Benefits of the adoption model have been noted in lessons from telecenter experience globally. These experiences also indicate, however, that the success of the model depends largely on the extent to which the NGO is well established and connected in the community it serves. In the case of Benin, the Songhai Center proved to be an excellent choice. With its dynamic director, who is knowledgeable about ICTs and committed to extending digital opportunities in Benin, as well as Songhai's strong management systems and multiple sites throughout the country, the telecenters benefited greatly from their association with Songhai, and prospects for their long-term sustainability are strong.

Experience in Benin and globally also suggests a relationship between the telecenter's success and the extent to which it is integrated into the core business of the host organization. Father Nzamujo made this integration a priority, introducing Songhai staff, students, and a wide range of visitors from the continent and around the world to the telecenters. Employees and student farmers at Songhai were the first to receive ICT training, provided with email addresses and accounts, and encouraged to use the

Father Nzamujo addressing a Nigerian delegation at the Porto Novo Center

telecenters. While some might question the usefulness of ICTs for rural communities, the Songhai Center's Director understood and articulated their value through staff meetings, presentations to visitors, and Songhai's publications and web site. Songhai's senior management also consistently used ICTs, thereby demonstrating ways in which information and communication technologies could further the organization's work and benefit individual users both personally and professionally.

Benefits from Centre Songhai

An equally valuable lesson from Songhai is that locating a telecenter within an existing organization also can benefit the organization itself. According to a project evaluation, the telecenter activity produced many positive changes in the Centre, including "adding a more dynamic dimension to its work" and "broadening the perspective and spirit of Songhai personnel." The majority of Songhai staff now have a telecenter membership card and make use of ICT applications and communication opportunities on an increasingly regular basis. The telecenters also have improved relations between Songhai and the outside world, introducing the Centre to other institutions working in the field of rural development and development communications—and increasing awareness of Songhai on an international level. By the end of the three-year activity, Songhai had received an 80% increase in the number of requests for collaboration and interest expressed in training in sustainable agriculture, which the Centre attributed to its new web site. Songhai also emphasized other ways in which the telecenters supported its work, including

- helping to solve problems related to product marketing through Internet communication;
- demystifying the Internet for rural residents, Songhai's primary clients; and

Box 1 From the Centre Songhai web site: *www.songhai.org*

There is an urgent need for African countries to…participate in the…world society of information and communication, and to this effect, the access of rural African people to efficient communication technologies will go a long way to bridge the gap between rich and poor countries.

The quantity and quality of production is a function of the quantity and quality of information available. In this way, Songhai expects to share the information it holds with other development partners. In short, we intend to create a favourable environment for rural African people to gain access to information technologies as an additional basis for sustainable development.

In the third millenium society, the sharing of information shall be a catalyst for progress. The Songhai telecenters are therefore spaces of transmission and exchange of information as well as…centres for secretarial services.

Apart from farmers trained by Songhai, village associations, local communities, agricultural entrepreneurs and other players in the field of rural development shall benefit from the informational support of our movement. *http://www.songhai.org*

Father Nzamujo

- providing farmers in Benin with networking opportunities both nationally and internationally (more than 250 farmers were using electronic mailboxes by the end of the project).

CyberSonghai also benefited in a variety of ways from its production of multimedia material for development partners, a required deliverable in this activity. Perhaps most importantly, the staff learned marketable skills through the training and technical assistance the activity provided, as well as from the production process itself. These new skills have given CyberSonghai additional services to offer its clients, opening yet another revenue stream for the telecenters. In addition, the Songhai Center produced CD-ROMs containing selected content from its library of innovative agricultural techniques, which now can be more widely disseminated. Finally, reaching out to development partners proved valuable for building relationships with other groups in the country, and introducing them to the benefits of ICTs also may help increase the telecenters' client base.

When undertaking a telecenter activity with a local partner, designers should recognize that the project presents capacity building opportunities for the partner organization itself and help ensure that the group's strategic planning takes full advantage of them. To the extent the Songhai Center did this, it paid off both for the Center and the project.

Technology Tips

The Songhai experience underscores the importance of the following practical and logistical considerations when designing a telecenter activity.

1. Substantial effort should be devoted to determining as accurately as possible the technical requirements for a functional telecenter, and sufficient resources should be provided to equip the center adequately.

Box 2 Community Learning Centers

Community learning centers (CLCs) have their roots in the old post or telegraph offices that served as central points for public information and communication in much of the world. They also build on the relatively recent phenomenon of the "business center," where services such as typing, faxing, telephoning, photocopying, word processing, and printing are offered to individuals and groups lacking individual access to such tools in their homes, schools, or offices.

CLCs emphasize the learning function of the technologies and services and their ability to increase access to basic education and lifelong learning opportunities. Unlike cybercafes, CLCs offer a wide range of training programs for clients new to information and communication technologies (ICTs). They also undertake outreach to groups who might not seek training on their own, hosting events to introduce NGOs, farmers, women, and health workers, for example, to the relevance and benefits of ICTs.

2. Equipment procured for the telecenter should include spare parts, hardware and software upgrades. Before buying equipment an assessment of local technicians and suppliers should be done. Equipment that can not be serviced locally should not be purchased.
3. Assuming effective outreach, the demand for ICT products and services almost always exceeds initial estimations. Though pilot projects are designed to test the waters, once created, the demand for ICT services often is not satisfied by pilot activities. People become accustomed to access, and their need for it and reliance upon it grows quickly.
4. Technical options are rapidly expanding, with new breakthroughs constantly available. While selecting new and unproven options is not advised, neither is purchasing equipment that may be soon outdated.
5. When determining equipment purchases, activities focused on ICT access and connectivity should be coordinated with and informed by current and planned policy and regulatory changes. Equipment selections may be determined most effectively through collaboration among the funder, implementer, beneficiary, and relevant public and private sector representatives, where the knowledge of all five can be brought to bear on the process.

As more resources become focused on NGO and other civil society organizations to diffuse ICTs for social and economic development, they will need information on relevant and affordable technologies, as well as assistance in choosing appropriate ICT technologies and accessing R&D sources for next-generation technologies to adopt.

Realistic Expectations

As with all development work, the design of ICT access activities should state clearly the intended results, including the target group(s) the activity is intended to benefit—and the support should match those desired results. A general or generic description of those who stand to benefit from ICT access is inconsistent with an activity that is highly specific in terms of budget, technical assistance, and other inputs. If the "rural poor" are the intended beneficiaries, for example, then expectations about their ability to pay for ICT services must be very realistic. In the case of the Songhai Center activity, the required deliverables included a financial sustainability plan as well as a specific number of outreach and training opportunities for largely unspecified "local development partners." However, the activity did not insist on an unrealistic engagement of the rural poor, which was appropriate given the duration and nature of the activity. In effect, the Songhai telecenter project sought to reach *those who reach the poor,* a reasonable result for a pilot activity with a limited budget.

Conducting needs assessments represents another obvious step in the development process. In the case of ICTs, such assessments should be conducted carefully because people do not ask for what they do not know. While a farmer in northern Benin is unlikely to list "increased access to the Internet" as an important need, he might say he needs access to information about lower seed prices, or improved irrigation methods, or better marketing opportunities. Similarly, rural women might ask for better medical care or educational opportunities for their children. In the case of Songhai, knowing the agricultural needs of farmers proved useful for designing telecenter products and services and for developing outreach, marketing, and partnership development activities. However, relying on preconceived knowledge and notions, particularly as they relate to another sector, may not be sufficient to achieve the ultimate goals of an ICT center. For this reason, a useful lesson for donors may be to require needs assessments to determine the specific information and communication needs of target clients and to support specific technical assistance in this area.

Management and Staff

As with all development activities, management is critical, and telecenters are no exception. In addition to ICT technical capacity, managing a telecenter requires expertise in business fundamentals, such as marketing, product and service selection, tracking users and monitoring trends, costing, scheduling, staff recruitment and training, and budget management.

The managers of CyberSonghai's telecenters changed several times over the course of the three-year activity. For the most part, each new manager was hard working who took his/her job seriously, and the telecenters themselves operated fairly smoothly.

This may be a function of the overall sophistication of the Songhai Center, which is a tightly run ship. It also may be due to Songhai's ability to identify and attract employees who, though young, possess the necessary skills and competencies. In general, however, telecenter managers clearly benefit from training in the business management and administrative functions they need to perform. While Songhai provided its managers with internal and on-the-job training, formal professional development opportunities for staff, perhaps supported through the activity contract, might have further enhanced the project's success.

Decentralizing telecenter management and empowering telecenter staff also can contribute to telecenter success. Global experience indicates that enabling telecenter managers and key staff to operate with increasing autonomy and empowering them to work proactively on behalf of the center opens the door for greater innovation and achievement. Particularly with longer-term staff that possesses sufficient knowledge of the institution's procedures and standards, a management approach that provides staff with opportunities for initiative could yield valuable results. For example, staff working closely with clients has access to information useful for identifying partnership development opportunities, determining desired products and services, designing effective outreach methods, and devising fee schedules and operating hours suitable for clients. Empowering staff also contributes to their job satisfaction, which can reduce attrition. This global lesson also proved true at Songhai, where long-term staff increasingly were encouraged to take initiative and empowered to participate in decision making. To the extent this occurred, the telecenters benefited.

Diffusing the Vision

The Songhai telecenters benefited from a Director with technical skills and a vision for the telecenters. Though the Director hired well-qualified staff overall, the turnover of staff was frequent. To the extent that recent graduates from computer science programs are to be relied upon to staff new telecenters, the problem of attrition will continue as these bright, young individuals accumulate experience and are presented with more attractive offers from the outside. The technology issues of early telecenter development are so demanding that they require continuing support and investment. Providing technical assistance visits from consultants is useful, as is their training of local staff. But it does not solve the problem of retaining qualified staff on an ongoing basis. Creative approaches to retention, such as more competitive salaries and other professional development opportunities, could help solve the problem. In short, conscious efforts to retain trained technical, managerial, and operations staff are needed to reduce attrition and ensure institutional memory and consistency.

In the global telecenter experience, one lesson that continues to emerge is the importance of engaging a "champion" with an ICT vision for the future. This was clearly demonstrated in Benin. On several occasions in which LearnLink was present, the Director shared his vision with his staff, and the experience was inspiring. From daily work with staff after these gatherings, it was clear that they had been touched by the experience—and imbued with a better sense of the overall mission. Indeed, on every occasion, staff continued to discuss the purpose of the telecenters for Benin even after the meeting. A lesson here is that sharing the vision works, and experience in Benin and elsewhere suggests that when such discussions are opened up and staff are invited to share their perspectives, ideas, and opinions—perhaps even to debate relevant topics—it works even better. Ideally, each staff member should be able to articulate the overall goals and know how his or her work contributes to their achievement. This diffusion of the vision—and perhaps the revision of the vision to meet changing circumstances—moves the process along.

One way in which this might be achieved, from a donor's perspective, is by providing key staff with additional opportunities for growth. Over the course of this activity, several such opportunities presented themselves. One was for CyberSonghai staff to participate in an exchange program with counterparts in Ghana, who also were establishing new USAID-funded telecenters. Another was for CyberSonghai staff travel to Nigeria, where Centre Songhai was initiating another telecenter project. Primarily for funding reasons, these opportunities could not be realized. However, others will arise, and future work that includes a provision for taking advantage of them would contribute to valuable staff development and might help reduce staff attrition as

well. In addition, these types of activities foster a participatory process that engages all involved in an activity, which we know from experience serves the activity well.

Outreach and Marketing: the Town Crier

Effective outreach and marketing to potential local clients and constituents is essential for success. CyberSonghai undertook a substantial number of outreach efforts—including its use of the town crier—to inform individuals, organizations, and agencies at the community, national, and international levels about their telecenters. Given the number and magnitude of the tasks the Songhai Center had to accomplish during the activity, its outreach efforts were impressive. In general, strategic planning that recognizes the purpose and potential usefulness of these efforts and includes consistent follow-up results has a greater impact on the communities served, as well as in mutually beneficial partnerships. This type of outreach is expensive, though, particularly in terms of human resources, and it takes time away from other business activities that may be perceived as more critical. For the most part, CyberSonghai staff with full plates of responsibilities also had to find time to design and implement public relations, marketing, and outreach activities. Yet experience at CyberSonghai as well as at other new telecenters suggests that the more groups to whom a center can successfully market its services, the more likely the telecenter is to sustain its operations. Fortunately, the Songhai Center's dynamic director can command an audience, and introductory information about the telecenters reached critical stakeholders. The Songhai Center's web site also helps this effort, especially with international audiences.

CyberSonghai moved the community towards ICT use in everyday life and work and established a culture of information and communication among its target groups. For long term success, CyberSonghai will need to continue to expand its program of "demonstration impact" to increase community awareness and engagement. Beyond staff, students, and visitors at Songhai sites, planned, focused activities on issues of interest to specific groups—women, health workers, the education sector, the business community, agricultural extension agents—would show the enabling effect of ICTs and demonstrate the benefits and impact on regular, everyday life for each group. A challenge for the future will be to develop and finance a robust outreach program with communities, organizations, and agencies in Benin that results in valuable, strategic partnerships. Not only would this benefit all parties, but it would diffuse ICT familiarity and use more widely in the country. Such a program is essential to ensure a telecenter's long-term viability as a community resource.

The Power of Strategic Partnerships

Strategic partnerships can strengthen a telecenter's impact and contribute to its sustainability, but planning, initiating, and maintaining them requires time, effort, and funds. Ideally, the telecenter managers would identify key constituents to contact, determine the most effective means to reach out to them, and devise with them partnership schemes that would benefit both parties. A LearnLink-administered telecenter activity in Paraguay, for example, benefited greatly from partnerships with a wide range of groups in the public, private, and voluntary sectors, who provided the telecenters with free ISP connections, training, secretarial assistance, and publicity in return for computer use and other in-kind exchanges. In one neighborhood, a group of carpenters and masons actually built a telecenter from the ground up to ensure its construction in their community.

Similarly, the CyberSonghai outreach program generated substantial business for the telecenters, particularly in Porto Novo. The extent to which these arrangements and relationships will be ongoing depends on the extent to which they continue to be nurtured and mutually beneficial. Now that the USAID-funded activity has ended and CyberSonghai has achieved the required number of deliverables relating to outreach and partnership development, continuing the program will be voluntary. Thanks to the inclusion of such deliverables in the activity, the process started off strong, and it is hoped and expected that the value of these activities is apparent to the telecenter staff and management.

Community Participation

The official title of this activity—"Community Networking Service Centers"—reflects the type of activity that was envisioned. The telecenters were to be accessible and affordable community resources, friendly and effective places for ICT training and use,

attracting clients from a variety of groups and sectors. To a large extent, this occurred, and both the experience in Benin and elsewhere confirms that a sense of community ownership contributes to telecenter success and sustainability. Ways in which community integration can be enhanced include the use of volunteers and interns, offering tours for school children, arranging exchanges with other development programs, hosting special events for particular groups—such as "women's days" or "NGO weeks"—and distributing flyers, posters, and brochures to schools and community centers.

Paying the Bills

How does a telecenter with a mission to diffuse ICT awareness and use among those on the other side of the digital divide do so when the burden of covering costs looms large? During the CNS Center activity, funds from USAID and specific deliverables that required collaboration with a variety of individuals and groups supported the process. However, expecting financial sustainability from a relatively short-term yet highly technical and ambitious pilot project, particularly in an underdeveloped area, may force a local partner to focus more on outreach to individuals and groups outside the target population—in other words, on groups able to pay.

Fortunately, once financial sustainability has been attained—or is in sight—alternative means for including disadvantaged groups are available. One option is to adopt sliding scale fees, where those able to pay essentially subsidize those unable to pay, or to pay as much, such as NGOs, students, the rural poor, etc. Another is to work with other development programs that might include an ICT training component, for example, in their implementation plan. In short, in the rush to court segments of the population able to pay for ICT products and services, methods to enable target groups unable to pay also should be devised, preferably at the outset of a telecenter activity. Fortunately, CyberSonghai's mission includes reaching out to rural communities, and its core constituents are farmers, both of which bode well for extending digital opportunities to the under-served.

The Gender Divide

CyberSonghai's final evaluation indicated that male users far outnumbered females at all three telecenters. Similarly, in training programs, women tend to enroll in the less technical sessions, such as those involving word processing or data entry. When asked, female trainees indicate a desire to work as secretaries or office administrators. There is nothing wrong with this in and of itself. However, it does suggest that a stereotypical digital divide is emerging, which major donors have pledged to bridge. On the occasions that the Songhai Center reached out specifically to women, the response was enthusiastic. Nearly 60 women, most from local NGOs, participated in an open house/Internet orientation at the telecenter in Porto Novo during its first full year of operation. Designed to introduce women to ICTs, the event included establishing an email box, distributing of a list of 20 web sites containing information relevant to African women, and demonstrating a variety of computer functions, including web surfing. It is suggested that, while Benin presents formidable challenges to the integration of ICTs into social and economic life in general, special outreach to women should be undertaken more systematically so as to avoid an in-country gender divide and assist women in taking advantage of the opportunities ICTs present.

Making the Market

Training programs for clients are essential for telecenter success, and every effort should be made design them to meet the needs of potential trainees, publicize them widely, and make them affordable to low income groups. USAID/Cotonou, AED/LearnLink, and the Songhai Center were right to include the provision of training sessions among the CNS Center deliverables. Ultimately, training potential users will make the market for telecenters because the better equipped clients are to use ICTs, the more they will frequent the telecenters. Beyond the financial aspects, however, helping people develop ICT skills contributes to the ultimate goal of ICT access activities by demystifying the technology and enabling users to take control of it and use it for personal, professional, and, ultimately, national development. Widespread publicity of training opportunities, and affordable access to them for low-income individuals and groups, also are essential to achieve development goals.

In the CNS Center activity, Songhai set its own training fees, which it determined on the basis of competing training programs and its own financial

needs. To extend such opportunities to lower income groups, subsidies from external sources may be needed. Utilizing needs assessments to determine training programs is particularly important for low income groups, whose needs likely are different from those of the students and business people who tend to be among the first participants in such programs. Similarly, outreach and publicity campaigns to attract low income users will be different than those designed to attract early adopters.

Evolving User Needs

Though equipped with state-of-the-art Internet access, the Songhai telecenters' initial and primary draw was their photocopy machine, followed by lamination and business card, greeting card, and letterhead stationery design and printing. While there is no question that providing these services where they were previously unavailable, insufficient, or unaffordable was useful, the telecenters were not established for those purposes. Nevertheless, the community needed them, and building on immediate needs is an effective way to draw potential ICT clients to the telecenters. Over time, and as it was able to offer more technologically sophisticated services, CyberSonghai tracked changes in usage, which moved on to word processing, desk top publishing, spreadsheets, and, fairly recently, to online activities, especially email. It is expected that this trend will continue. Until connections are faster and connectivity costs lower, online browsing will not increase significantly, at least among the majority of users. For more sophisticated usage, Songhai must continue to lobby for greater bandwidth and/or seek alternative connectivity means. Currently, Songhai is exploring funding prospects for a VSAT connection, which would enhance its ability to offer more affordable online services. In turn, online usage for other than email should increase. A key lesson is that usage is progressive and directly related to access opportunities, training in ICT functions, and costs. In short, expect the operational maturity of the telecenters, and the sophistication of telecenter users, to be progressive, not immediate.

From Data to Wisdom

Telecenter experts have tended to embrace the concept of a value chain of online experience, which moves, ideally, from accessing data and information to disseminating data and information to constructing knowledge to creating wisdom. Even in places where personal computers are ubiquitous, this trend has not been achieved among, perhaps, a majority of users. It is an ideal, however, that has merit, and as usage patterns in communities such as those in Benin progress, it is hoped that some semblance of the progression is realized. In subsequent ICT activities, USAID and others in a position to promote access and usage might keep this ideal in mind, using program design opportunities, for example, to help guide the process and promote the progression. In Benin, CyberSonghai is in the midst of the first two stages, with the second—the creation and dissemination of information—a major achievement. Turning data into knowledge and knowledge into wisdom is not alchemy, but it is not automatic, either. CyberSonghai will have to devise ways to make it happen.

A New Culture

Centre Songhai sums up the CNS Center impact as follows:

After a few years of experimenting, a culture of new technologies has started to take root in the telecenter communities. When there is a problem with the servers, and internal or external users are unable to access their electronic mail box, for example, their activities are disturbed, and they are frustrated. Email, as well as other computer-related functions, is becoming integrated into daily life.

It is important to note that this integration has taken place quickly. Interest in computer training and community appropriation of new information and communication technology occurred over a relatively short period of time, and today it has touched several socio-economic groups. While some may think that new technologies appeal mainly to the upper strata, the Songhai experience indicated an assimilation and absorption capacity of many sectors of society. Among the most interested are civil servants, development workers, business people, and students.

Despite the widespread interest, however, the income generating potential of the telecenters is limited due to high costs. In Benin, the infrastructure necessary for fully operational telecenters is concentrated in the large towns of Cotonou, Parakou, and Porto Novo. For this reason, connectivity costs are less expensive in Cotonou than in the other cities. A diffusion of new technologies

Box 3

Relationship With the Private-Sector

Strictly speaking, CyberSonghai does not actually *compete* with private-sector cybercafés, which tend to serve a different clientele. However, CyberSonghai follows the activities of the cybercafés and pays discreet visits to them to see how they are organized and determine their fee structure.

During start-up in particular, regular surveys and discussions with persons in charge were undertaken near the cybercafés to learn the costs of their services. This information then was used to fix prices at Songhai's telecenters.

Periodically, CyberSonghai staff visit the cybercafés to discover what is new. On the basis of this information, CyberSonghai then may offer a new service or consider reorganizing it or adjust a fee.

The nature of the services offered at CyberSonghai's telecenters differs from that of private cybercafés. For example, while affordable photocopying services are in great demand, the cybercafés tend not to offer this service. Moreover, they do not offer training programs in computer operation and applications, data entry, DTP, and other computer-related activities that CyberSonghai offers. Finally, the quality of the services provided at CyberSonghai exceeds that of the cybercafés, where clients typically are not provided with assistance but merely provided with access to a computer.

From the Centre Songhai Final Report, January 2002

Box 4

Community Impact

The short-term impact of Cybersonghaï on the surrounding communities of Porto-Novo, Savalou, and Parakou includes the following:

- The number of people taking advantage of CyberSonghai's computer training programs is approaching 1,000 at the three sites, most of whom are pupils, teachers, and NGO workers, with business people and farmers increasingly participating. While this is a small number compared to the total population, it is growing, which represents a positive trend.
- A culture of creating email addresses quickly developed in Porto-Novo, with 160 external and 55 in-house Songhai subscribers. These individuals have constant access and use it regularly to communicate with family, friends, and colleagues. Increasingly, clients use the Internet to explore web sites for personal and professional development.
- Exit surveys of telecenter users at the three centers indicate the following:
  - In Porto Novo: 43.75% expressed an improvement in their socio-professional life as a result of access.
  - In Savalou: 33.33% of users spoke about acquiring new knowledge thanks to the telecenter. They also expressed satisfaction in being able to discover, understand, and use a computer, as well as to use the digital camera for photographs and to scan images; 37.25% said their socio-professional lives had improved. Some, especially NGO workers who do not have computers, spoke about the benefits of preparing typed, formatted documents; 25.49% spoke about other changes, such as the saving of time through word-processing tools, which they view as an enormously valuable service.
  - In Parakou: 52.17% cited the acquisition of new knowledge, and 21.73% mentioned an improvement in their professional lives.

From the Centre Songhai final, internal evaluation report, October 2001.

Box 5

Elements of a Successful "Telecenter for Development" Activity

The following summarizes a basic mix of conditions, features, elements, and ingredients that contribute to the success of telecenter activities. Based on lessons drawn from the CNS Center activity, they can inform the development of similar efforts more broadly in Benin, West Africa, and perhaps beyond.

National conditions

- Sufficient political stability to ensure continued implementation of activities
- Democratic trends that enable the acquisition and sharing of information
- Legal/regulatory reform that fosters private initiatives, especially in telecommunications

Infrastructure conditions

- Assessment undertaken to determine technical requirements for availability, reliability, and affordability of electricity, telephone lines, and Internet access
- Where landline infrastructure is insufficient, alternative connectivity options are considered

Organizational conditions

- Telecenter "adopted" (hosted) by a well established local organization/institution
- Host organization produces and uses publications and databases
- Organization recognizes potential contribution of Internet
- Organization takes steps to improve and use telecommunications
- Organization has achieved relative financial stability
- Telecenter integrated into organization's core business
- ICT champion with vision brought in to lead the activity
- Senior management models ICT use
- Organization staff provided ICT training and time/opportunity to use ICTs
- A sufficient number of staff possess technical expertise

Project design

- Reasonable results requirements are set
- Appropriate target groups are selected
- Assessment undertaken to determine information and communication needs of target groups
- Telecenter adequately equipped to meet increasing demand
- Equipment appropriate to current and future infrastructure conditions, with spare parts, upgrades, and repair technicians locally available and affordable
- Deliverables include training for staff

Project management

- Telecenter staff given business management as well as ICT technicial training
- Professional development opportunities provided to staff to help reduce attrition
- Telecenter management decentralized when possible and staff empowered to contribute to innovation, achievement, and job satisfaction

Making the market

- Deliverables include outreach to other development partners and groups in different sectors
- Deliverables include affordable training opportunities for public based on needs assessments
- Deliverables include production of materials with/for other groups, thereby fostering partnership development
- Organization uses a variety of traditional and modern outreach/marketing methods
- Ongoing usage monitoring indicates changing community needs
- Fees determined through comparisons with competitors plus telecenter costs and sliding scale fees used for low income users whenever possible

to the rural zones—to farmers, small trades persons, craftsmen, housewives, illiterates, and the rural poor—is a priority for the future.

It follows that the telecenters must reinforce their promotion activities and other efforts to sensitize these groups to the benefits of ICTs. In addition, technical competences in rural areas are weak and need to be reinforced. To this end, Songhai will re-examine its personnel management policies to help guarantee greater stability in the provision of technical staff.

Broadening the user groups so as to reach the underprivileged layers of the country with affordable services is perhaps the most important challenge for the future.

Footnotes

[1] The Benin activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

[2] The African Global Information Infrastructure (GII) Gateway Project, also known as the Leland Initiative, was a five-year, $15 million project, designed to extend full Internet connectivity to up to 20 African nations. The project facilitates and encourages Internet use by Africans and their development partners to meet the challenges of achieving sustainable development. Approved by the U.S. Congress in l995, the initiative is named in honor of U.S. Congressman Mickey Leland who was killed in a plane accident in Ethiopia in 1989. Mr. Leland had worked extensively in African affairs and was a strong advocate of U.S. support to Africa.

[3] This paper uses the terms *community learning centers*, *telecenters*, and *Community Networking Service (CNS) Centers*, the official title of the activity, interchangeably.

[4] http://www.undp.org/hdr2001/indicator/cty_f_BEN.html

[5] http://www.undp.org/hdr2001/techindex.pdf

[6] http://www.uneca.org/aisi/nici/Documents_English/Beninpub.en.doc

[7] http://www.newafrica.com/profiles/technology.asp?CountryID=6

[8] Ibid.

[9] Worldwide the AED/LearnLink, the Leland Initiative, USAID Missions, other donors, and local partners turn calculated risk into promising development alternatives in support of projects such as the CNS centers.

Case Study

Ghana

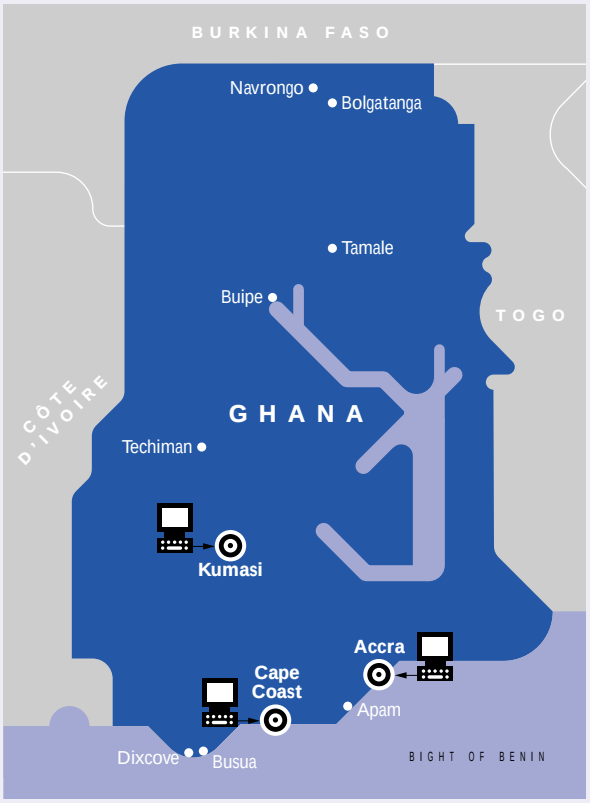
NGO-Run CLCs

Mary Fontaine
Mary Fontaine was the Director of Synthesis and Dissemination for LearnLink and project officer for the Ghana project.

This is the story of how three NGOs in three cities in Ghana brought modern information and communication technologies (ICTs) to the doorsteps of disadvantaged communities. It is also a record of how those NGOs—whose core business focused on traditional social and economic development—came to establish, market, and operate sophisticated telecenters—and how they managed to sustain them.

What happened in Ghana yields useful insights for extending ICT access and fostering technical capacity among non-technical populations. Moreover, the experience also demonstrates how local NGOs can succeed in the public Internet center business, achieving institutional and financial sustainability while meeting the information and communication needs of disadvantaged communities.

> **“I hope you will escort your services to the doorsteps of the community.”**
>
> Ben Emmful, CLC client



Ghana: Late 1990s

A West African country of 20 million people, Ghana in 1997 was in the midst of change. While most Ghanaians still made their living from agriculture, fishing, and mining in the rainforests, savannas, and coastal waters, unemployment in the cities was high, and people were struggling with an inflation rate of up to 20 percent. Despite the difficult economy, the nation continued its move toward democracy. In 1997, half the population was under the age of 20, and literacy and education levels were increasing. So was urban migration as young people searched for new outlets for their talents and opportunities for their ambitions.

The rapid urbanization in Ghana placed an enormous demand on municipalities for increased services in all sectors. Like other African countries experiencing the same phenomenon, Ghana embarked on a process of decentralization to cope with the rush to the towns and cities. In 1997, for example, 18,000 newly elected officials assumed significant local government responsibilities. Recognizing that local empowerment must be accompanied by a concerted effort to build local capacity, the USAID Mission in Accra supported approaches to strengthen urban management. One strategy involved the creation of "learning laboratories" where local officials, city administrators, and the community could build the capacity needed to handle the multitude of interrelated issues they faced.

The "laboratories" took the form of community learning centers.

When the Ghana CLC project launched in May 1997, access to ICTs was limited geographically and economically to the capital city and the upper classes of Ghanaian society. Personal ownership of computers was rare, and while cybercafes and technical institutes were springing up in Accra, they were beyond the financial reach of the majority. As in many countries, groups that most needed to benefit from ICTs— students, teachers, women, small merchants, farmers, NGOs, health workers, and other social change agents—were the least able to do so.

At the same time, interest in the Internet was growing at such an astronomical rate that one could hardly cope with it.

To address the problem, AED/LearnLink, the Leland Initiative,[1] the Research Triangle Institute, and three NGOs in Ghana implemented the "Partnership for Local Development" activity.[2] The project was designed to establish sustainable community learning centers equipped with state-of-the-art ICT applications that produced a measurable impact on community priorities. The program also was designed to include

- demonstrations for local officials, NGO leaders, service providers, teachers and students;
- procurement and/or development of relevant media products and courseware;
- training CLC staff and users to maximize the learning and networking opportunities that ICTs present;
- developing a set of assessment and evaluation tools for the activity; and
- adapting the CLCs, as time permitted, elsewhere in Ghana.

Those Standing Tall: NGOs Take the Lead

Three Ghanaian NGOs accepted the challenge of launching and operating the proposed CLCs. According to Jonnie Akakpo, LearnLink's Resident Advisor in Ghana, the leaders of the NGOs—"those standing tall"—are the main characters in this CLC story. Not only did the task require that they master ICTs themselves, but they also had to coordinate staff training, undertake creative outreach and orientation programs in their communities, conduct assessments to determine the information and communication needs of their target audiences, establish sophisticated monitoring, training, and costing systems, and—the bottom line—learn to operate a business that eventually would generate sufficient revenue to cover all costs. The three NGOs that stepped up to the plate included:

- *The Center for the Development of People (CEDEP)* in Kumasi, a dynamic NGO with solid roots in the community, focused on broad-based community development and human capacity building through training;
- *The Central Region Development Commission (CEDECOM)* in Cape Coast, a mature and progressive business and economic development organization, working to spearhead private sector development by focusing on small-scale enterprise rural housing, poverty alleviation, environmental management, and tourism development; and

Kate Jectson, PIE CLC Manager

- *Partners for the Internet in Education (PIE)* in Accra, a new association of primary and secondary school teachers dedicated to popularizing the use of computers and the Internet for educational purposes.

Project Impacts

Three years after the CLC activity launched, an independent evaluator assessed its impact. Though the Centers had been operating with a full complement of equipment and a full service menu for little more than a year, even in that short period of time they had positively affected clients, the host NGOs themselves, and larger social and economic development in the target communities. The following summarizes some of the key short-term impacts of the activity.

Over the course of the activity (1998-2001), Ghana's CLCs provided email, Internet browsing, and related computer training services to over 14,000 people. While the CLCs provided these services primarily to sectors of the community that already understood the value of ICTs, such as post-secondary students and administrative personnel seeking to upgrade their office skills, many others were reached as well. In Cape Coast, for example, a considerable diffusion effect occurred among small and medium sized enterprises, which had not recognized the benefit of such services previously and which, after just two years, comprised roughly 30% of that CLC's client base.

Impacts on Women

At the time of the evaluation, roughly 2,500 female clients had used the services of the three CLCs. Usage rates for women had reached 25% and were climbing steadily, in large part due to the special awareness measures the centers in Kumasi and Cape Coast had undertaken. That managers of all three CLCs were women is evidence of this commitment on the part of the NGOs to extend ICT benefits to both genders. Aware of the need to continue to promote usage among women in particular, the CLCs were planning future outreach activities to attract even more female users to the centers.

Organizational Impacts

Beyond providing email, Internet, and computing services to 10,000 users, a principal impact of the CLC services was their effect on the sponsoring NGOs:

Central Region Development Commission (CEDECOM)

In Cape Coast, CEDECOM's role in business and regional economic development was considerably strengthened through its sponsorship and association with the CLC. Indeed, the management board of the organization indicated that the CLC is now crucial to their operations and would have to be continued even if the operating revenues did not provide for financial sustainability. This is quite an accomplishment and impact in a little over a year. The Cape Coast CLC had aggressively marketed its services to its small business client base, which created a second diffusion impact on business owners and operators, helping them understand how digital tools can improve their competitiveness and performance.

Despite having to pay long distance charges for dial-up data services to Accra, the Cape Coast CLC stood an excellent chance of becoming self-sustaining after a year of operation. The CLC already generated as much revenue as it spent, and its host NGO, a business and economic development organization, was reinventing itself since launching the telecenter

initiative. In the final evaluation, managers reported that the Cape Coast computer services were in use 80-90% of the time. To strengthen their prospects for financial sustainability, CEDECOM began searching for a way to overcome the long distance dial-up charge to Accra and to expand the number of computers they have for use in training, email, and browsing. They also started to forge links with the hospitality, tourism, and crafts sectors, which are important components of the regional economy.

Center for the Development of People (CEDEP)

An NGO involved in social development, development education, information access, and publishing, CEDEP helped their staff, involved with all these functions, develop new skills and systems to improve their productivity and output. In addition, because of the CLC, CEDEP started to see itself as having a responsibility to bring email, Internet, and computing services to other regions surrounding Kumasi. Due in part to the CLC, the Executive Director of CEDECOM left his job to become a consultant, working full-time identifying partners and new sources of revenue for the CLC to expand its impact beyond the one telecenter site.

In the final evaluation, the management of the Kumasi telecenter reported an 85%-90% utilization rate, with the telecenter revenue almost matching the operating costs. Over a short period of time, the CLC staff helped transform the host NGO, and the organization's information distribution and publishing services were considerably enhanced by the telecenter service. CEDEP's principal challenges are the access to limited bandwidth and its telecenter location, which could be more convenient. An added challenge for this CLC's future sustainability was the need to reach out beyond the present student and administrative worker market that it served and to attract new clients from the small business sector and other NGOs involved with social and economic development.

Partners for the Internet in Education (PIE)

The host NGO in Accra, Partners for the Internet in Education (PIE), had a great deal to gain from operating the CLC. Given its mandate, PIE could have used the CLC to help define its mission. Because of a slow startup, PIE had not integrated the CLC into its mission when the activity closed. However, subsequent reports indicate the organization is moving in this direction.

During the final evaluation, the PIE CLC reported a 50% utilization rate, although all of the computers were in use during several days of observation. Its market was confined largely to law students who liked the proximity and its location in the back of a library. This opens opportunities to broaden the client base by changing its location. For the PIE CLC to become financially sustainable, it seemed advisable to offer a more diverse training service as well as to market the

Box 1 — Celebrating a New Center

In October 1998, the Centre for the Development of People (CEDEP) inaugurated its new CLC in Kumasi. Print and electronic media covered the event, and resource persons, including children aged 8 and 11, demonstrated software packages and equipment, including networked multimedia computers with full Internet access.

The CLC launch was supported by the entire community, with a local oil company donating fuel to transport staff and equipment, an interior designer decorating the launch grounds, and radio stations giving free air time to host interviews and air announcements designed to introduce the public to the CLC.

Stressing Ghana's entry into the computer age, the Ministry of Education representative urged students to make good use of the facilities to enhance their performance in school and learn about computers and the Internet.

Special guests included a representative of the Asantehene of Ashanti King as Chair of the occasion and representatives of the Ministries of Education and Communication. The Queen Mother of Mampong Kronko, Nana Aboagyewaa Kente, cut the ceremonial ribbon to the CLC facility.

CLC to new groups more aggressively. For example, in discussions with the management of the CLC, it was recommended that they approach the university where the law students were enrolled to discuss a contractual or fee-for-service relationship with the institution. The PIE CLC was principally intended to serve the education market, with a special emphasis on teachers. At the time of the evaluation, few teachers actually used the CLC, and while the education market is a challenging one on which to base a financially sustainable service, arrangements with educational institutions could be established.

Impacts on Telecommunications Providers

In two of the three locations, the CLCs had an impact on the behavior of telecommunications providers. In Kumasi, AfricaOnline purchased a leased fiber-line to Accra to handle the increased volume of data traffic it had to carry, due in part to the impact on usage by the telecenter. In addition, many of those involved with CEDEP had come to understand the importance of telecommunications in social and economic development.

The CEDECOM CLC in Cape Coast helped animate a cooperative proposal for the wireless transmission of data to Accra. It is very unlikely that this local proposal to improve services would have emerged had it not been for the demonstration effect of the telecenter there.

Over time, one can expect that those involved with the Community Learning Centers will come to assume a leadership role with respect to changes in the telecommunications services on behalf of the community. This impact is already beginning to occur in both Kumasi and Cape Coast.

Impacts on Poverty Reduction

In full operation for little more than a year, the CLC impact on poverty reduction was too early to ascertain at the time of the evaluation. Because each CLC had to strive for financial sustainability from the very beginning, revenues had to be generated from markets that already understood why computers, email, and the Internet were important. At the same time, the CLCs had begun to extend training, diffusion, and awareness campaigns to the less favored segments of their communities, and while they had not yet reached the poor themselves, they had started reaching those who served the poor. Once financial sustainability was assured, the CLCs planned additional outreach and training efforts to begin to serve those elements of the communities that would most directly affect issues relating to poverty reduction.

Impacts on Local Economy

Global telecenter experience suggests that a wide variety of ancillary economic activities accompany the use of IT and the growth of e-commerce—to support the industry, take advantage of IT access, meet growing demand, and even as a result of natural economic competition. Introducing IT can stimulate business development and provide opportunities for new employment creation and increased income generation. These opportunities quickly become available not only in urban centers but also in secondary cities, rural areas, and among minority and disadvantaged populations. Examples of spin-off business include

- computer repair and installation
- data entry
- software development and production
- training in computer use and software applications
- telecenters, Internet cafes, and business/communication centers
- IT careers in management, administration, and technical support
- Internet service providers
- graphic design
- web site creation

This proliferation of spin-off businesses occurred in Ghana. As Jonnie Akakpo, LearnLink's Resident Advisor in Ghana, explained:

Since we launched the first CLC) in Kumasi and subsequently set up in Cape Coast and Accra, more than fifty Internet cafes have opened in Accra alone. They were virtually nonexistent in Ghana before the CLCs opened. Also, many more ISPs have received licenses to operate because of increasing demand, in part created by our CLCs. Computer repair shops, with outfits for selling accessories, etc., also are springing up to provide the CLCs with services. The CLC activity has had a substantial impact on the business development of the nation's telecommunications providers. In Kumasi, AfricaOnline is purchasing a leased fiber-line to Accra to handle the increased volume of data traffic it must now carry, due in part to the telecenter's impact on usage.

Women's day orientaation at a CLC in Ghana.

Also, the telecenter in Cape Coast has helped animate a cooperative proposal for the wireless transmission of data to Accra. It is unlikely that this local proposal to improve services would have emerged had it not been for the demonstration effect of the telecenter there.

How did Ghana's CLCs achieve such a positive impact on their communities, host NGOs, national telecom industry, and even local economic development in such a short period of time? Highlights of their operations explain their success and suggest useful lessons for future, similar efforts.

Role of Ghanaian CLCs: Demystifying Technology

Initial assessments indicated a need for Ghana's new CLCs to fulfill a set of roles not addressed in the targeted communities—roles anticipated and envisioned only generally in the early days of the activity. After two years, not only project personnel but even clients were able to articulate the nature of these activities far more explicitly. Through interviews, focus groups, and surveys conducted at the conclusion of the activity, CLC staff, managers, and the growing number of "users" identified the following as particularly important for the communities the CLCs served

- enabling community members to learn about ICTs, both hardware and software applications, and how they can positively impact people's lives; providing affordable opportunities for individuals and groups to develop ICT usage skills to help meet communication and information needs;
- supporting the ongoing operations and strategic objectives of the host NGOs by improving internal and external communications and providing technology for producing educational and promotional materials and institutional reports and records.
- serving as incubators for a new generation of ICT leaders and champions who can advocate within their communities for the adoption and integration of these technologies into daily life.
- creating markets for the diffusion of ICTs by serving as demonstration centers and creating a demand for access;
- sparking the development of supporting businesses in communities surrounding the CLCs, such as hardware and software suppliers, equipment repair shops, and expansion of Internet Service Provider (ISP) companies;
- providing a structured environment in which monitoring, evaluation, and marketing tools and approaches can be developed, tested, and refined for technology-based activities; and
- helping bridge the digital divide by providing disadvantaged communities with access to ICTs for communication and personal and professional development.

The external, final evaluation indicated that, to a great extent, Ghana's CLCs served those needs effectively—and five years after launching the CLCs, they still are.

How did they do it?

The simple answer is that the CLCs first informed their communities about the usefulness of ICTs through creative outreach efforts and then provided targeted groups with affordable ICT training and access. But the details of the experience reveal the specific strategies that ensured success. These can be grouped into three primary categories: 1) outreach; 2) services; and 3) training. Before exploring these three, however, a more intangible quality—which contributed greatly to the success of Ghana's telecenters—must be mentioned.

> **“For the CLC concept and services to be embraced by the community, the technologies must be demystified and the practical benefits exposed.”**

Kweku Abban, CLC client

> **“This is a wide ocean of possibilities for education and business… We love it!”**

CLC clients

Creating a Welcoming Ghanaian Environment

To some extent, the ability to infuse a place with “positive vibrations”—to establish an air of easy friendliness, create a cheerful atmosphere, elicit smiles and laughter—is necessary for a successful CLC. Ghanaians bring to their CLCs the *joie de vie* that is also evident in their markets, schools, and restaurants.

But the ambiance that characterizes the community learning centers (CLCs) in Kumasi, Cape Coast, and Accra is not only a tribute to the country’s culture or the people’s nature.

During start-up in the late 1990s, the telecenter staff took specific steps to ensure that the surroundings were pleasing, the atmosphere soothing, and the environment conducive to working and learning. While the “accoutrements” are not lavish, the centers are air conditioned—useful both for the equipment and a client’s attention span—and the tables, chairs, curtains, and lighting are agreeable. The telecenter managers, trainers, and administrative staff are welcoming, friendly, and helpful. They also are competent and enthusiastic. As a result, the telecenters are not only comfortable and efficient spaces for ICT use and training, but also places where an openness to new possibilities is recognized and greeted with optimism and hopefulness.

The importance of creating a welcoming environment stands out as a valuable lesson for telecenters to come. Indeed, in exit surveys and focus groups in Ghana, a majority of those interviewed mentioned the “comfortable surroundings” as a major reason for returning after first visiting the centers, even despite their location on the top floors of tall buildings without elevators.[3]

Sometimes telecenters are quiet places where people participate in training programs, use software applications, or surf the Web, and excitement, enthusiasm, spontaneity or community spirit are not evident. One caveat to a more welcoming atmosphere may be tied to security concerns, which limit the extent to which telecenters are willing to utilize volunteers, for example, as office workers or trainers in return for use of the equipment. These centers have not yet attracted large, diverse groups of local people to come and discover the possibilities. In adopting a more open-door policy and approach to better engage community members—through volunteers, interns, tours for school children, or exchange programs, for example— telecenters can become more integrated into their communities, and local residents feel a greater sense of telecenter ownership. The Ghana CLCs engaged the community, and the centers benefited from it.

Outreach

All three CLCs undertook creative and effective outreach programs focusing on women working in development, the health sector, teachers, students, NGOs, local officials, small businesses, and the public at large. To inform and familiarize potential clients with the possibilities and relevance of ICTs, special days were set aside for target groups, who were invited to explore the CLCs and briefed about the potential usefulness of their services. While a demand for basic office functions such as photocopying already existed, more sophisticated multimedia applications were less obvious, and the benefits of the Internet were virtually unknown among many segments of the community. Visitors to initial outreach events, such as “Open Weeks” for particular groups, left with a give-away—a floppy disk, for example, containing information of relevance—that helped to make tangible the virtual world to which they had been introduced.

Box 2

Outreach and Publicity

Each CLC devised its own strategy for publicizing its products, programs, and services within its community. However, some common strategies can be identified. During the start-up phase, each CLC sent out introductory letters to its partners and potential clients announcing the new services. All of the centers organized public launches, which were presaged by announcements in the electronic and print media. The opening ceremonies were major events…

Each center developed a flyer describing its services to prospective clients. One center entered into a partnership with a local radio station, which advertises its services on air in return for information and news items provided by the CLC. The three centers collaborate in publishing a quarterly newsletter, and two CLCs developed web sites to showcase their NGOs and their services.

"Open weeks" were found to be a particularly powerful marketing tool. These were designed to introduce specially targeted groups, such as medical practitioners, women's development organizations, or merchants, to the potential of the CLCs and ICTs generally. The centers also planned radio talk shows to educate the wider community about the Internet and what it offers.

From "Ghana's Community Learning Centres," in Telecentres: Case Studies and Key Issues, the "Prespectives on Distance Education" series, edited by Colin Latchen and David Walker, The Commonwealth of Learning, 2001.

The centers also called on local dignitaries, officials, even celebrities to help draw a crowd. They placed posters in public places and notices in local newspapers. Word of mouth raised awareness. Some centers offered seminars on topics of interest as well, such as "The Computer as a Tool in Medicine" to attract target groups.

The outreach efforts did not serve only a marketing purpose, however. Rather, such efforts also were used to gather data about the information and communication needs of potential users. At inaugurations and open houses, as well as from new clients, users, and visitors, CLC staff requested information about their information and communication needs, which then were factored into the CLC business plan.

In this way, the CLCs became discovery vehicles—in a sense, demonstration centers for technology, places where the NGO as well as the community it serves could experiment with communications technologies and discover potential uses to development challenges. Examples abound. For instance, the web might become a resource for a WID worker looking for best practices in establishing credit sources for women, a small business owner seeking new markets, or a teacher in search of curriculum materials. The key lesson is to take the time early on to introduce potential clients and constituents to the range of benefits of ICTs and to gear that introduction to each specific group, whether it is women, health workers, business people, artisans, students, teachers, or local officials. The CLC's plan of action for materials development and service offerings then can be based on the expressed needs of the CLC's future patrons.

CLC Services

Unlike cybercafes, which tend to offer access to those already familiar with ICTs, Community Learning Centers offer a wide range of training programs for clients new to modern information and communication technologies. CLCs emphasize the learning function of ICTs and their ability to increase access to basic education and lifelong learning opportunities. Unlike training institutes, CLCs also undertake outreach to groups who might not seek training on their own, hosting events to introduce NGOs, farmers, women, and health workers, for example, to the relevance and benefits of ICTs. Moreover, while NGO-run CLCs seek financial sustainability, they also are not-for-profit, offering training and access services at a cost affordable to lower income groups.

Box 3

Challenges

A host of challenges greeted Ghana's telecenter staff every morning. Sometimes the electricity was not working or the telephone connections were slow or busy, precluding or interrupting online work. As the telecenters became more popular, they also became victims of their own success, with growing numbers of people waiting longer and longer to use one of the limited number of computers. Cash flow was a problem, too, especially at first when the telecenters were not yet generating sufficient funds to cover their expenses, and the host NGOs did not have reserves to carry the telecenter alone. Salaries for staff were low, and retaining skilled employees was difficult when private sector companies paid more and had growing needs for computer literate personnel. Malfunctioning equipment also caused problems, especially where the computers were old or spare parts scarce. Indeed, a sufficient number of state-of-the-art, multimedia, networked computers—accompanied by laser printers, rewriteable CD-ROM and zip drives, education software, and books and subscriptions to computer magazines and other supporting material—is perhaps the most critical requirement for running an effective telecenter. The operation is difficult in the best of circumstances, but challenges in low-income communities in developing countries can try the patience of a saint. If the hardware is faulty or unreliable, the endeavor may be doomed before it ever gets a chance to succeed.

From "HighTech/Grassroots Education: CLCs for Skill Building," in TechKnowLogia, July/August, 2000, (www.TechKnowLogia.org).

Ghana's CLCs undertook research and needs assessments to determine the most useful services to offer members of their communities and target groups. After some trial, error, and experimentation, as well as changes over time, the CLC service menu included the following:

- Secretarial functions
- Word processing
- CD-ROM playback and mastering
- Assisted and unassisted email sending and receiving
- Online research
- Internet chat
- File printing
- Educational and scholarship information finding
- Business research and marketing
- Random and focused Web browsing
- Computer-related training, including:
  - Spreadsheet (Excel)
  - Word processing (Word)
  - Database (Access)
  - Presentations (PowerPoint)
  - Internet orientation
  - Introduction to computers
  - Typing and keyboarding
  - Desktop publishing (Publisher and Corel)

A trend that characterized the Ghana CLCs—and which is supported by global telecenter experience—is the evolution in the services that clients requested. While initial demand focused on relatively basic office assistance—photocopying, desktop publishing tasks such as letterhead stationery production, and word processing—more sophisticated ICT use increased over time. Particularly among those who participated in training programs, the demand for new software programs, email, and Internet browsing grew steadily.

What did these services produce? Clearly the outputs of a CLC develop over its lifetime. While some can be seen from the start, others can only be observed as the CLC matures, as staff becomes better qualified, as word gets out about the "new organization on the block," and as organizations in the community learn what the CLC has to offer. In the case of the Ghanaian CLCs, the following outputs were identified at the time of the final evaluation:

- company/organization reports, promotional materials for small businesses, and student terms papers;
- letters and various types of business correspondence;
- advertising supports for small value-added information businesses;
- transformation of computer "phobes" into computer

“Thank you, CLC and USAID. More grease to your elbows...”

Kobbyna Acquaah, CLC client

“philes,” i.e., agents promoting computer usage;

- creation of computer literates—people who understand how to make computers work, what computers can do, and how those functions can be applied to education, business, and life;
- increased business productivity;
- national and culturally appropriate software applications for teaching and training;
- locally configured information resources (web sites, CD-ROMs, brochures, reports, etc.);
- international, regional, national, and local networking for businesses, organizations, and individuals;
- low cost delivery, dissemination, and acquisition of electronic documents and data;
- fax services;
- multi-purpose computer access for universities, colleges, and schools; and
- experienced office administrators, network managers, business managers, computer tutors, computer programmers, and computer entrepreneurs.

Training Programs

The training programs proved critical. Not only did they enable the CLCs to grow their client bases, but they ensured an essential source of revenue. By charging less than educational and training institutes—and offering more personalized attention—the CLCs were able to attract a steady stream of training participants who, over time, became regular clients.

Promoting their training programs aggressively, the CLCs succeeded in attracting 77 percent of their clients as participants in keyboarding, word processing, spreadsheet, computer literacy, and Internet orientation training. Ranging in age from 8 to 67, with 85 percent between 18 and 40, trainees included students, teachers, and researchers, as well as business people, NGO staff, medical practitioners, artisans, local officials, even national telecommunications workers. As client interest grew, the CLCs added new programs, such as computer networking, fundamentals of programming, PowerPoint, and advanced courses in word processing, spreadsheets, and database management. For the most part, training programs and materials were developed locally, geared to the level and interests of the trainees and relevant to local needs.

The success of the CLCs’ training programs contributed greatly to their long-term sustainability, both financial and institutional. One of their first successes following the end of the grant period was obtaining a contract from another donor agency to train secondary school students at the CLCs during particular hours of the day. While the CLCs’ revenues came primarily from email and Internet access, fees from training grew steadily, and their first ongoing contract ensured a regular income for the CLCs above and beyond their “walk-in” traffic.

Lessons from Ghana

Beyond the insights about outreach, services, and training, the Ghana experience presents a host of lessons for designing, launching, managing, and operating an effective and sustainable NGO-run, community-based telecenter. The following 9 lessons are the most relevant for replicating this activity.

1. The leadership and staff of the host NGO must be trained in the principals of business management, with an emphasis on the special requirements of information utilities. An organization’s managerial capacity—and vision—has to be expanded to oversee the management of a CLC, integrate the

CLC into the organization's core business, and ensure its contribute to the organization's goals. Instead of being marginal to the organization, the survival of the CLC then becomes an integral part of the achievement of organization's mission as a whole.

2. In the Ghana experience, the service offered by the government telecom was less than satisfactory, and an alternative telecom might have been more appropriate. One solution might be a radio connection to the Internet service provider as opposed to a hard wire connection. In this scenario, the service provider communicates via a FM radio connection from its rooftop to a transmitter, located within line of sight. The transmitter, in turn, passes the signal to the ISP via a VSAT uplink/downlink, and the ISP then feeds it to the Internet backbone, via satellite or undersea fiber optic cable.

   Another solution in the Ghanaian context might have been a direct connection to the fiber optic cable already in place from Kumasi in Accra and on to the Internet backbone. Both of these scenarios would have eliminated the need for using the slow and unreliable government service. In addition, they would have allowed the CLCs to have a more desirable, higher speed Internet connection (minimum 64 kbs) as opposed to the speeds of 14.4 kbs (or less) that the CLCs were experiencing as of the final evaluation. Though the argument is made that such technologies are prohibitively expensive, a counter argument can be made that higher speeds would result in greater efficiency of CLC services and operations and, therefore, higher CLC revenues. The increased revenues, in turn, would make it more likely that the CLCs would be able to attain financial sustainability. In short, it is important to carefully examine the connectivity issues developing countries face and resolve them during the planning stage for the CLC.

3. Serving the needs of disadvantaged communities and becoming financially sustainable requires creativity. For example, serving the needs of market women is a valuable activity, but it requires generous prior investment in literacy education, in addition to a public information campaign to demonstrate the benefits computers and information technology can offer. If this foundation has not been laid, then the cost of delivering it will have to be included in the CLC budget, or it will not be achieved. Obviously, there are other ways in which the needs of market women might be addressed in conjunction with the use of CLC resources—for example, by training a host NGO development worker to use the Internet to access information for market women and then deliver it to them in usable form. But even in this scenario, the CLC budget or that of the host organization would have to include provision for paying a development worker to acquire those skills so that he/she has the time to do this job. Otherwise, the cost of rendering specialized assistance becomes an unanticipated drain on the CLC budget. Although market women might become significant fee paying users of CLC resources, the initial outlays for transforming them into customers would have to be sustained by the CLC or the NGOs themselves and then recouped by other means. An alternative approach, and one the Ghanaian CLCs implemented, was to compensate for the cost of such a service by offering certain services at a premium to non-target users who were able to pay. The idea was to use revenues generated from activities and services that do not benefit the target audience to underwrite non-remunerative services. A similar approach involved sliding fee scales, with lower costs for non-profits, teacher, students, and other social change agents.

4. Attention must be paid to ensuring that CLC staff have the requisite training to teach what they are required to teach, and the managers of the CLCs must receive appropriate managerial training. An effective system of ongoing training of trainers and managers is critical to CLC success and essential if the centers are to keep up with the demands of a changing marketplace. Careful monitoring of those trained, through a follow-up survey, for example, could give the training staff and the CLC manager valuable feedback about which portions of the training need to be enhanced or upgraded, who needs or is seeking additional training, and what kind of training not offered by the center is required. Based on this data, the center might elect to send certain staff members for additional training in a target subject for which there is a strong demand.

5. Gender equity in the use of CLCs will not be achieved without specific interventions to attain it. CLC quarterly reports show that while the number of female users increased over time, they still lagged behind male users. It was necessary to continue to organize targeted and creative initiatives to attract girls and women to the CLCs. One effective means for doing this is outreach to schools. Both the World Bank and the British Council have launched initiatives in this direction, with the latter using the Ghana CLCs as a venue for pilot efforts. It is interesting to note that there are significant numbers of female college students using the CLCs, indicating again that educational institutions may be a good place to recruit them. Nonetheless, the top management of the host NGOs is still predominantly male, and this may translate into a reluctance to delegate full authority to the women who run the centers. Gender equity needs to be encouraged not only in the CLC management structure but also in the management structure of the host organizations that sponsor the CLCs.

6. Usage patterns in CLCs progressed from basic to more sophisticated over time, with immediate needs served first. For example, when the CLCs first opened, one of the primary activities was web-based email sending and receiving. In effect, the CLCs serve as post offices in settings where the postal system was inadequate. It is easy to wish that clients would use the CLC for "higher order" activities, such as research or e-commerce, until one takes a closer look at the users and the limitations of the CLC equipment. The former are often individuals whose primary need is for communication with friends, family members, and colleagues in other cities in Ghana or abroad. Such links are a source of self-affirmation and sometimes are useful for soliciting financial assistance and valuable information. Email is a useful and logical tool for these users in pursuit of these very critical and logical needs.

7. The siting of a CLC within an NGO can make the NGO a stronger organization, increase the prestige of the host organization, and help bring its members into the information age. It also can have a multiplier effect by introducing information technologies, often for the first time, to other groups with whom the host NGO has relations. In the case of the Kumasi NGO, for example, this clearly occurred. The heads of the various units, in both focus groups and in questionnaires, described how they had their first experiences with email or were trained to use some type of productivity software, e.g., Excel or MS Word. Some expressed satisfaction that the low fees charged by the CLC had enabled many more people to have access and learn what the technology has to offer.

8. The location of the CLC can make access a barrier for some of the target groups it seeks to reach. Each of the CLCs in Ghana is located on the upper levels of tall office buildings. In one case, the CLC is five long flights up! This is a considerable challenge for any older person and suggests one explanation (among others) for the relative youth of the CLC users. In theory, the CLC should be as close as possible to the target user community—even though the user community may not be the same group that contributes most to the CLC's financial sustainability

9. Staff remuneration should be increased to avoid attrition. Information technology workers are in high demand, and the CLCs are certain to lose their most talented staff as they become increasingly qualified and experienced. Because of the substantial investment made in training these individuals, it would make sense to find incentives to keep them from leaving the CLC for higher paying positions elsewhere. All members of the CLC staffs seem to be underpaid, so their flight to better opportunities is a constant threat. One way that this problem can be partially and immediately addressed is through the implementation of a financial bonus program for educational advancement. As staff become better trained, they could receive financial rewards and the opportunity for subsidized additional training. In this way, service to the organization would be rewarded and would help encourage and advance the staff's professional development. Another approach might be to recruit expatriate volunteers to handle some of the demands now being performed by the staff—for example, to search for external sources for

CLC funding, to lead advanced training in applications, or to help develop web sites or interactive multimedia learning materials for clients. This would free staff members to concentrate on CLC development and community outreach.

Adapting CLC Learning Systems

The term "learning system" is a generic reference to almost any situation where learning occurs. It does not necessarily refer to a formal or institutional learning environment. A community learning center (CLC), in and of itself, is a learning system, and even casual web browsing can constitute learning.

The successful adaptation of a learning system from one institutional setting to another can be a complicated undertaking because there are so many factors that must be taken into account and variables that affect the transfer. These include not only specific details regarding local environments, contexts, needs, resources, and target groups but also the larger issues of how one defines learning, adaptation, and even success. Perhaps most critical are the similarities and differences between the learning systems participating in the knowledge transfer.

For our purposes here, learning systems will be defined as those CLC-based practices, policies, procedures, and programs through which greater understanding and utilization of ICTs is attained. A successful transfer will be defined as the sustainable implementation of a learning system at a new CLC.

The learning systems that a CLC develops over time spring from the functions the CLC performs for the community or target group it serves. Thus, CLCs with different constituencies will emphasize the development of some learning systems over others. For example, one CLC might emphasize the development of information resources such as web sites and CD-ROMs, while another might devote more attention to applications training.

To apply the lessons and insights from Ghana to a new CLC, whether in country or outside, the first step should involve documenting all CLC learning systems, their history, and current methods of delivery. This documentation would then be distributed to the parties concerned about the experience a specific CLC has had in delivering a specific product or service and would be useful in training new CLC staff, trainers, and managers. It also would inform the prospective host organization regarding what inputs would be required for the successful delivery of the learning system. Employing audiovisual documentation, such as a documentary PowerPoint presentation, to assist in transferring the information would be helpful. Presented on videotape or produced in the form of a CD-ROM, its purpose would be to instruct as well as build support for the new CLC by offering a visual example of how a successful CLC works. In this way, people would be able to see what a CLC is and does (a picture is worth a thousand words) rather than having to envision and build the new CLC from an abstract concept.

Another method for transferring a CLC learning system is to create a CLC promotion team that can travel to new CLCs or the NGO that is planning to launch one. The team's purpose would be to tutor the host NGO, its sponsors, and the managers of the new center—in other words, to share the lessons learned from the prior experience. In the case of the Kumasi CLC, for example, their outreach to the local university and to micro-businesses clearly led to more demand for and usage of their CLC's services. It also heightened the demand for their training courses, which resulted in further physical growth of the Kumasi CLC and, ultimately, required the addition of a separate training room to accommodate the demand. In short, experienced CLC managers can help new mangers and new host NGOs better understand the ways in which the value and use of the CLC can be enhanced for the community it will serve.

Alternatively, or in addition, tours and special introductory/orientation events could be useful for transferring a CLC learning system. It is useful for prospective CLC clients to visit CLCs already in operation to observe first hand how various products and services are created, to whom they are delivered, how markets can be built for them, and what infrastructure is necessary to produce and deliver them on a sustainable basis.

Successful transference also will be assisted if the new CLC's business plan includes specific, quantifiable targets. Rather than state that the CLC will provide access to "less advantaged members of a community," for example, the CLC could specify a certain number of *specific functions* to be performed, offered, or delivered to *specific target groups*. This would help insure that the host NGO and the CLC managers include a strategy for delivering the desired learning

opportunities in their operating plans, making it more likely that they will succeed.

Similarly, essential for transference is clearly specifying in the business and financial plan all the inputs and elements that are necessary for the development and delivery of CLC products and services, the promotion of the enterprise, and the daily operation of the establishment. Examples of these items include the capital investment in computers, rental of a comfortable and convenient locale, purchase of appropriate furniture, adequate connectivity, staff, supplies, peripherals, software, networking hardware, and so on. Their inclusion in the budget provides a material basis for their sustainable transfer from one CLC to another. Alternatively, the new CLC can select which products and services it wishes to offer the community it seeks to serve and then develop a business and financial plan that will enable it to offer them on a sustainable basis. The way to proceed would be first to examine the potential demand for technology-based information/ communication services and products in the target community or market and then do a SWOT (strengths, weaknesses, opportunities, and threats) analysis of that market. This would provide a clear indication of the likelihood of sustainable success in offering those products and services in that market.

Of course, prospective CLC developers also should examine the outreach, publicity, and promotional activities that have proven effective (and ineffective) in familiarizing the target community with the CLC products and services

Finally, charging a particular individual with the authority to ensure that the CLCs undertake desired functions also will aid the transference. In other words, empowering the CLC manager, for example, to oversee the accomplishment of the principal CLC functional—and holding him/her accountable—would go a long way towards assuring accountability in CLC management.

Designers of new CLCs would do well to examine what inputs were necessary to offer various products and services successfully at existing CLCs and also examine which factors constrain the delivery or expansion of those services. New CLCs would also do well to examine which factors contributed to the failure of product or service. For example, despite rapidly growing demand, the Cape Coast CLC experienced difficulty offering reliable email and web browsing services because its had serious connectivity problems with the local telecom. Though a connectivity solution exists—an FM radio/VSAT link to the Internet service provider—it is costly and requires a large level of investment, which neither the CLC nor its sponsoring NGO can afford. Since the CLC cannot provide the level of service desired by its patrons, it loses a significant amount of potential revenue each month. The lesson here is that a new CLC, if it intends to deliver effective Internet-based services, would have to make sure it invests up-front the required amount for fast, reliable connectivity.

Learning from other CLCs what is required to promote and deliver sustainable, competitive products and services will insure that the desired learning systems, functions, outputs, and services can be transferred successfully to the new CLC.

The Bottom Line — Those Standing Tall

Beyond the impact on individuals and communities, NGO-run CLCs are having an exciting and rather unusual impact on the host organizations themselves. Their entry into the telecenter business illustrates a growing trend in the NGO world toward a kind of "social entrepreneurship" that is neither strictly non-profit nor for-profit. Generating revenue to run a business is a relatively new undertaking for most NGOs, especially small, indigenous groups in developing countries. Despite the risks, the Ghanaian NGOs accepted the challenge on behalf of their constituents, and all concerned have benefited as a result. For everyone concerned, that is the bottom line—and for Ghanaians, that is the definition of "standing tall."

Footnotes

[1] The African Global Information Infrastructure (GII) Gateway Project, also known as the Leland Initiative, was a five-year, $15 million project, designed to extend full Internet connectivity to up to 20 African nations. The project facilitates and encourages Internet use by Africans and their development partners to meet the challenges of achieving sustainable development. Approved by the U.S. Congress in l995, the initiative is named in honor of U.S. Congressman Mickey Leland who was killed in a plane accident in Ethiopia in 1989. Mr. Leland had worked extensively in African affairs and was a strong advocate of U.S. support to Africa.

[2] The Ghana activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

[3] Obviously, having to climb three or four flights of stairs to reach the Centers prevented certain segments of the population from taking advantage of the ICTs and training programs. At the conclusion of the project, the centers were considering moving to more convenient locations when finances permitted.

Case Study

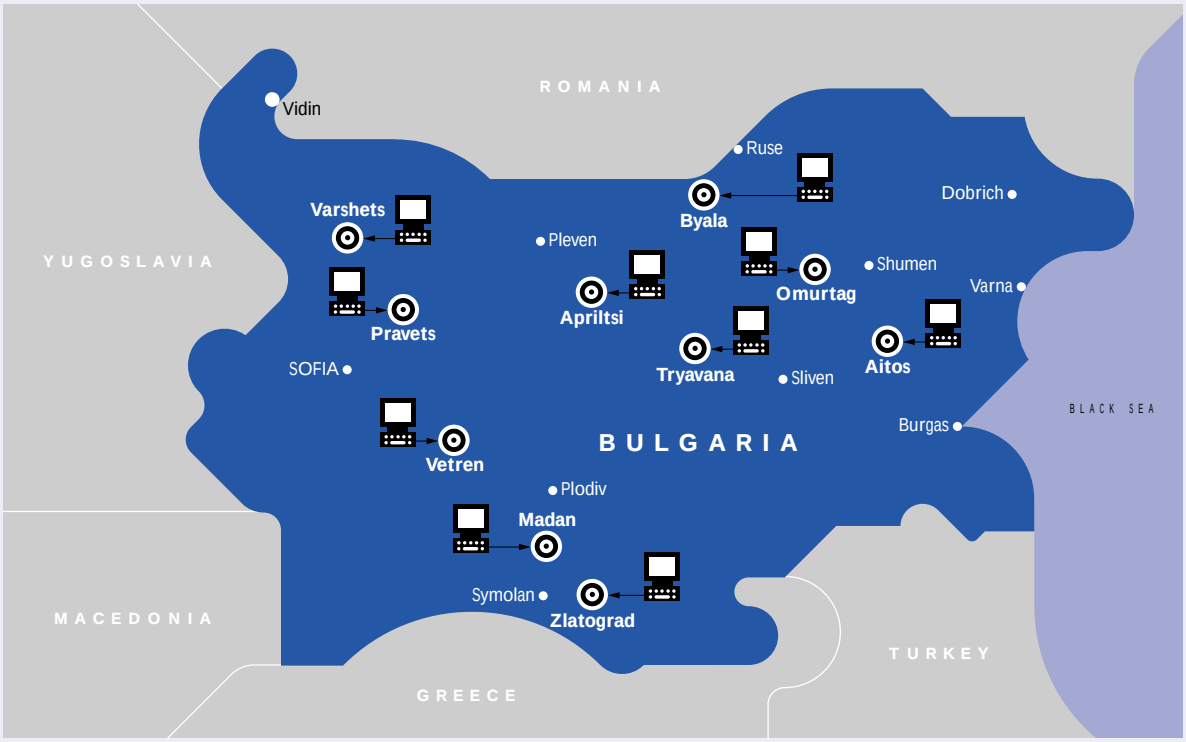
Bulgaria

Bulgarian Public Computer and Communications Centers (PC3s)

Iliana Nikolova
Dr. Iliana Nikolova was the PC3 Project Director, Sofia, Bulgaria.

Bulgaria is a southeastern European country[1] situated in the Balkans, on the crossroads from the Middle East and Asia to Europe. In 1989, when the 45 year-long communist regime ended, Bulgaria began instituting democratic changes. With 13 centuries of history behind them, Bulgarians are proud people who traditionally value education and development, and in the modern age, the nation seems to have a special affinity to computers and programming. The Father of computers, John Attanassov, was of Bulgarian origin, and for a while the country was the communist "Silicon Valley," having its own computer production industry. In addition, the Bulgarian national student teams traditionally score very high in international informatics contests, which bodes well for the future.[2]

Today, modern information and communication technologies (ICTs) are rapidly penetrating the professional and personal lives of Bulgarian urbanites. However, the situation is quite different outside the more populous cities. While multiple Internet providers compete with one another in the cities, few even operate in the many small towns and rural areas, where there is a growing demand for access to computers, the Internet, and related services.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SOFIA
Tryavana
Sliven
BLACK SEA
Burgas
BULGARIA
Vetren
Plodiv
Madan
Symolan
Zlatograd
MACEDONIA
TURKEY
GREECE

PC3
ЕЛЕЦЕНТЪР

The USAID sponsored Public Computer and Communications Centers (PC3) Project[3] was designed to address this demand. The project grew out of the recommendations of a 1999 USAID-funded survey of the Internet infrastructure in Bulgaria, conducted under the Presidential Initiative on Internet for Economic Development.[4] This report suggested telecenters as one means of extending public Internet access and modernizing ICT skills in Bulgaria. As a result, the PC3 project was implemented between September 2000 and May 2002, with funding from USAID's Information Technology team in the Human Capacity Development Center of the Global Bureau and with its administration and implementation delegated to the Academy of Educational Development[5](AED) in Washington, DC.

The PC3 Project at a Glance

The PC3 project envisioned establishing 3 to 10 pilot telecenters in small, underserved Bulgarian towns with poor or no access to ICTs. The telecenters were to be built in partnership with selected local organizations (public and/or private) using a cost-sharing model and were expected to offer public access to ICT (fee-for-service based), facilitate the economic and social development of the local communities, and to become demand-driven and sustainable. In the long-term, the telecenters were expected to act as catalysts for small, spin-off businesses. The initially planned project duration was 14 months (later extended to 20 months).

Between September 2000 and May 2002, AED/LearnLink implemented the PC3 project in Bulgaria. The project forged public-private partnerships with 10 local partners, selected among 90 qualified applicants, and supported their effort to establish and launch locally operated telecenters in small Bulgarian cities. The operators developed their own initial business plans and shared investments, while the project delivered computer and Internet equipment, subsidies for public ICT use during the initial phase, technical support, and training. Perhaps the most unique PC3 feature was the pre-paid service cards distributed to perspective target users to stimulate their initial use, promote skill enhancement and business development using technology, create a client base, and minimize start-up risks. The project also assisted the development of Bulgarian-language digital content, especially Internet- and CD-ROM-based information and training resources.

At the end of the project, external evaluators conducted a final evaluation, which concluded that PC3s unmistakably met their goals. At the same time, the evaluation revealed unanticipated actions and impact that proved important and effective, as well as intended effects that did not occur. The evaluators' summary notes that the PC3 experience illustrates that a small ICT business enterprise is a viable model for expanding ICT access and developing human, social, and economic capacity under conditions identified more fully in the following text.

The PC3 Story – A Closer Look

The PC3 Model

Though flexible in design to meet individual community needs, the typical Bulgarian PC3 takes the form of a locally owned and operated enterprise. It serves a small town with 5,000 to 30,000 inhabitants, offering fee-for-use and, to a limited extent, subsidized access to Internet and computer services, ICT training, and business support services. More specifically, noteworthy characteristics of the PC3 model include the following:

- *Public-private partnership.* Local partners included eight small private companies and two local NGOs.
- *Shared-cost model.* Local partners made their own contribution (up to 50% of the total cost), which was a commitment of spirit as well as money. The local contributions varied from PC3 to PC3 but typically included rent for the telecenter location, salaries for the local staff, furniture, some hardware and software, and consumables for telecenter's everyday operation.
- *Case-specific project contribution.* The size and the kind of the project's contribution to each PC3 varied from one center to another based on the operator's own contribution, local needs, and characteristics of the town.
- *Business and social objectives.* On the one hand, the project aimed at facilitating the emergence of sustainable ICT private enterprises, while, on the other, it expected the operators and centers to offer some "public-good" services, thus extending the benefits of the ICTs to those with a great need but very limited access.

- *Pre-paid cards.* One of the instruments used to achieve both business and social objectives was the pre-paid card, a system of vouchers with a twofold goal:
  1. The PC3 operators would offer a limited number of free introductory services to desirable user groups for "common good" purposes. Upon submission of used, certified coupons, the operators then could claim reimbursement from project funds for an equal amount.
  2. The pre-paid cards were meant to promote the telecenter's services and help to develop a client base, thus minimizing the initial business risk for the operators.
- *Focus on sustainability.* To avoid the often-observed closure of donor-supported activities once seed funding has ended, the PC3 model addresses critical sustainability issues in partnership with local entrepreneurs and involving the provision of for-profit and "public good" services within a sound business plan.
- *Project management.* The PC3 project was implemented by a local project team with a locally hired Country Director (four people all together), acting under the supervision of a Washington-based AED Program Director.

The PC3 Process: Lessons Learned

Designed as a pilot project, the PC3 experience was expected to yield valuable insights into the effectiveness and efficacy of the model. Important design and implementation steps, from which key lessons were derived, included the following:

- Project Initiation
- Selection of PC3 operators
- Subcontracting local partners
- Initial training of PC3 operators
- Establishing information and communication channels within the project
- Hardware procurement
- PC3 equipment installation and set-up
- PC3 pre-paid cards system development
- PC3 official openings
- Further training of PC3 operators and local staff
- Continuing support
- Monitoring and evaluation
- Content development
- Final evaluation
- Publicity and dissemination activities
- Establishing PC3 Association.

Lessons learned from the PC3 process

Project Initiation

A nationwide Request for Proposals (RFP) was distributed through two national and six regional newspapers, the USAID partner's network, and a specially developed web page. A pre-bid conference was organized to answer potential candidates' questions. The implementing agency, AED, played a leading role in preparing the RFP and provided significant guidance to the local project team in preparing the "Questions and Answers" document for the pre-bid conference. In response to the RFP, 92 applications from all over the country were received.

The large response to the RFP exceeded the initial expectations of the project team and influenced the next steps. Given the clearly demonstrated demand, and assuming the receipt of proposals of sufficient quality, the project team decided to proceed with the maximum number of telecenters authorized in the contract framework. A total of ten centers would be established.

Lesson: Publicizing the RFP as widely as possible in Bulgaria was important to the project. Aside from ensuring equal opportunity and transparency, widespread RFP distribution ensured a larger pool of potential local partners from which to choose. Careful drafting of the RFP and the additional clarity ensured through the pre-bid conference prevented misconceptions and resulted in well-informed applications. The guidance and support of the US implementing agency, AED, at this early stage of the project was crucial.

Selection of PC3 operators.

A systematic operator selection process followed in three phases. First, AED's project team used an iterative procedure with a rank scoring method to arrive at the best choices. During the initial phase, the project team in Sofia and Washington carefully reviewed all applications, scoring them according to five selection criteria that were described in the RFP:

1. understanding of the PC3 concept;
2. respondent's contribution;
3. business plan scenario;
4. characteristics of the town/community; and
5. telecommunication infrastructure.

PC3 homepage, http://pc3.orbitel.bg

Through this process, the initial applicant pool was winnowed down to 25 short-listed candidates. After site visits (the second phase of the process) and interviews in the PC3 office (the third phase), 10 PC operators—including Selected PC3 sites eight small companies and two NGOs—were selected.

Lesson: Though the selection process took several months, its thoroughness paid off. The team was able to select strong candidates who met all project requirements. Also, during the selection and subcontracting process, the operators were introduced to an approach to work that involved careful, precise, succinct, and transparent planning and decision-making, which helped build a mutual trust and positive attitude that proved important for future work. AED introduced the approach, which was fully accepted and utilized throughout the implementation of the project.

Subcontracting the PC3 operators

After negotiation, the project team and operators jointly decided on the mix of subsidies and equipment to be provided to each PC3 telecenter. Based on specific needs, the project contributions were added to the Technical Annex of each subcontract. Thus, some operators may have received more support for Internet connectivity, for example, while others received more computers. The subcontracts were officially signed at the first PC3 operators training, where the group of 10 operators met each other for the first time.

Lesson: The tailor-made project contribution included the optimal mix of inputs for each telecenter. It provided sufficient flexibility for the operators and enabled them to shape their own profile, corresponding to local abilities and needs. For example, if an operator planned to offer a specific ICT training course, he/she requested a relevant software package not necessarily provided to the others. This case-specific approach enabled the operators to assess and address the socio-economic context and technical climate in which they were to work.

Establishing information and communication channels within the project

To enable effective project communication, various channels and related procedures were put in place early on, including: PC3 office telephones, e-mail, fax, and project team mobiles; a regularly updated list with PC3 centers' telephones, addresses and e-mails; the PC3's group e-mail address; a PC3 virtual discussion forum and PC3 Web site; individual meetings with PC3 operators; seminars with all PC3 operators; and PC3 operators' monthly reports.

Lesson: Timely, efficient, and reliable communication within the project was of utmost importance for successful implementation.

Hardware procurement, equipment installation and set-up

The typical PC3 hardware profile included a local network (5 to 24 personal computers), Internet

connectivity equipment, printer(s), a CD writer, scanner, fax, and photocopier. Through a centrally issued Request for Quotes (RFQ), the major hardware and software items were procured, while operators bought Internet connectivity devices and more specific hardware and software items locally through a reimbursement mechanism. Initially, Internet access was achieved mostly through leased lines and dial-up (this was technically possible and reasonable at the time of the start-up), but by the end of the project—due to the penetration of less expensive and more reliable wireless solutions—the Internet connectivity mechanisms changed to primarily wireless (7 PC3s), Ethernet LAN (2 PC3s), and a combination of satellite and dial-up (1 PC3).

Lesson: The strict requirements of the contract for US source and origin of the computer and office equipment caused difficulties in the procurement process and delays in the delivery of the equipment. Pursuing US brands at a reasonable price, for example, led to the purchase of a photocopier that was not a good choice for the particular context in question.

Because the project approached each case individually in terms of Internet connectivity (it did not bind all operators to a pre-selected Internet provider and/or a particular connectivity option), the process allowed more flexibility later on. On the other hand, it soon became apparent that a fast, reliable Internet connection was a significant comparative advantage for PC3s competing against other providers, and some operators wished that more attention had been given to ensuring a more advanced and high quality Internet solution for all at start-up. It might be argued that this circumstance simply reflected rapid changes in Bulgaria during the project period.

AED/Washington's help with the procurement process was significant—they provided the methodology and guided the RFQ preparation and bids evaluation.

PC3 official openings

The10 PC3 centers officially opened during September-November, 2001. Considerable effort was put into preparing 'grand' openings—the inauguration of the PC3 centers was widely announced in the local communities, and local mayors were invited to cut the ribbon together with important national and international figures and representatives of the donor and implementing agencies.

Lesson: The grand openings played an important role in creating wider publicity and building local prestige for the telecenters.

PC3 project training

The PC3 project team emphasized the training of PC3 managers and local teams, which was considered crucial for PC3 local capacity building and, consequently, for the sustainability of the centers. The initial framework of the PC3 project envisioned two or three trainings, while in practice seven trainings were provided. In the first training, a telecenter expert from the US facilitated, while local trainers were hired for the subsequent five events. The last training was a visit to Hungry, where PC3 staff were able to study the Hungarian telecenter experience.

Lesson: Though operator training was not explicitly emphasized in the project design, a carefully designed sequence of training sessions, directly responding to PC3 operators' and staff training needs, proved to be a critical project input. All sessions focused on practical and timely topics calculated to help the PC3s succeed. They were developed with a view to enhancing not only the operators' skills but also the types of services they could offer if they chose.

The fact that the professional background of three PC3 project team members was related to ICT and business proved beneficial to the project.

Few project-funded trainees voluntarily transferred their newly acquired skills to other PC3 staff, which might have minimized the ripple effect that the training sessions could have had. There are delightful examples that illustrate the opposite effect, however. One PC3 operator reviewed written lesson plans before each training class, for instance, also inviting the students to participate. This resulted in the creation of a student manual based on the lesson plans. Nevertheless in the future, training in small business management might incorporate explicit training in team building and staff development concepts and practices, especially in cultures where these skills tend to be rudimentary or even absent.

PC3 sites training

Perhaps one of the greatest impacts of the PC3 centers has been their enhancement of the ICT literacy level of local communities. Over 4,000 clients received training in a variety of computer uses during the first

“Lesson: The grand openings played an important role in creating wider publicity and building local prestige for the telecenters.”

1. The US Ambassador in Bulgaria and the Minister of Transport and Communications opened the 10th PC3; 2. The USAID Administrator Andrew Natsios opened the first PC3 center; 3, 4, 5 and 6. Scenes from PC3 grand openings

six months of PC3s operation. Training was offered in both group and individual modes. The following topics (sorted in a descending order according to the number of trainees on each topic) were covered:

- Introduction to Computers
- Internet
- E-mail
- Computer Applications
- MS Windows
- English Language
- Multimedia for Children
- Business and Communications
- Web design.

Lesson: As PC3 clients value formal certificates, requests have emerged for a PC3 training certification process, which would accord a higher status and employability to those who complete such a process. This is important to consider in the future.

PC3 pre-paid cards system

The project introduced this mechanism to help achieve both social and business project objectives. In addition to providing free access to social change agents—who most need such access yet are the least able to pay for it and the least likely to visit the centers on their own, without an incentive—the cards also helped PC3 operators create a new clientele quickly, thus reducing the initial business risk. Most of the cards allocated to each PC3 were given to the operators when the PC3 opened, with a second card allocation distributed four months later.

The pre-paid cards also were used as a data collection instrument. To capture demographic and usage data, the layout of the card and the enclosed 10 coupons were designed accordingly.

Though an automated data collection process seemed more natural, the project decided not spend funds on developing a software tool for tracking card usage, primarily because of the short length of the data collection period (according to the initial project duration, the period for using pre-paid cards was no more than 3 months). Consequently, a paper-based system was devised to collect demographic data on the cards and use data on the coupons within.

Though complete and clever, the system and procedures proved to be complex, time-consuming, and labor intensive for both operators and the Sofia office. In short, not automating the data collection process turned out to be a mistake. When the project was extended, the overall time and labor for tracking card usage became significant. The project team tried to resolve the problem by ordering customization of an existing computer club shell to serve coupon tracking and reporting purposes, but for technical reasons the result was not sufficiently effective.

Distribution and management of the pre-paid cards has yielded most of the lessons learned from this project. Originally, AED's Sofia project office was to manage distribution of the pre-paid cards to potential "public good" users, such as teachers, health workers, agricultural agents, NGOs, etc. Since ten PC3s were established, however, the central distribution of cards was not technically possible, and the cards were given to the PC3 operators to distribute according to a set of guidelines. The operators were tutored and encouraged to establish a local Board of Directors to assist in the selection of recipients and the distribution process.

Lesson: Pre-paid cards elicited great interest and were highly appreciated by the local communities. The cards served as an effective tool to create ICT awareness and promote ICT skills enhancement. According to several PC3 operators, the cards also helped overcome the traditional tendency of small town dwellers in Bulgaria to view new initiatives with suspicion.

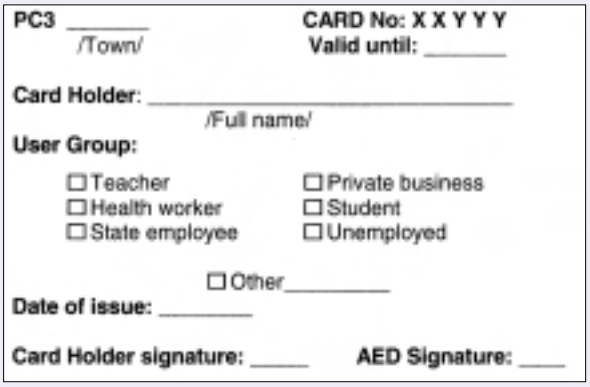
The operators appreciated the pre-paid cards because they created an immediate income. However, operators also complained about the strict card administration rules and the overall time and effort

Table 1 **Training in the 10 PC3 Telecenters (March 2002)**

User group	Total number of people trained
Students	3024
Unemployed	380
Private businessmen	232
State employees	214
Educators	141
Health workers	122
Others	44
Total	**4157**

> ***Lesson: Pre-paid cards elicited great interest and were highly appreciated by the local communities. The cards served as an effective tool to create ICT awareness and promote ICT skills enhancement.***

PC3 cards for the different centers – in different colours



PC3 _____ CARD No: X X Y Y Y
/Town/ Valid until: _____

Card Holder: _____
/Full name/

User Group:

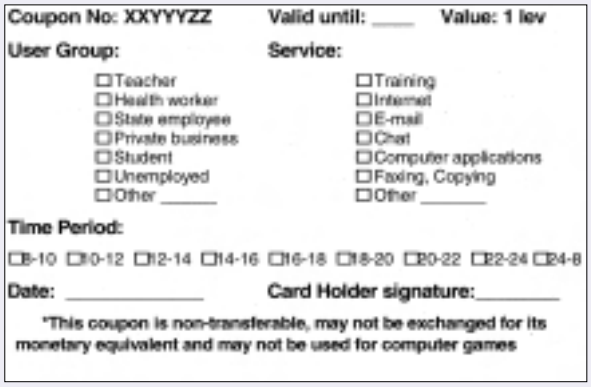
☐ Teacher ☐ Private business
☐ Health worker ☐ Student
☐ State employee ☐ Unemployed

☐ Other_____

Date of issue: _____

Card Holder signature: _____ AED Signature: ____

PC3 card



Coupon No: XXYYYZZ Valid until: ____ Value: 1 lev

User Group:

☐ Teacher
☐ Health worker
☐ State employee
☐ Private business
☐ Student
☐ Unemployed
☐ Other _____

Service:

☐ Training
☐ Internet
☐ E-mail
☐ Chat
☐ Computer applications
☐ Faxing, Copying
☐ Other _____

Time Period:

☐8-10 ☐10-12 ☐12-14 ☐14-16 ☐16-18 ☐18-20 ☐20-22 ☐22-24 ☐24-8

Date: _____ Card Holder signature:_____

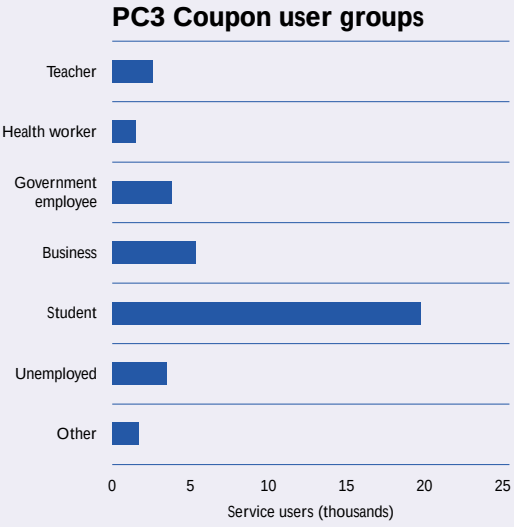
*This coupon is non-transferable, may not be exchanged for its monetary equivalent and may not be used for computer games

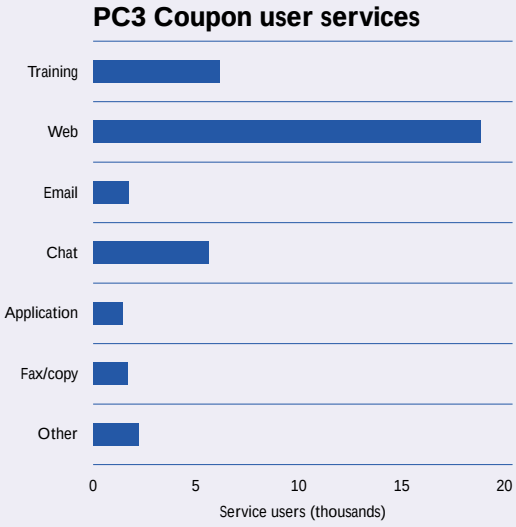
PC3 coupon

Figure 2 Trends Shown By PC3 Cards Usage Data

Analysis of the card usage data shows students and youth as the principal coupon users and the Internet as the service most heavily used. Times of use peaked in the afternoon after school. Student and youth training usually consisted of the basic "Introduction to Computers" course, after which they came mainly for online chat and web surfing. "Other" services and users indicated on the graphs illustrate the diversification of both during the project period.

The evaluators' observation survey of users, conducted near the end of the project, revealed further diversification of services: initially, training was mainly for children; youth were primarily interested in games; and there was greater use of computer applications than anticipated. Since then, new services have emerged: more diversified computer use by adults, a "minibar" (snacks and sodas) for youth and children, and considerable use of IP telephony ("phone" label).





required for card distribution and usage reporting.

Some PC3 Boards created to oversee card distribution continued to function after the fact. The long-term effect of their involvement resulted in strengthening the connections between the PC3 and the important local organizations that became supporters and customers.

PC3s that distributed their pre-paid card allotment all at once created a demand they couldn't meet: too many coupon users appeared to use too few computers. This also proved detrimental for business because paying customers sometimes found all computers occupied by coupon users. Distributing the cards too eagerly also caused a problem: some people would take a card just because it was a gift and never return. This meant lost potential revenue to the PC3 operators, who exerted considerable effort to get the cards back.

PC3 operators who learned to manage their cards tightly, distributing them in scheduled increments and specifying how they could be used—for training or Internet use, for example—were able to better maximize the benefits of the cards.

Experience with the pre-paid cards suggests that their value could be diversified for different services. Findings also indicate that the card allocation criteria could be improved and that, since the paper-based pre-paid card system proved rather unwieldy, managing the cards with a computerized program might be more effective. Better ways to use the pre-paid cards to subsidize use by the underserved also need to be devised, and the elusive question of how to serve "the public good" still remains.

Pre-paid cards can be a powerful tool for stimulating business development for small telecenters in poor environments. The cards not only can mitigate business financial risk but also build a customer base by encouraging customer loyalty and developing customer skills, as well as serving as an effective marketing tool. Because they affect business behavior, the cards can be used to direct services toward specific beneficiary groups. Therefore, careful planning of the distribution rules is essential.

Service development and enhancement

Along with the core set of services that all PC3 centers offered (Internet access, e-mail, CD-ROM use, computer training, document preparation, fax, printing, scanning, and copying services), each PC3 developed its own additional set of services to match the expertise of the local team, the specifics of the local context, and the needs of local customers—such as public telephone access, Internet telephony, Web design and publishing, graphics design and advertising, Internet service provision, city LAN building, and specific services for local administration, local businesses, educational institutions, community groups, and individuals. Some PC3s identified and successfully filled a service niche after offering special training of PC3 trainers in "ICT for children and students."

Information services, in general, represent the core of the PC3 services. Building information skills, though, needs special attention, time, and effort. Internet users do not naturally become information users. Rather, new information use skills take time to develop. As the PC3 evaluator observed, this development occurs, roughly, in three phases:

Phase I: Discovery of a new communication and entertainment medium. New Bulgarian users are somewhere in Phase I.

Phase II: Tool-using skills develop by discovering remote sites that are useful, using instructional and content-bearing media, and learning useful applications. PC3 operators seem generally to be somewhere in Phase II.

Phase III: Deliberately develop content-seeking and management skills for downstream and extended purposes, clients, or products. These are the skills of a researcher with experience in a profession or discipline, which require time and targeted effort to develop.

According to their service profiles, each of the ten PC3 telecenters shows signs of moving toward one or another of the following models, though they are by no means mutually exclusive:

- *Multi-service telecenter* for a small customer base, like a village telecottage, surviving by meeting a broad variety of customer needs.
- *Training center for IT skills (adults and children), foreign language learning, vocational retraining.* Developing successfully in this direction requires establishing contractual relationships with the appropriate national government ministries,

especially education and labor. In addition, a formal certification process would give the PC3 training center an authoritative standing to attract trainees.

- *Designated partner of the municipal government for electronic delivery of social and educational services to the local population.* A strong, competent, and involved mayor is a positive factor in this model.
- *Designated partner of local schools, orphanages, and hospitals for computer installation, maintenance, and user training services.* In the case of such specialized institutions, development of curricula and useful local content should occur in tandem with infrastructure development.
- *Cybercafe for email, surfing, snacks, and games.* PC3s located in a tourist area, or among a large population of children and unemployed young men, are likely to move in this direction.
- *Node of a national ISP.* In the short term, this may offer some stability of income, but in the long term each PC3 must assess what its own strategic place in the ISP market should be.

Lesson: Some PC3 operators are intuitive, forward-looking, and client-oriented. They devise interesting ideas for new services and partnerships and quickly implement them. Others need special attention, help, and push. Here the PC3 human network comes into play—the sharing of ideas and "know how" within the group of operators was strongly encouraged and facilitated in many ways. For example, the operators found invaluable the opportunity to exchange experiences among themselves during trainings and PC3 operators seminars; the project Web site embedded a section where answers to questions, advice for solving common problems, and "know how" for new services were published. (Both operators and project staff contributed to building and maintaining the content in this section of the Web site.)

Building information skills requires special attention and time, both for the operators and their clients. Offering quality information service (becoming 'infobrokers') should be an important goal and direction for the further development of the telecenters.

Ongoing support

Throughout the implementation of the PC3 project, various technical challenges were faced: poor local telecom infrastructure, insufficient maintenance skills available locally, need for technical training for the local staff, and ongoing guidance and support to the operators.

Lesson: Careful consideration and timely reaction to each particular problem was crucial for the smooth implementation of the project.

Monitoring and Evaluation

The monitoring and evaluation system of the PC3 project should have been designed and put in place earlier than it was. Given the amount of implementation work and the lack of specific experience in systematic project evaluation, however, the local project team relied on external assistance, which was delayed for technical reasons. An alternative approach would have been to hire an additional staff member or subcontract a local evaluation specialist to design and design and launch a monitoring and evaluation system early on. Failure to do so led to some negative consequences. For example, important data related to sustainability (data on paying users) was not collected systematically. Also, while waiting for the external evaluation support and trying to predict the needs of the evaluation, the local team and the operators collected and processed a great deal of data, some of which later proved unnecessary or improperly formatted. Nevertheless, the collection process took considerable time and effort, which could have been directed elsewhere.

Once external evaluators were identified and the evaluation system was designed, its implementation was quick and efficient. Most of the data already collected was useful and helped evaluators' work.

Lesson: Monitoring and evaluation system design should take place early on so as to provide clarity for all stakeholders and enable systematic data collection on project indicators over a sufficient period of time.

Content development

The initial conceptualization of the content development component of the PC3 project was too broad and vague. During the implementation phase of the project, however, it was further shaped and became more focused. Since Bulgaria rapidly progressed in telecommunications over the course of the project, and because there was a dramatic external increase in the amount and quality of Bulgarian-language content, AED/Sofia decided to

create Bulgarian language products specifically for the support and training of PC3 operators and their clients. One of the reasons for this decision was the fact that, concurrently with the PC3 project, an Internet information infrastructure in Bulgaria was developing rapidly: Bulgarian government, business, and NGOs were publishing on the Web their own information in the Bulgarian language, and several Bulgarian portal sites emerged.

After studying the PC3 information and training needs, the project team identified suitable authors, content providers, and developers, and as a result of an intensive content development process, a number of Internet and CD-ROM based information resources and training materials were provided to the operators for use in the centers. The set included a "How to…?" information resource aimed at meeting the most frequent information needs of the PC3 customers and, thus, helping the PC3 operators to serve their clients' needs. An online Internet Course in two modules—"Internet for Beginners" and "Internet for Advanced"—was used as a learning resource by the operators themselves and as a training resource for more advanced clients. Other resources included a bookmark collection of useful links, an educational software package for children and accompanying teacher's book, and a paper-based Business Education Course provided by a UNDP project.

Unfortunately, the content development process concluded almost as the project ended, so it was not possible to devote enough time to evaluate the content utilization or to collect and analyze clients' feedback.

Lesson: PC3 operators need some explanation about the notion and importance of local language content development. As with the development of information skills, operators require additional time, practice, and experience to be able to search for, identify, evaluate, select, and deliver appropriate content for their clients.

An important aspect of the PC3 content needs analysis was the priority of immediate life purposes that usually underlie PC3 clients' information seeking.

While multimedia technical developers are easy to find locally, content specialists able to meet particular content needs and produce professional Web and CD-based content in a relatively short time are relatively scarce. An additional project team member specially hired for content development purposes would have been appropriate.

Content development and utilization need more time than was available in the PC3 project. The project should allow sufficient time for planning and preparing for this activity, including identifying the necessary human resources. This should happen early enough in the implementation process so that there is time left to obtain feedback on the content produced.

Sustainability

Along with the pre-paid cards scheme and locally relevant content, the project team addressed sustainability through targeted business related trainings for the operators and by assisting them in individual business plan development. To ensure sustainability, operators adopted wireless technologies to obtain the fastest Internet speed, which became a competitive advantage. In general, operators learned to adapt their service provision to meet local needs and PC3 abilities. For instance, some had stronger Web design skills while others excelled at desktop publishing capabilities. Despite the client base, service and product diversity, training differences, and diversity of business plans, all PC3s relied on the pre-paid cards as income support. Among the many lessons learned, the most prominent for sustainability was the use of the pre-paid cards for stabilizing initial PC3 telecenter business income and attracting the paying client, albeit intended at the onset for educational and under-served groups.

Lesson: One project design weakness was an inadequate monitoring and evaluation process. A requirement for relevant data collection and reporting should have been included in the operators' subcontracts.

The personality and attitudes of the PC3 operators, as well as the quality of organizational relationships with the PC3, seemed to be important determinants of PC3 sustainability success. An active, social personality—a positive, upbeat attitude—and a calm, orderly, and professional setting all made a real difference. Finally, the demonstrated ability to accept and exercise personal responsibility for outcomes was a key characteristic of successful PC3 operators.

The operational lifetime of the PC3s at project closure was too short to enable speculation about how successful the PC3s will be in a business based solely on paying clientele, though recent PC3 income growth is encouraging. A longer-term evaluation or follow-up would provide such data.

Looking Back…

The main project outcomes are

- 10 PC3 centers established and operating (3 to 10 initially planned)
- 7 training sessions for PC3s conducted (2 or 3 initially planned)
- More than 6,500 pre-paid cards utilized by community members
- More than 4,000 end users trained
- New PC3 services developed
- Locally relevant Bulgarian language content provided/produced
- Municipal LANs established and Web sites for local institutions developed by some PC3 centers

The main implementation strategies that contributed to project achievements included

- *Local capacity building:* A strong emphasis on training, building the PC3 human network, and effective communication channels
- *Community outreach:* PC3 Boards, PC3 Cards, and PC3 opening events and promotion activities
- *Timely and adequate response to technical challenges:* Strong human and technological support during the initiation phase, as well as technical training for local staff
- *Focus on sustainability:* Demand-driven services, client-oriented approaches, locally relevant content development, and encouragement and facilitation of "share and reuse" within the PC3 human network

Some missing inputs made the project harder to manage than was necessary. For this pilot ICT project, the following ought to be considered critical inputs.

- Timely design and set up of the monitoring and evaluation system
- Up-front funding for automating the tracking of computer use and accounting for pre-paid cards users and paying clients
- Up-front funding for ensuring quality Internet connectivity using the best technologies suitable for the region

Reflection

The PC3 Project was an ambitious project in terms of the amount of implementation work required to meet the project objectives, the short project lifetime, and the small project team. Nevertheless, as noted by the evaluators, the project successfully demonstrated that the multipurpose telecenter can be a potentially sustainable and replicable demand-driven, small private enterprise model for human capacity development in a transitional economy country, where many communities lack Internet connectivity and remain isolated from economic and social change. Also, with appropriate preparation, a structured use of pre-paid service vouchers can help build a small business and reach specific user groups. This telecenter business/service model, as opposed to a wire-it-and-leave-it model, increased Internet penetration in Bulgaria. By supporting a project that treated operators as professional equals, the Bulgarian PC3 project transformed their opportunities in a positive way.

The importance of the human factor in this project must be stressed, as well as the involvement of a committed donor organization and a well-resourced implementing agency support structure. This synergy made the project succeed.

Still, there are no panaceas for alleviating the digital divide problem and building related human and technical capacity in underserved areas. Sustainability is a challenge.

Looking Forward… Replication prospects

The evaluation concluded that, once the project is conceived of as a human capacity and small business development project with a telecenter label, rather than simply as a telecenter project, its applicability to a wide range of social and economic development objectives becomes clearer. Because a telecenter functions as a complex communication center, it can conceivably handle whatever communications its local users need to send or receive electronically. Therefore, the following six lessons learned from the Bulgaria PC3 project can be used to inform the design of future development projects that envision using telecenters to deliver project benefits:

1. Since telecenter success depends on high quality managers, a careful bidding and selection process to identify the best applicants is essential.
2. Clear objectives and guidance about balancing of business development and social service components is needed, as are a clear definition of "common good" and "public good" in culturally appropriate terms that are understood by all.
3. Up-front investment in the best, fastest Internet connection available and in automating data capture for monitoring and evaluation purposes is important.

PC3 AED/Sofia Country Director Iliana Nikolova (center) signs agreement with Aitos PC3 staff in Sofia.

4. A design for a strong and continuing operator training program, using in-country resources that can result in useful in-country contacts and relationships among the trainers and beneficiaries, is useful.
5. A project designed to support, first, user communication efforts and interests, followed by user learning, and finally information use.
6. A culturally appropriate start-up activities plan that brings local prestige to the telecenter stimulates usage.

The Future of PC3

There is a saying in Bulgaria that, "Each miracle lasts three days." Will the PC3 become just another three-day wonder? We believe not. First, the PC3s are no longer viewed as miracles but are already an integral part of their communities' life. Second, serious efforts have been undertaken to position their usefulness in the future and ensure their sustainability. The most recent development in this direction is the establishment of an NGO—the PC3 Association—launched by PC3 operators and project staff members to stay together and create a partners network for further developing the PC3 concept and practices. The PC3 Association (PC3 Net) will look for strategic partnerships and opportunities to strengthen the existing PC3s and to stimulate and facilitate the establishment of similar centers in communities that need them.

Footnotes

[1] For a country profile, see, for example, http://www.undp.bg.

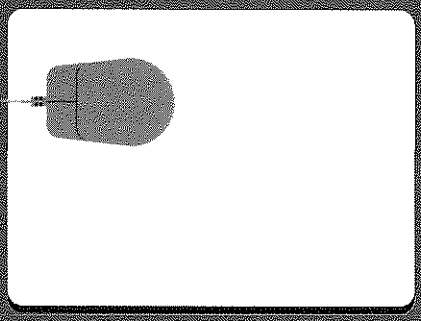
[2] Regretfully, some of the world's best known computer viruses were developed by Bulgarians. Perhaps this could be interpreted as a sign of wrongly directed potential.

[3] The Bulgaria activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

[4] USAID, Center for Economic Growth. *Initiative on Internet for Economic Development: Initial Survey of Bulgaria.* September 19-30, 1999, p. 21-5.

[5] http://www.aed.org

Strengthening Organizations with ICTs 2



Model-of-Use

2 Strengthening Organizations with Information and Communication Technologies (ICTs)

Eric Rusten
Eric Rusten was the Senior Program Officer for the Learning Technologies (LTNet) project in Brazil.

Over the last two decades, nongovernmental organizations (NGOs) have become increasingly important to local, national, and international development efforts as the challenges of development have surpassed the capacity of national governments. International bilateral and multilateral development agencies now channel a significant portion of their development aide through NGOs as a key strategy for implementing projects, strengthening civil society, and building local capacity. A 1996 study determined that, at the time, international donors were directing over $6 billion or about 15 percent of all development aid through NGOs (ODI 1996). NGOs also are increasingly important to government agencies, which have found that partnering with nonprofits is often an effective means of delivering essential services to less advantaged citizens, carrying out needed education and research programs, and achieving development goals. This partnership has become increasingly important as funding of public institution falls and government agencies become less able to provide services. As general donor funding declines and more is channeled to the NGO sector, more NGOs emerge and seek funding. As a result, competition for funding grows as the amount of money available to support NGOs shrinks.

Increasingly, citizens are becoming reliant on NGOs to advocate for local, national, and international policy change and to learn about critical educational, political, economic, health, and environmental issues. Poor people are becoming more dependent on nonprofits for essential social and educational services. In addition, as government responsibilities for social development decrease in many nations, NGOs have become more critical to strengthening institutions of civil society. In short, NGOs are a vital part of civil society today, and it is likely that their roles and responsibilities will expand and grow.

Technology Should Be Considered in Strengthening Institutional Capacity

There are many reasons why information and communication technologies (ICTs) should be part of efforts to strengthen institutional capacity. In order to increase effectiveness, prevent marginalization, and ensure socioeconomic development, ICTs accomplish the following broad objectives:

1. Increasing Institutional Efficiency, Impact, and Sustainability

A combination of financial realities and increasing need is forcing NGOs and their partners to seek ways to:

- achieve more with fewer resources;
- accomplish program goals in new and innovative ways;
- become more transparent;
- enable citizens and constituents to access resources and communicate directly with staff; and
- work toward increased sustainability.

One response to this challenge has been to use a variety of capacity building, institutional development, and reorganization strategies to strengthen NGOs[1]. In addition to these approaches, a few pioneering donors and institutions are applying bundles of ICTs to enable the institutions to become more dynamic, productive, sustainable, and cost effective. The most innovative efforts integrate the use of ICTs into more comprehensive capacity development initiatives and make ICTs an integral part of the institution's daily work and development programs. Blending technology projects into organizational restructuring and development can create mutually reinforcing relationships. Changes in organizational structure and function can be enhanced and enabled by using new technologies to introduce new means of communicating, learning, networking, collaborating, and managing programs.

2. Building and Sustaining Vibrant Public Institutions and NGOs

Using bundles of ICTs to support and enhance institutional capacity-building initiatives is only one reason to use these technologies. There are other compelling reasons for institutions to acquire both the physical and organizational capacity to actively integrate ICTs in administrative systems and, more importantly, to fulfill their missions. New electronic technologies and communications media are transforming the basic structures of almost every sector of society. Education, business, national and local governments, banking, industry, nearly all professions, and the very fabric of civil society are being influenced in profound ways. Nonprofits are not immune to the changes that digital technologies are bringing about in the world. Therefore, it is critical that these institutions avoid becoming trapped in a negative, reactive, catch-up cycle and marginalized by not taking advantage of these tools and integrating them into their programs.

3. Ensuring that ICTs Contribute to Social Welfare

It is important that institutions become more than simple users of ICTs. NGOs should take a leadership role in making creative use of ICTs for broad social benefit. The convergence of these tools with new media are providing fresh opportunities to achieve development goals, attack the root causes of poverty, enhance democratic participation, create new networks and communities for change, and invigorate public and private partnerships. Some of the most successful and dynamic corporations in the world are exploiting this mix of technologies and media to redefine markets, create new business models, and eclipse their competition. Also, new businesses are being created as people make creative use of these technologies to provide essential services, meet needs, and offer opportunities to learn and communicate in new ways. Institutions need to learn from this experience and strive to reshape their own environments and use ICTs for public benefit. Realizing this goal, however, requires that institutions and their funding partners become proactively engaged in these processes of change—not just passive users. Deciding how to do this, making intelligent use of these technologies, and applying them to their best advantage is a complex and difficult challenge.

Strategies for Using ICTs in NGOs

This paper helps NGOs gain an understanding of how ICTs can be used to increase institutional capacity. It also aims to help institution and donor staff make decisions about strategically applying these technologies to achieve more with fewer resources, build new and stronger programs, and increase the impact of broad capacity building efforts. The paper presents a model for institutional capacity building that can employ one or more of the following three broad strategies for applying ICTs:

- *Office computer networks* to improve administrative efficiency, management capacity, internal communication, and professional development.
- *Information management systems* to enhance educational and outreach programs by obtaining, creating, repurposing, using, and distributing more and better development information with greater efficiency and at lower cost.
- *Electronic networks and virtual communities* to enhance organizational learning and advocacy, increase knowledge of national and global policy issues, create new communities, enable collaborative programs, gain access to critical resources, and improve professional development.

Even though these strategies are technology interventions, it is essential to keep in mind that the technologies are **only** tools or means of achieving more important institutional and programmatic ends—technology alone cannot achieve these desired outcomes. At the same time, these technologies should not be viewed as simple add-ons to an organization's physical surroundings. Rather, to enable new electronic technologies to provide durable and fundamental benefit, they must be coupled with changes in values, attitudes, behaviors, skills, and knowledge, all of which comprise organizational culture.

This chapter focuses on planning, implementing, and evaluating institutional technology projects and a discussion of sustainability and potential problems. Also, it identifies challenges that often face technology and capacity building projects and comments on the future of ICTs in NGOs.

The Challenge of Building and Strengthening NGO Capacity

Over the last four decades, ideas about developing and strengthening public and private organizations in developing countries have changed greatly. In the 1950s and 1960s, development efforts concentrated on creating formal public bureaucracies to manage development. When the performance of these new institutions failed to meet expectations, they were diagnosed as being too weak to achieve development targets and objectives. This led to projects in the 1960s and 1970s focusing on institutional strengthening, primarily through staff training, of key systems such as finance, personnel, and planning. As research showed that the centralized bureaucracies created earlier were not reaching the poorest people, especially in rural areas, perspectives on organizational development shifted yet again. The new views focused on development management training with the goal of equipping local people with the skills needed to manage and implement development projects.

These earlier views of organizational development changed significantly in the 1980s with the growing importance of the private and NGO sectors and the decline in the ability of governments to effectively address development challenges. In response, donors shifted their focus from technical approaches dominated by training to longer-term efforts of organizational development that concentrated on institutional restructuring and change. However, modifying the structure of organizations, even when accompanied by improved processes and polices, often did not lead to expected increases in performance or efficiency. Poor results from organizational development efforts, coupled with the sweeping global economic and political changes of the 1990s, brought new urgency for more effective development institutions, as well as a shift toward developing human capacity rather than just engineering structural change. This concept, *capacity development*, is defined by the United Nations Development Program as "the process by which individuals, organizations, institutions and societies develop abilities (individually and collectively) to perform

functions, solve problems and set and achieve objectives."(UNDP, 1997) Capacity development programs seek to break away from past approaches and create broad, enabling environments for staff that promote continuous learning, collaborative working relationships, and problem solving.

Capacity building for public institutions and NGOs, as with all organizations, is a complex, challenging, and ongoing process that cannot be accomplished quickly. Generally, capacity development seeks to enable institutions to make better and more efficient use of human talents, organizational systems, information and knowledge, institutional relationships, and scarce resources. It involves a combination of activities, including helping organizations:

- acquire and make use of needed physical resources such as ICTs;
- access, process, use, and distribute information;
- understand and leverage relationships with other institutions;
- devise effective management systems and build and strengthen staff skills;
- design and implement quality programs that fulfill their mission; and
- craft sound strategies to sustain the organization as it evolves and grows.

More specifically, capacity development efforts focus primarily on enhancing and improving four important and interrelated variables:

1. *Individual*, especially those that influence and enable learning and sharing and improve the ability to solve problems and participate in decision-making.
2. *Organizational*, including institutional culture, the mission, vision, program strategies, structures and functions, policies and procedures, physical resources, access to information, and funding.
3. *Inter-institutional relationships*, or links among organizations and other actors that may be competitive, dependent, or mutually beneficial and that form larger systems.
4. *An enabling environment* comprised of a combination of institutional, socio-political, economic, and technological factors that either facilitate or inhibit change.

Not all of these are equally important for all capacity building efforts, and the three strategies — office computer networks, information management systems, and electronic networks and virtual communities—can be applied in combination with specific technologies to create different models of use in each of the above areas to enhance institutional capacity. Experience shows, however, that the most successful capacity building efforts touch on all four of the above variables.

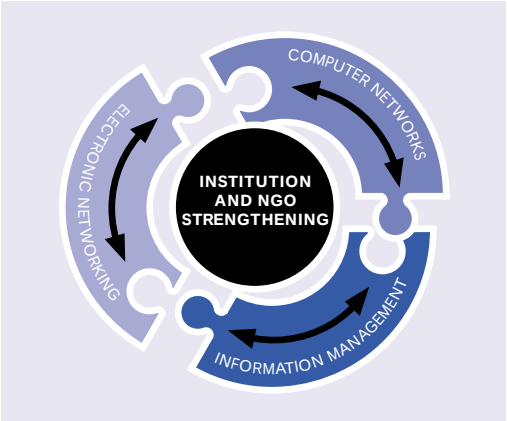
Using ICTs for Successful Capacity Development

Evidence from development projects suggests that integrating technology interventions into a capacity development effort can significantly improve chances for success. All three of the technology strategies mentioned earlier can contribute significantly to creating new incentives, abilities, and an enabling environment. Electronic technologies can help staff do their work more effectively, learn new skills, achieve new goals and objectives, and accomplish new tasks. Bundles of ICTs can provide staff with an array of new ways to communicate, process work, access information, collaborate, and learn, all of which, when combined, contribute to creating an enabling environment and incentives for change.

No matter which of the above four variables is the focus, it is essential that capacity building be directed toward achieving clearly defined and explicit goals and priorities. Without a clear purpose, it is very difficult to assess current conditions, set specific objectives, identify viable strategies, monitor progress, or evaluate results. Capacity development also must be more than a training activity or a theoretical exercise if durable and substantive change and stronger more effective organizations are expected

There is no single model or one way of using ICTs to help institutions become more effective and sustainable. The specific needs, goals, resources, staff capacities, and local context of an institution will dictate which technologies are most appropriate. Also, the different ways that technology bundles are used will reflect the perceived needs, skills, and innovative character of

Figure 1 **An Integrated Model**



different organizations. The flexibility with which ICTs can be used enables each organization to create unique systems or models of use to suit the different needs of institutions. The basic functions of individual technologies remain fairly constant from place to place, but the blend of technologies and associated uses created for organizations yields unique systems. Each time different clusters of ICTs are applied to meet specific needs, new models of use are created. In addition, the rapid rate of technical change, coupled with the speed that people learn new skills and develop creative applications, results in even greater diversity. Within this dynamic and diverse environment, however, it is possible to organize the variety of technology packages into the three strategies. These three strategies are shown in Figure 1 as an integrated model for institutional capacity strengthening.

Even though the three strategies can be used independently, they have their greatest effect when combined. The OCN strategy is usually the foundation on which the other strategies are built, and the most emphasis typically is placed on the electronic network strategy since it holds the greatest potential for enabling institutions to overcome the challenges discussed earlier and to significantly strengthen their capacity.

1. Office Computer Networks

On the surface, office computer networks (OCNs) are a deceptively simple way of using ICTs to strengthen institutions. Basically, an OCN consists of two or more computers, desktop or portable, connected together by cables, which are similar to phone cables, or a wireless linking system. Standard operating system software, either Windows 95/98/or higher or Apple Mac OS 7/8/or higher, or Linux (a free type operating system often used for servers) enable linked computers to communicate.

Along with all the regular benefits of using computers, office computer networks, or Local Area Networks (LANs) as they are often called, enable users to communicate with each other via electronic mail; easily receive office-wide memos, letters, and announcements; collaborate in writing documents and planning activities; access common files and documents stored on different computers; and share expensive peripherals and services such as printers, modems, CD-ROM drives, hard disks, data backup systems, and access to the Internet.

The technologies comprising most OCNs are mature, ubiquitous, relatively inexpensive, and are fairly easy to use. More complex and large OCNs may use specially-dedicated computers, called servers, to store common files, run special network software, maintain office-wide databases, and manage communications across the network. These larger networks also may include devices called hubs and concentrators to help manage network

communication and organize users into workgroups so that network traffic among users is more efficient.

From a capacity building perspective, the most important benefit of OCNs is their ability to provide staff with new and easy ways of communicating and collaborating with each other. Many organizations have hierarchical structures that control the flow and direction of information and limit opportunities for collaboration and communication, especially across different levels in the organization. One of the central goals of capacity development is to open up communication and information flows among staff and to create mechanisms that enable people across the organization to learn from each other and share information. It is difficult to achieve this goal without using office computer networks. Without more open and frequent communication, most capacity development efforts wither and die.

Inter-Office Electronic Mail. Electronic mail can help create a democratic communication system when everyone on the network is equally accessible to everyone else. It also can enable users to increase the frequency and diversity of communication. The experience of some nonprofits shows that, eventually, the quality of communication, both electronic and face-to-face, improves with the introduction of electronic mail.

Sharing Files and Collaborative Work. Easy access to common files—especially core documents about organizational mission, vision, and program strategies—can enhance feelings of ownership among staff and increase organizational transparency. Also, the ability of networked staff to engage easily in collaborative writing and planning activities with others can increase the efficiency of preparing papers and designing projects and improve products. An office computer network also provides an essential foundation for an organization to establish specialized information management systems and participate in electronic distributed networks by using external electronic mail or accessing the Internet.

Establishing OCN Networks is Easier Said Than Done. OCNs are deceptively simple systems. The commodity-like nature of computers and other network components makes it easy to believe that establishing an effective OCN to contribute to institutional capacity building is little more than the simple four-step process of 1) technical design, 2) procurement, 3) installation, and 4) training. It is also easy to believe that the benefits of networking are so obvious and seductive that staff will incorporate computers into their workday and adopt network communication and collaboration rapidly. This is rarely the case, however, and special effort is needed to gain the benefits that office computer networks can offer.

Experience in establishing OCNs in developed and developing countries, small and large organizations, corporations, public institutions, and NGOs shows that it is indeed relatively simple to physically link computers together to form an office network and train staff to use the technology.[2] However, it is important to realize that all OCNs must function within the context of an organization's and a nation's culture, and that aspects of these cultures may hamper open and democratic communication, collaboration, and sharing of information. Also, not all people in an organization will welcome change, no matter how small. Some may fear that their skills will become redundant and their jobs will be at risk. Others may fear a loss of prestige when they realize that work they once did manually can be computerized.

Solving these and similar problems and effectively preparing staff to use a computer network fully requires more than brief orientation seminars and how-to computer training courses.[3] Specific strategies are needed to alleviate fear and engage users in determining how a network can be used to make their work easier and more enjoyable. Training usually needs to be intermittent, ongoing, and customized to focus on actual work and not abstract examples. Senior staff also must demonstrate their commitment to using the network. In addition, policies and incentives may need to be revised to reward network use and innovation. In short, dealing with the people side of OCNs is far more complex and important than the four simple steps needed to get a network running.

An OCN in Nairobi, Kenya. It is common for OCN projects to be planned and implemented independently of capacity building or

Box 1

Staff Fears and Anxiety

The experience of a senior finance officer who was working in an African office of an international nonprofit illustrates a common problem with introducing an OCN. Initially, the finance officer refused to use the new network because he felt threatened by the new technology that younger junior staff already knew how to use. His refusal to use the new communication and collaborative system nearly crippled the whole project. This problem might have been avoided if the planners had recognized the need to identify and accommodate individual attitudes about change and taken steps to provide this person with private training to enable him to gain needed skills and familiarity with the technology before having to use it. In addition, if he had been involved in planning and decision-making about the system, he likely would have reacted differently to using it.

Box 2

The Data-Information-Knowledge Chain

Frequently the terms *data, information,* and *knowledge* are used interchangeably. It is more appropriate, however, to see these terms as interlinked in an "Information Chain."

Data are raw, individual facts, statistics, or items of information that convey little meaning. People use data to create information by organizing, manipulating, and grouping them in new ways. *Information* can be created only by the intellectual activity of people. *Knowledge* is created from information when people assemble and organize it in a useful system that can be used again and again to accomplish things or bring about change. Knowledge is usefully organized information that many people can use.

Box 3

Cultures of Information

Data, information, and knowledge do not mean the same thing to everyone. People in different societies value, seek out, share, and use information in different ways. People who plan interventions that either depend on the effective use of information or strive to change how information and knowledge are acquired, managed, and used often ignore this critical reality.

It is common for decisions about the value, management, and use of information to be based on the planner's own value system and expectations about how others use data, information, and knowledge. Not knowing how and why the local information ecology or knowledge and information systems differ can result in a crippled project.

It is common for people in some cultures to use oral information gathered from trusted friends, colleagues, and family members to make decisions. Written records, if kept, are often only used to satisfy administrative rules. Because they are not important to those gathering and managing the information, the data are often not accurate.

Understanding and changing differences in perception about information and knowledge is not easy. Not attempting this will guarantee that the project either will suffer difficulties or failure.

reorganization efforts or to be added to such activities to bolster their impact. In 1990, a nongovernmental policy research organization in Nairobi, Kenya, took a different approach. In an effort to develop new capacities and initiate an organic process of change and restructuring, the executive director established a simple OCN using basic phone cables to connect all office computers. In addition, new computers were given to senior researchers who had not used them previously.

This effort aimed to enable rapid and frequent communication among all researchers, especially across projects; to link staff to expensive printers to save valuable time and reduce frustration; and to provide continuous access to a bibliographic database of research publications to make research faster and more comprehensive.

The executive director also hoped that by achieving these three objectives, he would start a change process that would enable the organization to implement larger organizational changes more easily and successfully.

As the organization grew, it had begun to mirror the rigid university bureaucracy from which many of the researchers had come. Strict hierarchies were being established that inhibited the development of young researchers and constrained collaboration among staff. The core resource of the organization, its research talent, was not being used as efficiently or as completely as possible, and productivity was falling. Earlier efforts to change policies and structures to correct this problem had not succeeded in opening up the organization or in fostering collaboration.

The OCN project was not funded by an external donor, and the lack of money precluded providing staff with intense and continuous training. An internal peer-to-peer training program was used to get beginners started using their computers and the network. More experienced staff also handled the management of the bare-bones network. A series of office-wide meetings allowed all staff to discuss and prepare for the OCN and associated changes. Now that all researchers had computers and would be linked to printers and the database, research staff that had previously taken care of clerical and secretarial duties were able to focus on substantive research. In addition, all researchers and teams were expected to prepare proposals and reports themselves, identify their own research materials, and manage their printing needs.

Not all staff, especially some of the more senior researchers, responded positively to the introduction of computers and the network. In fact some of these people seemed to see themselves as the principal losers as a result of the new system. After the OCN, it became possible for dynamic clusters of staff with complementary skills to form and handle the changing needs of specific projects easily and respond quickly to new opportunities. Staff that were more comfortable with conventional, top-down structures had difficulty making the transition to the new system, and some eventually left the organization. To encourage working in teams, a new incentive system was instituted that explicitly stated expectations for working in teams and rewarded groups of researchers for securing new contracts and completing projects on time. The executive director demonstrated clear support for the effort and was seen by staff doing his own typing, printing, and working as a member of research teams headed by others. This high level of commitment was fundamental to the success of the OCN project and the larger capacity changes.

Within a year after starting the project, productivity had increased significantly, and several young researchers had taken on key leadership positions in the institution. Client feedback indicated that the quality of research products also had improved. The OCN stimulated and enabled an array of improvements that surpassed expectations, and it is unlikely that similar achievements would have been possible without the OCN intervention. However, these achievements likely would not have been possible if the executive director had just implemented the physical network without changes in policies and institutional functions and had not strongly demonstrated his support for the initiative.

This example illustrates that much of the power and benefit from OCNs is related to how they can enable institutions to collect, store, access, process, and distribute information. The critical role of improved information management to NGO capacity building is discussed below in the

second strategy of this intervention model. The following two strategies are built on the foundation of an OCN.

2. Information Management Systems

The stock and trade of a majority of public institutions and nonprofit organizations is information, and most staff are essentially information workers. The principal work of education, health, population, environmental, agricultural, community development, and human rights groups and research institutions involves using information to achieve their mission and benefit their constituencies. Information also is essential raw material for creating and running training, extension, and outreach programs, managing relief efforts, regulating private corporations, and organizing advocacy campaigns. For public institutions that seek to provide citizens with information important to decision making, OCNs can increase the ability to carryout that mission significantly. For human rights and social justice NGOs that primarily advocate for policy change or seek to protect the rights of disadvantaged people, information becomes a precious resource that, literally, can make the difference between life and death.

When information is the lifeblood of an organization, it is critical that people seek to improve the ways they obtain, manage, and use information. As such, improving how staff and organizations obtain, share, analyze, and use information is an essential part of successful capacity-building efforts. At the same time, improving an organization's information management systems can enhance broad institutional capacity-building projects. This strong link between capacity building and information in institutions is another reason why organizations should seek ways to improve their information management systems.

Conventional, non-electronic ways of handling many information management tasks are not as efficient or cost-effective as computer-mediated systems. Organizations have traditionally relied on only a few sources for most of their information and distributed their information products through only a few channels such as meetings, workshops, training and extension programs, and paper-based publications. Now, it is increasingly important for institutions to use a variety of media, including brochures, newsletters, posters, CD-ROMs, radio and video, faxed news releases, automated fax-back announcements, interactive Web sites, online learning environments, electronic databases, email and listserv[4] messages, formal reports, and mass mailings.

Computer-Mediated Information Management Systems. The ability of institutions to perform and compete effectively in an information-dominated world will depend increasingly on their ability to make creative and extensive use of modern information management systems. The speed with which new data become available and information is created, coupled with the variety of new sources, and the need to re-create information quickly for different purposes and media demands that institutions employ computer-mediated information management (IM) systems.

The phrase "information management systems," as used in this paper, should not be confused with computer and network management systems that exist in many organizations and also are often called information management systems (IMS) or management of information systems (MIS).[5] For this paper, IM systems involve the following five main information management processes:

- identifying and gathering new information;
- creating original information from other information or raw data;
- organizing, categorizing, storing, and retrieving information;
- filtering, restructuring, and repurposing information; and
- publishing and distributing information products via different media.

Because information is a uniquely human product, each of these processes requires intense human interaction. This can be accomplished, and has been for years, without the aid of electronic technology. However, without ICTs, these processes are slow, expensive, require highly specialized skills, and, today, because an increasing amount of current information is only

available in digital formats, would likely be incomplete. In short, developing effective IM systems demands that NGOs make more extensive and creative use of ICTs.

Building an Information Management (IM) System. As with the OCN strategy, the physical and technical aspects of an effective IM system are much easier to deal with than the human and institutional parts. The physical side of an IM system should be designed to meet specific IM needs as defined by (a) an organization's mission, goals, objectives, and programs, (b) clients' needs, and (c) the types of information most important to the organization. The design also should provide opportunities for the system to grow and expand as IM skills increase and needs evolve. All organizations' IM needs are not the same, so it is impossible to prescribe a single IM system or strategy that would be suitable for all nonprofits. Each IM system, like the OCN strategy, becomes a model of use as it is designed and implemented, reflecting the needs and character of the organization. Not all organizations, for example, need or want to develop sophisticated desktop publishing capabilities because it is often less costly and more effective to buy these services from specialists. Also, few nonprofits need to collect, categorize, and store large quantities of digital information in complex databases, so they do not need to invest in expensive database management capabilities.

A general-purpose IM system with modest capabilities for each of the five tasks listed above could consist of a single computer connected to an OCN with some mix of the following peripherals and software, depending on need and funding:

- A basic set of office software, including a word processor, spreadsheet, electronic mail application, presentation, and contract management;
- An off-the-shelf database application designed to categorize and store reference information and/or a do-it-yourself database software to enable skilled staff to create custom databases;
- A flatbed scanner with optical character recognition (OCR), image processing, and management software (often this software is included with the scanner);
- A CD-ROM reader with a sound system and, if needed, a CD-ROM writer, a device that can create CDs;
- A modem to connect to distant computers and/or the Internet (modems are often standard equipment and are commonly built into the computer's mother board);
- A mid-range color inkjet printer and, if needed and funding allows, a mid-range laser printer;
- Intermediate desktop publishing software or, if needed, a professional publishing application;
- Entry-level software to develop and manage a basic Web site; and
- Software to browse the World Wide Web.

Much of the above equipment is now standard on most mid-range desktop computers, and some software is also available for free. It is not essential that an IM system be part of an OCN. However, when the IM system is an integral part of a network, the number of people who actively participate in supplying, repurposing, creating, using, and distributing information resources can multiply its power and impact. A general-purpose IM system does not require a special computer. A standard mid-level computer, using either the Macintosh or Windows operating system software, with at least five gigabytes (GBs) of hard disk storage and 64 MBs of RAM, will meet average IM system needs.[6]

Electronic Publishing and Distribution. Institutions in most developing countries still rely on paper-based media as the primary source of information and as the primary medium to distribute their information products. The rise of electronic media, including CD-ROMs, the Internet, and the World Wide Web, is rapidly changing this situation. Gaining the physical capacity to access information from these electronic media, and to publish and distribute via them, is becoming increasingly important and progressively easier and less expensive.

CD-ROM drives, which only a few years ago were an expensive extra, are now standard equipment. Reference and research information, including databases from The World Bank and the United Nations, general encyclopedias, dictionaries, specialized texts, and complete collections of journals and magazines, are now

available inexpensively on CD-ROMs. In addition, instructional guides and training CDs that teach basic skills—such as typing, using computers and software, and helping people learn languages, prepare for certification exams, diagnose diseases, and prepare better proposals, reports, and research papers—are readily available on CD. One copy of a training CD can be used by all staff in the office and provide remedial assistance when needed.

The digital versions of major reference sources are not only less costly and easier to store than their paper equivalents, they also are much easier to use. The ability to search by keywords to locate needed information and then to cross-link and compare results can speed up research and learning and attain better results. It also is becoming increasingly inexpensive and easy for organizations to publish their own CD reference publications, learning tools, and publication collections. A blank CD-ROM disk that is capable of holding the information from several dozen books and full collections of magazines now costs less then $5 in most countries and can be as inexpensive as $1. The devices for recording information on CDs can be purchased for less than $400 and are becoming standard equipment on some computers.

The combination of the Internet and the World Wide Web is another powerful new medium for information access, publishing, and distribution. As reported in the popular press, more information was made available via the Internet in 1998 than from all paper sources in the world. Also, most of this information is freely available to anyone in the world using a computer that is connected to the Internet by no more than a standard phone line. Powerful Internet search tools make it increasingly easy for people to find information they need. Like CDs, information available online includes fully searchable reference texts, periodical collections and databases, graphics, research reports, conference proceedings, pictures, video, and sound. Once located, online information usually can be printed or stored on a computer for later use.[7]

One of the key benefits of Web-based information, other than ease of use, quantity and low cost, is the fact that information can be made available on the Web much more quickly than via traditional paper publishing systems. Also, publishing on the Web is technically easier and less costly than using more traditional media. This makes it possible for government institutions and the smallest NGO in any country to establish a global presence and make its information available to a much wider audience than ever before. However, it is important to keep in mind that not everyone may be able to access information available on the Web. If an organization decides to incorporate electronic forms of publishing into its communications

strategy, staff need to evaluate the capacity of its different clients to access and use electronic publications and tailor its strategy accordingly.

Direct access to the Internet is not required to publish information on the Web. Several intermediary NGOs, including Interaction, One World On-Line, and the Association for Progressive Communication (APC) and their affiliates around the world, publish information for other nonprofits on their community Web site for little or no cost. If an NGO has direct access to the Internet, it becomes possible for the organization to establish its own Web site, and this can be done without cost.[8] Several commercial firms and nonprofits provide access to limited amounts of "space" on Internet servers for establishing small Web sites. Basic, easy-to-use software needed to create a Web site also is available for free, and capable commercial programs cost less than $200.

As the amount and diversity of information available on the Web continues to grow at exponential rates, and as access to the Internet spreads in all countries and becomes more affordable, it will becoming increasingly important for public institutions and NGOs to get online as consumers and as publishers of information. For many institutions, using the Web will become an integral part of their IM system and will be essential to achieving their mission and, indeed, their very survival.

Using IM Systems: Providing better tools for managing an organization's information system does not guarantee that people will change their information management habits to make different or better use of information. Experience with and research about information use in different organizations and cultures shows that concepts about information, like those listed below, differ greatly among people and organizations, are deeply embedded in culture, and are extremely difficult to change. These concepts include

- how people get, share, and use information;
- the value ascribed to information from different sources;
- the perceptions about using information to create new information and knowledge;
- the role of information in communication;
- the most important sources of information;
- differences between personal and public information;
- the links among information, prestige, and political power;
- the perceptions about information as a means of social change and development; and
- the links among information, education, and learning.

To reap benefits from investments in improving IM systems, project planners and institutional leaders must assess and understand the cultural and perceptual underpinnings of local information management systems. More information on assessing an organization's information culture is provided in this document.

The staff of institutions relies on their work and personal networks as important means of carrying out their programs. Networks are critical to gathering data and information and distributing the institution's message. Without an effective network, even the best internal information management system will have little impact on the success of an institution. It is essential, therefore, for institutions to seek ways to strengthen, enhance, and extend their networks and network processes. The final strategy in this model for institutional capacity building discusses how ICTs can be used to enable institutions to leverage the power and potential of electronic networks.

3. Electronic Networking

Basic Networking Principles. One of the most potent forces for social change in the world today is electronic networking. All forms of networking are the principal means of learning, sharing information, and developing and reaffirming personal and community relationships. Until recently, time and geography limited the extent of a person's networking. Now, ICTs enable people to extend their networks and networking activities beyond these traditional limits in ways that redefine our perceptions of time, distance, and community. Through electronic networks, people and institutions are creating new ways of learning, communicating, and collaborating, and new types of communities are forming.

Limits and Constraints of Traditional Networking. Conventional methods of networking, including workshops, meetings, conferences, and phone calls, demand that all participants be in a certain place at the same time. This reliance on synchronous communication imposes strict limits on the number of participants and how often networking occurs. Conventional face-to-face networking also generally requires that some of the people involved travel to meet the others. The high cost of such travel, in time and money, often prevents most people from networking beyond local areas or at a distance. Face-to-face networking is one of the best ways of creating durable human relationships, however, and is often an initial first step toward electronic networking.

Even with the telephone, financial costs and time constraints, especially when several time zones are crossed, limit networking. Alternatively, asynchronous networking with letters, memos, newsletters, faxes, and telegrams only slightly increases the convenience and range of networking activities. Written forms of networking, except for faxing, suffer from time delays, and, in the case of newsletters, a lack of interactivity limits the networking effect.

These inherent limits to conventional networking are accentuated by the increasing tendency of funders to demand that public institutions and NGOs achieve more impact while spending less. This creates a classic "Catch 22" situation for institutions. They need to expand networking activities to accomplish more and increase their impact, but they have less money to engage in conventional networking activities.

Fortunately, ICTs are now able to offer many institutions a variety of solutions to this problem. As discussed, conventional networking makes it difficult and expensive for institutions to

- educate large numbers of people;
- expand their constituencies;
- build greater awareness about their work;
- develop knowledgeable coalitions;
- increase the impact of advocacy efforts;
- share achievements and innovations with peers;
- create and participate in virtual communities;[9] and
- strengthen and sustain existing networks.

Potential Benefits and Uses of Electronic Networking. The convergence of computers, communication technologies, and the Internet has increased the power and reach of electronic networking. For example, the current generation of electronic networks enables institutions to do much more than simply gather information and disseminate news reports and alerts quickly. With this newer form of electronic networking, it is possible to

- create and participate in "virtual" communities of NGOs within and among countries and collaborate electronically to achieve common objectives;
- establish and coordinate "virtual" teams of staff from one or more institutions that work together across time and distance;
- recruit, mobilize, inform, and coordinate diverse and distant actors to advocate for specific educational, social, environmental, and political changes;
- tap into formal and informal online educational and training programs for staff professional development;
- build and strengthen broader, more organized constituencies;
- stay informed about research, projects, reports, conferences, meetings, and other news critical to achieving organizational objectives;
- leverage the power of information by rapidly accessing, processing, repurposing, and disseminating it;
- stimulate innovation and change by exposing staff to diverse perceptions and alternative ways of doing things; and
- convene Internet-based conferences and workshops enabling participants to attend without leaving home.

Many corporations are using electronic means to increase networking as a core business strategy and as a means to become more profitable. Integrating new electronic networking process into organizations often stimulates the creation of flexible, flat institutional structures, replacing rigid vertical hierarchies and bureaucratic systems. In their place, as David Bollier describes, "a new kind of organization [emerges] that is more fluid, flexible, organically

coordinated and integrated with external entities. [These organizations are also] more comfortable with ambiguity, change and improvisation." (Bollier, 1997)

The characteristics described by Bollier for successful corporations also are needed by NGOs to enable them to survive and prosper while donors and clients are demanding that institutions deliver more with fewer resources. For many institutions, these characteristics are a matter of survival: either they change and become more effective and efficient, or they will become moribund or perish. Without electronic networking, it is unlikely that many institutions, similar to companies in the for-profit world, will find it easy to survive.

Getting Started with Electronic Networking. Taking advantage of electronic networking does not require an institution to have a complex and costly computer and telecommunications system. At a simple level, only four elements are essential to gain access to many of the potential benefits of electronic networking. These include

- a computer with free Web publishing software;
- a modem with free communications;
- a telephone line; and
- direct or indirect access to the Internet.

For many institutions, engaging in electronic networking is a natural and inexpensive extension of their existing OCNs and information management systems. In fact, to enable electronic networking to contribute to many aspects of institutional capacity building, it needs to be built on a robust OCN and integrated information management system.

The computers used for electronic networking can be any recent variety of either an Apple Macintosh or Windows-based system. If new equipment is purchased, "state-of-the-market" computers are recommended. If one or more new machines will be added to an existing OCN, compatible equipment is advisable.

At a minimum, the computer should use either Mac OS 7/8 or later or Windows 95/98 or later.[10] If the computer has the speed and capacity, it is best to use the most recent version of the appropriate operating system software. In addition to operating system software, one of the more common types of Web browsing software applications is necessary. For example, Netscape Navigator and Microsoft's Internet Explorer are the most common Web browsers available and have the features needed to engage in electronic networking. Navigator and Internet Explorer are also free, available in several languages, and they come in versions for Mac and Windows systems.

A modem enables the computer to connect, via a phone line, to the Internet or to other computers that are connected to the Internet. Modems are standard equipment on many new computers. An important difference between modems is the maximum possible communication speed and the type of phone service to which it can connect. In many cities of the developing world, poor-quality phone lines limit communication speeds. In parts of India, for example, maximum speeds commonly do not exceed 36,600 bps, while in the United States average speeds can exceed 54,000 bps, and very fast DSL (digital subscriber line) and cable services are become increasingly common in homes. The speed of communication significantly influences the types of electronic networking in which people can engage.

With the advent of the Internet, it has become increasingly possible for people in most countries to communicate and share information easily with others, regardless of time or geography. Linking distant computers via telecommunication systems, either through connections to the Internet or by direct phone lines, enables people to engage in electronic networking and computer-mediated communication. This new medium of communication is at the root of the emerging global information society and economy.

Strategies for Effective Electronic Networking. Of the many potential benefits of electronic networking mentioned earlier, the following four are especially important for developing country institutions:
1) accessing, creating, and distributing information, 2) advocacy, 3) professional development, and 4) creating virtual communities.

Electronic Networking for Information. The basic product of most institutions is information.

www.oneworld.net

www.iirr.org

Simply put, pubic institutions and NGOs are in the information business. And tools that improve an institution's ability to acquire, create, and distribute information can improve that institution's capacity, effectiveness, and sustainability. However, information and related management processes are expensive. Because of this expense, institutions traditionally have turned to conventional networking as a principal means of mitigating costs, improving information access and accuracy, creating a comprehensive information picture surrounding an issue, and then distributing the results to those whom the institution needs to reach. Unfortunately, conventional networking is constrained by time, money, geography, and staff.

Electronic networking enables staff to expand their reach for information beyond the limits of their conventional network. Also, by using the synchronous and asynchronous nature of electronic networks, staff can communicate with others and work collaboratively regardless of geography. For example, OneWorld, an international NGO, focuses on human rights and sustainable development and seeks to provide up-to-date information about a variety of issues, from AIDS and the environment to education. NGOs can join OneWorld's online or virtual community and participate in interactive debates, easily access information, and communicate with other NGOs, government staff, and concerned citizens around the world about their work and critical global issues. More and more institutions are making use of the information resources on the Web. The International Institute for Rural Reconstruction (IIRR), a Philippine NGO, is using its web site to disseminate news about IIRR and its resources with a global community.

Staff of a small NGO in the slums of Rio de Janeiro, Brazil use electronic networks to gather information to develop more effective programs for street children. They also use electronic networks to distribute information about their work, which has enabled them to increase and diversify their funding and expand their programs. As their network of supporters, collaborators, and donors has grown, new opportunities for staff to work with similar organizations outside of Brazil have increased including collaborative projects in Japan and the United States.

An NGO in Kenya, the African Center for Technology Studies (ACTS) used a simple store-and-forward email system to create an electronic network of researchers working on climate change around the world. As part of this effort, ACTS was able to prepare high-quality briefing material and convene an international conference on climate change and developing countries. This also enabled ACTS to position itself as an important international actor in the field, even though it was a small, young African NGO. Building on this modest start, ACTS extended its

use of electronic networking to enable its researchers to collaborate with scientists in other countries on studies that increased staff capacity and attracted financial and political support.

Electronic Networking for Advocacy. Advocacy for change is important to the missions of many public institutions and NGOs. A critical part of successful advocacy is communicating news and the institution's perspective on important issues to as many people, especially primary clients and decision-makers, as possible. And successfully communicating news and perspectives demands that institutions create and distribute accurate and compelling messages quickly, in a variety of ways, and as cheaply as possible. The combination of computers and communication networks enables institutions to collect accurate data and information on an issue rapidly, analyze and organize the information, and repurpose it in a form that meets their advocacy needs. The resulting advocacy information can be developed quickly into different forms of communication and distributed a variety of ways, including the following:

- Electronic mail *alerts* inform members, supporters, and interested people about last-minute changes in the status of an issue, new efforts the institution has taken to affect change, or information about what the recipients can do to help advocate for the change.
- Periodic electronic newsletters inform members with Internet access, replacing paper copies and, thus, saving production and distribution costs (paper copies are still sent to people without email or Internet access).
- Announcements posted on listservs inform a larger community of people interested in an issue about the advocacy effort. Such announcements can include information about how recipients can contact decision makers, where to go for more information, and the facts on an issue.
- The organization's web is updated with current information about the issue and what the institution is doing about it. Such a site could have mechanisms for people to download electronic pamphlets and announcements that they can distribute, automatically send decision-makers electronic post cards, and include forms that visitors can fill in to join the program or support the institution.
- An electronic conference is convened to allow interested people to engage in a dialogue over an issue, ask questions, get answers, and make their voices heard.

Each of these uses of electronic networking for advocacy differs from using conventional networking in several important ways. The electronic process takes far less time and makes better use of staff skills and resources. Using electronic networking is far less costly in terms of the time it takes staff to access information, produce and distribute advocacy materials, and gather feedback for clients and supporters. Material produced and distributed electronically can look more professional than materials produced by conventional methods.

Communication with clients, supporters, and advocacy recipients is carried out in a more timely manner than with conventional means, and more people can be reached. This combination of benefits explains why public institutions and NGOs around the world are making effective and creative use of ICTs to enhance and extend their advocacy efforts.

Electronic Networking for Professional Development. Institutions must contend with wide-ranging demands on their scarce financial resources. Building and strengthening the professional skills of staff is one such challenge that is all too often neglected because it is costly, and professional development opportunities that meet the needs of institution staff are scarce. In response to this problem, many institution staff use professional networking as a primary means of learning new skills and keeping their professional capabilities current. Unfortunately, conventional networking is limited by the ability to meet with other professionals in workshops, conferences, and business meetings. Now the benefits of conventional networking can be expanded and enhanced by engaging in electronic networking using ICTs.

At a minimum, email communication with fellow professionals and participation in newsgroups and listservs via an office's email system enable staff to engage in professional

www,oxfam.org

http://www.campaignforeducation.org/_html/home/welcome/frameset.shtml

discussions and debates as they carry out their daily responsibilities. Participating in this form of professional development also allows the staff to keep up-to-date, exchange information about projects they are engaged in, and share questions and answers with local and global professionals with common interests. Some institutions may take a more active role in this form of professional development by sponsoring and moderating listservs and email discussions.

At a more advanced level, staff with access to the Internet can participate in threaded discussion forums that focus on specific issues and themes of interest for staff. Unlike email networking and listservs, the content of a threaded discussion forum is continually visible on a Web site for all participants to read. Also, the forums' "threads" automatically link comments to previous messages so that readers can follow and engage in specific discussions that are part of the list. Most discussion forums also allow users to search for keywords electronically so that specific topics can be found easily.

Participating in discussion forums is an excellent way for staff to learn about current thinking on a specific topic or theme, become aware of new work being done around the world, and test their ideas with and ask questions of fellow professionals. By establishing and running discussion forums, institutions can contribute to the professional development needs of their own staff and those of other organizations. Such forums also can be a valuable means for institutions to make their programs known to larger communities and gain feedback from clients, donors, and colleagues.

Online courses offered via the Internet also are becoming a potent means for staff to gain focused professional development in a collaborative learning environment. By creating such courses, often by repurposing existing content, institutions also can actively engage in the professional development activities of their staff and others and possibly earn revenue.

Electronic Networking and Virtual Communities. Money and technology do not bring about sustained development. People do. And people acting in groups or communities are responsible for the most effective development. However, there are natural limits to the number and variety of communities that can form where the participants are restricted to only meeting face-to-face. One of the greatest potential applications of the Internet and electronic networking for institutional capacity strengthening is virtual communities of NGOs. Virtual communities form around common interests and purposes and are linked by a mix of technologies that includes the Internet, electronic mail, Web sites, videoconferencing, and synchronous chat. Unlike physical communities,

http://www.sn.apc.org/corporate/index.shtml

Box 4 Objectives of business-oriented virtual communities:

1. Aggregate uses to target advertising and increase sales.
2. Strengthen customer and trade partner relationships.
3. Improve collaboration and knowledge sharing among staff.
4. Provide staff with easy access to critical decision-making information.

virtual communities (VCs) are formed in "Internet space" and do not have a single physical location.

A virtual community's Internet space usually consists of a Web site housed on an Internet server somewhere in the world. Community members use the Web site to coordinate activities and share information. The physical location of the Web site is not important since participation in the VC occurs wherever members are located. Like physical communities, however, virtual communities are primarily based on relationships among members and the benefits derived from being part of a community. In addition, like physical communities, virtual communities need to be coordinated, supported, and governed, and they depend on the active participation of members for their survival. Even though forming a VC is easier, faster, and less costly than establishing a physical community, and membership is not limited by the location, income, or age of participants, creating a successful virtual community is not easy.

It is important to note that even though most participants in virtual communities never meet, these are real communities. It is only the place where these communities exist that is virtual. Virtual communities created by corporations, universities, and individuals can take many forms. For example, an NGO virtual community can be created by groups of NGOs seeking to apply the power of collective action to achieve their individual and combined missions. A case in point is the 11 independent Oxfam organizations around the world that created a virtual community on the World Wide Web to coordinate collaborative programs, convey a common message to donors, partners, and people interested in development and social justice, support Oxfam's advocacy work, and highlight global action campaigns. Oxfam's virtual community Web site is coordinated and facilitated by Oxfam International.[11] One of the key objectives of Oxfam's virtual community is to use it as a vehicle to launch and foster participation in Oxfam's global campaigns.

The Association for Progressive Communications (APC) formed one of the first virtual communities of NGOs focusing on international development issues.[12] APC sponsors a global virtual community of NGO Internet service providers (ISPs) that are dedicated to serving the Internet connectivity needs of international NGOs and citizen activists. APC's nonprofit association of 25 member networks works to build communities without borders by enhancing communication and cooperation across the global social justice community through six programs that

1. make the Internet a strategic resource for civil society and NGOs,
2. build the capacity of emerging communication service providers that serve the nonprofit community,

3. research and development for practical online applications that support the formation of virtual communities,
4. defend and promote productive online work space for civil society,
5. strengthen gender-aware Internet design, implementation, and use, and
6. strengthen African information sharing and independent networking capacity.

APC and its member ISPs go beyond the hardware and software of virtual communities and electronic networking by supporting the people and organizations working together worldwide for social, environmental, and economic justice. SANGONet, for example, APC's member for southern Africa, provides NGOs in that region with Internet access and capacity-building support to use ICTs for community development and social justice. SANGONet's services go beyond technology, focusing on providing regional NGOs access to organized development news and information on education, democratization, the environment, economic issues, women, information technology, health, housing culture, and human rights. Within the context of these issues, member NGOs receive help to create virtual communities.

Corporations and the for-profit sector have made extensive use of virtual communities to support business activities, improve customer service, create new sources of income, and make staff more productive. A brief review of active virtual networks created and used by institutions outside the United States and Europe, however, indicates that too few pubic institutions and NGOs in developing countries have started harnessing the power of ICTs to create virtual communities.

Challenges with Electronic Networking and Virtual Communities. As mentioned earlier, the technology side of creating virtual communities is fairly simple and inexpensive. In addition, much of the information and software and many of the services needed to establish a virtual community are freely available on the Internet. Given the great potential value of virtual communities and their relative technical simplicity, why haven't most institutions around the world started using these tools?

Assessing and Planning for Technology Projects for Institutions. A framework for assessment and planning for projects using ICTs can be organized into the encompassing environment, organizational readiness, and the technology environment.

Each of these domains includes a variety of elements comprising a mix of social, economic, cultural, institutional, and technical factors. Even though preparing and planning for each project requires a unique set of assessment elements, it is important to recognize that it is best to involve elements from each of these three domains. Also, even though there is no single recipe or one set of assessment and planning elements for all possible types of institutional strengthening projects, it is possible to identify a sub-set of elements within each domain that will be important for planning successful initiatives.

Assessing the Encompassing and Enabling Environment. All NGOs function within a web of other institutions, development projects, stakeholders, policies, global trends, economic and infrastructural realities, and local and national cultures. Identifying and learning about the most salient of these factors for a specific institution's technology project can be critical to success. When assessing the encompassing environment for institutional strengthening projects, the following may need specific attention:

- Material, institutional, and human resources in the surrounding environment that can be mobilized for the intervention.
- Local and national stakeholders and principal actors associated with the proposed interventions, both those who may have something to gain from the project and those who actually may lose or perceive that they will lose as a result of the intervention.
- The presence and absence of policies that may support or inhibit aspects of the proposed intervention.
- The state of local and national communication, electrical, and technical infrastructure.
- The presence or absence of social and cultural characteristics that may enable or discourage project activities. Specifically, aspects of culture dealing with communication, learning, and the sources, flow, and use of information.

- Equity assessment or the potential distribution of benefits and costs among different parts of society, specifically along economic, gender, and ethnic lines.

Assessing Organizational Readiness. Introducing ICTs into an institution to change the way people communicate, access, create, use, and share information, administer and manage programs and projects, and develop new ways of achieving the goals and mission of the organization demands institutional and personal change. Not all institutions or people are equally receptive to or prepared for change. Nor are they all effectively equipped to adopt new ways of doing things. Experience shows that integrating electronic technologies into organizations and realizing benefits commensurate with the investment cost is a very complex process. Assessing and understanding the state of organizational readiness for the different levels of change that can occur in institutional technology projects is essential for success. The following areas of assessment may be important for assessing the readiness of institutions to participate in such projects.

- Assessing an institution's motivation or lack of motivation for change. This includes identifying the source of the demand for change, the level of understanding among staff for and about the needed change, and perceptions about the costs and benefits of the proposed change.
- Assessing extant institutional and staff capacity with respect to the skills needed for the project and the training needed to enable staff to make full use of project inputs.
- Assessing institutional communication flows and methods.
- Assessing the organization's communications, electrical, and information infrastructure.
- Assessing the presence or absence of policies, management skills, and incentive systems that might support or inhibit the project.
- Assessing organizational equity issues.

Assessing the Technology and Infrastructural Environment. Projects that apply bundles of ICTs to enable institutions to strengthen their capacity demand different levels of technical and communications infrastructure. It does little to equip institutions with the computers and training needed to engage in electronic networking if the local communications infrastructure is either too expensive or incapable of supporting electronic communication with other institutions and individuals. Assessing the technology infrastructure is an essential part of project planning that entails assessing:

- the information and learning ecology,
- electricity, communications infrastructure, and ICT markets,
- existing and needed computer and communications equipment and software in an institution,
- local Internet service providers,
- access to technology support and maintenance services, and
- training needs and access to effective training services.

Assessments of the encompassing and technology environments and organizational readiness are obviously important to planning and implementing projects. A less obvious but equally important reason for assessing the three domains is to lay a solid foundation and gather baseline information for on-going monitoring and evaluation activities. Assessment results also can provide valuable inputs into identifying indicators for change and other aspects of evaluation design.

Monitoring and Evaluating Institutional Capacity Building Projects

Project monitoring and formative evaluation are as much a part of project success as good planning and implementation. It is not possible to anticipate or address all possible factors that will affect the implementation of a project or result from the intervention. Because of this, and the need to know if the intervention is leading to the objectives and goals of the initiative, it is important to build monitoring and evaluation activities into a project from the very start. Monitoring and evaluating institutional technology projects can be divided into two main parts. The first and easier deals with monitoring and evaluating a project's implementation, i.e., the delivery and installation

of inputs, carrying out of training, the number of people trained, the number of computers installed, the number and frequency of email messages sent, the number of visits to the project's web site, etc. This information is important for tracking the progress of the project and meeting contractual requirements. However, this information will not inform project participants if the initiative is strengthening the capacity of an institution or in what way capacity is being changed. Implementation evaluation also will not help identify what impacts the intervention is having on the programmatic objectives of the institution. This second part of monitoring and evaluation—impact evaluation—seeks to answer these challenging questions. It also is much more difficult to design and carry out and, ultimately, much more important to undertake.

In both cases, the following points are important to designing and carrying out an effective monitoring and evaluation strategy:

- Start planning for monitoring and evaluation at the very beginning of a project.
- Monitoring and evaluation (M&E) should be built into assessment and planning activities and should grow with these activities.
- Develop the M&E strategy with other project participants, especially with the staff of the institution where the intervention is taking place.
- Clearly define and specify the goals and objectives of the intervention. Break down broad general goals and objectives into their component parts.
- Since few project objectives dealing with institutional capacity can be directly measured, it is necessary to derive indirect measures that will indicate when and if specific objectives are achieved or not.
- Differentiate among immediate, short-term, mid-term, and long-term objectives. Design the M&E strategy so that each level of objectives provides data and information for the next level.
- Do not turn an M&E activity into an independent research project, and do not collect more data and information than is needed to answers core questions.
- Use a mixture of qualitative and quantitative tools to gather and analyze information.

Sustaining the Use of Technology for Institutional Capacity Strengthening

The real impact of an institutional capacity strengthening initiative, especially one involving ICTs, usually will not be achieved when the physical parts of the project are installed and the training completed. The most important results of such projects will accrue over time as the technologies are integrated into institutional functions and as the way that staff do their work changes. Because of this delay on the returns to institutional strengthening investments, it is especially important that projects pay special attention to creating mechanisms to ensure that the technical inputs, training, and strategies for change are sustained over time.

Sustainability issues related to institutional strengthening projects can be differentiated as financial sustainability, technical sustainability, and sustainable processes of learning, innovation, and change.

Financial sustainability involves more than just seeking new sources of funds to keep an intervention running after the initial project concludes operations. Possibly more important is making decisions from the start of a project that will enable institutions to afford ongoing project expenses. For example, in some developing country urban centers, a poor communications infrastructure may make it technically easier for a project to use a complex and expensive means, such as a radio modem, to link the participating institution to the Internet. Unfortunately, after project funding terminates and technical staff departs, it is unlikely that most cash-strapped NGOs will choose to spend large amounts of scarce funds to rent expensive equipment and pay high monthly communication fees. It might be better, in this situation, to select technical solutions that they institution can sustain over time.

Financial sustainability also includes efforts to modify institutional budgets and accounting methods so that they are aligned with the benefits and needs of the intervention. Budgets in many institutions often need to be overhauled to accommodate routine maintenance, the purchase of consumable supplies, periodic

connection fees, and the replacement of failed and out-of-date equipment.

Keeping the equipment running and supplied with needed inputs is an important part of sustaining a technology project. However, the most important aspect of technical sustainability concerns decisions about which technologies to use in the first place. Important guidelines for technical sustainability include the following:

- Choose technology that has locally available maintenance and support.
- Select equipment with demonstrated reliability under the physical realities of the country where the project is located.
- "State of the market" technology is often the best choice rather than "state of the art."
- Choose technology that can meet both current and future needs. Do not just plan for the moment, but do not choose technology just because it is the most powerful.
- Include periodic and ongoing training rather than a large dose of comprehensive training at the start of the project. Allow users to access training opportunities as they expand their use of the technology.
- Ensure that technology choices are driven, to a great extent, by human and institutional needs. Technology choices should not drive institutional capacity strengthening initiatives.

Making the financial and technical systems of an institutional capacity-strengthening project sustainable is a necessary but not sufficient condition for ultimate project success. The most critical success factor is creating the capacity within institutions to sustain processes of learning, innovation, and change. It is relatively easy for institutions to undergo change and enable learning when new technologies are introduced and training is provided by externally funded and administered projects. Once the external energy for change leaves at the end of the formal project, it becomes much more difficult for the organization's staff to continue the process of change. The inertia of tradition and organizational and social culture can dominate nascent change, and old institutional structures can replace new structures introduced by the project easily. There are several strategies that can be considered to help sustain process of learning, innovation, and change:

- Provide meaningful opportunities for staff from all parts of the organization to participate in assessing, planning, and implementing the project. Enable staff to internalize new systems, structures, and functions inherent in capacity strengthening initiatives.
- Identify and support project champions in the organization.
- Provide periodic and ongoing training and professional development opportunities for staff throughout the project, not just at the start.
- Ensure that the institution's leaders are fully committed to the capacity strengthening effort and that they make obvious use of the new technologies themselves.
- Help develop incentive systems that reward the creative use of the new systems and ongoing innovation.
- Create durable partnerships with other institutions within and outside the country where the project takes place so that there is both an outlet and source for new ideas.
- Focus on building and strengthening those aspects of an institution's information culture and ecology that support project objectives and goals.

Like changes and innovations in ICTs, institutional capacity strengthening never ends. These ongoing processes can be mutually reinforcing or at odds with each other. Electronic technologies can be powerful levers for change and development within institutions and potent, driving forces for change in the world surrounding institutions. Institutions can choose either to be subjected to the forces of technology and information-driven change, or they can take control of these forces and use them to build stronger, more responsive, and more effective institutions. Once a solid foundation for applying technology in an institution is created, it becomes easier to seek out and capitalize on emerging technologies to continue the processes of change, learning, and innovation inherent in capacity strengthening activities.

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Footnotes

[1] For ease of reading, the term ***institutions*** will be used interchangeably with *NGOs*.

[2] Creating simple computer networks likely will become even easier. It is now possible to network computers inexpensively without any additional cabling. Devices are available that allow computers to communicate with each other for basic file and peripheral sharing through a building's electrical system.

[3] Much computer training offered to staff rarely goes beyond the introductory how-to information about primary applications. Rarely does staff receive ongoing training in integrating these new tools and processes into daily activities.

[4] A listserv is an automated discussion tool that uses electronic mail. Messages sent by any member of a list are automatically forwarded to all other member of the list. People usually can subscribe and unsubscribe to lists via email. Lists are inexpensive to set up and maintain and nearly free to participate in.

[5] Business IMS or MIS most often are concerned primarily with managing and maintaining the hardware and software side of computer systems. They usually are not engaged directly with information other than creating and administering database tools.

[6] The speed and capacity of computers and the demands of software change so quickly that it is not useful to prescribe specific computer speeds or many other specifications. If new equipment is purchased, it is generally wise to buy "state-of-the-market" equipment, not the latest "state-of-the-art" computers.

[7] Care should be taken to avoid using copyrighted information, images, videos, and sound from the Web or a CD without permission or attribution. Copyright and the Web are highly charged issues.

[8] There are a variety of free and inexpensive Web servers available on the Internet. Most of these free services are made available through advertising on Web sites that use them. Users of free services will have to tolerate these advertisements as a "cost" of using this service.

[9] Virtual communities are groups of individuals and/or organizations that collaborate, share information or resources, learn together, and exchange information via the Internet. The "space" where community members meet and work has no physical place but exists as a web site. They are called virtual communities, therefore, because they lack physical existence.

[10] The Macintosh and Windows operating systems are the two most common types of operating system software. Even though other operating systems exist, they are not discussed in this paper.

[11] Oxfam International's VC Web site is on the Internet at http://www.oxfam.org.

[12] APC is located on the Internet at http://www2.apc.org.

Case Study

Ecuador

NGO Sustainability in a Networked World

Eduardo Contreras Budge
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This is an account of an Ecuadorian NGO struggling to become sustainable while its country and core institutions were scarcely sustainable themselves. These are the lessons distilled from that NGO's search for a new vision in times of deep social and financial uncertainty. They center on employing information and communication technology (ICT) processes and applications to promote organizational strengthening, renewal, and sustainability. Those who have been involved in the early reality-testing of ICTs will be able to recognize the experiences that inspired these lessons. For those who have not, the lessons are presented to describe the potential of ICTs for improving organizational reach, efficacy, and even purpose, as well as to highlight the challenges involved in trying to do so.

CEPAR

The Center for Population and Social Development Studies (CEPAR) is an organization based in Quito with an impressive record of achievements. The organization has depended, as so many other NGOs in poor countries, on donors' support to accomplish its work. CEPAR undertook this project to advance its organizational development objectives with the help of ICTs. Before the project began, CEPAR had not experienced the communications potential ICTs can enable. Nor had it grasped the relationship between sustainability and ICTs. For these reasons, some CEPAR staff were confused by project goals and said:

"We are a social development organization. We serve others. We will never be able to become sustainable. This idea makes no sense."
"Next month, as we struggle to survive, we will have more computers than people left here. Should we open a telecenter perhaps?"

Box 1 CEPAR

Since its inception in 1978, CEPAR has promoted informed policy dialogue on population, health, and social development matters. It has accomplished this by conducting field and analytic demographic research and by engaging in information, education, and communication (IEC) activities, particularly for health and population authorities and social leaders. Historically, the organization was associated with population and family planning studies, and its acronym reflects this initial focus on "responsible parenthood."

Over the past 20 years, in association with international partners, CEPAR has conducted 25 surveys, three national demographic studies, and 130 case studies on health, population, communication, and social policy topics. It has hosted nearly 1,000 professional development and networking events for over 90,000 participants, ranging from symposiums, panels, and round table discussions to specialized courses, workshops, and high profile conferences.

Among its information resources are several Ecuadorian demographic databases, most notably SICEPAR, as well as a specialized documentation center and a press clippings archive. The technologically advanced Informatics unit pioneered massive data entry, processing, and statistical analyses, and its Communications department published a quarterly magazine and newsletters and offered advice on developing communication plans and training materials.

Through its different units and cadres of professionals, CEPAR has collaborated with and provided services to the Ecuadorian Ministry of Health and other public institutions, international and regional groups, and academic, research, and civil society organizations.

CEPAR's continued and influential work has been recognized both nationally and internationally. In 1991, CEPAR received the Worldwide Population Prize from the United Nations. Ecuadorian authorities also have honored CEPAR for its contributions to research and analysis of health and population policies.

Yet CEPAR had to find new ways to expand its products and services and enhance its outreach and communication ability to survive financially. USAID, a long-term, major donor in the country, was phasing out its support for many health, family planning, and microenterprise activities and organizations—including CEPAR.

USAID had played a key role key in many development sectors in Ecuador, advancing poverty alleviation strategies and economic growth and micro-enterprise activities. Its support also prompted policy and legislative dialogue and reforms and contributed substantially to health, population, and child survival programs. In the late 1990s, however, USAID began shifting its programmatic focus to the environment and biodiversity, judicial reform, anti-corruption efforts, and border activities resulting from the Ecuador-Peru peace accord. "USAID is working with Ecuadorian private and public sector institutions to: 1) increase sustainable economic growth for a broad base of the population; 2) reduce levels of mortality and fertility; 3) strengthen sustainable democracy; and 4) manage the environment for long-term sustainability

LearnLink[1] was asked to work with CEPAR in September 1997, because USAID wanted to help CEPAR become sustainable in light of the planned closeout scheduled for September 2000.

LearnLink's collaboration with CEPAR came at a time when the organization was starting to redefine its vision, mission, and core activity areas—at the particular organizational moment when CEPAR was developing detailed strategic plans that addressed crucial sustainability issues. In hindsight, this ICT intervention could not have come at a worse time—or a better one.

Ecuador: Country Context

Ecuador is characterized by a mix of cultures and recent urban migration. Among its 12 million people—55 percent mestizo and 25 percent indigenous—most live equally divided between the highlands and coastal areas. Half the population now lives in urban areas, with few living in the rainforest. Quito, the political capital, is a cosmopolitan city with a small town geniality. It is also rich in history and culture, and the cityscape is dotted with cathedrals and museums of Baroque and religious art. The country's diversity is reflected not only in its culture but also in its geography. Though land area is small, Ecuador has one of the highest levels of biodiversity in the world.

Despite its rich culture and geography, Ecuador is also a land of widespread poverty, afflicting nearly 70% of its population. Continued poor economic performance over several decades has exacerbated the situation and limited growth in social development. Recently, Ecuador went through dramatic macroeconomic crises, subsequent political crises, and, concomitantly, a cultural "loss of hope." It is only in the last couple of years, after substantial setbacks, that the country is gaining ground on the economic and social development track.

Civil society organizations and NGOs were not at all immune from these events—the strands of generalized poverty cut across them, too. NGOs in Ecuador—and there are thousands of them, big and small—have been indispensable actors in social change and development, and most have consistently relied on the support of cooperating and donor agencies. In return, they have delivered valuable development processes and results. Several NGOs are highly specialized in services or target groups and areas while others are relatively isolated from each other and, in some instances, in competition for resources.

The project's focus

While CEPAR already had an Informatics unit that used computers for certain functions—and some staff who were quite proficient at managing electronic databases and statistical programs—the organization had not realized the full ICT potential. It was unaware of the potential benefits of larger networking, interactive communication, and information collection and dissemination capabilities. USAID hoped that introducing the organization to this potential and supporting the integration of ICT tools into the organization's operations and service provision would strengthen its prospects for self-sufficiency.

In general, LearnLink's task was to help CEPAR use ICTs to improve its effectiveness and catalyze sustainability efforts, improve networking with similar NGOs and institutions, and expand its information, education, and advocacy reach and influence.

The project objectives included assisting in the creation of a CEPAR web site and designing an online version of CEPAR's *"Correo Poblacional y de Salud"*

magazine. Since CEPAR's staff are already familiar with information technology applications, at least partially, the project's specific aims were to:

- expand the organization's electronic information options and services;
- enhance its electronic networking capabilities and services among health and population-related Ecuadorian NGOs and institutions; and
- help develop a similar networking capacity within the Andean region.

From the first day, however, the overriding concern was for CEPAR's long-term relevance and sustainability. Thus the USAID task order was not only about creating and sustaining a web site CEPAR could call its own or about developing Internet and networking capabilities within the organization and its partners. It was really about developing new organizational skills, which ICT tools could facilitate.

From past work, CEPAR was well supplied with computers and software applications. Before 1997, however, CEPAR had not ventured into the communicative aspects of ICTs, nor taken a proactive role in networking. While CEPAR did have ICT components and functions—prerequisites for a meaningful transition towards the full use of modern technology—it had not taken advantage of the internal or external communication potential of the computers they had. While, over time, they had instituted a shared drive of information for common use, email was not used, the Internet and World Wide Web were not accessed, and, simply put, there was no notion of how to use ICTs as a communications medium or as a means to access, share, and disseminate information.

The strategy and scope of activities that LearnLink developed and implemented, with significant CEPAR participation, set an ambitious, long-term navigational chart. CEPAR's internal perception that computer activities were short-term, however, limited the broader impact of the technical assistance, provided by the Intercultural Center for Research in Education (INCRE). Moreover, as the country started to slide into its most severe economic and political crisis of the century, the relevance and efficacy of planning a long-term ICT strategy was challenged, but the products were completed despite some mishaps and delays. The larger issue of survival and relevance is an ongoing challenge. Some key lessons emerged from this process.

CEPAR Magazine

Box 2 CEPAR CD-ROM

An example of how complicated it is to create a change in perspective about ICTs came about at CEPAR's public event to showcase its new "e-capabilities," which were unfamiliar to many of the invited NGOs. LearnLink advised CEPAR staff to bring in all the physical documents that they had managed to squeeze into their first CD-ROM and then to add up what buying all those publications would amount to. The results were staggering. Two very heavy boxes of valued CEPAR publications were not enough to balance the CD-ROM's embedded intellectual weight. Of more interest, however, was the result of the pricing. To approach the revenue of the individual print documents, the CD-ROM would have to be sold at about 100 times its special sale cost! And even if they sold it at such a low price, would not other organizations now have at their disposal, almost for free, the product of so much hard work over the years?

ICTs for Sustainability

As part of its sustainability strategy, CEPAR conducted a strengths, weaknesses, opportunities, and threats (SWOT) analysis while it simultaneously revised its core mission. Shortly after, LearnLink facilitated a SWOT focused on communication, ICTs, and CEPAR's future, plus a staff survey that focused on CEPAR's communication capabilities and flows. These participatory exercises engaged all of the staff in the challenge and provided a dual benefit: it was a collective learning experience that shaped ensuing tasks, helped locate a discrete interventions within the organization's ongoing programs, and identified its core concern: achieving sustainability, somehow.

Nevertheless, some expected that ICTs, or a web site, would readily produce income. This notion was then extended to the products and services CEPAR might provide to partner NGOs, some of which, in the end, did generate income. Unfortunately, when discussing ICTs' role in sustainability, a common mistake occurs in ignoring the time frame. ICT contributions to sustainability over short periods are small. Just as in the private sector, ICT effects are long-term. While ICT up-front costs are usually taken up by donors, operating costs are not negligible for an NGO, and an e-network cannot be expected to be cost-efficient during the initial, low-coverage reach and impact period.

Moreover, far too much importance may be attached to the technological instruments as such, rather than to the people who actually make sustainability with ICTs happen. For CEPAR, the added value of the ICTs was not just that the NGO had some new tools for serving other entities, nor that it could offer cheaper e-services. Ultimately, ICTs have an increased chance to contribute to sustainability when they are enmeshed into the organization's own, substantive work. This means that the issue is not merely financial, but organizational, which implies a concurrent strategy: Invest in strengthening the staff and the organization's capacities to integrate ICTs into its work.

When an NGO is committed, collective capacity-building works wonders. If the support is merely lukewarm, the focus should be on motivated individuals, with or without an ICT background, that push the ICT value forward.

Another lesson learned regarding the value of ICTs for organizational sustainability has to do with visioning. This presents a dual challenge. Not only must the organization provide a vision for the specific ICT intervention, but also ICT activities must be integrated into the entity's broader vision of itself. The link to sustainability is that, in the end, being sustainable is just a valid means for a higher end: the entity's continued relevance.

Assessments, Visions, and Project Designs

NGOs that are not up to speed on ICT facts and trends do well to start with an assessment of their understanding and capacity. This does not mean an external, number-crunching, expensive exercise. It does mean group commitment to honest, in-depth democratic discussion and incisive questioning. An outside professional facilitator can help move the process productively. This should be a participatory learning exercise, an opportunity for exploring and strategizing the future on firm ground.

Assessments, however, need both a vision and an ensuing action plan. While the full set of CEPAR assessments were instructive about needs and wants and status and prospects, the organization's integration of ICTs for sustainability was slow. In general, the organizational adoption of ICTs is not immediate, and its ripple effects on efficiencies and effectiveness take considerable time to flourish as organizational and personal barriers are overcome.

Slow integration is not surprising in an environment where ICTs for development are not the overriding concern and where communication connections are poor. Skepticism about ICT value abounds, fueled, in part, by immediate operating expenses. In the end, CEPAR adopted some ICT-enabled survival strategies and actions, but they did not correspond to the Task Order timeline. Moreover, they were adopted at a time when CEPAR was reinventing itself. The organization was shifting from a well-known and recognized past experiential tradition (population and health studies and policy dialogue) into a valid but far more diffuse vision of 'social development' generally, into which myriad competent NGOs provide their contributions. Finally, the exercise took place just as CEPAR found itself facing national crises, the imminent end of USAID's support, and the loss of its Communication and Informatics department heads and their specific technical leadership.

Integrating ICTs into the already challenging vision-

and-mission activity, along with the efforts to develop coherent long and short-range work plans, affected the outcome in practical ways, e.g., what the web site would be about, whether the online Journal should change its focus, who the prime audiences and users-to-be of the new online existence were, and so on.

More generally, the question was, "How, precisely, can ICTs be used as instruments to sustain an NGO whose vision and mission merit its continuance in similar or enhanced roles? It is well known that a sensible, proper use and dosage of ICTs can enhance the quantity and quality of an organization's reach, the efficacy and eventual impact of its activities and results, and the efficiency with which the above two are obtained. The trick is in actualizing such potential.

If there is no in-depth discussion and agreement on what an organization is, what it does (or will be able to do, provided "a," "b" and "c"), then the mere usage of ICT artifacts, as expressed in a web site or an email distribution list, will neither convey nor generate an adequate image of the new organization. The medium, in this case, is not automatically—and does not substitute for—the message.

On the other hand, whatever is presented, promoted, and communicated through ICT instruments—web sites, email, CD-ROMs—does indeed create an organizational presence and image. For most users, the online entity perceived is the only face of the entity they will ever get to know, and the "real" and the "virtual" must match.

ICTs are crucial instruments that can express what the organization is about and strives to achieve, or they can entirely miss the chance. Three ways in which ICTs can contribute to enhancing an organization's *raison d'être* were derived from the CEPAR experience: the web site, e-services, and e-networking. Ideally each of them nurtures the other two.

1. Web site as a Communication Challenge

One of the most significant outcomes of the intervention occurred in the process of developing the web site. The development of the web site involved a careful, step-by-step exercise that had most of CEPAR's staff working side-by-side with INCRE professionals. First, input for the design, focus, and content of the site was generated via in-depth consultations with all CEPAR content providers, regardless of their roles as trainers, communicators, or population researchers.

Subsequently, the technical staff from CEPAR labored to get the web site up and running. CEPAR staff had no previous web site experience and found constructing a web site involved many content and architecture decisions. The web site (www.cepar.org.ec) is operational and has been redesigned twice. As with all web sites, it needs regular updates and revisions including links to other web sites.

As a web site evolves, the skills the staff develops and their ability to share those skills with others are very important. These are not just technical skills—but communication skills in conveying exactly what the organization stands for and does. Web site development, updating, and growth need to advance in parallel with the entity's own growth. It is important to continue to invest in staff development for ICT competencies.

To enhance their identity, social value, and strategic repositioning, ICT-endowed NGOs such as CEPAR need their web sites to evolve. Typically, these tend to start as mere online mechanical replications of the real organization, but they easily can grow into much more. A well-developed web site can help the organization evolve into an enhanced, value-added online entity and resource center, and, perhaps, into an access and training source for similar-minded organizations that lack ICTs.

The most strategically relevant lesson, however, is to treat the web site as a communication challenge. A web site is the main message the institution can convey, worldwide, and it is worthwhile employing one of the growing number of tools that can be adapted to analyze, design, build, and test a web site for its communicative potential.

Marketing ICTs as a Communication Challenge.

Understandably, information technology people are less attuned to communication theory. A paraphrase from one staff member explained that, "I am much happier and comfortable talking about switches and routers with this expert you sent us than attempting to understand what a web site has to do with communication. We have a communication person here." But the organization had a strong tradition in information, education, and communication activities, events and products, and seeing ICTs as a new communication challenge beyond wires was important.

Communication issues discussed with CEPAR included

- Who are—or should be—the prime target audiences for the web site? What will compel them to come in, enjoy the experience, tell others, and then come back regularly?
- What exactly will the audience take away from the web site? What messages, impressions, and signals about the organization are conveyed? Are they good or bad? Are they accurate?
- More practically, if you were a potential user of the web site's resources, what is there that helps you, your work, and/or the people and NGO you work with? What can you find in there that is not otherwise available, or is more conveniently available, e.g., free, or in Spanish, or immediately?
- Who are the key users and stakeholders you must invite to the web site party; i.e., those who really must get the CEPAR message? Then, how do you guarantee that they do?

One key lesson was that putting a message online is not enough. A web site cannot just "be there"to say a result is achieved. It needs to affect users somehow—they like it or not, they get information, they interact, find a useful tidbit or a wonderful piece of advice, and then they move elsewhere through a good link. Subsequently, the results of the visit may impact another activity or person. An online presence is the beginning, not the end of the journey.

What is put on the web site matters, but it also matters that people come to the site and use it. Aggressive promotion of the site is needed. In the case of CEPAR, the promotion was performed through the NGO's real life partners and friends. As part of a social marketing strategy, CEPAR's two events were held to introduce the web site, its other e-products, and the capabilities of the NGO. Marketing stresses the importance of carefully identifying desired audiences and consumers and delivering effective messages to the right buyers and users. While this is not an "ICT matter" per se, it is a valid concern for web sites, and the project encouraged CEPAR to scrutinize its mailing lists, events participants, and so on, and then target information that would interest them.

2. Adding Value Through Easily Achievable e-Products and e-Services

While CEPAR's "Correo" quarterly magazine is now published online, the print publication was discontinued because its distribution was financially unsustainable. Not only did the staff produce the online magazine on their own, but they also produced, with no further help, the first-ever CD-ROM in CEPAR's 20-year history. CEPAR also advised other, smaller NGOs on ICT uses.

Some of CEPAR's activities, such as demographic and health research analyses and results, are now available online or on CD-ROM. Until recently, regular emails of CEPAR's bulletins and special alerts reached a growing, but still restricted, list of subscribers worldwide. But NGOs like CEPAR urgently need to increase the quantity and quality of electronic products and move toward more sophisticated offerings, such as discussion lists, online events, and even some manageable distance training opportunities.

A lesson here is that expanding e-services and products can begin with simple, low-cost strategies and activities. The first CD-ROM, for instance, took advantage of already completed work, and the value of the product and the experience were enormous. Recovery of CD-ROM costs was possible because the development costs already had been covered.

Producing information is one thing; marketing it to relevant users is another. In this case, as USAID suggested, cooperating agencies and public and private entities were a potential market for this CD-ROM, considering the amount of quality information and analysis they packed in.

Many NGOs such as CEPAR already have vast, archival research resources, publications, or educational or development materials that can be made available online or in electronic formats. Of course, considerable work is required to digitize the rich collections of materials that organizations have produced.

Additionally, many NGOs have resources in languages other then English, as was the case for CEPAR. In some cases, too, the resources may be from the perspective of the local cultural milieus, contexts and populations, a comparative advantage sometimes lacking in the work of international or Northern NGOs. Smaller, more resource-deprived local NGOs may partner with a more resource-favored entity to digitize existing materials.

Indeed, an NGO already possessing ICT capabilities can help smaller NGOs and community-based organizations (CBOs) develop in this area. In the case of CEPAR, the project proposed that the organization serve as "an incubator of electronic products and services," which could be achieved in three concurrent ways

1. by "adopting" NGOs and CBOs within its own web site, which could evolve into a portal. Such entities could be smaller, with fewer resources ,or simply some that were not yet prepared to want an independent online presence but could benefit from being visible on the Internet.

2. by providing preparatory and ancillary services and product development to similar entities, including training, tutoring, and production and co-production of e-materials.

3. by incubating and growing e-networks themselves. This was a particularly strong possibility for CEPAR, given its pre-established capabilities in creating, leading, or supporting real-life networks.

The lesson for similar NGOs is that organizations having competencies in both social development and in uses of ICTs for development, as well as skills in producing ICT materials such as web sites, CD-ROMs, and distance learning modules, have a competitive edge. Applying ICTs to education or development matters involves more than technology.

In the suggestions LearnLink made to CEPAR, two concurrent action lines were indicated for increasing range, quality, and reach of e-services and products: The first was to expand the supply of e-services or offerings, and the second was to expand core users and captivate audiences. To have a sustained, useful, and relevant presence and influence, NGOs going online should embark on a deliberate effort to conquer the right audiences and retain the core, strategic users.

3. A Network Is Not a Link — Real Networks Need e-Networks

By the end of the project, other NGOs—mainly smaller groups with which CEPAR had a prior relationship, such as the provincial Health Network—had begun to benefit from CEPAR's expertise in web site design, CD-ROM production, and e-communication. It was hoped that a far more expanded effort would ensue after the organization's final promotional outreach.

Unfortunately, while Ecuador seemed at a standstill due to its economic and political crises, there was a hiatus in organizational networking among institutions. Lack of adequate connectivity conditions was a very real impediment to being online, as was the cost of equipment and connection fees. Perhaps, it was thought, such an investment should wait for better times, especially since others locally were not getting connected, either.

As if those material impediments were not enough, some CEPAR staff at first understood networking to mean linking, that is, having a web site hyperlink to another entity. But a development network is not just a collection of links

CEPAR had a tradition of facilitating key real-life networks. In Latin America, at least, the notion of networking has been around for decades and had nothing to do with the current notion of "e-networking." Built on existing relationships—with pre-digital understandings—these real-life networks included existing relationships with groups that shared values, interests, causes, or action fields, even though the groups or individuals only met or communicated irregularly through conventional person-to-person means. Translating these pre-existing networks into the digital realm has been more of a challenge than was originally imagined.

Online Visibility

For NGOs that use and depend on person-to-person communication networks, more adequate and effective results can occur by aggressively expanding electronic networks topically, geographically, or socio-culturally. This can be done modularly, with a modicum of technology expertise to manage the obvious ICT requirements. But members must commit to providing the substantive contents that are exchanged and discussed among network partners. With adequate motivation and training, these leader NGOs also can bring other reluctant and technologically hesitant partners into the ICT realm of networking.

Although in e-networking, all postings are theoretically available to anyone, anytime, anywhere, the strategy suggested for CEPAR involved a

progression from the known outwards. Thus, the following realms—each with distinct core partners and key intended users and topics of relevance—were suggested:

- Local, tangible, real networks; real people; and NGOs: The NGOs know them, have met the people, visited their workplaces, and joined them at events. E-networks can take advantage of that familiarity by building upon that trust and on common needs and interests, for example by offering online seminars or follow-up training. Then other entities can be approached, such as local public sector agencies, donors, private sector groups, and other NGOs. These groups may not be online, or, if they are, may not belong to the network. Simply informing some entities regularly that the NGO is there, doing something, is the beginning, though sharing insights, contributions, and reports is even better.
- National level networks: Even if it were not to lead, the NGO should join existing e-networks of relevance created and run by others, which enables staying abreast of what is happening that concerns the NGO and its environment.
- Regional or sub-regional: In CEPAR's case, this meant getting into the Andean region, Latin America and the Caribbean, and Spanish- and Portuguese-speaking areas or entities. In these cases, there were comparative advantages for networking due to culture, language, or shared problems. To an extent, the foundations for selectively joining e-networks were derived from prior person-to-person and organizational knowledge and trust built through pre-existing, "real-life" networks.
- The world, but focused and one part at a time. Many NGOs play an intermediary role between local partners and the populations they serve, on the one hand, and cooperating agencies and development aid organizations on the other. Such NGOs cannot be absent from the important international networks. They can and should be selective and focused, but they must not be out of those circuits. The advantages of belonging are many. The added contribution the NGO can provide is to serve as a legitimate mediator and to express both its own views as well as the views of those who do not have a means to voice them.

NGOs and other civil society groups and community-based organizations coming into the e-networked world face a challenge when deciding to use ICTs. A natural option may be a minimalist one: use them to improve some internal processes, have a symbolic postcard presence on the Internet, email occasionally, surf once in a while, and leave it all to the information technology staff (many times, just one technician).

There is a better option, parts of which have been outlined here already, but it requires strategic commitments and hard work, most of it offline, in the real world, before and after it is made valuable online.

Given today's globally networked contexts, organizations that do not embrace ICTs—as much as their means allow for—may risk becoming obsolete, marginal, and irrelevant. Those that find a way to wield ICTs as the powerful tools they are, integrating them into major and minor tasks and using them for outreach through online messages, products and services, benefit from being present.

Development organizations today are not just increasingly online. They are conquering those new spaces for enhanced visibility, better outreach, and concerted actions. Social development organizations populate the Internet, though not all are developing, prospering, and growing equally.

While people in developing countries, such as those served by NGOs, will still lack adequate access to ICTs, mediating organizations increasingly have it. Thus, they can use vast numbers of relevant electronic resources to enhance the quality and effectiveness of their conventional, real-world reach and services.

Moreover, NGOs that do not partner with or have a mediating role regarding international development aid are invisible, unfortunately, to donors if they do not have an Internet presence, particularly since another NGO certainly will be found online.

Thus, an inadvertent or deliberate absence from Internet and development-relevant electronic networks, forums, and even plain-vanilla hyperlinks can be problematic. At worst, it can deprive otherwise leading and competent NGOs from having a substantive role in the international development conversations, exchanges and cooperation. For this reason, development aid is—and will continue to be—concerned about supporting organizational capacity-building and effectiveness with ICTs.

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Footnotes

[1] The CEPAR activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

Case Study

Jamaica

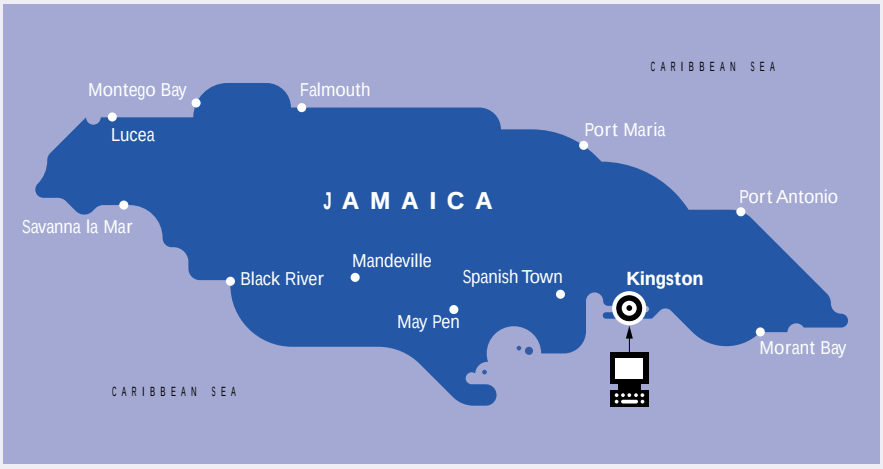
Jamaica: Two Views of Organizational Change

Mary Fontaine and Rosemary Peternel
Mary Fontaine was the Director of Synthesis and Dissemination for LearnLink. Rosemary Peternel was senior writer and editor for the LearnLink project.

Over a four-year period, LearnLink[1] worked with two Jamaican institutions—the National Family Planning Board and the Ministry of Health—to help strengthen organizational, operational, and technical efficiencies through the application of information and communication technologies (ICTs). Together, the experiences yielded valuable insights into different yet related aspects of using ICTs for institutional strengthening purpose.

The first concerns organizational culture and communication patterns—that is, how co-workers relate, manage daily tasks, and handle information flows. In ICT parlance, this is sometimes called the "soft" component of a project, which some maintain is the most difficult challenge facing initiatives employing or applying ICTs. Others focus more on the hardware dimension of such activities, where selecting appropriate equipment and networking systems pose significant technical and infrastructural challenges of their own.

The two stories presented here illustrate lessons from both the "soft" and the "hard" components of ICT-based initiatives. As LearnLink's experiences in Jamaica illustrate, both require specific knowledge of the "who, what, where, when, why, and how" of the organization's or institution's business.


CARIBBEAN SEA
Montego Bay
Falmouth
Lucea
Port Maria
JAMAICA
Port Antonio
Savanna la Mar
Mandeville
Black River
Spanish Town
Kingston
May Pen
Morant Bay
CARIBBEAN SEA

Computerization and Culture: The National Family Planning Board

The National Family Planning Board (NFPB) was created in 1970 as the principal agency of the Government of Jamaica to design, promote, and implement family planning and population awareness programs throughout the country. Its mission was to help achieve the development and demographic goals of Jamaica by

- ensuring the maintenance of a reduced population growth rate;
- promoting family planning;
- coordinating and implementing services that contribute to everyone's reproductive health;
- ensuring ready availability of contraceptives and information about family planning;
- providing training and support to other family planning organizations; and
- operating a nationwide family life education program.

One of NFPB's most important responsibilities was to supply a network of 350 government, private, and NGO family planning clinics with contraceptives and education and social marketing materials.

Professional staff worked in areas involving sophisticated data analysis, research, communication materials production, resource center management, inventory, and forecasting and distributing contraceptive products to public, private, and NGO family planning clinics nationwide. Other crucial systems included internal accounting, personnel management, and communication flows between the headquarters and regional and parochial offices.

NFPB's headquarters is in Kingston, with four regional offices, nine parochial offices, three family planning clinics in 12 remote locations, and a total staff of 88 throughout Jamaica. Yet the entire NFPB had only six non-networked computers for its critical tasks: one for statistics data entry, two for accounting, two for all word processing work, and one for a contraceptives warehouse.

In short, the NFPB's need for data management and communication networking far outweighed its capacity.

Meeting Information and Communication Needs

USAID/Jamaica asked the Academy for Educational Development's (AED) LearnLink project to help the NFPB establish a computer and communications network throughout the organization. The overall goal of the activity was to help the NFPB increase its capacity to carry out its work and positively impact Jamaican society with family planning activities. More specifically, the project intended to improve administrative efficiency, management capacity, internal communication, and professional development opportunities for staff.

Over a period of a year, LearnLink implemented the computerization intervention, providing technical assistance in three stages to achieve the following:

1. assessing the NFPB's hardware and software requirements;
2. procuring and installing computer hardware, software, and peripherals in the NFPB's headquarters and regional and parochial offices; and
3. training NFPB staff in the use of computers, Internet resources, and the reorganization of tasks and workflow resulting from the use of technology.

Assessment

At the outset of the activity, LearnLink staff traveled to Jamaica to conduct a thorough assessment, which included interviewing NFPB and USAID/Jamaica staff, reviewing the NFPB's organizational structure and workflow patterns, and determining the organization's amenability to computerization. The assessment concluded that the organization was heavily information dependent and could greatly benefit from computerization. While none of the NFPB staff had sufficient technical skills to manage a network, many staff members already had some computer experience, and the staff was generally positive about adapting to a computer network.

LearnLink found the physical environment of the Kingston headquarters offices to be capable of supporting a network, and while technical and financial issues constrained the inclusion of all field staff, limited integration was feasible. Lastly and importantly, local staff could decide—at least provisionally—most issues relating to the design and implementation of the computer network without a sophisticated knowledge of the technologies.

The first step involved designing a local area network (LAN) for the NFPB's main office in

Kingston, with remote dial-up connections for the contraceptives warehouse and each of the four regional offices. LearnLink and NFPB staff chose an independent Internet service provider (ISP) based on the dependability of its satellite services and its ability to provide inexpensive Internet access to the field offices. The design also included upgrading the headquarters' telephone system by installing a dedicated phone line for email and Internet access.

Organizational Culture and Communication

One of the greatest challenges to the success of the computerization initiative was the transition from the status quo to a whole new way of thinking and operating. Initially, some staff members found that the new systems made the jobs more complicated and returned to doing simple tasks the old way rather than taking the time to learn the software. Most, however, had the patience to familiarize themselves with the new systems and eventually reached a level of comfort that made them wonder how they had ever lived without computers.

> *…people have a lot of fear of computers. You are not just changing the structure of their work; you are changing their lives. Staff members would tell me that they were afraid of…[being] replaced by a machine.*[2]

Experience shows that it is relatively easy to physically link computers together to form a simple office network and train staff to use the technology. However, it can be extremely difficult to realize the full collaboration and communication benefits of a computer network. Office computer networks must function within a particular organizational and cultural context, which, if structured hierarchically, may work against democratic communication and the free flow of information. Moreover, while the system may resist the more open sharing of information that computerization facilitates, some individuals also may feel ambivalent, perhaps fearing that the computers may render their skills redundant or put their jobs at risk.

Such was the case at NFPB.

It is important to note that computer applications are only tools or means for achieving more important ends. The technologies alone cannot achieve desired outcomes. To provide durable and fundamental benefits, the new technologies must be coupled with changes in the values, attitudes, behaviors, skills, and knowledge that comprise organizational structure and culture.

Patterns, methods, and behavior

Imperative in the adoption of computer systems is an examination of workflow patterns and traditional methodologies for getting things done. During the networking process, NFPB staff were asked to analyze virtually everything they did to see how computers would be able to streamline—or even eliminate—certain processes. Staff also examined their typical work behaviors and tried to find ways to adapt them to the new technologies. As a result of the exercise, LearnLink discovered that people tend to retain certain behaviors because they are tried, tested, and comfortable. Then, as computers are introduced into a non-computerized environment, users will simply overlay old behavior patterns onto the new machines. Until people adopt new patterns that incorporate computers into the paradigm, however, the benefits of computerization cannot be fully realized.

Communication Democracy

One of the most important benefits of an office computer network is its ability to provide staff with new and easy ways of communicating and collaborating with each other. Email can create a democratic communication system wherein everyone on the network is equally accessible to others in an office. A network also can enable users to increase their frequency of communication. Over time, experience shows that the quality of communication, both electronic and face-to-face, improves with the introduction of email.

To facilitate the staff's adoption of organizational changes, LearnLink formalized them into "lessons" whenever possible. This proved to be a challenge because the technology was new and the organizational climate of using a network was initially beyond a majority of the staff's frame of reference. Saving files on shared drives, for example, or using email to facilitate communication and coordinate appointments were entirely unknown procedures.

Consequently, LearnLink instructors integrated organizational issues into the application training sessions. For example, instructors placed a great deal of emphasis on class demonstrations, where exercises were saved on the common drive, and participants were required to navigate the drive for each lesson. So that students were required to familiarize themselves with electronic means of acquiring

information, instructors distributed class schedules and communications by email. Throughout the training period, all individuals were equally responsible for centralized equipment — for example, everyone was required to load the paper bins on the printers when necessary, regardless of who used the paper. All users across the organization as a whole shared resources and accountability for these types of tasks, which were not attached to a particular department or individual.

Training

Several weeks before the training, LearnLink staff distributed a pre-registration survey to NFPB staff. According to the responses, a majority of the staff had little or no experience with computers. Therefore, the LearnLink team and instructors designed the training plan to provide all students with basic, comprehensive skills in several software applications, including Microsoft Office (Word, Excel, Outlook, PowerPoint, and Access), Windows, and Netscape Navigator. The team also planned to offer brief introductory courses for SPSS, MS Project, PageMaker, and PhotoShop.

Based on the computer experience and knowledge that staff described in their pre-registration surveys, different levels of training sessions were required. NFPB staff were divided into 10 groups of four to six students, and each staff member received two hours of training per day. Of special note was the participants' enthusiastic attitude. While many were somewhat anxious about their lack of knowledge and expressed some initial fears, they were willing and eager to attend the classes despite their concerns and busy schedules.

Sustainability and Ownership

All computer networks require maintenance. One of LearnLink's challenges was to design a network system that would not burden the NFPB with unanticipated costs. Therefore, LearnLink chose every piece of equipment with the intention of ensuring the network system's long-term viability. At the same time, cost constraints are a reality, so every effort was made to achieve a balance between the pressure to buy affordable equipment while maintaining high quality standards.

Tied into the concept of financial sustainability is the importance of ownership. When individuals share equal responsibility for a system, in this case a computer network system, they share accountability and ownership. Thus, they ensure its continued evolution and sustainability.

Though LearnLink made every effort to anticipate the actions needed to ensure NFPB ownership for the new system, some issues were not stressed strongly enough. Initially, for example, the organization did not understand how critical it was that the person filling the network administrator position be experienced enough to deal with the daily networking issues that arise. Giving the network administrator full responsibility for the network, as well as access to the resources required to support it, is essential for sustaining the system.

Of greater concern is keeping the staff motivated to continue using their computer skills and equipment. One approach might be for the organization to assign a particular staff member to manage changes as the NFPB continues to computerize its tasks. Another is to slightly modify several of the job descriptions to include the necessary computer skills required in a particular position. These types of actions help ensure that the

“...people have a lot of fear of computers. You are not just changing the structure of their work; you are changing their lives. Staff members would tell me that they were afraid of...[being] replaced by a machine.”

Glenn Strachan,
AED Vice President of Information Technologies, 2000

computer skills are not lost if an employee leaves the organization. The new employee would have the requisite skills or be expected to learn them.

In addition, the support and enthusiasm of NFPB senior staff was crucial to the success of this initiative. The Director of NFPB was behind the networking initiative since its inception. Not only was she involved in all phases of NFPB's development, but her staff agreed that she was the “glue that keeps everything together.” Similarly, NFPB's Medical Director was a strong and effective administrator who understood the need for family planning in Jamaica. Particularly interested in the potential of SPSS software for research, she used it extensively for sociological data analysis.

From the Individual to the Group

The NFPB staff's lack of experience with computerization as a group initially made it difficult for them to understand the consequences of using computers for the NFPB as a whole. Discussions about networking, sharing files and directories, and maintaining organization-wide appointments were distant to their frame of reference and overshadowed by their ambition to learn the computer skills at the individual level.

However, evidence indicates that the environment changed in incremental steps. Over time, individuals raised questions about issues that affected the entire group. For example, having the printer as a central unit for the entire organization prompted discussions about several points needing attention. Should paper become a central resource, or should senior managers devise another method of submitting paper from each department budget? Who is responsible for filling the printer's paper tray? How should NFPB manage paper waste — by individuals, departments, and the organization as a whole? By addressing these questions, plus other practical and organizational issues, staff helped streamline the operations of the entire organization.

Results

Short-term results of this computerization initiative were promising. The new system showed definite signs of improving the flow of information for the organization and helping the staff perform their individual tasks and implement the organization's family planning programs. Employees were able to explore resources on family planning and reproductive health on the Internet, and they could communicate with other professionals in the field quickly and inexpensively via email. Staff also were able to disseminate information to each other and the public through professional reports, presentations, and publications. As far as internal operations were concerned, administrative and financial staff were able to manage resources more efficiently using various software applications.

These changes have had a positive impact at both the individual and organizational levels. Computerizing some repetitive tasks left staff more time to pursue other activities such as research, project development, and program evaluation. As an organization, the NFPB began augmenting the breadth and quality of its projects and managing them productively through the use of the new network.

From the NFPB to the JMOH

While helping the National Family Planning Board establish a computer and communications network linking its four regional offices, LearnLink discovered deficiencies in the national health reporting system. To remedy the situation, LearnLink also assisted several

internal departments within the Jamaican Ministry of Health (JMOH) to organize and improve the already partially computerized Patient Information system (PAS) within a larger, integrated Health Management Information System (HMIS).

ICTs and Health Care: The Jamaican Ministry of Health

Health Reforms

Health care indices in Jamaica mirror those in larger, more developed countries. Although its economy is less developed, Jamaica has high literacy levels for a developing country and a structurally-sound health care system, founded on a British model and a manually-based process of health data collection. Many of its 2.5 million people believe that health care is very important, and they often hotly debate primary health care issues. During the late 1990s, pressure groups pushed for health sector reforms, and the health system changed. Now, the system is based on the tradition that health care is a public good and should be available free-of-charge to children, the elderly, and the poor. In fact, Jamaica created the National Insurance System to underwrite many health costs.

Although some people choose registered physicians with private practices and doctors at any of the 10 private hospitals, just under half of the population used public facilities, and the numbers were increasing. Within these MOH public facilities, a three tiered system operates consisting of two tertiary hospitals in Kingston ("A tier"), five secondary care hospitals ("B tier"), and ten, mostly rural, community health centers ("C tier")—the most poorly equipped and least used. "A tier" hospitals are the best equipped, followed by "B tier" hospitals. In addition, the MOH is responsible for six specialized hospitals.

In 1999, the MOH began implementing an audit system for determining quality of care. As part of that process, the country integrated information technology into reporting systems in a few major hospitals. By 2000, however, only segments of the health information system (HIS) had been adapted for computer data entry into a variety of databases. The health Patient Information System (PAS) linking hospital data was incompatible with detailed tabulations across all hospitals and very slow to yield useful national data for researchers, medical personnel, and health policy makers.

Recognizing the problem, the MOH recommended that "decisions be made to standardize and place central control and authority over the health information system while making quality data available in a timely fashion for those in need of it."

LearnLink's Role in Assessment

LearnLink first undertook an assessment of the information flow from the local level to aggregation at an intermediate level until final totals were obtained at the national level. In the assessment of each of the 12 systems, the investigator examined the methods of data collection, data flow, data collation and aggregation points, data entry and analysis, report generation, and use of the data.

Examining the strengths, weaknesses, and priorities, evaluators considered all 12 key health data systems pertaining to sentinel surveillance, environmental health, immunizations, primary and secondary care service delivery, work load, quality of care, coverage, and leading causes of admission and discharge at Jamaican public hospitals.

The more prominent deficiencies included a shortage of medical records staff, lack of appropriately trained medical records staff, extremely long lag time between data collection and report generation, and erroneous and missing data in monthly clinical summary reports. In addition, the assessment noted deficiencies in data quality, lack of common definitions, recurrent problems with the PAS, and even questions of data reliability. In particular, secondary care physicians lacked statistical skills and the ability to read and interpret data, while Regional Technical Directors needed training in decision making, managing their databases, and generating reports.

The assessment also revealed a lack of data on outpatient morbidity. Moreover, data records staff were unfamiliar with the International Classification of Disease (ICD) 10 coding scheme for recording mortality data. Staff morale was low and aggravated by the need to work overtime to restore or re-enter data.

A New Computer System

On the basis of the recommendations emanating from the assessment of the operating system,

AED/LearnLink and key departments within the Ministry of Health—Planning and Evaluation, Health Information, Epidemiology, and Systems and Information Technology—proceeded to shift priorities. They initiated a system-wide standard at major hospitals in "A and B tiers" and developed policy and procedural manuals that standardized definitions and practices for primary and secondary care databases.

After developing materials, instructors conducted face-to-face and computerized training for MOH staff as well as health medical records and technical data management staff across the island. Staff not only learned about the new HMIS procedures, but also, to manage that new information, and learned how to use Microsoft Access and Crystal Report Writer.

In addition, changes in the data flow necessitated a shift in the computer operating system from UNIX to LINUX at five major hospitals. This shift was essential for enabling queries within the large, multi-hospital medical database and creating a consistent infrastructure. Like interlocking pieces in a puzzle, each change was linked to other changes, such as the need to train medical records personnel within the Ministry, as well as hospital and regional data collection staff.

By facilitating the collection and flow of data and generating multiple options for aggregation of data, the new HMIS contributed to the timely collection of more useful data for researchers, medical practitioners, and medical accounting staff. After undergoing training, health data analysts could produce timely quarterly reports based on about 70-75% of the total patient population, a capacity that could reduce the 18-month time gap between patient data input and report output.

Eventually, planners expect that all medical institutions—even small clinics that serve about 25% of the total national patient population—should be following the standard reporting practices that the MOH initiated through this AED/LearnLink project.

"Above and beyond the call of duty"

Though this activity was technically complicated, the eagerness of the Jamaican health staff to learn new data management methods made it significantly easier. Now they have the capacity to perpetuate a uniform HMIS system at any level—thus providing a functional tool that is useful at the national, regional, and eventually local community level.

In addition, by training medical records staff and establishing quality control procedures, the project produced a model training curriculum for the MOH and improved data quality and report accuracy.

USAID/Jamaica recognized the success of this effort by awarding the AED/LearnLink project director for his "perseverance, flexibility, and creativity for going above and beyond the call of duty" and "for scaling walls" to strengthen the MOH's health information.

Footnotes

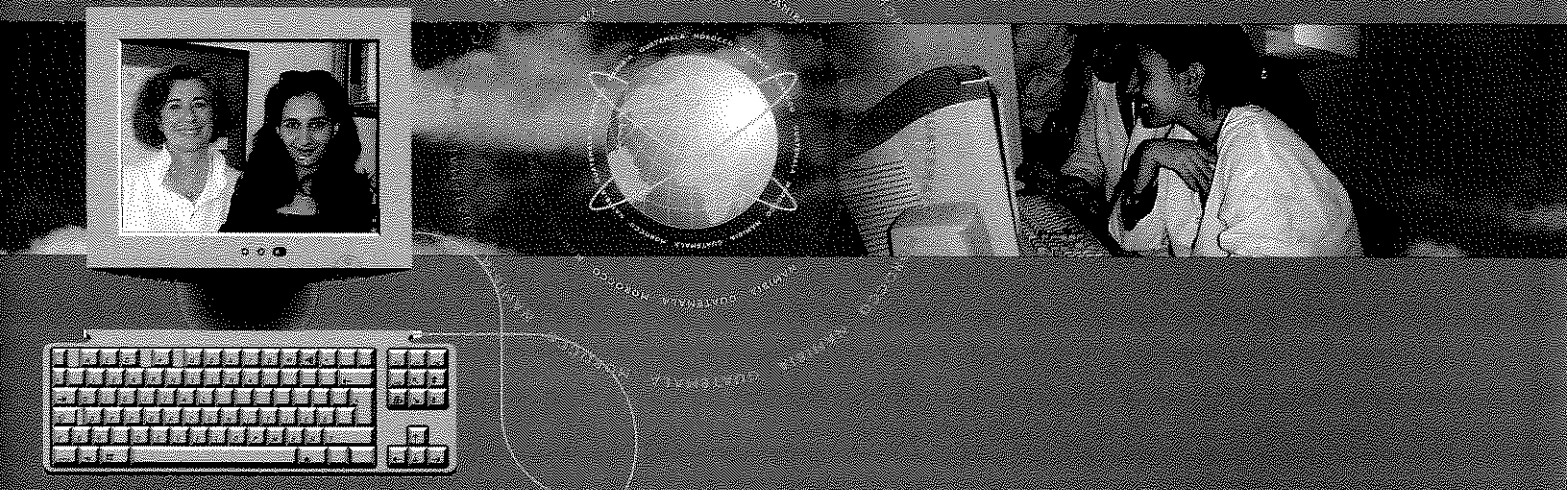
[1] The Jamaica activities are part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

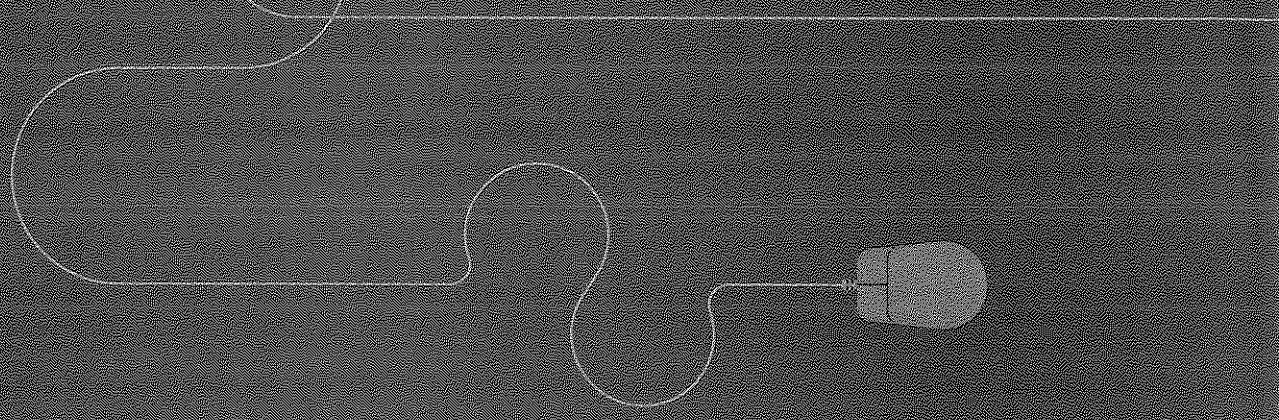
[2] Glenn Strachan, AED Vice President of Information Technologies, 2000.

Improving Opportunities for Educators

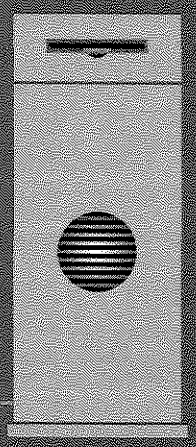
Computer-Mediated Professional Development

3





> **“Nothing has promised so much and has been so frustratingly wasteful as the thousands of workshops and conferences that led to no significant change in practice when teachers returned to their classrooms.”**
>
> Fullan 1991



3 Computer-Mediated Professional Development (CMPD)

Mary Fontaine
Mary Fontaine was the Director of Synthesis and Dissemination for LearnLink.

Introduction

While Fullan's observation may be too broad and bold a conclusion to apply universally, it contains far more than a kernel of truth for most countries. It also applies equally well to workers and offices as it does to teachers and classrooms.

Increasingly, more effective and efficient opportunities for professional development (PD) are needed to strengthen the skills of teachers and the labor force in every sector. Yet opportunities, especially in developing countries, remain limited and largely reliant upon traditional methods that have not produced desired results. Indeed, short and infrequent training programs, in which individuals gather at a central location for lectures from experts, can result in a net loss for human resource development budgets, costing more in travel and absence from work than they produce in improved practice on the job.

At the same time, new insights into learning are raising serious questions about the efficacy of the education and training approaches used in traditional professional development programs, and new challenges for national development are requiring skills that those approaches have not fostered or produced. Fortunately, new opportunities for improving professional development and teacher training—through the use of information and communication technologies (ICTs)—are becoming increasingly available and affordable.

This paper describes a promising, technology-assisted model-of-use for improving education and training in all sectors. Focusing on professional development for the labor force in developing countries, with special attention to educators,[1] the paper includes a summary of current challenges; an overview of the ways in which a technology-

> **Our Age of Anxiety is, in great part, the result of trying to do today's jobs with yesterday's tools.**

Marshall McLuhan

based approach can meet those challenges; examples of practical experience with this approach in technologically developed and developing countries; a summary of the lessons learned from these experiences; suggestions for assessment strategies; guidelines for monitoring and evaluation; and a discussion of the institutionalization process.

The premise is that, when applied to education and training, ICTs present opportunities for significant upgrading of knowledge and skills. Through computer-mediation, professional development programs can become not only more substantively effective but, in the long run, more economically affordable and financially feasible than conventional approaches.

Nations throughout the world are recognizing that "education is a cornerstone of economic and social development" (Lockheed and Verspoor 1991) and that their future prosperity is closely tied to the quality of learning opportunities they can provide their people. This paper posits that, through computer-mediation, ICTs help improve professional development opportunities for large numbers of people more quickly and, over time, at a lower cost than traditional delivery means. In this way, CMPD helps improve the quality of education and training on a scale heretofore unimaginable.

Such an improvement is critical for social and economic development in light of rapid changes in the world today—from globalization to the proliferation of advanced computer and communications technologies to the increasing importance of information and knowledge as a foundation for economic power and prosperity. While affecting all social systems, these changes have particularly profound implications for education and processes of learning. For people around the world, participating in the new global information economy requires that opportunities for innovative approaches to learning become available. Computer-mediated professional development is one such approach.

Challenges

Several new challenges to education and training stand out as particularly relevant to a discussion of professional development. Summarized below, they are followed by an explanation of how and why CMPD can meet them more effectively than conventional PD approaches.

Exponentially expanding knowledge

In the past, when knowledge was considered more or less finite in quantity, the traditional model of education in much of the world positioned teachers as disseminators of information and students as more or less passive receivers. The current information explosion makes it impossible for teachers or workers in almost any field to embrace more than a fraction of the body of knowledge in their discipline. Indeed, if they

entertain any hope of staying abreast of new developments, individuals in all sectors must become learners throughout their life (learning to know, active learners, cooperative learners, and lifelong learners). They will need to develop skills to access new information, construct new knowledge from it, and manage both. In this process, the most useful role for instructors will be to serve as facilitators of learning. Where knowledge has been passed from one generation to another through recitation and memorization, as in many developing countries, this challenge has profound implications for the way education is delivered. Relying on traditional educational devices and protocols alone, it is unlikely that such a revolution in the role of educators will occur.

Critical, analytical, and higher-order thinking skills

Instructors are increasingly charged with ensuring that learners develop the ability to solve problems, synthesize information, and think critically. In a sense, it is a return to the ancient past, the Socratic Method, which the Master himself described when he said, "I cannot teach anybody anything. I can only make them think." Phrased in early 21st century economic terms, rapid shifts in the global economy require workers to be able to solve problems creatively, anticipate trends, and respond effectively to dynamic changes—in short, to innovate. However it is expressed, education and training programs are challenged to help learners develop skills deemed essential for higher-order thinking, a phrase that has become an educational mantra in recent years. Few knowledgeable observers would argue that such skills are being acquired in developing country classrooms or workplaces today, and most would agree that without fundamental changes in the delivery of education and training, they are unlikely to be acquired in the near future.

Learner-centered approaches

Traditional teaching is rooted in the teacher-centered paradigm, in which learning is defined as a process of stimulus and response. Students are seen as passive, learning through a process of exposure to stimuli, delivery of appropriate responses, and receipt of reinforcement stimuli. In this scenario, the primary function of the teacher is to design a series of activities or "stimuli" that effectively reinforce student behaviors so that desired results (for example, answering a test question correctly) are repeated predictably. While this approach may prepare students to respond to examination questions, it does not necessarily equip them with the skills to apply knowledge to real-life situations. In the traditional learning scenario, students do not have to grasp conceptually why they react in a certain way. They do not have to process information, only store and retrieve it.

> **“If technology is used simply to automate traditional models of teaching and learning, it will have very little impact.”**

Chris Dede, 1995

In a learner-centered model of teaching, students engage in a process of exploration and critical reflection that tutors facilitate. The process helps ensure that students' understanding of concepts, strategies, and complex phenomena is developed or “constructed” rather than memorized or adopted. This paradigm is based on the belief that developing an understanding of “how” and “why” in addition to simply “what” and “when” prepares students to analyze, hypothesize, test, and construct solutions to real-world problems.

To date, most teacher training, adult education, and professional development programs generally do not use a learner-centered approach. The expertise to do so has not been developed, and the traditional tools of the trade do not support it.

Shortages of trained teachers

In many developing countries, the increase in population is racing past that of enrollment in teacher colleges, exacerbating already existing teacher shortages. If the efforts of universal education advocates are even partially successful, the number of teachers needed to accommodate the new students will have to double to maintain acceptable student-teacher ratios. Quickly churning out cadres of teachers for growing numbers of classrooms will not meet the real need, however, which is for skilled teachers inculcating thinking among students and able to meet the many new challenges facing them.

Countries throughout the developing world need to train large numbers of new teachers and upgrade the skills of the existing 60 million, many of whom are unqualified. In some sub-Saharan nations, student enrolments are outpacing the number of teachers available; and, worldwide, teachers are facing demands to educate for democracy, HIV/AIDS prevention, and for inclusive learning. These demands are far beyond the capacity of traditional teachers' colleges.[2]

Technology skills

Technology is penetrating work environments in all countries, and technical literacy increasingly will be required of workers everywhere to participate in the information-based economy. Yet most students, teachers, and workers have insufficient opportunities to use computers or acquire technical skills through the education and training programs to which they have access.

Together, these challenges, emerging trends, and increasing expectations have enormous implications for professional development, both in subject matter and pedagogy. Yet conventional approaches to teacher training and adult education are not addressing them well.

What is computer-mediated professional development, and how can it help?

Computer-mediated professional development (CMPD) can be described as training, course work, communication, and networking that takes place using a computer as the principal vehicle for the activities. CMPD differs from other forms of computer use for education, such as computer-aided instruction (CAI), computer-aided learning (CAL), and computer-based training (CBT), which, at their most basic level, are used to tutor students through programmed instruction and information. CMPD is a form of distance education or distance learning but goes beyond other computer-based forms of education.

> **“We don’t believe in information and communication technologies as such. We believe in the creative power of collaborative networks, combined with easy access to learning resources...”**

Berg and Vogelaar, 1997

In the traditional distance learning scenario, administrators deliver print-, audio- or video-based correspondence courses to remote or disbursed students who, in turn, digest and feed back the information with hopefully some synthesis or value added. In this correspondence approach, students’ “interaction” with the course administrator typically is limited to reading course materials, completing the required assignments, and returning them to the administrator for evaluation. In many cases, students may not receive much direct feedback on assignments beyond an overall grade for the course.

In CMPD, by contrast, there is opportunity for a high level of interaction among students, the instructor, and the computer-mediated material. Training is flexible because it can be conducted synchronously or asynchronously, and contact is dynamic and can be as variable as the trainee or trainer desires. Communication can take place through a variety of modes, such as email, listserv, chat rooms, bulletin boards, and desktop conferencing, all of which the computer facilitates. These methods also enable the development of ‘communities of practice’ in which professionals can communicate, cooperate, and collaborate.

CMPD often takes place where instructors and students are separated by physical distance, with technology used to bridge the gap. However, this is not always the case. Facilitators and participants may be scattered in homes, schools, or training centers throughout the world, or they may be together in the same room. For example, a master teacher may be in the room with in-service teachers who are using a computer application to explore new methodologies, create curriculum materials, or look for classroom teaching resources on the Internet.

CMPD requires a different approach from that taken with traditional distance education tools. When satellite teleconferencing was introduced, for instance, educators immediately saw that classrooms could be recreated virtually by broadcasting one teacher to many groups of students. Little deviation from the instructor-led model of classroom-based learning was required. Other examples of this same principle include the use of interactive radio instruction (IRI), instructional television, and audio and video cassettes for content delivery. In all of these models, media initially tended to play the role of instructor as information disseminator.

Introducing CMPD to the learning environment brings a very different set of capabilities to teachers and learners. While it still can be used as an information delivery tool, innovative uses of CMPD capitalize on its communication exchange capability. As a result, CMPD programs typically do not look like familiar instructor-led teacher-training courses. Indeed, it is desirable to move away from trying to recreate traditional classrooms with CMPD, which is better suited and more useful for collaboration and information-sharing rather than unidirectional information transmission.

A CMPD “course,” for example, may revolve around a series of readings and exercises that all participants are required to complete. It may be preceded and/or supplemented by face-to-face gatherings, where participants meet their fellow “students” and instructors. But the major portion of the process involves tutors and participants interacting with each other via computer-mediated communication channels. For this reason, CMPD can occur anywhere and anytime participants have access to an appropriately

equipped computer that will facilitate connecting to web sites, listservs, and other Internet-facilitated forums dedicated to professional development. The CMPD hallmark, however, is the opportunity for ongoing follow-up through communication, cooperation, and collaboration with course instructors and other colleagues, wherever they may be.

Benefits of CMPD

CMPD presents significant, potential advantages for professional development. Some of the key benefits are summarized below:

1. *Freedom to learn:* Effective CMPD programs are based on new adult learning theories that permit greater learner control over pace, content, sequence, depth of study, and schedule. This enables students to learn at their own pace and in a manner that is most comfortable for them, explore topics above and beyond those required, and prepare assignments, consult databases, and communicate with others when convenient and desirable. The mediation aspect of CMPD, as well as its use of the Internet, the World Wide Web, email, and other communication tools, enable participants to access information and knowledge and collaborate with colleagues. This adds a vital dimension to learning that is above and beyond that offered through computer-based training (CBT) and computer-assisted learning (CAL), in which individuals work independently with material provided via computer programs.

2. *Guides on the side:* In CMPD models, instructors take on a very different role, facilitating their students' learning but not dominating it from above. Experiencing student-centered learning firsthand, teachers receive a student's eye view of the approach, which helps prepare them to use the same process in their own classrooms.

3. *ICT skill acquisition:* Computer-mediated training allows participants to gain hands-on familiarity with the ICT tools that are increasingly essential for work in the modern information age. After such an experience, learners should be more comfortable using computers and more likely to incorporate computers and their by-products into their work when given the opportunity. Because participants acquire computer skills by using the technology in the course of their own professional development and not through a computer class per se, they are more likely to understand the application benefits of the technology.

4. *Individualized interactivity:* The communication and networking advantages of computers enable trainees to participate in real-time discussions with peers and instructors and to present their own ideas for consideration. This provides opportunities for regular feedback from instructors beyond the simple grading of assignments, as well as a chance to share ideas with others regardless of space and time (Osin 1998). CMPD offers interactive learning experiences that, in some ways, can exceed those offered by traditional classroom-based instruction, especially where classes are large. While the interaction may be virtual or a combination of virtual and personal, as when CMPD is combined with face-to-face meetings, the computer can facilitate more equitable interactivity for all participants than is sometimes the case in classroom situations. Communicating online can promote a democratizing, egalitarian, and less hierarchical form of interaction that offers everyone the opportunity for meaningful engagement. As one trainee noted, "This is staff development where everyone can raise their hands" (Bradley 1998). Of course, this change in communication culture or protocol does not occur automatically but requires thoughtful attention and preparation by planners.

5. *Networking online:* A related benefit of CMPD is the creation of online networks in which participants are able to share information, ideas, and experiences, collaborate on projects, exchange materials, or just chat with colleagues. Models of these "virtual communities," or "communities of practice," geared to individuals and groups sharing common interests, are springing up throughout the world, and many of them offer not only effective guidance and facilitation but opportunities for access to valuable information, knowledge, and expertise. For the most part, the extent to which such online networking adds value to practice has

not yet been measured, though the proliferation of email, computer-mediated conferencing, bulletin boards, and discussion groups worldwide suggests they provide more than just a novel experience for the participant.[3]

6. *Immediate application:* CMPD makes it possible to link participants' learning experiences directly and simultaneously with the work underway in their own offices or classrooms. After a session online, participants can apply the new techniques or use the new materials immediately, discussing the results with their instructor and fellow trainees while the experience is still fresh. This helps ensure that the instruction remains relevant to what participants are doing at any given time.

7. *Dissemination of almost anything:* CMPD also provides a means for trainees to disseminate their own work for peer review at any time and collaborate on projects with others regardless of their location.

8. *Beyond lectures:* CMPD supports simulation, role playing, and decision-making exercises for participants. If the computer is equipped with features enabling audio and video, participants also can view examples of effective and not-so-effective work practices.

9. *Beyond "dittos":*[4] For teachers, high-quality learning materials, teaching aids, and other resources can be disseminated widely and used as is or adapted for printing and using in the classroom.

10. *Updating of old material:* ICTs present teacher training institutes with an opportunity to update the form and content of traditional curriculum material. For example, old texts can be revised and digitized for inclusion on a web site, complete with resources, reference materials, and instructional aids that teachers everywhere can access. Unlike print texts, online curricula can be revised easily, as needed.

11. *Assessments of success:* By documenting protocols, course materials, and electronic discussions, facilitators can obtain quantitative and qualitative information needed for monitoring and evaluating CMPD efforts.

12. *Staying organized:* Due to the ease with which computers can manipulate information and data, CMPD facilitates better management and administration of instruction.

13. *Reaching anyone anywhere:* Anyone with a properly configured computer can access a CMPD program, which can reach large numbers of participants regardless of their location. For formal education in particular, this means that, for the first time, it is possible to provide ongoing professional development on the scale required to meet the growing demand for effective teachers.

14. *Reduced costs:* Over time, forecasters predict that carefully designed CMPD programs can reduce the high cost of classroom-based training with no loss—indeed, a likely gain—in learning outcomes. As one provider of teacher training materials observes, "This is the most exciting thing happening in education. We can double the amount of teacher professional development we offer for the same dollars nationwide by going on-line. We can offer special information and specialty materials that no school could possibly afford."[5]

Beyond these specific benefits, CMPD provides opportunities for meeting the formidable challenges presented earlier. Information can be accessed from libraries, research centers, and other reference and knowledge centers worldwide so learners have the opportunity to stay current in their fields. The freedom and flexibility to learn at one's own pace and through one's own initiative can foster independent thinking and promote innovation. The ability to communicate and collaborate with colleagues anywhere and anytime enables more creative problem solving. Technology skills are developed in the course of the training, not through "using computer" classes per se but through actual application—the surest way to learn. Assuming content delivered through CMPD programs is developed on the basis of sound learning theories (a critical assumption), the problem of pedagogy is addressed—students are

Uganda: Connect-ED

http://www.conected.ac.ug/pdle/Welcome/

anything but passive recipients of the wisdom of the ages. Even the problem of teacher shortages can be tackled.

To illustrate CMPD programs in action, the following section provides examples of activities underway around the world. While they focus on professional training for teachers, the illustrations are relevant to adult education, participant training, and professional development efforts in all fields. As teacher-training programs, they are designed to achieve goals important for education, though they easily could be designed with other goals in mind.

Examples of computer-mediated professional development projects

The projects described below are being implemented within specific contextual frameworks that influenced their design, development, and delivery. They are valuable as illustrations of some key benefits and requirements of CMPD generally, which will help inform the design of a model-of-use that incorporates best practices to date.

The examples fall into four main categories: 1) projects designed to stimulate pedagogical change and improve pedagogical practices; 2) those designed to enhance content or subject matter expertise; 3) activities designed to enable production of teaching aids and learning materials; and 4) efforts to promote professional networking and development of virtual educational communities. While these are distinct aspects of CMPD impact, the categories are not mutually exclusive. An effective CMPD program can achieve all four—and perhaps more.

CMPD to Stimulate Pedagogical Change

Throughout the world, teachers need new pedagogical knowledge. They need to develop new strategies for teaching their content, have access to a range of alternative teaching methodologies, and be able to gain new insights about the ways in which students learn.

One way for teachers to learn about new methods is through CMPD-facilitated mentoring and networking. In this approach, in-service and master teachers share and compare their experiences through email or via a computer-mediated discussion group. In-service teachers learn about new teaching methodologies, discuss teaching strategies and particular problems with each other and their mentor, and learn ways to adjust or adapt new pedagogy to their individual teaching situations. These exchanges can be supported by audio or video tape distribution through the school library or a more centralized media center and/or through occasional gatherings, meetings, and traditional classroom-based training.

Via the computer, master mentors provide feedback to in-service teachers on style and teaching methods according to individual teachers'

needs, customizing the advice to the classroom environment, time constraints, and the technological capabilities of the computer and the network available.

The Tapped In Project (http://www.tappedin.sri.com)[6]

[Teachers] have no time to work with or observe other teachers; they experience occasional hit-and-run workshops that are usually unconnected to their work and immediate problems of practice. [Effective professional development cannot] be adequately cultivated without the development of more substantial professional discourse and engagement in communities of practice.

Darling-Hammond and Ball 1997

The Teacher Professional Development Institute (Tapped In) is a year-round, worldwide, web-based professional development program supporting information exchange and offering informal person-to-person, group-to-group, and person-to group interactions as well as formal opportunities for learning through online courses. Based in the United States, the program describes itself as follows:

Tapped In is a shared teacher professional development (TPD) workplace patterned after a real-world conference center. Teachers with diverse interests, backgrounds and skills can share experiences, engage in mentoring and collaborative work, or simply meet their colleagues. TPD organizations can maintain their own agendas…while enabling their teachers to benefit from a range of expertise, ideas, and resources that no one organization could provide by itself. Membership is free for teachers, educators, and researchers.

Tapped In relies on a multi-user virtual environment (MUVE) that enables people anywhere to engage in real-time (synchronous) collaboration, send email, post to bulletin boards and listservs (asynchronously), and browse web sites collaboratively, all in a single on-line venue. Members can download free software and help guides and log in to Tapped In via a range of user interface options on Mac and PC computers.

Most of all, Tapped In is a professional community of K-12 providers, schools, teachers, and researchers committed to education reform. Although each organization has its own mission, all contribute to the sustenance and growth of the community by committing time and resources and by helping to underwrite the costs of teacher participation and Tapped In capabilities and services.

On any given day, Tapped In members can attend activities hosted by partner organizations, conduct their own activities, or expand their circle of colleagues by participating in real-time or bulletin-board discussion groups. Tapped In and our partners provide the tools, resources, and social support structures needed to supplement face-to-face events and sustain the kinds of interactions that are characteristic of successful collaborative work.

While online, teachers have a choice of activities in which to participate, including a variety of "After School Online sessions" such as "Tech in the Classroom," "K–3 Resources," the "Social Studies Forum," or the "Language Arts Forum."

In addition to the synchronous or "real-time" interactions, teachers can join email listservs and post messages on topic-specific, web-based bulletin boards. Tapped In also offers a specialized "Help Desk" that responds to individual questions from teachers, and it holds events such as "block parties," a summer carnival, lesson plan contests, and debates on hot topics designed to encourage participation. It also has established partnerships with several professional development organizations and indexed their course offerings so teachers can browse a broad selection of online courses and PD programs and follow up on those of interest.

To assist participants with technical difficulties related to computer hardware or software, the program offers online help in real time and "help guides" that can be downloaded and printed for ready reference, as well as tips for online etiquette and suggestions for maximizing the effectiveness of group meetings. Finally, Tapped In includes access to new research and papers on relevant or requested topics and publishes an online newsletter to which participants may contribute.

The Tapped In model enables individual teachers, single schools, or entire school districts to take advantage of its offerings. For example, a school district can choose a certain track of courses to require of all its primary school teachers and then create a virtual room for teachers to meet and discuss the courses. Tapped

In designers intentionally built in this flexibility to allow educators to carve out their own uses for the site to meet their individual needs. In large part, success depends on the individual initiative of teachers to improve their skills or the coordinated effort of schools or school districts to publicize the opportunity and facilitate or require teachers' participation. Regardless of school support, Tapped In was designed to facilitate professional development for teachers even in cases where policies or practice do not encourage it. As a leading technical advisor explained, "Although we cannot change school policies or find more time for professional development, we can help provide opportunities and mechanisms for teachers to overcome their isolation and make more effective use of the time they spend on their own professional growth." (Shank 1998)

Launched in 1995, the project now serves more than 15,500 educators from all over the world. Initially, Tapped In focused its work on community building and devising ways for that community to serve as a catalyst for engaging teachers in professional development opportunities online. As such, its work was at one end of a causal chain that would end, they hoped, with enhanced student achievement as a direct result of improved teacher performance. Tapped In staff are now assessing the effects of the community on teacher practices in the classroom , however, and wrestling with the difficulty of teasing apart the influence of the online activities from those in which teachers engage offline. Tapped In staff reports that teachers do not fear technology and are ready to work online given proper leadership and support (SRI 1999).

Sponsorship by a group of private and federally funded U.S. organizations means free access for educators.

Northern Territory University (NTU), Australia (http://www.ntu.edu.au)

Another CMPD program that stimulates pedagogical change is run by Australia's Northern Territory University (NTU). The teacher training program includes both on- and off-site components, with CMPD facilitating the latter. While at the training site, teachers participate in lectures, tutorials, and group exercises, and also familiarize themselves with using computers for communication by accessing databases of curriculum materials, for example. During this phase, students interact with each other and staff, thereby creating a social foundation for future online interactions.

The off-site phase follows via CMPD, using study guides, web-based resources, email, multimedia, and computers at regional centers.

The NTU teacher education program addresses several challenges unique to the Northern Territory in Australia as well as some overarching issues facing teachers generally. Geographically, the region is divided by vast distances separating the hundreds of communities sprinkled throughout the territory. In addition, 25 percent of the residents in the Northern Territory are aboriginal people, requiring the program to address the issue of language and cultural disparities among the participants.

Students take the eleven-week computer-mediated part of the course while living and working in their own communities, which causes minimal disruption to their professional and residential status. The self-paced design also permits individualized learning, enabling the course to accommodate learners at a variety of starting points and permitting students to progress in a manner and at a speed that is comfortable, effective, and convenient for them. In a highly diverse "classroom," where students come from a variety of educational backgrounds, cultural frames of reference, and with varying proficiencies in the language of instruction, this level of individualization is crucial for the success of all students.

The NTU program enables teachers to immediately implement in the classroom the theories and methodologies they learn through the CMPD program. Several studies of best practices in teacher education indicate that linking what is learned in a course with actual teaching in a classroom is essential for effective training. These studies suggest that situated learning, as the practical application of learning in the classroom is called, results in more profound and enduring skills comprehension and assimilation than simple text- or classroom-based learning (Lane 1999).

The NTU teacher education program yields four other important lessons as well:

- The brief block of traditional classroom-based learning establishes social networks among teachers.
- Teachers report that interaction and feedback are essential for them to feel they have engaged in a meaningful dialogue with the instructor.
- Especially in remote locations, teachers viewed the access to library and reference information as valuable.
- The teaching and learning philosophy of the program reflects a focus on the experience of the learner rather than the performance of the teacher. This learner-centered approach is modeled for participants who, in turn, should be better able to implement a similar approach in their own classrooms.

The SHOMA Project, South Africa (http://www.SHOMA.co.za)[8]

The SHOMA Foundation identified best practices from local and international experiences to design a course for South African educators using satellite television, multimedia, and the Internet. To promote the spread of outcomes-based education (OBE) in schools, the SHOMA approach uses multimedia materials delivered digitally via satellite in conjunction with training on using the Web and CD-ROM. In addition to technology-based material, the program uses on-site tutors and facilitators to guide the process and regularly scheduled cooperative learning sessions in which teachers apply, on the spot, what they have learned.

In the first part of the process, educators are introduced to OBE via satellite television. Teachers view short video clips and then, guided by questions posed on the screen, discuss the ideas presented. Staff from the national or provincial education department facilitate the process.

Educators then move to the Internet component. During this phase, teachers work individually to explore the concepts introduced on the video by visiting various education resource sites on the World Wide Web. The SHOMA Foundation digitized relevant aspects of the video to create an interactive multimedia CD-ROM to support the training, which teachers also use during this phase.

The final stage of the program is considered the most important part of the learning experience. In this phase, educators work collaboratively in groups of five or six to develop their lesson plans for the following week. This sharing of ideas and the immediate application of new knowledge in lesson planning—the translation of theory into practice—is the principal outcome sought by the project.

CMPD to enhance subject matter

Many teachers in developing countries have received only basic teacher training and lack a strong disciplinary background in the subjects they teach. The deficit is particularly acute in science and mathematics, areas in which more students need to excel if they are to gain access to the higher education necessary to meet their countries' professional manpower needs. As illustrated below, CMPD can serve as a valuable and ongoing subject matter resource for teachers.

The Math Forum: An Online Math Education Community Center (http://mathforum.org)

The goal of The Math Forum is "to build an online community of teachers, students, researchers, parents, educators, and citizens at all levels that have an interest in math and math education." The Math Forum works toward this goal by 1)encouraging communication throughout the mathematical community; 2) making math-related web resources more accessible; 3) providing high-quality math and math education content; and 4) offering model interactive projects.

The Math Forum offers a variety of online options for learning, exploring, discussing, and presenting math topics. For example, through the Mathematics Library, teachers can research topics ranging from arithmetic to algebra, geometry to calculus, and logic to number theory, numerical analysis, probability and statistics, and trigonometry. Descriptions of math applications also are available, including those used in business, telecommunications, computing, science, engineering—even sports. In addition, math questions can be answered through "Ask Dr. Math," in which expert mathematicians respond promptly to specific queries, all of which are archived online for reference.

Should teachers wish to consult with colleagues about specific topics, ongoing discussion groups enable teachers to participate in conversations and reach others with similar interests. The "Teacher2Teacher" service provides answers to questions about teaching, math education, and pedagogy. Also, the Math Forum features "Key Issues in Math," in which innovations in and concerns about math teaching are highlighted, as well as "The Teacher's Place," which offers the "best resources for teaching math at all levels." The Math Forum also provides lesson plans, projects for teaching math concepts, and links to other Web resources, all of which are screened by experts and peer reviewed.

Of special interest are a searchable listing of workshop announcements, a research division, a newsletter, science fair math projects, pages produced in Spanish, French, and German, and announcements about education and training programs.

In addition to educators, The Math Forum welcomes parents, students, and community members, hosting activities, forums, and events for each. Through the "Student Center," 18,500 students from 4,500 schools participated in the "Problems of the Week" award program, which presented creative problem-solving responses to non-routine challenges.

The Math Forum was one of five sites winning the 2002 Sci/Tech Web Award in the mathematics category and among the five Webby nominees for best education site of 1999. In addition, the Forum's Ask Dr. Math service received two awards for Exemplary "Ask-A Service" from the Virtual Reference Desk (VRD), one in 1998 and another in 1999.

The Math Forum is a free service hosted by Swarthmore College and supported by a grant from the National Science Foundation and private sector hardware and software contributions.

CMPD to Produce Learning Materials

A serious problem in poor schools is the lack of material support, including such items as curriculum guides for teachers and instructional aids for students. Through CMPD programs, access to such materials is greatly increased. Some programs are designed specifically to disseminate previously prepared learning materials that can be downloaded and printed or easily adapted to new classroom situations, while others provide the hardware and authoring software to create original materials. Examples of both are provided below.

The Miksike Learning Environment, Estonia (http://www.miksike.com)

The Miksike Learning Environment provides educators with teaching and learning materials in the form of some 20,000 worksheets in HTML format. Teachers can search for relevant worksheets and adapt these materials to their own classroom needs, free and without concern for copyrights.

Between 1994 and 2000, more than 100 teachers and education specialists created the worksheets in the Estonian language, with many translated as well into Russian (http://miksike.net), Swedish (http://eleverkstan.org), and English (http://miksike.com). According to web server user statistics, an exponential increase in visitors per day occurred between January 1999 and April 2000 (from 150 to 5,000).

The Miksike learning environment is more than just a large collection of freeware materials. With the help of educational and content experts who can be consulted online, Miksike is a collaborative learning environment, even offering schools opportunities to communicate internationally with counterparts in Australia, Sweden, Latvia, and the United States.

A private company, inspired by the threatened closure of small, rural schools in the country, established the project. Concluding that the traditional school model—four walls, a roof, and an expert teacher transferring knowledge to the students—was no longer sustainable, Miksike joined with the Estonian Ministry of Education in 1999 to launch the project. Initially, its aim was to support teachers in remote, rural schools by enabling them to access Internet services. After a year of pilot activity that yielded positive results, the project was expanded to all Estonian counties for the 2000-2001 school year.

In describing the project, an official explains that "Miksike is much more than just a huge collection of freeware materials. The essence of the Miksike Learning Environment is a set of virtual

teacher assistant ("Miksilitators") services, which are based on using these materials and make collaborative learning a reality." The official goes on to credit the project's success, in part, with an openness to change:

When we speak about technical development we often mean that we use larger and faster computers, faster Internet connections or upgraded systems. But technical development also includes changes in organization and in the education process itself. Organizational changes are usually slow. But regions that are considered less developed have a great advantage that is not the case in most Western countries. Young democracies like Estonia are often more open to changes. When old rules and systems break down, the society gets a possibility to jump into a new era, like the information age, when the western countries are stuck in their well organized systems that were developed for the needs of yesterday. The Estonian institutions that should supply the schools with educational material during 'the paper book era' never reached the level of proficiency of their colleagues in the West, so Estonia just skips this and take a giant step directly into the electronic age.[9]

The Miksike Learning Environment received The Stockholm Challenge Award for its innovative approach to improving education in Estonia. As the jury explained, "This project is the ideal Challenge contestant, focusing not only on technology, but on educational benefits through a supportive and incremental program. Its valuable approach combines a productive and active learning environment with simple tools that develop the content and resources first. The strong innovativeness, sustainability and transferability of MIKSIKE is demonstrated by its adoption in the US, Canada, Sweden and Ireland. In addition, its initial focus on rural schools and home education supports the overall objective of spreading the information society widely. The key for the success of online learning is educational vision first, then technology follows. This is precisely what MIKSIKE has done."[10]

Connect-ED, Uganda (www.itek.ac.ug)

An innovative model for creating computer mediated professional development learning materials is underway in Primary Teacher Colleges in Uganda through LearnLink's Connectivity for Educator Development (Connect-ED) activity. Connect-ED is being piloted in 8 of 45 Primary Teacher Colleges in Uganda, in cooperation with Kyambogo University and Uganda's Ministry of Education. Connect-ED is part of the U.S. Education for Development and Democracy Initiative (EDDI) funded by the U.S. Agency for International Development.

Connect-ED's team assessed the needs of teacher-trainers and pre- and in-service primary teachers and is developing electronic resource materials to supplement and enhance the text-based Primary Teacher College curriculum and audio-lingual classroom instruction. Connect-ED also works with local teacher counterparts and educators to train teachers to use technology as a tool for their own professional development, instruction, and learning and has installed educational technology learning centers at selected Primary Teacher Colleges (PTCs) throughout the country.

Through Connect-ED, Ugandan educators enhanced and digitized the official Uganda Primary Teaching Curriculum (www.itek.ac.ug). This multimedia curriculum covers six subject areas: Math, Language, Culture, Foundations of Education, Social Studies, Science and Health. The curriculum, not widely available to educators in print, is compiled on CD-ROM and available online. This project illustrates the ways that multimedia can provide for the adult learner's diverse needs and in a self-paced or instructor- led environment addresses a variety of learning styles while allowing for interaction to test ones' own knowledge. As an offshoot of the process, teachers have learned creative ICT and content development skills and developed a multimedia curriculum framework, digitized the text in six subject areas, and created multimedia materials.

In addition, a Digital Resource Library (a set of 6 subject-based CD-ROMs) offers pre-service teachers in Uganda a host of multimedia materials to support their studies. The virtual library is an interactive bookshelf with icons that offer the teachers maps, interactive games and quizzes, videotapes of Ugandan primary teaching best practices, and links to relevant references that

http://www.connected.ac.ug

http://www.itek.ac.ug

correspond directly with the national curriculum. The activities and photographs illustrate the subject matter and reinforce learning. One learner said, "I want to click on every single icon and see what is behind it."

One of the most significant aspects of Connect-ED is the Professional Development Learning Environment which educators use for training on how to use technology to improve their own teaching and learning. The Professional Development Learning Environment was created by Primary Educators. A few examples of areas of topics include: how to use Microsoft Word to write lesson plans; Excel spreadsheets for tracking students' attendance, PowerPoint to organize presentations which often end up on paper or an overhead projector. Still other areas include learning Inspiration to create visual aids and mapping diagrams; Project Based Learning; and Troubleshooting. This learning environment is accompanied by instructor led trainings and the learners are brought together in the Uganda Primary Educator chat room, and discussion board to collaborate synchronously and asynchronously.

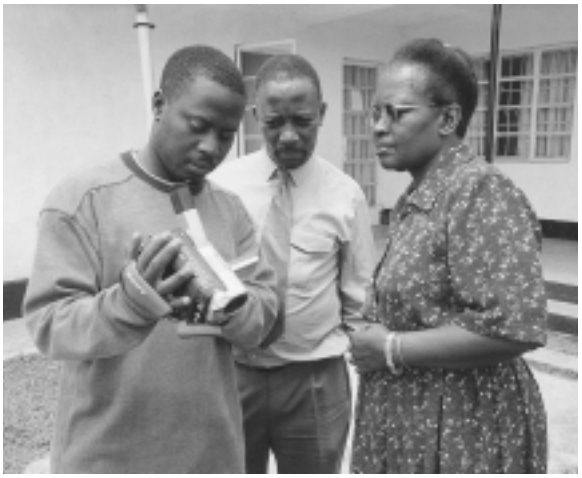
The official primary teaching curriculum, the digital library, and the professional development training materials are saved on a series of CD-ROMs that can be copied and shared and used on any computer regardless of connectivity—a critical feature in remote or rural areas removed from resources.

CMPD to promote networking and virtual communities

Perhaps the greatest advantage of CMPD for teachers is the opportunity for networking that online communication tools provide. Communicating and collaborating with counterparts at home or around the world to share information, ideas, insights, and resources can be a powerful source of inspiration and education for teachers, especially those in isolated or remote areas. Computer-mediated communication can be structured, through moderated discussion forums or listservs, or free flowing, through email and chat rooms. Unlike conventional groups of networks, electronic networking and the "virtual communities" that grow out of them are not limited by geography. In asynchronous communication, time is not a factor, either, because individuals can participate whenever it is convenient for them. The following examples illustrate CMPD activities designed to take advantage of the networking opportunities that ICTs provide.

The University of the West Indies Distance Teaching Experiment (UWIDITE)

The UWI is currently supported by 14 English-speaking Caribbean countries, stretching in an arc from Belize on the Central American mainland, across the Caribbean Sea to Jamaica and the Bahamas Islands—from the British Virgin Islands at the northern tip of the chain, to Barbados in the



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southeast, and on to Trinidad and Tobago just off the Venezuelan coast.

The countries are small, many of them are densely populated, and the total population of the region is only about 5.6 million. In the non-campus countries, the UWI maintains Extra Mural Centres, which are the focal points for liaison and feedback between the University, governments, and the communities at large.

The challenge to the University has been how best to serve the needs of the widely scattered countries with depressed economies. The UWI began experimenting with telecommunications in 1978 as one possible way of meeting the region's demands for education. The Caribbean Regional Communication Study (CARCOST), as it was called, was to determine whether and how interactive distance teaching and teleconferencing could contribute to education and public service in the Caribbean.

The CARCOST report recommended a pilot project to establish a telecommunications network, emphasizing that successful use of teleconferencing techniques for educational purposes in the Caribbean must depend heavily on the simultaneous development of other aspects of educational technology such as the use of print, audio-visual, and other media. An interactive rather than a broadcast system was favored because of the clearly expressed wish of potential participants, particularly in the more isolated populations, to communicate in real time.

The University of the West Indies Distance Teaching Experiment (UWIDITE) was the outcome. It links the three campuses in Barbados, Jamaica, and Trinidad and the Extra Mural Centers in Antigua, Dominica, Grenada, St. Kitts, St. Lucia, and St. Vincent, via a leased telecommunications network, which is used for interactive distance teaching and other types of teleconferencing. Eventually all the contributing countries will be included in the network.

UWIDITE has successfully mounted distance teaching programs for community aides, technicians, teachers, nurses, university undergraduates, and professionals of various disciplines including nurses and doctors. Some of the persons participating in the programs would not have received this training otherwise. The experiment has had its share of disappointments and frustrations, but it has been a very worthwhile experience. Those involved with UWIDITE can take pride in having introduced a very powerful technique to the education system of the Caribbean. It introduced well over 2000 persons to the power of modern telecommunications; provided a completely new training option for the Caribbean; transformed the quantity and quality of outreach, consultation, and services that the University and other regional institutions can provide; and improved many aspects of the University's administration, outreach, and operations. UWIDITE has already made an

enormous impact in the Caribbean. It won full acceptance and is the repository of many hopes. One measure of its public recognition is the 1989 Award for Science and Technology in Education, given by the Jamaican Society of Scientists and Technologists. Its 1984 Gleaner* Honour Award describes UWIDITE as "likely to have a most dramatic impact on the quality and improvement of life not only in Jamaica but the but the entire Caribbean, enhancing the education of the people of the region." [Quote from a private daily newspaper in Jamaica] [11]

The University of the West Indies Distance Teaching Experiment (UWIDITE) was established to meet the need for teacher education and in-service training in a region with few universities and where the majority of people are dispersed across the region. CMPD and other distance delivery methods permit practicing teachers throughout the region to take certification courses that update and extend their professional skills without having to leave their classrooms.

UWIDITE courses are designed to take best advantage of the technological infrastructure, ranging from self-paced print materials to a sophisticated computer-based delivery system at computer labs with multimedia and Internet capability. Print materials are sent to students before online interaction so the contact time on the network can be used for tutoring rather than lecturing. During a six-week in-service teacher certification course, undertaken at the school where the teacher is employed, a local tutor supervises and examines the teacher. Interaction takes place with lecturers through teleconferencing and via computer email as well as other online forums and with the local tutor. Through these built-in opportunities for dialogue and feedback, students and instructors together engage in ongoing evaluation and assessment of learning progress.

The combination of teacher training and in-class teaching results in optimum assimilation of the strategies and skills taught in professional development courses. Studies agree that effective teacher training promotes continuous inquiry and improvement when embedded in the daily life of schools. Not only do teachers benefit from the course itself, but they are able to implement what they learn immediately, returning to the instructor with questions or for follow-up as soon as the next day. In addition, teachers do not have to leave their communities, schools, or, in this case, their countries to participate, and their national governments do not have to foot the bill for expensive face-to-face teacher training and substitute teachers (or empty classrooms).

Use of CMPD for teacher professional development meets more than a need for convenient teacher support. In the countries served by the University of the West Indies (UWI), teachers have had very little access to master teachers in their training, peer teaching, or ongoing professional development. Although the demand for teachers is great, economic constraints enable only a limited number to be trained on a full-time basis at any time. To train teachers in a traditional classroom-based course across such a widely geographically distributed region would be impractical, requiring the majority of teachers to travel to participate. The costs of such an endeavor are astronomical, including travel reimbursements, lodging, and per diem for teachers and remuneration for course instructors. Even after such an investment, the impact of a three- or five-day seminar with little chance for follow-up may be negligible once teachers return to their classrooms without collegial support or contact with mentors.

Through the CMPD distance network, large numbers of teachers have access to high-quality, ongoing professional development. In addition, the program enables teachers in the English-speaking Caribbean to establish professional ties with their peers in neighboring countries, minimizing their sense of isolation from the professional teaching community and inadequate exposure to well-trained role models.

The designers of the UWIDITE program expected that the teleconferencing system would support a high level of interaction among students and between students and lecturers and that these interactions would constitute the primary learning opportunities in the CMPD-delivered courses. Therefore, interaction was facilitated through a variety of teaching activities, including dedicated time for group planning, grade-level and curriculum development meetings, and team teaching. Such interactions helped teachers with

planning, gaining access to resources, and building new relationships.

CMPD is fully integrated into the UWIDITE course design. Through listservs, email, web sites, and bulletin boards, student teachers can continually and collaboratively generate teaching ideas, address teaching problems from their daily lives in the classroom, and share their ideas about professional issues and developments in educational thought and practice.

Lessons learned from CMPD practice

Evaluations of CMPD programs are yielding useful insights for the design, implementation, evaluation, and sustainability of such programs in the future. Some of the most critical are summarized below, by topic, to inform the design of our CMPD model-of-use and ensure that it builds on previous experience, avoids recurring problems, and incorporates best practices to date. Drawing on evaluations of the CMPD examples cited above, the following section incorporates more generic lessons from other global experiences. While some of these lessons are specific to teachers, many are applicable to CMPD activities in general. Tips are provided for development and implementation of an effective CMPD activity, including resources, common constraints, obstacles, and pitfalls to overcome conditions and human capacity building issues that can facilitate or frustrate activities.

"Communication culture"

Merely creating a communications mechanism does not guarantee that instructors or trainees will use it. Efforts to introduce participants to the opportunities and potential benefits of networking, and to induce them to take advantage of it, likely will be needed.

Both instructors and participants in CMPD programs with sensitive introductions to online communication learn about the importance of interaction and the protocols and etiquette best suited to this means of communication. For example, traditional protocol often requires that students approach teachers—and teachers approach superiors—with deference. Communication is often one-way, with the experts bestowing their knowledge on students, who are silent note-takers. If communication with experts is to be valuable, both parties will need help in adjusting to new forms of communication without fear of reprisal.

A related concern is the equitable sharing of information — a feature missing usually in traditional communication. Indeed, the "knowledge is power" adage often applies to conventional forms of communication based on social, cultural, economic, and professional hierarchies. To maximize the effectiveness of CMPD, planners and participants should be given the opportunity to discuss the importance of widespread, democratic, and equitable sharing of information.

In the case of the UWIDITE program in the West Indies, for instance, an evaluation[12] revealed that "cultural constraints" prevented some participants "from communicating with instructors through such an informal medium." According to the evaluation, "While opportunities for interaction were readily available, data indicated that many teachers were not well prepared to participate interactively in class, thinking instead that they should listen quietly to lectures and presentations and take notes. Indeed, nearly one-third said they did not benefit from the high level of interaction that course designers intended for the UWIDITE computer-mediated components."

The evaluation went on to explain two aspects of communication culture that CMPD programs must address. These include that

1. *Students must be prepared to learn at a distance*. The classroom-based, instructor-led model of learning is familiar to every teacher. There is no need to explain protocol, define roles, or describe learning activities. Students in a classroom know that the teacher is the primary source of information, and that lectures and perhaps some group activities mediated by the instructor will comprise the core of the course. By contrast, CMPD is a completely new medium with which neither instructors nor students are familiar. Emerging research in the field indicates that the most effective CMPD courses are those that are preceded by a "mini-course" on how to learn using technology. Students should experience and practice interactions with computers "off the record" to get a feel for what

is different from and what is similar to their previous learning experiences. In the case of UWIDITE, the teachers should have been prepared to expect the high level of interaction that course developers relied on for optimal learning. Instead, student teachers at UWIDITE imposed their own familiar expectations on the mediated system, holding their questions until they met face-to-face with their tutors.

2. The needs, skills, and expectations of students should be assessed as part of designing a system that works for them, rather than forcing a system on them. The UWIDTE designers might have anticipated that teachers would automatically behave as "students," letting the course instructor lead them through the learning activities. A student assessment beforehand would have gathered information on attitudes about independent learning, group projects, and CMPD. Where CMPD resources are scarce or new, this assessment and thoughtful use of the resulting data are among the most critical steps in creating a successful teacher-training program. Program designers must address learners' expectations and "default" learning approaches if students are to benefit fully from the new approach. For example, if programmers make email the primary means of communication between teachers and instructors, they may need to require teachers to take a typing course and a brief training on communicating effectively through email first to use it efficiently as a communication channel….By identifying these kinds of issues ahead of time, designers can prepare for them when developing the CMPD course.

In short, when a high level of mediation and interaction is relied on to further learning in a CMPD program, students must be prepared for the interaction, tutors must be trained to facilitate it, and all must be made comfortable with the new "culture of communication" that such interaction requires.

Many CMPD experiments, especially in developing countries, have included a combination of personal and virtual gatherings. This is helpful for those unfamiliar with straight computer mediation because it establishes a connection between and among participants and instructors before relying on online communication to advance the training agenda.

Interactive, "Learner-centered" Facilitation Skills

Just as students must be prepared to "learn at a distance," CMPD requires new skills of instructors, facilitators, and moderators, who must be able to mediate interaction with resources, stimulate discussion among participants, organize group work, motivate learners to participate, and administer the new teaching and learning environment.[13] Because interaction is critical to the success of CMPD, appropriate feedback from instructors or experts is essential. Harsh, dismissive words, for example, can make or break a participant's will, while constructive, instructive guidance can stimulate enthusiasm for learning.

An independent evaluation of the SHOMA project in South Africa illustrates the importance of the facilitation role:

> *A key factor in the SHOMA pilot project was the role of the facilitators [who] demonstrated significantly different levels of competence…, and the teachers suffered when facilitators were ill prepared. Consequently, it is vital to develop a thorough training process to ensure that facilitators are well equipped to undertake their tasks and to minimize the risk of undermining the project's objectives by applying inappropriate facilitation styles and methods. Facilitator training should focus on all the aspects of facilitation…as well as on developing the technological competence of facilitators.*

Facilitators also need resource support to be effective. Such services could be print or web-based to help them develop and maintain proactive approaches to facilitation. It may be worthwhile to set up a support network for facilitators, who could communicate by email and participate in discussion groups. Experience and willingness to develop one's facilitation skills also should be an important selection criterion for facilitators. Finally, it is vital that an environmental scan of the potential site be undertaken to "match" facilitators to the needs of teachers in that context. Facilitators should be able to establish rapport with the teachers, an essential element in any form of effective education and training.

Similarly, the evaluation of the UWIDITE program in the West Indies stressed the

importance of training tutors and teaching staff for CMPD delivery:

Once…students have been prepared for mediated learning, the tutors and instructors must be trained so they are comfortable in the mediated environment and able to anticipate student concerns. UWIDITE students complained that tutors were not able to provide information relating to procedures for doing and submitting assignments, feedback on work submitted, or comments on general academic concerns. Subsequently, UWIDITE has run several training courses for tutors, whose role in facilitating computer-mediated learning cannot be underestimated. CMPD tutors must play the role of mentor and partner as teachers embark on a new approach to learning and, in turn, endeavor to apply their new skills in their own classrooms. This role can be pivotal in teachers' professional development.[14]

It should be noted that high turnover of staff at all levels within government structures and schools is a common characteristic of many developing countries. Experience suggests this is particularly true with technology activities, where individuals developing ICT skills are in demand in the higher paying private sector. Program design should include sufficient guarantees for continuity in light of this eventuality.

Multimedia Material Development

Merely digitizing print material is not sufficient for effective CMPD. Whether using web-based or CD-ROM resources, multimedia materials should be designed to maximize their interactive benefits. This holds true for video and audio supplements as well. Evaluations of CMPD programs such as the South African SHOMA activity clearly indicate that "the technologies must be tapped for their strengths."

The CD-ROMs should not be used as electronic textbooks in which teachers are simply "paging" mechanically through the text and uncritically taking notes on what they read. Instead, attention should be paid to exploring strategies for integrating meaningful interaction by teachers with the resources. This could be enhanced through inclusion of resources that teachers could actually use in their classrooms, either by noting the idea or printing a copy of the resource.[15]

While developing interactive multimedia materials is a specialized skill, curriculum developers can acquire it through relatively simple training and a large and growing number of excellent self-help resources, which should be included in a CMPD program design.

If participants are expected to use web sites or CD-ROMs, the materials must be user-friendly, with easy navigation and architecture, useful features, substantive content, prompt response mechanisms, interesting, intriguing, and inviting options, and regular updating. Competent technical support must be available as well to fix inevitable glitches quickly.

The navigability of the CD-ROM/web resources is paramount. It was apparent in the SHOMA experiment that teachers struggled to understand the navigation options within the CD-ROM/web resources. For example, the "Click here for further information" option was confusing and most often ignored by teachers, a problem exacerbated by the inappropriateness of using an exclamation mark as an icon. Use of the video clips also was greatly confused by the presence of two arrows, one of which did not activate the video. The need to scroll up and down through pages also unnecessarily complicated the process for teachers. These materials should have a simple layout and design that does not assume any level of expertise in the use of web-based resources. Use of a multimedia authoring package such as Toolbook may facilitate simpler design.[16]

Decisions regarding copyrighted material also should be made at the design stage. While acknowledging the importance of copyrights, some people often ignore such rules in their daily practice when using computers and the Internet. In cases where participants consciously followed copyright regulations, developing low-cost alternative materials sometimes presented rather significant obstacles to progress. The bottom line is that copyright rules must be respected, and CMPD planners must make allowances for this from the start.

An enabling technical environment for both humans and machines

The mystique of technology needs to be removed so participants feel comfortable manipulating machines. By preceding CMPD with short, basic, hands-on computer literacy training, participants

can gain a functional level of comfort with the equipment. An applications-oriented approach to training, in which trainees undertake common tasks using ICTs, has proven effective as a means to introduce new users to computer programs. As the SHOMA evaluation pointed out, "A serious problem throughout the pilot project was that teachers never really developed sufficiently advanced computer skills to engage the CD-ROM/web resources meaningfully."[17]

During the SHOMA pilot, it was notable that the teachers had no experience with the Windows 95 operating system. This was reflected in screen savers activating after short times, teachers working in windows that had been reduced to a quarter or even less of the total screen space, volume controls not being used, and other similar problems. An interface should be developed that removes some of these annoying problems for teachers in training. This may involve setting certain Windows defaults before computers are removed (for example, disabling the screen saver), as well as designing materials slightly differently. It may be worth adding a desktop icon that teachers can click to open the web browser as a full-screen window with the correct starting material loaded. Again, multimedia authoring packages can facilitate this type of design. Of course, none of these recommendations implies that it is not necessary to conduct more in-depth training of both teachers and facilitators on the Windows operating system.[18]

Moreover, sufficient and fully operational equipment is essential. A few old computers with limited capabilities for large numbers of participants are a recipe for failure. Investment in appropriate hardware and software is needed.

A helpdesk, functional and technical application managers, technical systems managers, and database administrators are examples of functions that may have to be put in place in one way or another. This does not mean that each project requires additional technical staff. Outsourcing of some of the tasks or a combination of several of them in one person is often a feasible option. As the SHOMA evaluation pointed out:

Project center managers should have a solid understanding of how to operate the technologies. This notion is not intended to suggest that managers need to become technical experts. However, basic levels of technological competence are necessary if this type of intervention is to run smoothly, an issue that will become increasingly important as the demand for computer skills increases. Center manager training should include elementary diagnoses of problems and the ability to initiate strategies to solve these problems as quickly as possible. Part of this training also should include a thorough introduction to the operating system of the computers.

A functioning information infrastructure is a prerequisite for success. Infrastructure needs, including sufficient funding for online charges, should be met before initiating a CMPD program requiring Internet, web, discussion forum, or email participation. This includes a national computer industry for providing and servicing hardware and software. The infrastructure is sufficient when there are enough computers for class work, when the power supply is stable and reliable, when connectivity is reliable and not too expensive, and when equipment is secured against viruses, vandalism, and theft.

Adequate but not overzealous security for equipment must be built into a CMPD program. Even though participants may want to use the ICTs, many projects fail to make them sufficiently accessible. In some cases, time in the laboratory is viewed as an extracurricular activity, and participants are not allowed inside during working hours. In others, access is controlled by one person or a small group of supervisors who are overly concerned about damage or theft—or simply not around to unlock the door—which deprives trainees of sufficient opportunity to use the computers. Nothing is more frustrating for CMPD participants than the inability to get online.

Explicitly learner-centered

Increasingly, educational reformers are calling for a move toward learner-centered methodologies in which students take more proactive control of the learning process. For the switch from traditional approaches to occur, however, teachers first must be persuaded to relinquish top-down, rote, and behaviorist practices, sensitized to the importance of this change and the reasons for it, and provided with excellent examples for implementing new approaches. Fortunately, CMPD programs lend themselves to this new pedagogy. With the

practice modeled in the CMPD program, teachers experiencing it can more easily appreciate its benefits and, in turn, replicate the approach in their own classrooms. Given the usefulness of CMPD for this larger educational reform goal, those who plan, design, and implement teacher training would be wise to include an explicit focus on it in their programs.

A supportive policy environment

A national telecommunications policy that is not only open but committed to expanding access can enhance or limit the effectiveness of CMPD programs. In large-scale activities in particular, a facilitating attitude of the central government and an explicitly supportive administration are critical conditions for enabling trainees to experiment, innovate, and learn. Tedious bureaucratic procedures are prone to frustrate projects. At the institutional level, CMPD needs to be supported systemically by policy, in which staff improvement programs hold a formal place in the organizational structure of the school, company, agency, or group. Participants should be aware of official commitment, not only to professional development in general but also to supporting entry to the information age. One way in which official support for involvement in CMPD programs can be demonstrated is by ensuring flexibility in trainees' schedules and sufficient time for participation. Another is for organizers, managers, and officials to use—and be seen using—computers themselves.

Access to knowledge and information

Effective professional development can open doors for participants to the knowledge and information age, enabling them to understand and appreciate its implications for the world at large and for themselves. Through professional development programs, participants should be able to gain access to new sources of knowledge and information that are relevant to their particular fields and useful for their own personal and professional growth. CMPD programs for teachers, for example, should provide them with opportunities to discuss and debate the changing role of education in the information age and come to understand the importance of their role in facilitating access to knowledge and information for their students.

Tried and true design and implementation procedures

As with other professional development activities, tried and true strategies should be employed in planning, designing, and delivering CMPD programs. For example, conditions should be assessed and baseline data collected at the outset to help ensure a program's relevance and enable useful monitoring and evaluation. Technical experts should be called up to assess infrastructure needs. In addition, inconsistencies among objectives, available online tools, and implementation approaches can cause problems. All must be coordinated and reinforcing.

Bottom-up approaches should be complemented with top-down approaches, suggesting inclusion of the Ministry of Education or other appropriate ministry in the CMPD effort. Lessons from current CMPD activities show that, in some countries, nationally defined regulations and curricula do not allow for experimental behavior of teachers, for example. Their initial enthusiasm has been frustrated by too many restrictions placed on their ability to apply the new knowledge and skills they have gained. In other countries, access to information is controlled, which limits the usefulness of web-based CMPD programs.

Start small with pilot projects and monitor them carefully, using feedback and monitoring results to adjust aspects of the program as needed before taking it to scale. Of course, appropriate stakeholders at all levels must be involved. Indeed, as the case studies following this model-of-use clearly demonstrate, successful projects are characterized by explicit and creative efforts to inform, engage the support, and recruit the involvement of local and national stakeholders from the public, private, and voluntary sectors—as well as from the participants themselves. As with all good development activities, promoting ownership contributes to success and sustainability.

In larger projects, experience indicates that coordinating teams should be established at the national and local levels, each with clearly defined responsibilities and tasks. The national task force coordinates with involved ministries and other national agencies and institutions, organizes countrywide activities, and oversees overall project administration and assessment. Negotiations among participating groups, relevant ministries,

telecom and Internet service providers, hardware providers, and other parties, also should be handled by the national task force. On the local level, teams should be established with the end responsibility of managing the facility, facilitating an open culture of communication and practice in which experimentation and innovation is possible, and coordinating activities with local-level partners and stakeholders.

As with other successful activities, a local "champion" can be instrumental in forging valuable partnerships, eliciting buy-in from diverse groups, and facilitating achievement of objectives and contractual obligations

Key characteristics

The lessons above echo some of the key characteristics of effective professional development programs in general that have been identified by scholars, researchers, and practitioners. A summary of these characteristics follows (McKee 1997):

Collaborative: Opportunities for collaboration, including a chance to interact with peers, experts, and administrators about a range of tasks, are available.

Motivational: Appropriate motivation, including a formal commitment from policy makers and administrators, extrinsic incentives (promotion, pay increase, bonuses), or intrinsic rewards (professional recognition, leadership opportunities), is provided.

Personalized: Participants involved in the planning, execution, and evaluation of professional development activities should be motivated to set personal goals for improvement and be able to interact around issues perceived as relevant to their concerns.

Integrated: Opportunities for an integrated, full cycle of learning, where professional development includes time and opportunities for training, demonstration, knowledge building, trial, practice, assessment, feedback, and reflection, should be available.

Accessible: Participants should have access to ongoing opportunities for professional development and sufficient time and materials.

Variable: A range of activities involving self-instruction, training, and collaboration are needed.

Research-based: Instructional designs for CMPD materials should be built on proven principles of adult learning and should incorporate the existing knowledge base.

Proposed CMPD Model-of-Use

Building on previous experiences, best practices, and lessons learned, our model-of-use takes the form of a web site, which could be developed for almost any area of endeavor. Certainly, there is a need for improved professional development opportunities in education, health care, the public sector, business, and many other fields in developing countries. For illustration purposes, it is assumed that the proposed site is created for educators. Initially, it may be developed for use in selected pilot communities, though, eventually, it will be expanded to serve provincial and even national needs.

It is assumed that the purpose of the site is to help improve educational quality through the four primary functions of CMPD activities described earlier: stimulating pedagogical change, enhancing content and subject matter expertise, producing teaching materials, and promoting networking and virtual communities among educators.

More specifically, the proposed model-of-use will enable educators to

- gain awareness of new learning theories and instructional approaches;
- access online and multimedia knowledge products produced for the project or available elsewhere, especially those containing current subject matter content delivered in a user-friendly, learner-centered manner;
- produce instructional aids that facilitate student learning; and
- share knowledge and experience with colleagues and participate in local, national, and international educational networks.

To achieve these goals, some desirable features of the web site—and of the CMPD program as a whole—would include:

1. Communication, networking, and information access options such as email, bulletin boards, facilitated listservs and discussion groups, and

computer conferencing.

2. CMPD curriculum materials accessible synchronously and asynchronously and from home or school computers or from a central location such as a telecenter.
3. Specially designed courses, both required and elective, perhaps produced by the Ministry of Education in cooperation with universities, curriculum experts, and teacher trainers and delivered via the web site. Courses will introduce new pedagogy and subject matter to teachers, who might receive nationally recognized credit toward advanced degrees or certificates, bonuses, or merit pay raises upon successful completion. After completing required course work, teachers would be encouraged to enroll in elective courses, which could be produced over time and also would be accompanied by an appropriate incentive, reward, or recognition. Ideally, courses should be offered at no charge to teachers, particularly if they are required to participate.
4. Assignments involving a variety of online experiences, including teleconferences, email, and discussion groups, and could require online collaboration with teachers in other schools and with facilitators at selected universities. This not only would introduce teachers to a range of computer-mediated communication methods but also would promote professional networking. As teachers become more comfortable with the technology and its features, they will be more likely to participate in these activities voluntarily.
5. An "Introduction to Technology" workshop preceding formal course work—which could be prepared and delivered by private sector technical specialists/partners—in which instructors and participants explore "communication culture" and receive training and practice in online protocols, "etiquette" and methods for communicating effectively through computer mediation.
6. Opportunities for teachers to apply their learning by working together online and/or offline to create lesson plans, design projects, and develop new teaching approaches based on CMPD learning.
7. Interactive activities designed to reinforce learning, e.g. exchanging lesson plans involving new classroom techniques or content or sample situations posed online to which teachers react.
8. Opportunities for teachers to compare experiences after applying new techniques or introducing new content in their classrooms.
9. Opportunities for learning how to use authoring programs to create teaching materials, which participants could share with colleagues through the web site.
10. Programs useful for educational management and administration, which school administrators could access. (Note: To see a sample program, go to http://www.aed.org/edu_tech.html.)
11. Email and online chats and meetings between instructors or educational evaluators and participants to assess progress in accomplishing course objectives.

The variety of online experiences that can be included in a CMPD program is great, and selection will depend on local needs as well as what is technically and financially feasible. The process of determining the extent to which the school (or company) is ready for CMPD must be made in the initial planning stages—to identify the specific needs, strengths, constraints, and resources that affect the intervention's design. The steps involved in an e-readiness assessment are summarized below.[19]

e-Readiness assessment

Not all developing countries, or groups within countries, are ready to benefit from a CMPD intervention. A variety of infrastructure, organizational, and even political prerequisites must be in place if the program is to be successful. It is not necessary for a participating country or group to have a fully developed infrastructure, organizational "culture," or even complete political stability before initiating a CMPD activity. But certain minimum—and several particular—enabling conditions (those that suggest readiness) should exist. The e-readiness assessment process determines whether, when, and to what extent the project can be undertaken with a reasonable expectation of success.

For example, key technical pre-conditions include (a) signs of deregulation of the national

telecom, (b) availability of a sufficient number of technical specialists able to assist the project, and (c) feasibility of alternative connectivity options should telephone lines prove so inadequate or inconsistent that a reliable online experience cannot be expected. However, all participating regions do not have to be connected immediately. Alternative delivery methods, such CD-ROMs, can be used to disseminate much of the same information that an online vehicle provides. While this precludes online communication, starting a CMPD program with offline ICT experiences has proven effective in many situations.

Assessing organizational conditions can identify potentially effective implementing partners. Some signs of enabling conditions in this arena include (a) a trend toward a decentralized management system, (b) sound financial management capabilities, (c) an openness to change, (d) an interest in or commitment to ICT use, (e) a leadership willing to support staff training in general and CMPD in particular, as well as to participate themselves, and (f) an entrepreneurial spirit.

The assessment should be conducted in conjunction with the appropriate ministry, institutions, prospective participants, and other constituents fundamental to the program's overall success. (In a CMPD program for teachers, for example, the training received by the teachers might not be considered valid or credible without the support of academics in higher education. To ensure accreditation, individual courses and the program as a whole must have the substance and orientation necessary to fulfill professional development requirements as locally and nationally defined.) In short, all key players must be on board.

A variety of assessment instruments may be used, such as Knowledge, Attitudes, Behavior, and Practice (KABP) studies, Participatory Rural Appraisals (PRAs), Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses, and other forms of environmental ascertainment including surveys, focus groups, and interviews. Equally important, existing documents and reports from reputable entities on the conditions in question should be consulted, and discussions with leaders and knowledgeable representatives of all envisioned partners should be undertaken.

Some of the specific topics to be examined in a CMPD-for-educators assessment might include the following:

- the social, economic, political, and demographic situation and trends in the country as they relate to education (or the field in which the PD program is to be used), including relevant policies, norms, and regulations, current problems, primary deficiencies, and critical needs, and existing, supportive resources, organizational readiness, and leadership
- the availability, capability, and "readiness" of primary players, leaders, and providers of other inputs;
- the technology and infrastructure environment;
- the larger development environment, including previous experience with or existing programs related to the one envisioned;
- the professional development needs of the target group, currently and in the future;
- current professional development and training ang frequency and effectiveness—as well as which aspects of the existing system are working and which are not;
- current levels of resource allocation to professional development for the target group and the extent to which national priorities enable enhanced, up-front commitments;
- the competence of the key players who will be relied upon to perform and deliver in the CMPD program;
- the extent to which interest and motivation for such an activity is present or can be promoted;
- key obstacles, constraints, and challenges to the program;
- the availability and costs of resources and inputs considered essential for the envisioned program;
- the extent to which key decision makers support innovative undertakings in general and the CMPD program in particular;
- prospective participants' knowledge of and experience with learner-centered pedagogy;
- specific needs for improvement in topical areas;
- the extent to which potential participants understand and are interested in the concept of "networking";
- computer skills/interest among potential participants;
- identification of possible, preferred, and essential public, private, and voluntary sector partners;

- up-front identification of "equity issues" that might affect design and/or implementation, such as gender biases or ethnic, rural, and geographic inequities;
- the prevailing "communication culture" in which the program will have to function; and
- the individual and organizational readiness of players, including motivation and commitment to change, human and institutional competence and capacity, and the structure, processes, resources, and operations within which the intervention must be implemented.

This type of information will indicate the likelihood that the CMPD project will succeed, suggest specific design elements that should be incorporated into the project plan, and identify individuals and organizations that are likely to emerge as champions and leaders—or as bottlenecks and weak links.

In addition, the assessment process should be used to obtain valuable quantitative and qualitative baseline data—including specific behavioral information about classroom practices—that will be necessary for monitoring progress during the implementation phase and evaluating achievement at the conclusion of the pilot stage. The assessment also will indicate the best and the essential people and groups to engage in the activity, all of whom will be convened to contribute to the program's design.

Bring Stakeholders Together

The alliance envisioned in this model-of-use draws on the capabilities of a variety of stakeholders, constituents, and partners. Increasing the number of groups traditionally involved in such efforts takes advantage of the expertise available in different sectors. It also broadens the responsibility for improving professional development opportunities—and education in general—to include players beyond those typically responsible. In the partnership development phase, care should be taken when delineating specific roles and responsibilities to ensure that all essential functions are covered and that accountability for them is not diluted, confused, or duplicative.

While each partner's roles and responsibilities will vary from one setting to another, it is suggested that both a national- and a local-level coordinating team be established to oversee all aspects of the program. Consisting of representatives from the relevant ministries and other national-level public, private, and voluntary sector partners, the first body will coordinate activities and collaboration among key players at the national level. The second team, including local administrators and other partners at that level, will manage implementation of the activity at specific CMPD locations, coordinate with other locales involved in the project, and—importantly—foster an open training culture in which experimentation and innovation is encouraged. Both groups may have specific responsibilities associated with ongoing monitoring and evaluation of different aspects of the program. Of course, actual participants—the teachers—should be represented in both teams, and outside experts in educational technology, for example, should be consulted as needed.

Involving groups at both levels in the program's conceptualization, design, implementation, monitoring, and evaluation will help partners perceive themselves as stakeholders, which, in turn, should increase their interest in working together to ensure success.

Drawing on the advice of experts who have designed and implemented similar programs elsewhere is useful as well. For example, a national web site for educators that might provide ideas and inspiration is the Education Network Australia (EdNA Online), which is "a network of and for the Australian education and training community (government and non-government schooling systems, vocational education and training, adult and community education, and higher education)."

EdNA Online is a service that aims to support and promote the benefits of the Internet for learning, education and training in Australia. It is organized around Australian curriculum, its tools are free to Australian educators, and it is funded by the bodies responsible for education provision in Australia.

As an information service, EdNA Online provides two key functions: 1)a directory about education and training in Australia; and 2) a

database of web-based resources useful for teaching and learning.

As a communications service, EdNA Online aims to promote collaboration and cooperation throughout the Australian education and training sector and facilitate the growth of networks of common interest and practice.

As a service provider to education and training systems and sectors EdNA Online (www.edna.edu.au/system.tools/) also provides a range of tools to assist in the management and discovery of information resources.

Design, Development, and Implementation. While details will vary depending on sector, context, budget, and other variables, essential steps in the design, development, and implementation process are identified below. These can be undertaken in a logical, strategic order, with some underway simultaneously. A suggested order follows.

Consult: Before initiating the pilot(s), meetings and workshops will have been held at the national level and in selected communities, teacher training institutes, and schools to introduce the program and obtain ideas, inputs, and concerns. These ideas will have been integrated into the final design and implementation plan.

Determine focus: An important consideration is whether the program will be offered to pre-service teachers, in-service teachers, or both. Initially, CMPD programs tend to be geared to pre-service teachers and then expanded over time to provide ongoing opportunities for those in service.

Finalize goals, objectives, inputs, and processes: Regardless of the scope, scale, and focus of the initial pilot program, program planners and coordinating teams as usual should formulate realistic, overall goals and set specific, measurable objectives to meet those goals. They also will select final target sites based on previously determined criteria and itemize financial, staffing, and ICT needs and procurement processes.

Start small: It is wise to begin with small pilot projects that are monitored carefully and then adjusted, refined, and fine-tuned before they are taken to scale. Because initial investment in infrastructure, equipment, curriculum development, and online activity is significant, however, the pilot phase for a CMPD program would be more useful if it is launched in several different locations with varying social, economic, and educational demographics. Comparing progress at the pilot sites over a year or two will yield good insights into the difficulties and enabling conditions that can be expected in different contexts. This, in turn, will provide valuable information for taking the program to scale later.

Determine budget and staffing: A business plan and budget should be prepared for each pilot site as well as the overall program. Included in the plans will be costs for equipment, software, connectivity, supplies, construction or renovation, staff, materials development (including the web site and content), training, and management, administration, and coordination. At the same time, job descriptions should be prepared. Likely positions will include curriculum design and development experts, instructors and facilitators, computer technicians, trainers, programmatic and financial managers and administrators, monitoring and evaluation specialists, construction workers, web site developers and managers, and coordinators to serve liaison functions linking partners.

Develop curriculum: A crucial component in the process is preparing effective curriculum materials that capitalize on the benefits of interactivity. Where connectivity is not immediately available and interaction among instructors and other participants not possible, *interactive CD-ROMs and other multimedia material can provide participants with a high level of interaction with the content*. The CD-ROMs can be produced to resemble the web site. Merely digitizing existing texts should be avoided. This is an opportunity to add a valuable and vital learner-centered and interactive dimension to professional development, and every effort should be made to do so enthusiastically. (For an example of CMPD material produced from a traditional national curriculum, see the Uganda education

web site created in 2002 at http://www.itek.ac.ug.)

As soon as the program design work is completed, curriculum developers with ICT and multimedia expertise should get to work. Typically, the existing national curriculum is used as the base for course and material development, though launching such a program also presents a good opportunity to review and update the curriculum if needed. Throughout this phase, consultation with the appropriate Ministry is essential. Ministry staff should be included in the process on an ongoing basis. An approach that has proven effective in similar programs is for teams consisting of outside experts, local educators and curriculum specialists, and appropriate Ministry staff to design the web site and prepare the content and accompanying print and multimedia material. In addition to the design work, the experts also serve as trainers to ensure that local educators are able to continue the work on their own after the pilot concludes.

Training: An equally critical component is training instructors/facilitators, managers, coordinators, and the curriculum developers mentioned above. In addition to preparing these key staff to undertake their respective roles effectively, training should include opportunities for all concerned to discuss and come to agreement on program expectations and assumptions. While physical facilities and equipment are being constructed, renovated, and procured—and while the web site and content are being developed and produced—the training process should be underway so that all involved can "hit the ground running."

Ensuring ICT access: Basic requirements for all pilot sites include access to electric and telephone infrastructure[20] and adequately equipped computers. To ensure access, construction or renovation can be undertaken to add computer centers to existing teacher training institutes, or arrangements can be made with already equipped NGOs, telecenters, community learning centers, libraries, or other conveniently located facilities for teachers to use the equipment. Whichever route is taken, a sufficient number of workstations, plus collectively used hardware such as scanners, printers, photocopiers, and authoring hardware such as a CD burner should be available. If possible, a library containing relevant print and digital materials and a meeting room should be included as well.

Upon completion of the pilot phase—with a suggested duration of two-three years—a process of taking the program to scale can begin, also in phases, which will ease the financial, management, and implementation burden.

Most important, because it is impossible to anticipate all the problems that might arise, program managers and the project design itself must remain flexible and open to modification, with backup plans in place to meet unexpected needs and unanticipated problems. One aspect of these plans should include identifying common technical problems, such as equipment failures and technical troubleshooting, so they can be corrected quickly.

Within this broad implementation framework, detailed work plans complete with milestones, benchmarks, and target dates should be devised on the basis of the specific context and circumstances and in accordance with the assessment analyses undertaken at the outset of the design process.

Monitoring and evaluation

Naturally, a system for determining the extent to which the CMPD program is achieving its goals and objectives will be needed. One method is to develop separate monitoring and evaluation tools focusing on different, distinct facets of the program, such as design, content, process, and results. Within each of these, a variety of items will be included. For example, monitoring the program's design would include assessing the effectiveness of partnership roles and responsibilities and configuration of the computer centers. Content monitoring would include feedback from partners and teachers on the courses, curriculum, and web site. Process monitoring would focus on center management, course facilitation, and technical performance.

To measure results and impact—such as shifts in instructional approaches, increases in subject matter knowledge, development of more effective instructional aids—accurate quantitative and qualitative baseline data, collected during the

initial and interim assessments, are essential. Since a major difficulty with evaluating this type of activity is attributing change to the CMPD input, setting specific, measurable objectives for the activity, in behavioral terms, also is important. Then the baseline and monitoring data can relate specifically to those behaviors. Finally, designing monitoring and evaluation tools that enable comparison over time will be useful.

While the overarching motivation for improved professional development opportunities for teachers is to improve student achievement, experience indicates that such a linkage is too complex to establish with a reliable degree of accuracy, at least initially. Therefore, a more realistic focus for a CMPD evaluation is to measure the extent to which teachers participating in a CMPD program exhibit specified behaviors, such as: 1) using new student-centered pedagogical approaches; 2) integrating CMPD learning into their classroom activities; 3) demonstrating new subject matter knowledge and teaching competence; 4) consulting new resources; 5) developing new teaching aids; and 6) engaging in networking opportunities.

For example, a teaching portfolio might be prepared that demonstrates the changes in pedagogical practice, curriculum content, and presentation/delivery that teachers have implemented in the year following participation in the CMPD program. Education and evaluation specialists are able to construct evaluation instruments and tools[21] to demonstrate such changes over time.

Setting benchmarks for achievement of specific objectives during the course of the project will facilitate useful and insightful monitoring, as will the use of tried and true methods of data collection such as surveys, focus groups, interviews, observations, and case studies.

For a CMPD intervention in particular, other questions that will yield useful information include:

1. If and how the computer mediation facilitates and adds value to the professional development. At the most basic level, comparing test results from traditional PD programs or courses with those from a CMPD program will help to answer this question.
2. To what extent have broader educational reform efforts been affected by CMPD?
3. To what extent has technology been integrated into the curriculum, the classroom, teaching practices, and students' and teachers' daily learning lives? Because such integration does not happen routinely, its occurrence constitutes a sign that the CMPD activity has been successful.

Sustainability and institutionalization

At the broadest level, sustainability of the CMPD model-of-use depends on the institutionalization of a culture of continuing professional development for educators—in other words, the extent to which teachers are willing and able to continue developing their skills after completing required course work. For this to occur, several conditions are necessary.

First, policy makers and education officials must support ongoing professional development for educators, not merely by requiring course work or training but also by adopting policies that encourage and even reward such efforts. Bonuses, incentives, and official acknowledgement through certificates demonstrate support, as does providing teachers with paid leave time to participate in professional development activities to upgrade their skills and enhance their competencies. At the national level, positioning improved educational quality as a key development goal, with sufficient resources allocated to it, also demonstrates support.

Second, engaging other constituents and stakeholders in the professional development effort will help to create an atmosphere that encourages teachers to strengthen their skills. Involving parents, community groups, and the private sector may help. In addition, local and national media can be engaged to better cover the "education story," and opportunities for teacher collaboration at regional, bilateral, and international levels—often a highly motivating prospect—can be initiated.

Third, for the current model to survive and thrive, it is critical that technological inputs are sound, functional, and sufficient, with competent technical assistance available to maintain, repair, and upgrade equipment when needed. If teachers are unable to access the CMPD material,

professional development progress through this means will not be possible.

Fourth, in the computer center scenario, teachers must view the facility as an inspiring and authentic place of learning in which the opportunities and services provided are valuable, the staff is competent, helpful, and enthusiastic, and the surroundings are convenient and well equipped. If the center is a shabby place where the equipment does not work properly or consistently, if the staff is cynical or incompetent, if the materials are old, or if the experience there is unpleasant, inconvenient and/or viewed as useless, then teachers will not consider their time there well spent, and they will not come.

For the CMPD approach proposed here to be institutionalized within the educational system, it must succeed in attracting teachers and meeting their needs at affordable costs. But even this is not sufficient. Several other key factors, all related to different capacity areas, are also determinants.

The key institutions involved in the activity must adopt a vision of where technology-assisted approaches may lead. Will the Ministry of Education and other primary stakeholders demonstrate a commitment to this approach to professional development, or will they resist such a fundamental and initially expensive change? If there are champions within the system who have enough influence to help form and move forward an agenda for using technology in teacher training, then there may be sufficient support to sustain the model after the pilot phase—and, presumably, external funding—ends.

In addition, the key institutions must be able to accept the ever-changing technology climate and be willing and able to anticipate and meet the constantly expanding need for improvements, expansion, and upgrades.

The model's long-term viability also requires a sufficient and increasing level of human capacity. Once external involvement and technical assistance ends, a cadre of internal staff, thoroughly trained in all aspects of maintaining and expanding the technology-assisted activity, must be ready to take charge. Hardware and software depend on "liveware"—that is, human beings within the relevant institutions or hired from the outside who can keep the system functioning. In addition, well-trained experts in the pedagogy of computer-mediated instruction must be available, as well as those with online facilitation skills and instructional design capabilities. Inevitably, as individuals gain new and highly marketable technical skills, some will secure employment outside the education sector, which means that many people must be trained to take on these essential roles.

Other factors affecting the project's viability include organizational, managerial, communication, and knowledge management capacity, all of which take time to develop. A lesson learned from previous experiences with CMPD is that, once computer applications and functions are mastered, the ever increasing amount of available information makes it very difficult to assess, process, manage, and store, much less use. Entire systems and ways of operating become obsolete almost overnight as the volume of new information grows.

Finally, financial capability is essential for institutionalization of the CMPD approach. Especially for institutions just entering this arena, new technologies imply new costs, and new costs typically imply a need for new revenue streams. Therefore, effective financial planning with the technologies in mind is essential. Institutions must be able to identify where the funds will come from to maintain and upgrade equipment, purchase new software, produce new material, and retain technical assistance over the long term.

In short, when designing a CMPD intervention with sustainability in mind, these issues should be anticipated, these questions should be asked and answered, and processes that are simple enough to manage yet sophisticated enough to achieve the desired results must be put in place.

Costs

The up-front cost of developing a CMPD program is high, although recurrent costs per person can fall significantly over time. Once infrastructure and equipment are in place, many more teachers will be able to participate in CMPD than in traditional, workshop-based teacher training. Thus, per learner costs can fall in the long term, even when factoring in expenses for ongoing operation, maintenance, and upgrading center facilities and equipment.

Because opportunities for follow-up and refresher courses also are greater once a web site is developed and equipment is in place, the prospects for regular, ongoing professional development—leading to continued and sustained improvement in teacher skills—are also brighter. In addition, as teacher performance improves, student achievement should improve as well, accompanied by lower dropout rates, higher retention rates, and an increase in the ultimate productivity of students once they leave school.

Finally, the trend of decreasing technology costs and increasing connectivity options are expected to continue, making hardware investments more feasible and online time more affordable.

For these reasons, the long-term costs of improving educational quality are likely to decrease as the CMPD approach is institutionalized, while the net gains are likely to rise.

Looking forward

The CMPD model-of-use proposed here is not intended to be static. Dedicated to technology-mediated learning, it should change continuously as technology innovation continues its rapid course. For this reason, the shape of future learning environments is difficult to imagine.

In addition to enhancing the efficiency of education, modern information and communication technology also is reshaping human interaction and ideas about the teaching and learning process. Technology is changing perceptions of teachers' and learners' roles, of the learning setting, and of the methods and goals of education. Developing an accurate picture of how computer-mediated learning will evolve in the future involves both ideological and technological forecasting.

Early media, for example, were used as tools to supplement teacher presentations or to facilitate permanent information storage. Today's use of educational technology is informed by advances in cognitive learning theory and influenced by the emergence of personal computers, authoring software, expanded capabilities of rapid access to information and communication via the Internet and the World Wide Web, and creation of effective interactive multimedia products such as CD-ROMs. These breakthroughs empower students of all ages and in all sectors by putting the control of learning in their hands, allowing them to range freely through information space, and multiplying opportunities for more intelligent and equitable teacher-learner interaction.

The CMPD strategy helps overcome problems commonly encountered in traditional professional development efforts. Unlike current teacher-training programs, in which some teachers participate on occasion, CMPD has the potential to offer virtually all teachers current and ongoing opportunities to access the pedagogy and knowledge required to teach and learn effectively in the information age.

Many argue that education is the essential key to social and economic development. To the extent that is true, returns from improving opportunities for education, professional development, and lifelong learning will justify investments. Employing ICTs for this purpose also brings the added benefit of familiarizing learners with ICTs, a growing prerequisite for participation in the global information economy.

Though it requires careful planning and monitoring, CMPD in developing countries is not pie in the sky. Indeed, experiences globally suggest a high level of achievement when opportunities are presented. What is needed is the will of those who make telecommunications and education policy and resource allocation decisions nationally—plus the commitment of the international community—to help equip the education sector with the tools for lifelong learning. Among people in almost all sectors, in almost all countries, an increasingly enabling infrastructure, a desire to learn, and the capacity to master ICTs are already there.

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Footnotes

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[2] R. Halperin, Distance learning for teachers: some feedback, UNESCO (http://www.unesco.org/education/features_en/271101_distance.shtml).

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[4] "Ditto" is a colloquialism that refers to duplicated exercise papers given to students.

[5] Robert F. Tinker, president, The Concord Consortium, in "Building a Better Teaching Force," quoted by Ann Bradley (http://www.edweek.org/sreports/tc98/cs/cs6.htm).

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[12] Ibid.

[13] Ibid.

[14] Ibid.

[15] www.infodev.org/library/WorkingPapers/AReady.pdf and www.infodev.org/ereadiness/methodology.htm

[16] It is expected that, with the growth of wireless and satellite communications, reliance on land-line infrastructure will decrease over time.

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Case Study

Guatemala

Invigorating Mayan Language, Culture, and Education

Bilingual Education

Andrew Lieberman
Andrew Lieberman was the Project Director and Chief-of-Party, El Quiché, Guatemala

This case study about a bilingual education project in Guatemala provides insights and lessons into practical uses of information and communication technologies (ICTs) for training teachers. Though focused on strengthening cultural identity in indigenous Mayan communities by enhancing bilingual and multicultural education, many of the technology applications can be replicated to other geographic settings and cultural contexts.

The pilot project[1] was designed to determine, test, and demonstrate ways in which ICTs can support bilingual education and help preserve and invigorate Mayan language and culture in Guatemala. The project's many objectives included materials creation in print, audio, and CD-ROM for pre-school students; training of pre- and in-service teachers; and ICT support for government agencies, private sector entities, and NGOs.

The project sparked tremendous interest in the uses of technology. Many of the leaders in the bilingual education movement now endorse the need for ICTs. Due to lowering equipment costs and improved telecommunications infrastructure, technology is becoming more accessible, which contributes to the growing interest in applying ICTs as tools to achieve social and educational goals.

This case study shares the lessons and insights learned in Guatemala and focuses on the impetus behind the project and the design and implementation approaches that proved successful—as well as those that did not. Moreover, the study highlights the local production aspect of the activity, an often neglected component of ICT-based initiatives. Based on global experience, the LearnLink project team knew that extending ICT capability in developing countries and

“We are not myths of the past, ruins in the jungle or zoos. We are people and we want to be respected, not to be victims of intolerance and racism.”

Rigoberta Mench'u Tum,
winner of the 1992 Nobel Peace Prize

“[This project] motivates the students... It's important that it is in their native language, which will help them take pride in their language and culture.”

José Guadalupe Perez, Center Manager

communities is most successful when the information and communication results are two-way, both enabling the access and the dissemination of information, knowledge, and wisdom. Through the Guatemala activity, remote Mayan communities produced creative and beautiful materials not only for teaching and learning but also for preserving their culture.

Guatemala: Country Context

Civil war in Guatemala broke out in 1954 when a military coup unseated the country's popularly elected president. Under the military rule that lasted until the mid-1980s, plantation development escalated, especially on lands formerly held by Maya. Rural, indigenous, and mostly illiterate populations suffered from systematic disappearances and massacres, scorched earth practices, and forced migration that resulted in social dislocation and abandonment of cultural traditions and rituals.

Following the end of the war in 1996, the Peace Accords defined a new vision for the country's development process, particularly with regard to the inclusion of the Maya. The Accords respond directly to the historical neglect and under-investment in education for this indigenous population, highlighting the government's new role in fostering economic opportunity, democratic participation, social inclusion, and multicultural understanding.

The objective of LearnLink's work in Guatemala was to contribute to the peace process by strengthening access to quality intercultural bilingual education in the Department (state) of El Quiché. Located in the western highlands of the country, 95 percent of El Quiché's population is rural and indigenous. In 1996, the school enrollment rate was 9.4 percent, compared to 31.2 percent for the whole country and 67 percent for the Department of Guatemala, the national capital. Promotion rates in El Quiché are slightly under 50 percent.

Guatemala is multiethnic, multicultural, and multilingual, with 23 indigenous languages spoken throughout the country. The challenge is to ensure that the country's multilingualism and cultural pluralism is in line with education planning and policy, particularly in the areas most affected by years of armed conflict and social exclusion. Despite important yet limited interventions, many teachers in indigenous areas have little understanding of the local culture, much less ability to communicate in the local language. Even Mayan teachers operating in areas with high indigenous population density still possess limited written language skills and are essentially ill prepared to teach Mayan children in their own languages or using bilingual education pedagogy.

Historically, pre- and in-service teacher training has been inadequate, particularly within the context of active learning and intercultural understanding. Students prepared in Guatemala's teacher training institutions received virtually no training in Mayan language literacy, first and second language learning and bilingual pedagogy, multigrade teaching methods, outreach techniques to bridge the gap between home and school educational environments, pedagogical understanding of Mayan cultural concepts, or operational notions of interculturalism. In addition, there were few educational support materials written in Mayan languages, and those that had been developed were not readily available to teachers or other educators working in the indigenous regions of Guatemala.

In the past few years, a tremendous effort has been made to address some of these shortcomings in the Guatemalan education system. LearnLink is one of those efforts. Using ICTs, LearnLink developed and applied tools for the effective use of educational and communication technology to better prepare bilingual teachers in the Department of El Quiché.

Box 1 — Profile of Juanita

On Juanita's first day of school, she is frightened and does not understand what people are saying. They are speaking Spanish, and she only speaks K'iche,' the Mayan language spoken in Zacualpa, her village in the western highlands of Guatemala. Juanita's parents were reluctant to send her to school, fearing that—as occurred with her older brother and sister—she will learn to favor Spanish over her native language. With no other school in the community, however, they defer to the mainstream Spanish-speaking world to help ensure a better future for their daughter.

Where are the bilingual teachers?

Based in Santa Cruz del Quiché, LearnLink's Proyecto Enlace Quiché, as the activity is known locally, began working in early 2000 to prepare teachers to teach in the local languages of K'iche' and Ixil. Among other activities, four teacher training schools in the region were selected based on their inclination and commitment toward bilingual education. Educational technology centers were installed in these schools — one in Santa Cruz del Quiché and three in the rural villages of Joyabaj, Nebaj, and Cunén. Each center contains at least 12 computers with software and supporting peripherals (printers, scanners, and a CD writer), as well as a digital camera, TV/VCR, video camera, cassette recorder, and a photocopier.

The centers are open before, during, and after school hours so that others in the community may take advantage of the ICTs. Initially supported by project funds provided by USAID and a member of the project's staff, the centers are now financially and administratively independent. Students pay a small annual fee in addition to their other school costs, and outside users are charged an affordable fee for specific services. The schools have integrated the centers into their school budgets and have established funds for expendable supplies, future computer upgrades, and other expenses.

Eventually, as outreach and marketing activities take hold, members of the community at large also will use the education technology centers for personal and professional development purposes.

Together, the activities associated with the Proyecto Enlace Quiché are designed to help preserve and invigorate indigenous languages and culture while paving the way for rural communities to move into the modern, information-based world

Developing Culturally Appropriate Mayan Language Materials

Project staff began their work by collecting, analyzing, and cataloging existing core educational and didactic materials for teaching K'iche' and Ixil. They established a network of individuals and institutions — schools, local NGOs, government institutions, and other USAID projects — to provide the resources. A library of more than 300 books, magazines, journals, and other materials was established in the project office, which forms the foundation for the multimedia learning and reference resources that are being disseminated to the teacher training schools.

Although some educational materials did exist, obstacles such as printing and dissemination costs kept the materials from reaching those who need them most. Too often, the materials remained in warehouses, forgotten and unused. After analyzing the materials they collected, project staff identified gaps in the quality and quantity of information and began working to fill them with a series of CD-ROMs for use in the project's bilingual educational technology centers and other education institutions.

CD-ROMs offer a means of disseminating large quantities of information at low cost (approximately $1 per CD in rural Guatemala). In addition, CD-ROM technology facilitates reproduction of materials because exact copies can be made of the entire contents at very low cost and with equipment that is continually becoming more available in rural Guatemala.

In the interest of reaching the most remote populations, the project's CD-ROMs and other materials have no copyright limitations — anyone may copy and distribute them freely, identifying the sources: USAID/AED/LearnLink/El Quiche project..

Collecting, compiling, and digitizing resources

- *Conociendo Nuestro Idioma – Knowing Our Language* To address the problem of dissemination, several existing and original pedagogy and grammar manuals were put into digital format. This CD-ROM contains a total of six books that support improved bilingual and intercultural education and teacher training, specifically in the languages of K'iche' and Ixil, as follows:
- *Escribiendo K'iche' and Escribiendo Ixil.* These two books, by the Universidad Rafael Landivar's Instituto de Lingüística/RODIPMA, are classic works for teaching Mayan language literacy to Mayan speakers. They cover the alphabet, grammar, punctuation, and dictation exercises and are a key resource for Mayan language teachers. In electronic format, they are used as self-study guides.
- *Gramática Pedagógica Ixil.* Because no teaching guides of this type existed previously, this Ixil grammar book was created by project staff. The electronic format makes it unique among

teaching guides in Guatemala, including 36 interactive exercises that users can work through at their own pace, practicing and conducting self-analysis tests on content comprehension as they progress.

- *Kaqetamaj usik'ixik, utz'ib'axik ri K'iche' Ch'ab'al and Q'ab'il u'j tetz sik'le - tz'ib' uj Ixhil.* DIGEBI, the government agency dedicated to bilingual and intercultural education, is using these books in its current literacy training program for in-service bilingual teachers. In CD-ROM format, they can be used for self-study and to review specific portions of DIGEBI's training program.
- *Manual de Sugerencia de Dinámicas que Apoyan mi Trabajo.* This manual, written by the Proyecto de la Niña/World Learning, was designed to help monolingual and bilingual teachers engage in more participative teaching methods in their classrooms, with a special emphasis on involving girls. Because it is in digital format, the user has the advantage of being able to review the entire content, adapt it to the specifics of his or her classroom, and print only those sections that are needed.

Engrandezcamos Nuestro Pensamiento – Let's Broaden our Thinking

Designed by the project's creative materials and multilingual education specialists, this CD-ROM is rich in fun and informative interactive games, making it one of the most popular multimedia packages for learning K'iche' and Ixil in the centers. Its main objective is to help bilingual (Spanish and K'iche' or Ixil) pre-service teachers improve their reading, writing, and listening comprehension skills in their own Mayan language. A series of games and exercises include introductions to the K'iche' and Ixil alphabets and pronunciation guides of all the sound combinations with visual and aural examples. The games also contain listening samples comparing K'iche' and Ixil sounds with Spanish sounds. A vocabulary list of the colors includes games that become progressively more difficult. Lastly, a series of games covers letters and sounds that are specific to each language. Designed for individual, self-paced instruction, the CD also includes a teacher's guide, which helps Mayan language teachers use it as an integral part of a complete course. In-service teachers also can easily replicate the content and use it in their primary school classrooms, designing their lesson plans and selecting specific games depending on the needs of their students.

Box 2 — Teacher Training Schools: Joyabaj and Nebaj

Joyabaj

Joyabaj encompasses not only the ancient town that pre-dates Spanish colonization, but also several hamlets and farms in the surrounding countryside. With a population of approximately 45,000, the area is located in the rugged mountainous area just west of the departmental capital of Santa Cruz del Quiché. Founded in 1993, Joyabaj's teacher training school—Instituto Privado Mixto Joyabaj—was established to address the scarcity of qualified primary school teachers in the area. Only 13 students attended the school during the first year, but by 2001, enrollment had reached 140.

Nebaj

The town of Nebaj is in the northwest of El Quiché, due north of the departmental capital. Unlike the other towns in which the project has worked, Nebaj is primarily Ixil speaking rather than K'iche'. With a population of over 56,000, the Nebaj region includes small villages, hamlets, and farms and is reachable only by dirt road. The terrain is mountainous, and the area receives abundant rainfall, making it lush and green year-round.

The Instituto Mixto Diversificado Ixil was founded in 1998 to try and meet the growing educational needs of the area, with a special focus on bilingual and multicultural education. During the school's first year of operation, 64 students were enrolled. Since then, enrollment has grown at an ever increasing rate, with 288 students by 2001.

Así se Ilustra mi Palabra – Illustrating my Words

When project staff and pre- and in-service teachers began the task of designing original educational materials to meet the needs of bilingual and intercultural instruction, they found that illustrating their materials with existing clip-art was inadequate. The project hired a graphic design firm to illustrate a database of culturally relevant vocabulary words in K'iche', Ixil, and Spanish. This CD-ROM contains 3000 illustrated vocabulary words, including those describing traditional Mayan rituals, foods, beliefs, clothing, and more. A valuable resource for educators involved in bilingual and intercultural teaching in these languages, the database can be used by individual teachers to create illustrated worksheets for teaching spelling to primary school students. Government agencies like DIGEBI can use the database to illustrate existing and future pedagogical guides. Moreover, the same illustrations can be used for all 23 Mayan languages throughout Guatemala.

Teachers and students create their own educational materials

As part of this activity, the teacher training schools were tasked with creating their own set of culturally appropriate educational materials. These assignments seemed daunting at first. Teachers and school administrators, already overworked, were reluctant to take on the extra work of learning how to use the computers and other technology tools. Several teachers expressed feelings of intimidation toward the technology and initially thought they would have to spend an entire school year only learning basic software. In addition, they were uncomfortable with showing their lack of computer knowledge in front of their students. They were assured by project staff that learning to manage the computers and software would come naturally as they launched their materials creation projects. After a series of workshops providing hands-on learning, this temerity all but vanished, and the teachers and their students dove into their projects with great enthusiasm

1. Florezcan las Palabras de los Hombres de Maíz (Pre-school Materials) One of the project's objectives was to enable Maya children from the region to begin their schooling in their native language, an unprecedented opportunity in the history of Guatemalan education.

Box 3

Teacher Training Schools: Cunén and Santa Cruz del Quiché

Cunén

In the 17th century, the town of Cunén grew out of a number of scattered farms and hamlets into a municipality that functioned largely as a governing center for the Spaniards. The town is located northwest of Santa Cruz del Quiché and is accessible only by dirt road. A highly mountainous region, the actual town is nestled in one of the region's many shaded valleys. Founded in 1998 to develop a bilingual education curriculum, the school Colegio Mixto Bilingüe Intercultural Hermano Oscar Asmitia opened, after two years of negotiations, with the support of the municipal government and local education officials. Nearly 125 students have been involved in the project, with over half speaking only K'iche'.

Santa Cruz del Quiché

Santa Cruz del Quiché is the capital city of the department, with a population of 20,000. Located approximately 164 km from the national capital, Santa Cruz is considered the major metropolitan area in this rural department, complete with markets, restaurants, hotels, a public transportation hub, and an Internet café.

Unlike the other three schools, Instituto Normal Mixto Juan de León Juan is owned and operated by the government and has large student body of over 800. Founded in 1960, the school's mission is to train primary school teachers. Juan de León does not have a strong bilingual education program, but the technology centers have provided the school with a good introduction to the concept.

“We now have a book on local traditions, which we never expected to have. We want to move forward and create more books... with games, poems, and other Mayan literature.”

Miguel Ángel Camajá Cabrera, School Principal, Cunén

Bilingual illustrated storybook in Spanish and Mayan languages in Guatemala.

Recognizing that cultural identity, like other fundamental learning, is developed in the early years, a key component of the El Quiché activity is the production of early childhood development materials in K'iche' and Ixil. Specifically, the project called for researching, collecting, preserving—and thereby validating—traditional Mayan language stories, songs, and poems by producing packaged radio programs for young children for airing on local stations. Audio CDs of the programs also have been produced and distributed to pre-schools throughout El Quiché, thereby enabling a multimedia educational experience for children even where there is no electricity. (Battery-powered CD players are readily available.) Accompanying the audio collection is a set of illustrated print storybooks that were produced by the pre- and in-service teachers at each of the teacher training schools.

With assistance from project staff, pre- and in-service teachers began by documenting oral histories from the elders in their communities and, with the technology tools in the centers, using these stories to create educational materials for pre-school children. As a first step, the pre-service teachers and their instructors received a series of training sessions in computer use, audiovisual production, desktop publishing applications, and most important, field research and interviewing techniques.

Armed with digital cameras, cassette recorders, and great enthusiasm, the students split up into groups and went into surrounding villages to seek out elders who would share their stories. A great number of stories were recorded, and then began the challenging work of transcribing them onto paper and translating them into Spanish. By mid-year the students had completed their field investigation for the storybooks, but they were not sure how to proceed in creating usable pre-school materials from this oral tradition. Project staff and consultants conducted a series of workshops for the students and their teachers on the practical principles of graphic design and layout as well as techniques for capturing oral history and converting it into a printable format.

The students began creating original illustrations for the stories and continued the difficult job of transcribing and translating these stories, which had previously never been put to paper. The best stories were selected, and staff from the project and each school worked with professional editors in Spanish, K'iche', and Ixil to polish the content. Using Microsoft Word and Adobe PageMaker, the students learned to design and format the books, not only ensuring that they would have a professional look and content, but also giving the schools a sense of ownership and pride in their accomplishments. The students decided to entitle their books “Florezcan las Palabras de los Hombres de Maíz” or “The Blossoming of our Ancestors' Words.” The final layout was completed at the end of the school year and 1000 copies of each book were printed in 2002, and disseminated throughout the department.

While the storybooks were being written, edited, illustrated, and designed, project staff and consultants were preparing for another, related task. Using existing equipment and resources, the students and teachers launched another challenging activity to turn their bilingual educational technology centers into recording studios. With support from the project, groups of students and teachers at each school wrote scripts based on the stories. They acted and recorded each part—in Spanish and K'iche' or Ixil, depending on location—and added sound effects, then mixed and edited the programs on the center computers. The finished products were recorded on CDs, and accompanying lesson plans were developed for use by pre-school teachers. DIGEBI, the government agency dedicated to bilingual and intercultural education, recommended local bilingual pre-schools where the programs could be piloted.

[The project] is good because it's enriched by a number of technical elements such as sound effects, voices, dramatization, and radio acting that allow the children to imagine and visualize the scenes. This enables them to learn more efficiently and effectively since, at that age, a child's mind works more through imagination and fantasy.

Osmán Ariel Girón, School Principal

By late summer the radio programs were completed and reproduced on CD, and agreements were made with Radio Quiché and Radio Ixil for transmission. The first of the programs were broadcast in early 2002, backed by enthusiastic DJs, pre-school teachers, and parents.

The stories are interesting and will hold the students' attention because of the sound effects. They sound like they are live stories. The students will be more motivated to attend schools because not in all schools do they teach with stories. The technology helps tremendously because without it, it wouldn't have been possible to include the effects.

Pedro Alexander Tuluxan Grijalva, 11th grade student who translated a story from Spanish to K'iche' and recorded the voices

On February 6, 2002, the Proyecto Enlace Quiché presented all of its completed educational products and materials to more than 100 participants, which included USAID and local Ministry of Education officials, school principals and faculty, and, most important, many of the students and teachers who put in all the long hours and hard work to create their masterpieces. Students from the 10th, 11th, and 12th grades smiled proudly as representatives from their schools spoke to the audience and presented their works. The same sentiment was repeated many times by both students and teachers: "It was a lot of hard work, but now that we see the fruits of our labor, we know that it was worth it."

Student teachers in Joyabaj taking a break from school work

2. El Pensamiento de Nuestros Abuelos — Capturing and Re-living Cultural Traditions

To practice applying their newly acquired skills, the students also produced multimedia CD-ROMs containing local cultural information. Each school chose a traditional activity to research, from courtship and marriage to textile weaving traditions. For the storybook project, the students interviewed community elders about customs that were no longer practiced. They re-enacted many of these customs and recorded them using audiocassette recorders and digital still and video cameras. The result is a CD-ROM entitled "El Pensamiento de Nuestros Abuelos," or "Our Grandparents' Thoughts," which tells about these traditions in a multimedia format, including text in the local language and Spanish, photos, video clips, and audio segments containing music and narration.

The project had a significant impact on the students; they're very creative kids, very participatory, and they're even more motivated with the computers….

Miguel Ángel Camajá Cabrera, School Principal, Cunén

Lessons

Neither prior technological skills, large sums of money, nor sophisticated infrastructure is needed to implement an effective educational technology activity. The most important lesson that can be gleaned from this experience is that original educational materials can be created at relatively low cost even in the most remote and resource-poor areas of the world. This type of activity could be replicated easily in almost any context.

Mastering educational technology is empowering. The Guatemala experiences have taught pre- and in-service teachers not only a valuable set of technology-related skills, but also a true sense of empowerment that motivates them to become more involved in their teaching.

Constructivist theories of education lend themselves to educational technology. This activity has employed the constructivist education theories of John Dewey, Jean Piaget, and others, which focuses on student-centered learning, where the teacher acts as facilitator and guide. The theories call for learning to take place in the context of students' actual experiences and realities, making newly acquired knowledge more meaningful and increasing motivation to learn. Increasingly, education scholars are suggesting that technology is integral to constructivism. Multimedia programs are highly visual and interactive, which help motivate students and encourage creativity through the use of graphics, layout, and sound. Moreover, supporters of educational technology believe that teaching in these highly visual, problem-solving environments ensures knowledge transfer to higher order skills.

Technology integration takes time and thorough planning. Due to contractual constraints, the project was carried out in 20 months. Most of the first year

was spent in hiring the staff, planning, training, procuring and installing equipment, leaving just one full school year in which the project worked with the schools. This may not have been sufficient to create lasting change in teachers' behaviors or develop a sustainable administration. Moreover, installing, administering, and making good use of technology centers are complex tasks, and the people involved require continual training and support. The project provided numerous training sessions for project staff, center managers, and participant teachers, which proved essential for success.

Some suggestions to overcome these obstacles include

- incorporating technology at the annual planning stage;
- providing a series of short training sessions at each center;
- keeping a focus on pedagogy and not technology;
- granting awards to teachers who pioneer efforts in technology integration;
- designing simple activities with tangible products;
- buying multimedia laptop computers to take technology into the classroom;
- creating an Intranet site in each school; and
- forming a support network among different schools.

Technology centers must be selected carefully and expectations must be clear. The activity was designed to create four technology centers in four bilingual teacher training schools in the Quiché department. The technology centers were offered to the schools without defining the reciprocal commitment. While a memorandum of understanding (MOU) was written and signed, it was vague. A better approach would have been to carry out a more thorough diagnostic of the schools and develop a more detailed plan in coordination with the teachers. This plan should include the actions to be carried out by the school to prepare for the arrival of the center, the actions to be carried out once the center is installed, and the actions that will be carried out to allow for sustainability and permanent donation of the center. In this way, there is a stronger commitment and less need for negotiation once the center has been created.

The schools were required to provide the building, electrical connections, security, furniture, operating costs, and one computer teacher. These conditions were easily met in all schools. To meet recurring operating costs, each school is charging $3/month per student, and these funds are being set aside solely for the technology center. This amount also can be used to cover the cost of consumables such as paper and toner, as well as the salary of the center manager.

While the original budget specified that eight computers would be purchased for each school, procurement was carried out so that each school had laboratories containing at least twelve computers. However, with class size of 40 to 50 students, it is impractical to hold class in the technology center. Therefore, access to the center is limited. Ideally, future centers should have twenty to twenty-five computers so that an entire class can work in the laboratory at once.

Materials creation projects make good use of the technology but are complicated. The teachers and students were very enthusiastic about the projects organized to create a book and CD-ROM during the 2001 school year. The teachers coordinated actively with each other and the students, and each school carried out its fieldwork and digitized the resulting information (transcribing and translating interviews, digitizing photos, etc.). However, to translate this raw material into finished educational material, many other steps were required. In some cases the schools did not have the specialized skills, such as in radio script writing, editing in both Spanish and Mayan languages, and advanced use of software such as PowerPoint or FrontPage. The project provided some training through workshops, consultants, and the center managers. Unfortunately, in the final production of both the book and CD-ROM, most of the work ended up being done by the project center managers, with the support of the project specialists. Due to a lack of time and skill, students generally were not involved in these final phases. This posed a serious risk to their ability to be able to replicate these activities without direct support from the project.

A technology center can be a financial asset to a school if administered correctly. The project encouraged formation of a technology committee in each school, development of a technology plan, strict control regarding equipment loaned to

students and teachers, financial record-keeping, and preventive maintenance. The center managers worked with principals in these areas, and monitoring visits were made by project staff and USAID personnel. Despite these constant efforts, only one school (Nebaj) showed a real capacity and interest in most of these areas. To institutionalize these changes, the project needed more time and more consistent training and monitoring. This also could help schools create their own strategies to finance the purchase of more computers and other needed accessories rather than hoping that the project will donate more. Building local capacity in preventive and corrective maintenance is especially important to make best use of the center and protect the investment. Obviously, the principal cannot be solely responsible for these issues. The key person is the center manager, who should be a strong facilitator and have a competitive salary and perks, such as the use of a laptop. To avoid overload, the center manager needs an assistant who can carry out many of the routine tasks, including teaching classes.

Community access may not be a priority for schools. The memorandums of understanding signed by each principal included a clause specifying that the schools had to give the community access to the centers and that the fees charged would be used for maintenance of the centers. In Nebaj, this was put into practice, and they have provided valuable services to appreciative community members and generated important funds. In the other centers, the principals' attitudes indicated that they felt this was more of a risk than a benefit. Since their current needs were being met by what the project was giving and what the students pay, there was no need to risk the equipment by bringing in "outsiders." This resulted in sub-utilization of the equipment and less benefit to the community than desired. If a specific project objective is to provide community access, it can be handled in several ways: the center can be managed by a community group other than the school itself, or a more explicit agreement regarding community access should be made at the outset. Also, the project can generate more demand for access in the community by applying social marketing and/or using vouchers for target groups to get them in to the centers.

Because the students occupy the center during most weekdays, the only time left for community access and extra student and teacher access is evenings and weekends. These time slots were seldom used. In two of the centers, voltage drops make the centers unusable during the evening hours. This problem could be solved, but the investment in a generator is high. Weekends easily could be used by staffing the center adequately. In Nebaj, this is being done successfully as the center manager works Saturdays and the assistant works Sundays, keeping the center open seven days a week.

CD-ROM production is complicated on many levels.

- *Platforms should be chosen carefully.* Each of the three CD-ROMs developed by the project specialists used a different platform. "Engrandezcamos Nuestro Pensamiento" is a flashy, visually rich, and highly interactive series of exercises for Mayan language learners. However, since it was developed in VisualBasic, programming time was significant and portability is limited. Moreover, only the project specialist could add more functionality. Even translating the system to another language or refining vocabulary would have to be done by an experienced programmer. In addition, this product cannot be incorporated into a web page. A product of equal or better quality could have been created more quickly and easily using a more favorable environment such as Macromedia Director. A product almost as good could have been developed using Java, which would have greatly increased portability and permitted web access. "Conociendo Nuestro Idioma," a collection of six digitized books, was developed in HTML using FrontPage. In some cases, materials were scanned, others were keyed, and still others were copied and pasted from Word and PageMaker. This was an efficient platform and provided significant flexibility, including the capacity to add interactivity and modify the content. The alternative, Adobe Acrobat, would have permitted faster development but would have limited interactivity. "Así se Ilustra mi Palabra" is a collection of clip-art in JPG format. It is structured in such a way that end-users can extend or translate to other languages as needed.

- *Interactivity is key.* While CD-ROMs allow storage of large amounts of information on one CD, this is of little benefit to target populations who have limited access to technology and where the body of relevant information is limited. However, the value-added interactivity feature was well received — the relatively simple, multiple-choice and fill-in-the-blank exercises included in the Ixil grammar introduction are the highlight of that CD-ROM.
- *Each CD-ROM should be accompanied by a teachers' guide and training on its use.* While a brief teacher's guide is incorporated into each CD-ROM, the guides fall short of providing a full vision of how these products can be used. Teachers experienced in technology integration easily will think of creative and natural ways to incorporate these CD-ROMs into their courses, but teachers new to technology need more guidance.
- *A computer-based system for learning Mayan languages is prestigious to Mayan speakers.* The visual richness and complete multimedia learning experience of "Engrandezcamos Nuestro Pensamiento" has generated much interest. It helps to legitimize K'iche' and Ixil as important written languages and sparks interest in learning the written form. Speakers of the other Mayan languages are anxious for this product to be translated for their languages as well.
- *The most difficult part of the design phase is standardizing the language, vocabulary, spelling, pronunciation, and methodology.* The project included one of the most problematic Mayan languages, K'iche'. It is the most widely spoken, but there is little consensus as to rules for writing the language. The revision process, carried out in coordination with the Academy of Mayan Languages and DIGEBI, the government agency concerned with the bilingual education, produced opinions on translations that contradicted each other as well as the project specialist's views, which caused some discord. Future projects must be better coordinated at the outset, and all content should be prepared, reviewed, validated, and approved before beginning the programming.
- *CD-ROM creation requires significant time and effort.* Each CD had its special challenges. In the case of the electronic books, all the text and links had to be revised. The clip art CD required careful scanning, naming, and organizing of each file. The interactive game CD, "Engrandezcamos Nuestro Pensamiento," required careful recording of thousands of sound files. It was a challenge to find people with the necessary patience and attention to detail to develop acceptable products. Despite a number of revisions, there are still some errors and weaknesses.

It may be that the project should not produce CD-ROMs. Instead, the project could support this capacity in other institutions. Ideally, permanent groups with external expertise in Mayan languages, such as the Academy of Mayan Languages, could create the CDs, with the project helping them through the process. When they have ownership of the product, they will be able to translate to other languages, update as necessary, and so on.

Building a library requires a librarian. The project was charged with building up a resource library in the project office and, later, with providing resource materials to the schools participating in the project. While some materials are readily available, many of the most beneficial are not commercially available, and seeking and acquiring them requires a series of visits, letters, and telephone calls. It is necessary to have one person who actively organizes the material and promotes its use. While these tasks were included as part of the Multilingual Education Specialist's functions, she did not actively tend to the library because work with the centers and the materials creation projects consumed all of her time.

A project web site is a necessity but requires effort to keep up to date. As a demonstration pilot project, it was important for the project to continually promote itself. The web page was an ideal forum to provide basic information and news, both nationally and internationally. The creative materials specialist designed an attractive web site and kept it up to date in addition to her other responsibilities. Project staff did not voluntarily contribute as much information as hoped for. A rule was made that after every event or significant activity, the person responsible would generate some content for the web page. However, this rule was not enforced. With more discipline and organization, the web page easily could become a repository for all project products.

Inauguration of an educational technology center attracts all ages

Mayan student teacher participating in a computer training class

Schools without Internet access can still design a web page and an Intranet site. Each school created a web page, which was published as part of the project's main web site. However, since the schools did not have access to the Internet, they could not see the page and, therefore, were not interested in updating or expanding it. The project considered creating an Intranet site in each school, which would have made the web page available to all students and teachers, but time did not permit implementing the activity.

Brochures and case studies are useful for marketing. The projects created simple brochures every six months or so, describing the project and recent activities. These provided a lost-cost means of selling their ideas of integration of technology and bilingual education. The case studies also provided more detailed data. Having these materials available facilitates responding to the numerous requests for information about the project.

Participation at conferences (including presentations and exhibits)s can give exposure to the project and create prestige and demand. While these events signify an investment in time for preparation, mobilization, etc. they are highlights of the project. They bring recognition to the project, donors, and participants, and they create demand for the services of the project.

Looking Ahead

Since the initial trepidation on the part of the teachers and school directors when the bilingual educational technology centers were first installed, a true blossoming has occurred. A great deal of time and effort has been put into the development of the centers, and there are challenges still to come, including the complete integration of technology tools into all aspects of the curriculum. Yet the outcome of this project is more than a series of CD-ROMs, books, and radio programs. It is an experience that has revolutionized the way these students and instructors learn and teach. These same students will graduate in a year or two and become teachers in rural primary schools. What better teacher than someone who has had the experience of creating learning materials in several forms of media from scratch, materials that are culturally relevant and meaningful to his or her students?

Footnotes

[1] The Guatemala activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

Case Study

Guatemala

Invigorating Mayan Language, Culture, and Education

Bilingual Education

Andrew Lieberman
Andrew Lieberman was the Project Director and Chief-of-Party, El Quiché, Guatemala

This case study about a bilingual education project in Guatemala provides insights and lessons into practical uses of information and communication technologies (ICTs) for training teachers. Though focused on strengthening cultural identity in indigenous Mayan communities by enhancing bilingual and multicultural education, many of the technology applications can be replicated to other geographic settings and cultural contexts.

The pilot project[1] was designed to determine, test, and demonstrate ways in which ICTs can support bilingual education and help preserve and invigorate Mayan language and culture in Guatemala. The project's many objectives included materials creation in print, audio, and CD-ROM for pre-school students; training of pre- and in-service teachers; and ICT support for government agencies, private sector entities, and NGOs.

The project sparked tremendous interest in the uses of technology. Many of the leaders in the bilingual education movement now endorse the need for ICTs. Due to lowering equipment costs and improved telecommunications infrastructure, technology is becoming more accessible, which contributes to the growing interest in applying ICTs as tools to achieve social and educational goals.

This case study shares the lessons and insights learned in Guatemala and focuses on the impetus behind the project and the design and implementation approaches that proved successful—as well as those that did not. Moreover, the study highlights the local production aspect of the activity, an often neglected component of ICT-based initiatives. Based on global experience, the LearnLink project team knew that extending ICT capability in developing countries and

“We are not myths of the past, ruins in the jungle or zoos. We are people and we want to be respected, not to be victims of intolerance and racism.”

Rigoberta Mench'u Tum,
winner of the 1992 Nobel Peace Prize

“[This project] motivates the students... It's important that it is in their native language, which will help them take pride in their language and culture.”

José Guadalupe Perez, Center Manager

communities is most successful when the information and communication results are two-way, both enabling the access and the dissemination of information, knowledge, and wisdom. Through the Guatemala activity, remote Mayan communities produced creative and beautiful materials not only for teaching and learning but also for preserving their culture.

Guatemala: Country Context

Civil war in Guatemala broke out in 1954 when a military coup unseated the country's popularly elected president. Under the military rule that lasted until the mid-1980s, plantation development escalated, especially on lands formerly held by Maya. Rural, indigenous, and mostly illiterate populations suffered from systematic disappearances and massacres, scorched earth practices, and forced migration that resulted in social dislocation and abandonment of cultural traditions and rituals.

Following the end of the war in 1996, the Peace Accords defined a new vision for the country's development process, particularly with regard to the inclusion of the Maya. The Accords respond directly to the historical neglect and under-investment in education for this indigenous population, highlighting the government's new role in fostering economic opportunity, democratic participation, social inclusion, and multicultural understanding.

The objective of LearnLink's work in Guatemala was to contribute to the peace process by strengthening access to quality intercultural bilingual education in the Department (state) of El Quiché. Located in the western highlands of the country, 95 percent of El Quiché's population is rural and indigenous. In 1996, the school enrollment rate was 9.4 percent, compared to 31.2 percent for the whole country and 67 percent for the Department of Guatemala, the national capital. Promotion rates in El Quiché are slightly under 50 percent.

Guatemala is multiethnic, multicultural, and multilingual, with 23 indigenous languages spoken throughout the country. The challenge is to ensure that the country's multilingualism and cultural pluralism is in line with education planning and policy, particularly in the areas most affected by years of armed conflict and social exclusion. Despite important yet limited interventions, many teachers in indigenous areas have little understanding of the local culture, much less ability to communicate in the local language. Even Mayan teachers operating in areas with high indigenous population density still possess limited written language skills and are essentially ill prepared to teach Mayan children in their own languages or using bilingual education pedagogy.

Historically, pre- and in-service teacher training has been inadequate, particularly within the context of active learning and intercultural understanding. Students prepared in Guatemala's teacher training institutions received virtually no training in Mayan language literacy, first and second language learning and bilingual pedagogy, multigrade teaching methods, outreach techniques to bridge the gap between home and school educational environments, pedagogical understanding of Mayan cultural concepts, or operational notions of interculturalism. In addition, there were few educational support materials written in Mayan languages, and those that had been developed were not readily available to teachers or other educators working in the indigenous regions of Guatemala.

In the past few years, a tremendous effort has been made to address some of these shortcomings in the Guatemalan education system. LearnLink is one of those efforts. Using ICTs, LearnLink developed and applied tools for the effective use of educational and communication technology to better prepare bilingual teachers in the Department of El Quiché.

Box 1 — Profile of Juanita

On Juanita's first day of school, she is frightened and does not understand what people are saying. They are speaking Spanish, and she only speaks K'iche,' the Mayan language spoken in Zacualpa, her village in the western highlands of Guatemala. Juanita's parents were reluctant to send her to school, fearing that—as occurred with her older brother and sister—she will learn to favor Spanish over her native language. With no other school in the community, however, they defer to the mainstream Spanish-speaking world to help ensure a better future for their daughter.

Where are the bilingual teachers?

Based in Santa Cruz del Quiché, LearnLink's Proyecto Enlace Quiché, as the activity is known locally, began working in early 2000 to prepare teachers to teach in the local languages of K'iche' and Ixil. Among other activities, four teacher training schools in the region were selected based on their inclination and commitment toward bilingual education. Educational technology centers were installed in these schools — one in Santa Cruz del Quiché and three in the rural villages of Joyabaj, Nebaj, and Cunén. Each center contains at least 12 computers with software and supporting peripherals (printers, scanners, and a CD writer), as well as a digital camera, TV/VCR, video camera, cassette recorder, and a photocopier.

The centers are open before, during, and after school hours so that others in the community may take advantage of the ICTs. Initially supported by project funds provided by USAID and a member of the project's staff, the centers are now financially and administratively independent. Students pay a small annual fee in addition to their other school costs, and outside users are charged an affordable fee for specific services. The schools have integrated the centers into their school budgets and have established funds for expendable supplies, future computer upgrades, and other expenses.

Eventually, as outreach and marketing activities take hold, members of the community at large also will use the education technology centers for personal and professional development purposes.

Together, the activities associated with the Proyecto Enlace Quiché are designed to help preserve and invigorate indigenous languages and culture while paving the way for rural communities to move into the modern, information-based world

Developing Culturally Appropriate Mayan Language Materials

Project staff began their work by collecting, analyzing, and cataloging existing core educational and didactic materials for teaching K'iche' and Ixil. They established a network of individuals and institutions — schools, local NGOs, government institutions, and other USAID projects — to provide the resources. A library of more than 300 books, magazines, journals, and other materials was established in the project office, which forms the foundation for the multimedia learning and reference resources that are being disseminated to the teacher training schools.

Although some educational materials did exist, obstacles such as printing and dissemination costs kept the materials from reaching those who need them most. Too often, the materials remained in warehouses, forgotten and unused. After analyzing the materials they collected, project staff identified gaps in the quality and quantity of information and began working to fill them with a series of CD-ROMs for use in the project's bilingual educational technology centers and other education institutions.

CD-ROMs offer a means of disseminating large quantities of information at low cost (approximately $1 per CD in rural Guatemala). In addition, CD-ROM technology facilitates reproduction of materials because exact copies can be made of the entire contents at very low cost and with equipment that is continually becoming more available in rural Guatemala.

In the interest of reaching the most remote populations, the project's CD-ROMs and other materials have no copyright limitations — anyone may copy and distribute them freely, identifying the sources: USAID/AED/LearnLink/El Quiche project..

Collecting, compiling, and digitizing resources

- *Conociendo Nuestro Idioma – Knowing Our Language* To address the problem of dissemination, several existing and original pedagogy and grammar manuals were put into digital format. This CD-ROM contains a total of six books that support improved bilingual and intercultural education and teacher training, specifically in the languages of K'iche' and Ixil, as follows:
- *Escribiendo K'iche' and Escribiendo Ixil.* These two books, by the Universidad Rafael Landivar's Instituto de Lingüística/RODIPMA, are classic works for teaching Mayan language literacy to Mayan speakers. They cover the alphabet, grammar, punctuation, and dictation exercises and are a key resource for Mayan language teachers. In electronic format, they are used as self-study guides.
- *Gramática Pedagógica Ixil.* Because no teaching guides of this type existed previously, this Ixil grammar book was created by project staff. The electronic format makes it unique among

teaching guides in Guatemala, including 36 interactive exercises that users can work through at their own pace, practicing and conducting self-analysis tests on content comprehension as they progress.

- *Kaqetamaj usik'ixik, utz'ib'axik ri K'iche' Ch'ab'al and Q'ab'il u'j tetz sik'le - tz'ib' uj Ixhil.* DIGEBI, the government agency dedicated to bilingual and intercultural education, is using these books in its current literacy training program for in-service bilingual teachers. In CD-ROM format, they can be used for self-study and to review specific portions of DIGEBI's training program.
- *Manual de Sugerencia de Dinámicas que Apoyan mi Trabajo.* This manual, written by the Proyecto de la Niña/World Learning, was designed to help monolingual and bilingual teachers engage in more participative teaching methods in their classrooms, with a special emphasis on involving girls. Because it is in digital format, the user has the advantage of being able to review the entire content, adapt it to the specifics of his or her classroom, and print only those sections that are needed.

Engrandezcamos Nuestro Pensamiento – Let's Broaden our Thinking

Designed by the project's creative materials and multilingual education specialists, this CD-ROM is rich in fun and informative interactive games, making it one of the most popular multimedia packages for learning K'iche' and Ixil in the centers. Its main objective is to help bilingual (Spanish and K'iche' or Ixil) pre-service teachers improve their reading, writing, and listening comprehension skills in their own Mayan language. A series of games and exercises include introductions to the K'iche' and Ixil alphabets and pronunciation guides of all the sound combinations with visual and aural examples. The games also contain listening samples comparing K'iche' and Ixil sounds with Spanish sounds. A vocabulary list of the colors includes games that become progressively more difficult. Lastly, a series of games covers letters and sounds that are specific to each language. Designed for individual, self-paced instruction, the CD also includes a teacher's guide, which helps Mayan language teachers use it as an integral part of a complete course. In-service teachers also can easily replicate the content and use it in their primary school classrooms, designing their lesson plans and selecting specific games depending on the needs of their students.

Box 2 — Teacher Training Schools: Joyabaj and Nebaj

Joyabaj

Joyabaj encompasses not only the ancient town that pre-dates Spanish colonization, but also several hamlets and farms in the surrounding countryside. With a population of approximately 45,000, the area is located in the rugged mountainous area just west of the departmental capital of Santa Cruz del Quiché. Founded in 1993, Joyabaj's teacher training school—Instituto Privado Mixto Joyabaj—was established to address the scarcity of qualified primary school teachers in the area. Only 13 students attended the school during the first year, but by 2001, enrollment had reached 140.

Nebaj

The town of Nebaj is in the northwest of El Quiché, due north of the departmental capital. Unlike the other towns in which the project has worked, Nebaj is primarily Ixil speaking rather than K'iche'. With a population of over 56,000, the Nebaj region includes small villages, hamlets, and farms and is reachable only by dirt road. The terrain is mountainous, and the area receives abundant rainfall, making it lush and green year-round.

The Instituto Mixto Diversificado Ixil was founded in 1998 to try and meet the growing educational needs of the area, with a special focus on bilingual and multicultural education. During the school's first year of operation, 64 students were enrolled. Since then, enrollment has grown at an ever increasing rate, with 288 students by 2001.

Así se Ilustra mi Palabra – Illustrating my Words

When project staff and pre- and in-service teachers began the task of designing original educational materials to meet the needs of bilingual and intercultural instruction, they found that illustrating their materials with existing clip-art was inadequate. The project hired a graphic design firm to illustrate a database of culturally relevant vocabulary words in K'iche', Ixil, and Spanish. This CD-ROM contains 3000 illustrated vocabulary words, including those describing traditional Mayan rituals, foods, beliefs, clothing, and more. A valuable resource for educators involved in bilingual and intercultural teaching in these languages, the database can be used by individual teachers to create illustrated worksheets for teaching spelling to primary school students. Government agencies like DIGEBI can use the database to illustrate existing and future pedagogical guides. Moreover, the same illustrations can be used for all 23 Mayan languages throughout Guatemala.

Teachers and students create their own educational materials

As part of this activity, the teacher training schools were tasked with creating their own set of culturally appropriate educational materials. These assignments seemed daunting at first. Teachers and school administrators, already overworked, were reluctant to take on the extra work of learning how to use the computers and other technology tools. Several teachers expressed feelings of intimidation toward the technology and initially thought they would have to spend an entire school year only learning basic software. In addition, they were uncomfortable with showing their lack of computer knowledge in front of their students. They were assured by project staff that learning to manage the computers and software would come naturally as they launched their materials creation projects. After a series of workshops providing hands-on learning, this temerity all but vanished, and the teachers and their students dove into their projects with great enthusiasm

1. Florezcan las Palabras de los Hombres de Maíz (Pre-school Materials) One of the project's objectives was to enable Maya children from the region to begin their schooling in their native language, an unprecedented opportunity in the history of Guatemalan education.

Box 3

Teacher Training Schools: Cunén and Santa Cruz del Quiché

Cunén

In the 17th century, the town of Cunén grew out of a number of scattered farms and hamlets into a municipality that functioned largely as a governing center for the Spaniards. The town is located northwest of Santa Cruz del Quiché and is accessible only by dirt road. A highly mountainous region, the actual town is nestled in one of the region's many shaded valleys. Founded in 1998 to develop a bilingual education curriculum, the school Colegio Mixto Bilingüe Intercultural Hermano Oscar Asmitia opened, after two years of negotiations, with the support of the municipal government and local education officials. Nearly 125 students have been involved in the project, with over half speaking only K'iche'.

Santa Cruz del Quiché

Santa Cruz del Quiché is the capital city of the department, with a population of 20,000. Located approximately 164 km from the national capital, Santa Cruz is considered the major metropolitan area in this rural department, complete with markets, restaurants, hotels, a public transportation hub, and an Internet café.

Unlike the other three schools, Instituto Normal Mixto Juan de León Juan is owned and operated by the government and has large student body of over 800. Founded in 1960, the school's mission is to train primary school teachers. Juan de León does not have a strong bilingual education program, but the technology centers have provided the school with a good introduction to the concept.

“We now have a book on local traditions, which we never expected to have. We want to move forward and create more books... with games, poems, and other Mayan literature.”

Miguel Ángel Camajá Cabrera, School Principal, Cunén

Bilingual illustrated storybook in Spanish and Mayan languages in Guatemala.

Recognizing that cultural identity, like other fundamental learning, is developed in the early years, a key component of the El Quiché activity is the production of early childhood development materials in K'iche' and Ixil. Specifically, the project called for researching, collecting, preserving—and thereby validating—traditional Mayan language stories, songs, and poems by producing packaged radio programs for young children for airing on local stations. Audio CDs of the programs also have been produced and distributed to pre-schools throughout El Quiché, thereby enabling a multimedia educational experience for children even where there is no electricity. (Battery-powered CD players are readily available.) Accompanying the audio collection is a set of illustrated print storybooks that were produced by the pre- and in-service teachers at each of the teacher training schools.

With assistance from project staff, pre- and in-service teachers began by documenting oral histories from the elders in their communities and, with the technology tools in the centers, using these stories to create educational materials for pre-school children. As a first step, the pre-service teachers and their instructors received a series of training sessions in computer use, audiovisual production, desktop publishing applications, and most important, field research and interviewing techniques.

Armed with digital cameras, cassette recorders, and great enthusiasm, the students split up into groups and went into surrounding villages to seek out elders who would share their stories. A great number of stories were recorded, and then began the challenging work of transcribing them onto paper and translating them into Spanish. By mid-year the students had completed their field investigation for the storybooks, but they were not sure how to proceed in creating usable pre-school materials from this oral tradition. Project staff and consultants conducted a series of workshops for the students and their teachers on the practical principles of graphic design and layout as well as techniques for capturing oral history and converting it into a printable format.

The students began creating original illustrations for the stories and continued the difficult job of transcribing and translating these stories, which had previously never been put to paper. The best stories were selected, and staff from the project and each school worked with professional editors in Spanish, K'iche', and Ixil to polish the content. Using Microsoft Word and Adobe PageMaker, the students learned to design and format the books, not only ensuring that they would have a professional look and content, but also giving the schools a sense of ownership and pride in their accomplishments. The students decided to entitle their books “Florezcan las Palabras de los Hombres de Maíz” or “The Blossoming of our Ancestors' Words.” The final layout was completed at the end of the school year and 1000 copies of each book were printed in 2002, and disseminated throughout the department.

While the storybooks were being written, edited, illustrated, and designed, project staff and consultants were preparing for another, related task. Using existing equipment and resources, the students and teachers launched another challenging activity to turn their bilingual educational technology centers into recording studios. With support from the project, groups of students and teachers at each school wrote scripts based on the stories. They acted and recorded each part—in Spanish and K'iche' or Ixil, depending on location—and added sound effects, then mixed and edited the programs on the center computers. The finished products were recorded on CDs, and accompanying lesson plans were developed for use by pre-school teachers. DIGEBI, the government agency dedicated to bilingual and intercultural education, recommended local bilingual pre-schools where the programs could be piloted.

[The project] is good because it's enriched by a number of technical elements such as sound effects, voices, dramatization, and radio acting that allow the children to imagine and visualize the scenes. This enables them to learn more efficiently and effectively since, at that age, a child's mind works more through imagination and fantasy.

Osmán Ariel Girón, School Principal

By late summer the radio programs were completed and reproduced on CD, and agreements were made with Radio Quiché and Radio Ixil for transmission. The first of the programs were broadcast in early 2002, backed by enthusiastic DJs, pre-school teachers, and parents.

The stories are interesting and will hold the students' attention because of the sound effects. They sound like they are live stories. The students will be more motivated to attend schools because not in all schools do they teach with stories. The technology helps tremendously because without it, it wouldn't have been possible to include the effects.

Pedro Alexander Tuluxan Grijalva, 11th grade student who translated a story from Spanish to K'iche' and recorded the voices

On February 6, 2002, the Proyecto Enlace Quiché presented all of its completed educational products and materials to more than 100 participants, which included USAID and local Ministry of Education officials, school principals and faculty, and, most important, many of the students and teachers who put in all the long hours and hard work to create their masterpieces. Students from the 10th, 11th, and 12th grades smiled proudly as representatives from their schools spoke to the audience and presented their works. The same sentiment was repeated many times by both students and teachers: "It was a lot of hard work, but now that we see the fruits of our labor, we know that it was worth it."

Student teachers in Joyabaj taking a break from school work

2. El Pensamiento de Nuestros Abuelos — Capturing and Re-living Cultural Traditions

To practice applying their newly acquired skills, the students also produced multimedia CD-ROMs containing local cultural information. Each school chose a traditional activity to research, from courtship and marriage to textile weaving traditions. For the storybook project, the students interviewed community elders about customs that were no longer practiced. They re-enacted many of these customs and recorded them using audiocassette recorders and digital still and video cameras. The result is a CD-ROM entitled "El Pensamiento de Nuestros Abuelos," or "Our Grandparents' Thoughts," which tells about these traditions in a multimedia format, including text in the local language and Spanish, photos, video clips, and audio segments containing music and narration.

The project had a significant impact on the students; they're very creative kids, very participatory, and they're even more motivated with the computers….

Miguel Ángel Camajá Cabrera, School Principal, Cunén

Lessons

Neither prior technological skills, large sums of money, nor sophisticated infrastructure is needed to implement an effective educational technology activity. The most important lesson that can be gleaned from this experience is that original educational materials can be created at relatively low cost even in the most remote and resource-poor areas of the world. This type of activity could be replicated easily in almost any context.

Mastering educational technology is empowering. The Guatemala experiences have taught pre- and in-service teachers not only a valuable set of technology-related skills, but also a true sense of empowerment that motivates them to become more involved in their teaching.

Constructivist theories of education lend themselves to educational technology. This activity has employed the constructivist education theories of John Dewey, Jean Piaget, and others, which focuses on student-centered learning, where the teacher acts as facilitator and guide. The theories call for learning to take place in the context of students' actual experiences and realities, making newly acquired knowledge more meaningful and increasing motivation to learn. Increasingly, education scholars are suggesting that technology is integral to constructivism. Multimedia programs are highly visual and interactive, which help motivate students and encourage creativity through the use of graphics, layout, and sound. Moreover, supporters of educational technology believe that teaching in these highly visual, problem-solving environments ensures knowledge transfer to higher order skills.

Technology integration takes time and thorough planning. Due to contractual constraints, the project was carried out in 20 months. Most of the first year

was spent in hiring the staff, planning, training, procuring and installing equipment, leaving just one full school year in which the project worked with the schools. This may not have been sufficient to create lasting change in teachers' behaviors or develop a sustainable administration. Moreover, installing, administering, and making good use of technology centers are complex tasks, and the people involved require continual training and support. The project provided numerous training sessions for project staff, center managers, and participant teachers, which proved essential for success.

Some suggestions to overcome these obstacles include

- incorporating technology at the annual planning stage;
- providing a series of short training sessions at each center;
- keeping a focus on pedagogy and not technology;
- granting awards to teachers who pioneer efforts in technology integration;
- designing simple activities with tangible products;
- buying multimedia laptop computers to take technology into the classroom;
- creating an Intranet site in each school; and
- forming a support network among different schools.

Technology centers must be selected carefully and expectations must be clear. The activity was designed to create four technology centers in four bilingual teacher training schools in the Quiché department. The technology centers were offered to the schools without defining the reciprocal commitment. While a memorandum of understanding (MOU) was written and signed, it was vague. A better approach would have been to carry out a more thorough diagnostic of the schools and develop a more detailed plan in coordination with the teachers. This plan should include the actions to be carried out by the school to prepare for the arrival of the center, the actions to be carried out once the center is installed, and the actions that will be carried out to allow for sustainability and permanent donation of the center. In this way, there is a stronger commitment and less need for negotiation once the center has been created.

The schools were required to provide the building, electrical connections, security, furniture, operating costs, and one computer teacher. These conditions were easily met in all schools. To meet recurring operating costs, each school is charging $3/month per student, and these funds are being set aside solely for the technology center. This amount also can be used to cover the cost of consumables such as paper and toner, as well as the salary of the center manager.

While the original budget specified that eight computers would be purchased for each school, procurement was carried out so that each school had laboratories containing at least twelve computers. However, with class size of 40 to 50 students, it is impractical to hold class in the technology center. Therefore, access to the center is limited. Ideally, future centers should have twenty to twenty-five computers so that an entire class can work in the laboratory at once.

Materials creation projects make good use of the technology but are complicated. The teachers and students were very enthusiastic about the projects organized to create a book and CD-ROM during the 2001 school year. The teachers coordinated actively with each other and the students, and each school carried out its fieldwork and digitized the resulting information (transcribing and translating interviews, digitizing photos, etc.). However, to translate this raw material into finished educational material, many other steps were required. In some cases the schools did not have the specialized skills, such as in radio script writing, editing in both Spanish and Mayan languages, and advanced use of software such as PowerPoint or FrontPage. The project provided some training through workshops, consultants, and the center managers. Unfortunately, in the final production of both the book and CD-ROM, most of the work ended up being done by the project center managers, with the support of the project specialists. Due to a lack of time and skill, students generally were not involved in these final phases. This posed a serious risk to their ability to be able to replicate these activities without direct support from the project.

A technology center can be a financial asset to a school if administered correctly. The project encouraged formation of a technology committee in each school, development of a technology plan, strict control regarding equipment loaned to

students and teachers, financial record-keeping, and preventive maintenance. The center managers worked with principals in these areas, and monitoring visits were made by project staff and USAID personnel. Despite these constant efforts, only one school (Nebaj) showed a real capacity and interest in most of these areas. To institutionalize these changes, the project needed more time and more consistent training and monitoring. This also could help schools create their own strategies to finance the purchase of more computers and other needed accessories rather than hoping that the project will donate more. Building local capacity in preventive and corrective maintenance is especially important to make best use of the center and protect the investment. Obviously, the principal cannot be solely responsible for these issues. The key person is the center manager, who should be a strong facilitator and have a competitive salary and perks, such as the use of a laptop. To avoid overload, the center manager needs an assistant who can carry out many of the routine tasks, including teaching classes.

Community access may not be a priority for schools. The memorandums of understanding signed by each principal included a clause specifying that the schools had to give the community access to the centers and that the fees charged would be used for maintenance of the centers. In Nebaj, this was put into practice, and they have provided valuable services to appreciative community members and generated important funds. In the other centers, the principals' attitudes indicated that they felt this was more of a risk than a benefit. Since their current needs were being met by what the project was giving and what the students pay, there was no need to risk the equipment by bringing in "outsiders." This resulted in sub-utilization of the equipment and less benefit to the community than desired. If a specific project objective is to provide community access, it can be handled in several ways: the center can be managed by a community group other than the school itself, or a more explicit agreement regarding community access should be made at the outset. Also, the project can generate more demand for access in the community by applying social marketing and/or using vouchers for target groups to get them in to the centers.

Because the students occupy the center during most weekdays, the only time left for community access and extra student and teacher access is evenings and weekends. These time slots were seldom used. In two of the centers, voltage drops make the centers unusable during the evening hours. This problem could be solved, but the investment in a generator is high. Weekends easily could be used by staffing the center adequately. In Nebaj, this is being done successfully as the center manager works Saturdays and the assistant works Sundays, keeping the center open seven days a week.

CD-ROM production is complicated on many levels.

- *Platforms should be chosen carefully.* Each of the three CD-ROMs developed by the project specialists used a different platform. "Engrandezcamos Nuestro Pensamiento" is a flashy, visually rich, and highly interactive series of exercises for Mayan language learners. However, since it was developed in VisualBasic, programming time was significant and portability is limited. Moreover, only the project specialist could add more functionality. Even translating the system to another language or refining vocabulary would have to be done by an experienced programmer. In addition, this product cannot be incorporated into a web page. A product of equal or better quality could have been created more quickly and easily using a more favorable environment such as Macromedia Director. A product almost as good could have been developed using Java, which would have greatly increased portability and permitted web access. "Conociendo Nuestro Idioma," a collection of six digitized books, was developed in HTML using FrontPage. In some cases, materials were scanned, others were keyed, and still others were copied and pasted from Word and PageMaker. This was an efficient platform and provided significant flexibility, including the capacity to add interactivity and modify the content. The alternative, Adobe Acrobat, would have permitted faster development but would have limited interactivity. "Así se Ilustra mi Palabra" is a collection of clip-art in JPG format. It is structured in such a way that end-users can extend or translate to other languages as needed.

- *Interactivity is key.* While CD-ROMs allow storage of large amounts of information on one CD, this is of little benefit to target populations who have limited access to technology and where the body of relevant information is limited. However, the value-added interactivity feature was well received — the relatively simple, multiple-choice and fill-in-the-blank exercises included in the Ixil grammar introduction are the highlight of that CD-ROM.
- *Each CD-ROM should be accompanied by a teachers' guide and training on its use.* While a brief teacher's guide is incorporated into each CD-ROM, the guides fall short of providing a full vision of how these products can be used. Teachers experienced in technology integration easily will think of creative and natural ways to incorporate these CD-ROMs into their courses, but teachers new to technology need more guidance.
- *A computer-based system for learning Mayan languages is prestigious to Mayan speakers.* The visual richness and complete multimedia learning experience of "Engrandezcamos Nuestro Pensamiento" has generated much interest. It helps to legitimize K'iche' and Ixil as important written languages and sparks interest in learning the written form. Speakers of the other Mayan languages are anxious for this product to be translated for their languages as well.
- *The most difficult part of the design phase is standardizing the language, vocabulary, spelling, pronunciation, and methodology.* The project included one of the most problematic Mayan languages, K'iche'. It is the most widely spoken, but there is little consensus as to rules for writing the language. The revision process, carried out in coordination with the Academy of Mayan Languages and DIGEBI, the government agency concerned with the bilingual education, produced opinions on translations that contradicted each other as well as the project specialist's views, which caused some discord. Future projects must be better coordinated at the outset, and all content should be prepared, reviewed, validated, and approved before beginning the programming.
- *CD-ROM creation requires significant time and effort.* Each CD had its special challenges. In the case of the electronic books, all the text and links had to be revised. The clip art CD required careful scanning, naming, and organizing of each file. The interactive game CD, "Engrandezcamos Nuestro Pensamiento," required careful recording of thousands of sound files. It was a challenge to find people with the necessary patience and attention to detail to develop acceptable products. Despite a number of revisions, there are still some errors and weaknesses.

It may be that the project should not produce CD-ROMs. Instead, the project could support this capacity in other institutions. Ideally, permanent groups with external expertise in Mayan languages, such as the Academy of Mayan Languages, could create the CDs, with the project helping them through the process. When they have ownership of the product, they will be able to translate to other languages, update as necessary, and so on.

Building a library requires a librarian. The project was charged with building up a resource library in the project office and, later, with providing resource materials to the schools participating in the project. While some materials are readily available, many of the most beneficial are not commercially available, and seeking and acquiring them requires a series of visits, letters, and telephone calls. It is necessary to have one person who actively organizes the material and promotes its use. While these tasks were included as part of the Multilingual Education Specialist's functions, she did not actively tend to the library because work with the centers and the materials creation projects consumed all of her time.

A project web site is a necessity but requires effort to keep up to date. As a demonstration pilot project, it was important for the project to continually promote itself. The web page was an ideal forum to provide basic information and news, both nationally and internationally. The creative materials specialist designed an attractive web site and kept it up to date in addition to her other responsibilities. Project staff did not voluntarily contribute as much information as hoped for. A rule was made that after every event or significant activity, the person responsible would generate some content for the web page. However, this rule was not enforced. With more discipline and organization, the web page easily could become a repository for all project products.

Inauguration of an educational technology center attracts all ages

Mayan student teacher participating in a computer training class

Schools without Internet access can still design a web page and an Intranet site. Each school created a web page, which was published as part of the project's main web site. However, since the schools did not have access to the Internet, they could not see the page and, therefore, were not interested in updating or expanding it. The project considered creating an Intranet site in each school, which would have made the web page available to all students and teachers, but time did not permit implementing the activity.

Brochures and case studies are useful for marketing. The projects created simple brochures every six months or so, describing the project and recent activities. These provided a lost-cost means of selling their ideas of integration of technology and bilingual education. The case studies also provided more detailed data. Having these materials available facilitates responding to the numerous requests for information about the project.

Participation at conferences (including presentations and exhibits)s can give exposure to the project and create prestige and demand. While these events signify an investment in time for preparation, mobilization, etc. they are highlights of the project. They bring recognition to the project, donors, and participants, and they create demand for the services of the project.

Looking Ahead

Since the initial trepidation on the part of the teachers and school directors when the bilingual educational technology centers were first installed, a true blossoming has occurred. A great deal of time and effort has been put into the development of the centers, and there are challenges still to come, including the complete integration of technology tools into all aspects of the curriculum. Yet the outcome of this project is more than a series of CD-ROMs, books, and radio programs. It is an experience that has revolutionized the way these students and instructors learn and teach. These same students will graduate in a year or two and become teachers in rural primary schools. What better teacher than someone who has had the experience of creating learning materials in several forms of media from scratch, materials that are culturally relevant and meaningful to his or her students?

Footnotes

[1] The Guatemala activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

Case Study

Morocco

Modernizing Teacher Training

Houcine Haichour
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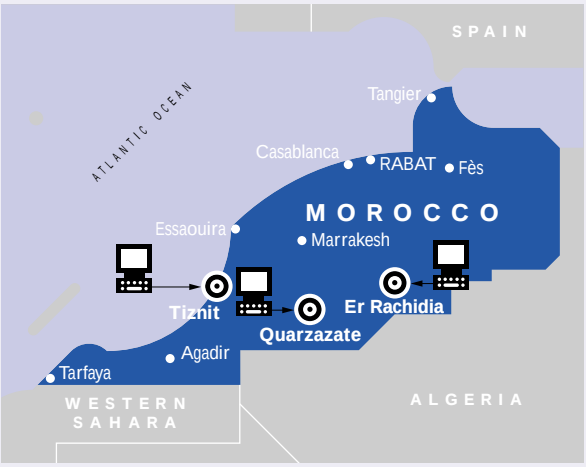
Over the last couple of years, teacher training colleges in developing countries have begun investing in information and communication technologies (ICTs) as a means for improving pre- and in-service teacher training. While research documenting the nature and impact of these initiatives in many regions of the world is increasingly available, little is known about the use of ICTs in teacher training settings in any of the countries of the Middle East and North Africa (MENA) region.

This paper is designed to help fill that gap. A case study of a USAID-funded educational technology intervention, the Computer-Assisted Teacher Training (CATT) project sought to harness the power of ICTs to accompany the government of Morocco's efforts to improve the quality of public education in the most impoverished rural areas of the country.

According to an external evaluation, CATT was an exemplary activity able to meet the high expectations of its different partners (Dahbi, 2001). With its innovative design, participatory mechanisms, and the quality of outputs it managed to deliver, CATT demonstrated that an activity designed in a bottom-up, participatory manner can achieve significant development results. This is the story of how a small project with a short implementation time and modest budget, in a country with scarce resources, achieved those results.


SPAIN
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Casablanca
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MOROCCO
Essaouira
Marrakesh
Tiznit
Er Rachidia
Quarzazate
Agadir
Tarfaya
WESTERN SAHARA
ALGERIA

Morocco: Country context

Morocco is a country of striking social disparities. Though classified as a middle income country, with a population approaching 30 million and a per capita income of only $1,250 in 1999, its poverty indicators are closer to those of low income than comparable middle income countries. Poverty in Morocco cuts across the rural-urban and gender divides, with rural women the most affected segment of the population.

In the 1990s, 19 per cent of the total Moroccan population lived on less than one dollar per day, while another 45 per cent was vulnerable to poverty during periods of drought. The incidence of poverty among the rural population is particularly acute: in 1998-99 more than one fourth of the population living in the rural areas was poor, compared to one tenth in urban areas. In 2000, only 42 per cent of the population in rural areas had access to safe water, and only 45 per cent of villages had electricity. In 1997, maternal mortality was 307 per 100, 000 births in rural areas compared to 125 in towns and cities.

Despite significant spending on education (6% of GDP), both quality and coverage remain weak. Illiteracy in the country is very high (52 percent), especially among rural women. Seventy-five per cent of rural girls aged 15-24 are illiterate compared to 23 percent in urban areas. Similarly, although school enrollment is increasing, 2.5 million children, a majority of them rural girls, still do not attend school. Quality is also an issue as evidenced by poor retention rates at schools: 25 per cent of children drop out before 5th grade, and only 10 per cent make it to the 11th grade.

Priorities of the New King

To address these serious social challenges, Morocco embarked on a process of unprecedented political, economic, and social reforms. These reforms gained momentum with the ascension to the throne in July 1999 of a new king, Mohammed VI, after the death of his father Hassan II. The new king projected the image of a modest monarch close to the people, which has earned him the title of "the king of the poor." Over the last three years, the Monarch has adopted policies to reduce poverty and made gender awareness, access to technology, participation, and governance, development priorities. In addition, the King has emphasized the role of civil society and NGOs as necessary partners in the development process. In light of these political openings, Morocco also has witnessed the rise of the media as a powerful component of the democratization process.

The Education Decade

Mohammed VI declared the ten-year period 1999-2009 to be "the education decade," adopting The Education Charter as the key document guiding the country's initiatives in the education sector during this decade. Formulated by the Royal Commission for Education (COSEF), the charter proposes a set of initiatives to overhaul the educational system, including leveraging the power of information and communication technologies (ICTs) to improve teaching, learning, networking, access to information, and professional development programs in the rural areas of the country.

Guided by the Charter, the Moroccan Ministry of Education developed twelve quality improvement plans including one focused primarily on the roll-out of educational technology. Under Plan 2008: *Un Center-Multimedia-Internet,* all schools would receive computers and connectivity within eight years. The priorities in the first year included the teacher training institutions for primary and secondary education and primary schools of significant size.

Encouraging the Ministry of Education's ICT initiatives is a successful liberalization and privatization policy in the telecommunication sector. The policy triggered a major reduction in communication prices, which led, among other things, to the mushrooming of cyber cafés even in the very smallest towns in the country. Although the number of telephone lines (116 per 1000) and personal computers (21.1 per 1000 people) continues to be low, it is evident that the number of people accessing the Internet through the numerous cyber cafés is high.

USAID Supports Educational Reforms

To accompany Morocco's efforts to improve the quality of education, USAID launched the Computer-Assisted Teacher Training (CATT) Project in 1999.[1] Part of USAID/Morocco's response to the Presidential Internet for Economic Development Initiative (IED), the pilot project initially targeted teacher training colleges *(Centre de Formation d'Institeurs et d'Institurices,* or CFIs) in seven provinces where girls' enrollment is low and retention rates are below the national average. The provinces included Errachidia, Al-Hoceima, Essaouira, Ouarzazate, Sidi Kacem, Taroudant, and Tiznit.

The project's primary objectives were the following:

- Equipping the CFIs with the necessary hardware

http://www.ibtikar.ac.ma

Technical staff

(6 PCs) and software;

- Creating a network of seven CFIs via the Internet;
- Training 70 CFI instructors and 490 student teachers on ICT educational applications; and
- Developing a community web site devoted to pedagogical innovation and experimentation among educators.

By the end of the project, CATT had met all its objectives. It managed to create high quality multimedia centers in the teacher training colleges, develop an integrated technology curriculum, design seven training modules to implement the curriculum, training over 1500 participants (Dahbi, 2001), and develop *Ibtikar* (Arabic for "innovation"), a web site dedicated to pedagogical issues in the country. Above all, the project created a dynamic learning environment that fosters collaboration (Dahbi, 2001, p.26) and critical inquiry (Coupe and Haichour, 2002).

Virtually all the project's stakeholders viewed CATT as a success, including the Moroccan Ministry of Education, which has generalized some of the project's materials and approach to other training institutions in the country.

Learning from Morocco

A number of factors contributed to CATT's success. The following sections discuss the design elements and implementation approaches that worked, as well as the key lessons learned from applying educational technology in a student-centered, low-tech environment.

Participation is Key to Appropriation

CATT was demand-driven. Through participatory mechanisms set up at both the central ministry and the local teacher training college level, CATT was able to respond flexibly to the different needs of its partners. As stakeholders became more involved in the project and familiar with its potential and constraints, they were able to orient it in the direction that best fit their goals for the project. This proved to be essential for the project's ultimate acceptance at both levels.

At the beginning, the general belief among CATT's stakeholders was that educational technology was about equipment. One of the CATT team's primary tasks was to enrich this technology-centered vision by incorporating into it explicit pedagogical and professional development concerns. Requesting the participation of all stakeholders in the process of designing and implementing the project resulted in the creation of two committees: *Commité de Pilotage* and *Commité Pedagogique*. The role of the project team was to provide these committees with information related to educational technology, which it achieved through a variety of means, including

- summarizing relevant educational literature;
- presenting cases of good practice;
- providing information on the implications of the different connectivity options;
- raising issues of certification, maintenance, and sustainability;

- providing input on the design of educational technology needs assessments; and
- presenting frameworks for the integration of educational technology in limited infrastructure environments.

Through these "consciousness-raising" exercises, CATT was able to empower its partners by filling critical knowledge gaps. As CATT's partners grew more knowledgeable about the different facets of educational technology, they were able to orient the project in the direction that best fit their needs. The function of the project was simply to respond to these needs.

Periodic meetings of CATT stakeholders prompted important debates about both CATT and the official educational technology program underway nationwide. Gradually, a consensus started to emerge among all the stakeholders that an integrated vision of educational technology, which included technical, organizational, pedagogic, and professional development components, should provide the basis for the ministry's efforts to generalize the use of ICTs throughout the country.

At the local level, CATT encouraged the formation of informal committees that included instructors, student teachers, and administrators. These committees managed the multimedia centers and provided staff with feedback about issues affecting the project. Knowledgeable about the local realities in their schools, the committees were able to adapt and direct the program to meet their needs. Their engagement in this manner also enabled the local stakeholders to develop a sense of ownership of the project and a commitment to its success.

Without the participation of all stakeholders in the design and implementation of the project, it could not have achieved its widespread success. Engaging stakeholders at all levels ensured their support, their ideas and insights, and their personal stake in the activity. It also helped to solve the inevitable problems that arose during the course of implementation. Participation was key to appropriation.

Power, Gender, and Role Swapping

Given the alarming disparities in the educational opportunities offered to men and women in rural Morocco, specific accommodations were necessary to ensure that women benefited from the CATT project. At the outset, project staff requested that all the core training teams include female instructors and female teacher trainees. Through the online educational technology placement test, project managers were able to monitor the number of females participating in the training in each college. In the early days of the project, more than one third of the project participants were women, and the percentage increased even more as the project reached its second year.

The presence of women on the *"Ibtikar"* team triggered some important disturbances in the power relationships in the teacher training colleges. In some colleges, competent female students assumed the role of lead trainers, whose audience included their own male teachers. In a generally male-dominated teacher centered context, the "ascension" of female students to this position represented a radical shift from the traditions prevalent in these rural areas of the country. According to a male teacher in Ouarzazate, this swapping of roles between female students and their male teachers made him acknowledge the value of his own students' knowledge and rethink his teacher-centered practices in the classroom. Indeed, throughout CATT's lifetime, "disturbances" of this type proved more important for introducing pedagogical changes from teacher-centered pedagogy to a learner-centered pedagogy than any explicit teaching about it.

In some teacher training colleges, women not only proved to be excellent technology trainers, but also excellent managers. In many of these centers, women served as catalysts for the major changes taking place in the institutions. Though they operated in an environment that is generally hostile to women, most were able to turn their multimedia centers into community centers, where both students and members of the community learn. In a country where teacher training colleges have been divorced from the concerns of the community, for women to take the lead on this issue represents an event worthy of headline news.

In some teacher training colleges, women have appropriated the technology to display their own artistic achievements. In Ouarzazate, Nezha Boufki and Karima N'Gadi, two student teachers are using their school web site as a "cyber gallery" to display their own paintings. In a town where galleries are non-existent and where the women artists are invisible, the Web is offering these student teachers a new space for asserting themselves and, hopefully, gaining financial rewards in the future.

Zaina Amagour, a student teacher (second from left)

Box 1

Profile: Latifa Amlal

Latifa Amlal is a young trainee in the teacher training college in Ouarzazate. Like most of the female student teachers in the region, Latifa comes from a conservative family. During her years at a technical high school, she acquired relatively advanced computer skills, which earned her the respect of her teachers and peers alike. Accordingly, she was selected to be a core member of the Ibtikar team when she joined the college in Ouarzazate. For the first time in her life, she was invited to participate in a training workshop in the remote city of Rabat. Her presence as a full member of the core Ibtikar team, on a par with her own teachers, was a source of pride for the shy, young student. In a very short period of time, Latifa was able to train over 50 students and teachers in the college. Moreover, through CATT, she was able to combine the pedagogical training she was receiving in the college with her computer skills to assert herself as an excellent teacher.

Box 2

Profile: Zaina Amagour

Zaina Amagour is a young Berber woman from the small, conservative town of Tiznit, located in the south of Morocco. When she was recruited by the project to serve as a full-time technology advisor, Zaina had no management experience; nor had she served as a technology trainer for large audiences. After a quick acculturation process in the teacher training college, Zaina was able to negotiate the power relationships with the experienced administrative and teaching staff at the college. Thanks to her strong personality and excellent communication skills, she quickly asserted herself as a valuable resource person. Zaina participated actively in running the multimedia center: she was able to set up flexible schedules for the students and teachers, accommodate the CATT project to the local realities, design and develop a web site for the college, and train scores of students and teachers. On her own initiative, Zaina led an information campaign in her community about the services of her multimedia center. She succeeded in convincing the pharmacists in her town of the importance of signing up for the technology training classes she was offering. As a result, non-teaching members of the community were able to use the teacher training college, for the first time, for professional development purposes.

Student Teachers as Technology Champions

One of the major factors contributing to CATT's success was that it tapped into the competencies of all its stakeholders, including the very young student body in the teacher training colleges. Despite an official discourse that emphasizes the role of the youth in development, the official pedagogical interventions in these teacher training colleges generally had focused on the instructors. CATT adopted a different approach. At the outset, project staff requested the inclusion of student teachers in all the core training teams in all the training colleges. The goal was to demonstrate to the Ministry of Education that the teacher trainees are valuable assets, who could help expedite the introduction of technology in remote regions—without the need for costly computer training firms. In a country with limited financial resources, this option could prove to be highly cost effective. Moreover, by encouraging students to be members of the core teams, the project also hoped to nurture a new culture in the colleges that values students' competencies and skills.

Box 3

Profile: Said El Haj

Said El Haj is a bright student teacher in the college in Taroudant, a small town in southern Morocco. He represents a generation of young Moroccans who have been exposed to the modern information and communication technologies of cellular phones and satellite television since an early age. When the first privately owned cyber café opened up in his small town, Said was one of the first to visit. His intellectual curiosity led him to embark on an online learning journey through which he was able to master programming languages, web publishing tools, databases, and other hardware and software programs.

When Said joined the training workshop, he served more as a trainer than a trainee. He mastered the CATT curriculum and approach quickly and organized many training workshops for his teachers and peers, which won him the respect of all. In his spare time, Said also developed a program to catalog electronically books in the college library.

Upon graduation, Said was not appointed to a remote area in the countryside to teach. Instead, in recognition of his extraordinary talents, the college appointed him to head the multimedia center in which he had performed so well as a student.

The experience proved very rewarding. Not only were the students able to adopt the CATT framework very quickly and share it with hundreds of others in the teacher training colleges, but they also were able to position themselves as valuable resources that even the most conservative training institutions cannot ignore.

CATT Speaks Arabic

In Morocco, technology-related trainings have always been conducted in a foreign language, typically French. Accordingly, Arabic-only users generally have been excluded from such trainings. In the primary education sector, which uses Standard Arabic as the language of instruction, the choice of French in technology-related trainings leads to the exclusion of a high number of potential participants. It also introduces a layer of complexity to the educational technology agenda: teachers are trained in French, but, because the educational system is "Arabized," they have to teach their own students in Arabic.

To avoid all these complexities, and to include as many beneficiaries as possible, CATT selected Arabic as the language of instruction. The project team developed project-specific modules in Standard Arabic, localized some of its online communication tools, and provided training in Median Moroccan Arabic (a mixture of the standard Arabic, colloquial Arabic, and French).

The choice of Arabic as the language of instruction proved highly effective. Many of the Arabic-only beneficiaries felt empowered because their ability to master the tool was not hindered by their language. They also felt they were participating dynamically in the construction of an educational discourse in their own language.

The Moroccan Ministry of Education has adopted the CATT training modules and approved them for use in training institutions throughout the country.

The Challenge of Authoring Arabic Ed Tech Materials In-House

The decision to adopt Arabic as the language of instruction immediately brought to the surface a number of serious challenges, the most important of which was the lack of quality educational technology materials in Arabic that the project could appropriate. Because the field is so new, very few published educational technology materials could be found in the country. Instead, the project team attempted to fill this gap by designing and authoring its own materials in-house. The decision received strong backing from all the beneficiaries, but especially from the project partners at the Ministry level, who were in the process of rolling out their country-wide educational technology project but lacked sound Arabic educational technology materials for training.

Box 4 — Profile: Lhassan Sassioui

Lhassan Sassioui is an instructor in the teacher training college in Sidi Kacem, a small town in western Morocco. A very competent Arabic language instructor and researcher, Lhassan has published many articles in the national newspapers on issues relating to the teaching of Arabic.

When Lhassan joined the project, he had little experience using computers and was extremely happy to discover that both the training sessions and the accompanying modules were in Arabic. After participating in a web publishing workshop, Lhassan immediately saw a niche for himself on the World Wide Web and began publishing his Arabic articles online. The new medium has given him access to a readership that may extend through the entire Arabic speaking world—-and also has freed him from the complex process of publishing in national newspapers.

In a relatively short period of time, Lhassan became one of the project's energetic Arabic educational technology champions. His positive experience in harnessing information and communication technology in his native language also has also motivated other students and teachers with similar interests to join the program.

Were it not for the selection of Arabic as the language of instruction, hundreds of other beneficiaries might have been excluded from the program.

For this challenging undertaking to succeed, three considerations were paramount. First, the beneficiaries themselves had to be involved in the process of developing the materials by providing feedback about draft versions, helping to coin new educational technology terms, and testing the draft versions with their own students. Without the participation of the beneficiaries in this process, the effectiveness of the materials could not be realized. Second, the materials had to be written in very simple language, using paraphrasing strategies, for example, to present otherwise arcane terms and to "popularize" the educational technology discourse. The project broke with a general practice among authors of Arabic educational materials that tend to use pedantic language and a didactic approach when presenting scientific information to a learning audience. Third, the design of the materials had to be based on a model that the teachers themselves could appropriate to produce learning materials for their own purposes. To achieve these objectives, the project team adopted a task-based framework for the design of its materials.

All beneficiaries expressed enthusiastic acceptance of the draft and final versions of the materials, and project partners—including the external evaluator—praised the structure, subject matter, and language used. At the end of the project, the Ministry of Education adopted the modules for use throughout the country, requesting 1,000 copies to get started.

The lesson from this experience is important. The Moroccan Ministry of Education has an army of talented educators who could be involved in generalizing educational technology in the country. Indeed their input to the development of educational technology materials is invaluable. To mobilize this teaching force, the ministry needs to put in place a system of incentives to encourage hard work and shift its working style from a top-down to a more bottom-up participatory style.

Learning From Others — The Value of Study Tours

An important lesson emerging from the CATT experience is that exposing policy makers and education managers to other countries' experiences

Box 5 Profile: Haji Ahmed Bouneaamani

Hajj Ahmed Bouneaamani is the director of the Sidi Kacem teacher training college. When the CATT project began, he was just three years from retirement. Hajj Bouneaamani had witnessed his center undergoing many changes over the years, but none as important as those triggered by the introduction of educational technology. His first experience with it occurred during the US study tour during the summer of 2000. Armed with a video camera, Hajj Bouneaamani video-taped all the details of his study tour, including the "non-hierarchical "sitting arrangements he observed in many of the U.S schools.

Upon returning to Morocco, Hajj Bouneaamani shared his tape with his staff and students. He also enthusiastically prefaced each educational technology workshop organized in his school with a short introduction in which he emphasized the importance of educational technology for development. On many occasions, the director would sit through the whole workshop with the core team in the same "non-hierarchical"seating arrangement he had observed in the U.S. His enthusiasm for the project also led him to participate in the online debates and offer valuable input to questions relating to educational technology applications.

Hajj Bouneaamani's belief in the value of educational technology prompted him to make some courageous decisions. For example, he decided, against the prevailing regulations, to extend the working hours of his multimedia center so that it would be open during lunch time, late at night, and on Saturday afternoons. As a result, hundreds of additional students benefited from the CATT training program. He also opened the multimedia center for site visits from the local high school teachers and students so they could get first-hand experience with technology. Hajj Bouneaamani's study tour in the U.S proved to be a transformational experience indeed!

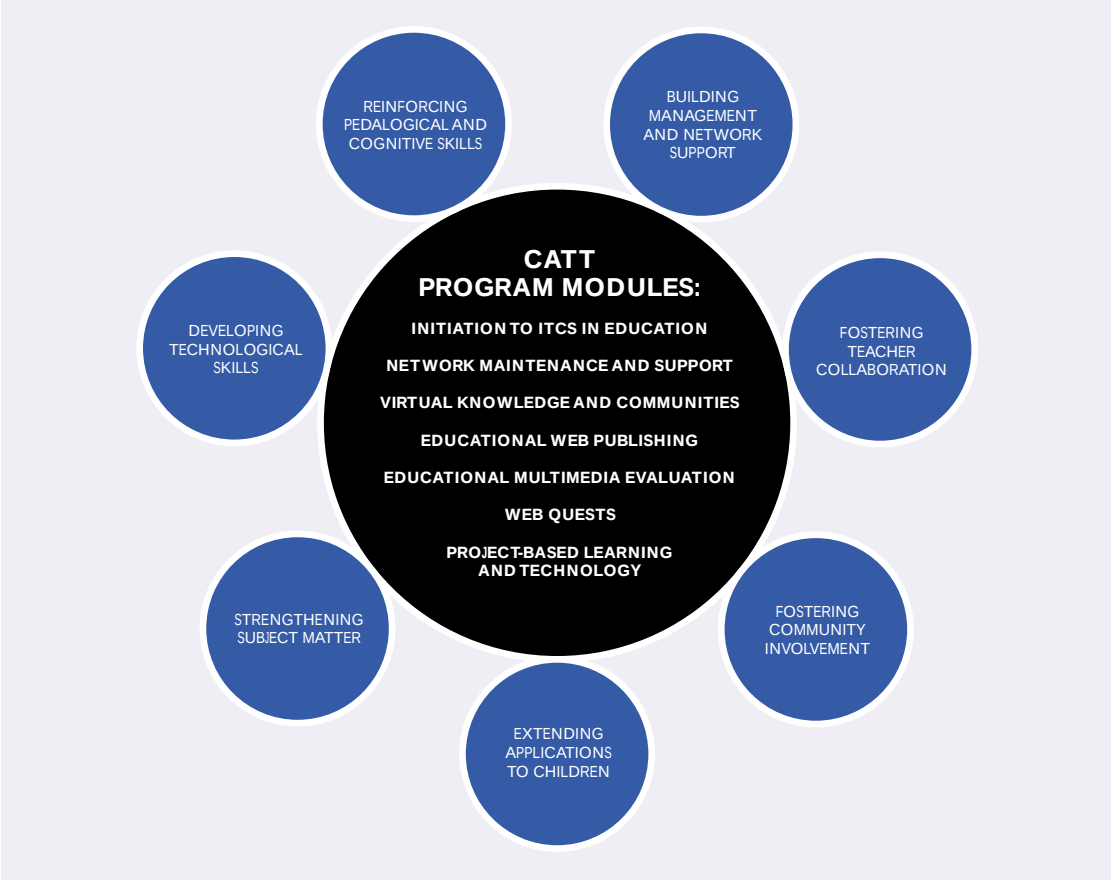
in educational technology can prove extremely valuable. In the summer of 2000, USAID and the Morocco Education for Girls Project provided CATT with funding for a study tour to the United States for the directors of coordination, rural education, training, curricula and planning, as well as for seven directors of the participating teacher training colleges. This provided CATT the opportunity to develop an introductory program covering education technology issues in the United States. In addition to meeting with senior consultants who provided general overviews, CATT participants joined junior consultants who enabled hands-on introductions to technology and practitioners working in education technology at public and private institutions who had experience developing and managing educational technology programs at the county and school level.

The visit influenced the project in several important ways. In addition to deepening trust with the project management, it also enriched the stakeholders' vision of educational technology. At the central ministry level, the trip triggered heated debate about the need to develop a comprehensive approach to educational technology, including planning, professional development, pedagogy, and decentralization, etc. At the local level, the training college directors developed a feel for learner-centered education, multi-cultural education, and the constructivist use of technology from the perspectives of the U.S. administrators, teachers, and students. The experience was transforming for many directors. In fact, upon returning to Morocco the directors worked actively to create the conditions for launching the project in their schools, vying to get them connected to the Internet. Thanks to the study tour, many directors were motivated to make some bold decisions, such as extending the working hours of the multimedia centers to accommodate the high demand on technologies. In a country where, traditionally, change is slow and difficult, the directors' willingness to challenge the central Ministry's mandates represents a courageous undertaking indeed.

Fusion of Pedagogy and Technology

CATT demonstrated that the development of technology skills and pedagogical approaches need not

Figure 1 **National Education Charter**



be perceived as separate processes. In fact, in a country where pedagogic reforms have been extremely difficult and costly to realize, technology served to create an enabling environment for demonstrating key components of the reforms. Throughout the project, pedagogy played a prominent role in the process of introducing different ICT tools.

The CATT team designed and developed an original educational technology curriculum that was well aligned with the National Education Charter, recommending, among other things, employing a learner-centered pedagogy, involving the community in education, improving subject matter competencies, and developing life-long learning skills.

The CATT program consists of seven major modules:

- Initiation to ICTs in education;
- Network maintenance and support;
- Virtual knowledge networks;
- Educational web publishing;
- Educational multimedia evaluation;
- Web Quests; and
- Project-based learning and technology.

Each of these modules wove together multiple objectives representing the major recommendations of the National Education Charter.

The framework offered multiple lenses for embedding educational technology into the general context of the classroom, the community, and the country. During each workshop, students were challenged to think about how ICTs could support different aspects of educational reforms, such as community involvement and decentralization, the importance of knowledge sharing and collaboration with colleagues, how different ICT tools could help strengthen subject matter competence, ways in which technology could be used with small children, and the importance of sound instructional design. With respect to pedagogy, the workshops encouraged the participants to think about constructivism, to which they had already been introduced in the past, and how it could be enhanced by technology.

The exercise proved highly effective because it helped link the new information introduced in each workshop to the students' background knowledge. It also helped shift discussion from an emphasis on technology to pedagogical approaches, applications, implications, and reform.

As the participants' technical competencies improved by the second year, so did their critical skills in other dimensions, such as their ability to link the tools to pedagogy, understanding the role of the community in particular instructional designs, and the importance of collaboration and sharing.

The final module of the training program represented the culminating experience of the students' multidimensional training. In this module, participants were introduced to project-based designs and challenged to use the different type of skills they developed in previous workshops to design and implement their own projects.

The uniqueness of CATT was that never, during any training workshop, was technology divorced from pedagogical and societal linkages. This enabled all participants—including the technologically challenged—to work on familiar ground. It also enabled them to embrace not just the CATT project but the whole educational reform agenda.

Isn't Educational Technology About CD-ROMs?

When CATT was launched, there was a general perception among some of the stakeholders that the project would end when it had put all the necessary equipment in place, provided some basic training on productivity tools, and purchased for all the teacher training colleges enough copies of off-the-shelf educational computer applications, such as CD-ROMs. In fact, this also was the general expectation for the Education Charter's Plan 2008, too. As a result, many multimedia production companies, lured by the market, started approaching the Moroccan Ministry of Education for the production of educational software to cure all the ills of the educational system.

CATT embraced a different approach. While the project team recognized the value of well-designed educational CD-ROMs, they were concerned about narrowing the educational technology options. Would they suit the local realities of the teacher training colleges, the language of instruction, the objectives of the curriculum, the learning style of the learners, and the financial resources of the ministry? The team also was unclear about how this approach could contribute to building local capacity in educational technology. Nor did the team understand how it could be aligned with the

recommendations of the Education Charter, which stressed the need to leverage ICTs to improve teaching, learning, networking, access to information, and professional development programs in rural areas of the country.

CATT offered to work with its partners to develop an educational technology program that was user-based, cost efficient, innovative, and responsive to the Education Charter's recommendations. Among other things, CATT offered to work with teachers to design innovative learning experiences, provide flexible models for the use of digital information in the classroom, create and support knowledge networks among all the teachers, nurture critical inquiry, and incorporate a gender awareness into the design and development of the training program.

When CATT staff presented the approach during the first workshop, it created a great deal of enthusiasm among the participants. Many saw the link between the Education Charter and CATT to have valuable potential for improving educational practices in their teacher training colleges. Perhaps it was this perception of the link between the pilot project and wider educational reforms that motivated the participants to embrace the project so enthusiastically, even when connectivity was delayed and all they had to work with were software programs.

In fact, though delays in the online connections were unplanned, unexpected benefits may have accrued from introducing participants to the Internet slowly, after they had mastered programs such as Word, Access, and PowerPoint. For the most part, participants' experience with computers prior to CATT had been limited if not nonexistent. Moving slowly from one software program to another, gaining in familiarity and confidence with a variety of "productivity tools," participants may have been better prepared "psychologically" for the online experience.

Nevertheless, when the first teacher training college, in Sidi Kacem, was connected to the Internet, the participants' enthusiasm for the project grew even greater, surpassed only by the excitement generated when all the centers were connected to a virtual network and the participants were able to communicate together.

When the project team demonstrated to the officials of the Moroccan Ministry of Education how the distant teacher training colleges were using ICTs to communicate among themselves—through chat rooms and bulletin boards, for example—their reaction was highly positive. The question on the table was no longer CD-ROMs versus capacity building through instructional design and communication, but how the CATT project could be extended for more years so that all Morocco could benefit from it!

Looking Ahead

In August 2000, an event of great relevance to the future of education in Morocco occurred. Catching many observers by surprise, King Mohammed VI, in his capacity as the supreme religious authority in the country, decided to open mosques to provide literacy classes to the population. The King announced that male and female teachers would be hired from the pool of unemployed university graduates and that the government would supply the necessary manuals, schoolbooks and other equipment to implement the program. The King's initiative was highly significant, showing his intention to mobilize whatever resources were available, including mosques, to overcome one of the serious challenges facing the country. Mosques are community institutions. Traditionally, they have been associated with religious practices, but they need not be limited to this function. They could be used as well as mechanisms for disseminating education and lifelong learning opportunities in the community.

While this innovation is not directly related to the CATT project, it is yet more evidence of the commitment to educational reform underway in Morocco. The success of the CATT project also demonstrates a buy-in at the highest levels of the country to both widespread reform and ICT expansion. Morocco has all the ingredients for leveraging the power of ICTs for development: a sound ICT policy, a competitive telecommunication market, a generally positive political environment, and a strong backing from the King. It is hoped that the CATT experience will help the decentralization process move quickly so that the full potential of ICTs for education and development may be realized.

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Footnotes

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Case Study

Namibia

Integrating ICTs in Education

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At the end of two years, the Computer-Assisted Teacher Training (CATT) project in Namibia held a conference in Windhoek for educators from the four target regions and representatives from the project's host agency, the National Institute of Educational Development (NIED). All together, approximately 40 educators, 10 from each region, came together to discuss their experiences exploring ICTs and integrating them into education in Namibia. Among the many outcomes of the conference, perhaps the most important concerned the post-conference assessment. Without exception, all participants agreed that, as a result of the project's implementation approach, they now believed that they could do this on their own. Now they could creatively integrate technology into education, continue to develop their own ICT skills, and lead their fellow educators and community members in using ICTs as tools for education and development in Namibia.

The conference was the project's final event and signaled the end of CATT/Namibia's work. It is also the end of this story. To explain how the Namibian participants and partners got there—and how the project managed to achieve its goal of self-actualization—the project's origins, activities, and approach need to be explored. This is the story as it unfolded in Namibia.

> **“Now I can do this on my own”**

Namibia and Education in the 1990s

Located in southwest Africa and home to almost 1.8 million people, Namibia is a vast land of some 800,000 square kilometers, approximately twice the size of the US state of California. While a few small cities and towns have a moderately high population density, the distances between these towns create major obstacles to professional exchanges between educators.

From the beginning, the project believed information and communication technologies (ICTs) could reduce and even render these distances irrelevant, enabling educators around the country to share best practices and brainstorm ideas for integrating technology throughout the education system.

After its independence from South Africa in 1990, Namibia was beset with challenges, many emerging from the vestiges of apartheid's social and economic policies. Even after a transition to democracy and the formation of a democratically elected government, wide disparities in social and economic development persisted bolstered by a poor economic system.

The new government began addressing systemic education problems by establishing a new Ministry of Education, which eventually separated into two—one ministry primarily focused on higher education and another on primary and secondary education. The government also consolidated many smaller, race-based education authorities into a unified education system and took steps to enhance the relevancy of Namibian education for its new society.

Soon after independence, the government also formed the National Institute for Education Development (NIED). A division of the Ministry of Basic Education, Sport and Culture (MBESC), NIED is a "think tank" for mobilizing resources to improve education. Its two units undertake educational research and develop resources and curricula for the nation's primary and secondary schools and teacher training programs. NIED works with teachers, schools, Teacher Resource Centers (TRCs), regional offices, the MBESC central offices, as well as colleges and international organizations concerned with educational research, resources, and development.

Although apartheid resulted in limited access for many Namibians to economic and development opportunities, the nation inherited and has developed an ICT infrastructure unsurpassed by almost any other country on the continent. Linked by fiber optic cable to South Africa and by satellite to the Netherlands, the nation was in an excellent position to introduce ICTs into education.

The MBESC prepared A Ten Year Plan for Educator Development and Support (2000–2010) that proposed establishing Educational and Development Support Units in all regions to meet the professional development needs of teachers and administrators. Another goal was to expand access to resources for teaching and learning as well as to improve educational administration. Underlying these objectives was the aim to reduce the disparities in teacher and administrative preparedness throughout the country. NIED, a major training and support service provider, eagerly adopted ICTs to deliver these services.

Supporting Namibian education: an overview

The US Agency for International Development (USAID) supported Namibia's emphasis on enhancing basic education and teacher training through the Basic Education Support Projects (BES and BES II), which focused on upgrading the quality of the primary school curriculum, teaching, and management. The CATT/Namibia project[1] was a separate activity, implemented through the LearnLink program, which complemented BES. CATT's goal was to use ICTs to strengthen professional development and provide continuous educational support to teachers and administrators throughout the country.

Namibia is a young country that is looking toward the future as it integrates modern technology into its education system. CATT/Namibia was developed to help introduce ICTs to facilitate educator communication and provide distance learning and web-based research opportunities for teachers and administrators. The project also was asked to develop computer centers within NIED in Okahandja and within Teacher Resource Centers (TRCs) in Rundu, Katima Mullilo, and Ongwediva.

As connectivity spread throughout the country, the project envisioned NIED serving as a "hub," linking the multimedia centers and gradually extending out to local schools.

Connectivity was achieved at NIED and the TRCs with leased lines and computer installation provided via a collaborative effort between UUNET, an international Internet bandwidth provider, and SchoolNet/Namibia, a local education NGO and its

http://www.0.nied.edu.na

young, computer-savvy volunteers known as "Kids on the Block." The computer centers offer multiple interactive resources for teachers, students, administrators, and community members, such as Internet and email access. Resources provided online via the project-supported web site, ED'S Net (www.edsnet.na), include a library of resources and training materials plus support for computer hardware and software use and curriculum development.

As teachers and administrators gradually applied ICTs to learning and management functions, they were better able to communicate with colleagues and access useful information, knowledge centers, and resources. By creating a virtual community in the education sector, especially in the historically disadvantaged northern regions, it also was expected that educators would be able to draw on multiple multimedia capabilities—email, listservs, chat messaging, web sites, discussion forums, file sharing, and voice and video communication—for building a community of committed educators.

It was hoped that by providing non-educators with access to ICTs at the centers—and providing models of effective ICT use by educators—an ancillary effect of the project would be to help increase ICT capacity in other sectors of Namibian society. With support from NIED and the Ministry, ICT integration in Namibia would occur not only in formal education institutions but also at the community and grassroots level, where it would facilitate lifelong learning for personal and professional purposes.

The Purpose and the Approach

The project began with five objectives.

1. Develop the capacity of National Institute for Educational Development (NIED) staff to develop multimedia teacher-training materials;
2. Establish an information and communications network for education professionals;
3. Support the development of prototype teacher-training materials for primary school educators;
4. Support the development of a cadre of technology champions within the Ministry of Basic Education, Sport and Culture (MBESC); and
5. Provide ICT policy support to NIED and the MBESC.

When determining how to achieve these objectives, the project sought a model of learning based on inclusion and self-guided interaction with learning materials and knowledge. The model should encourage exploration, discussion, and integration of ICTs, as well as introduce a process that would result in the transference of ICT skills to Namibian educators, enabling them to continue the effort after the project's end.

The link between the goals and the approach was CATT/Namibia's strength and the key to any lasting effects it would have within Namibia. The project planners knew a process needed to be established that educators eventually could follow on their own. Therefore, the project sought to model in its approach the goals of Namibia's education reform—

to develop a model consistent with the context in which it was to be implemented. For this reason, the implementation approach was considered as much a "deliverable" as were the project's stated objectives. Pitted against timelines, deadlines, and budget constraints, accomplishing this was not easy.

A Constructivist Approach

Throughout all its stages, the project's approach was to encourage critical thinking and reflection, both of which were regarded as strong components of Namibia's current education reforms. More specifically, the approach frequently modeled what is called *constructivism* in education. This is the idea that people construct their own knowledge from their experiences and interactions, as well as from their reflections on these experiences and interactions. While constructivist theories are more complex than that, the project approached its work believing that Namibian educators would be able to successfully construct knowledge, or rather, successfully learn, if a suitable environment were created in which they could do so. It was as simple and as complex as that.

The CATT/Namibia project had no intention of dictating how to integrate ICTs into Namibian educational contexts. Indeed, no one had ever even tried to integrate ICTs into all levels of the education system in Namibia before, and the project did not know, for sure, what would work.

Contrary to some critical interpretations, the constructivist approach requires extensive guidance and leadership, which occurs mainly behind the scenes. It has been called an "invisible pedagogy," one in which facilitators create a fertile learning environment along with a minimal amount of thoughtful structure that encourages people to explore and learn on their own. The structure must be both clear and easy to follow while remaining wide open for exploration and contemplation, and it must accommodate both new and more experienced users to learn.

What the project created was a series of structured interactions that allowed genuine learning and adoption to take place. The process provided guidance and support from start to finish in a way that valued, considered, and integrated participants' ideas and concerns throughout. In addition to creating settings where participants could be successful, the project also continuously explained what was taking place—and why—so they could learn how to produce similar learning experiences for others.

Successes and Lessons

Through the project's "invisible pedagogy," Namibian educators worked both independently and together to create and manage web sites, explore new software programs, research ideas for further study, and draft ICT policies. Previously out-of-work youth created self-guided, ICT learning materials first in English and later in the indigenous Namibian languages of Oshiwambo, Rukwangali, and Silozi. These same youth empowered new users with those materials. Ministry officials created regional teams of educators to explore what technology can do for Namibian education and how best to integrate ICTs into teaching, training, and management practices.

The process illustrated in the following examples began by including stakeholders in the design and implementation of the activities. This is not simple. It often involved working with the central offices of two ministries of education, an educational think tank (NIED), an education and technology NGO (SchoolNet/Namibia), as well as regional education officers. It also involved extensive discussions with all stakeholders to develop a plan that respected the context and founding principles of educational development in Namibia while introducing new ideas.

Equal Exchange of Ideas

The project viewed every interaction in the process as an opportunity to model inclusion. To this end, a major concern was the language used in the interactions. To be truly inclusive, to enable every participant to feel like an equal partner in the proceedings, the choice of language must invite this desire and reflect this intent. In practice this meant, for example, not employing traditional terms such as "workshop" or, worse still, "training." These terms lend themselves to notions of facilitator/participant, expert/novice. While useful in some situations, they do not fit the constructivist approach that this project employed. If the project sought to encourage an equal exchange of ideas, how could it expect "novices" to feel confident enough to speak freely in

the presence of "experts?" The project minimized the "us" and "them" phenomenon that characterizes many workshops, trainings, often even meetings. By carefully considering the language used, one begins to understand the important distinctions involved in such simple terms. While CATT/Namibia does not claim to have changed this cultural hierarchy in the target areas, the project nevertheless employed a new paradigm that enabled everyone to work together as a team and, in turn, contribute to the project's successes.

Champions Emerge

The project worked with groups of educators to identify and support the development of "technology champions" in the target regions. They devised ways in which ICTs could be used to enhance education and also shared their ideas with others, stimulating widespread discussion about the potential and possibilities of technology use in the education sector.

To design the "champion development" program, project staff worked closely with ministry colleagues to determine the best approach for working with the groups from whom—it was hoped—the champions would emerge. The project staff determined that

- The teams should be heterogeneous and include representatives from as many education stakeholder groups in the regions as possible.
- The teams should be organized in a way that encouraged communication between multiple stakeholder groups both within the Ministry of Basic Education and between the Ministries of Basic Education and Higher Education.
- The process should model learner-centered practices.
- The model should not be dependent upon or create a dependency for further training inputs.

In addition to these implementation requirements, the project also wanted to avoid pitfalls that it had seen in other projects and in other forms of technology training. Therefore, to the above list, the project staff determined that

- The process should not encourage a formal top-down training model but should seek to encourage a model based on wide, lateral spread.
- The process should not develop large, modularized ICT training manuals because, from the project's perspective, manuals are seldom used and do not model learner-centered practices.
- The process should help the learners overcome their basic fears of technology.
- The process must be able to work with and for groups of users ranging from novices to those moderately advanced.

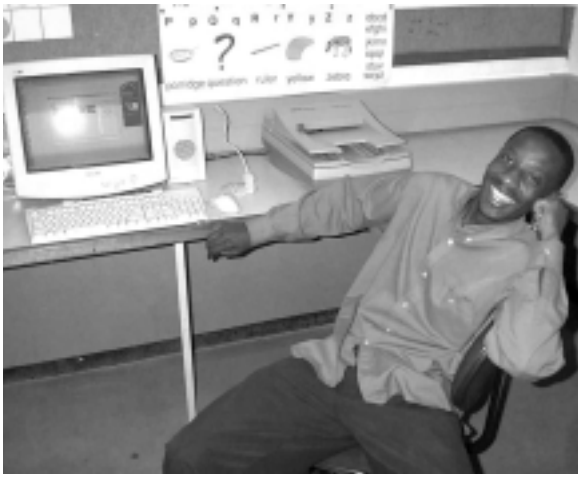
To ensure the most effective process possible, the project carefully considered who technology champions are, what they do, and how they can be identified. From the project's perspective, technology champions

- actively seek out new technologies to explore;
- learn through active experimentation;
- tend to seek help via networks of other champions;
- creatively consider how technologies can be used and actively experiment with these uses;
- share their ideas and experiences with others; and
- encourage others to use technologies in their work.

Open, Shake and Share

To meet all these expectations, the project worked with Ministry staff to develop a process it called OSSIAR, which is short for "Open, Shake, Share, Imagine, Act…and Reflect." The OSSIAR model, derived from the "active and reflective play" process children use to learn about new technology, incorporates Namibian pedagogical priorities such as action research and reflective practice. The facilitator is responsible for creating a fertile learning environment, minimizing the element of fear, getting participants started on exploring the technology, and encouraging them to work with each other, share information, imagine how the tools may be used, and reflect upon their learning experience.

Using this model, the Ministry and the project worked together to develop teams of professionals in each of the four target regions to explore the uses of technology for education in Namibia. Each Regional Education Technology Team (RETT) was encouraged to include members representing advisory services, the inspectorate, classroom teachers, teacher training college faculty, student teachers, principals, and teachers from adult and continuous education. The membership was heterogeneous, included members from both Ministries of Education, and represented most stakeholder groups in the regions.



SchoolNet volunteers

The project's work with the RETTs included facilitating three meetings with each team, followed by a National RETT Conference in Windhoek. While the project did not formally train these professionals, the groups were encouraged to explore ICTs using:

- Discover Windows 98
- Mavis Beacon Typing Tutor
- Microsoft PowerPoint
- Internet Explorer
- Internet Detective
- web-based email
- chat rooms
- CD writers
- Teleconferencing cameras
- digital cameras
- Webster development
  the ED'S Net Webst

Materials developed for this work were simple, one-page instruction sheets called (OPIs). They were used to help participants get started using a new piece of technology or software.

Team members became quite active in their roles as technology champions, choosing to share their training experiences with relatively large numbers of colleagues. Though the qualitative results are difficult to monitor, the quantitative impact of this "cascade" effect is impressive. For example, every RETT reported that its team members trained at least 100 others in each region.

Taking Chances

Providing hardware and connectivity is frequently the easiest component of a technology project. Yet this process also yielded a valuable lesson. In the end, the project successfully worked with partners to install computer centers at NIED and three regional Teacher Resource Centers. Each center received at least seven Microsoft Windows workstations, a scanner, laser printer, digital camera, a simple web camera, CD burner, and 24-hour lease line connectivity.

When establishing the centers, the project took a chance by asking a new education and technology NGO, SchoolNet, to serve as the vendor for procuring and installing the equipment, local area networks, and connectivity. Before this project, SchoolNet had not worked with lease-line connectivity and had never undertaken a project of this scale. Despite a few delays, SchoolNet's team of young volunteers performed admirably in delivering on their contract. Not only did SchoolNet establish the labs, the group developed valuable new capacity at the same time. Because SchoolNet was included in the process from the beginning, they gained practical experience that enhanced their technical and organizational expertise.[2] During the course of the project, they also launched a new service as an Internet Service Provider for educational institutions. The project computer centers became the first leased line customers connected to their system, effectively cutting costs to a small fraction of retail connectivity. After the project ended, SchoolNet

continued to provide significant technical support and training to staff at the centers.

Opening Doors

Use of the centers also has also been impressive. By the project's end, the total combined number of registered and paying users at the centers had reached just under 1,000, 40% of whom were female, 36% education professionals, 23% teachers in training, and another 30% students. The final 11% were community members, all of whom paid to use the centers' equipment and facilities. This represents a small but valuable income stream for the centers, and, significantly, heralds a new willingness on the part of the Ministry to open its facilities to the community in a way that helps share resources and costs.

Perhaps most impressive, all of this occurred in less than a year.

Training Technology Managers

To ensure effective management and operation of the computer centers, the project trained managers for the Teacher Resource Centers (TRCs) as well as Education Technology Trainees (ETTs) for the NIED and for the resource centers in Rundu, Katima, and Ongwediva. Training focused on the following topics:

- center policies
- introduction to computer equipment
- managing TRC funds
- generating revenue
- budgeting
- computer troubleshooting
- lending procedures
- training uses
- marketing

The ETTs also were provided additional training in computer "basics" and fundamentals of professionalism to ensure that all had baseline knowledge to prepare them for work in the centers. This included

- Microsoft Word
- Microsoft Excel
- Internet Explorer
- Outlook Express
- printers
- zip drives
- CD rewriters
- Scanners
- teleconferencing cameras
- digital cameras
- center management tips
- searching for educational web sites.
- Microsoft Excel
- network administration
- basic web design

Much of the work with both the TRC managers and ETTs began early in the project, while the constructivist approach was still developing. Therefore, these interactions tended to be characterized by "expert/novice" relations. Instead of users leading their own learning, we had unwittingly created consumers of training instead of creative ICT users.

As we adopted a well-structured though much more open-ended approach, the focus shifted from "training" to exploring, and the ETTs began to create self-guided learning materials to use in their regional centers. ETTs also shared their materials with other regions, where they were translated into local languages.

The "Home Furniture" Approach

Known as the Educational Development and Support Network (ED's Net), the CATT/Namibia web site incorporates content from other USAID and NIED education projects. Most importantly, the web content focuses on dynamic teaching philosophies, approaches, and pedagogy compatible with the introduction of technology to enhance learning. Online training modules, resource materials, and chat opportunities gradually were added to the web site. The web site features an open, highly interactive architecture and constructivist, learner-centered pedagogy.

ED'S Net contains almost 50 professional training modules covering basic teacher training topics, management topics, and materials on HIV/AIDS. Other features of the site include interactive discussion boards and areas where professionals in the field could post resources. All together, the site offers

- 20 Teacher Basic Competencies Modules (TBCMs), converted to HTML and published online;
- 3 BES II Management Modules converted to HTML and PDF and published online. This work was intended to provide models relevant to inspectors, managers, and principals;
- 5 HIV/AIDS Education Modules in Microsoft Word and My Future Is My Choice Program

materials published online at the request of the Ministry's HIV/AIDS Committee. These materials demonstrated how information could be shared over the web and provided a model for providing teacher training content online;

- 18 STAMP 2000+ General Education Modules published online in PDF format. A key professional at NIED provided these modules, covering a variety of basic education topics, via his contacts with the SADC (Southern Africa Development Community) Ministries of Education and the Commonwealth of Learning;
- 40 One-Page Information Sheets (OPIs). Providing basic training and guidance for Ministry Officials and other educators, these sheets covered topics such as accessing and using Discover Windows 98, Windows Help features, ED'S Net's communication features, web-based email, a program to help users search the Internet and identify quality sources of information, and 20 pages on the basics of web site development, among others.

ED'S Net was designed by Namibians for Namibians. While the project team could have produced the web site, enabling the users to produce it proved far more effective. The process undertaken can be described as the "home/furniture" approach, in which CATT/Namibia provided a largely content-free, "scaffolded" space to be filled—a home waiting for its Namibian residents to furnish it. It is a strong, solid, well-built home that NIED was able to furnish with the help of colleagues throughout the country and friends throughout the world.

By working with NIED to develop the initial idea for ED'S Net, the project established that this was NIED's web site, not CATT/Namibia's. This was an important distinction to make from the beginning. It allowed NIED to make recommendations and work together with project staff to create the site on their own, assuming the roles of webmaster and site developers, as described below.

A New Webmaster

One of the great project success stories is that of the NIED library assistant, Ms. Boshoff, who redesigned the NIED web site, developed a NIED Intranet, and was trained to assume the position of ED'S Net webmaster. The project also worked with her so she could assume additional network management responsibilities, as well as provide basic troubleshooting support for NIED's computer equipment. Before Ms. Boshoff took over these responsibilities, they were in the hands of foreign consultants and volunteers.

Applying New Skills

Project staff and NIED management agreed that NIED should create a specific group within the Institute responsible for designing materials for posting on the web site. By the time the project's support to the Multimedia Working Group (MMWG) ended in December 2001, the project had worked with the group on

- HTML;
- Internet communications tools;
- Web-based training materials;
- Teaching and learning in a multimedia environments;
- Incorporating video into teaching/training materials;
- Video planning and production; and
- DreamWeaver and Fireworks web authoring packages.

Using these new skills, the MMWG team produced the first year of the Namibian in-service teacher training program modules for publication on the ED'S Net site. One team member even developed web pages in Oshindonga, a local language in Namibia, which were posted on the site.

HIV/AIDS and ICT

Another unique feature of this project was its focus on HIV/AIDS, which currently affects about one in five Namibian adults and is reducing the number of available teachers and technical professionals. Information on local and international HIV/AIDS education and life skills programs was posted on the ED'S Net site, as were details about the InformEd Webster Competition, a web development contest for Namibian schools to create web sites around the topic of youth and sexuality. Almost 40 school-based teams registered for this first annual competition, which includes a grand prize trip to an international Education and Technology conference for the winning team.

Local news highlights ED'sNet web site and HIV/AIDS health coverage

Out-Of-Work Youth and ICT

The computer centers that the project created were managed by out-of-school youth or female high school graduates with low skill levels, who received intensive training in computer technology, applications, network maintenance, and management. As a small step toward gender equity, hiring female managers helped to offset the predominance of males in ICT positions in Namibia.

In early discussions between NIED and project staff, NIED asked the project to be very careful in selecting staff members to serve in the Teacher Resource Centers (TRCs). One concern was that the project would hire teachers and professionals away from the Ministry and pay them salaries that would be impossible for the Ministry to continue when the project ended. Another concern was that finding adequately trained people in the regions would be difficult if not impossible given the salaries that the Ministry could afford.

In response, the project and its partners pledged to try a different approach. Rather than search for experienced staff to run the labs, the project accepted the responsibility of locating otherwise out-of-work youth and training them to serve as Education Technology Trainees (ETTs). While the primary benefit to the Ministry was that these staff members could be paid at affordable levels, perhaps more important was that the project was able to demonstrate to the Ministry that such positions did not require advanced education and technology credentials. Rather, the Ministry could fill these posts with out-of-work youth eager for stable employment and the opportunity to learn ICT skills. At project's end, all the ETTs had proven themselves capable of running the day-to-day operations of the four computer centers established through the project, and the Ministry had decided to employ them to continue to do so.

Lessons

Due to time constraints, the placement and design of the computer centers was pushed through without employing the participatory, inclusive process that characterized the project as a whole. If the project were to do it again, staff would have invited far more input from the regions and the TRC managers themselves at the outset. The process would have been more effective if all partners had gathered to design the centers, select sites for the centers, and discuss cost-sharing potentials and possibilities for various roles and responsibilities. A much more thoughtful and deliberative process likely would have led to more thoughtfully placed, designed, and run centers. Project staff also could have asked potential TRCs to develop proposals for marketing, designing, operating, and maintaining their labs, with the project and the Ministry choosing from the submitted designs. This would have achieved much more directly and effectively the sense of ownership the staff constantly sought to establish throughout the project.

All of the project's successes and lessons can be

attributed to whether or not—and the extent to which—the three guiding principles of inclusion, constructivism, and cascading were followed.

1. Inclusion: A primary aim of the CATT/Namibia project was to create an environment in which Namibian colleagues could feel confident about doing their own work. This was assured through a process that put a premium on valuing colleagues' ideas. As the Namibian partners realized that the project genuinely attached merit to their ideas, they grew increasingly willing to share them.

2. Constructivism: The project's interventions were many and broadly focused. However, the single unifying thread was its effort to model and encourage constructivism as the operating paradigm and principle governing all activities. By providing a scaffolded learning environment, the RETTs, ETTs, TRC managers, and NIED were able to build on their experiences and interact with ICTs in ways that were relevant and creative. In essence, this model allowed them to see that they, too, could create constructive environments in which new users could learn without didactic teaching. Employing the previously described "invisible pedagogy," the project partners could create a fertile learning environment for those to come.

3. Scaffolding/Cascading: By creating a constructive learning environment, the project facilitated the development of both capacity and confidence among Namibian counterparts. Over time, this enabled them to share their new skills widely. In one case, for example, two members of the Katima Regional Education Technology Team (RETT) worked together to train almost 100 student teachers on their own.

One of the difficulties of this approach is to be able to step back and "take credit" where credit is due. CATT/Namibia spent a great deal of time emphasizing that the Namibian colleagues were able to work on their own. However, just as none of this would have happened without their hard work and dedication, it is equally unlikely that it would have happened without the project.

Using a behind-the-scenes approach, CATT/Namibia provided guidance and support throughout all stages of the development of the RETTs and of OSSIAR. CATT/Namibia provided leadership in developing and implementing the TRC Computer Centers and guidance in managing the centers. With the input and assistance of Namibian colleagues, the project also created the structure and developed the web site, the MMWGs, and locally-produced learning materials, as well as contributing to policy reform within the Ministry. While not responsible for the work done by the Namibian educators, project staff did assume responsibility for creating the conditions in which the Namibians themselves, with staff support, could achieve the project's objectives.

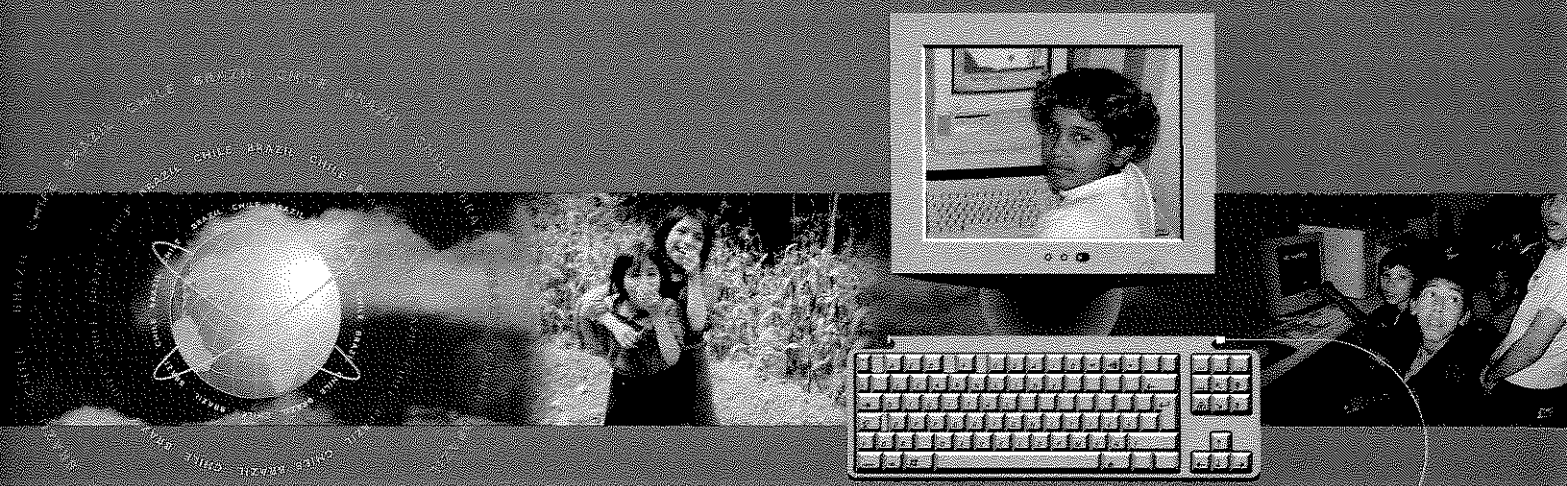
Perhaps most important, the project built trust between U.S. experts and their Namibian counterparts. This, in turn, laid the foundation for all the activities that followed. Together, CATT/Namibia and colleagues developed, designed, created, and established a solid, extensive framework for ICT integration in Namibia, a house that Namibians then could continue to build. After two years of close cooperation, careful communication, and equal collaboration, the CATT/Namibia project ended. After two years of exploring, experimenting, and learning together, now they can do it on their own.

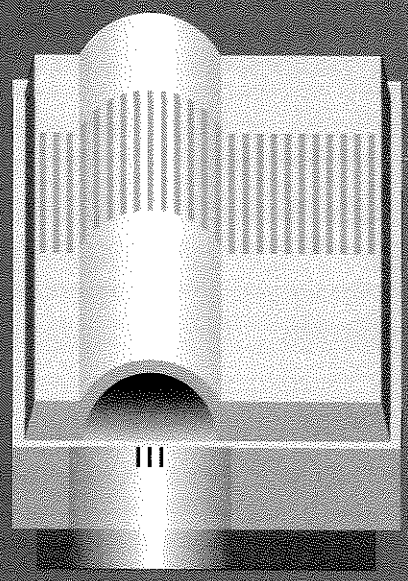
Footnotes

[1] The Namibia activity is part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

[2] Using lessons learned through the CATT/Namibia-supported computer centers, SchoolNet has developed methods for supporting schools running Windows-based systems similar to those installed in the TRCs. This is a short-term solution, though, as SchoolNet is now developing and rolling out a Linux terminal server solution that it hopes will dramatically lower costs related to the capital expenditure and maintenance for computer centers.

Using Computers in Schools 4




III

4 Using Computers in Schools

Eric Rusten
Eric Rusten was the Senior Program Officer for the Learning Technologies (LTNet) project in Brazil.

Education systems around the world face formidable challenges that are taxing conventional strategies. Fresh approaches are needed to address persistent problems of the past and provide students with an education appropriate to the needs of a modern, information-based global economy. Now, after more than two decades of unfulfilled promises to revolutionize education, computer and communication technologies are finally able to offer opportunities to significantly improve teaching and learning.

Education and learning are among the most important of all human activities and always have been the principal means of creating productive and sustainable societies. With globalization and the increasingly dominant role that information and knowledge play in all economies, providing quality education is becoming ever more important. At the same time, the emergence of information and knowledge as core assets for development and economic growth is widening the gap between the rich and the poor. The gap is growing between those who have access to and can manage modern information and knowledge systems and those who lack the access and ability to actively participate in the information age. As shown in various gender and ICT use studies, this gap is particularly pronounced for women of developing countries, and strategies must be created to address the gender as well as the digital divide (Hafkin and Taggart, 2001).

Quality education is fundamental to successfully addressing development problems and bridging the information gap. Recognizing the fundamental link between education and development is easy. Creating systems that provide quality education for all, even when demand outstrips human and capital resources, is an extremely difficult challenge. Yes there

is an urgent need to provide education that goes beyond teaching basic literacy and numeracy skills. Education must help to build higher-order cognitive abilities, strengthen processes of inquiry, enable collaborative problem solving, and prepare people to compete in global markets and become productive members of democracies. No single solution exists to address these immense challenges. New approaches and strategies for change are needed, and computers, mediated communication, and related educational technologies are an important part of these approaches and strategies.

This paper presents an overview of four interrelated models-of-use that show how computers and related technologies can be used to help developing countries improve educational quality, increase access to educational resources, and enhance equity. After reviewing critical challenges facing developing country education systems today, the paper describes how computers can be used to improve education. This discussion emphasizes the real and potential impact that computers can have in supporting student-focused education, which encourages and enables learners' discovery and knowledge creation rather than conventional teacher-centered delivery of facts. Next, the paper presents strategies for planning, implementing, monitoring, and evaluating projects that seek to integrate computers into schools and education systems. The paper concludes by considering future developments and trends in using computers in schools.

When used effectively and integrated into schools, computers can improve teaching and learning, strengthen teacher professional development, support broad educational reform, enhance school-community partnerships, and improve school management. This paper helps to explain the potential uses of computers in schools and help professionals decide if such projects would help achieve strategic educational objectives and address critical learning needs.

Improving Educational Access, Equity, and Quality

Over the last three decades, much international donor funding for education focused on the critical issues of strengthening basic education with an emphasis on increasing educational access and equity. These investments contributed to significant increases in school enrollments for both boys and girls in most countries, especially at the primary level. However, growth in enrollments among boys and girls generally has not been matched by improvements in the quality of education provided most students. In many cases, educational quality actually has eroded as the numbers of students increased without corresponding increases in supporting educational resources.

Labor markets and our global society increasingly demand more from school graduates than just basic skills. Education in the 21st century must continue to do what it has been doing to educate students and much more. Investments to increase educational opportunities will pay dividends in terms of meaningful development only if students learn useful, real-world skills, gain appropriate knowledge, develop higher cognitive abilities, and are able to work collaboratively across cultures and languages. Unfortunately, many schools provide students with grossly inadequate literacy and numeracy skills, and higher level thinking skills are often not taught at all (World Bank 1999).

For many nations, meeting educational needs is complicated by limited financial, material, and human resources, the accelerating demand for education at all levels, and persistent poverty and equity concerns. These problems result in a massive challenge for education. As Wadi Haddad (1998) states, "Business as usual will not meet the challenge. Linear projections will not do. It is time for a radical rethinking of education."

Rethinking Education and Technology's Role

For many nations, the basic ways of organizing and practicing education have changed very little over the last century or so. Continued efforts are needed to modernize content, increase school resources, enhance teacher training, and improve access and equity. As a result of globalization, however, a new paradigm is evolving in the educational arena and changing how teaching is delivered and learning is processed. To begin, learning is no longer confined to the physical school building or the classroom but can take

place anytime and anywhere, such as in computer labs and via the radio, television, or Internet. Additionally, the role of the teacher as sole provider of knowledge is also evolving to that of a facilitator and tutor. Lastly, learning materials are greatly expanding, and textbooks and some audiovisual aids are being supplemented by a plethora of multimedia materials in print, audio, video, and digital form. Through the power of networking, boundaries for learning are disappearing as both teachers and students are able to communicate, plan lessons, execute projects, share work, and forge new friendships and understanding across school districts, states, and countries. Computers and multimedia technologies in schools now offer potential learning opportunities and solutions that were not readily available before.

Critical Educational Issues

No single change or reform can possibly address all educational challenges, but information and communication technology can address a broad range of changes and improvements. Some areas in which the appropriate use of computers in education might make an important difference are:

- *Learner-centered education:* Teachers must take on new roles as facilitators who empower students to question, experiment, collaborate, inquire, and construct knowledge and understanding.
- *Higher-order cognitive skills:* New curricula, teaching practices, and pedagogies are needed that enable students to develop and refine critical thinking skills.
- *Enabling reflective learning and creative expression:* Educators need to create learning environments that enable students to acquire and use information that helps them understand their world and experiences and, eventually, generate new information and knowledge.
- *Lifelong learning:* Learning has to take place before, during, and after formal education, beyond the classroom, and through a variety of means.
- *Active inquiry, research, and analysis:* Students must learn to formulate critical questions, identify, acquire, and organize information from different sources, and analyze and make judgments about collected information.
- *Collaborative, project-based learning:* Students must be able to work cooperatively in groups, on projects that cross disciplines, constructing knowledge using a variety of both electronic and print research and reference materials, just as problems are solved in real-world and work situations.
- *Technological literacy:* Digital technologies have penetrated most work environments, so the lack of technical literacy and skills is a serious handicap in modern economies.
- *Educational/real world relevance:* Education must provide information, skills, and experiences that are relevant to the world in which students will live and work.
- *Individualized instruction:* Differences in individual knowledge, learning abilities, and styles are not usually accommodated in traditional classrooms. As a result, students often demonstrate lower retention rates, poor performance, a dependence on rote learning, and a lack of enthusiasm. Current learning models show that individualized, project-based instruction can reverse these negative effects and contribute to greater student and teacher satisfaction.

Can Computers in School Improve Learning?

Soon after the first personal computers appeared more than two decades ago, grand claims were made about how they, and related educational technologies, would accelerate learning, bring education to those without them, improve teaching conditions, enhance school and classroom management, encourage needed changes in pedagogy, and enrich and individualize learning. In short, computers would revolutionize education. After many promising experiments, numerous failures and near failures, and a few notable successes, it is clear that the promised revolution has not occurred.

The Rebirth of a Revolution?

New claims are now being made that a combination of cheaper and easier-to-use computers, new communications technologies and

the Internet, and a better understanding of how to use these technologies for education are finally enabling computers to help improve teaching and learning. At the same time, some see computers as means for developing countries to leapfrog conventional, slow-paced educational reform and development processes and join the global information economy more quickly. These new promises and the ubiquitous presence of computers in many sectors of society are driving an increased interest in bringing computers into schools and classrooms. Many projects in such countries as Brazil, Chile, Jamaica, Costa Rica, the United States, and Canada, plus others in Europe, Africa, and Asia, are seeking to make computers an integral part of education. In addition, international development organizations, including USAID, The World Bank, UNESCO, the International Research Development Corporation of Canada, and the Inter-American Development Bank, either already support computers in schools projects or are exploring how best to use computers to address education and development problems. Computer use in education is growing as more people realize that students will be ill-equipped to participate in modern economies without solid technical and research skills. More important, however, is the growing understanding that providing quality education for all will not be possible without computer technologies playing a significant role.

Along with this new enthusiasm for using computers in education, serious questions remain. Policy makers, donors, educators, and taxpayers are wondering about the real impact of computers on education in general and academic performance specifically. Planners wonder how the relatively high immediate and long-term costs of educational computing, especially for disadvantaged schools and poorer developing countries, will be handled. In particular, educators and others are concerned about how best to use these technologies in classrooms and schools and what specific strategies, if any, make sense for developing countries.

Answers to these questions are often incomplete and anecdotal, and the little empirical quantitative and qualitative research that has been done only indicates—but does not prove—that computer technologies, when focused on specific, measurable objectives and used properly, can have a deep and lasting positive impact on a whole spectrum of educational activities.

Emerging Evidence of Effect

While research on the impact of technology use in education is still in its infancy, a number of studies demonstrate technology's potential to transform both teaching and learning. One hallmark example, the 10 year-long Apple Classrooms of Tomorrow (ACOT) research program, examined the effect that integrating computers into teaching and learning has on student performance. This research (ACOT 1996) demonstrated that:

Students' behavior and attendance improved, along with their attitude toward themselves and toward learning. Their performance also improved in several ways:

- *Test scores indicated that, despite time spent learning to use the technologies, students were performing well and some were clearly performing better than before.*
- *The students wrote more, more effectively, and with greater fluidity.*
- *Some classes finished whole units of study far more quickly than in past years.*

The researchers found that instead of isolating students, access to technology actually encouraged them to collaborate more than in traditional classrooms. Also, instead of becoming monotonous with use, students found technology use even more interesting as time went on.

Independent researchers also learned that, in addition to performing well on standardized tests, ACOT students developed a variety of competencies that, although usually not measured, are indicative of quality education. ACOT students:

- learned to explore and represent information dynamically and in different forms;
- became more socially aware and confident;
- were able to communicate effectively about complex processes;
- used computers routinely and appropriately;
- became self-motivated and independent learners;
- mastered content quickly and shared their understanding spontaneously;
- gained the ability to work collaboratively; and
- developed a positive orientation toward the future.

Other rigorous studies demonstrated similar findings. The results of an in-depth research project conducted by staff of the Educational Testing Service (ETS) on the effects of computer use on performance in math supports several of the conclusions from the ACOT study (ETS 1998). The ETS study found that "the use of computers to teach higher-order thinking skills was positively related to both academic achievement in mathematics and the social environment of the school."

Additionally, longitudinal research results of large-scale technology integration in West Virginia curriculum showed a corresponding rise in test scores across many subjects and disciplines. More specifically, West Virginia experienced across the board increases in all basic skill areas, with eleven percent of the gain relating to Basic Skills/Computer Education (BS/CE) technology implementation eleven years ago. BS/CE also proved to be more cost effective and than other educational intervention programs (Shakeshaft, Becker, and Kotikamp, 1999).

Initial experience from developing country schools supports findings from the United States that computers can have a significant effect on many aspects of education. Results from programs in Grenada (Bosch 1994), Chile (Hepp 1998), Jamaica, Costa Rica (Wolff 1998), and LearnLink projects in Brazil, Namibia, Morocco, and Guatemala (AED/LearnLink 2002) indicate a spectrum of positive changes, including improved learning outcomes, greater teacher satisfaction, enhanced professional development, and improved school community collaboration. When new teaching approaches are introduced along with computer technologies, the effect on improved learning and the continued practice of better pedagogy is often greater. Additionally, stronger learning partnerships between students and teachers can occur when computer technologies are integrated effectively into learning systems.

Computers and related technologies are not a panacea for the problems facing education in developed or developing countries. In fact, computer projects may not be the most appropriate educational intervention for all countries. This is especially true for schools that lack the most basic infrastructure—furniture, electricity, and security. Donor representatives, ministry officials, school staff, and parents need to assess critical educational needs carefully before deciding that a computer project may or may not be the most appropriate.

Computer Technologies as Educational Tools

Computers are often viewed as tools that can be used to achieve diverse educational ends similar to the way that textbooks, laboratory equipment, curricula, or other educational technologies can be used to enhance education. This perspective of computers as tools is only partly correct. The limited view of computers as single-purpose and single-user tools often results in computers being treated as just another piece of equipment and not as an integral part of teaching and learning. One result of this narrow view of computer technologies and education is that computer use may be restricted to select groups of students, often those in computer science classes and those who pursue a narrow set of training activities such as word processing and computer programming.

In fact, computer technologies can be thought of as boxes comprised of multiple intelligent tools that take on new functions and enable new results to suit the needs of different users. As Herbert Kohl (1996) explains, computers more closely approximate the functioning of the mind than any other device.

Like the mind, [computers are open] to new use, new configurations and rules, new means of representation, and always new applications. In addition, computers are adept at crossing boundaries. Photos, words, sounds, and so on are all common objects that can be organized, manipulated, and joined to one another with the same general technique, but in unlimited combinations. This mobility has provided previously unimagined power to the mind to think globally and develop unanticipated connections or contrasts. [Computers] can (and most likely will) lead to new ways of telling stories, developing narratives, recording history, and organizing experience. The computer is unique, both a tool and an extension of the mind.

Changing the way we think about computers as tools is fundamental to our understanding of their potential impact on education and to

determining how to integrate computer technologies into all aspects of education effectively.

Seeing computer technologies as multi-use and multi-user tools affects how we consider using them and how we evaluate their effect on learning outcomes and improving educational quality. Studies and evaluations of computer education programs often seek to uncover significant causal relationships between single uses of computers and individual changes in student learning and behavior. The very nature of learning and education, and the characteristics of computer technologies generally makes such studies ineffective. It is not surprising, therefore, that results from these studies are rarely conclusive. Research, monitoring, and evaluation studies should be designed to combine a mix of qualitative and quantitative methods that examine computers' diverse array of effects on learning, teaching, and broad educational goals.

Models of Computer Use in Education

Because computer technologies are not single-use or single-user tools, they can be used to improve education in many ways. When considering potential use of computers in education, it is helpful to create a few models of good use to guide decision making and stimulate creative applications. Designing, planning, and implementing new programs and projects without models or examples are extremely difficult. Kohl (1996) describes this difficulty as the "paradox of large-scale innovation." According to Kohl, "[w]ithout models, people are left anxious and directionless, innovation fades, and things remain unchanged." On the other hand, the slapdash use of models can perpetuate poor practices, constrain the use of computers in schools, and inhibit innovation.

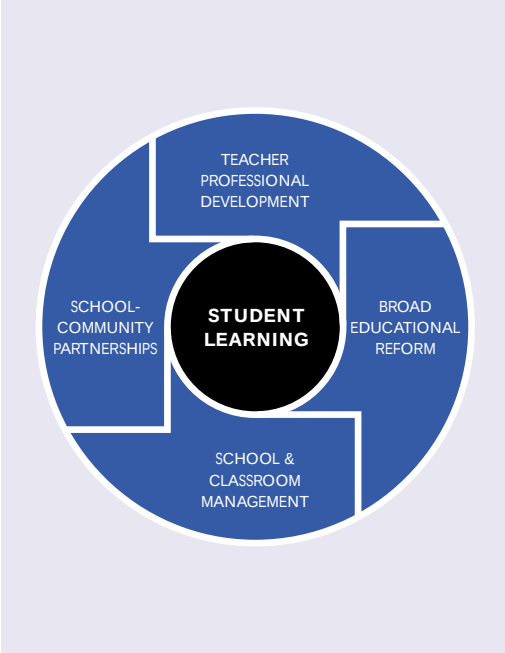
Two common approaches: Two contrasting approaches are often used to describe how computers can be used in education. One is based on how computer systems are actually installed in schools. This physical or structural approach results in two general types of school computer arrangements: stand-alone computers and networked systems. Similarly, physical models of computer use can be based on how computers are deployed in schools, either in classrooms or computer labs. The primary benefit of applying physical models when designing school computer projects is that their clear technical focus makes planning easier. However, using physical models to design school computer programs can result in technology issues directing the project rather than educational needs determining how technology should be used.

An outcome approach is the second and more appropriate way of determining how computers can be used to achieve specific objectives and solve problems. To achieve real and lasting benefits for students and teachers, it is essential that genuine, clearly articulated educational needs—not the technology—be the foundation and driving force of computers-in-schools initiatives.

A model of use: To keep education concerns the principal focus of computers-in-school initiatives, this paper organizes the educational benefits of computers into four main areas of focus that all support one common purpose—student learning.

It is important to realize that the best computers-in-school initiatives involve a mix of all the areas of focus this model describes. Therefore, the model should not be seen as a set of

Figure 1 **Integrated Framework for the Computers-in-Schools Model**



independent separate units but as an interrelated whole. Projects, however, will likely be planned and implemented to concentrate on one or two of the areas. In addition, experience shows that as initiatives mature and evolve, their focus shifts from one or two areas to include the others.

The paper examines the major elements of the model improving student learning; providing increased opportunities for teacher professional development; improving school and classroom management; strengthening school-community partnerships; and supporting broad education reform efforts.

Improving Student Learning

The potential for computers to significantly enhance learning and teaching are the most important reasons for introducing computers into schools and integrating them into all aspects of education. For this reason, improving student learning is the core of this model and is supported by the four other areas. The many ways in which computers can be used to enhance learning share one fundamental principle—"individualized activity" (Osin 1998)—that makes them different from all other educational technologies.

Unlike other types of educational technologies, computers enable individuals to have unique, interactive learning experiences. When mixed with communication technologies, they provide high levels of interactivity, some of which occur between users and the software they are running. For example, a student using a spreadsheet to apply mathematics principles quickly can see how a graph changes when the variables in an equation are changed. The student decides which variables to change, and the computer responds by displaying a new graph. The student and the computer are interacting at an individual level. Even when groups of learners work collaboratively with the spreadsheet, the user has both an individual and a group experience.

At another level, learners can engage in interactive educational games, which are designed to help them learn deductive and inductive reasoning as they solve entertaining problems. Each time learners apply logic to solve the problem with their own and game-based information, the scenario changes. This combination of "moves" by the learner creates a unique response from the computer that can test the student's thinking and logic skills. Through a process of repetition and increasingly more difficult problems, participants learn logical reasoning and sharpen their skills. The better the learning software or the exercises using basic

Box 1 The Internet - More Than Information

In addition to improving mathematical, logical, and analytical thinking, networked computers enable learners to interact with others across time zones, languages, and cultures, allowing them to develop better understandings of the world outside their immediate boundaries. The Internet thus serves as a democratizing tool for information and communication exchange and opens up the world to those who otherwise may not have the opportunity to venture outside their own villages or towns. From the words of a female student participating in the World Links program in Mauritania, the internet is a symbol of liberty,

"We get freedom from the Internet, since in our society girls are not allowed to go wherever we want… the Internet takes us out to other people, places, and realities…. It is our way of escaping from our closed society. It is vital to us, it gives us liberty (Carlson, 2002).

Another student from the PROEM school for street children participating in Brazil's RiverWalk project described his feelings:

"All negativity from my background and where I come from is erased when I am communicating with my peers over the Internet. This is the first time in my life I have ever felt like I am making a solid contribution of my ideas to others. I was equal to them and giving some of my knowledge back!"
(Riverwalk, LTNet Rusten, 2002).

applications, the more individualized and enriching the interactivity.

Research shows that individualized instruction accelerates and intensifies learning. When instruction conforms to a student's learning style, as well as his/her existing knowledge, rate of processing information, unique needs, and innate abilities, the student masters content and skills more quickly and completely, and learning is more enjoyable and rewarding. Computers can make learning individualized and interactive and enables students to discover patterns of information, experiment with and explore new forms of expression, and pursue questions and ideas. This capability of computers, when coupled with communications technologies, allows learning to become a dynamic social process within and beyond classrooms and schools. Networks of computers in schools, nations, and around the world can link students to diverse sources of information and perspectives that extend the horizons of study and catalyze collaborative learning.

Computers can improve teaching and learning in six principal ways.

1. Computer-Assisted Learning (CAL)

In this category of use, also called computer-aided instruction (CAI), computer-aided learning (CAL), and computer-based training (CBT), computers are used to tutor students by providing programmed instructions and information. Students respond to a series of questions, usually in a multiple choice or true and false format. At its less sophisticated level, CAI is used for drill and practice to aid in memorization and self-assessment, most commonly to support math and foreign language learning. More sophisticated forms of CAL strengthen logical thinking and problem-solving skills by guiding students through progressively difficult scenarios. These applications often require learners to combine new information from the program with existing knowledge to attain new knowledge and solve problems.

Research shows that when used to support and reinforce quality conventional teaching, CAL can result in improved learning outcomes. Students benefit from CAL by learning at their own speed and cognitive level, and they experience less anxiety when making and correcting errors. CAL tutorial and problem-solving applications also enable students to learn and master new skills independently. However, CAL can have a negative effect on learning if used as a substitute for teacher-facilitated learning (ETS 1998).

CAL also can supplement and bolster the quality of instruction when teachers are poorly trained or inexperienced, as in areas where lack of adequate teacher training results in teachers with both a poor command of the subject matter and

Box 2 — Latin America's Response to Improve Math and Science Education

The International Virtual Education Network (IVEN), a cross-country pilot project in Latin America, is developing simulation programs to aid in teaching complicated concepts in math and science. Using powerful information and communications tools, IVEN has created a virtual network of electronically enhanced math and science "learning modules." The equipment includes a state-of-the-art development laboratory that is connected to sets of workstations in the participating countries. This enables students to conduct scientific experiments online, use sophisticated scientific tools such as an electron microscope and other simulated tools, as well as have access to the most recent scientific research. In the absence of science labs in many Latin American schools, the IVEN network most closely matches them and brings a much richer math and science curriculum to the students. (Haddad, 2001)

effective teaching practices. When used in such situations, as it was in a rural school in Grenada, CAL for math and English education resulted in significant learning gains and a rise in test scores. Grenada marked the beginnings of measuring the quantitative impact of CAL technologies on language learning. Due to a breakdown of the main server and lack of ability to provide for maintenance, the program came to an early end. As a result, there was a substantial drop in test scores, indicating the technology indeed was making a difference, and its re-introduction into the schools was necessary (Bosch 1994).

Learning impacts: Two critical lessons emerge from nearly two decades of experience with CAL, as illustrated by the results of an ETS study of the effects of computers on student achievement in math. First, as with all tools, the quality of results is often more strongly linked to how teachers use CAL than with the applications themselves. Second, greater impact is achieved when learning problems and student needs direct decision making about what CAL technologies are used and how.

Additional educational benefits emerge when students and teachers create their own CAL applications. This builds high-level technical capacity, results in CAL tools being tailored to specific teacher- and student-defined needs, increases integration of computer use into school curricula, and strengthens feelings of ownership of computer systems. In the *Enlaces* project in Chile, for example, teacher and student teams have created CAL applications to enhance Spanish and English language learning (Rusten et al 1998).

2. Simulation and Exploration

Using conventional teaching approaches, teachers usually find large, natural, mathematical, economic, or social systems difficult to clearly explain or demonstrate. Similarly, the time and difficulty of performing complex mathematical equations and graphical functions often prevents teachers and students from fully exploring and understanding complex principles. Computer simulations, a sophisticated form of CAL, make it possible for students to experience and experiment with a variety of biological, scientific, weather, mechanical, business, mathematical, social, and political phenomena with less risk, cost, and time than has ever been possible. More important, however, computer simulations make it possible for students to quickly grasp complex concepts and apply their understanding.

In the absence of computer simulations, students usually learn the behavior of complex systems passively through general descriptions and definitions of system elements and primary governing rules. However, because most complex systems involve several levels of positive and

Box 3 — Computer Learning

Many school computer programs focus on teaching students about computers, training them to use basic applications such as word processors, spreadsheets, databases, and presentation programs. This approach to computer use in education is fine as long as it is just the first step in enabling students to use computers to enhance all other areas of learning. Unfortunately, many programs never go beyond these mundane training activities.

Learning the "how" of computer use is an important and necessary step for teachers and students, but it is an insufficient reason for introducing computers to schools. Experience shows that mastery of computer skills is best achieved by using these tools to accomplish other educational activities. In other words, learning with computers is the best way to learn to use them. In addition, the "learning about" approach to computer use actually can inhibit the integration of computer technologies into other spheres of learning. Under such systems, teachers, administrators, and students can create artificial barriers between computers and core disciplines.

Given the rapid rate of change in the computer industry, it can be futile to invest much effort in learning any one skill. Students would be better served by developing self-managed learning skills that they could use to learn new computer skills on their own.

negative feedback and intricate interrelationships, general descriptions and basic rules are incapable of conveying much understanding.

Learning impact: Computer simulation allows students to observe the behavior of complex systems and interact with key variables to derive basic principles and make predictions about the consequences of changes in such systems. A simulation of an ecosystem can enable students to comprehend quickly the delicate balance between species and the impact that shifts in the population of one species can have on the entire system. In a matter of a few minutes, several seasons or lifetimes can be simulated as variables are changed and monitored and predications made and verified. As students interact with a simulation, they develop and sharpen their cognitive skills and begin to construct mental models and new understandings of the complex world around them. There are a variety of educational simulation games for teaching physics, chemistry, biology, environmental studies, math, political science, economics, history, and geography.

As with other types of CAL applications, it is possible for students to construct their own simulations by defining the elements of a system and the rules that govern how they interact and function. Through such exercises, students attain new levels of understanding, they often cross disciplinary boundaries, and skills are reinforced and made relevant. The process of developing a simulation often requires students to work in collaborative teams, carry out detailed research in different fields, and address numerous problems and challenges. These and other educational benefits contribute greatly to creating a quality learning experience.

3. Research and Analysis

Living and working in knowledge-rich societies demands new abilities. Individuals should be able to formulate critical questions, identify, acquire, organize, and summarize information from diverse sources, and analyze and make judgments about the results. Learning and perfecting these skills requires that research and analysis activities be integrated into learning across disciplines and throughout schools. In addition to the practical benefits of developing critical workplace skills, learning that involves research and analysis fosters development of higher-order cognitive abilities and is more enjoyable than rote learning. Research and analysis are powerful learning processes through which students actively create their own understanding rather than simply acquiring information passively from teachers.

Computer technologies are not required to enable students to engage in challenging and productive research and analysis experiences. However, these technologies can remove or lessen barriers to quality research and analysis, making the process easier and less frustrating. Technology also can lower the costs of research and analysis and lead to more sophisticated and rewarding results. In all research and analysis activities, there are practical trade-offs between labor and intellectual activities. When students spend time and effort physically seeking information, less time is spent in higher-order activities such as reading and thinking about their topic, formulating new questions, or exploring possible relationships and patterns. Computers also can shift the balance between labor and learning in favor of higher-value activities and contribute greatly to producing quality results.

Digital Libraries

In some situations, computers and reference CD-ROMs, electronic journals and periodicals, and communication tools can provide affordable access to current research and reference resources that cannot be obtained from conventional libraries and paper-based systems. It is unlikely that most countries can afford to establish and maintain conventional libraries in the hundreds of thousands of schools that have none. This, coupled with the long-term social costs of students not having access to reference material or the opportunities to learn to research and analyze, makes computer-mediated research very cost-effective.

Conventional libraries are the principal sources of information for most student research in developed countries. Most schools in the developing world, especially those in rural or poorly served areas, do not have a library. Even a modest school library, with only a few thousand volumes, a handful of periodicals, desks, shelves,

Box 4 Rio de Janeiro's Response to Lack of Educational, Research Materials

Recognizing the need for providing state-of-the-art technologies in the schools within the municipality of Rio de Janeiro, Brazil, as well as the challenges of providing Internet connectivity in all schools due to budgetary constraints, education officials created "Geracao Internet," a regularly updated CD-ROM containing a collection of the best web sites for use in primary classrooms to supplement learning in all disciplines. Beginning in 2000, this CD-ROM was distributed to all public primary teachers within the municipality of Rio de Janeiro, Brazil. Considered another form of a digital library, the CD contains sites ranging from the Amazon rainforest to the Sao Paulo Zoo, to sites on world geography, math, language arts, and history, "Geracao Internet" provides the next best thing to having an actual Internet connection for those schools with computers lacking connectivity. Additionally, the information on the CD-ROM contains what would be volumes and volumes of printed information, thus saving valuable shelf space as well. (Rusten, 2002)

and supplies, can be prohibitively expensive to set up and maintain. For a fraction of the cost, it is possible to create a robust electronic library consisting of one or two computers, and a variety of CD-ROMs that can provide access to current and detailed reference information, a collection of periodicals, and an assortment of literature. Access to the Internet, if possible, makes an electronic library global. Electronic reference libraries cannot replace conventional libraries, but they are superior to no library at all.

It is useful to note that the same tools that provide access to digital information can enable students to analyze and digest it, as well as create reports and papers that combine text, graphics, and images. With a link to the Internet, the universe of reference sources explodes, and it becomes possible for students to engage in collaborative research with students in others schools and countries. In short, greater educational benefits can be achieved, at lower cost, through computer-assisted research and analysis than with conventional manual approaches.

4. Computation and Production

Computers excel at manipulating information, performing complex calculations, graphing relationships, and accomplishing repetitive tasks. Many of the most important learning activities—reading, writing, mathematics, languages, mapping concepts and relationships, presenting information in useful ways, discovering relationships and patterns, and sharing understanding with others—can be enhanced significantly by the judicious and creative use of computers. While these benefits are being realized, students learn practical skills in using core computer applications.

As routine work becomes less tedious, enthusiasm and creativity grows, and it becomes easier for students to focus on core intellectual activities. This effect of the integrated use of computers in education was clearly demonstrated in Apple Classrooms of Tomorrow (ACOT 1996). One ACOT participating teacher, Robert Howell, reported that, "The students don't get tired of working on the computer. They actually ask for things to do. In all my years of teaching, I never had anyone ask for another ditto." [1]

Other teachers participating in the online collaborative RiverWalk-Brazil 2001 project[2] noted similar positive student reactions to working with computers and the Internet, "This project had elevated the self-esteem of the students because they realized they could do the same work as others more fortunate than they. Their pictures and research are on the Internet, so they are "important citizens" who are contributing to the future generations. Two other Brazilian teachers, Maria Sakete and Sergio Barreto, reported how the students were more engaged in learning as well as how the project tied in with the classroom's thematic topics:

"…the students had raised some questions around the bridges. In this opportunity, we studied "volume and proportion," exploring the concepts of capacity, extent, size, and mass."

5. Learning Networks and Computer-Mediated Communication

When computers are linked to create local networks in classrooms and schools, it becomes possible for users to communicate across the network and access common resources including hardware, software, references materials, and text and multimedia files. When many local networks in a city, country, or around the world are interconnected, as they are through the Internet, the range, diversity, and means of communication and access to information grows exponentially. Network learning, or the use of computers and networks for collaborative learning, research, and communication, is rapidly becoming one of the most potent means for applying computer technologies to improve education. As Neil Rudenstine (1997) explains, network learning…

…enhances the vital process of "conversational" learning… People argue and debate, listen and react, and sometimes even discover common solutions to difficult problems. [Computer networks create] an array of new electronic forums for such conversational learning. Communication takes place at all hours, across distances, among people on campus, and beyond. Instructors can hold supplementary "electronic office hours" and moderate on-line discussion groups, unbounded by time or place. Students, even those who are reticent in the classroom, can put forward their hypotheses and invite their peers' reactions, or describe a problem they are struggling to solve and solicit suggestions from others.

Central to all learning networks, computer-mediated communication (CMC) uses a variety of software that enables synchronous and asynchronous communication. The most common tools include email, listservs, computer conferencing, online discussion forums, newsgroups, and chat rooms. CMC in its different forms enables people to share information, ask questions, make new friends, collaborate, and learn in ways unimaginable less than five years ago.

At a minimum, CMC can improve communication among administrators, teachers, and students within a school. Electronic mail, the single most common use of CMC systems, has been shown to lower overall communication costs while increasing the frequency and quality of communication. At its most robust, CMC enables users to engage in research and collaborative learning that would be impossible without this global system. CMC's effect on education and learning should not be underestimated, and teachers and students are only just starting to realize the benefits of this exciting use of computers in schools.

Learning impact: Engaging students in learning networks through deliberate strategies with defined learning outcomes and assessment activities can achieve many of the elements of a quality education. Participating in learning networks requires students to be active and engaged learners, "following leads, distinguishing the substantial from the trivial, synthesizing insights drawn from different sources, and formulating new questions. Seated before the computer, a student is challenged to make something happen, to act or pursue, rather than merely react or absorb. Such an approach holds particular promise in an era when students, more than ever, will need to sustain the capacity for serious learning throughout their lives and careers." (Rudenstine 1997)

Nearly all the information provided to students during the course of their education is heavily filtered and processed by teachers, textbook authors, educational radio and television programs, and curriculum guides. Therefore, it should be no surprise that students often lack the critical thinking and analytical skills needed to determine if the raw, unfiltered information that permeates the world outside the classroom is true or useful. The best way to learn these skills, as with all higher-order cognitive abilities, is through active and collaborative learning processes.

Chile's *Enlaces* program, which has built a national learning network to connect all primary and secondary schools in the country, is one of the oldest and best-known projects seeking to establish a learning network and use CMC. This national initiative is striving to leverage the power of CMC on a wide scale to increase educational access and equity, improve learning, and support a major educational reform effort. (Hepp 1998; Rusten et al 1998; Potashnik 1996)

Combining learning networks with computer-

mediated communication and the Internet has the potential to radically change education in new ways. Similarly, building learning networks, such as in the *Enlaces* program, can increase educational access and equity. Via *Enlaces*, students in Chile's poorer rural areas now can have access to the learning resources of their peers in urban regions. Geography and poverty have become less of a barrier to quality teaching and learning. Because of the democratic nature of the Internet, learning networks are enabling information and knowledge equity. Learning networks are one of the only viable strategies available to poorer countries and communities to address one of the world's newest forms of poverty, "the poverty of information and knowledge."

6. Artistic Expression and Creativity

Discussions about educational development and learning technologies rarely include consideration of artistic expression and creativity. Yet these two related but distinct concepts are vitally important to the ability of all communities and nations to survive and prosper. Creativity is critical to the success of some of the most important human endeavors, including education, learning, the social and natural sciences, business and commerce, governance and politics, entrepreneurism, and the arts. Creativity and its twin, innovation, may be humankind's best hopes for addressing the many challenges we face, and sustainable development and global democracy would be all the more difficult to achieve without the possibility of human creativity.

Whether education and schooling can teach creativity or induce artistic expression is debated. However, education either can foster and nurture creativity and provide productive outlets and training to refine and direct artistic talent, or it can stifle these precious human qualities. Computers can be a powerful means of fostering, enabling, and sharpening creativity, as well as providing a whole new set of outlets for it. The computer industry, and especially the Internet, is considered one of most creativity-demanding fields of work. Core activities, including software development, chip engineering, marketing, web site design, and the redefinition of commerce, both demand and enable creativity.

Learning impact: Computers enable and enhance creativity in four ways:

- First, computers and the different new media that have sprung from this technology are providing new mediums of artistic expression that have expanded definitions of art and music.
- Computer technologies, especially the Internet, are providing new ways to produce, publish, and distribute literature and poetry, making it

Box 5 — Creativity and Collaboration Across Continents: iEARN

iEARN is a global network of teachers and students who are using the Internet and email to implement collaborative projects that exemplify active and creative teaching and learning. iEARN participants and educators seek to prepare today's youth for a constantly changing and evolving multicultural world as new technologies emerge and economies become more interdependent. In the last decade, iEARN has connected schools from all over the world in more than 90 countries and is currently working with approximately 350,000 students with representation from 29 different languages. The projects are based on interactive discussions and sharing of work, as students and teachers debate, perform research and exchange opinions. The project topics and themes range from global arts and music to international foods and cultural patterns, world religions, local histories, indigenous peoples, youth service, and more. The idea behind iEARN is to get students to compare and contrast their lives with those of their peers in other lands. Through this process, better communication and cross-cultural understanding, as well as learning, result. By going directly to the source in dealing with the problems they face—to the real people of another country–problems will be solved and relationships forged. With the help of ICTs, learning and communicating takes on a new meaning and dimension.

possible for nearly anyone to share his or her art, writing, music, and poetry with a global audience.

- Computer programming, which demands and cultivates creativity, is one of the fastest-growing areas of employment.
- At a more practical level, computers have become a primary means for graphic artists, designers, architects, and a whole new breed of web site designers to create and publish images, develop new products, and design buildings.

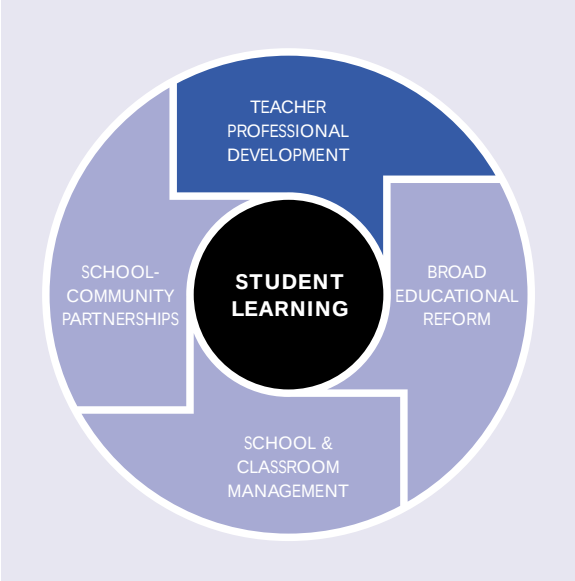
It is well known that academic achievement can be enhanced through participation in creative and artistic programs. In the US, research shows that students participating in music education score an average of 10 percent higher on Scholastic Aptitude Tests (SATs) than those who do not. Many classroom teachers have discovered that positive changes in behavior, performance, and attitudes toward learning occur when artistic and creative activities are integrated into academic studies. Computer technologies provide new opportunities to capitalize on the mutually reinforcing relationships between creative and academic achievement while helping students strengthen, refine, and direct innate abilities. Creative writing programs, for example, that use the combined power of computers and the Internet demonstrate the positive effects of mixing the creative, computational, and publishing capability of these technologies.

Teacher Professional Development[3]

One of the best ways to radically improve the quality of education is to increase educators' knowledge and improve their teaching skills. Conventional professional teacher development through residential degree programs, conferences and workshops, and periodic visits from content experts or teaching specialists can be effective means of building teaching capacity. However, for most developing countries, such programs are too expensive to be used extensively and cannot begin to meet the demand. When available, radio- and television-delivered professional development programs can help fill critical training gaps, but the lack of interactivity and absence of collaborative learning limits their effectiveness. Without alternatives, there is little hope that many nations can significantly and rapidly improve the teaching ability of most of their teachers, or even meet the needs of educating primary students, especially when the growth of school-aged children exceeds the current teacher supply.

The LearnLink's Connect-ED project was implemented to address the growing need for qualified teachers in Uganda. This ICT project, begun in the fall of 2000, helped bolster efforts to train primary teachers through the use of computer-mediated training. Through Connect-ED, LearnLink worked with its partners to develop a series of online learning modules drawn from the Institute of Teacher Education in Kyambogo (ITEK)'s courses in Science and Health Education, Social Studies, Foundations of Education, Language, Mathematics, and Cultural Education. Online trainings took place in newly constructed educational technology centers located in eight Primary Teacher Colleges throughout Uganda. (Country Report, Uganda 2001) Since then, computer technologies, including CD-ROMs, CMC, and hybrid systems combining computers with traditional distance learning programs such as radio, television, or voice-mail telephone programs, have made it possible to provide quality professional development quickly to large numbers of teachers.

The most promising new approach to building teacher capacity is computer-mediated professional



development involving CD-ROMs and the Internet. Such programs can enable groups of teachers to engage in intellectually challenging professional development delivered across the Internet and facilitated by online instructors. When educators participate in online professional development while actively teaching, they are able to use their classrooms as living laboratories to test new approaches. Results, questions, and concerns can be shared with peers across the country or in other nations for comments and suggestions. The collaborative learning aspects of online education can provide valuable guidance from more experienced teachers, mitigate feelings of isolation, and work to strengthen feelings of professionalism among teachers. Additionally at a most basic level, curriculum content that may not be readily available from existing textbooks can be transferred to electronic format and utilized in self-paced learning environments.

This transfer from text to electronic format is taking place in the previously mentioned Uganda/Connect-ED project. In addition to the teacher training modules, Connect-ED created The Digital Resource Library for pre-service teachers, which contains electronic resource materials to supplement face-to-face training and Kyambogo University's teaching curriculum. (LearnLink Newsline, Uganda 2002)

Computer mediated or online professional development can be undertaken at schools using the same equipment, software, and connections to the Internet that are used for other purposes. Because of teachers' concerns about privacy, computers used for their professional development should be maintained where students cannot bother the teachers. If teachers use professional development programs offered through universities or other organizations, then little additional investment other than course fees is required. It is important, however, for teachers to be given sufficient time off during the school day to participate effectively in such programs. In addition to helping teachers gain content knowledge and better teaching skills, online professional development gives them experience using computers and the Internet in an educational environment. This experience can make it easier and more likely for teachers to integrate these technologies into their teaching.

There are a variety of online professional development programs available to teachers from universities and other organizations in the United States, Canada, Australia, and the United Kingdom (Fontaine 2001). In late 1997, UNESCO launched its innovative Learning Without Frontiers (LWF) program by initiating the first of five learning networks for teacher professional development in Zimbabwe (Rusten and Verkuilen 1998). This pilot effort linked staff and trainees at Zimbabwe's five teacher training colleges with professionals at the University of Zimbabwe's Distance Education Department to form a learning network for teacher educators, trainees, and practicing teachers.

Box 6 Brazil's Teacher Training Challenge

With the world's eighth-largest economy and more than 50 percent of Latin America's high school students, Brazil faces one of the largest teacher training challenges in the world. Several hundred thousand uncertified teachers, many with minimal education, staff thousands of remote rural and small village schools throughout Brazil. A recent law required that by 2003, all of Brazil's public school teachers were to receive training equivalent to a bachelor's degree. At the same time, the growing demand on schools is forcing them to hire even more uncertified teachers.

Conventional face-to-face approaches to professional development could not begin to train teachers fast enough to enable the states to comply with the law. Also, the cost of providing conventional professional training to the many thousands of teachers who need it far exceeded the education budget of the entire country.

Given this forbidding situation, how did Brazil attempt to meet this self-imposed deadline and build the teaching capacity of its educators? The country had only one option—educational technology. This involved a combination of television, radio, and computer mediated-professional development.

Initial reports from project staff indicated that a lack of computers, insufficient teacher technology skills, and negative institutional and professional momentum inhibited progress toward achieving the project's ambitious goals. However, as a UNESCO representative involved with the project explained four years later, "One of the lessons we can learn is that people set up their own networks according to their own specific needs. The web site that was designed [for the Zimbabwe activity] was not accessible, and the electronic discussion list, monitored by Paris, did not serve the needs. However, people set up their own individual 'distribution lists.' Frequent exchanges took place between individuals at the colleges as well as with people outside the colleges, encountered through other ways than the project. I think one should see the project more as an activity, a catalyst to introduce ICTs. Sustainability lies in the fact that the colleges continued using the Internet, paid for their own connection fee, and increased the number of computers. Further, participants became creative and designed their own specific projects/activities. That project activities did not take place as planned is of less concern." *(February 22, 2001 email exchange between Mary Fontaine, LearnLink, and Jeannette Vogelaar, currently at the Ministry of Foreign Affairs, The Hague, The Netherlands.)*

This example is illustrative and useful for future learning. As of this writing, LWF is no longer in operation, and proposed plans for expansion to Namibia have been discarded. The lessons to be drawn from this are that ICT for teacher training cannot work without carefully thought-out plans and overall support from all involved—from policy makers at the top to the teachers on the front lines going through the trainings. Without building the local capacity of those who will be expected to use the technologies in their teaching, a project has very little chance of surviving past the pilot phase.

With this in mind, the LearnLink Namibia computer-assisted teacher training (CATT) project successfully engaged the support of the Ministry of Basic Education, Sport, and Culture and partnered with National Institute for Education Development (NIED) in a pilot project to expand information and communication technology training and resources in selected Teacher Resource Centers in Rundu, Katima Mulilo, and Ongwediva and at NIED. Participating teachers were trained in the most current constructivist, learner-centered teaching strategies, combined with comprehensive technology trainings to best support project-based learning. This dual approach allowed teachers to apply and adapt ICT knowledge to all disciplines at the regional, district, and local levels. Thus, technology skills were embedded into the curriculum and not taught as a separate subject.

A further example that serves as an exemplary model for effectively training teachers to integrate technology into developing country school curriculums is the World Links program, an initiative of the World Bank Institute started in 1997. World Links is operational in twenty-two developing countries and reaches approximately 200,000 teachers and students. In over twenty-five partner countries, students collaborate on various project-based themes on a wide range of topics, from the environment to AIDS, cultural heritage, biology, and literature. One of the keys to success for World Links is a modular professional development training program, corresponding to different levels of teacher experience using technology, which is designed to help teachers learn to apply ICTs to improve teaching and learning. The professional development training consists of five phases, including:

- Introduction to the Internet for Teaching and Learning;
- Introduction to "Telecollaborative" Learning Projects;
- Curriculum and Technology Integration;
- Innovations: Pedagogy, Technology, and Professional Development; and
- Planning and Management of School-based Telecenters.

Each phase lasts one week and consists of 40 hours of training, totaling 200 hours of training in all, taking teachers with no prior experience with computers to full competency over a two to three year period. (Carlson and Gadio, 2002) One teacher who completed the trainings explained that, "During my thirty years of teaching, I have come across many innovations in the field of teaching and learning: the Internet is a unique

one. This thing is so amazing to me that I wish I was at the beginning of my career today." (Teacher, Senegal) Yet another remarked, "This program is a great motivation for students: students get more motivated and love working with computers to do different kinds of activities. The teaching is different, and the class is more interesting, because the teacher becomes a guide, a facilitator for the students." (Teacher, Chile)

ProInfo Brazil is a highly successful model for not only providing and introducing computers into the public schools of Brazil, but, more importantly, for investing strongly in training their teachers to effectively use and integrate computer technologies into their daily teaching practices.[4] As one teacher explained, "It wasn't necessarily the computers, it was the way computers were used to engage both my teaching and my students' learning. Their enthusiasm for learning was infectious. Through ProInfo, I've rediscovered the joy of teaching and cannot wait to come to school everyday. Counting the days to retirement is now in my past," (*Personal communication* Rusten, 2001)

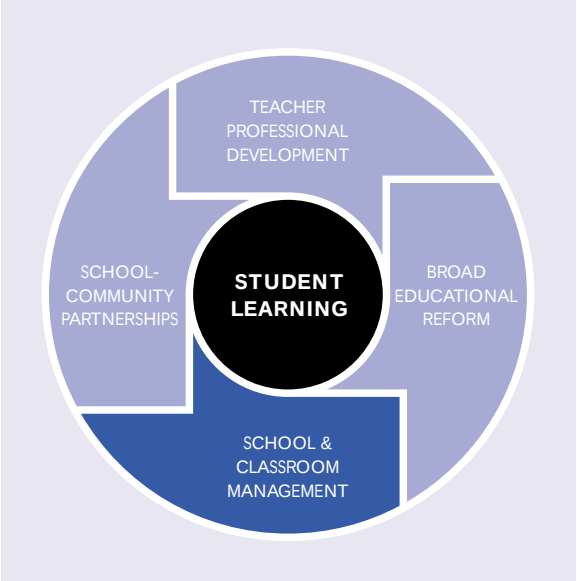
Improving School and Classroom Management

Computers excel at managing data, and they can make it easier for teachers and administrators to maintain accurate records to improve school and classroom management. As education systems seek to decentralize services, financial support, management, and responsibilities, it becomes increasingly important for schools to build the capacity to maintain financial and personnel records. Using computers can increase accuracy, reduce the time and costs involved in entering data, and make it possible to quickly retrieve and analyze information for decision making.

Many schools that seek to introduce computers into their education and management systems likely will need to turn to local businesses for funds to purchase, maintain, and expand the computer system. Schools that are poorly managed and cannot provide a financial analysis for the computer system they want will probably be unable to convince businesses to donate cash or other resources to a development project. Therefore, computerizing management systems using school resources may be a necessary first step in implementing larger computer education projects.

Computers also can make it possible for teachers to maintain accurate student records, track and analyze performance, and use the resulting information to make decisions about how to individualize instruction. Burdensome and tedious record keeping takes time away from more important tasks and inhibits teachers from maintaining records. Simplifying the process can encourage teachers to keep better records and, more important, make use of the resulting information. Before changing the way teachers and schools manage classroom and school records, it is important to evaluate the school's information ecology[5] and the staff's perceptions of its current information management system. This understanding can prove instrumental in making effective decisions about knowledge-intensive projects and designing new information management systems.

As with all parts of this model, using computer and communication technologies just to improve school information management might be an insufficient justification for using scarce resources and would be a poor use of these tools. Greater benefits are achieved when 2 or more parts of the model are combined to form the focus of an intervention. For example, combining an improved school and classroom management system with efforts to integrate computers into teaching and learning could be mutually

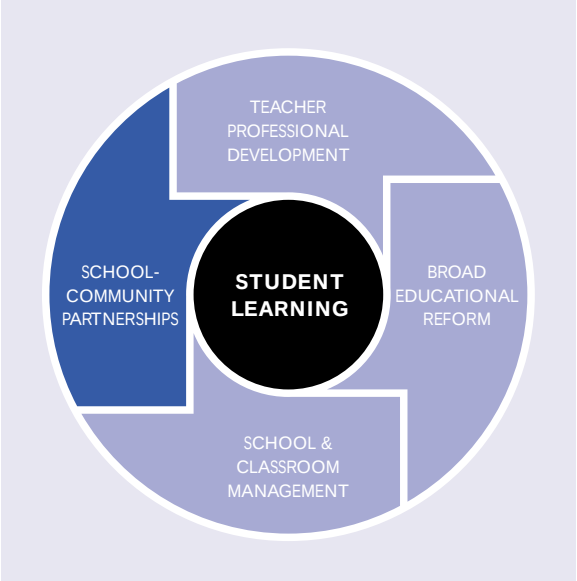


supportive. By reducing the time it takes to maintain records and, at the same time, improving understanding of student performance, teachers would have more time to focus on targeting computer use to meet individual student needs.

Strengthening School-Community Partnerships

Much of a school's initial investment for computers often will come from government agencies, international donors, or local businesses. After this first investment, schools generally are expected to maintain and expand their computer system by generating needed funds from their own sources and by modifying the school's budget. Funds will be needed to maintain the computers, buy supplies and additional equipment and software to meet expanding demand, pay for monthly Internet access fees, replace failed or outdated equipment, and possibly cover the salary of technical support specialists or instructors.

Some schools use their computers to raise needed funds through a mix of revenue-generating activities after normal school hours, including computer training courses open to the public, computer time rental programs, desktop publishing businesses, and a variety of high-end computer services offered to local businesses and government agencies. Schools that provide community members access to their valuable computer resources on a fee-for-use basis often achieve two important goals. First, they earn essential funds to maintain the computer system. Second, and possibly equally important, they strengthen positive relationships with the community. Strong school, community, and private sector relationships can translate into longer-term financial support, access to needed volunteers, and political support for policy changes. This was demonstrated in LearnLink's Guatemala project, which opened up some of its technology centers to the community to provide valuable services to community members as well as generate important funds. The technology center in Nebaj, for example, offered services to the population as a whole, including Internet access, photocopies, scanning, computer rental, printing, desktop publishing, and even custom-designed courses.



It is not easy to achieve a balance between providing needed community services and earning sufficient money to cover the costs of non-school use of the computer system while generating revenue for the school's core budget. However, there are a variety of examples of schools, both private and public, rural and urban, that have succeeded in achieving this balance. A school in a rural community in Grenada, for example, ran computer courses for adults and students from a local college and provided computer use in the evenings and on weekends for a fee. Funds generated from these activities helped the school pay the computer teacher's salary and maintain the equipment (Bosch 1994). Many of the schools participating in the Jamaica 2000 project were able to raise their share of the funds needed to participate in the project from community members and local businesses. After the computers were installed, some of these schools started after-school computer activity programs for local businesses to cover the costs of ongoing maintenance and purchases of supplies (Rusten et al. 1998).

Little research has been done to examine the sustainability of school-run, revenue-generating projects that use school computers. However, given the relative scarcity of computer technologies and skills in many developing countries, it is plausible that such funding strategies will work for years to come. Ultimately, however, as computers become more prevalent and businesses start providing these services, it will become

progressively more difficult for schools to engage in non-core activities to raise funds to support core assets and functions, and other, more sustainable funding strategies will have to be found.

Building and strengthening community links to the school may be a much more valuable result of engaging members of the local community in a school's computer initiative. Schools in many countries have used the promise of a computer project to get businesses and parents to provide goods, services, and labor to build or remodel computer lab facilities, ensure that the electrical system is properly installed, and install network cabling linking the school's computers. This community involvement was clearly demonstrated in the LearnLink Amic@ Telecenter project in Paraguay.[6] Although not housed in a school but used by school-aged children, one Amic@ telecenter was not only built by the community but used materials supplied by the community to build it as well.

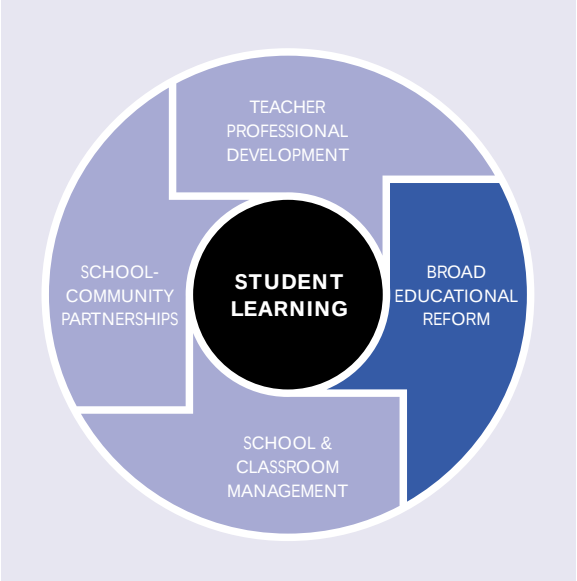
NetDay (www.netday.org) activities around the world demonstrate how community members can make a substantial contribution to enhancing a school's investment in technology while strengthening links to the community. NetDay was started as a grassroots movement in the United States to install cabling to link a school's computers together to form a local network and make the network Internet-ready. From 1996-2001, NetDay expanded to 40 states and mobilized over 500,000 volunteers to wire more than 75,000 classrooms in states across the country. Since starting in the United States, NetDay programs have been instituted in countries across the globe, from New Zealand to Brazil. Similar to NetDay, SchoolNet Namibia mobilizes groups of volunteers to install school networks and provide technical support. One notable program, "Kids on the Block" enlists and trains youth volunteers to provide technical support and mentoring, as well as assistance in the set-up of low-cost local area networks.

The international NGO Schools Online (www.schoolsonline.org) represents another key example of the importance of strong school-community relationships to bring computers, connectivity, and training to schools around the world. In partnerships with World Links and iEARN as well as many high tech corporations, Schools Online helps bring technology to developing countries ranging from Argentina to Bulgaria to Zambia. Programs have been developed to provide the most efficient access to the Internet to as many students as possible. As of early 2000, over 400 schools in over 32 countries received the equipment and support necessary to get online. Yet another example of community support for ICT development is World Computer Exchange (WCE), an NGO providing high quality refurbished computers and networking equipment at the lowest possible cost to developing country schools and NGOs. As community members, business people, and parents become involved in NetDay, Schools Online, and WCE-like activities and projects, it is more likely they will continue to support the school in other ways in the future.

Supporting Broad Education Reform Efforts[7]

Just as school computer initiatives can revitalize and initiate school community partnerships, technology projects can have a positive effect on broad educational reform efforts. The following section explores the synergy between technology projects and educational reform.

Comprehensive educational reform is a complex and challenging undertaking. The easier part of the process is defining what is wrong with the current system, what needs to be changed, and what new factors need to be introduced into the education system. Unfortunately, most reform



directives are long on the "whats" but short on the "hows" of successfully accomplishing the reform. It is common for reform documents to require schools and teachers to:

- create lifelong learners;
- support the development of higher-order cognitive skills;
- foster creativity;
- change teaching from a traditionally didactic to a student-centered process;
- teach research and analysis;
- better prepare students for the workplace;
- make education more relevant; and
- provide access to current research material.

These are all admirable objectives, but they can be difficult to achieve. Enacting effective and lasting reform demands a variety of interrelated approaches. Unfortunately, when school and educational reform is discussed, computers and associated technologies usually are not part of the conversation—and they generally are not viewed as mutually reinforcing allies in the struggle to improve education.

When schools look for ways to implement reforms and achieve broad objectives, it is understandable for them to turn first to conventional, familiar approaches for solutions. Many conventional approaches have been tried with varying degrees of success- some are too expensive to be considered. As schools seek alternative approaches, some may turn, often accidentally, to computer technologies as levers or stimulators of change and as possible means of enabling and facilitating reform strategies. The *Enlaces* project in Chile provides a good example of how the needs of a national reform effort and those of a pilot computer networking project coincided. Each initiative provided critical inputs and means to the other, and a near perfect symbiotic relationship was created that continues to contribute to the achievement of both integrated initiatives. (Rusten and Contreras-Budge et al, 1998)

Many of the characteristics and benefits of computer technologies can become instrumental for facilitating active reform programs. Reform efforts can provide the national policy mandate to encourage schools and teachers to try new ways of doing things and make room for alternatives and change. This combination of forces can make it possible for computers-in-school projects to be integrated into school systems while focusing on the interests of teachers, administrators, students, and parents.

Educational reform does not always occur as a result of changes in national policies. Reform, especially in teaching and learning in the classroom, can occur when teachers have opportunities to change the way they work with students and engage the learning process. Experience shows that such changes often occur when teachers are given opportunities to learn to integrate computers into their teaching.

One example, LearnLink's Computer Assisted Teacher Training Pilot Project (CATT) in Morocco, drew attention to the issues of education and curriculum reform and the potential role ICTs can play in the reform process. CATT's development of online learning modules that integrated computers and multimedia tools into classroom learning for the Ministry of National Education (MNE) started small and was contracted to provide training to a core group of 50 teachers and 350 student teachers. Due to teacher enthusiasm and creation of additional technology centers, the program actually trained over 335 teachers and 1600 student teachers. At the close of the project in October of 2001, the MNE officially approved all seven teacher training modules for use nationwide. There is evidence that reform efforts such as CATT in Morocco can result in longer term national policy changes.

Further exemplifying this bottom-up process of educational reform is Brazil's ProInfo project. ProInfo started in 1997 as a national initiative in partnership with state and local authorities to establish a network of teacher training and technology resource centers across the country. Its primary goal was to integrate technology into all aspects of the curriculum. To ensure that computer labs were being installed in public schools around the country and used to improve learning, ProInfo invested approximately 40 percent of project resources in teacher training. Unlike many other computer training programs, however, ProInfo's approach focused on

introducing teachers to new ways of teaching founded on constructivist principles that make extensive use of computers. Teachers learn to use the computers as they learn to create interactive and collaborative learning environments that foster interdisciplinary, active learning. After less than a year of program activities, observers noticed that teachers who participated in the computer training program extended the use of computers for teaching beyond the computer lab. Also, teachers reported that, for the first time in their careers, they started teaching collaboratively with other teachers and were becoming facilitators of learning rather than presenters of information. It is too early to tell whether these changes will reform teaching in Brazil or if student performance will improve. However, reports from some schools show that teachers are using these new approaches in classes that do not involve the use of computers.

Establishing a school computer program and achieving any of the benefits discussed above is not automatic. Schools, especially in developing countries, face formidable challenges to integrating computers into education systems. In addition, computer and communication technologies are not always the best response to meeting the needs of schools or education systems. There may be more pressing and critical needs to which technology is ill-equipped to respond. If planners decide that a computer program is an appropriate response to educational needs, then the following section may help lessen the difficulty of planning and implementing a school computer program.

Critical Challenges for Computers-in-School Initiatives

Experts, educators, politicians, scholars, business people, and parents around the world are making the same claim—that computer technologies hold great promise for improving educational access, equity, and quality. Castro (1998) writes:

The technological revolution holds great promise for education. Technology in communication, image, and data processing is evolving at lightning speed, while also becoming cheaper and more reliable. The consequences for education are enormous. Technology has gone from being a set of solutions in search of a problem to increasingly offering precise and well-defined potential for education. A technological revolution in education is becoming possible, even though it has not yet happened.

Realizing the promised benefits and turning potential into action and possibility into reality is not easy. Even after schools recognize the need for educational change and reform, conservative attitudes and behavior make change and reform in schools daunting. A complex mix of financial, technical, policy, process, political, educational, social, and language factors can create formidable barriers to change that can frustrate the most ardent champion of integrating computers into schools. It is possible to meet these challenges, however, and build new, stronger education programs that apply the best that computer technologies have to offer to help make learning all it can be.

Strategies for Success

There are no prescriptions or recipes for successful school computer projects. Although experience is limited, lessons are emerging that point the way toward improving chances for success. A few of the more important strategies are discussed briefly:

Focus on education, not technology: First and foremost, school computer projects should be educational development projects, not technology projects. This focus on education demands that projects clearly articulate the educational objectives of the intervention and that the objectives define specific learning and educational goals that the school seeks to achieve. Planners and implementers also should define why these goals and objectives are important and how they and others will know when the objectives have been achieved. Project participants should identify specific indicators of achievement that can be used to assess progress and evaluate the project.

The educational objectives of a project should not be dictated to schools and teachers from distant ministries, universities, or development agencies. Rather, they should be developed in a participatory process that involves teachers, administrators, government and donor representatives, community members, and technical specialists. Strategic planning and

SWOT (strengths, weaknesses, opportunities and threats) analyses offer good models for this process.

The ProInfo project in Brazil is an example of the importance of a participatory process in developing and implementing a school computer project. The national planners for ProInfo set very few dictates for the program; rather, they worked collaboratively with state and municipal education officers, school principals, and teachers to define how the ProInfo project would be implemented in each state, municipality, and school. Common technical and pedagogical principles guide how each ProInfo computer lab is established and used, but all ProInfo schools have their own character, reflected by local decisions made in partnership with national ProInfo staff (Salles and Rusten, 1999 and 2002).

A participatory process serves as a first step in building a strong sense of ownership among all stakeholders in the project. By continuously strengthening these feelings of ownership, project staff create a momentum for success that can be used to encourage innovation and ongoing collaboration.

Experience shows that because of the important role computers play in the intervention, there is a tendency for technological issues to supplant educational needs. Critically evaluating the state of education and teaching at a school and comparing this to alternative practices can be a painful and disquieting process for teachers. Discomfort about and fear of the evaluation and suggested changes may encourage some to move the process away from education and toward technology.

Enable transparent, participatory decision-making: Complex, difficult projects demand continuous and rapid decision-making. Secretive, top-down judgments can jeopardize feelings of ownership and make people believe that decisions are being made to benefit the few at the expense of the many. Conversely, decisions made by committee can inhibit prompt action and prevent difficult choices from being made. Therefore, a balance must be achieved between making decisions quickly and moving issues through a process of consultation and dialogue, but not necessarily consensus. At the same time, it is important that this process is as transparent as possible.

Design projects with a critical mass of technology: One of the central objectives of all school computer projects is to improve student achievement. Being able to demonstrate authentic progress toward this objective quickly can be instrumental in sustaining interest, funding, political support, and a continued commitment to the project by teachers. Achieving even modest gains will be unlikely if the number of computers available is so small that students and teachers only can use

Box 7 A School's Revenue-Earning Plans Scuttled by the Law!

The new principal of a school in a poorer part of a Brazilian city was concerned about sustaining the school's new computer lab. To address this problem, she had arranged for a local firm to rent the lab on weekends for its own training program. The principal had figured that revenue from the rental would allow the school to purchase computer supplies, buy educational software, cover the cost of additional electricity needed by the lab, repair equipment, and buy new equipment to expand the lab. She also had calculated that the revenue would help buy library books and support other educational programs.

The plan seemed sound, and a contract was offered. The income was desperately needed and would help the principal build a stronger school and sustain her new lab for the next three years.

Unfortunately, she did not realize that it was against Brazilian law for a "public good," the computer lab, to be used to earn profit by a private firm. When she learned this, she was devastated and all the more concerned about the future of the new lab.

Fortunately, ProInfo program staff are developing a set of legal revenue-earning strategies that principals can use to help sustain their labs.

computers a few minutes each week. There is no magic number of computers that can guarantee success, and decisions more often depend on funding than on what is best for education. If only a few computers are affordable, then student use needs to be carefully orchestrated to enable a core group to use the computers enough to be able to demonstrate achievement.

This principle applies to establishing central computer labs in schools and to placing computers in classrooms. In both situations, an insufficient number of computers can significantly reduce impact. There is an emerging bias against establishing centralized computer labs in favor of placing computers in classrooms. Among the advantages to classroom computers are easier integration into routine teaching and learning activities for teachers and easier access for students. In contrast, using computer labs can be a superior strategy when funding and support for computers systems is scarce and when infrastructure, security, and space in schools are limited. Decisions about which deployment strategy is best should be based on a careful assessment of a school's capacity to support computers, funds that are available, objectives of the effort, the skills and attitudes of teachers with respect to using computers in their teaching, and a clear awareness of infrastructure and security needs.

Integrate and infuse technology into the curriculum; do not treat technology as a separate subject to be taught: One of the most important decisions to be made by teachers and administrators early in a project are how computers should be used to supplement existing resources, who should have priority access, and how access should be scheduled and controlled. As demonstrated in the Jamaica 2000 project, there is often a tendency for school computer projects to focus on the needs of computer science students and to use computers primarily to teach students about basic software applications and programming. A common result of this is to seriously inhibit the integration of computers into teaching and learning into all curricular areas. Another impact of a computer science focus is that it tends to alienate most teachers and students, causing their interest in the project to fade quickly.

Projects that succeed in demonstrating positive gains in student achievement and strong, committed ownership among teachers concentrate on targeting computer use for basic education skills such as language arts, science, and math. Further gains are achieved by tightly integrating computer use with conventional classroom instruction, allowing each to complement the other.

Brazil's ProInfo project exemplifies this principle. From the start of this ambitious initiative, all teacher trainers and teachers received extensive training focusing on integrating computers into core teaching activities. For example, teachers were not taught immediately to use any standard computer software applications. After a brief introduction to computers, teachers helped develop an educational project related to what they were teaching that involved the use of several software applications. As they worked on their projects, they learned to use the computer and the software. Thus, learning about and using the computer and respective software places the primary focus on the teachers' educational interests and needs, not on the technology. More importantly, the teachers demonstrated through their learning how computers can be integrated into routine subject matter teaching. Initial results from the ProInfo project indicate that this approach is working; teachers are seen practicing what they have learned weeks after their training.

Build teachers' computer ability and confidence: Teachers cannot use tools and applications they do not understand, and they cannot practice new approaches to teaching without new skills. Providing teachers with the time and training needed to familiarize them with computers and to learn to use core educational applications in their classes is proving to be one of the most important factors in project success.

Pedro Hepp (1998), founder and coordinator of the *Enlaces* project in Chile, explains that one of *Enlaces'* "greatest strength[s] has been its recognition that a significant impact on education by using computer technology will only be possible if teachers are capable of integrating it adequately into academic life. [Its] greatest weakness is that teachers do not have enough time during their work day to adequately familiarize

themselves with the educational potential of these instruments." Similarly, UNESCO's Learning Without Frontiers project in Zimbabwe cites the lack of teachers' skills and familiarity with computers as the primary reason for the low level of teacher participation in project activities, and as a result, suspension of the project for the future. (Rusten and Verkuilen 1998, 2002).

Project experience in many countries shows that teachers are often reluctant to participate in computer training programs because of fears about learning to use computers. These fears can range from believing that using a computer is too difficult for them to learn to concerns that the computer mouse will give them electric shocks (Rusten and Arias 1999). Recognizing and overcoming these fears should be an important part of any training effort. One effective strategy is to train teachers to be computer trainers rather than using computer specialists. Using trainers who are also classroom teachers and who understand the challenges faced by their peers and the realities of the classroom can improve training results. Teachers who are trainers can use real-world examples, making teacher trainees much more comfortable about asking questions.

As mentioned earlier, however, it is important to balance teacher training with practical experience using computers in classrooms in traditional learning activities. The computer-mediated communication capability of computers and learning networks can be used to help achieve this second objective. Linking teachers via a learning network, as in the *Enlaces* project, can enable them to share ideas about using computers in their classrooms, ask questions of their peers in other schools, and devise collaborative strategies for using computers in the classroom. At the same time, the medium of communication also builds capacity and skills that later can translate into the innovative use of computers.

A single training experience, whether 2 days or 2 weeks, is rarely sufficient to provide teachers with the broad range of skills they need to use the tools, feel confident enough to create new lesson plans that incorporate computers into their teaching, or continue learning on their own. Successful projects show that training must be provided gradually, over time, to allow teachers to learn progressively and have an opportunity to test ideas, use their new skills, and then return to a training situation to ask questions and learn what others are doing.

Create teachers' user groups: Creating and supporting teachers' user groups can be an important and inexpensive way to strengthen feelings of project ownership, spread innovations and skills, and enable sustainability. User groups can be started by creating teacher-led project advisory committees to advise on project design and serve as liaisons between the other teachers and the project. Once established, teachers' users groups also can be used to strengthen communication among teachers, administrators, project staff, and the larger community. The support for innovative teaching and using technology was evident through the user groups that the Learning Technologies Network (LTNet) created in Brazil[8]. Teachers utilized the various on-line discussion boards, chat rooms, and face-to-face meetings held throughout LTNet's duration to share ideas, provide technical assistance, and meet like-minded educators from around the country.

The CATT project in Morocco provides a further example of the many networking opportunities made possible electronically. Linked together through the Internet, a virtual community of educators was established that allowed teachers to communicate their ideas and receive assistance from one another in technical and pedagogical matters relating to the application of project-based, constructivist teachings.

Cultivate community support: Active participation of parent groups, businesses, and other members of the local community can improve the initial success and sustainability of school computer projects. The issue of maintaining such projects can be divided into 2 parts: financial sustainability, or the ability to pay for consumables and replace aging equipment, and political sustainability, or the ability to maintain political support for the project.

Computer projects in schools often are implemented using special funding, and the excitement of the new program sometimes overshadows recognizing the need for ongoing support. Core

school budgets often are not modified to account for support needs or changes in staffing, and new revenue streams usually are not developed to meet new needs. As a result, as start-up funding dwindles and costs mount, it becomes increasingly difficult for the educational benefits of computers to be realized as equipment breaks down, supplies disappear, and use is constrained. Schools in many countries often turn to parents, local businesses, and community organizations to help provide a portion of the funding needed to sustain the use of computers in schools. This can range from donations of equipment and supplies to the imposition of a special computer fee. Regardless of what specific support is needed, the key is cultivating community participation from the start of a program. Community members need to feel a sense of ownership for the program and to understand how they, and the community as a whole, benefit from their involvement.

Similarly, strong community involvement in a program from the very start often will generate broad public support for making computers an important part of education. When parents and businesses feel it is in their interest to maintain and expand computer use in schools, then politicians and decision-makers will be inclined to support such programs. Also, strong community participation in the program will encourage principals and teachers to seek ways to integrate computers into daily teaching and learning. The combination of these factors will contribute greatly to the ultimate sustainability of computer school programs.

Plan for sustainability from the start: School computer systems are expensive to maintain and support over the long term. The thrill of buying and setting up a project can deter schools from planning and making the difficult decisions needed to provide long-term budget support for projects. However, sustainability questions should be asked from the very start. Strategies for achieving financial sustainability need to be evaluated in the light of realities.

The prospects of starting and running a revenue-generating scheme to maintain and sustain a computer facility and fund new equipment may seem easy on paper. Unfortunately, such plans often prove difficult in practice. Few principals or teachers have the skills needed to organize and run a business enterprise in their schools. In addition, maintaining the public needs of a school can be a challenge while pursuing a business venture because the lure of revenue for cash-strapped schools can pull administrators and teachers away from their core responsibilities. Successfully sustaining a computer project generally will demand a strategy that includes a mix of approaches.

Examples, which have been tried in many programs throughout the developing world, are provided below:

- Schools and government can modify budgets so that recurrent and periodic expenses associated with maintaining computers in the school are covered.
- In some cases, user fees may be charged students to cover the costs of paper ink and other consumables.
- Partnerships may be formed with community organizations and businesses to raise funds for large purchases, such as software and new equipment to expand and update the school's computer facilities.
- Some type of revenue-generating activity, such as opening the labs up during the evening and on weekends for fee-paying use, training activities, email accounts, etc., can be instituted.
- Students and/or teachers provide computer-related services to local businesses, possibly as part of computer education classes.
- Foundations and other donors support special training for teachers and to purchase equipment.

One of the most difficult challenges facing most schools trying to sustain a computer facility is providing ongoing technical support when project funds end. Several strategies may be used, including:

- hiring a previous student or teacher with the needed skills to provide these services;
- contracting with a local polytechnic college so that higher-level students can receive practical experiences by providing the school with technical support services; or
- finding local firms to donate support services

in exchange for using the equipment during low-use periods or for advertising.

In LearnLink's Namibia activity, technology center equipment and use is maintained by local PTA organizations and out-of-work youth. These individuals are specifically trained to manage the centers as well as provide the necessary tech support. Because the pay level is below a teacher's salary, the educational system can afford their valuable services, proving that by devising creative ways to address sustainability, equipment maintenance is possible as well as affordable.

Use participatory monitoring activities: Involving teachers and administrators in project-monitoring activities can result in several important benefits. First, teachers and administrators will learn first-hand about a project's progress, difficulties, and achievements. With guidance, they can translate this information into changes in project activities to overcome problems. Teachers can become excellent sources for solutions to project problems and a means to share lessons with a wide audience.

When planning and implementing monitoring activities, it is important to consider using a mix of qualitative and quantitative tools to collect different types of information. It is also important to keep track of basic logistical and quantitative information about a project to ensure that funds are used wisely and critical activities are completed.

Demonstrate applications and new uses: Encouraging teachers to use computers and new applications in their classrooms can be a slow process, but demonstrating new applications for teachers and students in different situations can accelerate their adoption. Simply making applications available to teachers rarely works. Fostering an environment of experimentation, however, and developing programs that reward the innovative use of computers in schools can extend the benefits of demonstrating software applications.

Assessing, Planning, and Implementing a School Computer Project

After deciding to invest in a computer project, the difficult task of implementation begins. Many elements need to be considered to implement a project successfully. Project design should start with a carefully planned assessment of the school's readiness for the intervention, the larger development environment in the community, and the technical infrastructure environment within the school and surrounding community. The assessment not only provides information essential to designing and implementing the effort, but it also should provide baseline information and a framework for monitoring and evaluating the intervention. Ultimately, the success of a school computer project is determined by the project's long-term sustainability.

Assessing the Environment

Throughout planning, implementing, evaluating, and institutionalizing a project, there are numerous problems, pitfalls, and potholes. Being aware of some of these at the start can help minimize the effect of these difficulties. The following sections review important parts of the process to implement and institutionalize a school computer project.

Infrastructural and technical assessment: The infrastructural and technical assessment is, in many ways, the easiest to undertake. It focuses on physical and human technical resources and is concerned with their presence and costs. The following areas need to be addressed in carrying out infrastructural assessments:

Assessing telecommunications: If the proposed computer system needs to be connected to the Internet or a local or national network, it will be necessary to assess local telecommunication services. To do this, the following questions must be asked:

- Is telephone service available locally? If not, what alternatives exist to secure telephone service? If yes, are additional telephone lines available, and what do they cost?
- Is the telephone system digital or analog?
- How reliable is telephone service?
- Is there an Internet service provider (ISP) within the local calling radius of the school? If yes, what types of Internet services are available, and how much do they cost?

- Does the ISP offer educational discounts? Would it be interested in a partnership relationship?
- What speed of Internet access is possible and usual?
- How many clients does the ISP have?
- How do other organizations access the Internet?
- Would any other organizations be interested in collaborating with the school for ISP services?
- Are there local or national plans to deregulate telecommunications services?
- Are there any special regulations controlling the use of telephone lines for Internet access?
- Does the computer's modem need to be licensed?

Assessing the electrical supply: All school computer projects depend on a reliable, clean supply of electricity to power the computers and telecommunications equipment. To assess the electrical supply for the project, the following questions should be addressed:

- What is the voltage of the local electrical supply?
- How reliable is the electrical supply?
- Does the electricity supply vary more than 10 percent?
- How costly is electricity?
- Is the electrical wiring in the room housing the computers properly grounded?
- Can the school's electrical wiring handle the additional load caused by the computer system?

Assessing facilities and furniture: Computers in schools are established either as clusters in computer labs or in small numbers in classrooms. In either case, they can exist as stand-alone systems, or they can be networked. In assessing the physical facilities needed to house the computer system properly, the following questions should be addressed:

- Will the computers be clustered in one or more computer labs or distributed throughout the school?
- Will a new room need to be built, or will existing space be used?
- Can the rooms housing the computers be locked to prevent theft?
- Are the rooms air-conditioned (heated or cooled)? Will air conditioning be needed? Can the electrical system handle the demands of an air conditioner?
- Is there a dust problem in the school?
- Will the computers be connected to form a network?
- Do the computer rooms have sufficient natural or electric light?
- Are there suitable and sufficient tables and chairs for the computers?
- Would rolling or portable tables improve computer access and use?

Assessing the presence of technical expertise, computer vendors, and maintenance: Purchasing, configuring, installing, and maintaining computer equipment are critical factors to a successful ICT project. The presence or absence of skilled local people and the availability of equipment and maintenance service locally can have a significant impact on the cost of the system and can influence decisions about hiring and/or training staff to handle maintenance and support needs. The local, regional, and national computer business sector needs to be assessed to determine its diversity, availability, quality, and cost.

Monitoring and Evaluation

Monitoring and evaluation activities are usually required elements of donor-funded initiatives. They often serve external needs, and project participants may perceive monitoring and evaluation as primarily a means of finding fault when projects do not proceed as planned. This perception of monitoring and evaluation is destructive and unfortunate. Nonetheless, however monitoring and evaluation components are perceived, they are absolutely fundamental to project success, sustainability, and expansion of ICT use in educational systems.

Monitoring and evaluation activities for school computer projects can be organized into two parts. The first, which is easier to carry out, focuses on monitoring and evaluating project implementation. The second focuses on monitoring and evaluating project impacts.

Monitoring and Evaluating Project Implementation

This type of monitoring and evaluation seeks to answer a series of practical questions about the implementation of a school computer project. Project planning and design is an imprecise art that combines making informed predictions, hypotheses, best bets, and, at times, bad guesses. Foretelling the future is prone to error, and a well-designed monitoring activity permits staff to identify errors early in a project, make needed adjustments, and continue activities. These monitoring and evaluation activities also enable staff to capture valuable information and lessons that can be used to improve future interventions, and they can be studied by researchers to better understand processes of change.

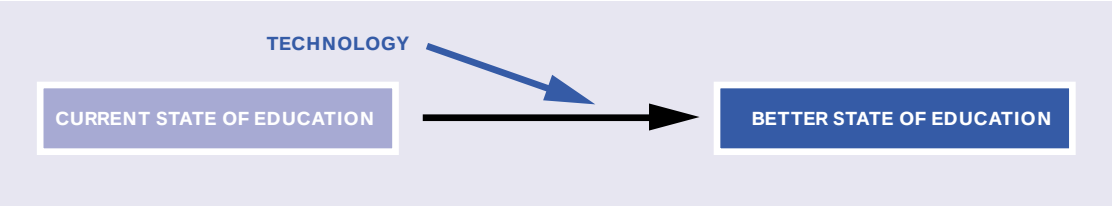
Much of this type of monitoring and evaluation focuses on addressing quantitative questions about the number of computers installed, the numbers of teachers trained, and the numbers of students using computers. In this type of monitoring and evaluation, those undertaking the process also examine the financial aspects of computer projects and seek to determine the extent to which project funds are being spent and managed properly.

Below are sample questions that may be used to monitor and evaluate project implementation:

- Are teachers, principals, and key members of the community involved in planning the implementation of the project?
- Have the schools' physical infrastructural needs been assessed prior to implementing the project?
- Were the schools' computer facilities, electrical supply, network cabling, security measures, furniture, and Internet access properly prepared when the computer equipment was delivered?
- How were teachers selected for computer training activities?
- How many trainees participated in training programs?
- How many hours of training were delivered to teachers?
- How long did it take for computer facilities to be developed?
- What installation problems occurred, and how were they addressed?
- What training difficulties were experienced, and how were they addressed?
- How was the vendor bidding process carried out and administered?
- How much did it cost to prepare schools to receive the computers?
- What aspects of the project's design and plan had to be changed after start-up?
- What assumptions about the project were found to be correct and incorrect?
- How many computers arrived at the schools in working order?
- Did equipment vendors meet the terms of their contract?
- What types of problems with maintaining the computers and facilities occurred during the first year of the project?
- Were teachers and principals provided with on-going professional development opportunities in using computers and integrating them into teaching and learning?
- How many schools have access to the Internet?
- Of the schools with Internet access, how many teachers and principals have personal e-mail addresses?
- How many schools have developed web sites to highlight their school computer project?

Keeping track of how a project is progressing, including documenting the problems that are encountered and how they are addressed is an important part of successfully implementing a project. It is also an important part of making the project process transparent so that participants, donors, and general citizens can be assured that project funds are being used properly and project objectives are being accomplished in a timely fashion. However, monitoring and evaluating project implementation cannot tell us if the school computer project is having an impact on education or what other kinds of impact may be occurring as a result of the project. This is a much more challenging and demanding task that must go far beyond simple quantitative data.

Figure 2 **Better Learning: More Than Technology**



Monitoring and Evaluating Project Impact

At a basic level, monitoring and evaluating the impact of school computer projects seeks to answer three questions. One, are the computers and Internet technologies having a positive impact on teaching and learning? Two, what types and degree of impacts are occurring? Three, how cost effective is the use of computer and Internet technologies in achieving these impacts compared to other educational inputs and interventions? Unfortunately, providing conclusive answers to all of these questions is not easy and, in fact, may not always be possible

Monitoring and evaluating intricate systems such as education is a complex and difficult process. Integrating computers into education should not be thought of as a simple input-output system, as shown above (see figure 2), where a single input—technology—is added to a learning environment to produce a simple output—better learning.

There are several problems with this simplistic approach to evaluating the impact of computer and Internet technologies on education. Each of the main parts of the above education change equation—the starting state of the system, technology inputs, interactive processes, and output state of the system—are discussed below to better understand why this simplistic approach to evaluating the impact of technology on education is insufficient.

First, education systems comprise a complex web of relationships among people, with different abilities, learning styles, backgrounds, motivations, perceptions, and experiences. The goals and objectives of education are multiple, interrelated, and difficult to define. At its simplest, the goal of education is to enable and facilitate learning, a complex process of change where people interact with each other and explore problems, information, and knowledge within a complex menagerie of environmental variables. Through this process, they may develop and increase their skills, knowledge, and understanding of themselves and the world. Even though a variety of theories seek to explain learning, our understanding of this complex process is incomplete. Within the context of this imperfect understanding, it is not surprising that evaluating the impact that computers and the Internet have on education is extremely difficult.

Second, computer and Internet technologies are not simple inputs like fertilizer on a field of maize. In the case of fertilizer, we have a nearly complete understanding of how each element of nitrogen, phosphorus, and potassium interacts with plant systems to enhance growth and photosynthesis to increase the output of valuable products. In contrast, computer and Internet technologies have many hundreds, if not thousands, of elements that can be combined in numerous ways and interact with complex learning systems to produce multiple outputs and results. We have a very limited understanding of the different elements comprising these deceptively simple technologies. And as new software and technologies are developed and new uses created, the complex mix of elements and their interrelationships grows.

Third, in projects, computer and Internet technologies are introduced into interactive learning systems and used by different educators with diverse approaches, methods, and abilities to achieve a variety of immediate and long-term objectives. At the same time, each group of students that makes up the interactive system will respond to the introduction and use of computer and Internet technologies in different ways. Also, the ways that teachers and students use computers and the Internet in learning systems will have a significant impact on the type of intellectual and

cognitive interactivity that occurs and, in turn, the impact and results that emerge.

A 1999 study by the Educational Testing Service (ETS) showed that when computers were used in drill and practice math exercises, student abilities, assessed by standardized tests, either remained the same or declined. In contrast, when the same technologies were used in discover and problem-solving exercises, students showed a significant improvement in math skills.

Fourth, the outputs of education and learning systems are as complex and difficult to define and understand as the interaction that occurs among groups of learners, content, facilitating elements, and diverse environmental variables. Outputs also emerge at different time intervals along a continuum, some immediate and others in the distant future. Furthermore, most educational outputs are not discrete but rather the results of cumulative processes where minute changes gradually accumulate over time and emerge as recognizable differences in abilities, understanding, or personal character.

Approaches to Impact Evaluation

Basically, evaluating the impact of technology projects on education seeks to identify changes in the variables that the program seeks to influence. Since it is extremely difficult to evaluate educational impact directly, evaluation efforts must try to measure indirect indicators of change in teaching and learning. Also, since no single indicator of change can account for the totality of possible impacts on education or explain the multitude of causal relationships, it is important to use clusters of change indicators in any evaluation effort.

The following lists some of the indicators and measures of change that can be used in different combinations to attempt to monitor and evaluate the impact of school computer programs:

- Before and after measurements;
- With and without measurements;
- Standardized tests to measure changes in learning achievements;
- Measuring changes in attitudes and behavior toward teaching and learning;
- Measuring changes in school attendance, retention, and repetition rates;
- Measuring changes in student perceptions about their futures;
- Measuring changes in the rates of learning complex concepts;
- Measuring changes in problem solving skills, creativity, and happiness;
- Measuring changes in the frequency of interdisciplinary teaching and learning activities;
- Measuring changes in writing skills, the richness of vocabulary, and the frequency, length, and complexity of written work; and
- Measuring changes in team work skills.

Even though education change systems are complex and imperfectly understood, there is often a tendency to use simple techniques to determine if technology inputs have an impact on learning and, if so, what the character of those impacts might be. One of the more common and simpler approaches to evaluating school computer projects is to compare standardized test scores before and after computer and Internet technologies have been introduced. The ETS study is an example of this type of evaluation. This

approach may demonstrate that changes occurred and may hint at the reasons for these changes, but it only will show a very narrow set of impacts.

Standardized tests usually seek to assess only a discrete set of academic and cognitive skills in a multiple-choice format. These tests also tend to assess the test taking skills of students and favor a narrow set of learning styles. In contrast, many school computer projects are introduced to expand a broad range of educational and learning objectives, not just improve a single group of skills such as math or reading. As a result, the standardized test approach to measuring the impact of technology projects will not be able to evaluate a majority of these desired impacts. In fact, it can be argued that the multifaceted nature of education change projects, such as many school computer initiatives, demands that much more diverse approaches to evaluation be used.

Brazil's ProInfo program is an example of how using clusters of indicators can help overcome the limits of a simplistic approach to evaluating the complexities of program impact. Examples of some of the initial indicators of change that were observed and measured in this innovative program are listed.

- There is an increase in the level of interdisciplinary teaching and learning.
- The programs multipliers (teacher trainers and technology resource specialists) are observed practicing what they learned a year after their training programs.
- Learning became more active after teachers started integrating the use of computers in their teaching. This was measured by comparing student-to-student and student-to-teacher interactions before and after teachers participated in technology training programs and after computers were introduced into the schools.
- Multipliers were seen to become more entrepreneurial in the way they organized educational activities, training workshops, and school-community activities related to the school computer program.
- Private schools started recruiting the teachers and multipliers who received ProInfo's technology education training.
- Teacher demand for ProInfo training increased as they observed what teachers who had received the training were doing.
- Teachers reported greater job satisfaction after starting to integrate the use of computers in their teaching.
- Portuguese language teachers reported that student interests in writing and their writing skills improved after computers were used in composition classes.
- Parents of children in classes making routine use of computers reported greater satisfaction with the education their children were receiving.
- Enrollment demand at schools with computers grew faster than at schools without computer education programs.
- Community participation in schools with computers was greater than in schools without computer education programs.

By using a cluster of diverse indicators of change, the ProInfo program is gaining a more complete understanding of the different types of impacts that the program is having on teaching and learning. It is also possible to conclude that,

for those teachers who are integrating computers into routine learning activities, there are positive and important changes in student learning.

A study in the United States carried out by the Center for Applied Special Technology with 500 students in seven states also demonstrates how a cluster of indicators was used to evaluate the impact of using computers and on-line communication tools on learning performance. In this study, half of the students had access to on-line communication tools, and half had no access. Both groups of students were assigned a project on Civil Rights in the United States. The following nine learning measures were used to evaluate the projects produced by the students:

- Effective presentation of the material in the report;
- Effectiveness of stating a civil rights issue;
- Accuracy of information in relation to the selected issue;
- Presentation of a full picture of the issues with details;
- Demonstration of insight into civil rights;
- Effectiveness in bringing together different points of view;
- Completeness in presenting the issue;
- Well-organized content in the report; and
- Demonstration of "best work" (e.g., well planned, neat, showing initiative, etc.).

Based on these measurements, the study concluded the following about the impact of using computers and on-line communication tools in learning:

- Students with access to these tools had significantly higher scores on their assignments based on the nine measures of information management, communication, and presentation of their ideas.
- Using the tools and access to on-line resources helped students become independent critical thinkers, able to find, organize, and evaluate information and effectively express their new knowledge in creative and compelling ways.

An example of monitoring and evaluation (M & E) in practice, which showed how computers and information technologies were impacting education in schools, was the report done for the World Links program in its second year of operation, from July 1999 to June 2000. Prepared by the Center for Technology in Learning at SRI International in Menlo Park, California, the report sought to accomplish four goals:

1) Describe the implementation process of the World program as well as barriers to implementation in various participating countries.
2) Identify differences between World and Non-World schools in terms of teaching practices, computer use, and ICT impacts on learning.
3) Determine other contextual factors that affect teacher practices, ICT use, and assessment.
4) Identify existing challenges and offer recommendations to improve the program.

The method for gathering the data consisted of surveying a sample of teachers in both World and Non-World schools in 12 of the 15 countries participating. Data was collected from more than 500 teachers in 140 schools in the areas of learning activities, computer use in support of learning, learning impacts, and challenges to implementation. The results show that the World program was making a great deal of progress to improve student learning and re-invigorate teaching. Prominent findings include:

- 78% of World teachers surveyed stated that student knowledge about computer use increased a great deal as a result of working with computers.
- 68% of World teachers stated that computers helped them design collaborative student projects.
- More than 79% felt the program had greatly improved their ability to use computers and the Internet.
- More than 80% of teachers indicated participation in the program improved their attitudes about technology and their teaching.

Key comparative findings include the following:

- World teachers are more likely to collaborate with colleagues.
- World students use ICTs more often than non-World peers.
- World students are more likely to have

improved attitudes toward different cultures and countries.

- Female participation is higher in World Schools.

Lastly, the report highlighted barriers to success and recommendations for future improvement. Some of the barriers included: lack of appropriate computer hardware and software; unreliable Internet access; inadequate tech support; and lack of planning time. Key recommendations included: more professional development for teachers; more strategic planning; and the creation of national policies to align with education practices to further support for ICT use in schools. (McGhee and Kozma, 2000)

These examples illustrate that while evaluating the impact of computer and Internet technologies on education is a difficult process, it is possible to gain insights into how their use is affecting teaching and learning. They also demonstrate that measuring this impact cannot be done using the simple input-output evaluation model described earlier. Strategies for monitoring and evaluating impact must be developed as a project is being designed and planned, and monitoring and evaluation efforts must start as implementation gets underway. Most importantly, monitoring and evaluation helps to guide programs if they are getting off course and re-direct them to make the necessary adjustments to effectively impact the learning process.

Sustaining School Computer Programs

Development projects and reform efforts are not institutionalized automatically or easy to sustain. Achieving this requires active strategies and policies to ensure that initial investments in infrastructure, technology, training, and integrating the use of computers in teaching and learning are sustained and encouraged to grow. This will not occur without sufficient support from essential staff, especially principals and teachers. One of the most important strategies to sustain and expand projects is to involve teachers and principals, as well as members of the community from the very beginning in all decision-making and implementation processes. A continuous effort is needed to engage staff in meaningful planning activities, including:

- carrying out and interpreting assessments;
- planning and designing the system;
- determining how the computers will be used to support teaching and learning;
- choosing software;
- deciding how professional development and training activities will be managed;
- determining how computer use will be allocated among teachers and students and across grades and subjects;
- devising monitoring and evaluation processes; and
- deciding how the school budget may need to be modified to expand and support the system.

The more meaningful and authentic teacher and principal involvement is in planning and managing a project, the greater the chance that the school and staff will take ownership of the system and apply the time and resources needed to ensure that it grows.

Staff engagement alone is insufficient to ensure sustainability of expensive interventions such as school computer projects. Since outside funding usually covers most of the initial investment for a project, staff often do not grasp the real long-term costs needed to keep a system running, replace failed and outdated equipment, and expand to meet growing demand. Most school budgets are over-expended and have little capacity to meet additional demand, especially from expensive capital projects. Under these conditions, sustainability of a school computer project often is dependent on the ability of the school to devise an effective financial strategy for this purpose. Making school computer initiatives sustainable can be divided into two distinct areas of concern—physical sustainability and pedagogical sustainability.[9]

Physical Sustainability

This type of sustainability focuses on sustaining the infrastructure for connectivity and housing the computers and the software. Computers and computer labs that are used by large numbers of people, especially in demanding physical environments, can suffer from a variety of technical problems. Without sufficient maintenance, systems will fail, frustrating teachers and students and preventing use.

Infrastructure maintenance and security: Computer facilities, which may include air conditioning, lights, desks, chairs, and electricity, need to be maintained and funded to keep the computers running and to provide an effective learning environment for the students and teachers.

Routine maintenance: One of the most common causes for the failure of school computer projects is that resources and funding were not provided to maintain the computers and the lab. It is essential that schools and projects establish specific budgets to cover these costs. At the same time, it is important that purchase contracts for equipment include a maintenance contract from the vendor to cover repair and replacement.

Connectivity:[10] This includes both Internet service provider (ISP) fees and the costs for telecommunications. Most countries outside of the US and Canada apply meter rates for using telephone lines, and connecting to an ISP can last up to eight hours a day. The minimum level of connectivity is to provide part-time access for one or two computers to a phone line to connect to an ISP. Free software exists that will allow several computers to share one connection via a local area network. However, the rate of Internet access becomes increasingly slow as the numbers of computers connected to a single phone line increases. Faster access may be available via dedicated high-speed lines. The costs of this faster connectivity, however, can be prohibitive.[11]

Software: In addition to covering basic maintenance, it is also important that budgets cover the cost of upgrading and purchasing new software to enhance the use of computers in education. Much software is available free from application suites that are compatible with Microsoft Office—utilities, anti-virus software, educational games, graphics applications, web development tools, etc.—and with careful research, it is possible for schools to obtain and update numerous software package without cost.

Replacing and expanding systems: Computers have a useful life span of 3 to 5 years, and it is important that schools establish a budget that will grow over the life of the equipment to enable the purchase of new computers to replace aging systems and to increase the numbers of computers for students and teachers to use.

Funding physical sustainability: One of the most difficult challenges that face schools establishing computer labs or installing computers in classrooms is covering the costs of physical sustainability. Existing school budgets usually have no surplus funds to cover these recurrent and futures expenses. If supplemental funding is not available from state or federal educational bodies, schools may need to turn to one or more of the following alternative funding strategies:

- Small annual user fees that all students pay;
- School community partnerships with the school's parents' and teachers' association and/or local companies to sponsor the maintenance and expansion of the school's computers;
- Fee-for-use programs for members of the local community to use computer facilities during the evenings and weekends when students and teachers are not using them;
- Use of student, teacher, parent, or community volunteers to provide maintenance services and supervise computer facilities.
- Special fundraising events such as school dances and carnivals. Such events are often a good way to raise the funds needed to buy new computers, software, or pay annual connectivity fees.

Physical sustainability, which is essentially a planning, managing, and budgeting issue, is much easier to achieve than pedagogical sustainability. No matter how well maintained equipment and facilities are, if teachers and students do not continually use computers as an important part of teaching and learning, then school-computer projects will fail.

Pedagogical Sustainability

This area of sustainability focuses on enabling and continuing the integration of computers and the Internet into on-going teaching and learning programs. Most teachers who have access to computers, either in labs or classrooms, do not

make routine use of computers and the Internet as an integral part of their teaching. Also, initial enthusiasm for using computers, which accompanies the installation of computers in the school, often dwindles over time. There are many causes for this unfortunate situation, including a lack of:

- training in how to integrate technology into their daily teaching;
- access to computers and the Internet;
- on-going pedagogical and technical support to guide the use of computers;
- on-going training to integrate computers into curricula;
- professional incentives to encourage teachers to integrate technology into their programs; and
- programs that enable interested teachers to share their experiences, exchange ideas, and plan activities with other teachers both locally and at a distance.

Teachers must make continuous and integrated use of computers and the Internet before this investment can have a significant, positive, and ongoing impact on teaching and learning. The integrated use of computers in education will not occur automatically simply by providing equipment and initial training. Well thought out and managed strategies that support and encourage teachers to make effective use of technology must be used to enable teachers to learn how to integrate these tools into their teaching and help them make routine use of computers. The following are critical elements of any strategy for pedagogical sustainability:

Initial training: Initial training programs need to focus on the pedagogical use of computers and provide teachers with basic skills in using computers, the Internet, and main software applications.

Ongoing professional development: Teachers need to be provided with different types of learning opportunities, including periodic workshops, peer-to-peer training, mentoring, on-line or CD-ROM training programs, and conferences. As with initial training, ongoing professional development should focus on the pedagogical use of computers and provide essential 'how-to' information. The World Links program, for example, which trains teachers to use ICTs in the classroom in over 20 developing countries, suggests that a minimum of 80 hours of professional development is required before their teachers can begin to integrate technology into their teaching practices. The complete World Links Teacher Professional Development Program, however, includes 200 hours of training, equivalent to five 40-hour weeks. (Carlson and Gadio, 2002)

Easily available technical support: Teachers, especially those who are new to using computers as part of their teaching, will be more likely to make ready use of technology if they have easy access to technical and pedagogical support. Teachers have little time to spend being frustrated over annoying technical problems. Without reliable technical support, either in their school or via the phone, most teachers will not bother using computers in their teaching.

Ongoing pedagogical support: Even when teachers have needed technical skills to use computers and software, few integrate the use of computers into routine teaching without ongoing pedagogical support. Initial training programs may help teachers start experimenting with integrating computers into their teaching, but continuous use requires more. This often involves staff, either in the school or in a local resource center serving several schools, who work with individuals and groups of teachers to plan and organize educational projects that integrate the use of computers. Such support staff also organize periodic workshops and meetings where new approaches and examples of integrating computers in teaching are presented. Support staff also may find or create and distribute information on computer education projects to teachers either as paper flyers or e-mail messages. Pedagogical support staff also highlight and publicize ways in which teachers are integrating computers into their teaching.

Professional networking: It is common for only a few teachers in a school to start making active and

continuous use of computers in their teaching. One of the best ways to encourage these teachers to continue using technology is to provide opportunities for them to share their experiences with other teachers. Periodic conferences and workshops can recognize and reward early adopters and provide essential ongoing professional development opportunities. Unfortunately, face-to-face meetings are expensive and occur infrequently. A less costly and effective means of providing ongoing professional development opportunities is to establish one or more listservs to enable teachers to send and receive e-mail messages from each other about using computers in their teaching. It is usually essential that such a listserv be moderated and facilitated by someone who is both very knowledgeable and respected by the members of the discussion list. If resources and support are available, a collaborative web site and on-line discussion forum or web folio, as shown on the following page, also can provide teachers who are using computers with different means of sharing what they are doing and encouraging late adopters to start making use of computers in their teaching. The web folio, a component of LTNet in Brazil, allows administrators, teachers, and trainers to post their project ideas, successes, and challenges, as well as obtain additional ideas and advice via postings from other educators, trainers or administrators and through real-time communication in various chat rooms linked to the site.

Involve principals and the community: There are many ways to encourage teachers to learn how to use computers in education. One of the more important is to mobilize the interests of principals and parents in making computers and the Internet an important part of routine teaching and learning. Enthusiastic principals and parents can motivate teachers to do the extra work needed to experiment and learn how to integrate technology into their teaching. Involving Principals into the technology integration equation was especially important in Brazil's ProInfo/LTNet project. Teacher trainers, also known as 'multipliers,' received training one day on technology integration into the curriculum, and the next day multipliers trained the principals. This process then was repeated at three different sites within Brazil. Due to the training's success with participating principals, a more comprehensive training program was created for an even larger, statewide group of principals. (LearnLink Newsline, Spring 2001)

Curriculum reform and policy change: Enabling large scale and continuous integration of computer use in teaching and learning may require changes in curriculum and educational policies. For example, adding sections to most if not all curricula about integrating the use of computers in teaching each subject, with concrete examples of how to do this, will support efforts to encourage all teachers to start using

Webfolio used by Brazilian teachers.

computers as a routine educational tool. Similarly, including computer literacy and the integration of technology into teaching as part of pre-service teacher training programs, routine performance appraisal systems, and certification requirements will provide additional incentives to teachers to learn how to make effective use of technology and to actually use computers in their teaching programs.

No single strategy will be sufficient to ensure the sustainability of a school computer program. A combination of physical and pedagogical strategies will need to be used to prevent the costly initial investments in computers, infrastructure, and teacher training from being wasted and to make it possible for computers to have the level of impact on education that is possible.

Looking Ahead

When considering issues related to using computers in school settings, questions about whether they will make a difference in increasing access, equity, and quality arerarely asked anymore. Now, most planners, administrators, and teachers are asking when the computers will reach the school and the classroom. Not all efforts to introduce and integrate computers into schools and education will be equally successful. Some initiatives will fail, while others will succeed and become models of good use and practice. However, there is no turning back the tide of the information age. Computers have permeated most areas of modern life and are rapidly becoming commodities for use in the classroom and beyond.

Continued innovation in computer and communication technologies, coupled with falling prices and costs of connectivity around the world, will make it progressively easier for schools and communities to afford to make robust use of these technologies in education.

Effective adoption of computers into education does not depend solely on technical or infrastructural matters. Rather, it depends primarily on a complex mix of financial and human factors, including sociological, psychological, institutional, political, and cultural concerns. It is far easier to address technical and infrastructural problems than to even begin to understand the complex social issues surrounding computerization of learning and change, let alone address these factors.

One of the most persistent and critical issues plaguing development in general, and the use of technology in education specifically, is equity. Differences among people and societies continue to grow, affecting not only economic disparities but also health, environmental, educational, and information disparities. The challenge for many governments and organizations continues to be the need to devise better ways to bridge this gap. It is clear that education, in all sectors, is the single most important means available for addressing

poverty and equity issues. Realizing the potential of education to bring about sustainable change requires that the power of education be magnified and intensified. One potent means for achieving this is through the deliberate and considered use of computer technologies.

Computers have the capacity to leverage, focus, and intensify the effect of human efforts. Thus, when judiciously and thoughtfully used, computer technologies offer unprecedented opportunities to improve the access, equity, and quality of education for all, especially those who have yet to unleash technology's power for learning.

What will classrooms of the future look like, and what types of technologies are we most likely to see both students and teachers using to support learning? Will computers and Internet connectivity reach all students across the globe, or will it die out? These questions are difficult to answer, but one thing for certain is that technology will not be going away. We are merely at the beginning of the road to technology integration in education. In our new global economy, new global education is needed, and key to this is learning how to incorporate the best tools to educate our children and prepare them to be productive and caring, global citizens. Thus, continuing educational reforms such as the implementation of constructivist, project-based, interdisciplinary curriculum must go hand-in-hand with ICTs if they are to make a difference.

Trends that will most likely continue regarding ICTs and schools are:

- *Use of web-based/e-learning as a viable platform for instructional delivery:* Web-based instruction that is simple and easy to navigate is gaining popularity. It also is necessary in areas where there are teacher training shortages or where access to training is inadequate.
- *Emergence of educational portals within regions and countries:* Portals are increasingly emerging and serving as excellent resources and communication networks to improve teacher practice and reduce feelings of teacher isolation.
- *Growth of distance education programs:* In countries lacking resources for non-formal and non-degree educational institutions, distance education will increase via online platforms and video based learning.
- *Sharing resources online:* When teachers and students share resources online, levels of both teacher satisfaction and learning rise. Such sharing is especially useful for school districts that do not have the means to create all of their own materials for teaching and for veteran educators to share successes with those newer to the field.
- *Increased inter-school exchanges and collaborations:* Online projects among students from different schools and countries are proving very successful and effective for learning. The variety of projects makes such collaborations applicable for students of all ages and all subject disciplines.
- *Use of strategic plans for sustainability, including funds for upgrading, replacing, and expanding computer/ICT equipment:* Many evaluation reports and lessons learned from existing ICT projects in schools confirm the need for plans to include funding specifically for the upgrading and replacement of tech equipment.
- *Increased establishment of digital libraries in under-resourced areas:* In many developing countries, universities that are constrained by funding, physical space, and overall intellectual resources are served well by digital libraries with the latest electronic journals and research in fields such as science and medicine.
- *Increased pressure on educational policymakers to put ICTs at the top of the education agenda:* Educational policymakers must put ICTs at the top of their agendas if computer use is to continue and expand. To ensure increased funding for training in effective technology integration in the classroom, policymakers must be made well-informed of ICTs' potential for enhancing learning in the knowledge economy.

Developing countries and their educational institutions vary in their access, readiness, and political will to become part of the wired, global information society. Nonetheless, almost all developing countries have some level of information technology capacity. Past and current ICT education projects and initiatives included in this volume and in other literature serve to guide and instruct how best to take advantage of

technology's power to improve learning and teaching. Together, continued and sustained efforts at educational reform, coupled with increasingly effective use of ICT's, can harness the potential of technology for the benefit of future generations and a better tomorrow.

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Footnotes

[1] A ditto is a colloquialism that refers to duplicated exercise papers given to the students.

[2] RiverWalk-Brazil 2001 is a collaborative project funded by Japan's Ministry of Land, Transport, and Infrastructure, in which students and teachers from six countries research and share information about rivers in their communities to foster cross-disciplinary learning about world rivers and the people who live near them. This project is described more fully in the individual case study of this volume, pp…..

[3] Another paper in this LearnLink series, *Computer-Mediated Professional Development*, addresses this topic in greater detail.

[4] See the case studies in this volume from LearnLink projects in Morocco, Namibia, and Guatemala for more in-depth coverage regarding the issue of ICTs for educator development.

[5] A school's *information ecology* is the total information environment within a school and includes all systems and processes for acquiring, managing, storing, analyzing, disseminating, and organizing data and information.

[6] See AED/LearnLink web site for additional information about this project: http://www.aed.org/learnlink

[7] Educational reform is often seen as a top-down national or state-level process of policy changes in the basic structure and functions of an education system. Reform also can be viewed as a bottom-up process that enables and supports teachers to discover new ways of teaching. Reform as used in this paper includes both of these perspectives.

[8] LTNet, part of the USAID-funded LearnLink project at the Academy for Educational Development, helped develop a web-based collaborative learning environment. As the project came to an end in December of 2001, it was converted to NGO status in Brazil to continue to sustain LTNet for future use.

[9] Sustainability and ICT projects are further discussed in Steve Cisler's article, "Planning for Sustainability: How to Keep Your ICT Project Running." He discusses four areas (the "Four Pillars of Sustainability") to consider for ICT project success: social, political, technological, and economic sustainability.

[10] Connectivity usually refers to maintaining a connection to the Internet and the World Wide Web. However, when Internet access is not available, it may be possible to use store-and-forward e-mail by making short long-distance phone calls to remote computers that have Internet access.

[11] For connectivity options and pros and cons of each, see article, "Infrastructure: Hardware, Networking, Software, and Connectivity," by Rusten and Hudson in *Technologies for Education; Potentials, Parameters and Prospects.*

Case Study

Brazil

RiverWalk: Online, Interactive Learning

Eric Rusten and Vera Suguri
Eric Rusten was the Senior Program Officer for the Learning Technologies (LTNet) project in Brazil.
Vera Suguri was the LTNet Project Director, Brazil.

Educational technology initiatives are taking learning to a whole new level, enabling teachers and students around the world to interact with one another in global classrooms. While those of us who are products of fairly traditional schooling may read, with a justified sense of wonder, about live video-conferences with astronauts in space and email exchanges with leaders around the world, educational researchers have not analyzed the process or ascertained the impact of most such experiences. The RiverWalk Project is an exception.

Conceived in Japan, The RiverWalk Project was born at the University of Michigan's College of Education. It is an international, interactive, and interdisciplinary initiative based on project- and problem-based learning principles, which are deftly applied on the multilingual RiverWalk web site. Building on this platform, educators in Brazil not only participate in the program but, in collaboration with LearnLink's Learning Technologies Network (LTNet) project, also have turned it into a web-enabled form of professional development for teachers.

The story of RiverWalk-Brazil explores the two primary dimensions of the program: the online forum, geared for students and developed by the University of Michigan, and the online professional development and collaborative learning environment for Brazilian teachers, developed by LTNet. The story describes an educational technology initiative grounded in sound learning theory, illustrates the potential of international partnerships for learning, and proves, without a doubt, just how much fun learning can be.

“My impression is students were very interested because of the Internet. They said, ‘Wow, so now we have the opportunity to interact with students across the country. They can see the results of our work.’ The other thing is that they loved the field trip to rivers. . . Many are from poor schools, so they don’t do this very often.”

Eduardo Junqueira

“Through River Walk-Brazil, our schools have opened the windows to the world.”

Vera Suguri

Box 1

Global Learning

Naoko, a twelve-year old girl in Japan, browses the Internet and stumbles upon an online account of a group of Brazilian youth trying to save their local river. As Naoko clicks through the digital photos and journal-like text the schoolchildren published, she gets a glimpse of the cultural, economic, and ecological issues their town faces. She views a photo of townswomen who earn their living by washing clothes in the river. She learns from the children's own words that they are concerned that the soap from the clothes will harm the river's ecology and that the backbreaking work will harm the health of the women who labor on the river's edge. Naoko's eyes light up when she reads that to help solve their community problem, the compassionate Brazilian children published and disseminated river education booklets and are encouraging the city council to build a public laundry facility for the washerwomen. Naoko begins thinking about the river that runs by her own neighborhood…

RiverWalk: Making a Splash at the University of Michigan

The RiverWalk Project is an ongoing, collaborative project in which students and teachers from six countries—including Brazil—research and share information about rivers in their communities. The project was born out of a desire of Japan's Ministry of Land, Infrastructure, and Transport to develop an international education program on rivers. The Interactive Communications & Simulations group (ICS) at the University of Michigan's College of Education was approached for assistance because of its twenty year history incubating and implementing innovative learning experiences for school children around the world. With funding from the Japanese government and support from various entities at the University of Michigan, Jeff Kupperman and his colleagues from the ICS group launched the RiverWalk project in November 2000.

A visit to the multilingual RiverWalk web site (www.ltnet.SchoolLinks/VEE/RiverWalk/P_AAC_RW_Base.htm) allows one to view the results of project- and problem-based learning, as well as an integrated set of easy-to-use tools employed to publish work and carry out discussions. The web site features student-published tours (mini-web sites) presenting projects about their local rivers, accompanying discussion boards for other RiverWalk participants, *virtual backpacks* that allow participants to take and synthesize material from each other's online tours, project facilitation by mentors at the University of Michigan, and a downloadable manual to help schools get started with their project. Currently, funding from Japan makes it possible for schools to participate in the project free of charge. While many web tours are publicly accessible, some portions of the site are password protected.

Some of the big questions RiverWalk students explore include

- Why have so many civilizations grown up around rivers, and how have the relationships between various societies and rivers changed over time?
- What does it mean for a river to be "clean" or "polluted?"
- What happens when countries or other political units compete for limited water sources?
- How do societies choose to live with rivers? What decisions need to be made about how to reap various benefits from rivers while controlling

their potential for destruction?

- What does it mean to take environmental action in your community, and what can a class of students do?
- What can rivers mean to people, aesthetically, culturally, or personally?

One RiverWalk partner, Vera Suguri, captures the project's potential impact with the following observation:

For students to learn about conservation, it isn't enough to talk about the problem, show the situation via TV and videos, or by providing information in a traditional manner. Working with projects like RiverWalk, the students become active participants. Teachers and students decide together about what river to study and how to study it. In our case, the participants went to visit the rivers they were studying. In one school, students interviewed local fishermen who had lived on the river's banks for over two decades. The reality of river dependence was seen and felt. After viewing other schools' projects, our students realized the extent of river problems in our country as well as others.

Brazil Participates In Something New

RiverWalk already had participants from Japan, Taiwan, the U.S., Canada, and Israel when a Brazilian journalist studying at the University of Michigan began recruiting schools from his homeland to join the project. Eduardo Junqueira, a visiting student with the University of Michigan Journalism Fellows Program, asked Vera Suguri from the ProInfo program[1] in Brazil's Ministry of Education to help identify and encourage teachers from fourteen public schools to join the RiverWalk project. The fourteen schools were strategically selected to represent the diverse economic, geographic, and cultural diversity of the country and to ensure that all the great rivers of Brazil would be included. The common thread among the selected sites is that each has a highly motivated teacher leader and that each school has access to Internet technology—if not in the school itself then at a local computer resource lab developed under the ProInfo program.

With RiverWalk, Suguri saw an opportunity not only to get Brazil's schoolchildren and teachers involved in an international, cross-curricular, educational technology project, but also to develop a meaningful, web-enabled form of professional development for the teachers within and outside the project. Suguri brought in the US./Brazil Learning Technologies Network (LTNet), part of the LearnLink project,[2] to help develop a web-based collaborative learning environment *(AAC - Ambiente de Aprendizagem Colaborativa)* for Brazilian educators participating in the project.

While separate from the RiverWalk web site, the AAC in the LTNet web site (http://www.ltnet/SchoolLinks/VEE/Riverwalk/P_AAC_RW_Base.htm) advances RiverWalk's goals by providing an environment for professional development tailored for the Brazilian teachers involved in RiverWalk. The AAC is easily accessible to everyone, whether or not they are officially involved in RiverWalk. ProInfo's Suguri sees this feature as a way to model good professional practice and to help teachers who are just beginning to use technology learn to develop and participate in projects. Moreover, the site is accessible to researchers and environmental specialists to allow them to contribute to the schools during the learning process. Regarding this feature, Sugari comments, "It is not usual for teachers and students to accept contributions from outsiders during the learning and teaching process. I think that this aspect is very innovative. Through the AAC, this collaboration is achieving a larger return on the investment of the work of the eleven participating Brazilian schools."

A visit to the teachers' collaborative learning environment (AAC) gives a taste of the sometimes messy process involved in adopting new learning technologies. To help teachers plan activities together and exchange thoughts about the process, the collaborative learning environment includes four guiding questions[3]:

- What do we know?
- What do we want to learn?
- What did we learn?
- How did we do it?

The AAC also provides teachers with several technologies to help them explore the four questions: a listserv, chat rooms, a photo gallery, and a user-friendly "webfolio," where teachers upload text and graphics. Suguri selected teacher trainers from two of the eleven active sites, Lourdes Matos of Montes Claros and Noara Resende of Belo Horizonte, to be *madrinhas* (literally, *godmothers*) or

activity coordinators for the teachers in the other sites. Staff in the US and Brazil trained the *madrinhas*, mostly online, to use the technologies in the collaborative learning environment, and the *madrinhas*, in turn, trained the rest of the participating teachers to use their environment in a similar manner.

The culture of the AAC is marked by teacher autonomy in decision-making while maintaining a highly cooperative work environment. According to Suguri, teachers "weren't obliged to follow any pre-determined structure. They decided what river to study, number, grade and level of participants, who would be interviewed, what places or institutions to visit, the size and feature of their own project, etc." However, it is not uncommon for teachers with higher computing skills to assist those with less experience, for teachers to send encouraging emails to each other, or to bounce ideas off of colleagues online.

Dynamic Learning

According to one project developer, the dynamic learning that RiverWalk nurtures requires "many actors." Without a balanced human and technical infrastructure, the project would have suffered. Table 1 delineates the roles of each of the partners in the RiverWalk-Brazil project.

Instructional Technology Framework

One may study RiverWalk-Brazil by applying a

Table 1 Key Partners and Roles

Partner	Roles
Teachers and students at the eleven participating schools in Brazil and their related ProInfo teacher training and technology resource centers (NTE's)	• Convene the RiverWalk project's Brazil participants. The teachers and students at these schools are responsible for developing and publishing content on the RiverWalk web site. Teachers at these schools collaborate with each other via the collaborative learning environment (AAC) housed on LTNet's web site. • Organize educational activities and field trips to enable students to explore and learn about their river. The teacher trainer/coordinators at the ProInfo NTEs provide technical and logistical support to the schools.
RiverWalk-Brazil coordinator Eduardo Junqueira and staff at the Interactive Communications & Simulations (ICS) group at the University of Michigan's College of Education	• Developed the RiverWalk web site (http://www.riversproject.org). • Developed the general framework and guidebook for the RiverWalk project for countries around the world. • Tailored and translated the web site and guidebook to be sensitive to Brazilian culture. • Provided a common space for Brazilian schools to present their work in an international forum alongside other countries. • Facilitated and coordinated day- to -day communications. • Built trust with Brazilian teachers. The RiverWalk coordinator for Brazil, Eduardo Junqueira, is a Brazilian journalist studying at the University of Michigan. It was reported that teachers felt they could trust him and that he "looked out for their best interest" largely because he was "one of them."

popular framework from the instructional technology literature: Grabinger's concept of rich environments for active learning ("REALs"). REALs emphasize the social component of learning as well as the authenticity of the context in which this learning takes place. As Grabinger explains, "To create REALs, teachers must involve their students, parents, administrators, and colleagues in planning and implementing strategies that encourage student responsibility, active knowledge construction, and generative learning activities on a large scale and in a variety of methods and forms" (1996, p. 688).

Both components of RiverWalk-Brazil—the original Interactive Communications & Simulations group-developed RiverWalk framework and the ProInfo/LTNet-developed teachers' Collaborative Learning Environment (AAC) can be analyzed in the REAL framework. It is why this project has more pedagogical muscle than many similar endeavors. Table 2 (overleaf) outlines the main attributes of REALs and some manifestations of each attribute in RiverWalk-Brazil initiative. For easy identification, technology tools are in bold.

Perspectives and Lessons

In any educational innovation, there are interesting perspectives and lessons that emerge during actual project implementation. The quotations from project participants help illustrate what it is like to be part of RiverWalk-Brazil.

Table 1 Key Partners and Roles *(continued)*

Partner	Roles
Vera Suguri, a pedagogical coordinator at ProInfo, a national educational technology initiative within Brazil's Ministry of Education.	• Used ProInfo's network of teacher training and technology resource centers and participating schools to identify suitable participants for the RiverWalk-Brazil project. • Facilitated communication among: a) teachers to encourage active participation and b) all project partners to coordinate project efforts. • Brought innovation and pedagogical input into the project, including co-designing the teachers' collaborative learning environment (AAC). • Gave a national presence for the project by presenting at conferences and building relationships with principals, State Secretaries of Education and local coordinators. It was stated that people in Brazil take RiverWalk more seriously because it is a ministry-associated activity.
Eric Rusten, Director of the U.S./Brazil Learning Technologies Network (LTNet), part of the LearnLink project at AED	• Developed and maintains the online Collaborative Learning Environment (AAC) where teachers collaborate as they implement the RiverWalk project (http://www.ltnet.org/SchoolLinks/VEE/RiverWalk/P-AAC-RW-Base.htm). • Brought technical and pedagogical innovation to the project. • Acted as an equal partner with the Ministry of Education and schools of Brazil.
Local communities throughout Brazil	• Companies, forestry organizations, museums, families, community associations, and foundations lend support to the project in a variety of ways, from making lunches for student field trips to serving as subject matter experts for students and teachers.

Table 2 **Attributes of Environments for Active Learning**

Attributes of rich environments for active learning	Manifestations in ICS's STUDENT-focused RiverWalk framework	Manifestations in ProInfo's/LTNet's TEACHER-focused Collaborative Learning Environment (AAC)
Constructivist influences People learn by making connections between old and new knowledge, indexing and making generalizations from new knowledge, and developing common understandings of new knowledge through social interaction with peers.	Students synthesize and evaluate new learning about rivers to develop effective web tours comprised of narrative descriptions, pictures and hyperlinks. Cross-curricular connections encourage the natural flow of learning. For example, measuring the effect of droughts on rivers can include math objectives, e.g., measuring river depth, social studies objectives, e.g., analyzing economic impact of drought, and creative writing objectives, e.g., writing about drought from a fish's perspective. Easy to use publishing tools and simple moderated discussion boards allow students to focus on synthesizing content rather than on technological tasks.	The webfolios are easy-to-use online publishing tools that enable teachers and students to instantly publish text and graphics to create mini webpages that document the process of the project. The "add a comment" function on each page of the webfolios provides a forum where others can articulate the new connections their colleagues' webfolio page helps them make. Also, the AAC's listserv and chat room provide two communication mechanisms for participating teachers to plan activities, discuss difficulties, receive training inputs, and share results.
Authentic learning contexts Learning that takes place in an authentic (not simulated) context, is relevant to students' lives, can develop richer cognitive connections, and support collaboration.	Students work in virtual workgroups to identify, analyze, and/or resolve river issues in their own communities, much like scientists, government agencies, and concerned citizens do. A "virtual backpack" feature allows students to grab graphics, sound, and text from others' web tours to include in or help inform their own web tours.	Teachers are motivated to participate in the community because they want their classrooms to do well on the RiverWalk project. The questions and concerns they express via email discussion lists and chat are based on a real, simultaneous classroom experience. Because peer trainers *("madrinhas")* work as members of the collaborative team, they can provide contextualized and authentic professional development opportunities.

Table 2 **Attributes of Environments for Active Learning** *(continued)*

Attributes of rich environments for active learning	Manifestations in ICS's STUDENT-focused River Walk framework	Manifestations in ProInfo's/LTNet's TEACHER-focused Collaborative Learning Environment (AAC)
Student responsibility and initiative Students participate in intentional, goal-directed learning. In doing so, they self-reflect and develop metacognitive skills.	Students are encouraged to use discussion boards to critique their own work and that of their peers, thereby giving them an opportunity to think about the learning process that RiverWalk affords. The downloadable RiverWalk guidebook encourages students to take action in their community and highlight their initiative in their web tours.	Using questions about learning objectives to organize participation in the online learning environment encourages teachers to publish their new learnings in the webfolio. Their suggestions for improving the learning environment web site (e.g., adding features, launching particular discussion topics) are easily sent from teachers to web site designers via chat and email.
Cooperative learning Students work together to solve problems, taking on multiple roles, and working steadfastly through difficulties while doing so.	The workgroup interface, discussion boards, and "virtual backpack" give students multiple ways to lend their expertise and support each other in the learning process.	Mutual rules of engagement help build an online environment in which teachers feel safe to seek help from each other and offer help without overshadowing others. Chat events give teachers the immediate back-and-forth conversation they need while the listserv serves as a convenient way to send questions, share results, and schedule other online activities with the whole group.
Generative learning activities Students actively use tools to investigate problems and seek solutions to problems. In these situations, students are often co-designers of instruction alongside teachers.	Ideally, RiverWalk students identify the river issues that matter most to them. The Internet allows students to freely search other external online resources (such as web sites with relevant maps, geological information, and economic insight). In doing so, they are not passive recipients of knowledge; rather, they become active solution seekers and creaters of new knowledge.	The site contains a variety of resources, including instant publishing tools that help teachers take ownership of the environment and generate ideas, as well as links to other sites that support their online experimenting and exploring.

Table 2 **Attributes of Environments for Active Learning** *(continued)*

Attributes of rich environments for active learning	Manifestations in ICS's STUDENT-focused RiverWalk framework	Manifestations in ProInfo's/LTNet's TEACHER-focused Collaborative Learning Environment (AAC)
Authentic assessment The focus is on process as well as product in student learning.	The emphasis on problem-based learning allows for performance-based assessments such as rubrics. The online medium captures and preserves students' published web tours as well as their participation in online discussions.	The online medium exposes the teachers' learning process, thereby making it easier to evaluate their level of participation and professional growth. Peer online trainers *("madrinhas")* are visible in the community and use various online communications tools to keep in regular touch with teachers, helping them as they begin adopting new technologies.

Teacher Growth

Eduardo Junqueira, the journalist and Interactive Communications & Simulations group-based mentor that coordinated Brazilian classrooms' participation in the RiverWalk web site, said that when the Brazilian teachers were first approached about the RiverWalk project,

…the teachers were very proud to join the project but very scared that they might not succeed. 'Are you sure I can do this?', 'I'm not sure.' I told them, 'If we don't try, we'll never know.' Then, slowly, they started trusting. They had experience in the past with foreign partners, and in some cases they had bad memories. How did I gain their trust? I answered their emails, gave feedback, tried solving their problems. Once trust was established, they started their projects---field trips, interviews, pictures.

One teacher shared her perceptions of her own skill growth during the course of the project:

When I stated participating in the RiverWalk project, I didn't know even to type, and now I am learning to scan pictures, navigate in the Internet, and many other things in computing.

Another teacher, commenting on the impact of RiverWalk participation on him and his students, states:

The participation in the RiverWalk project brought great advances in the teaching and learning process and helped develop ecological consciousness and citizenship in our students…When I showed the RiverWalk project to the city council, they were very embarrassed with the pollution of the River Jaguaribe and tried to justify [overlooking it].

Programmatic Issues

RiverWalk mentor/coordinator Junqueira reflects on how he helped teachers become accustomed to communicating online:

Sometimes we [participate in online] chat. I 'talked' teachers through it as they were uploading pictures, etc. Since we are working online, I told them, 'You have to tell me exactly what's on your screen for me to know what the problem is.' This was a new type of communication for them. After a while, they realized it was not so hard.

LTNet's Director, Eric Rusten, sheds some light on critical elements contributing to the effectiveness of the teachers' collaborative learning environment (AAC):

The online environment used for the RiverWalk project was not entirely predetermined. Teachers could request changes, which would be implemented quickly. If it took two days to implement the change,

it may be too late. Being responsive to participant needs and suggestions builds a strong sense of ownership and helps sustain enthusiasm and project momentum. For example, during one of many online discussions, the teachers decided that they needed to add a fourth key question to the Webfolio. Within two days the system was redeveloped to include this new question. We have no ego invested in this project. We change the environment according to what they [the teachers] want.

Explaining why it was important to have a broad spectrum of Brazilian schools involved, Rusten states:

By enabling different types of schools to participate, more innovation is possible. One teacher, for example, used what we called "scooter net" to enable her students to have their content published in the RiverWalk web site. After having the students write up their narratives and identify images for their tour, the teacher drove her scooter to the ProInfo computer resource and training center in a nearby city, uploaded the files to the web site, and printed copies of the completed pages so the students could see the results of their effort. Vera Suguri also selected different schools to demonstrate that anyone could participate; she included a school for at-risk street children and a school for children with hearing impairments. She also selected state and municipal schools. The result was to send the message: 'You don't have to be from the capital; you don't have to be rich to be involved.' There are no excuses not to participate in collaborative learning projects.

Project *madrinha* Noara Resende, who serves as a trainer and facilitator for teachers, makes an observation on the role of local support for RiverWalk:

Other important partners are the school directors and the students' parents. Many of the directors reacted positively and got the whole school community involved. Many of the parents have sent me thank you messages, and even want to see some of the student work published on the Internet. Everyone's collaboration makes it easier for teachers and students.

Project *madrinha* Lourdes Matos comments on the importance of evaluation in the RiverWalk-Brazil.

The students' evaluation is an essential part of the project because the activities are designed according to students' progress and needs. It is the teacher's responsibility to assess students and plan accordingly. A final evaluation will take place at the end of the project. The purpose of that will be to assess student learning and help students and teachers reflect on the process, as both parties are responsible for the knowledge produced during the course of this project.

Student Growth

Junqueira describes students' initial reactions to the project:

My impression is students were very interested because of the Internet. They said, 'Wow, so now we have the opportunity to interact with students across the country. They can see the results of our work.' The other thing is that they loved the field trip to rivers. There are animals, there are trees, they have each other, they have a picnic. Many are from poor schools, so they don't do this very often.

One teacher for at-risk students observed that:

…this project elevated the self-esteem of the kids because they realized that they could do the same work as others. Their pictures and researches are on the Internet, so they are "important citizens" who are contributing for the future generations.

Finally—and perhaps most importantly—are the chat excerpts from school children themselves. Below are the comments from students from various Brazilian schools:

…No, we are concerned with pollution issue and, before throwing trash away on the street, we will think first.

…If the trash from here goes there, the trash from there comes here. Indirectly, we are helping to preserve Sao Francisco River because our school has collected 10,000 disposable bottles, which surely would get there through Velha's River.

…It was great to visit the river because it helped us to raise questions and learn more on subjects which, before the visit, we didn't use to care about.

…Huron River is practically the same as Sao Francisco River in the quantity of water because we already can see the sand banks in some parts of the river!!!

Conclusion

"Through RiverWalk-Brazil, our schools have opened the windows to the world," states ProInfo's Vera Suguri. As the project demonstrates, forming and using partnerships are integral to this type of educational innovation. Doing so helps participants' get the support they may need to make the innovation their own. Many times, information and communications technology can bolster learning environments such as RiverWalk. However, while technology can help learners do things that may have been impossible earlier, technology does not automatically improve learning partnerships. Only people can do that.

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Notes

List of Schools Participating in RiverWalk-Brazil
River - **State**

Manuas – **Amazonas**
Escola E.M. Carlos Gomes
Escola E.M. Armando de Souza Mendes

Jaguaribe - **Ceará**
Escola E.E.F.M. Cornélio Diógenes

Basilia - **Distrito Federal**
PROEM

Montes Claros – **Minas Gerais**
Escola Antônio Canela
E.C.E. Capelo Gaivota

Belo Horizonte - **Minas Gerais**
Escola E.M. Hilda Rabello Matta

Campo Grande - **Mato Grosso do Sul**
Escola E.M. Barão do Rio Branco Pólo
Escola E.M. Oito de Dezembro

Campos - **Rio de Janeiro**
Escola C.E. Dom Otaviano de Albuquerque

Tapera - **Rio Grande do Sul**
Escola Oito de Maio

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AED's US/Brazil Learning Technologies Network (LTNet) is funded by the US Agency for International Development.

Special thanks to RiverWalk developer Jeff Kupperman and RiverWalk-Brazil coordinator/mentor Eduardo Junqueira for their contributions to this article.

Footnotes

[1] ProInfo is a national program, started in 1997, that works in partnership with state and local authorities to establish a network of teacher training and technology resource centers across the country, build computer labs in public primary and secondary schools in all states, and train thousands of trainers and teachers to integrate technology into all aspects of the curriculum.

[2] The LTNet activity was part of a seven-year Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the US Agency for International Development (USAID). It was funded by the USAID Bureau of Economic Growth, Agriculture, and Trade (EGAT) and Office of Energy and Information Technology (EIT), and other USAID Bureaus, offices, and missions. It was operated by the Academy for Educational Development.

[3] The first three questions are based on the KWL technique developed by Professor Donna M. Ogle at National-Louis University. Originally, Junqueira had asked teachers to answer these questions on paper, but it was suggested later that putting them in a public online format would be more beneficial for all teachers involved in the project.

Case Study

Chile

Chile: Building the National Learning Network "Enlaces"

Eduardo Contreras Budge
Eduardo Contreras Budge was Program Evaluator for LearnLink projects and Senior Program Officer for Amic@s project in Paraguay.

Growing from a handful of primary schools in 1993 to 1,500 schools by the end of 1997, the *Enlaces* Project in Chile is a model in how to take a "computers in school" initiative to scale. The Project provided important planning and implementation lessons based on the experiences of teachers and students using computers as an additional learning device. Though Internet connectivity was extremely limited at startup time, the project began with the vision of "linkages" or *"Enlaces"* in Spanish.

Much has happened to the world, the country, and the program since then. Yet, the original lessons are relevant today. They are at the heart of how to integrate ICTs into learning environments.

What follows is the story of the early years of *Enlaces*—a picture in time, mid-1998, but enhanced, with updates summarizing recent events. It traces the evolution of the project from pilot to scale. The project was based on sound pedagogical criteria, responsive and responsible expansion strategies and initiatives, and the judicious application of past lessons learned worldwide. The story is a valuable case study for other developing countries, particularly those initiating or expanding their own ICT programs into schools and teachers' professional development. Local solutions will vary, of course, but similarities with current projects worldwide are striking.

The Vision

The vision of *Enlaces* was to create a national learning network of Chilean schools to improve education and meet the future needs of society. *Enlaces'* focus on modernizing education and its visible achievements have enabled the program to generate broad public and government support. The high level of support from schools, parents, businesses, and politicians makes it easier for the program to obtain practical assistance from all sectors of society, achieve objectives, and solve problems.

Enlaces enabled teachers and students to communicate easily with others within the network and with people around the world via the Internet. Teachers and students frequently attend meetings, events, and exhibits of locally-produced software applications and computer-assisted educational projects. Simple and creative school projects, such as "Wordarium," "Guessing the Character," and the "Poetic Dictionary," were used to increase and enrich collaboration among participants, enhance creativity, and build vocabulary and information processing skills. The network also enabled teachers to share their experiences and engage in collaborative problem solving and learning.

Studies carried out by *Enlaces* researchers and UNESCO consultants showed a positive change in teachers' attitudes toward teaching, computers, and the benefits of the network after being involved in *Enlaces.* These studies found that student dropout rates had fallen and achievement among slow learners had increased in *Enlaces* schools. Interviews with teachers and students also showed an increase in student motivation and creativity.

The World Bank, SRI International, the Universidad de La Frontera, and Fundación Omar Dengo (Costa Rica) conducted a major qualitative study of computers in schools serving middle- to low-income students. Six successful *Enlaces* schools in Chile were selected for an in-depth study from June to November 1996. Researchers found that student-teacher relationships within computer labs were more personal than in traditional classrooms and that students showed greater ability to work and learn independently. Computers also have increased the likelihood of cooperative learning situations. Positive impacts on behavior and self-esteem were also reported among slow learners and special education students. Teachers were positive about the impacts on their own behaviors and self-esteem and believed that computers increased collaboration and strengthened relationships among teachers in the network. Parent and community involvement and interest in computers in schools increased as well.

Although the World Bank/SRI report did not draw specific conclusions about student learning, interviews with teachers reflected their belief that computers did enhance thinking skills and the quality of work of their students. The changes in behaviors and relationships among students and teachers may indicate improved learning. However, more focused research on the effect that computers and learning networks is needed to verify and quantify this effect.

The *Enlaces* program, then and now, is an excellent example of a successful education and technology project in the developing world. Chile's experience represents one possible approach to bringing computers into schools to enhance education. It provides useful lessons and information for understanding the risks and potential benefits of experimental pilot projects that eventually become national programs.

Enlaces Interface: La Plaza

www.redEnlaces.cl

Project Summary

Enlaces is a bold and forward-looking initiative that has radically expanded and enhanced learning environments and educational opportunities for Chile's students and teachers. Using a creative mix of computers and communication tools, *Enlaces* has created a virtual community of teachers and students across Chile and has linked this network to the rest of the world via the Internet.

Enlaces is part of a nation-wide education reform effort that seeks to improve the equity, quality, and efficiency of primary and secondary education. *Enlaces* began in 1992 as a pilot effort run by a small group of people at the Catholic University of Chile in Santiago. Initially, the project's goal was to see if a combination of computer and communications technologies could be used to connect schools to form a small learning network. Project planners believed that a network linking schools could contribute to better teaching and learning, help teachers and students develop new skills, and initiate new ways of learning and applying knowledge.

After demonstrating a high degree of success, the *Enlaces* prototype was adopted by the Ministry of Education in late 1993. It was to become a nation-wide initiative and was part of the national education reform program, MECE (Improvement of Equity and Quality of Education).

Enlaces and the larger reform effort share important, mutually-reinforcing goals that are critical to overall success. By modernizing the education system, government officials believe that Chile will sustain economic growth and social development and play a more active role in the global information economy of the 21st century. By the end of the 1998 academic year, more than 3,000 primary and secondary schools and half of all primary and secondary students (1.4 million) were participating in the *Enlaces* program. The Ministry expected that all secondary schools and half of Chile's primary schools would be linked by the year 2000.[1]

The remaining primary schools, covering 11% of all students, are in remote rural areas not served by the telecommunications infrastructure. Linking these schools to *Enlaces* remained a priority of the Ministry, and a variety of creative approaches to solving the challenge of providing these schools with basic communication services were being tested.

The *Enlaces* project had the following main objectives:

- Establish a virtual education community of teachers and students using a computer-mediated communications network linking all primary and secondary schools in Chile. This network, as explained by Cristian Cox, MECE's Director, is "a communication network that radically expands the schools' learning environments."
- Enable all teachers and students in Chile's primary and secondary schools to have equal access to basic entry-level computer and communications technology and related educational resources, regardless of location or socio-economic status.

www.redEnlaces.cl

www.educarchile.cl

- Improve teaching practices to increase learning.
- Teach students to conduct research, process information, and improve planning skills; stimulate creativity; and build effective communication abilities.
- Improve the administration and maintenance of student records and instructional materials.
- Enable teachers across Chile to share educational resources and engage in collaborative learning.
- Provide teachers across Chile with a forum to share innovative ideas and experiences.
- Prepare students for the modern workplace by teaching them to use computers and related information and communication technologies (ICTs).

In concert with these educational objectives, there were economic and social expectations as well. Students from *Enlaces* schools would likely become agents of change, introducing ICTs in other sectors of Chilean society as tools for learning and development. These skilled graduates would also provide for sustained national economic growth and development.

The Early Years: to mid-1998

Pedro Hepp, National Coordinator of the Ministry's *Enlaces* program, started and directed the pilot project with a small cadre of committed professionals. Hepp and his team linked some 60 primary schools in 1994, and prepared a proposal for World Bank support to expand the network to secondary schools. At the end of 1996, Ministry and World Bank funding enabled *Enlaces* to link over 300 primary schools and 160 secondary schools. By the end of 1997, over 1,400 schools were already part of *Enlaces*, with 1,700 more schools added by the end of 1998, and another one thousand during 1999. A technical assistance network of 35 universities also was in operation. The program's goal of linking all of Chile's secondary schools (about 1,400) and half of all primary schools (about 4,000) by 2000 was on the verge of being achieved, though additional private-sector and school community support was hoped for to achieve full implementation.

By mid-1998, *Enlaces* was already both a physical and social network linking Chile's educational institutions. The physical network included computers in schools with links to universities for technical support, a telecommunications infrastructure, software, and communication resources. Users accessed the resources and services through a locally developed interface known as La Plaza, meaning "a town square." The La Plaza interface represents a common cultural setting familiar to anyone in Chile. Users would simply "click" on parts of La Plaza to access their email accounts, information and reference materials, a number of educational software packages, a chat room for interactive discussions with others on the network, and a bulletin board for school and community announcements.

Given the earlier connectivity conditions of country and schools, most communication among

Enlaces members was carried out along standard telephone lines via a store-and-forward email method where schools dialed out to regional nodes late at night when rates were low and forwarded accumulated messages to their destination. Initially, *Enlaces* did not provide schools with real-time access to the Internet, but some schools established these services on their own. In 1998, due to more favorable connectivity options and Internet growth, *Enlaces* staff started addressing the question of providing schools with full Internet access as an educational tool, even though its own web site, which was overhauled in August 1998, had existed since 1995.

The social network consisted of primary and secondary school administrators, teachers, students, universities, and staff and officials of the Ministry of Education. To date, the Ministry oversees *Enlaces'* policies, guidelines and funding, and a consortium of 35 universities in different regions of Chile provides technical support and teacher training. The *Enlaces* network is headquartered at the Universidad de la Frontera (UFRO) in Temuco, Chile. By mid-1998, a project team of approximately 40 professional and support staff worked in the different regions to manage and support project activities.

Enlaces is funded by the Chilean Government, through the Ministry of Education, with additional assistance from World Bank loans. According to Potashnik (1996), Chile expected to spend approximately $80 million on *Enlaces* until the year 2000, including a Word Bank loan for $20 million. Communities, schools and businesses also provided some cash and in-kind contributions for local *Enlaces* schools. About three-quarters of the funds were earmarked for equipment, and the remainder was for training and technical support. Ministry officials realized that long-term sustainability of *Enlaces* would require private sector involvement, and they were actively campaigning for resources from businesses and offering tax benefits to encourage donations to Enlaces schools. Hepp (1998) reports, however, that few businesses had been willing to provide sizable contributions because of the lack of strong incentives and inexperience with this kind of public-private partnership[2].

Apple Computer Corporation donated some initial equipment through its Apple Classrooms of Tomorrow (ACOT) program, and Apple's Chilean distributor won the initial public bid to provide *Enlaces* with equipment. ACOT also provided consulting services, advice and training to teachers and *Enlaces* staff. CISCO Systems provided the remote access servers at the pilot phase for the dial-up access to schools. After becoming a national program, both IBM Corporation and Apple won major contracts to provide *Enlaces* with equipment. The combination of IBM and Apple computers and equipment made it more difficult and costly to manage and maintain *Enlaces'* technology base.

During 1998, one of Chile's major telecommunications companies, CTC, donated 5,650 telephone lines to *Enlaces* schools, including 860 lines designated for rural schools. CTC also provided reduced rates for telephone costs and offered all government-supported *Enlaces* schools up to 88 hours of free Internet access per month. In addition, CTC would train 10,000 teachers on educational uses of the Internet[3].

Enlaces is an open learning network, and private schools were encouraged to join if they provided their own equipment. All schools had to pay their own operating and recurrent costs. In the early *Enlaces* network, telecommunication costs were very low but increased when the Internet was used. In the first four years, all schools entering *Enlaces* had to prepare proposals for their own educational projects detailing how the technology and the network would be used to enhance education. Once the Ministry approved the school's plans, *Enlaces* provided the necessary equipment. A network of supporting universities trained the principal and at least twenty teachers from each school. The trained teachers were then required to train additional teachers in their schools. *Enlaces* also provided schools with additional technical support during their first two years in the network.

Primary schools were allocated equipment and services based on numbers of students. Schools with up to 100 students received three computers and one printer; those with up to 300 hundred students were given six computers and two printers; and schools with more than three hundred students received nine computers and two printers. Each school also received one modem, one CD-ROM player, and a selection of educational software. Secondary schools were provided with a multimedia computer lab with eleven computers, three printers, a network server and modem, CD-ROM drives, and other multimedia

tools and software. Individual schools are still responsible for recurrent costs and are encouraged to develop strategies to expand and sustain their new computer and communication systems.

Universities in different regions continue to provide technical assistance and training to schools and teachers participating in *Enlaces*. Along with support, training, and managing the network, the universities also help teachers become self-sufficient in their use of information and communication technologies to enhance education and stimulate creativity and innovation. The *Enlaces* National Coordination Office sets basic standards, and each regional center and cluster of affiliates develops its own plans and activities to meet the specific needs and capabilities of the schools in its area. *Enlaces* also published a quarterly magazine and maintained a web site (www.*Enlaces*.ufro.cl) to provide teachers and others with supplementary educational resources and information about the program.[4]

By 1998, *Enlaces'* biggest achievement was the creation of a computer-mediated communications network of teachers and students at hundreds and then thousands of Chilean schools, universities, other educational institutions, and the Ministry of Education's own programs. At the time, this impressive accomplishment enabled a series of significant and far-reaching benefits, which are outlined below.

Enlaces contributes to Chile's national education reform effort: The Ministry of Education's broad educational reform effort includes initiatives to provide students and teachers with access to modern technology. Through the *Enlaces* project, computers and telecommunication capabilities were introduced directly into Chilean schools to support new learning and teaching practices.

Increases equity among Chile's schools: The Ministry of Education selected schools for the Enlaces program according to poverty indicators. *Enlaces* was part of the MECE program, which explicitly addressed equity issues and schools at "pedagogical risk." Since *Enlaces* began, it focused on providing economically and socially disadvantaged schools with computer equipment and training. In fact, a majority of the schools in the small pilot program were among the poorest communities in the country, serving mainly indigenous populations in southern Chile and schools in Santiago. Using the La Plaza interface and both locally developed and commercial educational software, *Enlaces* also helped ensure that all teachers and students linked to the network would have access to the same kinds of information, regardless of location. As the program expanded, this equity goal remained a focus of project activities.

Lessons

Focus on Teachers and Teaching, not the Technology

Central to the success of educational technology projects is training and supporting teachers and integrating technology into learning environments. In addition, actively involving teachers in decision-making about using computers and learning networks is critical to the program's continued success. If they are not, long-term educational achievements and changes in pedagogy will be unlikely. Student learning also is accelerated when teachers successfully assimilate education technologies and integrate their new skills—and the technology—into new approaches to teaching and classroom management. Achieving this is dependent on building effective support systems for teachers. This convinced teachers that technology is an ally for improving teaching and learning and reinforced the idea that technology can be a useful means of enabling educational reform.

Enlaces provides teachers with a variety of learning opportunities, including formal group training at teachers' schools and in workshops, collaborative projects with teachers from different schools, the sharing of experiences via the project's magazine and web site, and through informal teacher networks. During training, teachers are provided with "teacher only" rooms to learn and practice new skills. *Enlaces* and other similar projects have learned that teachers do not like learning to use computers while their students are present and will avoid training activities if not held in private facilities.

To enhance the rate of adoption in *Enlaces* schools, computers are introduced as general educational tools that all teachers can and should use—not just math or computer science teachers. Training and orientation are aided by the easy-to-use software interface La Plaza. Once the initial fear of the technology was eliminated, teachers learned more advanced skills quickly and began using the

technologies in their classrooms.

Teachers' concerns about quickly adopting new technologies and ways of teaching influenced the program design. Computers were introduced gradually over two years with ongoing support and training. *Enlaces* focused on meeting teachers' needs and linking technology to teaching. Teachers and administrators also appreciated the program's focus on using the technology to improve school and classroom administration. Providing teachers with practical tools for handling mundane management tasks allowed them more time for more enjoyable educational activities. This feature of the program contributed to teachers adopting new pedagogies that included the use of technology.

In a further effort to address teachers' needs, the *Enlaces* learning network provides teachers access to email and discussion groups. Use of the network for communication helped all teachers, even those in poorer schools, feel part of a larger educational community and reduced feelings of isolation so common among teachers in rural areas.

To join *Enlaces,* all schools must propose educational projects using the new technologies. These teacher-designed projects foster self-reliance and demonstrate how innovative teachers across the network are using the new system to enhance teaching and learning. Designing and implementing their own computer education projects has been an important learning and formative process. These projects and experiences are shared with others through local and regional events, as well as through the Internet. Women teachers across all disciplines devised a substantial number of these projects.

A determining factor for teachers' involvement in *Enlaces* is the lack of time that teachers have for extracurricular activities, including computer training, self-instruction, skills practice and intensive collaborative work. The development of required professional skills occurred primarily on a voluntary basis outside the teachers' normal workday. Dependence on teachers' willingness to spend their own time and resources to make technology projects successful should not be the rule. Programs need to provide teachers with sufficient time during their workday for training, practice, and innovative planning.

The *Enlaces* program is evolving and expanding and now seeks to intensify the relationship between technologies and learning processes, both at a broad strategic level—the restructuring of educational and learning practices—and at the micro level through practical day-to-day applications that improve classroom management and enhance teaching and learning.

Use a pilot project to test theories and strategies before implementing them on a large scale. New, complex, and technically difficult initiatives are often best started as small, flexible pilot projects designed to test key ideas, refine strategies, and demonstrate potential. *Enlaces* successfully transitioned from a pilot project to a national program due to its long-term vision and its effectiveness at the pilot stage. Although the *Enlaces* project helped complete the technological requirements for introducing computers into schools, the project itself has focused on educational development. It gained the political and financial support necessary for it to become integrated into a national agenda for improving education. If *Enlaces* had not been integrated into the national educational reform effort, it is unlikely that the program could have achieved its current level of success.

Organize a small, professional, decentralized management team. Although *Enlaces* is part of the Ministry of Education, a fairly small autonomous team of professionals manages the program. Because of the complexity of the *Enlaces* network and its far-reaching goals and objectives, *Enlaces* requires a highly competent professional team to design, manage, and maintain it. Individuals in direct collaboration with the schools make most of the administrative decisions. The autonomous and decentralized nature of the program has attracted leading education professionals to join *Enlaces* as collaborators and promoters. The *Enlaces* experience demonstrates the importance of creating and maintaining a decentralized management structure comprised of committed professionals so that people closest to actual project activities can make decisions that reflect local realities and needs and not central policies.

Utilize a preexisting infrastructure. Projects such as *Enlaces* that seek to create dynamic learning networks will benefit significantly from a well-developed power and telecommunications

infrastructure. The underlying communications and power network in Chile played no small part in the early achievements of *Enlaces*. In poorer, rural parts of Chile that lack these resources, the program has experimented with wireless alternatives to provide basic connectivity to participating schools. This demonstrates that an extant infrastructure can make learning network projects easier and faster to implement. However, the absence of a well-developed infrastructure should not preclude such initiatives. For much of the developing world, it may be too expensive and take too long to establish a conventional power and communications infrastructure to reach all communities, especially the poorest and most remote areas. In such situations, it may be possible to create clusters of linked schools or learning network cells via wireless technologies. Countries considering projects similar to *Enlaces* must carefully evaluate current and planned infrastructures against the demands of technology projects. Such efforts must also assess alternative strategies for meeting these needs since the long-term benefits of enhancing education through computer -mediated communication will likely outweigh short-term costs.

Gradually introduce computers into schools and integrate the technology into teaching and learning activities. It takes time for teachers and schools to adjust to using computers and communications tools and integrate these technologies into educational programs. *Enlaces* shows that while computers are useful tools, it is necessary to introduce them in ways that are not threatening, enabling teachers, administrators, and students to learn how to use them to improve education and make their work easier and more enjoyable. Change and innovations in educational practices start with methods that are already being used. *Enlaces'* structure allows changes to be gradual and in many ways self-directed by the teachers themselves.

Schools should have sufficient autonomy to define the ways in which technology will be used to support their own educational needs and activities. At the same time, educational technology programs need to use training and demonstration activities to show the diversity of possible applications and new opportunities for local innovation. *Enlaces* has been an exercise in empowerment for teachers and school administrators by encouraging them to develop their own proposals for using computers in their schools. Teachers are the primary actors and beneficiaries of the program. Their involvement has given them a sense of ownership of the program and fostered a willingness to implement change.

The training *Enlaces* provides familiarizes teachers with the use of technology. However, it is insufficient to allow teachers to fully integrate technology into their curricula. Continuous training is essential to develop skills, confidence, and a desire for innovation. Although schools are provided with the necessary equipment and infrastructure, teachers must be willing and able to use these tools if they want to help their students learn new capabilities effectively. The gradual introduction of technology into schools, the design of a culturally appropriate and an easy-to-use interface, and on going support has been essential for the success of projects like *Enlaces*.

Decentralize technical assistance and training. Much of the technical assistance that *Enlaces* provides consists of teacher training and producing training materials and work guides. Universities deliver the assistance, which is advantageous for many reasons. The universities are up-to-date on education and technology trends, and they can provide advice on pedagogical matters. This decentralized arrangement also gives the universities and schools more power to define and direct the program to meet their specific educational goals and implement their own school-based projects. The universities are accountable to the schools and the Ministry for delivering training and technical support, but they are free to apply basic standards set by the Ministry flexibly. In addition, universities have opportunities to conduct research to evaluate the progress of students and teachers in *Enlaces* schools within each zone. Another advantage is that universities must deal with the realities of introducing technological innovations and skills into public primary and secondary education.

Using universities to deliver support services to a complex project also has disadvantages. For example, universities may have limited capabilities in keeping computer systems and communication networks running. When they exist, commercial vendors may be more reliable providers of these types of services.

Universities also tend to have slow administrative procedures, bureaucratic systems, high operating costs, and a lack of discretionary financial resources. Even though universities have research capabilities, there are no guarantees that staff will choose to make educational technology projects a focus of inquiry.

Although universities may not be the best means of providing support, training, and research services to projects such as *Enlaces,* for Chile they were the most reliable and efficient way of reaching the schools and teachers in a decentralized manner. A hybrid arrangement with both private and public agencies providing aspects of technical assistance and training may be an effective approach for complex projects. Such an arrangement also may keep costs down, promote community involvement, and encourage economic development.

Use robust processes for assessment, monitoring, and evaluation. Dynamic but not complex monitoring and evaluation strategies and tools to collect both quantitative and qualitative information can help maintain strong local and national support for expensive and long-term projects.

Enlaces staff devised a strategy for monitoring and evaluating the use of the network by teachers and students, as well as their progress toward achieving short- and long-term project results and outcomes. These approaches included monitoring the use of La Plaza software, the flow of communications among schools, the number of email contacts made by participants, and assessing student achievement using the national exam and other instruments. The data collected through this system provided *Enlaces* with the raw material to identify and explain early usage patterns and changes in attitudes, behavior, and learning outcomes related to *Enlaces.* Unfortunately, only initial results from 1995 were reported, and no subsequent information was provided in the January 1998 evaluation report.

Project staff carried out a series of small, qualitative studies to improve planning and implementation. These studies focused on assessing the concerns and attitudes of teachers, principals, and students about using computers and communication networks to enhance learning. Early results from teachers showed that they were skeptical about the plans for *Enlaces;* many believed that poorer schools would never receive computers, and that if they did, the equipment would be old, used systems and that teachers would not be trained to use them. As the project progressed, however, focus group meetings and interviews indicated that teachers' attitudes toward using technology in the schools were positive.

Teachers also valued the simplicity of the La Plaza interface. Although limited, the electronic resources made teachers feel that they were indeed part of the larger *Enlaces* program and a networked community of learners. Many teachers also felt that they were part of a "modern wave" of education improvement in Chile. Student assessments showed that they felt much more motivated to learn in innovative, fun, and engaging ways. They also believed that they were learning marketable skills in writing, computer knowledge and teamwork within their schools and across the network.

In 1997, a major, independent, qualitative study examined classroom, school, and national-level implementation strategies, comparing them to a similar project in Costa Rica (Alvarez et al, World Bank, 1998). Six *Enlaces* schools were selected to participate in the study, which stressed a number of specific positive changes in learning and teaching that have occurred as a result of using computers for education and of linking schools together electronically.

The results from these studies did not provide definitive conclusions about the effect of *Enlaces* on learning performance. However, they did provide valuable insights into the multitude of effects that this project is having on teaching and learning in Chile. They showed, for example, that *Enlaces* was making a substantive impact on pedagogy and a valuable contribution to the larger education reform effort. They provided examples of real-life, classroom-level experiences and lessons from *Enlaces* that are relevant to other schools and teachers in Chile and other countries.

The *Enlaces* program devised a complex set of quantitative tools that were designed to assess student progress over time and track changes in teachers' and parents' attitudes and perceptions of the program. Unfortunately, the results from this evaluation process, based in part on factorial analysis, are not interpretable. *Enlaces* staff admit that the most serious complicating factor is the number and pervasiveness of different processes that are involved in the national educational reform effort. It is extremely difficult to isolate the impact

that *Enlaces* might be having from the impact of the larger reform program. Additional difficulties derive from the varied way in which schools, teachers, and students use *Enlaces* to enhance different aspects of teaching and learning. Notwithstanding such complexities, some comparisons using national achievement scores of *Enlaces* and non-*Enlaces* schools also were undertaken.

Sustain and expand technology projects. Development projects that require significant investments in technology demand sound strategies to cover maintenance, replace outdated equipment, funding for new equipment to meet increased demand, pay recurrent operating expenses, and provide ongoing user training. To address parts of this sustainability challenge, *Enlaces* provides participating schools with the initial equipment and software and two years of technical assistance. During this time, schools are expected to develop plans and mechanisms for sustaining the project. Reports indicated that most schools were successfully meeting part of this responsibility. However, schools had limited success in receiving effective service from equipment vendors and in keeping costs for telephone service and equipment insurance and repair low. The lack of skilled technicians to service both IBM compatible and Apple equipment, especially in remote areas, also proved problematic.

An even greater challenge—the need to replace outdated equipment and buy additional equipment—rapidly became a painful reality. It appeared that few schools had created budgets or funding mechanisms to upgrade equipment and software and buy additional equipment needed to meet the growing demand. This was also at the same time that *Enlaces* was encouraging schools to use the World Wide Web and the monthly access and on-line use costs were significant. For *Enlaces* to be sustained and institutionalized, progress must be made by schools and the ministry to develop an equitable means of funding the purchase and continued use of ICTs in schools over time. School budgets must be changed to reflect these new needs. Through creative partnerships among schools, parent groups, and the business community, supplemental funds could be provided to maintain and buy equipment, provide continuous training, and increase Internet and network usage.

Enlaces is an ongoing program that has successfully managed a complex transition from a carefully planned and nurtured pilot project to a nationwide effort. Projects like *Enlaces* that seek to achieve national coverage without sacrificing educational equity and quality need to address a number of important factors, including:

- a focus on teachers as the main pedagogical actors and a commitment to supporting their learning needs;
- support for the establishment of a social network of learners and educators, facilitated by user-friendly technology and decentralized support arrangements;
- respect for schools' autonomy and the decisions they make about using technology to meet local educational needs; and
- creating a balanced mix of project vision, strategic planning, efficiency, and needed flexibility and creativity in the face of emerging educational challenges and rapidly evolving technologies.

Two other aspects of the *Enlaces* experience deserve special attention. First, *Enlaces* staff put the needs of learning and learners before technology. Strategic program decisions reflect this principle, from extensive and well-budgeted teacher training to school-directed local projects for using technology and the inviting interface of La Plaza.

Second, *Enlaces* planners have judiciously applied learning from other efforts to introduce and use computers and telecommunications to improve education. Lessons learned in different cultural settings echo through the *Enlaces* implementation process. One can only hope that *Enlaces* continues to be an innovative and equitable learning network that learns from its own experiences and that of others.

The Enlaces Project: 1992-2002

Between 1992 and 2002, the *Enlaces* Project underwent significant changes. Some of the key developments are summarized.

Increased coverage of schools and students

Table 1 summarizes *Enlaces* increased coverage and shows a dramatic increase in the number of schools and students.

Targets were met and substantial additional progress has been achieved in full primary school coverage. The remaining rural school problem is being addressed within the Ministry's "Básica Rural"

program. In 2000, a pilot project was implemented in 14 rural schools, with 62 micro centers covering 340 schools added in 2001, and 600 more in 2002.

While student coverage is now almost universal, the ratio of computers-to-students needs to improve. By 2006, the ratio will be 1:35 instead of 1:65 as it is now. Some school-community initiatives are improving such ratios.

Access to Internet and WWW resources

The coverage increase masks another critical qualitative change. Full Internet access is now prevalent. This was not the case prior to 1998. Some schools are now jumping into high bandwidth, provided at increasingly affordable costs. Dial-up access to Internet has accelerated enormously because of a decrease in connectivity costs and Internet plans. The substantial increase in access and use of online educational resources is now part of the Enlaces coverage.

Access *per se* means the potential use of any and all educational resource on the Internet (and substantial numbers of them are available in Spanish). Moreover, quality and pertinence of use within a formal schooling environment is enhanced by the new educational portal and several related resources. Teachers continue to be supported, too, in the development of their ICT competencies and skills, online and offline.[5]

A new portal and more resources for the educational community

The most visible change for *Enlaces* is the new portal, www.educarchile.cl, online since October 2001[6] and segmented into four sub-portals: Students, Teachers, Family, Researchers and Policy-Makers. A successful partnership between the public, private, and philanthropic sectors supports the site.

Digital content on the site includes lesson plans, summary index cards and guides to educational resources, educational data banks, and interactive services for the educational community as a whole, including online training and email accounts. The implied lesson is paramount. *Enlaces* is now not only about schools, teachers, and students: it is the reference site for all those interested in education.

The original *Enlaces* network web site, though, is not defunct and still operates on its own as www.redEnlaces.cl, with a focus on the educational network itself and its accompanying resources. One link leads to the specialized *Enlaces* Trainers' Network[7], which adds unique additional training resources for teachers and educators.

Improved teacher access to computers and use of e-resources

While the complaint about not enough computers in schools is valid, a program that subsidized teachers' purchase of computers seems to have influenced educators' personal decisions to own one at home. A recent independent poll[8] shows that 64% of teachers in the public education system own a PC (i.e., over 80,000 teachers), and 41% (over 50,000) have Internet access. Virtually all report using these resources to support their professional tasks and development. Teachers are actively engaged in enhancing their professional profile and their e-readiness, a critical component for sustaining

Table 1 ***Enlaces* Expansion 1992-2002**

Item		1992	1994	1996	1998	2000	2002
Number of schools	primary	5	58	311	2206	4052	5942
cumulative	secondary	0	0	161	952	1283	1336
% coverage schools	primary	0	1	4	27	50	74
	secondary	0	0	11	66	89	93
	total	0	1	5	33	56	77
% coverage students	primary	na			48	85	96
	secondary				81	95	98
	total				56	87	97

Source: www.red*Enlaces*.cl ("cobertura"). 2002 est

educational reform and integration of ICTs into the teaching and learning process. The fact is more noteworthy if one compares the teachers' prevalence figures with the country's (17% and 10% respectively for PCs and Internet). In fact, the teachers' rates are equivalent to that of the highest percentile of the population. The value and impact of proactive equity measures cannot be more strongly underscored.

Computers in schools available for community access

Chile is still not a relevant actor in telecenter development, except for a few noteworthy initiatives. Worldwide, it is not common to see school ICT and Internet facilities open up to the community. After field testing the idea, the Ministry of Education opened up the *Enlaces* network to the community in August 2002, with 590 schools applying for entrance. The plan will encompass 5,000 schools reaching an estimated half a million persons to be trained in ICT uses by 2005.

Growth pains, new challenges, persistence of educational inequities

Even success stories are not all rosy. The problems of deep persistent social inequities, which tend to permeate educational systems, cannot be solved by ICT infusions alone. Yet evidence highlighted in this case study show that *deliberate, proactive, and well-focused ICT initiatives can be strategic in addressing inequities.* Some problems become non-problems after a while, perhaps due to other economic and social developments such as more affordable connectivity options and more educationally-relevant Internet content and resources.

Sometimes solving old problems creates new, superior challenges, as is the case for increasing the availability of computer time per student and the continuing development of more sophisticated Internet usage and creativity in applying such resources to learning.

The Chilean educational system remains "significantly segregated: where poor students go, middle and upper class students do not go and vice versa." Moreover, the educational culture has internalized a "representation of inequality" in a system operating in "three different bands," i.e., municipalized, subsidized, and private, according to the latest yearly survey of educational actors.[9] Nevertheless, most parents have high trust in their children's teachers and principals. The survey notes that 80% of principals and 74% of teachers, regardless of their school, have a computer at home. In 41% of the students' homes, there is a computer, too, though Internet access at home is available for 46% of paid school families and for only 15% of municipal ones.[10] This is why computers, software applications, and Internet access are important inputs to schools, as partial equalizers. Poorer schools in the study complain about insufficiencies in all three aspects.

Introducing computers in schools may be the single most important factor in preparing developing countries for the challenges of globalization and the coming Information Age. The challenge is not unlike that of extending the reach and quality of education: first, it is about universal access to primary education, followed by equity and quality of learning and successively expanding the agenda to cover all actors and levels of the educational system. Putting computers in schools and providing the very first window to the Internet is but the momentous initial step.

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Footnotes

[1] Those targets were met.

[2] The new portal is a major public-private-philanthropic partnership.

[3] CTC is now Telefonica. An even better agreement was subsequently concluded between the Government of Chile and Telefonica.

[4] The magazine, essential for teachers in the start-up years, was discontinued in 1999. The supporting web sites were folded into the new portal, though the network's web site is still active.

[5] See www.red*Enlaces*.cl for additional teacher resources for their online work.

[6] The new portal is the confluence of the classic and beloved www.red*Enlaces*.cl and the educational portal www.ie2000.cl developed by Fundación Chile, a public-private entity (see www.fundch.cl/dt/fc_index.htm). Those links now redirect to the new portal.

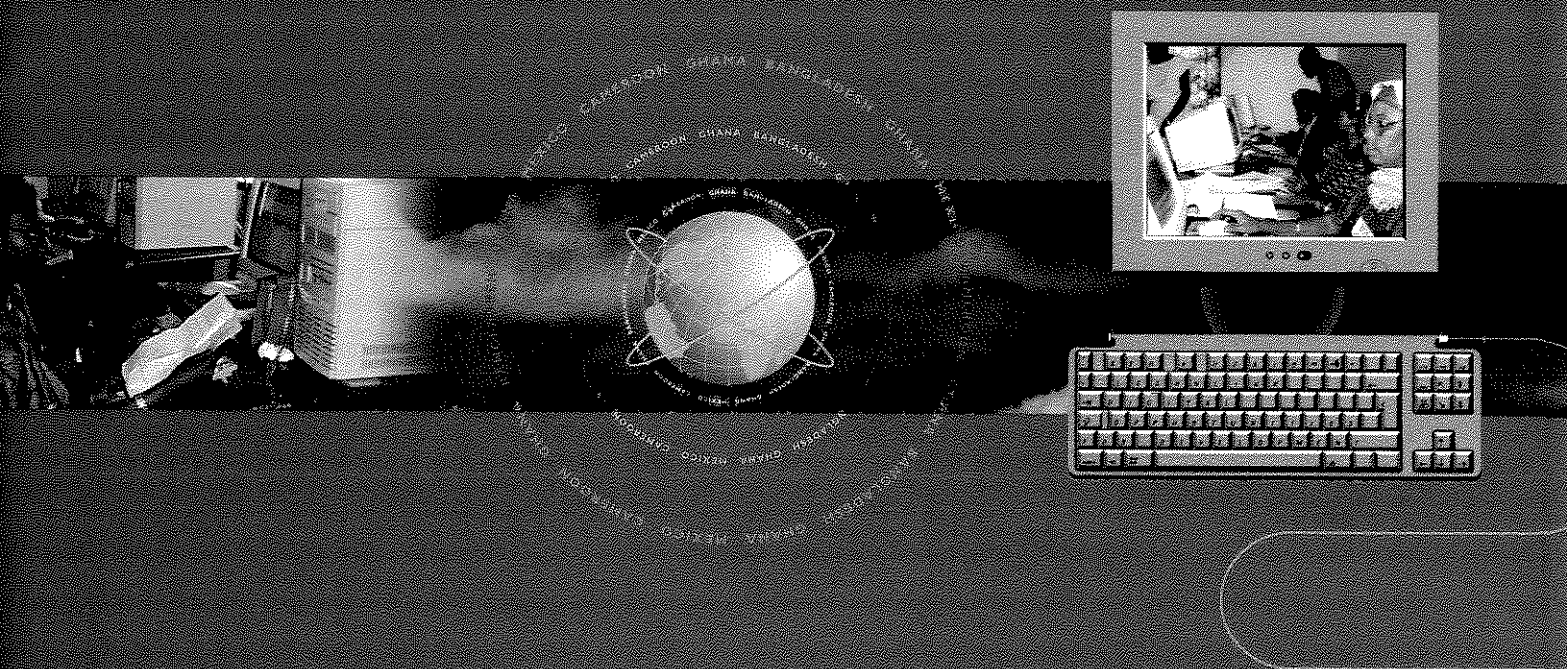
[7] www.red*Enlaces*.cl/capacitadores/capacitadores/index.html

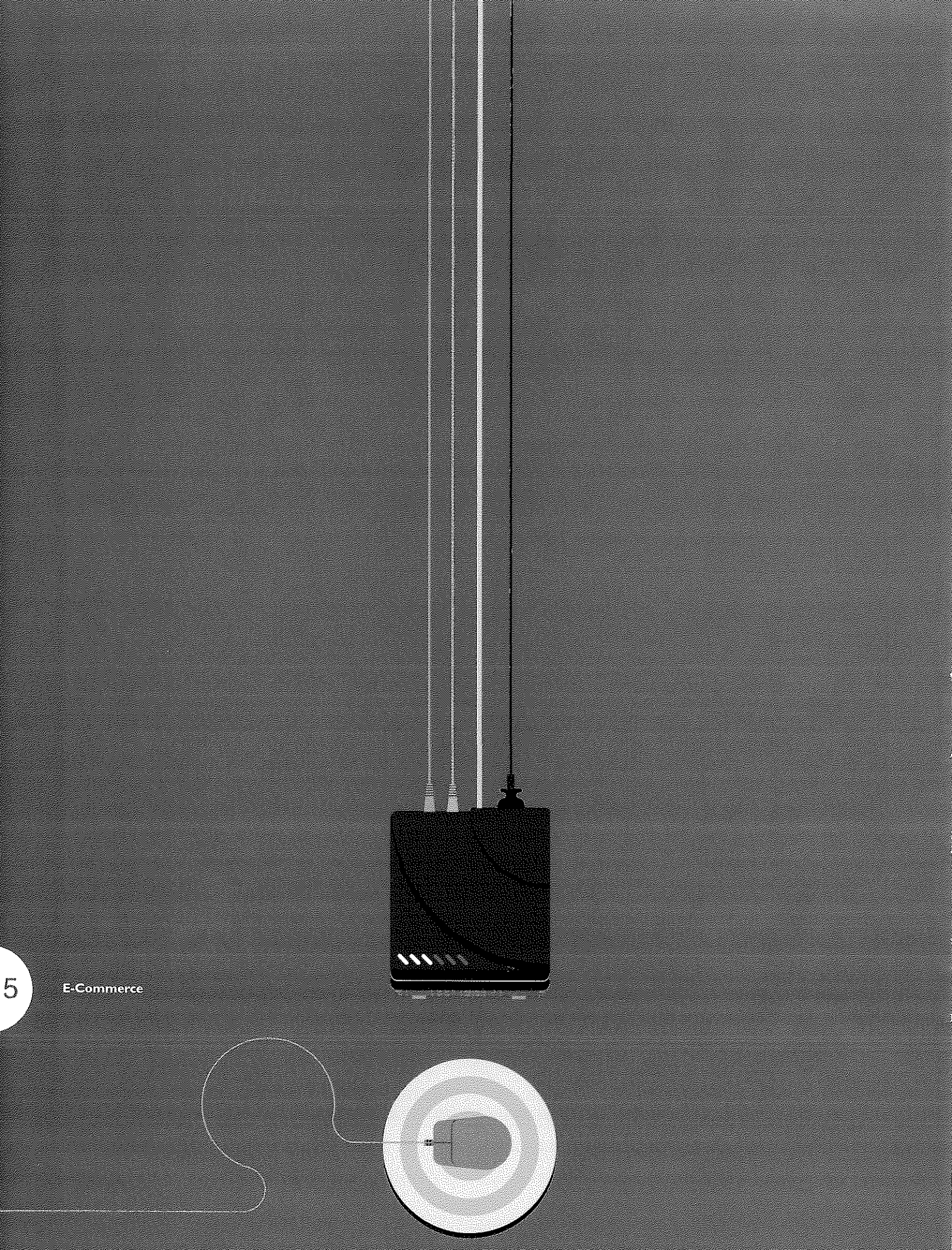
[8] Collect Investigaciones de Mercado, mid-2002. Reported in red*Enlaces*, mineduc and media, July 2002.

[9] CIDE, 2002. This is noted in its third national survey, 10-11/2001, applied to a representative sample of 231 educational establishments in which almost 15,000 persons were consulted (principals, teachers, students, parents). See Refs and www.cide.cl

[10] The home computer percentages are 32, 40 and 67% according to students' type of school, a notable gain for poorer families whose Internet access grew from 9.5 to 15% in a year. See the CIDE report for full details on perceptions of the schools' e-facilities.

Foundations of Electronic Commerce 5





5 Foundations of Electronic Commerce

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Overview

E-commerce, a prime driver of the global economy, has changed business processes worldwide, increasing logistical efficiencies and facilitating the buying, selling, and marketing of goods. Similarly, e-commerce has benefited millions of consumers through decreased prices, increased competition, and faster order and delivery times.

Large and small companies across multiple industries depend on e-commerce applications to survive and compete in local, national, and global economies. These companies use e-mail to communicate with customers and suppliers and the Internet to handle marketing and electronic transaction processing and settlement. They rely on myriad hardware and software solutions to manage large databases and carry out sophisticated analysis of complex business operations, support back office automation, assist document sharing, and facilitate communication with clients, customers and colleagues.

While e-commerce has advanced most rapidly in developed countries, companies in developing countries increasingly use e-commerce to strengthen their core business practices and spin off new businesses. In Asia, for example, the e-commerce solutions market looks to grow at an annual rate of 24 percent, while Latin America's online retail revenues were expected to more than double between 2000 and 2001. In short, e-commerce will continue to transform business – and societies more broadly - on a global scale irrespective of geography, topography, gender, ethnicity, or nationality. This transformation is likely to intensify and companies in developing countries must become versatile in at least basic e-commerce applications if they are to participate in the global economy.

Development practitioners who wish to promote e-commerce have a unique opportunity to learn from the spectacular failures that befell many pioneering e-commerce initiatives at the start of the 21st Century and the way in which companies are now successfully using a variety of e-commerce applications. In the short-term quest for rapid profitability, U.S. and European companies often rushed to develop expensive, high profile applications without adequately assessing whether demand existed for them. In addition, many e-commerce businesses that adopted these digital applications lacked the physical infrastructure to handle increased demand and fulfill consumer expectations. Companies have since matured in their use of e-commerce, using precisely tailored applications to compliment their core business processes and leverage applications for transaction processes with a high return on investment (ROI). Similarly, businesses in developing countries are wise to use e-commerce applications judiciously, and practitioners are urged to promote appropriate and cost-effective e-commerce initiatives that are linked closely to and augment traditional business principles.

The purpose of this paper is to propose a model-of-use for development practitioners interested in applying e-commerce approaches to address targeted development challenges. The model presents an analytical and programmatic framework for understanding the opportunities and costs involved in implementing e-commerce initiatives. The central premise of the model is that three primary components must be addressed if e-commerce applications are to become widespread and effective in developing countries: (1) a strong enabling environment, (2) active human capacity development, and (3) effective local delivery and support mechanisms. These three components are closely inter-related and mutually dependent.

A strong enabling environment includes effective legal and regulatory frameworks covering issues including taxation and electronic payments, a competitive telecom environment, and a well-run national infrastructure, such as roads, a postal system, and a customs commission. This effective enabling environment is also one based on the principles set forth in the Framework for Global Electronic Commerce, an inter-agency document drafted by the U.S. Government in 1997. Among the Framework's key principles are that the private sector take the lead on e-commerce initiatives, that government should avoid undue restrictions on e-commerce, and that e-commerce should be promoted on a global basis.

Active human capacity development includes widespread training and awareness campaigns to strengthen information and communications technology (ICT) and business management skills. Effective local delivery and support mechanisms include widespread public access to telecommunications, the availability of local content that is relevant to businesses and consumers, and the use of commercially popular technologies that can deliver e-commerce applications reliably and affordably to the consumer.

Practitioners are urged to evaluate each of the three components of the model to determine what type of e-commerce intervention will provide the most value for their specific needs and how the relative strength or weakness of the other two components will affect the particular e-commerce initiative they undertake.

The model-of-use is structured as follows:

- Overview of e-commerce: This section provides a definition of e-commerce, a brief history of e-commerce since the rapid growth of the Internet in the mid-1990s, and an outline of general future trends;
- E-commerce adoption in developing countries: This section discusses the benefits and impact of e-commerce in developing countries, focusing on key economic sectors (e.g. tourism and financial services) and on important user groups (e.g. small and medium sized enterprises and women-owned businesses).
- The model as a potential solution and examples: This section discusses the three inter-related components essential for e-commerce development and provides a practical guide for implementing illustrative e-commerce interventions in each of those components. The interventions include reforming national customs agencies, implementing e-commerce awareness campaigns within business associations, and using wireless, market-based applications to strengthen SMEs' access to

> **“The global economy does not include all people in its workings, although it does affect directly or indirectly the livelihood of the entire humankind.”**

Manuel Castells

market information. These three interventions can stimulate e-commerce at the micro- and macro-level by improving the enabling environment, strengthening human capacity, and deploying innovative and cost-effective technologies and applications to improve business processes.

Introduction

Manuel Castells’ observation (see above) is a prescient one. Despite the much-heralded decline of the dot.com sector, e-commerce—and the Internet in particular—has become a driving force in global business. Companies increasingly weave e-commerce applications into basic business processes as opposed to treating these applications as stand-alone activities. This trend should continue as new technologies and platforms (e.g. wireless and television) bring direct and more affordable e-commerce applications to consumers.

Given the steady growth of e-commerce, large and small firms alike will compete successfully in the global economy only if they can integrate at least basic e-commerce applications and services into their business. To spur this adoption, development practitioners would be wise to implement or at least facilitate appropriate e-commerce initiatives at both macro and micro levels.

At the same time, practitioners should approach e-commerce initiatives with caution. The Internet and other modern information and communications technologies (ICTs) will not, on their own, guarantee economic and social growth. For e-commerce applications to succeed, companies must have effective management structures, viable products, and clients and customers who can take advantage of e-commerce applications. In addition, host country governments must develop effective policy and regulatory structures, and a clear and sustained local demand for the applications, products and services must exist. Finally, many complex e-commerce applications and initiatives are not appropriate for companies in developing countries, particularly given high connectivity and other operating costs.

This model-of-use addresses the impact of e-commerce on developing countries. It also suggests how practitioners can evaluate the feasibility of integrating e-commerce initiatives successfully into their economic development agendas and provides a practical set of approaches to implementing a variety of interventions.

What Exactly is E-Commerce?

E-commerce can be defined as any economic or business activity that uses ICT-based applications to enable the buying and selling of products and services and to facilitate the transaction of business activities between and among organizations and individuals. This includes using ICTs to strengthen a company’s internal operations, e.g. logistics, procurement, and human resource and contracts management, information and data management, communication functions, and to facilitate the flow of products between businesses and consumers, e.g. marketing, ordering, payment, delivery, and searching for suppliers.

Three main categories comprise e-commerce: business-to-business (B2B), business-to-consumer (B2C), and business-to-government (B2G). B2B applications include electronic marketplaces, which are forums that bring together businesses to exchange goods and services as well as offer value-

added services, e.g. handling of online payments, exchange of documents, etc. B2B also includes e-mail between entrepreneurs to exchange price and product information, companies using the Internet to check for supplier prices and order goods, building company web sites, and banks and financial service companies adopting online payment systems and practices.

B2C applications often overlap with B2B applications, particularly in areas like electronic retailing marketplaces. Other examples include companies developing web sites to showcase their products, setting up virtual malls to offer a wide range of consumer goods, enabling consumers to purchase goods online, and creating online customer service centers.

B2G entails government agencies publicizing their procurement requests online and having companies bid for the procurement contract electronically. Compared to B2B and B2C transactions, B2G has yet to make a substantial presence, though the linkage between e-government and e-commerce transactions is receiving increased attention.

The Rise, Fall, and Rebirth of E-Commerce

The rapid growth of the Internet in the mid-1990s propelled e-commerce to dizzying heights. The number of online marketplaces and retailers skyrocketed, and it seemed that every second company strove to be the next Amazon.com or eBay. The hype of e-commerce corresponded with that of the Internet. Fueled by vast infusions of venture capital, new Internet-based companies (the "dot-coms") grew exponentially. Many commentators predicted that e-commerce would end traditional business cycles.

Indeed, e-commerce transformed some sectors. Most notably, the travel and finance sectors developed successful stand-alone, online initiatives and integrated e-commerce applications into traditional business processes. In the e-finance arena, for example, online brokers succeeded despite market downturns, even causing traditional brokerage houses to reduce commissions (Mullaney 2002).

These notable exceptions aside, the e-commerce sector (and telecommunications and the Internet industry more generally) have experienced immense turbulence. Bankruptcies of high profile dot.com companies, e.g. E-Toys, occurred frequently, and many traditional "brick-and-mortar" companies quickly pulled back from developing or integrating e-commerce applications. Several reasons prompted this caution:

- Online travel and finance companies succeeded because they based their products on information and services that were quickly available 24 hours a day seven days a week, as opposed to selling and shipping tangible goods. Thus, these firms avoided the logistical challenges that affected other types of fledgling e-commerce companies trying to market, sell, and move tangible goods. The growth of on-line travel services was also enabled by the advent of e-tickets which did not need to be shipped to customers. This is especially true for countries where express shipping services were less prevalent.
- Suppliers refrained from using online marketplaces to engage in direct price comparison with their competitors or hid their prices behind password protected areas of their web sites accessible only to registered customers.
- Companies rushed to attract first-time users and devoted vast resources to elaborate e-marketing campaigns and sophisticated web sites. Unfortunately, few site visits resulted in sales or subscriptions, and many companies ignored their proven customer base. Many e-businesses reportedly spent three to five times less to keep customers than traditional companies, and as a result customer loyalty to a specific firm was discouraged.
- Companies assumed that electronic marketplaces would seamlessly match buyers and sellers, generate ever-increasing liquidity, and subsidize the development of value-added services such as supplier verification, credit, and settlement. Yet a critical mass of buyers did not exist at the beginning. Customers and buyers often viewed electronic marketplaces as a simple way to learn about products and compare prices or as matchmaking process and refused to pay transaction fees. This reluctance might have stemmed, in part, from the conception that "everything on the Internet is free."

- Companies focused on content but did not budget for the high staffing costs necessary to continually maintain technically sophisticated web sites.
- Many companies developed advanced transaction-based processes without software to support them. Therefore, initial online processes suffered from high introduction, upgrade, and maintenance costs, as well as security issues affecting digital transfers. Many companies failed to fulfill customer orders, eroding consumer trust.

In the wake of the dot.com sector crash, e-commerce has undergone a healthy maturation process. Venture capitalists now perform detailed risk assessments and due diligence before funding e-commerce companies. Many web-based companies, particularly in online retailing, also have been replaced by traditional "multi-channel" players, i.e., firms that use both online and offline business processes and that have well-established brands, product lines, and customer bases as well as strong fulfillment capacity.

These multi-channel companies often deploy e-commerce applications more methodically, first building their basic telecom infrastructure and logistical systems before attempting complex or large scale e-commerce applications like supply chain and customer-relationship management software (Hof 2002). For example, these companies focus on developing a company Intranet, a contract fulfillment platform, and a reliable database of customers and suppliers. They also match online applications precisely to their various product lines in such areas a procurement and customer service, and they use the Internet as an additional distribution channel to offer price and convenience benefits that compliment their offline processes. As one commentator observes, "…the future of B2B e-commerce lies not in exchanges but in software and solutions that bring real efficiencies to specific business processes" (Sahwney 2002).

With this maturation and the consistent increase in Internet users worldwide (see table below), the scale of e-commerce transactions has grown steadily, if not at the explosive levels of the late 1990s. In 2001, the number of online purchasers totaled approximately 70 billion, up from 46 billion in 2000. Revenues almost doubled during that time, increasing from $123 billion in 2000 to $223 billion in 2001. By 2004, goods traded online likely will exceed $1.4 trillion, or 18% of the total value of goods traded. B2B revenues, which are expected to grow an additional 74% in 2002, predominate over B2C or B2G revenues; though this ratio eventually may change with the steady rise of government e-procurement processes taking place (Mann 2002).

The Future of E-Commerce

E-commerce will continue to grow for several reasons:

- The number of Internet users continues to grow, providing a strong base for e-commerce transactions. The following table shows the rapid growth of Internet users worldwide.
- Companies are using more refined applications to integrate their business units and enhance their abilities to search for and link with suppliers and buyers. Leading e-business

Figure 1 **Internet Users Worldwide**

	1998	2002
World Total	181.7 million	544.2 million
Asia/Pacific	33.6 million	157.5 million
Middle East/Africa	3 million	8.8 million
Canada and USA	93.7 million	181.2 million
Latin America	5.6 million	25.3 million

NUA; International Telecommunication Union; Computer Industry Almanac

solutions companies like SAP, IBM, Sun Microsystems and Oracle have developed more user-friendly platforms for supply chain management, customer and product lifecycle management, enterprise portals, and human resource management. New product development software enables companies to analyze their data (so-called "Business Intelligence") better and helps marketing executives improve the quality of their marketing programs and automate how new products are defined, designed, and marketed. While larger Fortune 500 companies use most of these solutions, companies are tailoring these types of solutions for small and medium-sized enterprises (SMEs).

Companies are using a wide array of new and relatively inexpensive information delivery mechanisms that maintain links with customers especially for value-added services and support. New hardware like personal digital assistants (PDAs), mobile phones, and lap top computers strengthen supply chain capabilities especially when coupled with wireless devices. As a result, companies to offer customers advanced services such as real-time diagnosis and repair, remote inventory tracking, and performance-based contracts. Eventually, many companies will use wireless tools to enable customers to purchase goods via PDAs or other mobile devices. Similarly, voice technologies (e.g. automated speech recognition), digital televisions, and so-called "silent" commerce, e.g. the use of micro-processors and tags to monitor equipment, are emerging. One study estimates that almost 30% of surveyed companies will use television commerce over the next three years, and over 50% will undertake "significant wireless commerce opportunities" (Ferguson, Hodo, and O'Mahony 2002).

Companies increasingly benefit from IT outsourcing specialists, like Application Service Providers (ASPs), to handle their complex e-commerce solutions. An ASP generally owns and operates a software application, e.g. supply chain management, as well as the infrastructure to run the application, e.g. central servers. Companies then access the particular application from the ASP over the Internet and are billed for using the application on either a

Box 1 — Korea: Source-To-Pay Solution

In Korea, the electronics manufacturer LG Electronics recently selected the U.S.-based business solutions company Commerce One to build a supplier relationship management system. B2B E-Commerce Provider GTWEB Korea will build and maintain the system, known as a "source-to-pay" solution. LG Electronics engages in $4.9 billion worth of purchasing annually, and the system is expected to reduce purchasing costs by approximately $190 million.

Commerce One

Box 2 — US: Managing Inventory

Home Depot has saved over $20 million per year by providing their floor employees with PDAs to check on and order new inventory. In Japan, NTT DoCoMo has partnered with vending machine manufacturers to build wireless applications into the machines. This has enabled the machines to accept payments from wireless devices and transmit inventory information and maintenance requests automatically.

Boston Consulting Group

per-use or monthly/annual fee basis. Many ASPs also will offer web hosting services integrated with e-mail. Some benefits of ASPs, particularly to SMEs, include eliminating the need to hire IT staff, lowering bandwidth costs and other infrastructure, e.g. routers, and avoiding the expense of buying and upgrading complex business software. Although some ASPs are still struggling with poor security, such as insufficient virus protection and network security, the current economic slowdown could encourage more companies to use well-tested ASPs rather than purchasing and operating their own systems.

- Transactional applications are becoming more widespread in such areas as online payments, e-financing, and credit risk management. Much of this has to do with improved security protocols to support secure online transactions, such as Secure Electronics Transactions (SET), which provides a global standard for encryption and security. Moreover, companies are developing unique identity systems for speech and handwriting recognition, which are still in the experimental phase. Intermediaries also are emerging, e.g. First Virtual Holdings, whereby a customer registers a credit card in a secure mode and receives an ID for transactions. The intermediary then handles all credit card clearance with the merchant once the order has been confirmed by the user.

  So-called smart cards (cards with multifunctional chips that include security features) and virtual cash (also known as e-cash) also are gaining in popularity, especially in Europe, and the widespread use of pre-paid cards (especially for mobile phone use) should stimulate this market in developing countries as well. These initiatives are not localized: firms are looking to start regional and global systems for online, real-time gross settlements.

  New standards for designing and transmitting data over the Internet such as the non-proprietary Extensible Markup Language (XML) are enabling many businesses to conduct business transactions more easily and conduct increasingly sophisticated data queries (www.xml.com).

- Telecommunications infrastructure can support the growth of e-commerce applications. For example, fiber optic networks have produced an enormous amount of high bandwidth capacity worldwide. So-called peer-to-peer networks are eliminating the need for expensive central servers to route Internet traffic. Spatial data systems are emerging that can enable companies to determine the precise location of goods, which will improve logistical capacities. And mobile communications are becoming ubiquitous, enabling the rapid delivery of e-commerce right to the consumer. By 2005, one study estimates, over two billion people will be linked by networked systems of mobile communications, and the volume of machine-machine communication is expected to surpass human-human communications (Gage 2002).

Conclusion

"That which doesn't kill you just makes you stronger." This popular saying is apropos for the e-commerce sector. The turbulence encountered in the wake of the dot.com crash and the resulting skepticism for many e-commerce applications did not result in the death of the sector. On the contrary, companies across the world have learned from their failures and are creating and refining highly sophisticated and cost-effective e-commerce applications to suit their core business needs. As ICTs become ever more widespread, and as the cost of communications continues to drop, e-commerce will become even stronger and more pervasive. The e-commerce sector—and the global economy more generally—will directly involve many more communities and economies, leaving the livelihood of few untouched by its workings.

E-Commerce in Developing Countries

Opportunities and Benefits

E-commerce is transforming economies worldwide, but a lack of reliable data is preventing a clear picture of how businesses are using e-commerce and what benefits (and costs) it is generating. Private sector companies have been gathering data for their internal use, employing many different methodologies, indicators, and reporting approaches. In developing countries, gathering precise data is

even more difficult. However, national statistical offices in developed countries have begun collecting data on e-commerce, and this practice hopefully will carry over to developing countries.

This caveat aside, one can make some generalizations about the benefits of e-commerce to date:

- Companies can use even basic applications such as e-mail to communicate more effectively with their customers and suppliers. Companies can also use more advanced techniques to improve customer service in the post-sales arena, such as web-based frequently-asked questions (FAQs).
- E-commerce can create important economies of scale, particularly by allowing buyers to form virtual consortia and aggregate demand, thereby having more leverage over suppliers.
- Employees can access central databases from any location, increasing operational efficiencies.
- Companies can shorten their traditional supply chains, minimize transport obstacles, and reduce delivery costs. These benefits are particularly pertinent for electronically based or digital goods, though supply chain software is also critical for tangible products.
- Developing country firms can access information about new technologies and practices to improve the quality of their goods.
- Companies can improve their payment processes (settlement and invoicing) through electronic transaction processing.
- Electronic marketplaces and auctions can facilitate the linkage of buyers and sellers and speed procurement between businesses in such areas as making invoices, purchase orders, and payments.
- Companies can reach new and under-served markets without having to rely exclusively on joint ventures, intermediaries, and expensive marketing campaigns. This is particularly important for SMEs, which can reach a large number of users if they develop a functional and easily accessible web site.
- Developing countries can move into new fields such as tele-servicing, thus creating jobs and increasing national revenues. Tele-servicing includes off-shore data input, web development, database creation, and digitizing old documents.
- Consumers can increase their buying power through open electronic marketplaces and web site comparison-shopping.

A Look at the User Community

E-commerce in developing countries has been slow to develop, particularly outside of major metropolitan areas. Some of the primary obstacles to development, which will be discussed in more detail later, include poor access to ICTs and capital, inadequate regulatory frameworks, and low customer awareness about the benefits of e-commerce.

Given the often high start-up and operating costs inherent in e-commerce, larger companies have accounted for most of the online transactions. In Brazil, Mexico, and Argentina, for example, web sites from the 25 largest companies generate more than 90 percent of online revenues. Large "multi-channel" retail companies, as opposed to web-based companies, also are dominating e-commerce retail activity in most regions, with the exception of Latin America.

E-commerce appears to be supporting four broad areas of business: sales and marketing, human resources, logistics, and purchasing. An illustrative table of companies surveyed in South Africa, Russia, and India (figure 2) show the following emphases:

Accenture

Developing countries currently witness the most dramatic e-commerce growth in the following areas:

Tourism

In Latin America, online travel sales are experiencing rapid growth, with most of the early growth driven by regional web-based companies. These web-based companies are the strongest, allowing consumers to review a wide range of ticket options and services and have their tickets and travel vouchers delivered to their homes via conventional postal services. Airlines hesitated to offer high-value web sites, as many have separate buying and booking process, but some, such as Aeromexico, are now using the web to conduct personalized campaigns. In Brazil, a new airline, GOL, is carrying out nearly all of its ticket sales via the company's web site. Because GOL does not need to support an expensive network of

Brazil: Online marketing and reservations

Brazil: Online marketing and reservations

Box 3

Mexico: Global Distribution

In Mexico, a 96-year-old cement manufacturer (Cemex) is using a complex IT system to build a global distribution network and make its internal operations highly efficient. For example, Cemex is using GPS receivers and computers on its trucks to dramatically reduce delivery times while trucking cement and has developed a complex online network to sell its cement to small distributors.

Wired Magazine

Figure 2

E-commerce In Three Countries

Country	Sales and Marketing	Human Resources	Logistics	Purchasing
South Africa	93%	53%	50%	50%
Russia	77%	67%	60%	60%
India	79%	56%	60%	45%

Box 4

Brazil: Internet Sales

Established multi-channel players have made the automotive sector one of the top e-commerce performers in Latin America. In Brazil, large companies like General Motors sell cars directly on the Internet at a discount, which has driven car sales. It is estimated that cars worth $504 million were sold in this fashion in 2001.

Boston Consulting Group

walk-in offices and sales agents, it has been able to capture a significant portion of customers because its ticket prices are nearly 50% less than the other national carriers.

Similarly, Asia has witnessed rapid growth in this area. Internet travel sales tripled from 1999-2000, and major airlines enhanced their online ticketing capacities. Airlines are bypassing travel agents, integrating e-business activities into their main units, developing online booking systems and customer databases, building out call centers to support these online functions, and pushing new applications like short-messaging service (SMS) to contact consumers directly on their mobile phones.

Tourism web portals have struggled to attract foreign tourists and generate revenue for in-country travel agencies and national tourist boards. As a recent study pointed out, travel agents and other intermediaries in developed countries, e.g. Expedia, still control information flows and profits (UNCTAD 2001). National tourist boards and indigenous travel agencies must gear their content and services to demanding international consumers and improve fundamental platforms such as online payment. At least in the short term, tourism businesses and tourist boards in emerging markets should take advantage of credible intermediaries by establishing partnerships with them and using them as effective sales channels. Given the intense competition among intermediaries to capture new market share, it is possible for tourist boards and travel agencies to strike favorable deals with companies such as Orbitz or Expedia.

At the same time, new initiatives are underway to develop effective portals and online marketing. For example, the Australian government has launched a campaign to increase the awareness of online opportunities for tourism in its tourist industry, focused on a web site targeted for its national tourist agencies. The Association of South East Asian Nations has announced plans to develop a portal to provide comprehensive travel and tourism information on its member countries as well as a platform for online transactions.

Also, individual companies are developing online systems geared toward particular constituencies and countries; one well-known company called Kalakbayan Travel Systems (KTS) has developed Lakbay.Net, which provides travel information on the Philippines as well as a reservations and payments system. KTS compliments this system through a dedicated television channel.

Consumer Auctions / Electronic Marketplaces

Latin America has witnessed some of the most rapid growth in this area. Consumer auctions transactions in 2001 were expected to double their 2000 transaction dollar volume, with the auction business dominated by two regional entities as opposed to one in the U.S. (eBay). This has occurred because of the shift from consumer-consumer to business-consumer business, which has generated far higher transaction volumes. Small businesses also have taken part in Latin

Box 5 — Uganda: Electronic Banking

Although Sub-Saharan Africa's financial sector lags behind in e-commerce applications, countries like Uganda have witnessed some highly positive developments. Uganda's banks are using leading-edge technology to reach new consumers and increase online transactions. The National Bank of Uganda is developing a central electronics payments platform for clearing checks and credit cards, as well as ATM interconnection and inter-bank payments. Several of Uganda's banks also are using Local Area Networks (LANs), Wide Area Networks (WANS), and satellites to connect their offices with remote branches. These developments will enable these banks to link directly to international payments systems and enable customers to easily transfer funds from one branch to another.

CARANA Corporation

America. Commissions paid by small businesses support the two major online auction entities.

Overall, it appears that electronic marketplaces in developing countries will be most viable as open information exchanges rather than as transaction-oriented marketplaces. This is due to the fact that transaction marketplaces depend on a high degree of confidence between buyers and sellers concerning issues such as product specifications and on infrastructures capable of handling electronic payment processing and order fulfillment. Instead, so-called "bulletin boards" will likely predominate, whereby sellers display catalogues and other sales information and then conduct offline transactions with interested buyers (Humphrey 2002).

Financial Services

In Asia, the online financial services sector has been a top performer. Companies are taking advantage of the high offline search costs for brokerage-related information and are offering dramatically lower online commissions than offline fees. Financial service providers also expect that, by 2004, 20% of their customers will conduct online transactions such as funds transfer and stock trading. However, adoption will take place on a country-specific fashion – for example, Korea probably has reached its maximum growth point in online brokerage while India is poised for explosive growth.

This picture contrasts dramatically with the U.S. and Europe, for example, where relatively few users actively use online banking services provided by large financial institutions. In the U.S. and Europe, only about 2 percent of the bank's customer base is actively using online banking, making this channel exceedingly expensive to operate.

Tele-servicing

Due to lower labor costs, developing countries are witnessing the rapid growth of off-shore tele-servicing companies. Tele-servicing offers companies a wide range of services, including data processing, back office automation, telemarketing, and customer support. In addition, tele-services can be undertaken either online, focusing on customer-service and often known as "call centers," or offline, focusing on data input and transcription services.

India is probably the best known offshore tele-servicing site, employing some 16,000 people in 2001. Large Indian and multi-national companies like British Airways, American Express, and GE Capital all have established call centers, and multinational players reportedly have achieved costs savings of 50% over call centers in other places. The Philippines is emerging as a strong competitor in this field, spurred on by an encouraging policy and legal environment, e.g. the creation of a cabinet-level information technology and e-commerce council.

Yet the future of tele-servicing is unpredictable. For example, many smaller Indian start-up tele-servicing companies could not generate sufficient operating revenue, meet exacting quality standards, or develop the cultural and linguistic requirements necessary to satisfy Western requirements. Thus, like the Internet and telecom decline, larger companies able to devote extensive resources to training and infrastructure are far more likely to thrive in this sector than smaller ones. For smaller tele-servicing companies, a potentially promising strategy is to partner with a larger company and effectively act as the local point of presence in areas where the small company has extensive experience.

Agriculture

E-commerce applications in agriculture have been slow to take off, particularly in the private sector. In rural areas, infrastructure to support e-commerce is inadequate, in part due to the perception that there is little demand or capacity to pay for telecommunications services outside large urban areas. Moreover, the relatively lower commodity value for agricultural products, especially by small producers, inhibits sustained investment in this sector.

As a result, donor agencies and host country governments have taken the lead in promoting agricultural-based e-commerce applications. In Tanzania, the International Institute for Communication and Development (IICD) has worked to develop the "Business Information Services" (BIS) project. BIS seeks to provide real-time, value-added information to farmers in such areas as prices, optimal harvest times, and availability of farming inputs. This service hopes

to link farmers and buyers directly, enabling farmers to bypass intermediaries.

Similarly, in Jamaica, the Rural Agricultural Development Authority (RADA) is carrying out an ambitious $18 million program to provide farmers and other industry stakeholders with crop production and marketing data. Expected to be operational by 2004, the system looks to enable secure payment transactions between buyers and farmers by establishing registration numbers, a tracking service to monitor crop availability and prices in overseas markets, technical guides for improving production, and an analytical model to help forecast agricultural output and prices. Farmers will rely on extension officers for much of the information, as well as having the chance to receive computer training at their local parishes. These interventions are still in the pilot stage, so it will take several years to determine whether they can make a substantial impact and if these models can be successfully applied elsewhere.

SME Development

Because SMEs make up a substantial portion of the workforce and economic output in developing countries, it is critical that they benefit from appropriate e-commerce applications. In Indonesia, for example, SMEs (here defined as making under $5m in income) comprise an estimated 88 percent of the workforce and produce 39 percent of the country's output (da Costa 2001).

Due to the high costs of connectivity and inadequate telecom infrastructure, most SMEs in developing countries use more basic e-commerce applications, particularly e-mail. As a recent study of SMEs in Asia showed, these companies rely on e-mail to communicate with customers, particularly with customers in overseas markets (Asia Foundation 2002).

Small and medium-sized enterprises also use e-commerce applications, albeit fitfully, to reduce marketing costs and improve business processes. In Ukraine, an estimated 20 percent of SMEs have Internet access and 40 percent of SMEs with Internet access have web sites. These SMEs rely on the Internet to search for business information, e.g. supplier price information and trade-supporting services such as finance, insurance, and transport, and using offline applications for accounting, databases, and word processing. Like SMES in most developing countries, Ukrainian SMEs mainly use the Internet to search for Ukrainian suppliers and equipment, as well as orienting their products to the Ukrainian market (BIZPRO 2001).

Moreover, SMEs geared toward diaspora populations depend on e-commerce to sell items such as crafts and culinary products. For example, a cake delivery company (Tortas Peru) in Peru enables Peruvians living abroad to buy these cakes for their relatives in Peru (www.tortasperu.com). A local cake manufacturer based in Lima teamed up with a large Peruvian non-governmental organization (NGO) specializing in ICT access and a U.S.-based firm comprised of Peruvian expatriates. Customers can order cakes from an online catalogue and pay via credit card or check. The headquarters in Lima then sends orders via email to a housewife who is a member of the company network in one of the seven cities where the cakes are delivered. The housewife members use public access telecenters extensively to receive orders. In turn, cake deliveries are captured by photograph, which are then sent to the overseas Peruvian customer as a confirmation receipt. While similar examples of Diaspora-based e-commerce abound, determining their impact or revenues generated is difficult because the data for this type of activity are primarily anecdotal.

International development organizations also have developed web portals and online catalogs to help SMEs market their goods directly to overseas consumers without having to use expensive

Box 6 — E-Commerce Applications

E-commerce can assist SMEs to reduce the costs of working through intermediaries and aggregate demand by creating "buying consortia." In Haiti, green pepper cooperatives use the Internet to check international exporter prices to determine whether local buyers are giving them a fair price.

www.tortasperu.com

intermediaries. One of the best known examples is the U.S.-based firm PEOPLink, which uses e-commerce to sell arts and crafts on behalf of local artisans (www.peoplink.org). PEOPLink also trains artisans in Internet use, web site development, and in digitizing photos of their products that can be placed in the catalogs themselves. This web portal has been successful in some cases, though its impact on a broad scale is hard to determine due to the lack of comprehensive data.

One of the primary challenges to SMEs in developing countries is handling transaction processes for consumers abroad and at home. Except for the most sophisticated companies, developing effective online transaction processes has been difficult, particularly in terms of payment. In emerging markets, online payment is even more problematic, as reflected in the scarcity of credit-card transactions. For example, less than 10% of SMEs in Thailand, the Philippines, or Indonesia who have web sites are reportedly equipped to handle online transactions (Asia Foundation 2002). Furthermore, many SMEs lack the infrastructure to ensure the reliable shipment of goods.

SMEs in developing countries have several options for handling transactions and order delivery. One is simply to generate orders online and then conduct the transaction and order fulfillment offline. Another is to collaborate with firms that specialize in secure, multi-currency electronic transactions, such as the U.S.-based firms Paypal and WorldPay, and which are setting up operations in developing countries. For

Box 7 Kenya: Web Marketing

The Wikiyo Akala Project (WAP) in Kenya has benefited greatly from the use of innovative electronic payments solutions and web-based marketing. Located in a slum community in Nairobi, WAP works through a non-profit importer and reseller of the sandals, known as Ecosandals.com. WAP and Ecosandals have teamed up with a U.S.-based company called GetAfrica, which acts as a distributor and marketer for the sandals. GetAfrica processes the orders and payments for the sandals, handles all bulk shipments of the sandals geared for North American customers, and maintains a highly user-friendly web site linked directly to Ecosandals.com. These e-commerce applications have enabled WAP to employ almost 30 full-time workers who receive training in English, math, and computer skills.

example, Paypal reportedly has over 16 million clients and three million business accounts, and they have set up operations in countries such as India, the Dominican Republic, and Jamaica. Paypal charges no monthly fees but levies a service charge of about 2.2 percent per transaction. SMEs in developing countries also can partner with distributors in developed countries who handle shipping and the order fulfillment and payments online.

Women-Owned Businesses

Women in developing countries have been much less engaged in e-commerce than men. This imbalance is not surprising as women's use of ICTs in developing countries generally lags far behind that of men (Hafkin and Taggart 2001). However, in some cases, the Internet and other technologies are helping female agriculturalists gain greater market access and information. For example, in Senegal, a women-led community of approximately 60 artisans sells locally-produced arts and crafts via a sophisticated web site, which offers added features such as providing cultural information about the products (www.taftaf.com). Women also are setting up community access centers and large-scale tele-service sites. In Ghana, a female entrepreneur recently established an offline call center run by women computer programmers called AQ Solutions[1].

Conclusion

E-commerce has enabled scores of large and small companies worldwide to dramatically improve their business processes and spin off new businesses and services. In developing countries, this has resulted in impressive gains in a variety of sectors, including finance, tourism, and online retailing. Larger companies are using web-based advertising and sophisticated logistical applications to strengthen their sales functions and operations. Smaller companies that lack the capital to invest in connectivity and web site design are relying on more basic applications such as email, or they are teaming up with distributors and marketers in developed countries to handle more advanced applications. In addition, many developing country governments are playing effective supporting roles in the surge of e-commerce by developing national e-commerce policies web portals and facilitating the creation of business incubators and industrial parks.

These steps are all encouraging, yet they are not enough. The underserved still vastly outnumber those who enjoy the benefits of e-commerce. E-commerce has yet to impact those living in rural and remote areas and to uplift women, youth-at-risk, and the disabled. Development practitioners can help alleviate this imbalance by implementing concrete, actionable, cost-effective interventions. The model that follows seeks to provide a practical road map for implementing such initiatives.

Proposed Model-of-Use for E-Commerce Development

Background

Development practitioners can tap into the transformative power of e-commerce to stimulate economic and social growth. But where does one begin? E-commerce initiatives and applications abound, ranging from strengthening a company's operations to strengthening e-commerce policy to helping SMEs improve their marketing reach.

To begin with, e-commerce interventions should build on (and support) one or more of three primary components:

- A powerful and transparent enabling environment. This includes consistent policy and regulatory frameworks to encourage e-commerce development and a robust infrastructure that enables the rapid and cost-effective flow of goods within and between countries.
- A high level of human capacity development. This includes a workforce with ICT and business management skills, eager for and able to use a wide range of e-commerce applications.
- Effective local delivery systems, including widespread access to reliable, affordable telecommunications and to relevant and dynamic local content.

Together, these three components form a "model" for approaching e-commerce development. Practitioners will likely choose an intervention that that falls within one of the three model

components. However, the success of that particular intervention often will depend on the relative strength or weakness of the other two model components.

This model-of-use first examines the role that each of the model's three components plays in e-commerce development and the challenges and opportunities that developing countries face in optimizing these components. The model then provides a feasibility study that practitioners can use to determine where their countries stand in relation to each of the three components. Finally, this section provides an illustrative and practical intervention in each of the three model components that practitioners can implement to stimulate e-commerce development.

Overview of the Three Model Components

Powerful and Transparent Enabling Environment

A powerful and transparent enabling environment for e-commerce involves both the telecommunications sector as well as key infrastructure issues, e.g. roads, customs, and electricity.

In the telecom sector, e-commerce depends on a consistent, comprehensive, and transparent legal and regulatory framework that effectively addresses online transactions in particular and Internet use more broadly. A detailed discussion of these issues is beyond the scope of this model, but in brief, they include:

- Effective dispute resolution mechanisms: New types of dispute resolutions are needed to handle potentially huge numbers of claims. Ideally, these mechanisms can be made available online.
- Establishing jurisdiction, particularly to assign responsibility in a transaction when the Internet site and legal residence of a company is located in one country and the buyer is located in another.
- Consumer protection: International agreement on common rules for the protection of consumers is needed. The OECD has developed useful guidelines that need to be integrated with other relevant guidelines and implemented on a global level. Among these guidelines are that e-commerce users should have equal rights with consumers who bought offline, including having proper access to the transaction, an opportunity to review a purchase before confirming the order, and having the right to use a secure payment mechanism.
- Privacy and data protection: Polices need to be established to determine corporate responsibilities for withholding private consumer information and penalties for disclosing the information inappropriately.

Taxation of web-based transactions. Developing countries must establish efficient tax collection mechanisms for e-commerce. Many advocate also for neutral tax treatment for e-commerce transactions as opposed to transactions via non-electronic means. Countries also must develop a global consensus on tax principles with a stress on clarity, consistency, and neutrality.

Security and authentication, particularly the authentication of electronic communication, e.g. encryption and electronic signatures. To

Box 8 — Online Transactions

The lack of widespread credit card usage has stunted online transactions in developing countries where cash-on-delivery dominates. As of 2000, for example, cash-on-delivery accounted for 43 percent of transactions in China, 61 percent in India, and 70 percent in the Philippines. Key inhibitors for widespread credit card adoption are the high deposits required and a lack of trust in online payments. Companies are trying to respond to consumers' fears by publishing information about security procedures and payment policies, but it will take years before widespread trust is obtained.

The Boston Consulting Group

the fullest extent possible, developing countries should allow the private sector to experiment with a wide range of technologies and methods to ensure security and authentication. For example, the European Union (EU) is working with local commercial banks and payments processing and technology companies in Bulgaria, Cyprus, Greece and Romania to promote the use of the "BALCARD", a pre-paid card to enable secure cross-border Internet transactions (www.balcard.org).

- Intellectual property rights. Countries are urged to adhere to the World Intellectual Property Organization (WIPO) regulations, which protect digital content.

Ensuring that local e-commerce development initiatives are compatible with broader regional initiatives and frameworks. This issue is particularly salient for countries seeking accession to regional bodies such as the European Union (EU). In these instances, it is important that IT platform and applications for the particular e-commerce intervention be consistent with those used by other regional member countries. Thus, the platform and applications should ideally be as open (non-proprietary) as possible and be compatible with not just single equipment vendors (e.g. Microsoft) but regional ones as well. For this reason, development practitioners are encouraged to engage not just multi-national IT companies (e.g. software developers) but also local ones as well, since these companies may be more technically aware of regional standards issues.

Many of the main inhibiting factors to e-commerce development lie outside specific ICT or e-commerce interventions. Rather, they relate to obstacles confronting the effective transport of

Box 9 — Digital Certification

Several countries, e.g. Cambodia and Peru, recently have established national infrastructures for digital certification. In Peru, the national telecom operator joined Ecuador as the second Latin American country to develop an infrastructure for digital certificates and allow its consumers to use secure applications for e-services. Customers now can digitally sign and encrypt documents that, hopefully, will build trust in electronic transactions. In South Africa, the government has authorized the national post office to serve as the preferred authentication service provider for both public and private use.

International Telecommunication Union

Box 10 — E-Commerce Logistics

Some companies are taking advantage of the difficulties of e-commerce-related logistics by establishing specialized logistics companies of their own. In Haiti, a company called Mail n' More is enabling consumers to buy online and then receive their goods seamlessly. The consumer first opens a P.O. Box in Haiti at Mail n'More's office in the capital of Port au Prince. The consumer also opens a virtual US mailing address at a Mail n'More facility in Miami, Florida. Then the consumer orders the product online and pays with a credit card based on the virtual Miami mailing address. The company ships the product to Mail n' More's facility in Miami, where it is automatically routed via a well-established shipping company, e.g. DHL, to the customer's P.O. Box in Haiti.

goods nationally and internationally. Without addressing these obstacles, businesses cannot send or receive products in a timely or reliable fashion.

One of the most immediate concerns is at the customs level. To enable the efficient flow of goods, countries must strengthen their regional customs posts, reduce corruption, and ensure that their customs declaration procedures and systems are consistent with international best practices.

To improve the situation, the United Nations Conference on Trade and Development (UNCTAD) ASYCUDA Programme has been at the forefront of efforts to help developing countries automate their customs administrations. Recently, a new web-based version of the ASCYUDA system has been developed which will allow for customs authorities to handle most of the customs process via the web (www.asycuda.org).

Human Capacity Development

Human capacity development is also critical for e-commerce, especially in developing countries where a considerable lack of knowledge and awareness at multiple levels thwarts e-commerce efforts. For example, national governments have been slow to adopt, much less implement, national e-commerce policies or e-procurement programs. Also, companies have received scant training in Internet-based business models or in ICT-use, and thus few businesses perceive the benefits of participating in e-commerce. Among Ukrainian SMEs, for example, most Internet non-users are unaware of other SMEs in their sphere who use the Internet (BIZPRO 2001). In addition, few universities and vocational institutes offer relevant ICT and e-commerce courses. This lacunae, along with relatively low literacy rates and, therefore, the lack of localized content, also inhibits widespread adoption of e-commerce.

The lack of human capacity building in ICT and business management particularly affects women. Insufficient access to training in ICTs, math, and science, coupled with poor credit access and time-consuming responsibilities related to childcare and household chores, are just a few of the major inhibitors to women's participation in e-commerce.

There are many ways to build capacity amongst businesses who seek to use e-commerce techniques, such as training programs. E-commerce training programs can be offered in a variety of formats, including classroom-based programs, radio programs, CD-ROM and other self-managed learning sessions, mentorships, etc. For smaller businesses, training programs should cover at least the following topics:

- Opportunities and costs of integrating e-commerce techniques;
- Where and how to integrate the e-commerce technique within the company's business process;
- Appropriate types of technologies and applications;
- How best to monitor and evaluate the impact of the e-commerce intervention; and
- Developing an action plan for integrating the e-commerce application (Payne, 2002).

A wealth of training material already exists for e-commerce development that can be customized and adapted for new uses. Please refer to Appendix 1 for a list of references that can help businesses and development practitioners implement e-commerce training programs.

Effective Local Delivery Systems

The lack of affordable and reliable telecommunications access, particularly to the Internet, is a crucial obstacle to e-commerce development. In many developing countries, Internet access costs can represent 120-150 percent of monthly GDP per capita. Though their price is dropping, personal computers also are priced too high for most markets. As a result, Internet use is largely concentrated in developed countries.

The lack of telecom access is particularly acute in sub-Saharan Africa. Although basic telecommunications infrastructure is improving, Internet usage is still almost non-existent – a recent report estimates one Internet user for every 200 people in Africa compared to a world average of one user for every 15 people.

In many developing countries, especially those with a monopoly state telecom provider and lack of reliable supporting infrastructure, e.g. electricity, widespread telecom access will continue to problematic. High interconnection

rates between providers (which get passed to consumers), restricted spectrum allocation regimes, and time-metered calling charges as opposed to flat-rate ISP pricing and affordable leased lines restrict telecom access largely to major metropolitan areas. The scarcity of independent, well-trained telecom regulators committed to liberalization, competition, universal access policies, and new technologies, e.g. Voice Over Internet Protocol (VOIP, also commonly referred to as Internet telephony) will not end this problem anytime soon.

However, if a country's telecom sector liberalizes, ample potential for widespread access exists. Newer technologies can lower connectivity costs dramatically. Wireless Internet technologies, for example, can enable users to bypass a country's antiquated telecom exchanges and reduce costs. A line-of-sight, spread spectrum, wireless Internet link can cost around $1,500 for installation plus $250 in recurrent costs. This is roughly equal to the cost a consumer would pay to a local telecom provider, and the consumer would enjoy exponentially higher reliability and speed. Very Small Aperture Terminal (VSAT) satellite technology can also reduce connectivity costs, especially in rural areas and particularly if users can aggregate demand and reduce charges through ISP callbacks and toll-free numbers (Hawkins 2002, Best and Maclay 2002).

Practitioners can also promote e-commerce development by introducing bold initiatives to spur PC use. Korea, for example, created a subsidy program that enabled one million households to buy desktop PCs for under $900. Another method is to promote the use of cost-effective hardware and software solutions. The Simputer is one such promising device. Developed in India in 2001, the Simputer is a portable, hand-held, Linux-based computer that operates without a keyboard but instead uses sound, touch, and icons. The Simputer translates English-language web sites into local languages and enables illiterate users to listen to this content via a paid smart card. Designed to be owned by associations or cooperatives, the Simputer's developers now are trying to obtain new revenue streams by targeting the e-government, health care, and education sectors, among others.

Finally, practitioners can promote e-commerce by encouraging the establishment of cost-effective, public access ICT facilities. Telecenters, in

Box 11 Telecenters In Bulgaria

The Academy for Educational Development (AED) recently established a network of 10 entrepreneur-operated telecenters in Bulgaria. These telecenters, which are located in small towns, offer a wide range of affordable, fee-for-use services to SMEs, NGOs, and government agencies. These services include web design, training, content creation, and basic telecom services.

Academy for Educational Development

particular, can provide a wide range of ICT services and access, including Internet, fax, photocopying, basic telephony (including Internet telephony), and word processing. Some telecenters also provide more advanced services, such as business training and legal advice for SMEs. SMEs can receive basic training in computer literacy and Internet use first, setting up an e-mail account and learning word processing and business management applications. With this exposure, employees then can begin to use the Internet for product research, develop company web sites, etc.

Even basic types of telecenters, or public kiosks, can be helpful in spreading e-commerce. In Brazil, an electronics and home appliances company set up small Internet kiosks operated by one clerk in underserved areas. Apparently, opening these kiosks has allowed the retailer to expand to 25 additional locations and boosted sales (Boston Consulting Group 2001).

Feasibility Study

To effectively evaluate the potential impact of an e-commerce intervention in one of the three components, it is important first to conduct a feasibility study. The feasibility study should cover each of the three components and be able to ascertain the following:

Category 1: The Enabling Environment

Illustrative criteria include:

Policy and Regulatory Issues

- Presence of a comprehensive and practical national e-commerce and IT/telecommunications policy
- Clear and consistent taxation of e-commerce transactions
- Licensing, permit, and registration procedures for SMEs
- Tax incentives for ICT business equipment and training
- Favorable tariffs and duties for imports, e.g. of computers
- Legislation pertaining to intellectual property, privacy, consumer protection, digital certification, remote secure transactions, and computer crime
- Legislation on electronic payments and transfers
- Existence of uniform commercial codes

Transport and Customs Issues

- Quality of roads, utilities, postal system, electricity grid, etc.
- Effectiveness of import/export clearance systems, e.g. level of corruption, decentralization of customs posts to ensure timely delivery of goods, compliance with regulations and procedures of other countries

Category 2: Human Capacity Development

Illustrative criteria include:

- Number of universities, vocational institutes, and polytechnics offering courses in ICT and business management
- Presence of ICT-based companies that offer certifications and training.
- Number of schools and universities with reliable Internet access
- Level of outward migration of skilled workers
- Quality and pervasiveness of online and computer-mediated curriculum (in e-commerce and general curriculum)
- Presence of e-commerce training programs particularly for SMEs
- Number of English speakers
- Literacy levels
- Number of business associations and their level of awareness concerning e-commerce
- Number of local IT-related firms, particularly focusing on higher value services, e.g. software application development, systems integration, web design and hosting, and manufacturing
- Number of Internet users (residential and commercial)

Category 3: Delivery Mechanisms

Illustrative criteria include:

- Teledensity (urban and rural) for fixed and mobile telephony
- Level of competition and liberalization in the telecom sector
- Presence of an independent telecom regulator
- Cost of voice and data access relative to annual per capita income
- Effectiveness of universal access programs
- Ability of telecom infrastructure to support high bandwidth applications, e.g. digital switching infrastructure, presence of fiber optic backbones and high-speed wireless networks, number of international gateways

- Number and viability of ISPs
- Presence of Application Service Providers (ASPs)
- Presence of industrial parks and business incubators
- Number and distribution of Internet cafes and telecenters
- Presence of online company databases
- Presence of industry portals
- Presence and relevance of local content-based web sites

Fortunately, a large number of assessments have been conducted by international development organizations that can assist the practitioner with his or her evaluation. For example, the World Bank's Information for Development Program (infoDev) has compiled a helpful representative list of e-readiness assessments and assessment methodologies (www.infodev.org/ereadiness/methodology.htm).

Once the basic assessment is completed, the evaluator can assign a "point-score" valuation to determine where to apply specific interventions. This valuation also will help the practitioner understand how the intervention will support and possibly augment another one of the components. Similarly, the valuation may help the practitioner better understand if or how the relative weakness of one component will negatively affect an intervention in another component.

Illustrative Interventions

The following section presents several different types of illustrative e-commerce interventions in each of the three model components:

Category 1: Improving the Enabling Environment

Illustrative Intervention: Strengthening the Customs System

Outdated and inefficient customs systems and poor linkages between various customs systems hamper companies' abilities to use e-commerce applications effectively. One crucial intervention, therefore, is to align customs processes with global best practices. This intervention also is critical for host country governments, who often rely heavily on taxes and duties on goods both imported into the host country and used as a trans-shipment point.

Many customs systems are beset with multiple problems:

- Over-centralization at one collecting point, usually in the capital city. As a result, all goods directed to other destinations first must be cleared in the capital city, which results in delivery delays, spoilage (if the goods are perishable), etc.
- Little coordination between countries' customs systems, resulting in widely divergent documentation requirements and poor harmonization regarding customs procedures
- A low level of skills amongst customs officials, particularly in modern management and ICT
- A lack of a centralized and up-to-date computerized customs tracking and clearing system
- A lack of transparency and corruption, spurred on by poor pay and a lack of transparency in regulations
- A lack of a unified and computerized financial management and revenue accounting system that links customs offices at border posts with the central customs office
- Little if any access to an automatic and constantly updated catalog of dutiable goods and tax rates

This intervention proposes to decentralize the customs system by strengthening regional customs posts and telecom linkages between customs posts. The secondary goal is to improve the skills and morale of customs officials. All activities must take place in close collaboration with senior customs commission officials and other key public and private sector stakeholders.

Implementation

Three essential activities should be undertaken for this initiative:

1. Assessment and Strategic Planning
2. Experimental Demonstration Projects
3. Developing a Comprehensive Reform Plan

Step 1: Assessment and Strategic Planning

Before undertaking a massive reform effort in an area as complex as customs, the current (or existing) system should be assessed first. To the extent possible, the assessment should identify the following:

- Which customs agencies are delaying customs clearance and contributing to communications breakdowns
- Nature, level, and location of corruption
- Level of ICT use and quality of data flows between customs posts
- Senior level officials willing and able to influence change
- Quality of infrastructure

Step 2: Experimental Demonstration Projects
Reforming and decentralizing customs processes rely on multiple interventions, e.g. strengthening basic communications infrastructure, changing policies and management practices, and improving technical skills. For this reason, it is recommended that 1-2 pilot activities be launched to test the feasibility of strategies. The national customs commission could then use the results from the strategies to develop a nationwide plan for decentralization.

The demonstration projects should focus on:

- Deploying appropriate ICTs, including wireless communications, up-to-date goods tracking software, and servers
- Introducing new management, accounting, and data collection techniques
- Educating targeted beneficiaries, e.g. truck drivers, about the operation of the system
- Training and capacity building
- Linking the customs processing activities, via computer systems, between the pilot sites and national customs office and with shipping and export agencies
- Developing agreements with the Customs Commission for making counterpart contributions
- Monitoring costs of installing and operating new communications systems
- Conducting follow-up interviews with targeted beneficiaries to determine project effectiveness

Step 3: Developing a Comprehensive Reform Plan
The results of the strategic plan and pilot tests would guide the design and implementation of a comprehensive reform plan nationwide. To ensure buy-in of the system, the plan should be developed in close coordination with senior customs officials, and the main costs should be met with funding from the host country government.

Category 2: Human Capacity Development Illustrative Intervention: Increase Regional and National E-commerce Awareness and Skills Through Business Association Training

Background

The lack of a skilled ICT user base, as well as a lack of education and awareness about the benefits of e-commerce, is particularly problematic for SMEs in developing countries. This lack of IT awareness and skills can be resolved on two levels. The first is through the creation of strong local advocacy and promotion bodies. Asia has been a leading player in this effort, particularly in Australia through the National Office for the Information Economy, which provides extensive seminars, conferences, and a support network for online businesses. Singapore's government has established a $1 billion venture capital fund to invest in start-ups and has promoted widespread Internet use by wiring all schools and providing subsidy packages to stimulate broadband providers.

Second, companies must receive training in the following key areas:

- Basic ICT skills: this includes spreadsheet management, Internet and basic e-mail, and word processing
- Familiarity with English: until sufficient local content is created, familiarity with English will be important, particularly if a user wants to conduct a search on a foreign Internet site
- Programs to publicize the benefits and challenges of e-commerce, designed particularly to illustrate for entrepreneurs ways in which the Internet can help companies reduce costs and increase efficiency

This intervention proposes to heighten e-commerce awareness and skills through targeted training at the national and regional business association level. Associations should be selected, first, because they can more easily aggregate companies, as opposed to selecting individual companies from the outset.

This intervention includes three main association strengthening activities:

- Pre-planning Assessment
- Pilot Projects
- Replication

Step 1: Pre-planning Assessment and Development of Performance Indicators.

To ensure that cost-effective awareness and promotion activities are implemented, an assessment should be conducted that covers the following:

- Identification of key sectors: Practitioners should focus their e-commerce awareness campaigns on associations belonging to the most relevant and high-value sectors. For example, many developing countries enjoy a competitive advantage in tourism and agribusiness. For these countries, it is recommended that e-commerce campaigns focus on national tourism boards or commodity export associations;
- A baseline analysis of the targeted associations' members: the analysis should cover e-commerce awareness and organizational capacity level, e.g. ability in providing membership services, advocacy, and information dissemination;
- Identification of related association strengthening programs to avoid duplication and, if possible, to combine with this training and awareness program;
- Availability of public access telecenters and/or business incubators that can deliver lower cost e-commerce support services to association members once training is completed;
- Availability of industry-specific and inexpensive training programs, especially on CD-ROM, in basic ICT and e-commerce applications;
- Meetings with relevant labor unions about costs and benefits of e-commerce (if applicable) and follow-up agreements covering issues such as job placement for workers displaced by automation, compensation packages for employees who increase their skills through e-commerce training, etc; and
- Collaborative agreements signed between the practitioner and association whereby in-kind contributions, training timetables, and performance expectations are clearly identified.

Practitioners should also develop a clear set of performance indicators to analyze the impact of the training and content-creation programs. These indicators need to be linked closely to the baseline analysis and should include the average costs and revenues of each association member, number of clients, etc.

Step 2: Pilot Project: Stage 1: Selection of Trainees and Training Design.

At most, one or two national associations should be targeted in the pilot phase. The pilot project should first involve a focused training program in the following areas:

- ICT skills (e.g. spreadsheets, word processing, email applications)
- Business planning and operational management
- Web design
- Web-based marketing and online transactions
- Awareness about outsourcing possibilities, e.g. ASPs, IT consulting companies, and their benefits
- Information sharing with members
- Follow-up training at telecenters, polytechnics, universities, etc., as needed

In designing the training program for business associations, it is important to structure the curriculum around several fundamental guidelines.

E-commerce applications should be demand-driven. Businesses should develop a thorough understanding of their markets and customers' needs before buying or developing B2C e-commerce applications. Companies that have successfully used e-commerce generally have adhered to the following guidelines:

- Focusing on best customers, particularly those who are most recent users, who use the site most frequently, and who spend the most. Successful companies also have used targeted online marketing (or personalization) campaigns to great effect. This includes using applications to maintain current profiles of their customers and send them promotions tied to their needs and value. This ranges from online book sellers proactively sending out recommended book titles to calling or emailing priority customers to ensure that orders arrived. For SMEs in developing countries, this type of promotional work can be done offline, e.g. keeping an updated Excel database of priority customers, etc.
- Ensuring sufficient customer service support for the company's online activities. Unfortunately, many companies have not grasped this message. For example, one survey found that roughly 25% of web sites in Latin America do not have a customer service phone number.

- Creating specific messages geared to customers and clearly presenting product prices, taxes and other costs, and accessibility. Users need to be able to locate and access the web site despite low connectivity speeds. Thus, all business web sites should have minimal graphics and critical key words embedded in their code (to attract search engines), be easy to understand, be updated regularly, and, if possible, offer personalized services.
- SMEs that wish to sell or advertise goods online locally need to understand their customers' literacy levels and readership rates, ability to access the Internet and other ICTs, level of disposable incomes, comfort with online as opposed to personal negotiation, etc. SMEs wishing to export goods overseas need to be certain that their product is appropriately tailored to overseas demand, complies with the standards and regulations of the overseas market, and is priced to accommodate shipping and insurance costs, etc.

Integrate e-commerce applications within core competencies. Companies should not try to develop new product lines and business models just to introduce new e-commerce applications. Successful companies have used e-commerce applications instead to add depth to their core product or service lines by adding content services oriented toward the same type of customers identified in their original business model. These companies have carefully evaluated how each e-commerce initiative has augmented specific business processes and have developed concrete and measurable objectives to determine the real value of each initiative.

For example, a company that wishes to implement an e-procurement initiative assesses the extent to which the application has generated direct reductions in materials costs and purchasing. Similarly, a company using an application to develop a new product must track how quickly the company brought the new product to the market. If the application does not meet these measurable objectives set out in the original vision statement, then it is eliminated.

Outsource applications whenever possible. Few companies have the capacity to develop e-commerce solutions or to maintain them in-house. Therefore, these companies should outsource their complex applications. In many developing countries, local ICT specialty firms are now available to handle these applications, as are multi-national vendors of business software solutions. Thus, practitioners are urged to consider the promotion of application service providers

Box 12 — Online Grocery Sales

Many food companies in Latin America have begun to use the Internet to sell groceries online. This is particularly the case in Argentina and Brazil, where grocery delivery is already an established practice. By the end of 2001, Latin American online grocery sales were expected to reach $79 million, an amount comparable to the United States.

The Boston Consulting Group

Box 13 — Ordering Products Online

Several countries are experimenting with extremely useful applications of traditional and non-traditional business practices. In Japan, the international company 7-11 serves as the intermediary between the consumer and the seller. For example, the consumer will order the product online, and the company will send the product to the consumer's local 7-11 branch. The consumer then pays for the product at the 7-11 and picks it up.

(ASPs), support to local ICT consulting and integration firms, etc.

Effective e-commerce requires an effective organization. If a company has serious management and organization problems, then the best e-commerce applications in the world will not help. Traditional companies generally need to be ready and willing to break down vertical, hierarchical patterns of communications and authority to fully realize the benefits of e-commerce.

Companies should use e-commerce applications, therefore, to strengthen their own management and operational capabilities before trying more advanced services and applications. This is particularly the case for SMEs, whose profits are largely dependent on the cost of their inputs and who need to track their supplies effectively. For example, many small companies have limited digital inventories and rely mainly on paper-based records, thus losing the ability to track real-time inventory. Reliable and affordable software is now available to enable companies to automate important processes, or at least make them more efficient, and companies should focus on this before attempting complex online transaction services.

Companies also need to closely examine their organizational structures and information flows to determine whether it is feasible to use an e-commerce application. Before using wireless technologies, for example, a company should assess the extent to which it has employees who travel, remote goods and equipment, and data that needs to be updated and transmitted quickly. It may be far more advantageous to focus on basic e-commerce transactions first, such as e-mail and customer-oriented platforms.

Ensure that the basic infrastructure is suitable to support e-commerce applications. Companies should approach complex applications cautiously. For smaller companies in particular, insufficient operating infrastructure precludes developing and administering high-level applications, which requires large and specialized staff, more complex payroll systems, and the like. Instead, companies in emerging markets should focus on more basic and easily measurable applications that match their operating capacity, such as looking for investors and suppliers on the web, maintaining a database of customers, and focusing their efforts first on selling products and services that other local and regional enterprises need.

If local companies are going to integrate applications such as inventory and/or customer relationship management, they will also need to ensure that the applications are compatible with the platforms and protocols used by their buyers and suppliers. This is particularly salient for overseas buyer and suppliers, who often use disparate hardware platforms, operating systems, etc. The use of open non-proprietary protocols and standards helps both parties track and update information at the same time and reduces the possibility of miscommunications. For example, EAN International and the Uniform Code Council have developed a set of global open standards based on Unified Modeling Language (UML) to enable companies with different supply chain management systems to effectively communicate with each other (www.ean-int.org).

Step 3: Pilot Project: Stage 2

The second stage of the pilot project should focus on developing value-added content, which should include:

- An industry-specific web portal to establish links between consumers and international suppliers;
- Publication of online business directories and other key databases. An Association's membership can publish detailed product specifications and other information, such as guidance of use. The business directory can be integrated within the overall industry portal and disseminated as a stand-alone product.

It is recommended that six months after the completion of the training and content-creation program, an impact analysis of the program be conducted. The analysis should be completed before additional associations are selected for the program.

It is also recommended that practitioners encourage these associations to share their knowledge of e-commerce with national-level entities engaged in e-commerce development. For example, governments who have created or are

establishing national e-business forums comprised of the private and public sector. These forums focus on practical applications such as electronic payment, privacy issues, and commercial codes.

Category 3: Effective Local Delivery Mechanisms: Increase SMEs' Access to Market Information through Mobile Telephony Applications

Background

In their rush to achieve competitive advantage, many companies purchased expensive "bleeding-edge" technology. Yet advanced Internet-based e-commerce applications may not be appropriate, particularly in areas where connectivity costs are high and connectivity itself is unreliable. In many such places, mobile telephony is more accessible than PCs, is quickly displacing fixed-line telephony, and is becoming increasingly important for business. In Bangladesh, for example, it is estimated that half of all phone calls involved economic purposes, e.g. commodity market prices. Global System Mobile (GSM)-based systems can receive data at up to 9.6kbs, which is ample for simple e-mail messages. This type of platform, as well as SMS (short messaging service), also known as "text messaging", can enable the rapid flow of market-based information, and practitioners are urged to explore this type of technology.

In 2001, the CARANA Corporation conducted an ambitious project to deliver a wireless market information service (WMIS) for Uganda's fishing industry. A pilot system was created in collaboration with one of Uganda's main mobile telephone providers (MTN-Uganda) whereby Nile Perch price information was transmitted on a regular basis to "fisherfolk" and processors via SMS. MTN received daily content on Nile Perch prices from a content provider and placed this information on a dedicated WMIS channel on its SMS platform. Using the dedicated SMS channel, users then would send SMS queries using standard keywords and receive the real-time fish price information.

The project sought to explore whether SMS could enhance economic growth in the following ways:

- Whether producers could make better decisions about where to sell their goods
- Whether the relationship between offering better quality and getting higher prices could be reinforced, providing an incentive to producers to implement improved production practices
- Whether individuals or associations with mobile access could use the future income stream from re-selling access as collateral for obtaining credit
- Whether buyers could reach producers through SMS with specifications and quality requirements for which they would be willing to offer higher prices
- Whether national-level associations could use this information to widen their networks and develop mechanisms for collecting and obtaining real-time market information
- Whether there is a demonstrable advantage over radio programs that offer one-way price information

The project was supported by the USAID-funded COMPETE project, which was designed to strengthen Uganda's exporting competitiveness in the coffee, cotton, and fisheries sectors. What follows is an extrapolation of lessons learned from this project.

Step 1: Feasibility assessment

Prior to launching this type of initiative, it is important to ascertain the following:

- Level of demand by small producers/fisherfolk for affordable, real-time market access, particularly price information
- Extent to which the mobile phone industry is sufficiently competitive and growth-oriented to leverage providers to support development applications. For example, the practitioner should determine whether mobile providers would be willing to offer promotional campaigns to stimulate SMS demand in return for expanding their market share.
- Whether the mobile providers already have been working with micro-finance institutions (MFIs) to expand telephony to rural areas
- Whether end-users of this service can resell mobile services at a profit, thereby generating extra revenue stream and ensuring sustainability

If it appears that these fundamental conditions are in place, then a three-step pilot project approach may be feasible:

Information needs assessments/demand survey. At a minimum, the information needs survey should identify the following:

- The demand for market information in the particular sector
- The prior use of mobile telephony and SMS in the target regions
- The key type of information to be gathered
- Priority languages
- Optimal times of delivery

The results of this survey should be disseminated to the mobile telephone providers and other key stakeholders, e.g. the relevant national association and MFIs, to gain their support.

Step 2: Design a pilot template

During this phase, the following steps should take place:

- Hire a content provider. The content provider will gather the price information that will be delivered through the mobile telephone company's SMS platform. A key component is the recruitment, training, and management of local price information collectors. It is recommended that the content provider be formed as a partnership between a well-established local survey firm and an ICT firm specializing in SMS applications.
- Select the sites for the price information network, set data collection and dissemination schedules, and develop mechanisms to monitor the collectors' effectiveness. At a minimum, the price information should include both seller and processor prices, as well as national prices.
- Develop a user manual that covers SMS abbreviations, how to access the SMS channel, etc.
- Negotiate agreements with mobile phone companies and MFIs
- Negotiate agreements with sector associations. These associations would be responsible for providing price and market information, working with local producers to help market WMIS, monitoring compliance with data quality standards, etc.
- Develop indicators and pilot benchmarks for both the producers and the mobile providers
- Develop a monitoring and evaluation plan

Step 3: Launch of the pilot

During this phase, the following steps should take place:

- Develop a price information service and ensure reliability of content delivery and dissemination via the SMS platform to trial users
- Market WMIS through aggressive promotional campaign
- Sign up subscribers
- Sell and distribute cell phones and service
- Provide micro-loans to eligible subscribers in target communities
- Conduct an impact assessment

To promote this application properly, a few fundamental conditions must be met:

- The basic mobile telephone network is operational at the collection sites.
- More than one mobile provider has SMS capability and that subscribers from different mobile providers can communicate with each other. This will better leverage competition and increase the scale of the information flow.
- Product-specific promotional campaigns are implemented, particularly at the beginning of the project. This should include national radio programs.
- The data is updated.

Following the pilot, an evaluation should be conducted to determine whether the pilot has made a significant impact in delivering market prices and whether the private sector (particularly the mobile telecom provider) has benefited from the application. The evaluation should cover topics such as access and usage of the service, number of new subscribers, and users' perceptions of the economic gains based on WMIS. This evaluation will assist the practitioner and the private sector to determine whether or not to replicate the intervention elsewhere.

Conclusion

This model presents three distinct types of interventions that can stimulate e-commerce development. Each of the interventions supports

an important component of e-commerce development – strengthening the enabling environment, building capacity, and building off of and promoting effective local delivery systems.

These interventions are mutually reinforcing but can be done independently from one another. And yet these interventions have several critical points in common. First, they should involve detailed feasibility assessments and pilot projects at the outset, as well as monitoring and evaluation during and after the project. Practitioners can therefore obtain crucial support from the public and private sector and learn from the initial mistakes before implementing a more comprehensive project. Second, practitioners should involve the private sector to the fullest extent possible. As demonstrated in the mobile telephony project, it is important to leverage competition amongst businesses and telecom providers for the benefit of underserved communities. Firms should see that delivering appropriate e-commerce applications to the underserved is a valuable opportunity to gain market share, positive publicity, and to test the viability of cost-effective applications and delivery systems. As the global economy forces firms to become ever more competitive, the possibilities for leveraging private sector-led support should only increase.

Looking Forward

E-commerce promises to fundamentally transform the way companies do business. Some of these transformations are going to be wrenching, like the introduction of any new technology, e.g. the automobile, steam engine, e-commerce will dramatically displace traditional business relationships, particularly in non-e-literate businesses or relatively fragile economies. For example, increased information and competition may reduce profit margins for some companies and enable middlemen to gain power if they become computer-literate. E-markets can create cartels as well by enabling suppliers to share their data more easily, particularly in countries that lack strong or transparent business codes. And as rapid automation is deployed, companies will displace some workers while those trained in e-commerce will exercise a high degree of mobility.

These concerns notwithstanding, e-commerce applications also will deliver tremendous benefits to large and small companies alike in developing countries. These applications will enable companies to locate new customers, spin off new businesses, develop and refine products, and improve logistics and procurement processes.

Given the power of e-commerce applications to transform companies and processes, it is likely that several trends will emerge:

- The line between traditional business practices and ones enabled through e-commerce will blur together for many companies, whereby e-commerce will likely become the primary platform for most business activities.
- The distinction between "e-government" and "e-business" will begin to fade, particularly as governments continue to move to electronic procurement and automated administrative systems and as governments ally with large and small companies in areas such as procurement and logistics.
- E-commerce applications will permeate traditionally non-business sectors; e.g. a local health clinic will be able to use ICTs to improve its procurement system, better monitor patients, etc.

This model suggests that practitioners can facilitate the development and capture the benefits of e-commerce at multiple levels – ranging from a policy and regulatory initiative, to a human capacity development program, to an innovative way to deploy technologies and existing applications for an e-commerce application. Practitioners need not address all three of these components simultaneously, but they do need to be aware of the interplay between the three components when designing an initiative.

The model also suggests that in many ways the private sector is taking the lead on developing and implementing effective e-commerce approaches and applications. Perhaps development practitioners can make the most significant impact by creating effective incentives for private sector partners to collaborate and apply e-commerce applications for the under-served. These incentives could include:

- Competitive grants programs to stimulate innovative uses of e-commerce solutions among NGOs and SMEs;
- Enabling telecommunications providers to meet government universal service mandates by facilitating e-commerce initiatives; Encouraging government departments to promote open standards such as XML by establishing centralized e-procurement registries based on XML;
- Providing tax breaks, favorable publicity and other incentives for companies who provide appropriate e-commerce-based applications, technologies, and capacity building training programs to under-served businesses and constituencies e.g. women, youth-at-risk, etc; and
- Fostering government procurement opportunities for SMEs, particularly women-owned businesses.

By promoting demand-driven and scalable types of initiatives, and by rigorously analyzing and tapping into innovative and cost-effective private sector-led approaches, practitioners have a tremendous opportunity to tap the power of e-commerce and make an important and far-reaching contribution to their constituencies.

Appendix

Documents to Help Prepare for e-Commerce Training Initiatives

The resources below include some sample training materials for SME's as well as reference material on the topic of SME's and electronic commerce:

Annual Report, Information for Development Program, Global Information and Technologies Department, The World Bank, Washington, DC, USA, 2001. Includes a helpful and thorough overview of e-readiness assessments of developing countries; describes different approaches to assessments; references to sources of assessments.

Asia Foundation, SMEs and E-Commerce, 2002. (E-commerce in Thailand) http://www.asiafoundation.org/pdf/SME-e-commerce1-thailand.pdf

Benchmarking National and Regional E-Business Policies for SMEs, Final Report of the "E-business Policy Group, Enterprise Directorate General, European Commission, Brussels, June 2002. Provides numerous examples (and best practices) from Europe of government sponsored SME e-business training and awareness initiatives.http://europa.eu.int/comm/enterprise/ict/policy/benchmarking/final-report.pdf

CastleAsia, SMEs and E-Commerce, Prepared for the Asia Foundation, January 2002. http://www.asiafoundation.org/pdf/ID-SME-ecommerce-study-6-02.pdf (E-Commerce in Indonesia)

Claessens, Stijn, T. Glaessner, and **D. Klingebiel,** E-Finance in Emerging Markets: Is Leapfrogging Possible, Financial Sector Discussion Paper No. 7, The World Bank, June 2001.

Creating a Development Dynamic, Final Report of the Digital Opportunity Initiative, Sponsored by a public-private partnership of Accenture, Markle Foundation, UNDP, July 2001.

Curry, James, O. Contreras, and **M. Kenney,** The Internet and E-commerce Development in Mexico, BRIE Working Paper 144, Berkeley Roundtable on the International Economy (BRIE), Berkeley, California, January 2002. http://brie.berkeley.edu/~briewww/pubs/wp/wp144.pdf Thorough and excellent analysis of electronic commerce.

da Costa, Eduardo, Global E-Commerce Strategies for Small Businesses, The MIT Press, Cambridge, MA, USA, 2001. Provides plenty of statistics (and sources thereof) regarding use of e-commerce. Focuses on challenges and opportunities of international e-commerce.

Duncombe, Richard and **R. Heeks,** Enterprise Development and Information and Communication Technologies in Developing Countries: Supporting "ICT-Flyers", IDPM, University of Manchester, Manchester, UK, 2001. http://idpm.man.ac.uk/idpm/ictflyer.html

E-Commerce: Accelerator for Development, IDC Policy Brief Issue 14, Institute for Development Studies, University of Sussex, Brighton, UK, September 2001. http://www.ids.ac.uk/ids/bookshop/briefs/brief14.html

The Economic and Social Impact of Electronic Commerce, Preliminary Findings and Research Agenda, Organisation for Economic Co-operation and Development, Paris, 1999. http://oecdpublications.gfi-nb.com/cgi-bin/OECDBookShop.storefront/EN/catalog/BO-1-13-xx

E-Commerce at the Grass Roots, Implications of a Wired Citizenry in Developing Nations, prepared for the National Intelligence Council, Booz-Allen & Hamilton, Virginia, 2000.

Electronic Commerce: Small Business Participation in Selected On-line Procurement Programs, Report to the Ranking Minority Member, Committee on Small Business and Entrepreneurship, US Senate, US Government Accounting Office, Washington, DC, October 2001.

Enos, Lori, "What Small Biz Gets from the Web," E-Commerce Times, September 21, 2001. http://www.ecommercetimes.com/perl/story/13551.html

Greenfield, Paul and **J. Colton,** APEC e-Business: What Do Users Need? Prepared for the Australian National Office for the Information Economy, Version 1.0, Canberra, Australia, September 2001. http://www.noie.gov.au/Projects/international/APEC/CSIRO_report/exec_sum.htm

Heeks, Richard and **R. Duncombe,** Information Technology and Small Enterprise, A Handbook for Enterprise Support Agencies in Developing Countries, Version 1, IDPM, University of Manchester, UK, 2001. http://idpm.man.ac.uk/idpm/esahbk.htm

Hafkin, Nancy and **N. Taggart,** Gender, Information Technology, and Developing Countries: An Analytic Study, for USAID Office of Women in Development, June 2001. http://www.usaid.gov/wid/pubs/it01.htm

Heeks, Richard and **R. Duncombe,** Information Technology and Communication Technology, A Handbook for Entrepreneurs in Developing Countries, Version 1, IDPM, University of Manchester, UK, 2001. http://idpm.man.ac.uk/idpm/enthbk.pdf Example of good, basic handbook for SMEs in developing countries with tailoring to fit the level of technology each business already uses.

Heeks, Richard and **R. Duncombe,** Information Technology and Small Enterprise and Small Enterprise in Africa, Lessons from Botswana, Summary Final Report, IDPM, University of Manchester, UK, January 2001. http://idpm.man.ac.uk/idpm/ictsmesfr.pdf

Appendix *continued*

Helping SMES to "Go Digital," Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Commission of the European Communities, Brussels, Belgium, 13.3.2002, COM (2001) 136 final. Available in electronic form at http://europa.eu.int/eur-lex/en/com/cnc/2001/com2001_0136en01.pdf

Hilbert, Martin R., Latin America on its Path into the Digital Age: Where are We? Division of Production, Productivity and Management of the Economic Commission for Latin America and the Caribbean of the United Nations, ECLAC, June 2001. http://www.eclac.cl/publicaciones/DesarrolloProductivo/5/LCL1555P/Lcl1555.pdf

Humphrey, John, Business-to-business e-commerce and access to global markets: exclusive or inclusive outcomes? Institute of Development Studies, Final Draft, January 2002. http://www.gapresearch.org/production/jh%20b2b%20gvc%20final.pdf

Internet Access Technologies for SME, Industry Canada, March 2002. Explains internet access technologies but of course, not all are available to developing countries. Web-based document. http://ecom.ic.gc.ca/english/research/rep/iat_sme_report.html

Kirkman, Geoffrey, P. K. Cornelius, J. D. Sachs, K. Schwab, The Global Information Technology Report: Readiness for the Networked World, World Economic Forum, New York, 2002. Some sections available in electronic form: http://www.cid.harvard.edu/cr/gitrr_030202.html

Lallana, Emmanuel C., P. Pascual, Z R. Andam, SMEs and e-Commerce in Three Philippine Cities, prepared for the Asia Foundation, April 2002. http://www.asiafoundation.org/pdf/SMEs%20&%20eCommerce%20Philippines-7-02.pdf

mC? The ECA/IDRC Pan-African Initiative on e-Commerce. Prepared by Mullin Consulting Ltd, April 2001. Telecenters emphasized. Summarizes e-commerce specific initiatives, barriers by country (Senegal, Mali, Ghana only).

mC? The ECA/IDRC Pan-African Initiative on e-Commerce, Regional Report on East Africa. Prepared by Mullin Consulting Ltd, April 2001. Summarizes e-commerce specific initiatives, barriers by country (Egypt, Tunisia, Morocco).

mC? The ECA/IDRC Pan-African Initiative on e-Commerce, Regional Report on West Africa. Prepared by Mullin Consulting Ltd, April 2001. Telecenters emphasized. Summarizes e-commerce specific initiatives, barriers by country (Uganda, Kenya, Ethiopia).

Monnier, Philippe D., Cybermarketing, A Guide for Managers in Developing Countries, Technical Paper, International Trade Center, UNCTAD/WTO, September 1999. Offers much concrete information that can help trainers on e-marketing topic. Organized as a course might be on the topic. Includes links to good examples of e-marketing, matrices comparing technologies, and much more to help the development professional.

Osterwalder, Alexander, M. Rossi, M. Dong, The Business Model Handbook for Developing Countries, Ecole des HEC, University of Lausanne, Switzerland (no date). http://inforge.unil.ch/aosterwa/Documents/InternetInEmergingMarkets/Publications/BMH4DC.pdf

Paré, Daniel J., "B2B E-commerce Services and Developing Countries: Disentangling Myth from Reality," Prepared for Association of Internet Researchers (AoIR) International Conference, Internet Research 3.0: Net/Work/Theory, Maastricht, the Netherlands, October 13-16, 2002. http://www.gapresearch.org/production/DraftAOIR3.pdf

Press, Larry, S. Goodman, T. Kelly and **M. Minges,** "Electronic Commerce in Nepal," e-OTI: OnTheInternet, March/April, 2001. http://www.isoc.org/oti/articles/0401/press.html

Rao, Madanmohan, "IP Telephony to Have a Dramatic Impact on Asian Voice, Data Communications Markets," e-OTI: OnTheInternet, May/June 2001. http://www.isoc.org/oti/printversions/0601rao3.html

Roundtable 3: Realizing the Potential of Electronic Commerce for SMEs in the Global Economy, Issues Paper, Bologna 2000 SME Conference Business Symposium, 2000.

SME Retailing on the Internet, Industry Canada, Ottawa, Canada, 2002. Written for Canadian SME's but includes information useful to develop training materials for SME's in developing countries, including a retailing "showcase" with links to exemplary sites and a questionnaire to analyze e-retailing potential. Web-based document. http://strategis.ic.gc.ca/SSG/ir01688e.html

Tigre, Paulo Bastos and **D. O'Connor,** Policies and Institutions for E-Commerce Readiness: What Can Developing Countries Learn from OECD Experience? Technical Papers No. 189, OECD Development Centre, CD/DOC(2002)01, April 2002. Available in electronic form at http://www.oecd.org/pdf/M00028000/M00028358.pdf

UNCTAD Secretariat, E-Commerce and Development Report 2001, United Nations Conference on Trade and Development, United Nations, New York and Geneva, 2001 (Internet version). Available in electronic form at http://www.unctad.org/ecommerce/docs/edr01_en/edr01_en.pdf

Useful web sites

Asia-Pacific Economic Cooperation (APEC) Electronic Commerce Steering Group. Especially useful to development professionals in Asia-Pacific region to keep updated on issues, progress related to electronic commerce. http://www.ita.doc.gov/td/industry/otea/ecommerce/apec/

BIZPRO, USAID sponsored economic development project web site with useful links related to SME training (including web-based). http://www.bizpro.org.ua

Bridges.org. Reports, analyses; training material and guides; statistics. http://www.bridges.org/resources/reports.html Including on-line resources for ICT training: http://www.bridges.org/techguide/resources.html

Development Gateway (World Bank) Topics and Discussions. For a wide variety of documents (including many examples) on ICT and development; e-commerce and development; e-commerce and arts and crafts; and more. http://www.developmentgateway.org/all-topics

Digital Dividend. A site offering innovative examples of SME's using e-business techniques. Also offers a clearinghouse to match investors/sponsors with prospective projects. Also offers helpful links page and links to dozens of e-commerce sites in developing countries. http://www.digitaldividend.org/

Digital Opportunity Channel. Source of success stories, news related to e-commerce and ICT for development. http://www.digitalopportunity.org/

E-Business awareness campaign for SME's of the European Commission. http://europa.eu.int/comm/enterprise/ict/policy/godigital.htm

e-Marketplace Services. Full of reports, articles, case studies. Focused on helping SME's understand and use e-marketplaces. http://www.emarketservices.com/

EMPREC, UNCTAD's programme to promote the sustainability of small and medium enterprises. This program provides general business training to SMEs and also has an Electronic Trade Opportunity capability. http://www.empretec.net/

Food and Agriculture Organization's (FAO) information center has documents related to the use of ICT for agricultural development http://www.fao.org/waicent/search/default.asp

HP (Hewlett-Packard) e-Inclusion Program offers examples of innovative uses of ICT by SME's (and other organizations). Good source of examples for training. http://www.hp.com/e-inclusion/en/

Information for Development Program (World Bank). Good source of case studies related to ICT, many including small businesses. http://www.infodev.org/

Information Technology for Africa. Coordinates IT training programs for the Southern African Development Community (SADC). Works with IT partners in Europe and Africa. Sponsored by the German government. http://www.it-ab.net/

Institute for Connectivity in the Americas, a new initiative of the Canadian government resulting from the 2001 Summit of the Americas. In 2002, this site is just being developed but already has some useful white papers and discussion groups and promises to also have virtual discussion groups and may be a good source of examples of SME successes with e-commerce in Latin and South America. Has a list of links that will be useful for those addressing SME e-commerce readiness in Latin and South America. http://www.icamericas.net/

International Chamber of Commerce. Useful site to track policy and legal issues; e-business initiatives. Has a Business in Africa focus section; addresses online shopping dispute resolution and online contracting. Also provides interesting illustration of virtual exhibitions. http://www.iccwbo.org/

International Telecommunications Union. Source of case studies and country assessments, especially on infrastructure, in-depth publications regarding telecommunications training, laws, regulations, gender issues, universal access, and more. http://www.itu.int/home/index.html

Internet Law and Policy Forum. Useful site to track legal issues related to e-commerce in developing countries. http://www.ilpf.org/

The Internet Society. Excellent source of technical and public policy issues constraining spread of Internet usage; training options; articles in its e-publication e-OTI: OnTheInternet. Articles sometimes offer good case examples of e-commerce in developing countries. http://www.isoc.org/

LearnLink: Digital Tools for Development (USAID sponsored project) http://learnlink.aed.org/index.html

NUA Internet Surveys by Category. Source of Internet statistics, including breakdowns by regions and country. http://www.nua.com/surveys/

Organisation for Economic Development and Cooperation's section of web site focusing on electronic commerce. http://www.oecd.org/EN/home/0,,EN-home-29-nodirectorate-no-no--29,00.html

Techknowlogia, a web-based periodical. http://www.techknowlogia.org/

USAID's Development Experience Clearinghouse. Try using keyword search for "business support services," "women in development," and "training." http://www.dec.org/

Appendix *continued*

United Nations Conference on Trade and Development (UNCTAD), e-Commerce site. Useful background papers, reports, presentations. http://www.unctad.org/ecommerce/index.htm A recent background paper for July 2002 conference covers enabling environment for e-commerce. See http://www.unctad.org/en/special/c3em15do.htm for document in three languages.

Worldcom Digital Library. Free web-based library including many useful articles on electronic commerce. http://www1.worldcom.com/us/resources/library/

Sample Web sites to Help Prepare SME's for e-Commerce

Use these to get ideas how you might use a web site for your target SME's or to find training materials and articles of interest to SME's. Most of these sites are not focused only on e-commerce but do offer advice, information on e-commerce.

Appalachian Center for Economic Networks. Example of US site focused on helping rural businesses (including agricultural) use e-business techniques. http://www.acenetworks.org/

American Express Company has a web site for small businesses in developed countries. http://www.americanexpress.com/homepage/smallbusiness.shtml?openvan=open

Business 2.0 http://www.business20.com/ Not necessarily for small businesses only but full of useful information.

eCommerce Advisor's Small Business Advisor http://www.ecommercetimes.com/small_business/

Emerging Business http://www.ebmagz.com/

International Finance Corporation (IFC) offers a SME Toolkit (pre-release version) which includes tools (articles, resources) on e-commerce as well as information on web-based marketing. http://www.smetoolkit.org/presentation/SubCategory.jsp?iCategoryId=76

National Association of Manufacturers. E-business section as well as a section for small and medium manufacturers. Includes virtual university. http://www.nam.org/

National Federation of Independent Businesses. Includes tips and tools (many short, practical articles) related to the Internet and e-commerce. http://www.nfib.com/

SBDC (Small Business Development Center) Net. E-Commerce guide and links to other resources. http://sbdcnet.utsa.edu/SBIC/e-com.htm

SCORE http://www.score.org/ See thorough business resource index with useful links and e-mail counseling service.

Small Business Computing Newsletter (e-mail based) with useful links as well. http://e-newsletters.internet.com/smallbusinesscomputing.html

UN Development Programme's web-based document on electronic commerce. http://www.undp.org/info21/e-com/e-main.html Appears to be a bit out of date but is a good example of how a web-based resource can be designed.

US Small Business Administration (SBA) has several sites and documents useful to small businesses figuring out how to use electronic commerce, including an on-line course on e-commerce (http://www.sba.gov/classroom/courses.html). See also the SBA's Business Advisor Site http://www.business.gov/busadv/maincat1.cfm?catid=320 which has links to several related sites with sample training materials and courses and SBA's advice on the digital divide: http://www.sba.gov/classroom/digitaldivide.html. All of these could be used as models for similar web sites, documents or courses for SME's in specific developing countries.

Some Sources of Technical Volunteers

Geekcorps provides technical volunteers plus offers a list of businesses and organizations it works with to help small businesses in developing countries use ICT. http://www.geekcorps.org/ then select "Other Sites" link.

InterConnections. If the business in the developing country is a nonprofit, this organization will offer help. http://www.interconnection.org/

NetCorps, Canada's technical volunteer service http://www.netcorps-cyberjeunes.org/english/main_e.htm

Peace Corps (US) now has a information technology focus area in which it offers volunteers to help small enterprises use technology. http://www.peacecorps.gov/assignments/focusareas.cfm#it

United Nations Information Technology Service. http://www.unites.org/

Volunteers in Technical Assistance. http://www.vita.org/

VSO. http://www.vso.org.uk/

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CARANA Corporation. (2002) "Terminal Report of a Pilot Project to Develop and Implement a Wireless Market Information Source." Final report for USAID-funded project in Uganda.

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Center for International Development. Readiness for the Networked World: A Guide for Developing Countries. Harvard University. www.readinessguide.org A comprehensive explanatory guide and diagnostic tool for evaluating ICT readiness on multiple levels, including infrastructure, public awareness etc.

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Development Alternatives International. BIZPRO (2002). "The Internet as a Tool for Micro, Small, and Medium Enterprise Development in Ukraine." http://www.bizpro.org.ua/clients/bizpro/bpuaen.nsf/index?openpage An overview of how Ukrainian SMEs are (and are not) using e-commerce and the constraints to further e-commerce development.

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Industry Canada. "Developing Your Portal: A Tool-kit for Communities." http://smartcommunities-broadband.ic.gc.ca A good overview of about various portals (e.g. community, government and business portals) as well as a guide to setting one up.

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[1] For a more detailed look at AQ Solutions and a closer look at women's participation in e-commerce, refer to the LearnLink's case study "E-Commerce in Developing Countries: Opportunities for Women."

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Case Study

Cameroon and Ghana

Economic Opportunities for Women

Nancy Taggart
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E-commerce has given hope to both industrialized and developing countries because of its potential to reduce transaction costs and enhance international trade, thereby boosting economic growth.[1] As of 2002, global e-commerce revenues are estimated at $1.93 billion and are predicted to rise to $8.53 billion by 2005.[2] Socioeconomic conditions, such as poverty and illiteracy, plus antiquated or restrictive telecommunications policies and limited information technology hardware and infrastructure, make it difficult for developing nations to participate in e-commerce. While little conclusive data exist to indicate the impact e-commerce will have on developing countries, experts predict that if those nations remain behind technologically, the benefits of e-commerce will go largely to industrialized countries.[3]

Women and girls are particularly vulnerable to these constraints. Two-thirds of the world's illiterates are women, women comprise 60 percent of rural populations where infrastructure is weakest, and they carry the primary burden of childcare and household chores, allowing little free time to attend school or training or initiate income-generation activities.[4] Yet women are central to developing country economies, and improvements in their well being directly impact that of their families and communities. Women represent 75 percent of workers in the informal sector, which forms over 55 percent of the economy in Latin America, 45-85 percent in parts of Asia, to nearly 80 percent in Africa.[5] In sub-Saharan Africa alone, women grow and sell 80 to 90 percent of food for family and local consumption, and head, on average, 22 percent of households, rising to 60 percent in parts of West Africa.[6] The anticipated impact of e-commerce on developing countries and women's central role in these economies highlights the importance of involving women in e-commerce ventures.

www.hextgenven.com/portfolio/aqsolutions.shtml

www.asafe.org

This paper explores opportunities e-commerce offers women in developing countries, looking at two cases of e-commerce ventures in which women play major roles.

The power of electronic networks to eliminate geographic barriers to trade, making it possible to conduct business transactions over electronic networks across the globe, has the potential to create vast new areas of jobs for both men and women in developing countries. One area of employment opportunities for women is teleservices, where electronic networks enable businesses to outsource tasks to employees in other states, countries, or continents. Data processing, call centers, and software programming represent a few potential growth areas. For example, by 2008, 1.1 million people in India are expected to be employed in remote data processing, two-thirds of whom are expected to be women.[7] Call centers, in which workers provide telephone-based services at a central office offsite from a company's headquarters, are another major employment area for women and said to be emerging as "one of the most important sources of employment growth in the next decade."[8]

Among the range of e-commerce activities, some experts find that offline teleservices (i.e., data input and transcription) are more viable for developing countries than online services (call centers) because of lower start-up costs and, when starting small, a better capacity to expand. Offline services also can be provided in developing countries despite unreliable telecommunications infrastructure and often restrictive regulations.[9] (The case study of AQ Solutions discussed below provides an example of a women-owned offline venture in Africa.)

In addition to direct employment opportunities, e-commerce broadens access for small business owners, entrepreneurs, and traders to valuable market information that, normally, they would be unable to access beyond the borders of their village or state. This is particularly important for women for whom information is typically out of reach due to illiteracy, constrained mobility as a result of socio-cultural norms, and physical isolation, particularly within rural areas. For example, the Internet can benefit agricultural producers by facilitating access to information on market prices, sources for intermediary supplies, and new local or regional markets for their products. In one instance, a coffee company in Costa Rica, Café Britt, reportedly undertakes the entire cycle of growing, processing, exporting, importing, and selling through its web site, thus eliminating reliance on a middle man and enabling direct exchange between consumers and farmers.[10]

Similarly, a government-led project called Gyandoot Intranet (http://www.gyandoot.net) in Madhya Pradesh (MP), India, offers Internet access to illiterate farmers, including women, via rural Internet kiosks through which they access market information and process government transactions. Farmers in MP had been largely dependent upon middlemen traders, who commonly quoted lower than market rates and then 'pocketed the difference.' With the help of Gyandoot Internet kiosks, farmers track the cost of the produce and identify where they can get the best deals. In addition, farmers and villagers save the time used to travel to government offices by using the Internet to obtain copies of land records, register for applications, and file complaints with the district government.[11] While women are not the sole beneficiaries in the pilot programs described above, they are often a majority of primary producers and have the potential to benefit enormously from these services.

The U.S.-based non-profit organization, PEOPLink (http://www.peoplink.org/), is another example of a B2B (business-to-business) e-commerce program using the Internet and other technologies as tools for broadening local producers' markets. Working with artisans in Africa, Asia, and Latin America—a majority of whom are women—PEOPLink provides artisans with digital cameras to promote and market their crafts online to buyers in the U.S. and Europe, who then sell the goods to consumers. PEOPLink also has developed CatGen (http://www.catgen.com), a software tool that enables artisans to create an Internet-based catalog of their crafts, which can be printed for face-to-face marketing or posted on the PEOPLink web site. The PEOPLink network not only expands artisans' access to consumers and wholesalers but also strengthens local business skills by training artisans in the use of information and communication technologies (ICTs). One crafts group in Nepal, for example, reportedly increased its sales from $125,000 in 1998 to $450,000 in 2000 as a result of marketing its products through PEOPLink's training and online

tools.[12] Opportunities for artisans to transfer skills acquired with PEOPLink's support to other income-generating ventures may be possible as well.

The Crafts Center's Artisan Enterprise Network (AEN) (http://www.artisanenterprisenetwork.org/) is a similar vehicle. AEN is a U.S.-based program that brings together private corporations, public agencies, and nongovernmental organizations to pool their business experiences and knowledge and make them available, both in person and via the Internet, to artisan entrepreneurs worldwide. AEN makes the following on-line resources available to artisans in Spanish and English:

- A training course on how to successfully manage a handicraft business;
- Lists of trade shows and tips for success;
- Lists of wholesalers, U.S. importers, and retailers of crafts;
- Links to e-commerce web sites;
- Information on professional organizations, journals, magazines, and continuing education opportunities;
- Sources for buying raw materials, tools, and equipment at wholesale prices; and
- Funding resources for artisans.

In addition to the e-commerce initiatives highlighted above, two women-led programs that employ women—ASAFE and AQ Solutions—are unique examples of locally initiated and managed enterprises responding to the needs and interests of local entrepreneurs and technicians. An overview of their successes and challenges provides insight into some of the factors that shape e-commerce ventures in developing countries and demonstrate strategies for involving women.

Women and Tele-Services in Ghana

When one thinks of teleservices, South Asia is the region that usually comes to mind. But according to AQ Solutions, Ghana is the region of choice for such ICT-based services. Ghana's official language is English, it has a 64.5 percent literacy rate (75.9 percent male, 53.5 percent female) that exceeds India's 52%, the time zone is five hours ahead of the US, making it possible to conduct transactions within US business hours, and Ghana's government has created a conducive telecommunications policy environment for ICT business development. An estimated half a million people in Ghana have access to the web in some form, over 15,000 users through a direct connection to the Internet and over 500,000 users through shared Internet connections via homes, offices, or through friends and cyber cafes.[13]

AQ Solutions (AQS) is an offshore outsourcing company that provides software development and other ICT services through professionals based in Accra. The company was established in October 2000 by a Ghanaian businesswoman, Awo Quaison-Sackey, based in New Haven, Connecticut, and currently employees 25 staff in Ghana. AQ Solutions' clients are American companies, including Northeast Insurance, Yale New Haven Hospital, and Smart Equip. AQ Solutions' future plans include the establishment of a call center in Accra by the end of 2002 in partnership with Phoenix Insurance.

While AQ Solutions is in its early stages of development, a few factors can be highlighted as important to its success so far.

Awareness & Commitment to Recruiting Women

The CEO, Awo Quaison-Sackey, is committed to creating

Box 1 — Profile of AQ Solutions' Only Female Programmer

A woman in the field of software programming, Abigail is a rarity in Ghana. Though she is the only woman software programmer at AQ Solutions, she is considered a "star." She holds a BSc in Computer Science, graduating as one of 21 females in a class of 150 students. Abigail started with AQ Solutions as a trainee and soon tested beyond the performance levels of her male peers. Unlike the majority of Ghanaian young women, she is 29 and still single.

Abigail was attracted to AQ Solutions because of its competitive pay package, the opportunity to work for foreign clients, and the software coding experience. She says she was initially discouraged by the attitudes of her male colleagues at AQS, who thought she "should sit and watch them do the work."

opportunities for women in the IT sector, demonstrated by her membership in UNIFEM's newly established Global Advisory Committee, whose goal is to facilitate African women's participation in ICT careers.[14] AQ Solutions' Ghana-based staff, such as Johanna Awotwi, Administrative Officer responsible for recruitment, is very aware of the issues affecting women's participation in non-traditional careers such as ICT and undertakes efforts to attract more female employees. As the company plans to develop a call center in late 2002, staffing will be a priority again. Awotwi intends to use strategies to attract female employees for those jobs, including giving presentations at secondary schools and universities and headhunting for top students graduating with degrees in Computer Science.

Local Knowledge & Insight Go A Long Way

Because of AQ Solutions's female and Ghanaian management, the company has insight into the local culture, economy, and workforce—all essential areas with which a business should be familiar. Moreover, the insight into factors shaping women's employment may give the company an advantage over other companies in tapping into the female labor pool.

AQ Solutions has experienced serious challenges during its first year. Among these has been the initial skepticism of U.S. companies toward the viability of working with Ghanaian-based technical staff and slow business following September 11th.

Skills Lacking

While software programmers at AQ Solutions are paid well (salaries for programmers reach $400/month, compared with $200/month for end-user support services), the company's Administrative Officer, Johanna Awotwi, says it has not been easy to find such programmers in Ghana. "About 85 percent of Ghana's ICT sector employment works in end-user support, and only about 10% of these are women. Most companies in Ghana buy software off the shelf and modify it to their needs, rather than doing the coding to develop new software. So what we were doing was new." Training programs do exist in Ghana that enable local people to acquire ICT skills for programming, but the programs are, reportedly, too expensive for most Ghanaians.

Awotwi also finds that Ghanaians are hesitant to join a new start-up because they prefer joining an established company with a recognized name that is less risky. So many of AQ Solutions' employees start by working part-time, working at another job as well while they wait to see if AQ Solutions is able to sustain itself.

Stereotypes Deter Women

Finding skilled female ICT technicians is an even greater challenge. In fact, only one full-time software developer and one to two part-time ICT staff are women. Moreover, the number of women studying computer science is small. Secretarial skills and experience with MS Office is prevalent, but few women—or men—have acquired programming skills. Awotwi attributes this problem to women's lack of awareness about ICT job opportunities, their perception that ICT sector jobs are "too stressful," or their "fear of mathematics" and related subjects.

Long Work Days Don't Work for Women

Quaison-Sackey also speculated that the start-up company work atmosphere may deter prospective female employees from working there because it is difficult for most African women to work long hours due to time constraints from their household responsibilities. According to Awotwi, Ghana's employment laws actually ban women from working in the evenings. She finds this to be a major obstacle to women's job opportunities in the ICT sector, especially for those who want and need to work odd hours. In fact, AQS is trying to lobby the government to eliminate these laws so they can tap into the pool of female workers as their staffing needs grow.

Bringing IT to Women Entrepreneurs

Cameroon has a growing economy (4-5 percent growth annually for the last five years) in which 53 percent of the economically active population are women. The country has been liberalizing its telecommunications policies over the past four years, resulting in privatization of mobile telephony and expected privatization of the telecom in the near future. In 2001, the number of Internet users in Cameroon was estimated to be 45,000, compared to 500,000 in Kenya, 100,000 in Senegal, and 60,000 in Uganda.[15] Cybercafes are prevalent in Douala and Yaounde, the country's two largest cities. However, government telecommunication regulation continues to be a major problem for businesses trying to integrate ICTs into their services.

Within this context is the story of *L'Assocation pour le Soutien et l'Appui a la Femme Entrepreneur (ASAFE)* (http://www.asafe.org), an association of 3,000 women's businesses from Cameroon, Mali, Chad, Guinea, and Benin. Established in 1989, ASAFE provides information, business support, and banking services to its member business owners, the majority of whom are in the food processing and textile sectors. ASAFE raises funds through contributions from its members, grants, and service fees through the sale of ASAFE goods.[16] Over the last four years, ASAFE's activities have focused on expanding the scope of support it provides to its members and increasing its own revenues by integrating ICTs into its activities. Today, ASAFE's portfolio of activities, based in its newly established 4-story resource center called "Vie des Femmes" in Douala, include:

- A "one-stop resource center for entrepreneurs displaying products and packaging examples";
- A "cyberboutique" offering pay-by-use public Internet access and services;
- A computer training room for ASAFE members;
- Provision of networking technician training via a Cisco Networking Training Academy;
- French translation of documents for Canadian clients by ASAFE members; and
- Marketing of textiles to Canadian consumers.

With guidance from the international private sector, ASAFE also is hoping to create a small business incubator for "traditional and new enterprises," including establishing a call center and a national women's radio program to facilitate local information sharing among rural women.[17]

E-commerce Entry Point: Women Entrepreneurs

ASAFE demonstrates the effectiveness of working through existing institutions and networks in which women are already well represented to introduce them to ICTs. Small enterprises, particularly in Africa, are dominated by women. An association comprised mostly of women-led enterprises, ASAFE had an available pool of ambitious entrepreneurs lacking awareness of ICT opportunities and skills.

ASAFE's members were first introduced to ICTs following Internet training for women in Kenya that ASAFE Executive Director, Gisele Yitamben, attended in 1998. Yitamben then worked with the Canadian consulting firm, Networked Intelligence for Development (NID) (http://www.networkedintelligence.com), to develop an Internet awareness training and trade exhibition for its members in 1999. The training introduced women entrepreneurs to e-commerce as well as to digital cameras and to the development of business plans and database software. As a result of the training, more than 50 percent of the trainees at the meeting were eager to obtain Internet access for their businesses.[18] In short, by building e-commerce into established women's businesses, the typically daunting hurdle of attracting women to a non-traditional sector like ICT and computer science was not an issue.

Strategic Partnerships

In large part, ASAFE's success is attributable to strategic alliances at the national, regional, and international levels.[19] ASAFE's regional and local membership endows it with a base of entrepreneurial talent and energy drawn from across West Africa. Supporting this, ASAFE has developed partnerships at the global level with the private sector, donors, and multilateral institutions providing technical assistance, guidance, and access to new markets for their products. Beyond the technical assistance provided through ASAFE's partnership with NID, mentioned above, NID has helped the group initiate some small-scale e-commerce activities, including the sale of ASAFE members' crafts to buyers in Canada and the translation of documents into French.

ASAFE also has received support from the International Telecommunications Union (ITU) and Chell.com, a Canadian private company, to acquire resources for start-up costs, hardware, and software for its resource center. In addition, ASAFE partnered with Cisco Systems to establish a Networking Academy in 2001 that provides certified training in computer networking. ASAFE is in the process of obtaining donations for scholarships for young women to attend the Cisco Networking training.

Leadership

According to Nidhi Tandon of Networked Intelligence for Development, ASAFE's persevering and visionary Executive Director, Gisele Yitamben, has been pivotal in forging these partnerships. Yitamben attended the recent World Economic Forum, where she met with representatives of Hewlett Packard, Sun Microsystems, and other IT firms to discuss the needs

of women entrepreneurs in Cameroon. Yitamben requested support from these firms not for funding but for guidance and technical assistance in conceptualizing and planning the creation of a business incubator for African entrepreneurs, which she feels is strongly needed. In addition, Yitamben has devoted significant time to tackling the regulatory constraints that affect ASAFE's planned ICT services in Cameroon.

Strength in Numbers

An institution established for over 11 years, ASAFE is well positioned to develop e-commerce activities. Where an individual business may struggle to generate the resources to acquire the necessary facilities, hardware, and technical staff for an ICT platform, a network such as ASAFE has many members to share these costs. Because of its regional presence, ASAFE also possesses the credibility needed to help attract donor and international private sector support. Moreover, as a network of businesses with a large pool of workers and range of products, ASAFE's efforts to scale up e-commerce activities is a feasible undertaking.

The Greatest Challenge: Governmental Regulation

Yitamben's and ASAFE's foremost constraint has been the telecommunications policy environment of Cameroon. To realize their business goal of integrating ICTs into their services, ASAFE has struggled to gain connectivity for its "cyberboutique," secure a license for establishing a wireless ISP outfit, and access hardware donated by the ITU, which, reportedly, is still held up by government 'red-tape.' ASAFE and its partner NID attribute their difficulties to "a top-down government telecom structure" versus a "bottom-up informal industry-driven Internet." As the country's telecom system was liberalizing, the greatest obstacles included lack of a clear telecommunications authority and inappropriate standards and laws.[20] ASAFE and NID have emphasized that governmental regulation has been their primary obstacle.

What About Gender?

It is clear from the cases discussed above that there is a range of pivotal factors, beyond gender, that determine the success of an e-commerce venture. However, an understanding of women's and men's differing job interests and time and skill constraints is essential if businesses hope to tap into local labor markets. Equally important is considering if and how e-commerce ventures respond to men's and women's information and income needs, particularly if businesses seek to have a local market for their products or services and/or wish to reach the neediest groups in their communities.

Areas for Intervention & Support

Support in the following areas can help to foster more initiatives like AQ Solutions and ASAFE:

- Broaden awareness among businesses, governments, chambers of commerce, and entrepreneurs about e-commerce and the opportunities it offers to strengthen businesses and create jobs. Provide technical assistance and guidance to government and business networks on ways to foster and support the use of ICTs by local enterprises.
- Develop tailored e-commerce training programs appropriate for small business women in developing countries.
- Make affordable ICT training available to women and men in developing countries to develop a skilled corps of entrepreneurs and technicians to support the growth of an ICT sector and ICT enterprises.
- Continue to promote governmental reform of telecommunications policies and regulations in ways that make ICTs accessible to small businesses.
- Generate interest among girls and women in math and science at earlier levels of schooling through outreach using female role models in science and ICT professions and by adapting curricula and teaching methodologies to engage girls in these subjects.

Footnotes

[1] E-commerce is broadly defined by UNCTAD's *E-commerce and Development Report 2001* and the Canadian consulting firm Networked Intelligence for Development as "the use of electronic networks (via computers) to conduct value transactions involving the transfer of information, products, services, or payments."

[2] UNCTAD's *E-commerce and Development Report 2001.*

[3] **Nancy Hafkin** and **Nancy Taggart,** *Gender, Information Technology, and Developing Countries,* AED LearnLink, 2001.

[4] http://www.wiego.org/main/fact1.shtml, http://www.womensedge.org.

[5] International Population Center, Food for the Future. UNFPA, 2001. http://www.unfpa.org/modules/intercenter/food/womenas.html.

[6] International Labor Organization, *World Employment Report 2001.* http://www.unfpa.org/modules/intercenter/food/womenas.html.

[7] Ibid.

[8] UNCTAD's *E-commerce and Development Report 2001.*

[9] **Andrea Goldstein** and **David O'Connor,** "E-Commerce for Development: Prospects and Policy Issues," OECD Development Centre, 2000/2001. (http://www.oecd.org/dev)

[10] "Innovative Intranet Connects India's Rural Villagers to Government-to-Citizen E-Commerce," September 2000. (http://www.microsoft.com/business/casestudies/cyberedge_madhyapradeshindia.asp)

[11] Implementing a Global E-Commerce Network of Artisan Groups, InfoDev & PeopLINK Final Report, http://www.infodev.org.

[12] Balancing Act, Issue 54, October 200. (http://www.balancingact-africa.com/news/back/balancing-act54.html)

[13] UNIFEM Press Release, "African Entrepreneurs Join Forces With UNIFEM To Shrink Digital Divide For Women," March 1, 2002. (http://www.undp.org/unifem/pr_afr_digital.html)

[14] International Telecommunications Union, March 2002.

[15] **Dorothy Okello,** "A Look at ASAFE: Electronic Commerce for African Women Entrepreneurs," *Acting Locally, Connecting Globally: Women in Sync Toolkit for Electronic Networking.* (http://www.apcwomen.org/netsupport/sync/toolkit3.pdf)

[16] Networked Intelligence for Development (NID), "Building Networks between North American private sector and women entrepreneurs in West & Central Africa: A working case study," December 2000.

[17] Ibid.

[18] Ibid.

[19] Interview with Nidhi Tandon, Principal at NID, in May 2002 and NID's "Building Networks between North American private sector and women entrepreneurs in West & Central Africa: A working case study" December 2000.

[20] Interview with Nidhi Tandon, Principal at NID, in May 2002 and NID's "Building Networks between North American private sector and women entrepreneurs in West & Central Africa: A working case study," December 2000.

Case Study

Bangladesh, Ghana, and Mexico

Three Examples of e-Commerce

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Private sector firms worldwide, in sectors ranging from tourism to agriculture to manufacturing, are integrating electronic commerce (e-commerce) into their everyday business practices.[1] In developing countries, large companies and small and medium enterprises (SMEs) alike have adopted e-commerce techniques such as web-based marketing and customer service, electronic transaction processing, inventory management, e-procurement systems, and email. Yet despite the rapid and demonstrated uptake of e-commerce techniques, there is still scant detailed evidence about how individual companies in developing countries are using e-commerce to improve their business and what the overall costs and benefits are of using those techniques.[2]

This paper explores how enterprises in three countries—Ghana, Bangladesh, and Mexico—have begun to integrate e-commerce techniques into their businesses. The first, a sophisticated Internet café in Accra, Ghana, has branched out from its core focus on providing Internet access to establish a highly successful business incubator facility servicing e-commerce-oriented companies. The second, a group of shoe manufacturers in Bangladesh, has applied e-commerce techniques to increase their exports to international markets. In the third company, Mexicana Airlines, a comprehensive web portal has helped expand product lines and improve customer service capabilities.

Taken together, these three mini case studies demonstrate some critical principles about how private sector firms of varying sizes in developing countries can adopt and adapt e-commerce methods and systems to strengthen their businesses. First, even when access to affordable information and communication technologies

1. Bangladesh applied e-commerce techniques to increase their exports

1. Bangladeshi women assemble shoes for export
2. Exports to a Japanese shoe store

2. Ghana created a sophisticated internet cafe

http://www.busyinternet.com

3. The Mexican national airline developed a comprehensive web portal

http://www.mexicana.com

(ICTs) is difficult, companies can successfully integrate e-commerce into their activities by using, leveraging, and, in turn, strengthening existing public access infrastructure, such as telecenters. Second, e-commerce need not revolve solely around business-to-consumer, transaction-oriented processes. There is much more to e-commerce than the Amazon.com model[3]. As these examples illustrate, often the most important forms of e-commerce involve business-to-business interactions and non-transaction-oriented processes. This can include online technical support, back office automation, basic web site promotion, and offshore call centers. Third, it is critical to align e-commerce tools and applications to the expectations of the prospective market, the local culture, and the needs and capacities of specific customers. Finally, e-commerce initiatives can benefit from being integrated within economic sectors, such as tourism, that have high growth potential.

Business Incubators and E-Commerce Development in Ghana

Context

Ghana has been described as one of the "jewels" of West Africa due to its scenic environment, long history of strong educational institutions, and extensive natural resources. A country of approximately 20 million, Ghana possesses tremendous economic potential, particularly through its gold, timber, and cocoa production, which form its major foreign exchange sources. Yet, despite the recent advent of a pro-business, progressive government and a GDP growth rate of approximately 3 percent in 2001, Ghana still suffers from chronic unemployment, low per capita incomes, a reliance on international donors to support government expenditures, and high inflation[4].

This rather bleak economic outlook carries over to Ghana's telecom sector. Amidst often half-hearted efforts by the government to liberalize the sector, Ghana remains firmly in the grip of the state monopoly operator, Ghana Telecom. Competition in both the fixed-line and mobile market is almost non-existent, and most Ghanaians have little access to affordable or reliable ICTs. In 2001, it was estimated that Ghana had just 249,000 fixed telephone lines, a ratio of about one to every 100 people and there were 2.08 cellular and fixed lines for every 100 users and only 0.19 Internet users per 100 people. Given the poor telecom infrastructure and prices for bandwidth that were almost 10 times that of the U.S., the low Internet penetration among average citizens was easy to understand.[5]

In response to the high prices for connectivity, and for the Internet in particular, Ghana witnessed the emergence of hundreds of cyber cafés. The bulk of these, approximately 250, were established in Ghana's bustling capital city of Accra. These Internet cafes fulfilled an important role by providing affordable ICT services such as email, chat, Internet browsing, and simple fax and photocopying. But none went beyond that to offer ICT services geared to areas such as e-commerce promotion and development—that is, not until the advent of BusyInternet.[6]

Emergence of BusyInternet

In the heart of downtown Accra, a city of approximately 2.3 million people, US-based Internet entrepreneur Mark Davies decided to establish an Internet café that would change the traditional way that cyber cafés did business. Davies had been encouraged by the country's switch to a pro-business progressive government and the country's nationwide fiber optic network, one of the only such networks in sub-Saharan Africa. In addition, he was impressed by the energetic entrepreneurs he met, people who would be keen to develop the kind of ICT-enabled business that a high-end cyber café could provide. As Davies remarked: "There are a lot of smart and ambitious people around who are really keen to push this sector. It will be interesting to see how fast this industry develops. We want to facilitate that and see Ghana participate regionally and globally."[7]

In 2000, Davies launched an international ICT development company, BusyInternet International, in New York and created a subsidiary known as BusyInternet Ghana. To launch the cyber café in Accra, Davies received funding largely through investments from local Ghanaian firms, including Databank, a technology company called Soft, and Fidelity Discount House. These companies own the majority of shares in the center, while the IFC and other investors are minority shareholders.[8]

Davies converted a dilapidated bottle gas plant into the café, which included over 15,000 square feet of offices and training rooms. The center is run on a for-profit basis and has 50 employees. It offers consumers high-speed Internet browsing (for about $1 USD per hour), software programs, disc

http://www.busyinternet.com
Ghana: BusyInternet homepage

> **“Bandwidth in Ghana is so scarce that simply providing good connectivity at retail prices is a great business model”**

“Getting Ghana Going,” by Esther Dyson, distributed by the New York Times Syndicate, March 20, 2002, http://www.edventure.com/conversation/articleprint.cfm?Counter=9396788.

and CD-copying, and over 100 terminals in an open area downstairs and 50 terminals in private carrels and offices with telephone and Internet connectivity upstairs.

The center is state-of-the-art, which was intended to stimulate ICT usage. As Davis observed, “We want to develop a look so that people feel they’ve walked into a totally new experience. We’ll have tremendous outreach potential to young Internet enthusiasts. This is an important part of what we’re trying to do—to create a social environment that other organizations are seeking access to.”[9]

An E-Commerce Hub in Accra

Davies recognized the potential of his center as a launching pad to move far beyond offering just ICT access and training. Given its importance as one of the key regional trading hubs in West Africa, Accra is home to a large array of local and multi-national companies, many of whom are well positioned to take advantage of appropriate e-commerce applications and services. Thus, Davies moved aggressively to develop BusyInternet as a catalyst for e-business promotion, helping companies participate in export markets and conducting matchmaking events for foreign and local investors.

Davies’ strategy was to create an active business incubator located on the top floor of the facility. He took the business incubator concept from the United Kingdom, where many small, London-based companies struggled to find affordable space, more flexible and short-term leasing commitments, and adequate Internet and telephone connectivity. Through the incubator concept, companies also could reserve meeting room space and obtain office support services without having to pay higher rents or retain full-time support staff. The incubator concept rapidly caught on, and a host of local web development and programming companies contracted for space in the building.

We want to take the headache out of providing Internet-based learning—we’re more about customer service than program development. There are loads of programs out there already; we just want to give them the platform they need to succeed…. We hope to create a soft landing in all our markets for anyone, businesses or non-profits, seeking the right facilities for the new technology-based business/learning environment.[10]

Through its business incubator, BusyInternet enabled the growth of one of the most visible examples of e-commerce – offshore teleservicing companies. These types of companies primarily serve large multi-national clients and specialize in data processing, customer service, and telemarketing. Teleservicing companies have thrived for several reasons, including comparatively lower labor costs than in western countries and geography—such companies often are located in a time zone several hours ahead of the client. As a result, at the end of the business day, the client can send data to the

offshore site for overnight processing and have the processed data ready at the beginning of the client's next business day.

One of BusyInternet's most high profile clients was the teleservicing company Data Management Internationale (DMI), a Delaware-based company that assisted organizations in managing their paperwork, electronic files, computer reports, and so on. DMI established the offshore data processing facility in Accra as a base for digitizing information from New York City. As of mid-2002, DMI's Accra-based facility had focused primarily on the Department of Environmental Protection in New York, which had contracted with DMI to conduct daily processing of the approximately half million tickets that the Department issued annually. Department employees scanned the tickets in New York and sent them daily as digital photographs to the company in Accra. DMI then would input the data into a searchable database that was sent back to New York.[11]

Although DMI's offshore facility at BusyInternet was highly successful at drawing in business, it did not come without controversy. On the one hand, the company reportedly paid workers almost twice Ghana's per capita income, perhaps explaining why DMI's Accra office was flooded with applications. On the other hand, the facility was likened to an "electronic sweatshop." Employees worked in revolving eight-hour shifts on a 24-hour basis, receiving one half-hour and two ten-minute breaks during their shift. DMI officials even began formulating plans to pay workers by the keystroke and deduct wages for each typographical error. Another concern was the political fallout that often accompanies the creation of offshore call centers or production facilities, particularly the criticism that these facilities take jobs away from US workers. For this reason, DMI moved to shift the data processing for the New York clients back to its US-based office and have the Accra office focus on other clients.

Some Lessons

BusyInternet's successful foray into business incubation and e-commerce promotion provides some useful lessons for other ventures seeking to promote e-commerce.

Lesson: Use public access facilities to support and cross-subsidize commercially driven e-commerce activities. This can enable companies to integrate e-commerce applications incrementally and avoid the cost of purchasing expensive hardware and software and hiring dedicated staff. Also, companies can aggregate their purchase of connectivity and enable

Box 1 — Events at BusyInternet

Busy Anniversary *21st - 24th November 2002*
Food, Fashion & Career Shows, ITAfrica Fair, Live Music, Free Browsing, Technology, Fun & People. Come share this special time with us!

Weekend DVD Movies *every friday, saturday & Sunday, 4pm, 6pm, 8pm & 10pm*
Big-screen, surround sound & cool comfort. 10,000 cedis.

Making the Right Choice for You *Last thursday of every month, 10am - 11am – FREE*
One hour of fun and learning aimed at promoting positive sexual. behavioural practises amongst Ghana's youth. Why should you abstain? How can you abstain? To be part of this program, just sign up at the info desk at BusyInternet. "A Collaboration between BusyInternet & PPAG"

Internet for Beginners *Thursday 28th November10am - 12pm – 35,000 cedis*
Learn how the internet works, what's on the internet, email, chat and instant messaging, plus one hour hands on activites including setting up an email account, chatting, finding useful sites…

(http://www.busyInternet.com)

the public access facility to bear the high cost of bandwidth and utilities in many developing countries. Finally, these types of public facilities – and business incubators more generally – can encourage the cross-fertilization of business strategies, including e-commerce strategies.

Lesson: Be aware of potential negative consequences of e-commerce-related activities and create flexible mechanisms for addressing these challenges.

Although it is not readily proven whether DMI was an "electronic sweatshop," this observation raises a critical and often-neglected aspect of e-commerce. As in more traditional working environments, conditions for many employees at e-commerce-oriented companies can be arduous. Therefore, development planners and practitioners should be careful to ensure that appropriate working conditions are built into any e-commerce project. One way to do this is to insist on social responsibility compacts between the donor and the targeted beneficiary to ensure that workers will be well treated. Practitioners also can integrate work quality indicators and transparency requirements into their monitoring and evaluation practices.

Bangladesh Shoe Industry Uses e-Commerce Tools to Prosper [12]

Context

By any measure, Bangladesh is one of the poorest countries in the world. As of the end of 2002, out of a population of approximately 133 million people, some 36 percent of all Bangladeshis live below the poverty line, and unemployment stands at roughly 35 percent. State and private sector corruption, inefficient state enterprises, and resistance to change by powerful trade unions and other bureaucrats have impeded attempts at economic and political reform. As one report summarizes, "…Bangladesh remains a poor, overpopulated, and ill-governed nation."[13]

These problems have carried over to the telecommunications sector. Less than 1% of Bangladeshis have access to a fixed line or mobile phone, and only about one in every thousand people is estimated to use the Internet.[14]

In this difficult environment, the USAID-sponsored Jobs Opportunities and Business Support (JOBS) Program sought to promote innovative business development services and show how companies could leverage a variety of e-commerce tools across business processes. Another key objective was to see if companies who adopted these tools could dramatically increase exports, revenue to local businesses, and employment for women.[15]

In particular, the JOBS Program focused on integrating e-commerce techniques among Bangladesh shoe manufacturers for the purpose of increasing shoe exports to Japan. By most measures, Bangladesh was an unlikely place to find a sector export development effort taking full advantage of electronic commerce techniques. At that time, shoe exports to Japan totaled 160,000 pairs valued at US$ 2.6 million, most of which was from only two or three manufacturers in Bangladesh.

Critical Tools to Target Business Development Services

The JOBS personnel and manufacturers used systematic market research to understand their prospective customers' needs and to help figure out the appropriate types of e-commerce tools to use.

First, the JOBS Program and manufacturers decided to maintain their focus on Japan as the target of the e-commerce-enabled marketing strategy. One of the reasons for this was that Japan did not impose duties on imports from Bangladesh. The project then conducted intensive initial market research via various web sites offering information on the Japanese market, the shoe industry in particular, and the export of shoes from Bangladesh.

Once the industry was targeted, the team used web sites to track down a shoe design expert for the Japanese market. This expert came to Bangladesh to review shoe designs and prepare the firms to attend the important shoe industry fair in Japan. In fact, the project team identified the industry fair itself by more web-based market research, and all fair registration was conducted via the web. To prepare to attend the fair, the project team also paid for membership-only access to the key Japanese shoe industry web site for the targeted Bangladeshi factories involved in the program. From that site, they were able to learn details regarding shoe design, fashion forecasts, trend analysis, and other players in the industry. Based on this information, the program provided training to the enterprises in product design, production processes, and quality control.

After the manufacturers and project team gained this specific information on the industry, the JOBS team worked with the manufacturers on using email to communicate with Japanese business buyers, as well as developing web sites that offered basic marketing information and virtual factory tours. In response to prospective customers' requests, the shoe manufacturers established email addresses to communicate quickly and easily with their prospective customers. The manufacturers also set up virtual factory tours on a web site to boost confidence in their quality and capacity to complete orders satisfactorily.

The JOBS team recognized that e-commerce marketing techniques relied on a variety of media and thus helped three firms develop CD-ROMS for eight Bangladeshi enterprises attending the fair. The CD-ROMs provided information to prospective customers on the firms' designs, factory capabilities, sample shoes, workers' environment, production and quality control capabilities, and a virtual factory tour. According to the JOBS project team, the CD-ROMS significantly boosted the confidence of the buyers in Japan.

Based on the program's work, the Bangladeshi enterprises began receiving orders from Japanese buyers. Much of the communication with these buyers was conducted via email, reducing the costs of communication over fax and express delivery services. The buyers often sent pictures of the products they wanted or adjustments needed in samples sent. Also, some of the Bangladeshi firms were able to use electronic commerce to track down and source raw materials from new suppliers.

Results: Growth in Revenue, Employment, E-Commerce Skills and Confidence

After the program's first year, shoe exports increased from 160,000 pairs to 200,000 (US$ 4.4 million). By 2001, exports had increased to 933,000 pairs valued at US$ 20.5 million. Initially, three firms exported shoes to Japan, but subsequently 10 firms began exporting shoes, and almost 200 new jobs were created. These gains also affected poor women in villages nearby the factories. Because the shoes to be exported required handiwork that was not possible in the factory set-up, the factories sub-contracted this work to a group of village women, who completed the work in their homes and delivered it to the factory. For example, one of the shoe factories contracted with four groups of women, almost 120, to do hand stitching.

Some Lessons

E-commerce is not a panacea for business growth. The JOBS program emphasized that integrating e-commerce applications was only one important component of successful business development, which also required that the manufacturers re-align their sales and marketing strategies from top to bottom. E-commerce can be most effective when employed as part of comprehensive business development, including industry analysis to target appropriate industries, training, product quality improvement, and so on.

Use e-commerce techniques to cater to specific customers. In the Bangladesh example, the JOBS personnel and manufacturers were careful not to try to be all things to all people. They recognized that they had limited capacity to diversify and market their brands and that it was most feasible to segment their market and build from there. By catering to and successfully fulfilling orders from one set of recognized buyers, the manufacturers could build their brand reputation and have the confidence that the buyers themselves would do word-of-mouth marketing on behalf of the manufacturers.

Web portals and tourism – the case of Mexicana Airlines

Background

One of most promising areas for e-commerce is in the tourist sector.[16] In part, this is due to the strength of that sector in many developing countries, as well as the fact that much of the "value-added" within the buyer-seller transaction relies on the quality and speed of data as opposed to the delivery of a tangible product. For example, tourist companies and booking agencies make much of their profits as intermediaries between the consumer and the primary service provider (e.g. hotel, cruise ship, airline) through electronic processing, online booking, and user-friendly descriptions of the tourist destination.

In particular, the airline industry can be credited with pioneering many e-commerce practices. For example, the airline industry is credited with creating some of the world's first business-to-business (B2B) electronic information exchanges and marketplaces. The industry also was the first to develop computer reservations systems and transform them into global distribution systems.[17]

One might assume that a relatively young, "upstart" airline company would pioneer the use of Internet-based e-commerce in the airline industry as opposed to an older established carrier. Yet precisely the opposite occurred. In fact, one of the earliest airline companies to enter the online industry was Mexicana Airlines, the fourth oldest airline in the world—privatized in the early 1990s—with some 6,000 employees currently serving over nine million customers per year.[18]

What makes this case particularly relevant for development practitioners is that Mexicana began focusing on an online business platform even though credit card usage and Internet penetration in Mexico (and Latin America more generally) was almost non-existent. To solve this dilemma, Mexicana carefully tailored and expanded its online platform and applications to meet—indeed shape—the evolving capacities and needs of its consumers.

Expanding the E-Commerce Platform

In 1995, Mexicana established its presence online, and in 1997 it became the first airline to offer a Latin American web site. While recognizing that e-commerce could be a key element of its business growth, however, the company wisely realized that there was inadequate infrastructure to support more advanced applications. Thus, Mexicana focused on using the early versions of its web site to complement its core business functions and provide only basic services (e.g., allowing passengers to make online reservations). But as the company built its customer base, and as the availability of cost-effective Internet applications and online transactions in Latin America became more widespread, Mexicana felt confident that it could expand its online presence.

In 2000, the company expanded its e-commerce platform by upgrading its web site into a comprehensive portal. In particular, Mexicana wanted to use the portal to develop online ticket sales and facilitate communications between customers and employees. The company also looked at the portal as a means to enable market segmentation, which means offering customized information to specific customers. Finally, the company wanted to determine if it could use an expanded online platform to increase revenues and decrease costs, encourage customers to purchase non-core products (such as tour packages), and improve customer service in such areas as reservations.

Mexicana hired two firms, Vignette and Electronic Data Systems (EDS), to assist in web site content development and in creating robust and reliable systems for reservations and communications protocols. In designing these upgraded systems and content, all the players agreed that the portal had to be easy to use by all types of customers and that it should be centered around "scalable infrastructure" so it could grow with market demand. To ensure the usability of the portal, Mexicana created a system whereby non-technical users from across its business units were instructed to create and constantly update the personalized content to match the specific interests of customers.

By the end of the upgrade project, Mexicana had rolled out a comprehensive web portal (www.mexicana.com) that enables customers to make airline reservations, purchase tickets, plan and construct vacation packages (including all-inclusive travel packages offered by Mexicana), and check on their frequent flyer accounts easily. To encourage customer use of the portal, Mexicana also started a program called Mex-E-Savers, which provides special prices via the web site.

The new portal strengthened the company's core business processes in several areas. First, it enabled Mexicana to provide highly customized and relevant information to its consumers proactively. To do so, the portal takes information provided by the customer when he or she first registers and encourages the customer to create his or her own preference profiles. The airline then creates and sends out information on specific travel packages relevant to the customers' age, marital status, geographic base, and other demographics. The portal also attracts customers by providing information on local restaurants, hotels, and official information on travel such as visas and permits.

Equally important, Mexicana used the upgrade to strengthen its electronic transaction processing capabilities. Although credit card usage is still problematic in Mexico, as it is in much of Latin America, the online platform has built in a highly secure and redundant system. Mexicana's system can conduct a search of the customer's account automatically to determine if it contains sufficient funds for the customer to charge the ticket. After the charge has been confirmed on the customer's credit card, then the sales agent concludes the sale by sending an electronic confirmation to the customer, who also has a customer profile page generated and updated by Mexicana.

The portal also has formed an integral component of Mexicana's strategy to partner with other large airline carriers (the so-called "Star Alliance").[19] Through this alliance, Mexicana and its partner airlines offer travelers such services as the ability to earn and redeem frequent flyer miles or points on any member airlines, which enables Mexicana to leverage the customer bases of the other airlines.

In all, the upgraded portal has enabled Mexicana Airlines to increase its business dramatically. As of 2002, the company generated an estimated $1 million monthly in online sales and new revenue streams in both traditional airline tickets as well as tour packages. Online ticket sales grew from 20 to 34 percent of the company's total ticket sales, and, as Internet costs dropped between 15-20%, the company also has improved its capacity to handle online business overall.

Some Lessons

Focus on the Customer when Designing the Application and Technology. Mexicana developed its Internet portal by first examining customer needs and capabilities and then working backwards to develop an appropriate system to cater to its customers. As this case demonstrates, Mexicana was not intimidated by the initial lack of Internet or credit card penetration in its marketplace. Instead, it first focused on using its online platform to complement its traditional business process and establish a cost-effective "toe-hold" in e-commerce. Mexicana then wisely scaled its investment in the online platform to accommodate and take advantage of the growing Internet presence among Mexican consumers.

Similarly, those in other environments with low Internet penetration need not delay e-commerce initiatives. Instead, development practitioners or companies in developing countries can conduct analyses of their local industries before integrating e-commerce technologies and services into business processes. For example, such efforts should examine the customers' use of ICTs, their ability to engage in electronic transactions, their literacy levels, and the level of personal networking required to sell a product as opposed to technical capacities. Once such an analysis is completed, realistic and potentially high-impact e-commerce projects can be developed.

Be Aware of the High Up-Front Costs of Many E-Commerce Applications. Mexicana was committed to upgrading its e-commerce capacity across the entire range of its business cycle, from developing and distributing marketing content to enabling electronic transactions. Companies seeking to invest in e-commerce applications need to conduct an extensive and realistic analysis of the types of processes they want to "e-enable." This analysis should cover a wide range of issues, including types of customers and suppliers, primary costs and revenues, appropriate e-commerce techniques, and available technologies.[20]

Caveats and Conclusions[21]

When properly designed, electronic-commerce techniques can help companies ally with new partners, promote their products in new markets, reduce operating costs, and spin off new businesses and products. Yet merely installing an e-commerce application is not sufficient to ensure high profitability.

E-commerce does not benefit all economic sectors to the same degree or in the same ways. It is most likely to benefit sectors that have information-intensive activities and products or services that can be used or delivered electronically. These sectors include financial services, education, professional services such as consulting, and government services. The tourism industry, of critical importance to many developing countries, also is being transformed because all the information needed for tourists to make their choices can be shared electronically.

But there are ways that even sectors with heavy, fragile, or volatile products can benefit from employing e-commerce techniques to do business with their customers and suppliers: setting prices, placing orders, improving many business processes such as product design (and collaboration), customer support, and product documentation distribution. The florist industry is an example of one with very fragile and perishable products that uses e-commerce tools well, adapting to electronic auctions between buyers in Amsterdam and sellers worldwide (including East Africa).[22]

Depending on a SME's sector, its move to electronic commerce may be a defensive one, just to keep pace with competitors (e.g., in tourism). In other cases, a SME will be able to use electronic commerce to get a jump on less innovative players

in its sector by using ICTs to forge new partnerships with e-commerce-enabled businesses in other countries.

Although much publicity is given to the "B2C" aspects of electronic commerce, the greatest potential for gains from electronic commerce will come from "B2B" electronic commerce. Businesses in developing countries that make products that other businesses use are the first that should evaluate how they can take advantage of electronic commerce.

Most importantly, e-commerce is not a panacea for business growth. Many companies have tried and failed at using e-commerce, which is not necessarily easy to use. In some developing countries, SMEs have been reluctant to consider using electronic commerce because so much on the Web is in English; in others, the high cost of Internet access has been a deterrent. Indeed, engaging in e-commerce requires considerable up-front investments in time, capital, and effort.

As the three examples from Ghana, Bangladesh, and Mexico demonstrate, e-commerce is a tool that can help a well-managed company do better. Before entering the electronic arena, companies (and development practitioners) first should ensure that:

- the firm's organizational and marketing capacity is strong;
- the ICT infrastructure is adequate to support the application;
- the people using the ICTs are sufficiently skilled;
- the core product meets customer demand; and
- the commitment to re-defining the business process exists.

With these factors in place—and a little good luck—sustainable and profitable business improvements can accrue.

Footnotes

[1] E-commerce can be defined as using electronic (primarily digital) modes of communication to facilitate business process, including retail, inventory management, and customer service.

[2] One exception to this includes E. da Costa, *Global E-Commerce Strategies for Small Business*, 2001. The MIT Press.

[3] A large, on-line retail bookseller based in the United States.

[4] CIA World Factbook, Ghana 2002. Refer to www.cia.gov/cia/pblications/factbook/geos/gh.html.

[5] United Nations, Department of Economic and Social Affairs / Millenium Indicators – Ghana. Refer to http://millenniumindicators.un.org/unsd/mi/mi.asp.

[6] In addition to the cyber cafés, public access facilities that provide ICT services and access as well as training programs have emerged in Ghana. These facilities, known as Community Learning Centers (CLCs) or telecenters have grown up primarily in the country's secondary cities and smaller towns. See the case study on AED/LearnLink's CLCs in Ghana.

[7] "Internet Business Centres Spring Up Across the Continent . . . Now Ghana," *Balancing Act News Update*, issue no. 52, http://www.balancingact-africa.com/news/back/balancing-act52.html.

[8] A. Safo, "Busyinternet Launches a Nation Onto World IT Map," Accra Mail, November 23, 2001. See http://allafrica.com/stories/printable/200111230024.html.

[9] "Internet Business Centres Spring up X-Ross Continent . . . Now Ghana."

[10] "Internet Business Centres Spring Up Across the Continent…Now Ghana," op cit.

[11] R. Worth, "In New York Tickets, Ghana Sees Orderly City,' New York Times, July 7,2002, via www.busyinternet.com.

[12] This overview was prepared by Judith E. Payne with assistance from IRIS team members A. Imran Shauket, Project Director, JOBS Project, Bangladesh, Asif Ahmed, and Faisal Saeed.

[13] CIA World Factbook, Bangladesh 2002.

[14] Office of Telecommunications Technologies, International Trade Administration, US Department of Commerce. Telecommunications Country Profile: Bangladesh. http://www.tiaonline.org/policy/ref/countries.cfm.

[15] Implemented by the IRIS (Institutional Reform and the Informal Sector) Center at the University of Maryland. See http://www.iris.umd.edu/adass/proj/bangladesh.asp. See also USAID Program Data Sheet: Bangladesh; http://www.usaid.gov/country/ane/bd/388-005.html.

[16] UNCTAD e-commerce study, M. Tetelman study, BCG study on Latin America.

Footnotes *continued*

[17] B. Smith, D. Gunther, B. Venkateshwara Rao, and R. Ratliff, " e-Commerce and Operations Research in Airline Planning, Marketing, and Distribution," 2000.

[18] Information for this case study on Mexicana Airlines relies primarily on EDS Case Studies – Mexicana Airlines (www.eds.com/case_studies/case_mexicana_airlines.shtml) and Vignette, "Mexicana Airlines flies high with Vignette Technology" (www.vignette.com).

[19] The Star Alliance consists of Air Canada, Air New Zealand, ANA, Austrian Airlines, bmi british midland, Lauda Air, Lufthansa, Mexicana, SAS Scandinavian Airlines System, Singapore Airlines, Thai Airways International, Tyrolean Airways, United Airlines and VARIG.

[20] For a helpful overview of how companies can weigh the costs and benefits of e-commerce, refer to J. Payne, "E-Commerce Readiness for SMEs in Developing Countries: A Guide for Development Professionals," Academy for Educational Development/LearnLink, 2002.

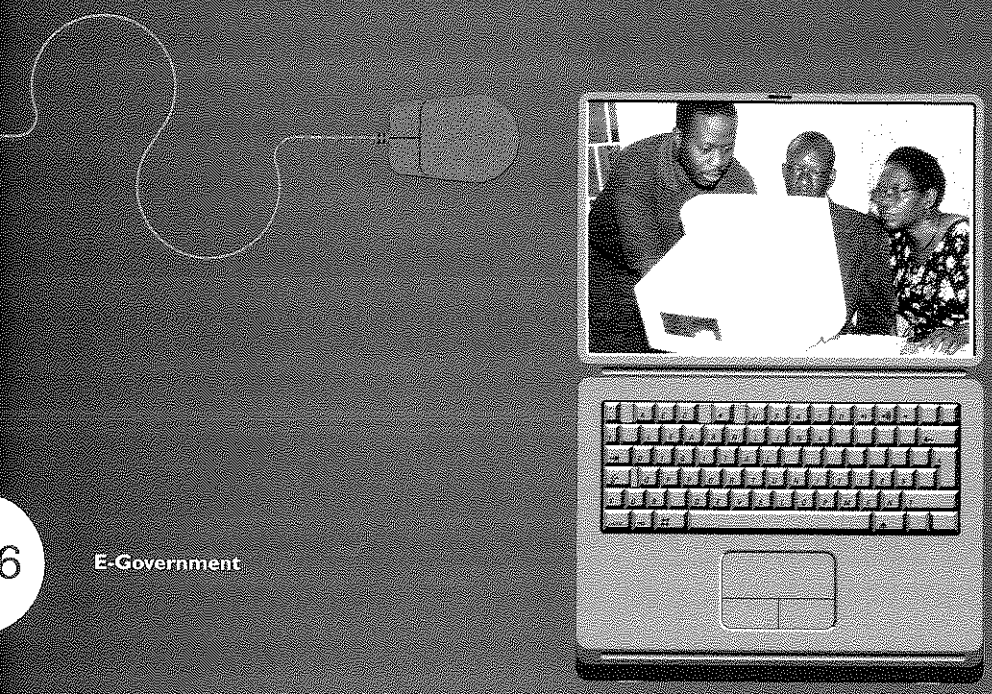
[21] This paper's conclusions were drawn from "E-Commerce Readiness for SME's in Developing Countries: A Guide for Development Professionals," prepared for AED by Judith E. Payne, November 2002

[21] See Humphrey, John, *Business-to-business e-commerce and access to global markets: exclusive or inclusive outcomes?* Institute of Development Studies, Final Draft, January 2002. This paper's Chapter VII, Helpful References, number 22.)

[22] For an analysis of the impact of e-commerce on various industries, see Mann, Catherine L., "Electronic Commerce, Networked Readiness and Trade Competitiveness," in Kirkman, Geoffrey, P. K. Cornelius, J. D. Sachs, K. Schwab, *The Global Information Technology Report: Readiness for the Networked World*, World Economic Forum, New York, 2002. (This paper's Chapter VII, Helpful References, number 24.)

An Orientation to E-Government 6

This paper provides the foundation for an e-Government model-of-use, beginning with a definition of e-Gov and an orientation to the e-Gov agenda and underlying principles and themes. It offers several sets of guidelines, resources, and conceptual, strategic, and practical tools for assessing, designing, implementing, and evaluating e-Gov initiatives and interventions in developing countries.



6 Foundations of E-Government

Eduardo Contreras Budge
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Introduction to e-Gov

Simply put, "electronic" or e-Government is the systemic use of information and communication technologies (ICTs) to support the functions that a government performs for its constituents, typically the provision of information and services. Governments worldwide have been long-time users of technology, particularly for databases, information processing, and automation. Certainly, one potential benefit of e-Government is that ICT infrastructures, architectures, processes, applications, and databases will enable better provision of information.

More specifically, e-Government can refer to functions enabled by the Internet and World Wide Web. Some use the expression "Government On Line," or GOL, to describe this stage of e-Government development, which is characterized by putting information online, perhaps with a few services added in.

Right now, there are a large number of rapidly evolving e-Gov initiatives, proposals, proponents, critics, and vendors. For example, google.com found over 555,000 references to "e-Government." Most such endeavors may be worthwhile and meritorious, and some might even be exceptional in vision, strategy, audacity, or achievement.

Though most people in the world are not online, there are increasing examples of what is visibly involved in e-Gov:

- a group of students researching information about what the Ministry of Industry and Trade does for the country's development;
- a citizen sending an e-mail petition to her elected representative;
- a vendor looking at current requests for bids to provide uniforms to the Department of Prisons;

- government employees reading their agency's communiqués and daily news abstract;
- an environmental NGO searching for Council Notes on Logging Regulations and Permits Issued;
- an agriculture co-op checking the official crop price bandwidths;
- an SME incubator applying for a Ministry of Economy credit line on behalf of a group of female entrepreneurs;
- an exporter filling out required Customs forms online;
- remote location public servants communicating with their headquarters;
- young people receiving a weekly newsletter from the municipal Cultural Events office;
- a university professor downloading Census data and statistics for her research;
- IT staff from several departments accessing and modifying a centrally-shared database;
- primary school teachers at the Ministry of Education portal, using online learning materials and lesson plans;
- an investigative reporter perusing the Governor's public works budget;
- e-mails replacing paper-based interoffice memos;
- government staff being trained in computer operations and selected productivity applications;
- telecommunications operators staying abreast of proposed regulations and notices of new tenders;
- a UACT (Universal Access to Communications Technology) citizens' group sending comments to the Ministry of Telecommunications;
- a websurfer finding, by intent or accident, a public agency's web site; and
- an enthusiastic taxpayer preparing and filing his taxes online!

At a minimum, the visible manifestation of e-Gov is individual citizens, business people, NGOs, students, public servants—maybe someone like you—looking for some bit of information, maybe guidance or an address, perhaps obtaining a government form, fulfilling an official obligation, or learning something about how an agency works. One also would glimpse, or imagine, that something was happening behind the screen, inside the particular agency or site contacted, so that one's need could be met online.

What is far less evident is the physical infrastructure making it possible. Besides the networked computer terminals and some cables, there is a supportive enterprise architecture and software, allowing for the storage and circulation of information or the networks and intranets enabling instantaneous communication. Any necessary changes are neither visible nor relevant to the average user.

What is important to understand, however, is that "e-Government" (also referred to here as "e-Gov") is not simply the presence of one or more government web sites. Even behind the relatively simple GOL façade, there is already a complex ICT enabling structure, though it may only be supporting information publishing and access. Behind closed doors, the public sector machinery, infused with ICTs, is correspondingly changing. To date, no country can say it has an e-Government. Yet many would adhere to the notion that deploying ICTs in government, particularly Internet-based platforms, already is affecting how governments are organized and conceived.

For the more advanced nations, the major defining trend in e-Gov—and the accompanying action agenda—is not just about meeting basic human development needs. Increasingly, it is also helping to shape and manage the transition from an "Industrial" towards an "Information Age."[1] With active civil societies and powerful private sectors and transnational corporations, governments are not the only actors impacting the transition. But some governments are taking their public good and service tasks to heart and actively help to guide the transition in democratic, fair, effective, and inclusive ways.

While this model does not deal with e-Governance, it is precisely the factors of inclusiveness, equity, democratic accountability, transparency, civic engagement—and other values imbedded in the notion of "good governance"—that provide a substantial ethical grounding for e-Government.

In making the case for e-Government, it is also increasingly true that developing countries risk exclusion and irrelevancy in the global scenario if no comprehensive actions for broad, meaningful change are taken. In practice, state reform and government modernization nowadays can hardly proceed without calling upon ICTs.

> **To date, no country can say it has an e-Government**

http://www/developmentgateway.org

Taken together, this confluence of factors—radical changes in the value of information, rapid advances in communication, a global economy with technology prerequisites for participation, and increasing calls for "good governance"—advances the case for e-Government.

The systemic complexity of what is understood by 'government' makes e-Gov initiatives differ from other ICT-for-development interventions by orders of magnitude. Yet an "e-Government intervention" or "model of use" is not an impossible task, and substantial steps and actions are being taken, even in improbable contexts. It is possible to devise and implement a series of interventions involving ICTs that help address two challenges facing governments in developing nations today:

- developing a public sector that is more effective and responsive in addressing persistent development challenges; and
- simultaneously helping to prepare the nation generally, and its public sector particularly, to participate in the global information and communication revolution.

E-Gov agenda

E-Government initiatives and interventions in developing regions have a large agenda and a range of pressing, strategic opportunities. Increasingly, ICTs are being employed to assist governments and public sector organizations (PSOs) both in governmental processes and services and in relationships and interactions with civil society, business, citizens, and other public entities. However, e-Gov is far more than merely enabling governments to operate electronically. As this paper argues, the public sector also must help create an overall "enabling environment" in society as a whole for e-Gov interventions to succeed. This involves

- providing and enabling a favorable environment and policies for development of ICT infrastructure, capacities, initiatives, and uses;
- creating conditions for equitable physical, technical, educational, and cultural access to ICT tools and applications;
- facilitating and promoting widespread and varied uses of ICTs by society—whether private sector, civil society, citizens, or public servants;
- guiding, supporting, or encouraging uses of ICTs for socio-economic development and country competitiveness;
- using ICTs on its own to better serve society; and
- participating in the debates and policy dialogues that are shaping global, national and local governance in the emerging information age.

E-Gov visions, principles, and themes

The e-Gov vision belongs to society, not only to public sector leaders, and it should be constructed accordingly to reflect the concerns and

contributions of key stakeholders and provide broad social ownership and legitimacy. As part of a longer-term process supporting the e-Gov evolution, engaging in "visioning exercises" can enable developing countries to determine what is or may not be entirely appropriate or feasible according to their own circumstances and dreams.

Eventually, ethereal visions for e-Gov are supplemented by more discrete guiding principles orienting e-Gov activities. Putting together principles also allows different stakeholder positions to be incorporated, i.e., some emphasizing efficiency while others rally around transparency, and so on. Once a specific vision is adopted, the range and levels of commitments can be made much more explicit.

Typically, the principles of "good governance" are imported into e-Gov visions. Good governance is defined as democratic, responsive, efficient, participatory, inclusive, and transparent. These principles provide added value to e-Gov, imbuing it with ethical imperatives as well as with a means for assessment: Indeed, one recent gathering of e-Gov experts concluded that "E-Government initiatives should be measured by the degree to which they contribute to good governance…"[2]

Reviewing different visions for e-Gov identifies some common themes. Perhaps the single most unifying theme supporting the vision is the strategic, paradigmatic shift in perspective regarding government and its constituents. The essential shift places the citizens in center stage and the government providing services in ways that make sense from the people's point of view. The shift is fundamental to e-Gov visioning—and the beauty of it is that ICTs can, literally, produce such change.

Borrowing unabashedly from the private sector, this radical change in perspective is called "customer-centric" (or citizen-centric) government. Governments are not currently organized from such a perspective but rather from the various agencies that constitute the public sector as a whole. Services have been distributed among different agencies, with one particular set "belonging" to a given agency. To access that service, citizens (physically) go there, after finding out which one it may be. The process is repeated as needed. This is "agency-centric," "agency-convenient," and bureaucracy-centered. Called "silos," these agencies typically do not communicate or coordinate with each other. The vision for change is referred to as "joined-up services," in which, thanks to ICTs and e-networks, services can join-up virtually at the center. In this e-Gov scenario, the citizen-as-customer arrives at a "single window," a one-stop-shop, without caring too much (or at all) how it is that one or several government agencies satisfy his/her need, be it a piece of information or completing an e-transaction.

From the citizen's viewpoint, this is what is called a "seamless" government. Behind the seamless e-façade, however, something is happening. The new, networked models of operation, enabled by ICTs, are interacting with the hierarchical, rules-bound, institutional organs of the state. Finally, when the process is complete, government has been "transformed." This represents the final stage of e-Gov, which is way too far in the future to be part of current visions.

One succinct version of a vision for e-Gov in the US is that it is "an order of magnitude improvement in the federal government's value to the citizen."[3] It is based on three governing principles—Citizen-centered, Results-oriented, and Market-based. Its operating principles are Unify and Simplify, both from the citizen's and the government's side. In the US Office of Management and Budget's (OMB's) e-Gov Strategy, the vision is grounded on and is one of the five key components of "The President's Management Agenda and Performance Plan, 2001." As expressed therein,

> *"Our vision combines successful online operating practices with the federal government's human capital and physical assets to build a "click and mortar" enterprise. In this vision, organizations serve citizens, businesses, other government and federal employees. Our goal is that services and information will be rarely more than three clicks away when using the Internet. Achieving this vision requires that agencies integrate and simplify their operations."*[4]

E-Gov is much more than a web site

Lest there be any illusion that it is ICTs that make a citizen-centered renewal, Deloitte and Touche warn that "non-customer-centric agencies must first put the foundation in place—that is, make the customer their top priority—before they are ready

for e-Government."[5] Consistent with others, they also note that "translating the growing awareness of constituent-as-customer into better service is a daunting task…," and "…A cornerstone of improving customer service is an agency's commitment to its people."[6] The quote is relevant for two reasons: the vision for e-Gov relates to actual service transformation, and that requires hard work, other than merely proclaiming a vision; motivated and skilled public servants are essential to move the vision forward. It also is a reminder that simply having a web site is by no means a citizen-centric public service.

With this brief background and orientation to e-Gov, it is possible to construct a preliminary model-of-use that identifies strategic steps in the e-Gov process, drawing on experience to date to inform future efforts. The nine steps described here constitute key considerations for e-Gov interventions, as follows: 1) Envisioning e-Gov, 2) Determining the role and functions of e-Gov, 3) Moving through e-Gov stages, 4) Assessing readiness for e-Gov, 5) Addressing major obstacles, 6) Planning e-Gov interventions, 7) Delivering e-Gov, 8) Evaluating and learning from e-Gov, and 9) Sustaining and scaling up e-Gov.

The first six steps concern assessments, design, and planning issues, and the final two touch briefly on matters of evaluation and sustainability of e-Gov interventions. Step 7, "Delivering e-Gov," describes the heart of the e-Gov effort, focusing on e-Gov functions, customers, and processes. While not literally suggested in the order presented, the nine provide development planners and practitioners, public officials, donors, and other constituents and stakeholders with insights into e-Gov opportunities and challenges, examples of activities and areas in which interventions might be useful, tips for crafting e-Gov initiatives —and the potential benefits of doing so for developing nations.

Step 1. Envisioning e-Gov

Perhaps the first step involved in moving toward e-Gov is envisioning what it will look like and do when it is underway. There are several ways of visioning that are useful for subsequent strategizing and devising e-Gov interventions. Probably the most difficult is to envision a "whole-of-government" transformation. Indeed, attempting to visualize a "complete" government as citizen-centric is extremely hard. A fruitful perspective is to look at one specific public service from the perspective of the single citizen and start asking what it would take to produce some feasible, ICT-enabled changes that would make that citizen's interaction easier, faster, and more effective. While the exercise is still agency-centric, it also rethinks the single agency's relationship with its constituents in a manageable way. Another way is to envision it purely from the person's perspective, around a set of his/her related needs, irrespective of the agencies that provide the services. The question to ask then would be, "What would it take, within government and those sets of agencies, to coordinate and integrate?"

These types of exercises are useful because they emphasize that engaging in visioning—thinking up and down through the implications—is better than simply adopting a vacuous and far-far-away "vision." It can do wonders for initial e-Gov interventions.

Visions, however, are not without problems. They can be affected by initial conceptions and hurried extrapolations from the private sector and, notably, corporate organizational and new management visions. Early utopian visions also have led some to expect, erroneously, that some Internet-enabled "e-democracy" or digital democracy would electronically re-engage citizens with their governments and transform government from the outside. This type of hype was not based on in-depth knowledge of the capabilities and limitations of ICTs. Neither were initial ICT and Internet practices, some of which were only geared to the "low-hanging fruit." In the case of e-Gov, it may have created the wrong illusion that having the web site was it.

Dan Jellinek, Editor of the e-Government Bulletin, claimed that "where problems are arising is not with specific service-related initiatives…but with the bigger picture—the large-scale e-Government vision in which every public sector agency and all their partner agencies as well work together to provide a wonderful seamless, nationwide gateway."[7] This is dated, yet the cautionary note remains valid: eventually, visions must prove themselves worthy of appearing achievable.

The essential point is that visions lead, and thus must be carefully and knowledgeably crafted in participatory ways to engage all involved in transforming the worthwhile vision into many realities, imperfect as these may be. To make these multiple efforts add up coherently and make a difference, the notion of an e-Strategy is welcome. A strategy has the value of approximating dreams to current situations by providing a path that can be walked. As expressed by Kate Wild while prefacing the Information Policy Handbook for South Africa:

"One lesson, however, seems to be particularly clear. Good policy must be visionary and widely owned by society; but it must also be capable of implementation – and implementation is constrained by scarcity of skilled human resources, perhaps particularly so when the new ICTs are in play…. "[8]

Step 2. Determining the roles and functions of e-Gov

One of the best investments that societies can make for long-term development is to invest in effective government institutions and transparent processes for governance. E-Government initiatives can play an important role in this context.

C.A.Primo Braga [9]

A number of good governance principles are also expressed as e-Gov functions and roles—that is, what e-Gov is supposed to do and under what circumstances. The problem arises when such core tasks are entrusted to technology. ICTs can indeed automate functions, and they can allow data and information to be stored, circulated, and accessed. They also allow for previously unachievable networking effects among civil servants and within and between agencies. *Per se,* they do not promote transparency or avoid corruption, empower citizens, or allow for their renewed participation and "re-enchantment" with public affairs. How they are deployed and used, however, may make important contributions to each of the above. This is why visioning and strategizing, along with well-thought-out implementation schemes, are of the utmost import. They enable such valued principles and functions to actually happen.

Specific e-Gov initiatives—particular solutions to some governmental problems that are associated with ICT components—can contribute to one or more of these valued functions: [10]

- Increasing the efficiency of government operations
- Increasing transparency
- Modernizing the public sector

Increasing the efficiency of government operations. Braga[11] calls this "greater efficiency of the public administration by the automation/digitization of administrative functions"—in other words, simplifying processes and improving service delivery. Resources are used more effectively, and better tools are made available to both staff and agencies, as well as to clients' interaction with the service. Efficiency gains are the first quoted arguments for ICT infusion. It is usually the first step, started decades ago when automation was brought in, but the process is a long, continuous one.

Increasing transparency. Braga also says that "ICTs can create greater transparency and accountability in the functioning of public organizations and can allow the public sector to extend its role as a client-oriented service provider. This is at the very core of the development opportunities associated with e-Government activities."[12]

Making government operations and results open to the public eye is closely related to anti-corruption initiatives, typically mentioned as another valued function of e-Gov actions. What ICTs can do, for instance, is to make public on the Web a number of hitherto hidden or non-transparent agency operations, notably but not exclusively dealing with matters in which monetary transactions are involved. These have been the most quoted examples, but they easily could be transposed into the political realm, where transparency is a key element of trust and involvement in governance matters. Thus, indirectly, it also could contribute to citizen participation.

The notion that the Internet creates transparency is not exactly true, though it does make records public and available to all interested and capable of finding them. Usually, investigative reporters, academics, the media, and concerned

NGOs are those who take advantage of such public display to produce some social effect. An extra value to transparency is that it can educate public sector staff about accountability and reduce "undesirable discretion" and crooked procedures.

Modernizing the public sector. "It should be emphasized…that in the case of developing countries, e-Gov activities often go beyond the goals of increased efficiency and lower costs in the delivery of services. E-Government projects can play a critical role in public-sector modernization programs."[13] Braga does not elaborate, but this role of ICTs is at the core of government change and, ultimately, transformation. It involves a number of activities affecting government internally as well as in its relationships with constituents. In terms of e-Gov interventions, it is wise to remember that modernization is not a whole-of-government endeavor (except when it is the national government itself that embarks on such voyage) but actually interventions that address particular areas, functions, or sectors of the government apparatus.

Typically, modernization efforts related to ICTs aim at those aspects of the government that are most closely linked to ICTs and "e-society" or "e-commerce" development—for instance, creating or sustaining the favorable environment, improving service transactions with businesses, facilitating import-export paperwork, and modernizing the capacities of regulatory and revenue-generating agencies (e.g., tax, permits, paid public services, tariffs, customs). Such initiatives may or may not help cross-subsidize other areas of government involvement, for instance ICTs in education or public access points to the Internet and ICTs.

ICT-supported modernization functions usually involve services, since they are the public face of government. Yet one must not forget that the process, even if it looked at from the citizen-as-client perspective, also involves substantial modernization and overhaul internally.

Modernizing government is not restricted to the notion of 'services.' Information is also involved, by itself or as part of the processes involved in generating and ultimately delivering the service. To start with, Government is "the single largest collector, user, holder, and producer of information," states Heeks.[14] Another name for modernizing government could be the "informatization" of government, meaning the explicit treatment of information as a public resource involved in all government operations.

Informatization includes both the information as well as the supporting structures, platforms, and processes (mostly ICT-based) that make information tangible.

Box 1 Reviewing Stages for E-Gov

Reviewing accounts of developmental phases or stages for e-Gov is important. How the stages are conceptualized prefigures a road towards achieving the vision, a sense of priorities as well as urgencies, and some visible indicators or benchmarks for progress. Just like the e-Gov visioning and strategizing, the stages-as-pathways exercise must be done right.

In developing countries particularly, where the resources for implementing parts of the e-Gov agenda may be very limited and must be strategically leveraged to produce more widespread and faster progress, time devoted to adequately "staging" e-Gov is of the essence. Plans, strategies, and implementation of initiatives based on inadequate reading of how to progress through stages poses the risk of taking the wrong path at the wrong time. It also may compromise ends and resources. Spending monies on a given route implies up-front "sunken costs" and technological decisions, which then preclude or severely limit alternative options.

In short, it is a matter of added value, though such value must be looked at in a broader timeframe and context. It may make little or no sense to move into a transactional stage when most of the agency's clients are unable to transact online. Furthermore, unlike having a web site, enabling online transactions by necessity implies substantial changes in the agency's own operations.

Step 3. Moving through e-Gov "stages"

Practically all e-Gov discussions include a "stages" section that refers to the degree of progress a government has made towards the ultimate e-Gov status. Implicit in most, however, is a presumed path that must be followed. While the 'stages' imply both front-end window and back-end office developments in the path towards e-Gov, their manifestations and indicators are most explicitly visible in the nature of the public sector's presence on the Internet.

In their simplest form, the stages refer to a sequence that starts with an initial web posting of government information, increasing over time in quantity, quality, and presentation. It is followed by the addition of some interactive features and capabilities for users. Then, some agencies progressively start offering more or less full transactional capabilities between constituents and a set of services. This is what is observable and actionable from a user's perspective. From within the government, transit from e-publishing to transactional status involves an increasingly elaborate set of complex changes in processes and structures, ultimately and ideally concluding in the so-called transformation of the State into a fully networked entity: e-Gov itself.

Even when there is a unified plan and targets governing their progress, public services do not start or progress equally. This is why the overall 'stage' of a government is a mixed bag of specific agencies' relative progress towards their desirable and achievable goals for online presence and activity. It is also why comparisons across countries are rather weak and questionable beyond some "big picture" assessments.

Generally, e-Gov reviews indicate five distinct stages, which explicitly consider developing nations and provide for the actual "placement" of different governments into levels.[15] This categorization provides some worldwide empirical grounding for the overall status of e-Gov as of this writing, though things change very fast. The key stages include the following:[16]

1. *Emerging Presence*. This initial phase corresponds with having a basic web site and being visible or present on the web. In other words, "a country commits to becoming an e-Gov player."[17] For many developing countries, progress through this level represents an achievement by itself.

2. *Enhanced Presence*. The amount and quality of information increases substantially and is also more oriented to the users' interests and needs. Governmental web sites multiply, not infrequently in disorganized and inconsistent manners. Links among sites appear, and a single governmental portal or gateway may already be emerging.

Table 1 **E-Gov Stages**

Stage	Characteristics
Emerging Presence:	Presence on the Web; basic web site
Enhanced Presence:	Emerging portal, interactivity, customer service, and links; improved quality and increased quantity of information; prolonged stage as information is digitized
Interactive:	Two-way interactivity; searchable, customized databases; extensive internal and external email communication; full or partial intranet
Transactional:	Enables complete transactions—"full, electronic case handling"; full intranet linked to external web site
Seamless:	Fully networked government with all agencies linked

Internally, questions emerge and decisions are made about what should be published—or withheld. Nevertheless, the agencies' web sites are manifestations of transparency and openness, as well as an expression of the public status and value of information held by the government. Of course, "setting up a web site does not, by itself, change the way the agency operates."[18] "Electronic publishing occurs when the agency develops its external web site to be an important element of its overall communications strategy, [… but it] still does not link in any significant way with the agency's back-office systems."[19]

This second stage is also a prolonged phase in developing countries. Even if the process of e-publishing does not become increasingly sophisticated, there is an enormous amount of print material that needs to be digitized. This enhanced presence is not restricted to a simple posting of information; over time, better document downloading options and search capabilities—some, some quite advanced—are incorporated. This "one-way interaction"[20] signals the natural transition to the next stage.

3. *Interactive*. The government's web presence "expands dramatically…," and two-way interactivity is possible. Specialized databases can be searched, and some forms and applications can be downloaded or submitted (UNPAN). At the highest point of sophistication, "users can personalize in a useful way how the site works for them… extensive e-mail contacting of officers is encouraged, and responses are timely and well-organized… The agency also has a full or partial intranet…"[21] However, it is common at this stage that emails are not answered. "This reflects the fact that it will take time to put in place a new customer-oriented organizational culture, which is a prerequisite for successful e-Government."[22]

4. *Transactional*. This is "the current stage for several agencies and the most immediate target for many e-Government initiatives worldwide."[23] As one expert describes this phase,[24] it involves "full electronic case handling." "Users can accomplish specific dealings with the agency online. Users can authenticate themselves…,[and] they can then undertake a complete transaction….The agency has a full intranet, linked to the external web site. It also may have an "extranet"… for other government agencies or contractors."[25]

5. *Seamless, Integrated or "Joined-Up e-Gov."*[26] The final stage is closer to the vision, and, presumably, the sum of all the above. The expanded prevalence of transactional capabilities throughout the public sector would lead to a fully networked government, in which all agencies are linked together—in fact, have transformed themselves to deliver information and services to citizens and clients. At this stage, government has the "[c]apacity to instantly access any service in a 'unified package.' Ministerial, departmental, and agency lines of demarcation are removed in cyberspace. Services will be clustered along common needs."[27]

For design and implementation purposes, it is important to note that, in each of the stages, behind the front-office window lays extremely complex, preexisting government machinery that the introduction of ICTs is diversely affecting. What must happen backstage is usually ignored in e-Gov advocacy, yet many of the key challenges, opportunities, and hard problems lie here, and it is an arena in which developing countries must make fast but well-supported and well-reasoned strides.

Box 2 Governments online

Of the 190 United Nations Member States, 169 or 89% had some type of online presence by the end of 2001. These 190 are the basis for the subsequent percentages noted.

- No web presence: 11%, 21 countries;
- Merging: 17 %, 32 countries;
- Enhanced: 34%, 65 countries;
- Interactive: 30%
- Transactional: 9%; and
- Seamless: none

Inf(UNPAN, 2002, p. 2, Box 2)

Step 4. Assessing readiness for e-Gov

Usually, what is addressed in "e-readiness" assessments is the country's—not the State's—relative degree of preparedness for participating in e-Gov. The readiness degrees typically are derived from a combination of quantitative country or sectoral indicators dealing with ICTs. Based on some cumulative indices, countries are ranked or grouped into stages.

Several e-readiness models support such indicators and results, and they also provide guidelines for actually performing the assessments. Some models focus on the business sector's preparedness to play an e-commerce role in the global economy, along with the country's overall ICT infrastructure conditions and the supportive policy and regulatory environment for such a commercial role. More generally, these business-oriented models assess the country's degree of insertion in the global economy and its competitiveness status and prospects, which is increasingly marked by the use of ICT tools and networks.

Even if modestly focused on only a few e-commerce factors, these models provide substantial contributions to a government's assessment of its own conditions of preparedness. In fact, most of the factors affecting the country and the economy as a whole affect the government, too, as they do the social context within which e-Gov initiatives and interventions will be deployed. Nevertheless, to supplement the above, specific e-Government readiness assessments are needed. Guides for the latter are only just emerging[28] though there are some e-Gov rankings.

Typically, though the lists, categories, and names vary, the following constitute the key components that would be considered in an e-readiness assessment. Most affect the country or society as a whole, some are more attuned to economic e-readiness, and some are focus primarily on the public sector.

- ICT and Network Infrastructure
- Enabling Environment
- Information and Communication Ecology
- Organizational Capacity
- Human Capital
- ICT Prevalence of Use
- Web presence of Government

Few assessments consider all dimensions, though assessments in several dimensions tend to overlap. Indeed, "Untangling Networked Readiness" was one of the most complicated parts of the Network Readiness Index's (NRI) development.[29]

Box 3 InfoDev Program

The InfoDev program probably has developed the best available advice and guidelines for e-readiness assessments .Though they are not geared to e-Gov in particular and do not discuss the specific components involved, they are the only ones that provide guidance for integrating assessments as a broader ICT-for-development strategy.The approach suggested by InfoDev involves four steps: choosing the right assessment tools according to country "e-goals," conducting the process involving diverse stakeholders, developing a detailed action plan, and implementing the arrived-at plan.

Based on past experiences, infoDev also provides "these few words of wisdom" for developing country leaders:

- Take a comprehensive approach to gauging e-readiness;
- Do your homework: review assessments already done in the area;
- Reflect the views of all stakeholders;
- Make results publicly available;
- Use results to develop an e-strategy that addresses how e-readiness will be improved and ICTs used to benefit the country; and
- Do not make unrealistic promises in the action plans.

E-readiness work is a tool for action in e-Gov initiatives—not an academic or a ranking exercise of "who's readier than whom." Moreover, visioning and assessing e-Gov go hand-in-hand. While a vision justifies, strengthens, and eventually defines an assessment, the latter guides, focuses, and refines the visions. Formulating e-Gov strategies and planning interventions is a frequent back and forward travel between them.

ICTs and Network Infrastructure and Access: These are the set of material requisites for using networked ICTs—"[t]he minimum necessary condition for readiness is access to adequate network infrastructure."[30] Though usually thought of as merely ICT infrastructure, this component increasingly demands a more thorough review.

It is more than "pipes" and more than the state of the telecommunications infrastructure and sector, the computers, peripherals and hardware generally, and the inter-networking capabilities of the country. In fact, the earlier notion of "ICT infrastructure" alone is giving way to a more complex "access" set of indicators, which consider all of the above but add more valuable qualifiers as well. Among them are the characteristics of the Internet service on its own, the availability of networking software, applications, and solutions, and the local support and service for network operations, expansion, and improvement. Availability also considers the geographical (and sectoral) extension of the networks, the quality of the networks, and the affordability of access for different population groups. "The exorbitant cost of Internet access is a widespread obstacle to network use."[31] "It is important to remember that the absolute cost of Internet access remains a serious stumbling block to extending connectivity in the developing world."

In developing countries, the non-ICT infrastructure must be assessed, too. It can be construed as a direct condition for ICTs and e-networks (e.g., electrical grid) or as complementary components for the country's development, e.g., roads, transportation, and postal service. Lacking sufficiently developed infrastructures—not being materially e-ready—will curtail the country's and the government's possibilities for advancing e-Gov for development. While a government is very rarely either "ready" or "not ready," "[l]ack of connectivity to the web, inferior technology, limited e-mail capacity, absence of intranets all need to be addressed within national, regional, state and local public sectors before governments can realistically expect online service delivery to be effective."[32]

Enabling Environment: An enabling environment for the government differs from that for business and for the country as a whole. While the latter is all-encompassing, the one for business is focused and leaves out factors important for human development. The enabling environment for government is closer to the nation-as-a-whole concept but focuses on the specifics affecting the progress of e-Gov activities.

One conception of what constitutes a favorable e-Gov environment is "the country's capacity to launch, sustain, perfect and promote an effective e-Government program.[33]" In this broad sense, "enabling environment" extends to a consideration of the following, each of which is assessable:

- Policies, laws, rules, regulations and incentives supporting e-Gov-related initiatives: This includes telecommunications sector regulations and incentives, competitiveness, universal service provisions, and tariffs all of which should be favorable, strategic, consistent, and productive.
- Economic and business climate: Business leaders and associations are very keen and pragmatic at noting favorable and unfavorable environments for their own development interests, and a number of such concerns can be relevant to e-Gov initiatives. The private sector has a considerable stake in developing ICT and network solutions.
- Public awareness of the benefits and uses of ICTs and e-Gov, as well as education and training for accessing and using them: More generally, the prevailing information, education, and communication ecology at a societal level is a key enabling factor for the sustainability and growth of e-Gov.
- Political vision, strategic leadership, and ongoing commitment to e-Gov.

Information and Communication Ecology: In the e-readiness rage, much attention is paid to technological readiness, but information is given far

less attention. Since ICTs and networking effectively revolutionize the treatment of information and communication, and e-Gov interventions directly impinge upon them, special care should be taken to assess these essential elements as they currently exist.

"Ecology" refers to a systemic approach to information, education/learning, and communication matters, which goes way beyond technology-dominated assessments.

If information is poorly valued, that is a crucial point for an intervention that will set ICTs in place to deal with information. Negative valuing (or mere ignorance of why information matters) must be carefully assessed to uncover the reasons for it and prepare a sound design. In the same vein, e-networking for sharing information resources presupposes there is valuable, good, reliable, and valid information to be usefully shared and, just as critical, that there is indeed a willingness to share what is typically proprietary information. Information hoarding may be the competitive advantage of an agency (or some of its officials) and a source of power.

Organizational Capacity. There are well-known ways to assess organizational capacities, as well as strategies to enhance them. Understanding how ICTs will merge into an organization is essential for a successful and sustainable introduction of technological innovations.

LearnLink's Assessment Guidelines provide ample details about how to proceed and what aspects are generally considered in an organizational assessment, as focused on its preparedness for an ICT intervention. In general, these consider three broad domains:

- The entity's "reason why:" That is, why does the agency exist, what are its purpose and functions, and who are the populations served; what is its mission, goals, strategy, culture, and leadership; how does it value information, ICTs, knowledge, and learning.
- The organization's competencies and capacities: How is it organized, and how does it operate to perform its tasks and deliver its products and services? What are its planning systems, decision-making processes, and key resources (infrastructure, equipment, finances, human resources, information, and knowledge management); how sustainable are the organization's operations and finances?
- A performance assessment: This is not an evaluation of performance itself, but an assessment of the effectiveness, efficiency, and relevance of the organization or agency vis-à-vis its products, services, and constituents.

A major e-Gov concern is "the limited back office capability to handle the new responsibilities created by e-Government." The problem arises because e-Gov projects tend to focus on "the output of services provided to external users before ensuring the administrative capacity exists to support such initiatives."[34] The whole purpose of e-Gov initiatives is lost unless the organizational and networking aspects of the public sector are transformed by ICTs. Ensuring that the receiving organizations themselves accommodate e-networking tools for better internal performance and public outputs is the defining rationale for organizational preparedness assessments.

Moving beyond the public sector, it should be noted that a rapid but serious assessment of the country's organizational readiness as relevant to e-Gov initiatives also is desirable, even if it does not sound feasible.

At one level, the country's organizational readiness is a crucial part of the overall favorable or enabling environment. At a more programmatic and operational level, it means that e-Gov initiatives, armed with that knowledge, can take advantage of suitable organizations that can provide experience, lessons and advice, potential strategic partnerships, and a pool of qualified human resources. In fact, assessments are not just about finding out about deficiencies and shortcomings. A good portion of an assessment is an inventory of existing initiatives, helpful organizations, and available opportunities.

On the other hand, if the assessment discovers a dearth of organizationally prepared entities, then an additional task for e-Gov initiatives is to lead by example and to foster civil society and the private sector's preparedness for the country as a whole. As a bonus, these sectors then would be ready to interact with the public sector's e-Gov offerings when they start to emerge.

Box 4

Role of ICTs

Even if the results are extremely long-term, a key e-Gov component is incorporating ICTs into education and the country's learning systems. Vocational training and on-the-job skills development that relate to ICTs in development should be factored in, too, as well as the emerging web-enabled modalities of distance education and learning. This is to be a massive effort if equity is sought: pilots are exemplars but, ultimately, are only brief anecdotes of what might be done.

A specific mention should be made for incorporating ICTs for development challenges, competencies, and skills into the university system of the country. Not only would some practical results accrue in the relatively short-term, as well-prepared professionals are made available, but it also would build human and organizational capacity for the future.

A strategy for developing at least components of a "learning society" also should be considered. Notably, shorter timeframe sets of continuing interventions should accompany e-Gov projects to start preparing the workforce and civil society generally for ICTs. Their role is to serve as intermediaries, providing linkages and bridging the distances while e-Gov progresses. This strategy is a powerful enabler for sustaining e-Gov growth. Moreover, a competent citizenry creates stronger public accountability for e-Gov initiatives.

These and other broad interventions go well beyond providing better sustaining conditions for e-Gov in itself. Rather, they constitute direct progress towards incorporating ICTs and networking capabilities into society as a whole.

Several e-readiness guides that are specifically geared to the commercial sector have good indications of what organizational capabilities to search for, as clues for readiness. They are particularly relevant for those aspects in which an e-Gov intervention has features similar to an e-commerce intervention or for those aspects in which the public organization shares features somewhat similar to those of private organizations and corporations. Some examples include:

- the organization's readiness and the adaptations it undertook to deal with clients electronically
- how the entity deals with security and privacy of information and transactions
- how and why a large corporation assessed itself and then planned for and managed organizational readjustments to incorporate ICTs and the Internet into its core business processes.

A particular lesson on organizational readiness can be derived from the spectacular rise and fall—and more careful current rethinking (reassessments, actually)—of the "dotcoms," such as the physical processes that must accompany virtual ones (e.g., product warehousing and transportation, or non-Internet services).

Human Capital. This component needs to be considered on two levels: that of the public sector itself, for which stand-alone interventions can be devised as a result; and that of the country's human capacity as relevant to e-Gov. In the latter case, this is an essential part of the enabling, sustaining environment for e-Gov interventions and becomes increasingly critical the more ambitious the initiative is.

Unfortunately, due to poverty, inequity, lack of educational opportunities, and a low-skilled workforce, the "ready" human capital base in developing countries is small. Within each country, of course, there are cadres of well-qualified professionals and skilled workers—pockets of modernity—and there are public and private institutions that do provide well-educated, competently qualified human resources. These are the basis for supporting specific e-Gov interventions. But they do not suffice to sustain the demand side of the equation, and there is no short-term solution for that. "Without an educated, ICT-savvy populace, no community can fully participate in the Networked World."[35]

Moving more directly into the specifics of an e-Gov intervention, even a small initiative will need to rely on some supporting key personnel from the non-public sector, for example as technicians or service providers. Thus, it is wise to have some assessment estimates of how such pools of expertise are configured and how public sector initiatives can tap into them to obtain—and afford—the needed personnel.

As experience attests over and over, project managers often will find it hard to recruit and retain the required professionals, some of whom do need to be quite technologically savvy. Developing the new competencies for public servants and training the staff from the inside of the entity is a required strategy, too, though it can have some unavoidable effects when the savviest trainees, tempted by private sector pay scales, then leave.

Prevalence of Use. What happens in society and the economy generally as regards the prevalence of ICT use affects the starting points for e-Gov initiatives. From a specific governmental intervention perspective, social and economic prevalence of use is an enabling and supportive environment, in whose absence or deficiencies the nature, scope, reach, and quality of the intervention may rest. Needless to say, the more comprehensive the e-Gov initiative is, the more the work that needs to accompany it to build such usage up, in both quantity and quality.

It is not surprising that comprehensive, whole-of-government initiatives rest substantially on the preexistence of overall social uses of ICTs and e-networking, as is the case in developed countries. A lesson that is much more relevant to developing nations, however, who lack such prevalent access and use, is the simultaneous and continuing governmental support in developed countries for strengthening the quantity and the quality of networking through a variety of mechanisms. In this sense, it is the public sector, through development assistance and donor cooperation that is helping create its own supportive e-environment for ICT diffusion.

In any given country, an intervention will have to decide how and how much to assess regarding network use, or ICT prevalence. To start with, several of the previous enablers assessed are providing good indications of ICT prevalence, or lack of it in critical areas for the e-Gov intervention. ICT prevalence across the educational sector is a good measure, as is the prevalence of ICTs used in economic activities, in different business sectors and various markets, including the ICT-related employment figures.

Even if the ICT prevalence of use is reasonably assessed, the fact remains that most measures rely on quantitative, aggregated indicators, which may not prove robust enough. As with the measures of mere ICT access (a crude but necessary first assessment step), ICT prevalence does not consider the richness or the limited use of ICTs for worthwhile purposes. Kirkman et al recognize this fact. Many of the network use indicators "do not capture the quality of such use….There is a balance to be struck between getting people online and enhancing their experience with ICTs."[36]

Prevalence of use should be a dynamic and not a static notion. Assessments will typically estimate it from available indicators at one point in time which, given the fast spread of ICTs, are quickly outdated. A better way is to estimate trends and formulate projections.

In accordance with the intervention being sought, some specific sectoral, topic, or population estimate of ICT prevalence may be simpler and more useful than some global and disheartening figures of low prevalence. It is the relevant environment for the intervention that matters, not the full context. For instance, it may matter more to know how some civil society organizations, NGOs, and community-based organizations (CBOs) are enabling public access to the Web in a given sector than to establish that virtually all poor people lack access. What would matter for designing the intervention is the prevalence of ICT use in community-related organizations per se.

Web presence of Government. The most visible and readily available manifestation of e-Gov's own e-readiness is the overall web presence of the public sector and of specific government agencies. It is a key indicator set since an impressive amount of readiness information can be gleaned out of such web sites.

E-Government Leadership at http://www.accenture.com

One major worldwide study evaluated web sites along with the other dimensions referenced above and includes a sample form tailored to public agency sites[37]. More generally, there are many good tools for evaluating web sites, most of which consider a "regular user" perspective, as well as more professional evaluative reviews. The focus, however, is always on a citizen-centric or customer-centric web site:

- overall site organization, 'look-and-feel'
- content/information presented, its breadth and depth, quality, and accuracy
- supportive underlying technology features
- navigability of the site from a user's perspective
- communicative, stylistic, and aesthetic features that enhance and facilitate use
- ability to search for and find information; downloads available
- appropriately organized, selective links to other relevant resources and sites
- quantity and quality of user services provided and the interactivity allowed
- in some cases, transactional capabilities; if so, security and privacy
- contact information and feedback
- maintenance and updating

Accenture's 2002 Report[38] assessing e-Gov progress focuses exclusively on the government's online presence. While it is a small survey—only 22 countries—it provides sound and useful guidelines for assessing online presence of the public sector. Accenture's report analyzes "165 national government services across nine major service sectors." It distinguishes Service Maturity and Delivery Maturity.

The first establishes whether an online presence has emerged, both in breadth (number of services online) and depth (level of completeness). Service can then be ascribed to a level that roughly corresponds to the well-known publish-interact-transact sequence. Delivery Maturity reflects a new stage for e-Gov progress—"the sophistication of delivery mechanisms," which equates with customer relationship management (CRM). Ultimately, Accenture groups the countries into four colorful categories, from "Innovative Leaders" to "Platform Builders."

More relevant, however, is the analysis the report makes of its findings, highlighting the notion that assessments are tools for continued action, a review of progress, and a deeper understanding of the upcoming challenges. The theme is the progress from rhetoric to reality.

The e-readiness assessment is a country and governmental tool. While there seems to be a rage for positioning countries and governments in an information race, such ranking does not really matter for what a given country wants to do. And the rankings themselves are questionable other than as broad assessors of progress or standings. Comparisons of the status of countries' readiness

produces bizarre results that adversely affect big developing countries. As recognized by Harvard's Kirkman et al, "India is effectively penalized in the Index for its size, the scope and scale of its many social and economic development challenges, and the smaller degree of IT penetration… the national data do not pick up the impacts of these regional endeavors."[39]

A country can never be e-ready enough; but one is never completely unready for e-Gov interventions, either. A nation just has to start somewhere. The next sections address such challenges.

Step 5. Addressing major obstacles

The major obstacles confronting e-Gov correspond precisely to the "readiness" factors discussed in Step 4 above. Emanating from social inequities or deficiencies in a country's or a population's preparedness for e-Gov, they cannot be ignored when developing e-Gov interventions. Fortunately, as indicated above, they are at least partially addressable.

In simplified terms, the primary challenges to e-Gov are those factors that impede the full deployment of basic e-Gov processes and the provision of e-Gov services. They could thus be approached as supply, demand, and process challenges.

"Hard" supply obstacles are, for the most part, the material technological conditions that need to be present for e-Gov to proceed (the ICT infrastructure, in short). These are not all-or-none conditions. However, the technology that is or is not in place affects how the supply of e-Gov offerings may proceed. They affect the generation and delivery of services, information included.

Process challenges refer mostly to internal public sector changes and readjustments that are concurrently required in both the operations and the structures of government agencies as the whole of government starts transitioning towards e-Gov. This is the challenge of public sector reorganization and capacity building, both for people and for the entities. More generally, it is part of the State's long-term modernization process.

Demand challenges deal with the "uptake" of e-Gov services that are eventually provided—that is, accessing and using whatever e-Gov may be providing. This is not a minor challenge. A public sector web site may never be visited for a myriad of material, cultural, and operational factors. These challenges go beyond the "first-generation ICT access problems"—"there is nowhere to access"—but they progress from there into ensuring useful and widespread access to e-Gov services.

Step 6. Planning e-Gov interventions

The good news is that e-Gov interventions are similar to other good projects in that they need to consider and solve well known issues. These are development givens, barely worth repeating here: plan well, involve all stakeholders, be participatory, set purposes, results, and progress indicators, monitor implementation, and so on.

The bad news is that the intrusion and obtrusiveness of ICTs in e-Gov projects create new challenges that defy traditional ones—and present new learning opportunities. The truth is that not much is yet known about how to develop successful e-Gov projects, though many lessons are emerging from pioneering efforts, both successes and failures. Over time, it is expected that new initiatives will build upon past lessons. Yet there is still much unexplored territory ahead.

Why is planning for e-Gov slower, more complex, and different than for other interventions, such as e-commerce? One reason may lie in the sheer size and complexity of the public sector.[40] Government affects many people, in many areas, at different levels. In addition, unlike business clients or customers, all citizens must be served, and with equitable conditions. A less noted factor also is gaining visibility: the incentives and deterrents for government going "e" are quite different than those of private sector corporations. Consider, for instance, efficiency gains that may result in a decreased budget, sharing and coordination efforts that produce loss of status and power, networking that challenges hierarchies and silo authorities, innovative solutions hampered by public regulations, and so on. On top of that, there are the general deficiencies in e-readiness factors already discussed.

To grasp the magnitude of the endeavor, consider this sobering and encouraging, not disheartening, example. Subash Bhatnagar states it thus:

In isolated pockets, innovative e-Government applications have already been implemented. However, the real challenge is to have a wide-scale impact. In a large country like India, if you do something in 200 or 3,000 places where the number of villages is 600,000, it is not going to create an impact. I believe the real challenge is to make e-Government widespread….[41]

The key issue is that, eventually, the whole of government will be affected. Since there will hardly be a full, whole-of-government approach to actually doing e-Gov projects, the need for an overall, overarching vision and strategy is essential. Though the project itself may be limited in scope, the overall approach should be coordinated, synergistic, integrated, and consistent across interventions and over time. Synergy might mean a number of diverse initiatives in scope, reach, and timing, aiming at different issues and constituencies and with differing degrees of expected impacts over the area they address.

The issue for planning, at various levels, is how to make disparate interventions come together and support each other somehow. After all, we live in a real world where full synergy and integration is not to be expected. The issue, thus, is to avoid as much as possible the incoherent patchwork of initiatives at cross-purposes with each other, each one contributing mixed signals for the rest of government and for society at large.

Since time does fly in e-Gov, and changes in ICTs and e-networking occur so fast, a forward-looking and flexible yet firmly grounded and well-thought out approach is needed. Integration and consistency of efforts and initiatives is the key. Within this, coherent revisions are made due to the learning acquired from earlier stage implementations, as well as from the fast growing accumulated experience and lessons obtained from the e-Gov journeys of other nations.

Leadership and ownership. Planning is not an abstract exercise. It is moved along by strong leadership and commitment. Thus, as in many key interventions, champions, advocates, and energetic and visionary leaders are needed to start the process and particularly to keep it moving along briskly even in the face of inevitable problems and roadblocks, disappointments, and even initial failures. There is no disagreement whatsoever as to the role that committed and well-informed leaders play in moving along the agenda and the programs of e-Gov.

Leadership is needed at all levels. It is not just the blue-ribbon Presidential Task Force or e-Gov Experts Commission. E-Gov involves many segments and levels of the public sector, with many different tasks and very specific commitments to achieving benchmarks that are inevitably set up in good e-Gov planning processes. The key point is that for e-Gov to succeed, leaders from outside of the ICT-related world need to be captured, convinced and let loose to preach, energize, push, get things moving, and secure the monies for them.

In many cases, such societal and organizational leaders, as well as politicians and high-level public officials, may not be cognizant enough of the ICT implications that are the basis for e-Gov initiatives and/or of the significance of e-Gov in the country's overall future development. Thus, another key task for interventions is to create the awareness, the sensitization, and the education of those leaders. This is a matter-of-fact situation in many developed countries, where influential think-tanks and policy-advisory organizations, as well as savvy private sector leaders and respected academicians, set themselves to the task of providing adequate inputs to those leaders.

Funding. "Be wary of shortcuts and detours," warns Janet Caldow of IEG/IBM, noting that "how fast you progress toward e-Government is directly proportionate to funding. Solid business cases can be made for that investment. And finding the right partner is critical. Governments face an almost insurmountable resource gap."[42]

Evidence from projects indicates that funding is tied directly to political commitment. E-Gov initiatives need convinced champions and marketers with deep pockets or deep influences. And e-Gov may be quite expensive, notably in startup costs.

Moreover, returns on investments are not immediate. There seems to be no clear empirical evidence for cost-effectiveness yet. E-Gov is a

long-term proposition, and results from the investment take considerable time. Costly mistakes can be made too, particularly in the hasty purchase of inadequate technical equipment, platforms, or solutions.

The money being spent in e-Gov varies according to the relative overall progress of the initiatives. Initially, procurement is always the heavy item, first for infrastructure and then software. Recent events have highlighted as never before the need for investments in security matters as well.

But funding is not just needed for infrastructure. Funding for capacity-building is essential and must be considered at design time. Training of staff, specifically, as in any ICT-related project, is always espoused as the ingredient that needs substantial and initial investments, yet when realities set in, it tends to be delayed till later or shortchanged.

One serious difficulty that most e-Gov initiatives face is deciding where the funds will come from—out of whose budget—and how they can be justified in an agency-centric and silo-based mentality with strict budgetary rules and accountabilities. This is a serious hindrance. To advance to a more horizontal and networked form of government, traditional, hierarchical, and separate vertical agencies must put up the funds. Yet the strict accounting regulations and procedures in place tend not to encourage, or even allow, for such expenses.

Step 7. Delivering e-Gov — the provision, access, and use of information and services by citizens, businesses, and government itself

This section deals with questions of what information and services to make available to whom and by which means. To see the big and simplified picture of e-Gov, one could imagine three dimensions interacting with each other, as in supply, demand, and process:

- *Supply:* e-Gov delivery functions—provision of a variety of information and services, one-way or bi-directional (from partial interactivity up to full online transactional services). While "delivering" is a must, the types and the modes of delivery vary substantially. Some are easier to deliver and/or more responsive than others.
- *Demand:* for information or services from e-Gov constituencies—citizenry, businesses, and government itself.
- *Process:* front- and back-end: The technology-mediated process is neatly manifested through an e-window, the archetypal point-of-contact, beyond which the many processes of the government machinery operate to make it happen right. Thus, for each e-Gov service provision, we consider a front-window façade, most notably the Internet/www, and a plethora of complex back-office operations—technological, organizational, and human—that support, enable, or are absolutely required to complete the e-interaction, even at its simplest level.

Supply — The Information Function of e-Gov As Provider of Public Information

Many public sector organizations are not information-ready.[43] An ICT system will deal with what it receives and treat "that" as information. A premature infusion of ICTs may only complicate the problem if it is not clear what sorts of information will go "into the system" and how will it be treated. This is not an argument for delaying interventions involving ICTs since they are part of the solution to good and future information management. However, it is a cautious note based on experiences.

The key point is that progress in information-based government is, by itself, a notable intervention. Given the nature of government and its public responsibilities, many e-Government proposals can be considered a success if simply the right information is publicly available, as a final product or even a raw, unfinished public resource that others may then use, adapt, and refine.

Not all informational tasks and phases in e-Gov have to be derided as just primitive first steps to overcome as soon as possible. (This is, by the way, one of the implicit assumptions in some e-readiness models and rankings.) Nor should they be construed as ending in purely passive, one-way provisions of just basic information. Increasingly, they are more sophisticated in their quantity, quality, depth, and inter-relatedness, as well as in the interactivity and choices that are provided to information seekers and users. One need just take a short tour around

governmental web sites across the world to see the current status and fast evolution (revolution sometimes) over a very short timeframe. In many cases, it is possible to analyze this evolution online.[44]

Remember, however, that beyond the visible Internet face, information—on its own and as handled by ICTs—presents challenges to the public sector that go far beyond showcasing and providing it. Information must be collected, preserved, and safeguarded, it must be of high quality and sufficient quantity, in some cases it must be private and secured, and so on. Several e-Gov interventions are addressing precisely these topics in developing countries.[45]

Providing access to transactional services. However e-Gov is advocated, transactions (think online banking or amazon.com) are few and barely anecdotal in developing countries generally, though there are indeed promising exceptions. When they do exist, they tend to be located on innovative private sector web sites with web-savvy clients or customers (more B2B than B2C[46]) with an adequate platform for transacting securely.

Lesser-demanding e-Gov services that can occur totally or partially online, however, are rapidly increasing, especially if they are of the one-time and/or one-agency type of interaction (e.g., pay a bill).

In the shorter term, G2B and G2C transactional capabilities in e-Gov may not be the priority in developing countries anyway, aside from some specific opportunities with global economic industries, for example, as in e-procurement, export-import, or tourism.

Government as an enabler of e-society. Treating e-Gov as the sum of information and services for specific constituencies may dilute its strategic significance. A broader notion for e-Gov, one which matters enormously for developing nations, is the government as an enabler of e-society. This may not be a key issue in developed countries, which can rely on already existing and continuously emerging strong and innovative private and third sector (civil society) contributions, initiatives, products, and leadership. But in many developing countries, it is up to e-Gov to foster, create, and nurture its own enabling environment. In an ideal scenario, this would be a truly democratic and participatory endeavor, which project conceptualization, design, and strategy choices could help enable.

In the discussion about e-Gov roles, there tends to be a focus on just three constituents: citizens, business, and the government (or its employees). This creates an individual-client-service paradigm, that is, a citizen or a businessperson looking for a bit of information or having a service interaction with an agency on a one-on-one basis.

This three-constituent view lacks a broader dimension: the country itself. While some equate the aggregation of citizens with the country, that may not be enough. In fact, the articulate discussions about citizenry, civil society, and e-Gov do not commit this reductionist mistake. A substantial number of contributions to the e-Governance agenda stem from this broader notion of citizenry and society generally participating in the construction of e-Gov as part of a broader process of constructing e-Society. It is a focus on the forest, rather than a tree, and thus, in essence, a view from an e-Gov ecology.

The government, meaning the State or the public sector, can substantially help e-Gov initiatives by enabling or stimulating "e-Society" activities for the country's national development as a whole. The rationale for explicitly linking the country dimension with e-Gov is that the "conducive environment" for increased ICT availability, development, and usage in society overall seems to be taken for granted in developed countries. Taking the enabling environment for granted is a dangerous assumption for developing countries, as is basing interventions solely on what there is, rather than what must be still addressed, if overall social development and equity is to occur.

UNCTAD[47], among others, has noted that the government in developing countries is the largest economic actor, and thus its actions are very influential. They can accelerate change and stimulate the spread of "e" initiatives overall. As UNCTAD also notes, good governance is vital for the New Economy.

In a restrictive view of enabling environment, the governmental role is described as providing business with the favorable economic and regulatory climate and incentives for investments in ICTs, notably in infrastructure but increasingly,

too, in more inclusive ICT, networking, and software solutions. While this is indeed necessary, the public sector can do much more.

There is an increasing conviction in the development community that governments should take a far more proactive role towards enabling an information society. This superior role for government involves designing, developing, and implementing policies and strategic planning regarding the role of ICTs in national development and in their countries' competitiveness in the global arena. Transformed into implementable programs, such policies and strategic planning should involve all sectors and social actors in a participatory process that promotes equity. Thus, one can advance e-Gov initiatives by making as much use of e-networking and ICT tools as is possible, thereby leading by example as well as learning the possibilities and the limits of the new tools at the same time.

Beyond developing overall policies and engaging in strategic planning regarding the role of ICTs in development, some areas in which this e-society enabling can be exerted include sector specific strategies. A list of areas might include e-business, public access, public revenues, education and social development sectors, research and development, professional development and workforce training, and so on. One area of special importance is that which explicitly deals with e-networking vis-à-vis the poor, the disenfranchised, and those being left behind.

Delivering information and services equitably. A government cannot choose its customers. By definition, a government is charged with delivering public services to a broad range of diverse constituencies. In developing countries, particularly, one of the most serious issues facing e-Gov is how to serve all constituents in an equitable fashion. Emulating business models, where customers are chosen and enticed to purchase the product or service, will not work. Nor can the service simply be geared to those who can afford it—in the case of e-Gov, to those with ICT access and expertise. A complicating factor is that "e-ready customers-citizens" also self-select to use e-Gov services, thus generating a legitimate but not inclusive set of constituents that may become the major demanding force.

So how can e-Gov serve all equitably? For developing countries, and in varying degrees, the following may be useful:

- E-Gov will not relate directly to most citizens but should grow in extension and quality over time.
- Choose the first citizens and the first services carefully and do not forget what is missing and what was left behind. Correct your mistakes soon.
- Never equate "e-citizenry" with "citizenry."
- E-Gov is part of the larger Government. There are definite responsibilities and actions by government agencies to sustain equitable services to all citizens. Much of the citizen-centric approach can happen in the back-office.
- E-Gov is part of a broader public sector reform. Ultimately, much of what is done there, "e" or not, directly affects the quality of service to citizens and the government's relationship with the citizenry. In other words, e-Gov, as regards a citizen focus, may not be much concerned about generalized access at the beginning, but more interested in actually using ICTs and networking internally to better serve the citizens.
- Be proactive, open, and attentive to citizen needs and initiatives that bring the "e" closer to both government and citizens. Part of the proactivity and the better relationship with citizenry in general, and a few parts of it specifically, can be expressed in the new public faces of public agencies, that is their web sites. Even if they cannot provide some services, they can offer, at least, some information and an image of modernity, transparency, and concern for the public.
- While having a master vision and strategy for citizenry in e-Gov, let the "one thousand flowers" of citizen-oriented initiatives bloom. Be sure to do the landscaping, though, and do it in a participatory manner.

The new e-Gov strategy[48] in the US, for example, focuses on four citizen-centered groups, the first of which is directly responsive to Individuals/Citizens. The citizen/individual, or G2C, is summarized as "build easy to find, easy to use, one-stop points-of-service that make it easy for citizens to access high-quality government services."

> **Being online should be preferable to being in-line.**

Citizens are not just consumers of government information and services, but this is certainly one valid aspect of citizenry. Governments provide services, and citizens also comply with a number of public sector directives and duties, and not exclusively as "civic" responsibilities. The customer dimension is not the only one, but it does matter, and it matters more when the e-citizens-as-customers already have experienced some e-services elsewhere in the private sector and expect similar advances and convenience from the government.

In practical terms for interventions, it means e-Gov can move along hoping for, and creating elements of, e-citizenry, but e-Gov initiatives can make sense on their own even as preconditions for generating citizen demand for e-Gov services. As the US Government (OMB) says, "Only through changing how we do business internally—that is, streamlining work processes to take advantage of modern IT systems—will citizens experience the transformation envisioned."[49]

Specific action items for a citizen-centric e-Gov include the following:

- Ask and listen to the voices of very different people; tryout and test concepts, prototypes, web sites, and services with different communities.
- Build a better web site. Enough is known about how to do this. A web site is an extremely powerful communication device. Treat it accordingly.
- Change the government mindset, at all levels. E-Gov grows citizen-centric, it doesn't happen overnight.
- Promote and offer incentives for public take-up of e-Gov services and informational offerings. Ultimately, a citizen-centric approach will be effectively demand-driven, not supply-forced. This will take not only time, but also the actual development of the enabling societal, cultural, and technological conditions.
- Pilots and demonstration projects may be a temporary way of doing business, with valuable learning accruing.

Interventions aimed at providing the public and different groups with access to ICTs and Internet, as well as with support and training, provide useful catalyzers and enhancers of citizen demands for some e-Gov services. Generally, access to and use of e-Gov by common citizens can be improved by expanding points of access, providing training and learning opportunities, and developing user-friendly and useful, focused web sites, based on the following elements:

- Understand access and use as a societal, rather than as an individual factor. (In developing countries, the individual ICT ownership model is not relevant.) Telecenters are one case in point, as are ICT Resource Centers for the educational community, or Infocenters located in SME incubators or associations, as well as computers in schools, universities, and in NGOs. The notion can and should be extended to private sector initiatives, beyond the obvious one of cybercafes.
- The second key element in fostering access and use is the notion of intermediaries. Some people act as 'infomediaries,' similar to librarians, capable of accessing the right information or answers from networks and the Internet; some act within the ICT-site context as technology-enablers or champions,

people adept both at the ICT-networking skills and the interpersonal skills. More generally, these mediators are the missing link between e-Gov offerings and non-ICT versed people who are nevertheless governments' constituents and customers. Heeks has the same notion:

> *"…a substantial need for a third model—of those who are neither direct owners nor direct users of ICTs. To benefit from e-Governance, these people will have to rely on 'reintermediation' models that insert a human intermediary between the citizen and the growing digital infrastructure of e-Governance… Realistic e-Governance for development projects will therefore have to identify and nurture such intermediaries."* [50]

- A third distinctive element is that citizens, communities, and prospective users of e-Gov services need to know they exist. Awareness and social marketing campaigns are thus needed, too, as well as social advocacy efforts.

Demand: Three Main Constituencies for e-Gov Services and Information

Access to government services is usually treated from the perspective of three main and distinct users at the national or country level:

- People, citizenry, civil society groups, and organizations
- Private sector, businesses, markets
- Public sector, government, or the State itself and its public servants. Note that the government can be treated as a third main user though it has special windows and more doors than do "outside" users.

A fourth cross-cutting dimension can be added when local and global boundaries are crossed, as is increasingly and inevitably the case.

These simple categorizations underscore the point that there is no single, one-message, one-channel fits-all paradigm. There is no average user. Each has its own features and needs, and e-Gov is supposed to be user-centric, that is, able to cater to each and all. This further complicates the transition from a supply-oriented to a demand-customized paradigm for the public service.

Regarding transactional services, this heterogeneity and uniqueness of 'customers' is precisely the complicating factor. It is somewhat easier for information to be targeted somehow, or self-selected and filtered by the user, than for the unique interactions that involve real two-way exchanges.

Different governments provide different macro solutions for this user-focus. In the redesigned USA's FirstGov.gov, for instance, a distinction among the three groups is readily apparent on the homepage itself.

What people, citizenry, civil society groups, and organizations want. It is at times surprising to know what surveys say about what citizens want provided as e-Gov services. In some developed countries, for instance, there are preferences for renewing a driver's license, getting a fishing permit, accessing information about national parks and making reservations, obtaining vital life certificates (birth, marriage), and, inevitably, taxes. But primarily, what citizens do online with the government, in developed nations, too, is search for specific information. And they usually find it.

A recent US poll entitled "The Rise of the e-Citizen" suggest that "while many government site users focus on their personal needs in dealing with government agencies, there is abundant evidence that a new "e-citizenship" is taking hold."[51] That is, people are also searching for information on public policy issues, and many have already sent comments to public officials. The report is of interest because it shows how some conceptual distinctions are blurring. Similar reports of actual usage are emerging from other developed countries. In this case, citizens act as customers interested in a service concerning them, but they also look for policy or "civic" matters. They actively look for information, but they also interact and, in far fewer cases, complete a transaction. And they are still exploring and learning how to do all of this at the same time they are actually doing it.

Even if few citizens or community groups actually access some information, the fact that some material products of hitherto obscure government processes are made public may be of immense value. This is the rationale for espousing transparency, anti-corruption efforts, and accountability via e-Gov procedures.

One high-level former IDB official, under the lead "Make every citizen an auditor," notes that "procurement represents a huge amount of money—between 10 and 15 percent of GNP in many countries…and today…whatever happens in the public sector is now in the public domain," thanks to the communications explosion and the constant scrutiny.[52]

If, on the other hand, some information is provided in e-Gov web sites as a purported solution to the development, social, or personal problems of constituents, then the relevance and efficacy of the information must be assessed. UNDP[53] notes that:

- ICT initiatives will not be appropriated unless they deliver information that is relevant and useful to the end-users….
- Even if the information accessed is useful, development outcomes will be negligible unless the end-user has the capacity to act….and
- ICTs work best when they render more effective existing or clearly desired information flows.

The information in government web sites is increasingly more specific and linked to possible interactivity between the citizen-as-seeker and a public official. Increasingly, too, it is an integral part of services provided. A newer trend is more demand-oriented, rather than supply-driven, as a result of increasing levels of government readiness in ICT infrastructure and platforms. Thus, what matters now is what citizens want, not just what e-Gov provides.

Ultimately, e-Gov must not only provide useful information, but demand-driven services as well. To accelerate online service provision and ensure uniformity, compliance, and integration, governments in developed countries mostly establish ESDs, or electronic service delivery targets.[54] An early lesson is that not all public agencies need to do the same things at the same time, nor equally so. Rather, tailored targets are needed.

Governments are organizing the gamut of services offered to citizens according to a number of parameters, all of which share the notion of a citizen's point of view. For joined-up services to progress, governments will have to reorganize what they have to provide according to subjects and citizens needs, not according to which agency may provide all or parts of the service or information required.

This organization of online services runs counter to commonly held notions of government, which we have all encountered during most of our lives. Three examples, into which developed nations have put considerable resources, illustrate. Note that these efforts rely on very enabling contextual factors, both social and technological. The first is the current US e-strategy for organizing citizen-centered projects into portfolios. A site in progress is www.recreation.gov. Another example is an eligibility assistance portal, an online tool for locating government benefits for citizens. And FirstGov.gov lists several online services for citizens, such as Find a Government Job, Volunteer, Zip Code Look-Up, and Change Your Address.

Information as a Public Resource.[55] The topic of information as a public resource is most cogently addressed by Crossing Boundaries, a Canadian organization. In fact, their overall synthesizing proposal for e-Governance and e-Government, as presented by Donald Lenihan, is composed of three main areas: improving service delivery; information as a public resource; and e-democracy, or extending the "public space."

The first one goes beyond government online, implying back-office clustering and integration for customer-centric and "seamless" e-Gov. The second addresses how to "liberate" the information the government has, and the final one has to do with governments and citizens, going far beyond service provision and information access. This is also in line with our own conception of e-Government as a tool for good governance.

The essence of Crossing Boundaries' argument around reversing the notion of e-Gov as service delivery into a new, complementary perspective that focuses on "the new information capacity" of e-Gov:

> *"…the new infrastructure creates far more than new plumbing; it also creates a dynamic and powerful new capacity to collect, create, integrate, share and store data and information…, shedding a new light on e-Gov, leading us to look at the role and value of information as a new public resource."*[56]

There are four major challenges and roles for e-Gov in this regard:[57]

- "Make government a preeminent source of quality public information." As e-Gov progresses in integration, and as ICTs become more sophisticated in their power and uses, e-Gov "will penetrate them (the nooks and crannies of the government edifice), liberating much of the information from isolation and obscurity." This naturally involves strategic and practical challenges—and thus provides intervention opportunities. Lenihan highlights two: how to guarantee reliable, authoritative information, and how government should be "a manager and guarantor of information," in the face of so much poor, unreliable, ambiguously trustable and advocative or private interest information bits. In both cases, there is a public expectation for quality government performance. "A key challenge… for governments is to begin treating their information holdings, and their information capacity, as a major public resource that should be put to use supporting citizens, businesses and other organizations."
- "Make government smarter." That is, use the information for better policy-making and better public debate, typically hampered by lack of enough and easily available information.
- "Make government more transparent and accountable." This is a more complex issue, dealing with how the transition from machine-modeled to networked-modeled government needs new forms of accountability, rather than the chain-of-command form.
- "Make government information a public resource." "Knowledge is power. As a result, governments are often hierarchical, secretive, and controlling about information… Moreover, the processes by which information has been used to arrive at decisions are often less than transparent." E-Gov, adds Lenihan, "requires a different kind of culture—one that is less controlling and more collaborative, less hierarchical and more horizontal, less secret and more transparent."[58]

The European Union has recently adopted a proposal dealing with "improving access to and expanding use of public sector information."[59] The proposal for the EU Parliament and Council says, in part:

Within the exercise of its public tasks, the public sector collects, processes and disseminates huge quantities of information….Citizens and businesses alike can greatly benefit from a good provision of this type of information on the Internet. It will facilitate their

Box 5 Information Is Power

Interventions, whether e-Gov or not, take into consideration the questions of power in its varied forms or proceed at their own risk. Power matters in organizations generally, and, specifically, it can make or break e-Gov interventions.

Without going into such issues as privacy, publicity, security, and accuracy, suffice it to say that the Internet-using public in developed countries has become personally aware of them while using the Internet for informational or service/transactional purposes. Savvy users and watchdogs have warned about the potential or actual risks of misuses of personal information by some unscrupulous private sector dotcoms, whether voluntarily or inadvertently provided by the user.

Even in the most perfect and innocent of all governments, how do constituents react to all of their personal information being potentially available to the whole-of-government or to the public-at-large, by intent or by accident? This is indeed a complex set of related but separate issues that are being addressed by concerned public and private bodies. For instance, consider the public availability of information versus the right to individual privacy.

communication with the public administrations and can increase their participation in the democratic process. Public sector information is very important for democratic and civic life. Equally, public sector information is a key resource for economic activity and proper functioning of the internal market….Indeed, public sector information also has a considerable economic impact. [60]

This provides a new, fresh, and provocative perspective for e-Gov—and not just in Canada or Europe. Indeed, in developing countries, a majority of citizens lack appropriate preconditions to access government-held information or even services. While poor governments may be reluctant or even ill-advised to spend copiously on developing e-services for a minority, such an investment as part of a broader development agenda for the nation as a whole may be viewed as justified.

Secondly, in developing countries, private sector involvement with ICTs may be fragile or indecisive, and lack of access to ICTs—as well as lack of direct relevance to the population's daily chores and needs—impedes or inhibits civil society's endorsement and sustained use. Steps towards e-Gov can have a significant effect in increasing the spread and use of such tools for national development. Pioneering PSOs can model good practice and stimulate experimentation and adoption of ICT tools across the rest of government, society, and business. In this sense, e-Gov initiatives can showcase the product and create the market.

What the private sector, businesses, and markets want. The so-called Government-to-Business (G2B) and Business-to-Government (B2G) areas of e-Gov actually deal with a series of different actors, arenas, and levels of government, private sector, and market relationships. By their very nature, these G2B2G relations also differ substantially from how government relates to its citizenry. Three key themes are involved:

- *Individual businesses as clients or providers of e-Gov.* The predominance of the flow is B2G, even if in response to a G2B request, e.g. taxes, procurement, tenders, etc. B2G also concerns e-Gov funding options, provision of ICT hardware and equipment, and, increasingly, complete ICT, networking, and software applications solution packages.
- *The private sector in varied roles and levels.* inclusive of public-private partnerships, as an indispensable and experienced actor in e-Society, e-Business, and even e-Gov itself. These are B2G contributions and influences for e-Gov that go beyond a purely commercial transaction. They matter very much to interventions, since they transcend specific and project-bound procurement and vendor contractual relations.
- *More generally, the regulatory functions and roles of e-Gov vis-à-vis markets and the private sector and involving ICTs and e-networking.* Some of these markets and their actors are not local or national. Thus, there are set of local and global e-commerce rules as well as national rules regulating e-Gov's relations with corporations. The flow of relevance here is mostly G2B, since it is about fostering the enabling environment and the conditions both for specific B2G and G2B transactions as well as the more general e-Society, e-Business, or e-Commerce initiatives. There are, of course, B2G contributions to the creation of this environment—the private sector does not simply wait. When strong civil society groups have established themselves as legitimate stakeholders in e-Gov and e-Society, there may as well be C2G inputs.

The most elaborate examples of e-Gov in its transactional capacities revolve around some specific form of G2B/B2G interaction.

For an e-Gov intervention based on the above three G2B areas, three key areas of consideration are relevant to activity design and strategies:

- *Better business via e-Gov:* For starters, the private sector derives an overall benefit from clear, fair, and stable rules—and an enabling environment generally—for its incursion into e-commerce or e-Gov. It also benefits, more generally, from participating in a modern economy with a modern public administration. This transcends local frontiers. An additional benefit promised by the introduction of ICTs into public sector organizations (PSOs) is the efficiency and transparency they would facilitate. The cost of doing business with the government is decreased. Several business advocates for e-Gov cite these factors as powerful reasons for supporting it.

> **"We're in the business of selling databases, and you're buying too many of them"**

Larry Ellison, Oracle Corporation

- *Suppliers of technology solutions:* This is an obvious second area of relevance for interventions. Private sector companies have increasingly gone beyond merely supplying "pipes." In fact, they may supply hardware equipment, telecom infrastructure and capabilities, software and applications, architecture, data and information management, etc.
- *Learning from the private sector, tapping into its e-expertise:* The third consideration for e-Gov is the ICT experiences, resources, lessons, and professional expertise residing in the private sector obtained from applying ICT solutions to business processes. While this expertise derives particularly from large enterprises and corporations, increasingly, the private sector is gaining expertise in the e-Gov arena itself.

There is a de facto risk that e-Gov projects and priorities may end up catering to e-business clients and concerns. A number of countries, says UNPAN, "have created for themselves a temporary dilemma: choose between a citizen-centric approach or prioritize information and service delivery to address the needs of a specific sector: i.e., the business community[61]." This is a strategic approach, UNPAN adds, "preferred by many developing and newly emerging countries… since it… supports the premise that ICT led economic growth has consistently raised economic productivity, created jobs and increased income."[62]

What Government itself wants. The public sector itself can be a primary user or beneficiary of an e-Gov intervention, with public agencies and civil servants taking advantage of data and documentation exchange, shared databases, e-mailing, intranets, and both formal and informal integration and networking between agencies. In this sense, governmental actors are also constituents, though with considerably more access, open doors, and privileges than outside users. Nevertheless, they also represent the user's perspective.

Information inputs, processes and outputs are core parts of government operations. Interactions proceed, internal transactions occur, and services are performed or exchanged among agencies, with or without ICTs, not to mention all the 'flows' between public servants or government employees. Thus, even if no constituent services at all were provided through e-Gov access points, an ICT infusion could provide dramatic improvements in the flow and management of information within government. Such a challenge alone would be basis for a solid vision for e-Gov, since it would involve far more than a web site presence. It probably would be evidenced first as visible efficiency gains in government processes.

Information, data, knowledge, records, and archives all reside—in varied organizing systems or schemas—in quite different public sector entities simply grouped as "government." In many cases, information has not yet been digitized at all. In

http://www.firstgov.gov

others, information may be residing in not fully compatible legacy informatics systems and databases.

In a World Bank-supported e-Gov intervention in Ghana, "three million inactive files made it extremely difficult to locate information about any aspect of government policy or service delivery, while creating easy opportunities to hide the trail of corruption."[63] The document states the relevance of good records management for computerization and eventually, as a key contributor to the reform and modernization of the public sector agenda.

The magazine FCW reports[64] that government needs to "avoid information fragmentation" and use fewer, larger databases. As Oracle Corporation's Ellison put it:

Information has acquired a new, visible value in the networked world. Yet changing how information has been dealt with traditionally in the public sector presents a challenge in which, if ICTs are the tools, civil servants in public entities are the main actors. The changes range from such simple routines as using emails instead of memos or walking to the other official's desk, or standardized forms for archiving documents then shared in a database, to more daunting changes, such as officially-sanctioned "communities of practice" across agencies. Every new practice adopted means an older, sanctioned, and established habitual practice needs to be abandoned. This is not done fast.

A recent UNESCO-COMNET study of 15 e-Gov profiles notes that, "the real challenge in administrative systems reform is the inculcation of attitudes that acknowledge data and information to be a corporate resource—and therefore shareable and subject to standards—as well as introducing process and regulatory changes that fly in the face of established hierarchical decision-making structures."[65]

This is thus a ripe set of opportunities for e-Gov interventions: getting the public sector staff prepared for e-Gov changes. Again, this can be initiated with a rapid assessment of the PSO's and its staff's e-readiness, inclusive of information-readiness, for e-Gov.

Processes: Web sites and portals are the most visible manifestations of governmental information that is made publicly available.

Currently, most countries have varied web sites of public agencies, ministries, and, increasingly, a unifying central government portal.

Based on their USA review, Leigh and Atkinson note that what one is likely to find at a government site are single-agency links to 'their' information only, self-publicity and promotion of the agency, press releases, "indecipherable acronyms," "unfriendly portals" (after the front page), and "search engines that don't work."[66] Thus, they suggest these "actionables,"[67] most of which readily apply, even if in a more modest scale, to developing countries going online:

- Web site design based on consumer needs
- Customer-focused Web directories
- Intergovernmental sites
- Empower e-Gov advocates to cut through bureaucratic barriers
- Allow users to personalize pages
- Extend the .gov domain to state and local government
- Obtain continuous feedback from users

On the positive side, setting up and sustaining an official government portal indicates clearly to those who access the sites the relative status of e-Gov. It is, thus, a set of concrete products, a benchmarking tool, as well as an evaluative measure. On balance, this is the significant value of going online, even if learning is not yet complete.

The portal paradigm embodies the one-stop-window, citizen-centric approach, which is not yet widespread. Single-entry points eventually involve intra-government reorganization or, at least, interagency cooperation. In fact, once past the portal, the same old individual, isolated, and unlinked agencies may still pop up, as they do in any region of the world, developed countries included.

Portals should not be thought of as the simple entry point to diverse and poor-quality web sites within which the user is then abandoned. The design and architecture of the portal signals considerable governmental progress from the first stage of 'webification.' It is a gateway that holds promise and the opportunity to start reintegrating agency information and service offerings into a more customer-centric format. And powerful but easy to use technologies such as new generation search engines "would break down the barriers for citizens who want government services but do not know where to get them."[68]

Vivienne Jupp of Accenture makes one of the best and most succinct appraisals of what progressing towards portals means strategically for e-Gov:

In the first generation of online presence, the implementation hurdles of making e-Government programs come alive…have been immense. But with…portals, these hurdles become less of a barrier…. While demanding strong levels of interagency cooperation, it does not require the wholesale dismantling of existing government departments in order to create a new interface to the citizens and businesses governments serves[69]*." The virtual agency is linked to the physical agency in a way that is invisible and effortless to the user."*[70]

Several good examples of single entry points already can be found in both developed and developing countries. According to Deloitte-Touche[71], four major attributes characterize customer-centric portals:

- Appeal to customers' initial interest plus return to it
- Aggregate information about accessing services
- Fulfill customer demands for services
- Connect portal services to databases integrated in back-office

The enormity of such tasks may explain why e-Gov may look stalled, worldwide. As Federal Computer Week[72] observed, "Electronic government is popping up all over the world….But e-Gov's global development remains largely haphazard…and functionality remains limited." The reasons may be that "reality set in," up-front costs are considerable, and offering services is more complex than realized.

Meanwhile, portals "have proven ideal for imposing some logical order on the large quantity of information and services governments offer online," notwithstanding the fact that "e-Government is so complicated."[73] As the Gartner Group indicates for higher-level stages of e-Gov, more back-office work needs to be done. "A framework that improves the efficiency and effectiveness of all critical activities will do more for e-Government in the long run than a better portal.[74]

Back-office operations and public sector reorganization issues. The within-government travails of e-Gov, typified here mostly in the discussion about information flows and interactions within and among public offices and between staff, have a front-window or user expression. Common to all such front-end uses are the back-office processes and structures that allow for it. While some of them are unmistakably technological, many are human and organizational.

The issue and challenge for e-Gov interventions is that there is very limited back-office capability in government to handle all the

information chores that appear so simple at the web site window to Government information and services. In fact, the back-office operations that enable a seamless government as seen from the client's perspective are increasingly complex and demand far more sophisticated and expensive ICT integral solutions. As Lenihan[75] argues, "providing clients or citizens with what they regard as seamless service would require much higher levels of coordination and cooperation between departments…" In other words, seamless service is not the equivalent of seamless organization. The government portal provides the front-end façade of some degrees of "seamlessness," but the fact remains that the virtual agency is not the actual, physical "bricks-and-mortars" government.

The UK calls this back-office work that enables the front-window integration the "joining up" as in joined-up services. It is a goal, and it requires special, substantial, long-term, and integrated work—another intervention arena.

Back-office transformations eventually define what e-Gov is about. The more the e-Gov interventions progress beyond passive information provision, the more transformations within government are needed, and these are increasingly only possible through ICT deployment.

In intervention terms, this implies addressing strategic and shorter-term tasks that advance the organizational and functional requirements for e-Gov—that is, interventions to manage the transition within a PSO—or the whole of government—to eventually transform itself into an information-based and ICT-enabled public sector. These tasks, which are best treated as parts of intervention strategizing and planning, include non-informational components such as infrastructure, architecture, investments, leadership, managing change, capacity-building, and other conventional programmatic matters.

Delivering e-Gov locally. For e-Gov interventions in developing countries, the local context seems particularly suitable for a number of pilot or full-fledged initiatives. Though the model has focused on national government, much of the argumentation advanced is applicable to the local levels as well. Whether ICTs are used within a given local environment, or as facilitators of communication and common projects between local governments, there are good reasons for and solid examples of e-Gov at these levels. For one, interventions are more manageable at the local level. Pilots and low-risk, flexible experimentation can occur, projects can be discontinued or substantially reformulated, successful activities can be showcased and paraded, failures buried and retried elsewhere, and so on. Local interventions also are financially more affordable, the obstacles are more addressable, controllable or sidestepped, and the timeframes and resources involved are more manageable.

The local arena is a natural ground for experimenting with new local governance styles—for instance, involving community groups and private sector entities in for socio-economic development that includes e-Gov mechanisms as expressions of modernity and efficiency.

Even if a local government has insurmountable access and e-literacy problems among its constituents, that does not prevent the local authorities themselves, or a few techie-inclined municipal professionals, from linking up with other similar local governments on one-to-one or association modalities, irrespective of their geographic or sovereign location. In fact, linking local governments, similar and dissimilar, and across national boundaries as appropriate, is a viable and attractive e-Gov intervention. Even if no common services or transactional e-capabilities are implemented, the sharing of informational resources, experiences, and learning is in itself of enormous value to otherwise small, isolated, and low-institutional capacity local governments.

One as yet unsolved issue in e-Gov, however, is the relationship between different levels of autonomous governing entities, e.g., national (or federal), state (or provincial, departmental), and local or municipal governments. How are the legitimate attributions and responsibilities of each preserved, combined or integrated? This very real jurisdictional issue fundamentally affects the stages of e-Gov in which transactions may occur, and particularly when devising and implementing citizen-centric access points to services. The bottom line is that the user wants a solution, never mind if the provider is a local or a national government entity.

Going global. For practical reasons, most e-Gov proposals, guidelines, and interventions stay within the confines of a given, fictionalized developing country, isolated, as it were, from the global environment. While global governance issues greatly exceed the scope of this model, the issues must be indicated at least. Not only are they part of the enabling—or restricting—environment for e-Gov, e-commerce, and e-society, but they matter very much to developing nations.

The governments of developing countries have a limited say and power in global matters, in part because globalization is mostly economic—and clearly enabled by advances in ICTs. However, evidence indicates that global governance arrangements could help address some negative aspects of global development trends and persistent inequities, as well as extend and accelerate some shareable e-Governance procedures and resources for the global public good.

Powerful social actors in the global arena include international bodies or donor agencies of developed countries, private corporations, and international or northern NGOs. They are well equipped with technological prerequisites and resources and are very knowledgeable in sophisticated and productive ICT usage. They also tend to define the agendas for e-Gov, inclusive of interventions.

Interventions that enhance developing countries' active and knowledgeable participation in these global fora and taskforces contribute to better e-Gov initiatives at home. While some actions pertain more to the global arena, many of them start by building local capacities and are thus possible components of in-country e-Gov interventions with a double payoff: national and global.

Step 8. Evaluating and learning from e-Gov experiences

Evaluation in e-Gov interventions must absolutely start together with the intervention itself, that is, from the early conceptualization and design phase onwards. Even if the e-Gov intervention's premises and design are right, evaluation must look at what actually resulted from the intervention, compared to what was originally intended. Then, there is the question of what actually transpires in e-Gov interventions, that is, the realities, hardships, and surprises of implementation and execution. Simple and timely monitoring and formative evaluation processes and mechanisms have to be set up. In several cases related to ICT and network usage, automated tracking procedures can be used, though care must be taken to preserve the subjects' privacy and anonymity.

Over time, the evaluation focus will change. Initially, after preparatory assessment periods, the next focus is on developing indicators for expected results and outcomes and monitoring, even in very simple ways, the initial processes. Qualitative methods are quite suited for evaluating users' experiences, interactions with e-Gov products and services, or testing a transaction or a look-and-feel of a web site.

Generally in e-Gov, one sees a transition from supply-oriented to demand-oriented evaluation variables. Supply variables are those related to the provision of e-Gov, such as a web site, PSOs' offerings, inputs and outputs of public sector staff preparedness, and accomplishments of government-set milestones. Demand-oriented evaluations look much more into the clients' perspectives and actual uses of e-Gov facilities, processes, and products.

Demand-based evaluation starts with gauging users' first impressions and actual hands-on experiencing of prototype government web sites (e.g., alpha and beta testing) and even the concept for the potential web site, portal, or gateway. Through a mix of quantitative and qualitative approaches, this type of evaluation then continues to measure increasing access to and usage of the sites. The most recent verb for this latter stage is "uptake," which is the actual usage of governmental web sites and the proactive measures to be taken as result of the evaluation. Uptake also will reveal real and potential disparities and inequities that need to be addressed.

E-Gov is a momentous innovation, in scope and implications. Per force, it calls for innovative strategies to move it along from partial successes too replicable and scalable experiences. "Bureaucracies had to be rules-based in the past. But today, they have to be results-based, flexible and accountable. The move to e-Government requires us to be innovative."[76]

An innovative strategy requires quite explicit learning processes. If e-Gov is to be coherent and

successful, learning must flow freely to the highest level as well as to the most humble activity. More emphasis should be put on how exactly to translate lessons learned and experience gained into clear-cut guiding principles and actionable work plans. There is much talk about the value of lessons learned but not enough listening, much less learning. Innovativeness will not go far unless good learning and communication procedures are in place and put to actual use.

Because some obstacles are considerable in the shorter term, actions should be taken to start addressing them first, as part of an inclusive e-Gov strategy. These actions also can be implemented as interventions to support e-Gov on their own. Concurrently, some obstacles may have to be taken as givens, sometimes even for the long run, such as deficiencies in infrastructure, ICT access, e-literacy, and extant public sector capacities and resources. Interventions should proceed around them while keeping the ultimate development purposes in mind.

Evaluation also should help define and then measure the extent to which benchmarks are achieved. Initially, e-Gov benchmarking was a risky exercise. Nowadays, thanks to accumulating lessons, there has been some accumulation of what constitutes achievable benchmarks in a given time if the appropriate resources are mobilized. This is a case-by-case procedure, whether the benchmarks are for the country's government as a whole or for an individual agency. In both cases, care must be exerted to ensure the benchmarks are sensible. For instance, it may not be relevant to e-Gov progress (let alone feasible) that all public sector organizations have an online presence with specified features by a particular time.

The UK has set up a benchmarking procedure for its Electronic Service Delivery[77] that measures progress towards core government services targeted for 2002. Reports are available for 2000 and 2001, and the template allows for international comparisons. The purpose of the exercise is to derive lessons regarding the introduction of e-services in the first report and to expand and topically specify such cross-country lessons in the second one. The example is indicative of the level of sophistication that evaluation functions have in e-Gov progress. Such benchmarking is applicable to a comparably more advanced ESD than what is available in most developing countries. Still, the framework-template is valuable since it considers the four major components for e-Gov: Demand (citizens and businesses), Supply (front office), Capability (back office) and Change (commitment and drivers of change).

Step 9. Sustaining and scaling up e-Gov

The drama, or challenge of e-Gov initiatives, is that they cannot be unsustainable. The very first pilots may well wither and die, but a commitment to e-Gov initiatives is not an irresponsible dotcom adventure, and neither governments nor cooperating agencies are high-risk-taking venture capitalists.

In the simplest of terms, once a web site is up, it should not ever be down again. If the site offers the virtual 24/7/365 government to the citizen, then eventually one expects the same 24/7/365 support operations. Initially, it is a webmaster's responsibility. But ultimately, it is the responsibility of the PSO as a whole, and there are specific responsibilities for individual public servants to keep the site current and comprehensive.

Sustaining an e-Gov initiative also means progressing in quantity, quality, and range of information and services provided. It means training civil servants, outsourcing contracts, responsiveness (who will answer the emails?), ongoing and growing funding, and continued improvements based on listening, responding, and adapting to client needs and requests.

Users—citizens, business persons, and government officials—will grow impatient if progress is not swift enough, and there is always a comparative yardstick within the same country: what the private sector is doing, and what civil society is doing.

The more one advances into developing e-Gov, the more risks one must consider. Among them are jurisdictional issues among real agencies that are virtually joined-up and new liabilities for governments regarding, for instance, the treatment of information, public and private. Privacy and security of interactions and transactions emerge as soon as the one-way web site progresses forward.

ICTs are not free, e-solution packages are expensive, costly mistakes are made, and someone must pay. Sustaining means looking forward to the survivability and compatibility of e-solutions acquired or developed by the government.

UNDP's Evaluation Office's review of lessons learned in ICTs for Development[78] notes a focus shift towards "a holistic approach that sees ICTs as key development enablers." If so, basic challenges derived from lessons learned from past ICT projects, when transposed into an e-Gov model, tend to relate mainly to human factors, and to capacity-building notably. "Sustainability is compromised by unrealistic timeframes, insufficient training, and when the technologies chosen do not fit the task." Far too optimistic and ambitious timeframes do not consider the realities of staff limitations in the level of effort they can devote to achieve impossible targets. In addition, "Training, and ongoing training, is critical to instilling the confidence required….Thus, allow for generous and on-going support for training, with success criteria linked to "use and appropriation (not just 'use')."

A final word: e-Gov, citizenship and e-Governance

Overall, we cannot expect ICTs to create democracy in Central America. There needs to be will on the part of the state to become less authoritarian, to be open to the participation of the people in decision-making, to make information available, and to become accountable to the public….The terms [e-Government and e-Governance], and indeed the processes, are no longer the domain of government. Instead, ICTs become an important aspect of democratic processes and the establishment of a more open and participatory form of governance…

Katherine Reilly[79]

This document does not deal with e-Governance. But there have been practical advances in this arena, sometimes far more than anecdotal, plus a lively and even focused debate and good initial lessons and advice.

In the very big picture, e-Gov initiatives actually contribute to good governance. They go beyond G2C and even C2G interactions, and they also encompasses C2C, or citizens-to-citizens vis-à-vis their governments and the governance processes. Thus, ultimately, the whole exercise expands into e-Society realms.

In some respects, e-Gov is a tool for good governance. Eventually, one can expect the e-Gov agenda will be a smaller and highly specialized part of a broader e-Governance agenda and sets of interventions. Inasmuch as the e-Governance agenda picks up some broader issues and debates that, to date, have been dealt with under the emerging e-Gov agenda, they will become far more technically precise, practical, and geared to results and achievable targets.

The broad and still vague area of e-Governance is also where extreme techno-promises flourish and also flail, fail, and fall. While optimists argue that e-Government and e-Governance are the tools for "re-engaging" disenchanted citizens with their governments, e-citizens are but a minuscule and self-selected set of all citizens, at least for now.

These final points should interest e-Gov intervention models as regards citizenry:

- Participating in governance and in democratic processes is not restricted to voting. With the help of ICTs, democracy and citizen participation can be enhanced in their other expressions as well, such as: providing citizens with the information they need for informed debates and decisions; opening up new venues for voicing opinions; contributing to e-Gov plans and strategies; and watching over progress and mishaps so that e-Gov actions do indeed advance accountability and transparency, efficiency, and service to all.
- As if to dispel the notion that e-Governance discussions were inappropriate or too premature for informed public debates, in July 2002, the UK called for an e-consultation on e-democracy. The site is at www.e-democracy.gov.uk. Citizens, or anyone for that matter, can see or download proposals, respond, debate, suggest. Other civil society groups elsewhere pioneered these e-discussions.[80]
- To make e-Gov work, a vibrant civil society making e-Society progress, inclusive of e-Gov discussions and first experiences, is needed. This is not just the Government's game on its own. Though it does have a key role to play, it is not enough to sustain e-Gov socio-culturally. A view of e-Gov is also needed from constituents—the citizenry and civil society (as well as business, which needs no additional prodding).

The expression "involve civil society" may be too vague a notion to express the more proactive and participatory purposes of engaging societal groups, communities, and organizations with the construction of what is, in the end, their own e-Government. These efforts must be visible, influential, agenda-setting, and, hopefully, consensual and concerted initiatives by society. Moreover, they should involve the voices that tend to be more powerful and (hopefully) representative of others who will be absent from the debate: academia and universities, NGOs and community based organizations, civil society groups, business corporate or associative entities, inclusive of SMEs, and not only the ICT-related industry.

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[1] "… the full movement into the information age involves technology becoming an integral part of every aspect of economic, political, and social interaction, such that full participation in the society is dependent on access to and use of information and technologies. Electronic government, for example, involves online voting, online and interactive government services, access to government information, and other essential elements of participation in democracy. Therefore, the survival of democratic principles in the information age will be determined by and depend on successfully bridging the Digital Divide. (http://www.ala.org/oitp/digitaldivide/brief_dd.html)

[2] Palermo Conference 2002.

[3] Forman, 2002.

[4] US-OMB, 2002, p3.

[5] Deloitte and Touche, 2000.

[6] Ibid, p2, 8.

[7] Jellinek, 2000, referring to the UK.

[8] Wild, 2001.

[9] Braga, 2002, p1.

[10] Mainly, we follow Braga's listing and improve it with Heeks contributions to same topic.

[11] C.A.Primo Braga, 2002.

[12] Braga, op cit.

[13] Braga, op cit.

[14] Heeks, op cit (book).

[15] UNPAN 2002.

[16] The key stage models include Gartner's Four Phases (Gartner, 2000), including Presence, Interaction, Transaction, and Transformation, in addition to UNCTAD's 5-stages, which adds a basic Internet visibility phase (UNCTAD, 2001).

[17] UNPAN, op cit.

[18] UNCTAD, op cit.

[19] UK-NAO, op cit.

[20] Unwin, 2001.

[21] UK-NAO. This is their "interactive e-publishing" phase 3.

[22] UNCTAD, op cit.

[23] Gartner op cit.

[24] Unwin, op cit.

[25] UK NAO.

[26] UK NAO.

[27] UNPAN op cit.

[28] As of this writing (7/02) there was an infoDev grant to CDT, The Center for Democracy and Technology, to develop such guidelines, as an e-Government Toolkit.

Footnotes *continued*

29 Kirkman et al, HU's CID, NRI 2001.

30 Harvard's CID Readiness Guide.

31 Kirkland et al, CID, 2001, p 22-23, Box 1 and Fig 4.

32 UNPAN op cit.

33 UNPAN, op cit p 24. The three macro domains (each with its own several indicators) are Telecommunications, Human Capital, Web Presence.

34 Ibid.

35 HU CID Guide.

36 Kirkman, CID, op cit, p25.

37 UNPAN, op cit, 2002, App 4.

38 Accenture, Rhetoric… 2002 report.

39 Kirkman et al, H's CID –NRI 2001.

40 UNCTAD, 2002, op cit.

41 Bhatnagar, 2001, infoDev eXchange, p 5.

42 Caldow, 2001, op cit.

43 As noted earlier, authors such as Michel Menou for information, ICTs and development, and Richard Heeks particularly for Information Systems (and ICTs) in e-Gov, as well as the diverse literature on Knowledge Management are the key pointers for these issues.

44 The Alexa toolbar (owned by amazon.com) has a tool, WayBack Machine (from The Internet Archive), that can find dated earlier versions of many web sites since 1996. The address for the Internet Archive is http://webdev.archive.org.

45 See, for instance, the Records project in Ghana, noted later.

46 B2B=Business-to-Business, B2C=Business-to-Consumer

47 UNCTAD, 2002, op cit.

48 US Govt, OMB, e-Gov Strategy, op cit, 2002.

49 US Gov't, OMB – EGov Strat, 2002.

50 Heeks, Understanding… 2001, p9.

51 Pew Internet, 2002.

52 IDBAmerica, May-June 2000, p8, interviewee: Jorge Claro

53 UNDP, ICTD…, 2002, op cit, p 11-12.

54 See, e.g., the UK's e-envoy documents (Benchmarking… 2000 and 2001) that also take note of other European nations ESDs.

55 This title, and part of the argumentation, as quoted, is borrowed from Lenihan, Crossing Boundaries, 2002.

56 Lenihan, op cit, p 20.

57 Lenihan, pp 20 through 26.

58 Lenihan, op cit, p 26.

59 European Commission, 5 June 2002, same title as quoted. In www.cordis.lu/econtent/psi/pubsec.htm Full document is online as .pdf file. Referenced as COM(2002) 207 Final; 2002/0123 (COD).

60 EC, op cit, 2002, p 2.

61 UNPAN, 2002, p29.

62 ibid, unpan, p29.

63 WordBank Intranet: Following the evidence trail to development. June 2000. WB's Information Solutions Group and the International Records Management Trust.

64 FCW , 7/16/02, p14, Dan Caterinichia.

65 UNESCO-COMNET EGov profiles, 2002.

66 In Leigh & Atkinson 2001, p 7-9.

67 ibid, pp 9-16. See article for the full detail of their suggested measures.

68 FCW, 7/2/02, p14.

69 Jupp, Accenture… Portals, 2001, p1.

70 Ibid.

71 Deloitte-Touche, 2001, (e-Gov next generation).

72 FCW, Aug 27, 2001. WWW: Has e-Gov stalled…? (William Matthews).

73 Ibid.

74 Gartner, FirstTake, 1 March 2001 "FirstGov moves…" (French Caldwell).

75 Lenihan, 2002.

76 Cappe, 2001.

77 e-envoy, UK, 2001 and 2000, Benchmarking…

78 UNDP, 2001, ICTD, Essentials 5.

79 Reilly, Government, ICTs and Civil Society in Central America, 2002, pp 11-12.

80 Notably, Steven Clift in the USA.

Case Study

Chile

E-Gov Experiences and Lessons

Eduardo Contreras Budge
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In the last decade, Chile has experienced strong economic growth, cut its poverty rate in half, and is striving to maintain its competitiveness in the global context. Chile is also deeply committed to strengthening its democratic processes and institutions. One way is through electronic government (e-Gov).

E-Gov can be defined as the public sector's use of technology, especially the Internet and World Wide Web, to improve its information, communication, and service delivery functions, as well as its constituents' access to such services.[1]

The Chilean experience with e-Government demonstrates how progress can occur even though it may be irregular and imperfect. The case study illustrates some of Chile's e-Gov experiences that may be relevant to other developing countries.

Lessons

The actual "implementation" of e-Gov is not as simple and clear cut as espoused by enthusiasts. Even if a carefully conceived vision is adopted and then effectively translated into directives, action plans, and resources, actually "doing" e-Gov takes substantial time and effort by all involved. The processes involved in creating and implementing e-Gov can be complicated and slow.

The government must assume a key role in leading the process, particularly in the early supply-driven and market-creation moments. Historically, people's expectations have been that the government would take care of social well-being and the common good, even in times of global market forces and concurrent market paradigms. While both the private sector and civil society entities are increasingly taking on many traditional government functions, the government still has an opportunity to exert leadership in steering society towards modernity. E-Gov can be key in this process especially where weak civil society and business conditions prevail. It is up to the government to create the initial demand for e-Gov. Government can do by providing the products, services, and the market creation for e-Gov itself, as well as the technological and societal conditions for it to advance. E-Gov starts as a supply-driven challenge.

Progress toward e-Gov systems can be made even if enabling conditions in society are still absent or incipient. The rationale for e-Gov is also global and not just internal. An e-Gov agenda also must work concurrently in providing, facilitating, or enabling the technological, social, and cultural-educational conditions that, in ideal terms, would precede the development of e-Gov solutions.

E-Gov can be used as a tool for enhancing a country's economic development and global competitiveness. In Chile, a powerful argument for e-Gov has to do with the dynamics of economic globalization. Information and communication technology (ICT) and electronic networking (e-networking) provide key competencies for strengthening capabilities and conditions for competing in the global arena. E-Gov can serve as a catalyst for a whole-country commitment to strengthening technology capacity, which is increasingly essential for global competitiveness.

The progress, sustainability, and success of e-Gov initiatives are contingent upon adequate demand for the information or services provided. Demand generation may be weak or atypical at the beginning of e-Gov initiatives since pioneering agencies are very focused on the service they provide, such as taxes. Others may need to wait a while before their actual constituents develop an online presence. But ultimately, the initiative is judged by its actual reach and the quality of service it provides. Thus, even if the users and audiences are potential and hypothetical at the beginning, a citizen-oriented perspective must prevail in design and construction of web sites and e-services.

Also, it is better to have (constructive) criticisms and even negative evaluations later, when users are confronted with e-Gov offerings, than not to undertake the initiatives. The public needs to see an actual offering before they can imagine how it could be better. In this way, even early e-Gov 'failures' provide good lessons on how to create, sustain, and augment demand by citizens and businesses.

A concerted effort involving all parties is needed, including the public sector, the private sector, and civil society at large; yet such initiatives may well be disjointed and erratic at times. The government cannot manage all activities or conditions needed for e-Gov to succeed. Some are market-driven or correspond to private sector initiatives and investments. Others come from civil society and business contributions to creating a favorable climate, more demand, and better usage conditions, e.g., access points, training, content provision, and actual projects.

The private sector needs government "signals" to advance on its own and forge alliances and partnerships towards electronic initiatives. The government can send 'signals' to the private sector that encourage or discourage forays into electronic commerce. Examples of auspicious signals might include a loosening of state control of telecommunications, for example, or a drop in duties for imported computer equipment. In response, the private sector should be more proactive. There is a limit to what governments can do to enable concerted, nation-wide efforts, especially where enabling conditions are inadequate, inconsistent, or inequitable.

Box 1

Chile: Transition to e-Gov

In the 1990s, the early efforts and Internet presence were those of a few noted academicians and university departments, followed by a handful of public agencies and a few private pioneers. These and similar emerging actors eventually came together, formally, in mid-1998 via a Chilean Presidential Commission on ICTs and development.

At this time, a low competency level of human resources was evident despite a good ICT infrastructure. At least 30 governmental web sites were online, and most public agencies reported some sort of intranet, though email and the Internet were restricted to higher authorities.

In January 1999, the Presidential Commission on ICTs presented its report to President Eduardo Frei. The report delineated a country strategy for ICTs, overall, and not merely e-Gov (which was not the top priority then, though the Commission set high standards for government's role). Its purpose was to open a debate, search for a broad consensus, and advance specific proposals.

Among related actions, a Presidential Instructive on Public Sector Management followed. About 70 public agency web sites were reported, though Internet usage was still quite low. Some pioneering initiatives were underway, which later will be shown to be exemplary, e.g., taxes and e-procurement.

The top ICT news in 2000 was Ricardo Lagos' Inaugural Presidential Address to Congress, which emphasized the importance of the Internet and new technologies. The President stated that Chile could be at the vanguard of using ICTs for development. Though most families could not access them yet, the conditions were in place.

An Inter Ministerial Committee for ICTs was created, and the President subsequently headed a joint public-private working mission to Silicon Valley and Microsoft. (Later, a donation from The Gates Foundation was received).

A Presidential Instructive on Citizen Participation, aimed at public services, focused on tools to bring government closer to civil society. Ministries committed to targets to be achieved, nearly a third of which were directly related to e-platforms for government-citizen interaction.

In May 2001, the Presidential Instructive on e-Gov was released, focusing on three areas: Service to Citizens (including Businesses), Good Government, and Democratic Development. The Instructive put forth orienting guidelines and detailed task guidelines that public service agency heads must follow to achieve objectives in the three key areas. Each agency prepared plans within the next six months.

A new Presidential Instructive dealt with Infocenter development. At the time, over 300 government web sites were online from Ministries and selected public services, plus another 100 developed by State enterprises & Embassies. The "Trámites" Portal (citizens' transactions with governmental agencies) was started, and the Government portal was entirely redesigned.

In early 2002, 98% of public agencies had portals or web sites. Three key portals were defined and operating: information and gateway (main portal), services (tramites), and topical or sectoral portals/sites, e.g., enterprises, SMEs, and major Ministries. Services to citizens increased (35 services online were expected by 2003), and quantity of information had increased.

The Government's e-Agenda 2002-05 began, as did the first public debates about direction and progress, including what else the government, the private sector, and civil society needed to do. After what seemed like a hiatus, e-Gov and e-society seemed to be moving quickly again with multiple initiatives addressing both supply and demand factors.

Even where the State, the private sector, and civil society share a vision of their country's "electronic-enabling," E-gov tends to advance in irregular ways. Overall, however, it is a synergic process, with multiple and heterogeneous initiatives mushrooming, at times even conflicting or short-lived. While strategic integration of e-Gov and e-country initiatives is desirable, the trend may be that, at times, they are short-lived, ad hoc, or even conflicting. Indeed, it is likely that things will not proceed so smoothly or coherently. Thus, a continued observation and analysis of trends, events, and the multiplicity of projects is needed, as is continued dialogue among all involved parties.

E-Gov progress, in terms of governmental accountability, must be in consonance with broader government principles, agendas, and programs, particularly good governance and service to all citizens.

E-Gov initiatives—such as making information publicly available or enabling electronic filing of forms—start to impact the public sector's own processes and structures early on. The initial changes in work processes to accommodate online service provision, for example, are apparent almost immediately. Yet the deeper impact on public sector machinery, organization, and "culture," as well as the institution or agency as a whole, take time. Sound principles and leadership are needed for this transition, though the opportunity for innovation and reform exist from the moment the agency goes online. Good governance provides the rationale for the changes the public sector needs to really transform itself.

Ultimately, the move to e-Government tends to promote ICT usage in society

As the government integrates e-Gov processes, structures, products, and services into its system, it sends a message and sets a course for society as a whole. The public sector's move into electronic functioning can spark a similar move by other sectors, thereby heralding the country's entrance into the global "information society" arena. A forward-looking government that has embarked upon the e-Gov path is not only engaged in e-Gov but also in promoting ICT usage in society generally.

With these broad observations in mind, the timeline puts Chile's experience in context.[2]

Vision and macro-strategy

In late 1998, the Presidential Commission on ICTs, SubCommission on Citizens and Equity, stated the following:

"Chile requires conviction from the State. Chile needs a Visionary State: a conviction that today's opportunities can decisively influence tomorrow's economy and society. An Enabler State: identify the required factors for ICT development by civil society and economic agents. An Implementer: The State must be a model in the adoption of ICTs."

It then proceeded to detail some strategic points for each of those roles. Irrespective of the key strategic initiatives each country may see as most pertinent, the tripartite role for the State is valuable as an integrative device for an e-agenda that advances both e-Gov specifically and some e-society enablers and interventions. Among such points, as noted by the Commission, are the following:

Visionary

- Use e-networks as strategic for national development
- Adopt universal access as a Nation's Task
- Create a shared vision: equity and productivity as horizons
- Provide leadership in creating basic infrastructure for transition into a knowledge society

Enabler

- Enact necessary laws and regulations to "incentivize" private effort and social equity
- Reinforce civil society and autonomous initiatives to develop tools and contents
- Provide funding for competitive proposals
- Address privacy concerns

Implementer

- Must be done under state leadership and coordination. There is no other social or business actor that can achieve this mission.
- Modernizing the state implies introducing ICTs as fundamental tools, demanding also a redesign of its organizational culture.
- Develop ICT solutions to facilitate citizens access to information about government programs and benefits.
- Adopt ICTs as a management model within the State and in relation to its constituents.

- Create an empowered task force with immediate assessment and decision-making responsibilities to unblock government barriers and problems and to multiply government's technical and communicative assets.
- Identify real information demands and define target audiences.
- Develop flagship projects and communicate them vigorously.

The tasks for the State related not merely to e-Gov but to ICTs for the country's overall development. They were presented as inclusive, involving all social actors, with each contributing to the nation's effort. This underscores the fact that a vision for e-Gov is part of a broader vision for the role of ICTs in national development, as well as in congruence with good governance principles.

Main programs and actions

This case study is not a comprehensive overview of Chile's e-Gov progress. Instead, it selects a few highlights to illustrate what a more comprehensive strategy, dealing with several aspects of e-Gov, might look like.

The ICT Presidential Commission reported in 1999 that its recommendations were a strategic wager for the future, with fast institutional adaptation needed. Eleven guidelines and 61 specific proposals were presented, under three main objectives:

- Universalization of access
- Development of competitive capabilities
- Modernization of the state in the service of citizenry

Subsequently, the e-Government agenda and implementation coordination were set up under the Ministry "Secretaria General de la Presidencia" and within "PryME," the overall State Reform and Modernization Program.

It is significant that e-Gov is part of PRyME, the government's agenda of key reforms. The goal is to create a democratic, efficient, and flexible state at the service of citizens. E-Gov is one of its main components, but other, concurrent elements include institutional and political reforms, public management modernization, decentralization, transparency, and participation.[3]

The e-Gov vision and principles are similar to those found elsewhere, that is, citizen-oriented, easy-to-use, available for all, and transformative but evolutionary. The three areas are described below:

Services to citizens:

- promote access to ICTs
- integrate official services
- aim at "single window" service enabling users to access complete information or items on one web page
- enact identity and security norms

Modernize state (Good Government):

- redesign official processes with ICT help
- provide continuing education and training
- create supportive information systems
- promote networking and communications with ICTs
- devise standards
- monitor and evaluate progress and impacts
- aggregate government demand

Advance democracy:

- provide good, quality information, general and specific
- develop a government gateway-portal
- achieve good, user-oriented web page development
- devise quality standards for contents
- take steps to ensure transparency
- elicit and listen to citizens' opinions and inputs

Citizens and information

This section describes the use of the government's main portal as an information provider, with services offered to citizens and to businesses (some actually transactional), and some of the internal (or back-office) processes of e-Gov.

The Chilean experiences illustrate some of the conditions, enablers, and inhibitors to e-Gov development, as well the roles of the private sector and civil society as contributors.

The flagship for the information function is the government's portal at www.gobiernodechile.cl. At a general level, it is an expression of transparency, as well as the current step in advancing democracy and citizen participation. Designed as an informational portal and a gateway to government ministries, agencies, news and information, it was relaunched to add additional features to the original

1. Chile's e-government portal; 2. Chile's website for Education; 3. Chile's website for Health; 4. Chile's website for telecommunications; 5. Citizen-government communication; 6. e-government site for procurement; 7. Chilian site for paying taxes.

portal, www.estado.cl. The new portal establishes a quality standard, and, while not all other government web sites are identical in design, at least the government's unique logo or corporate identity is present in all of them.

Given the size and complexity of the public sector, the portal is a welcome improvement for governments' online presence. However, a portal by itself would not be as indicative of a government's commitment to e-Gov unless the major public sector ministries or agencies also were progressing in developing their own specialized portals. In Chile (and elsewhere), it is interesting to look at sectoral web sites, too, and gauge their degree of development vis-à-vis the portal yardstick.

Services to citizens

Portal Trámite Facil ("easy transaction")

Trámites are the usually undesired but necessary interactions and relationships citizens have to conduct in any government office anywhere. Push papers, come back next week, you forgot this document, now go to the next office or agency, and so on. By 2001, the portal intended to facilitate those inevitable "trámites" had provided online information for around 700 of them. Of those, 32 could be done online. By early 2002, e-Gov had advanced to 70 online trámites, and the portal had new information for about 1,400 procedures. It received some 30,000 visits per month.

Paying Taxes Can be Fun — The SII Portal

One particular Chilean web site has captured worldwide attention. The Internal Taxation Service ("Servicio de Impuestos Internos" at www.sii.cl) has been a pioneer in developing transactional e-services and has had tremendous success in attracting potential taxpaying citizens (and businesses) to online filing. Started in 1998 by providing taxpayer information online, the site then went interactive and progressed to online filing in 1999. The number of people filing taxes online is impressive, and the site is a comprehensive, authoritative, and friendly portal providing other interactive features to users as well.

By the May 2002 deadline, online filing had surpassed paper-based filing—over 1.1 million (or 55%) filed online, compared with 925,000 not doing so. The 2002 e-filing represented a 45% increase from 2001 (788,000 filings, or 41%). Previously, in 2000 and 1999, 26% and 5% of taxpayers had used the online procedure, respectively.

It must be noted as a lesson that the SII actually helps taxpayers pay. Of the 2002 online declarations, 43% had been prepared by SII and accepted or amended by those receiving them. Thirty seven percent of taxpayers chose to prepare their own using the electronic form in the SII portal, and the final 20% used commercial software that SII authorized.

Incentives are used to help comply with and switch to online filing—for example, e-payers were provided with a few extra days to submit. Not only did people report the system to be trustworthy, safe, and fast, but the "back-office" performed well, too. The system could handle the last hour rush, literally, processing over 9,000 returns received in the final hour. Still, the agency is not satisfied. It complains that 300,000 taxpayers chose not to use the prepared tax document and thus missed the opportunity for a faster, neater, and less error-prone procedure.[4]

Services for business

Towards e-procurement

Though several Chilean government portals and web sites are emerging to serve businesses in general[5], the most well known site deals with government purchases. A much-cited and referenced document synthesizes the purpose and origins of this "public procurement e-system," as of January 2001.[6]

Historically, the government's main buyer was DAE (Direccion de Aprovisionamiento del Estado, or State Purchasing/Procurement Directorate, at www.dae.cl). Due to its rapidly aging set-up, however, several agencies developed their own systems. As part of a Public Management Modernization plan, public procurement was set up for substantial overhaul, leading to a Government Procurement Act in October 1999 and a pilot of the then www.compraschile.cl site, later redone and revamped as www.chilecompra.cl.

Serving as the e-meeting place for buyers and sellers, the web site represents a G2B2G (government to business to government)[7] interaction. Despite current limitations on going to full scale and engaging in actual e-procurement, the site offers businesses working with government a number of benefits, as

well as important savings for government agencies—above and beyond contributing to the critical matter of public transparency. In addition, the site is an interesting example of a public function operated by a private company, Sonda.

Currently, the site is called the Information System for Public Sector Purchasing and Contracting. The user may proceed to Acquisitions (what), Requesters (buyers), Providers (registration), Reports, or Data. The site publicizes procurement and provides transparency.[8]

The web site is still in progress as an enabling portal for procurement. Currently, it is a contact site only, with online completion of transactions awaiting passage of a law still under discussion. As it stands today, the site has registered about 12,000 potential providers, and many are SMEs. In its role as contact point, registered providers offer their products, public agencies post requests, and the e-system matches them and sends an email to potential vendors. Transaction is completed offline.[9]

One expert points out that e-procurement can be strategic. From a purely informative use, the expert explained, it could evolve "into a government privileged tool to stimulate SMEs to use e-commerce," adding that when government starts using e-purchasing, it forces providers to modernize, too. And cost reductions are significant.[10]

Assessment of government's web presence

An evaluation of 162 government web sites[11] concluded that contents are not user-oriented and that user-focus and service vis a vis design, navigation, functionality, and interactivity are poor. But what matters is that these web sites had to be developed before they could be assessed—though certainly pre-launch testing is essential—and that people learn and correct the initial mistakes. To assist the process, standards and "web design clinics" are in progress nowadays. What also matters is that moving from what a public agency deems worth communicating on its own terms to what a citizen or simple-user needs and can interact with usefully is not easy. This is especially true when e-Gov sites make the difficult transition from information provision only to service delivery as well.

Modernizing the State

A government online, as in a portal and web sites, does not exhaust e-Gov at all. It is a necessary first step, since it sends a signal of commitment and unleashes processes. Meanwhile, the usual public sector management challenges continue, plus all the 'within government back-office' work that accompanies and makes e-Gov's most visible expressions possible.

In Chile, the Presidential Instructive on e-Government (May 2001) quickly produced its first results: 85 Implementation Plans expressed in some 300 projects, of which half dealt with internal management. (Egana and PryME, 5/01). Many of these go unnoticed yet are essential to developing e-Gov and improving services to citizens, even if they are unaware of or do not interact via e-Gov channels.

The heart of the matter, and the lesson, is that citizens may be better served by intra-government modernization as aided by ICTs and a web site may not be needed for such purposes. This is not to say that there should not be government web sites. Rather, it simply argues that e-Gov has more than one route to move along, and "webification" is not the only one.

Back-office developments for e-Gov include, in the current Chilean case, a number of cross agency projects as well as some high-impact , focused sectoral projects. Among them:

- Expanding Intranet usage
- Professional Development & Training
- Consolidated, full IT resources inventory
- ICT Management Units strengthening and enhancement
- ICTs for Financial Management
- Territorial Information System
- Five intra-service and three inter-service processes automated (relieving the citizen from moving papers from agency to agency)

One specific illustration of back-office improvements with ICTs concerns budget preparation. With the government's Budgetary Office and Microsoft's cooperation, the 2002 budget was moved along mostly via Internet. The Finance Ministry received 114 out of the 141 budgetary formulations for 2002 through the Internet. (Diario La Tercera, 28 ene 2002)

Progress on the long-term objective of the Single Window, however, has been slower. The *Ventanilla Unica* involves citizen-to-government interactions and transactions, and several public agencies may be involved in any one citizen request. It is far more of a

back-office effort than a web site e-meeting point between citizens and the public sector. Some 20 public services do some online transactions already, but they are not integrated as the single window concept predicates. Nevertheless, to date there are *ventanillas únicas* that simplify (one step, one place) some transactions that previously required several steps and processes.

Some critics point out that management improvements have proceeded far better and faster than organizational readjustments and that a few star projects obscure the fact that other services are not progressing fast enough.

Conditions and enablers for take-off

Not all of the following conditions had been satisfactorily met or even partially achieved when Chile began its e-Gov efforts, whether as pilots, innovative projects, or in a more integrated fashion. The lesson is to proceed anyway and not wait until all e-ready conditions are met. Careful assessments can guide the priorities and pace of the process.

Some lessons emerging from the Chilean experience follow.

Country infrastructure. Both the country's ICT and networking infrastructure and the government's deserve careful attention. ICT systems may appear to be invisible if well-designed and delivering faultless performance, but, ultimately, ICTs, networks, and e-services are not virtual. They are supported by real, physical, technological equipment and competence. While market processes may help in rapidly developing and advancing the nation's ICTs, government must take special care in procuring or updating its own ICT systems.

Utreras notes that by mid-1998, one could observe "uncoordinated public services." Many had their own national network, all of them ad-hoc. It is time to have a Government Network." He adds that such a network is not about building an infrastructure but about a better use of resources and improvement of contents.

Most developing countries will find themselves in the same predicament. Many, as was the case with Chile, do not even know, systematically, what infrastructure and ancillary ICT resources they have, and an integrated inventory might be needed to discover what is available.

Though Chile had a relatively good ICT infrastructure, it was and still is unequal, socially and territorially. Therefore, some initial e-Gov initiatives were aimed at advancing the agenda where it was feasible, while better conditions obtained. It is only more recently, when infrastructure and access inequities were less pronounced, that a number of web sites geared to less favored social organizations and agents have appeared.

Another lesson is that one may in fact do nothing and simply wait for the infrastructure to improve itself, thus providing better ICT foundations over time. While this is not the best way to frame it, what is true is that ICT advances are extremely rapid, and some prior barriers and seemingly insurmountable infrastructural impediments have become non-problems with the passage of time.

Access expansion. Until recently, most estimates indicated that only 10 percent of the Chilean population had access to the Internet. Then, in 1999, the ICT Presidential Commission prioritized universal access at reasonable costs. Since then, national economic development and market forces, along with the government's enabling regulatory conditions, have produced substantial gains in access to ICTs and particularly to the Internet. In addition, targeted governmental interventions have been implemented to increase equity of access.

By mid-2002, 34% of Chileans had cell phones, which were widely used. Over a six year period, costs of cellular calls and Internet charges decreased by a third. (La Tercera, 6/02) Today there are five million cellular phone users and three million estimated Internet users, up from 300,000 as recently as 1999. Internet dial-ups are now 650,000, and there are 59,000 dedicated line connections serving 20% of the population.

Among government initiatives to increase equity in access are:

- The *Enlaces* Project, which establishes a virtual education community of teachers and students using a computer-mediated communications network linking all primary and secondary schools in Chile. Operating since 1992, *Enlaces* is now on the verge of reaching universal school coverage. A recently launched *Enlaces* extension is opening the first 500 schools to community members. Soon, at least half a million persons will have been trained for Internet use.

- The Telecommunications Undersecretariat (www.subtel.cl) coordinates the National Program for Infocenters, implemented by several agencies (such as the Poverty Reduction Fund). It also manages FDT, the Fund for Telecommunications Development, originally aimed at rural telephony and expanded since to telecenters. After the pilots, 83 telecenter subsidy funds were awarded to successful proposals, and an additional 253 subsidies are in competition.
- Special Infocenters for SMEs are operating and will grow to over 100, as will a public-private partnership providing recycled computers to social organizations.
- With a US$9 million donation from The Gates Foundation and a similar amount from the Government, 368 libraries will be equipped and networked by 2003. Installation and training is already underway.

As these initiatives illustrate, access can be increased by several means. SubTel estimates that by the end of 2003, 1,500 infocenters of all sorts will be operating, providing at least 6,000 public access points (4 PCs per site) to the Internet throughout the country.

e-literacy. Ultimately, e-literacy is not just for public servants but for the population as a whole. One cannot expect e-Gov to evolve into a demand-driven, service- and citizen-oriented program if there is no adequate e-literacy to drive it. In the long run, educational programs such as *Enlaces* will generate e-literate graduates. Meanwhile, however, the adult, out-of-school, and workforce population that lacks ICT and Internet skills cannot use e-Gov information and services.

Moreover, since most current and regular users of e-Gov services and information are already literate in ICTs and network navigation, they become the de facto standard for user-oriented web sites, thus decreasing their usability for ICT-non-literates. In this more encompassing way, e-literacy is necessary if e-Gov is to be a tool to help good governance and democratic enhancement.

Training and professional development

In 1998, a leading researcher noted that "specialized human resources are very scarce, and we face the paradox of having one of the best technical access systems in Latin America, but with professionals with very low capacity levels to operate them." (Utreras, page111)

Training and professional development for public servants is needed at all levels, notably the higher ones. Only recently, however, is public discourse on the need for ICT and Internet training surfacing on the public agenda and into specific initiatives, whether involving public service entities, universities, businesses, NGOs, or CSOs. The call is increasingly reflected in media coverage and op-ed pieces as well.

In addition to public agencies themselves, training beyond basic e-literacy must reach the general population. The pioneering telecenters in Chile, e.g., El Encuentro, Cunco, and Red Comunitaria, are exemplary in incorporating user training as a key service component. Indeed, nowadays, all the previously noted public access initiatives provide training services.

For example, Fundación Chile, a public-private entity, now certifies ICT aptitudes, aiming at certifying 10% of the workforce (El Mostrador, 10-1-02).

Teachers in Chile provide an excellent example of focused e-literacy interventions that evolved into personal and professional development. By July 2002, 41% of teachers had Internet access at home, and virtually all of them had access at their schools. Ninety percent use it for educational and professional tasks, with 67% of them trained through the Enlaces program. (Tercera, 7/02)

Research and Development

Chile seeks a high level of technology competencies. This goes far beyond e-Gov, but it is part of a government's macro agenda for ICTs, the Internet, and the fundamental enablers for continued national development. e-Gov is part of the package. Advancing development with the contribution of ICTs means providing the infrastructure, then guaranteeing equitable access, then developing good user skills and practices via e-literacy, training, professional development.

Still, it is not enough. After a demanding comparative study, Brunner (UNDP, 2002) forcefully set the challenge. "The results of the analysis show a worrisome picture: Chile is falling behind in the technological race, a fact explainable by the lags and weaknesses in practically all of the elements that [configure] its transference platform." Such national technology capacities are what enable international competitiveness, "which is constructed. It is an acquired advantage." The platform includes human

capital stock, R&D, ICT infrastructure, as well as specific factors dealing with economic and technological transference relationships.

While Brunner does not deal with e-Gov per se, he does point out the significance of shifting responsibility for R&D in technology transfer from the government to private industry, including universities. Ultimately, while the government may provide leadership, initiatives, and guidance for e-Gov, sustaining e-Gov and making it useful as a tool for development in a global environment will be contingent on a very strong human capital basis. In this sense, e-Gov interventions must be more than anecdotal if they want to catalyze societal impacts. They must be ambitious and exemplary actions that call upon all of society's innovativeness and capacities.

Lessons

While most e-Gov initiatives are in fact implemented by public sector agencies, the lasting impact of e-Gov is only obtained when civil society and private sector entities and leaders are also involved. E-Gov is not an exclusively governmental intervention. Rather, it demands participation and commitment from the non-public sector agents and common citizens. For the most part, Chile has tried to involve all of society in its initiatives, directly or by the best available proxies. When some have not been able to reap the most immediate benefits, actions have been taken to address the obstacles, such as unequal access. Public-private partnerships are emerging, civil society organizations are undertaking relevant initiatives, and media are contributing to putting e-Gov into the agenda.

Perhaps the most enduring lesson is that building a culture of e-Gov in particular and, more generally, a culture of ICTs for development and for everyday life is a long road. That challenge alone is, by necessity, a full societal challenge and not merely one for the government. The trick is vision, coherence, leadership, executive capacity, perseverance, and inclusive involvement of many in a variety of diverse projects aiming at a similar purpose: an effective, democratic, and responsive government serving all.

1. It takes considerable persistence by recognized leaders and significant, visible products and public events to get e-Gov into the public agenda. A media strategy may be needed to make progress newsworthy.

2. Legal matters and regulations are not just a matter of the 'enabling environment.' Two key enabling laws are still in parliament (E-signature and authentication, and public sector e-procurement), and the existing privacy laws may need to be revised for the "e-times." It is not just a matter of Presidential Directives. Also, the success of SII online tax filing was enabled by a fast law authorizing it.

   Pioneers may get lonely, and their successes cannot be extrapolated easily. The SII and the e-procurement cases are easily justified in terms of cost-effectiveness and are immediately productive. Most web sites cannot make a credible business case at all, given their aims and audiences.

3. New thinking and new practices are required regarding innovative alliances or cooperation between public sector agencies, businesses, and civil society organizations, notably academic institutions and ICT-committed development NGOs. Not all the content and services need to be generated, provided, managed or controlled by the public sector.

4. The quality of information and content in Chile's government web sites are not only a function of preexisting and continuing quality content developed within the public sector. It also has been fueled and stimulated by the quality of locally-produced content available from diverse private sector entities and civil society organizations, including online mass media, universities, and Internet portals.

5. Education is at the heart of ICT progress. No e-Gov, either supply or demand-driven, can prosper without continued, substantial, long-term human capital development.

6. Based on Chile's experience, Enrique Fanta, the Subdirector of the PRyME project, provides these lessons to countries embarking on e-Gov:
   - have an e-Gov policy (with vision and principles, supported at highest level)
   - establish a high level institutional setting for coordinating implementation, but with strong decentralization into public services

- define successive and consecutive stages (don't cross all bridges at the same time)
- develop global strategic guidelines, but promote a decentralized implementation. (Fanta, 2002)

Be aware of problems in implementing e-Gov initiatives, such as resistance, conflicts, lack of support, and an absence of newly demanded capacities and attitudes (loosely adapted from Orrego, 2001).

"Lack of adequate balance between speed, depth and comprehensiveness" (Orrego, 2001) is a recurrent challenge in broad, ambitious e-Gov initiatives. Alternatively, isolated projects may solve a very particular challenge but may not make enough of a global impact or produce momentum.

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Footnotes

[1] Where enabling infrastructure, access, and usage conditions are widely available, proponents postulate that effective e-Gov initiatives and systems can contribute to increased civic participation in political processes, facilitate greater transparency, lead to more effective governance, and even foster desirable democratic trends in society. For a more complete discussion of e-Gov, see the model-of-use preceding this study of Chile.

[2] An impressively thorough and indispensable review of ICTs and Internet development in Chile up to 1998 is found in Utreras. It can be supplemented by a recent document by Orrego & Araya, 2002, as well as with documents available online at Chile's www.modernizacion.cl web pages for e-Gov.

[3] See www.modernizacion.cl for details on vision, principles and specific guidance for public sector authorities.

[4] Information obtained from web site, www.sii.cl, May 10, 2002.

[5] See, for instance, the portal www.sitioempresa.cl hosted by the Ministry of Economy.

[6] World Bank, PREM Notes, written by Orrego, Osorio and Mardones.

[7] Government-to-Business-to-Governemnt

[8] Fanta 3/02

[9] La Tercera, April 01 2002, www.tercera.cl.

[10] Juan Rada, 2002.

[11] Paulo Saavedra, 2001. See http://administracionpublica.uchile.cl/docs/ppt_paulo%20saavedra.pdf for his report. Later on, Orrego and Araya (2002) analyzed 17 sites, public and private, as regards their citizen-oriented perspective and functionality.

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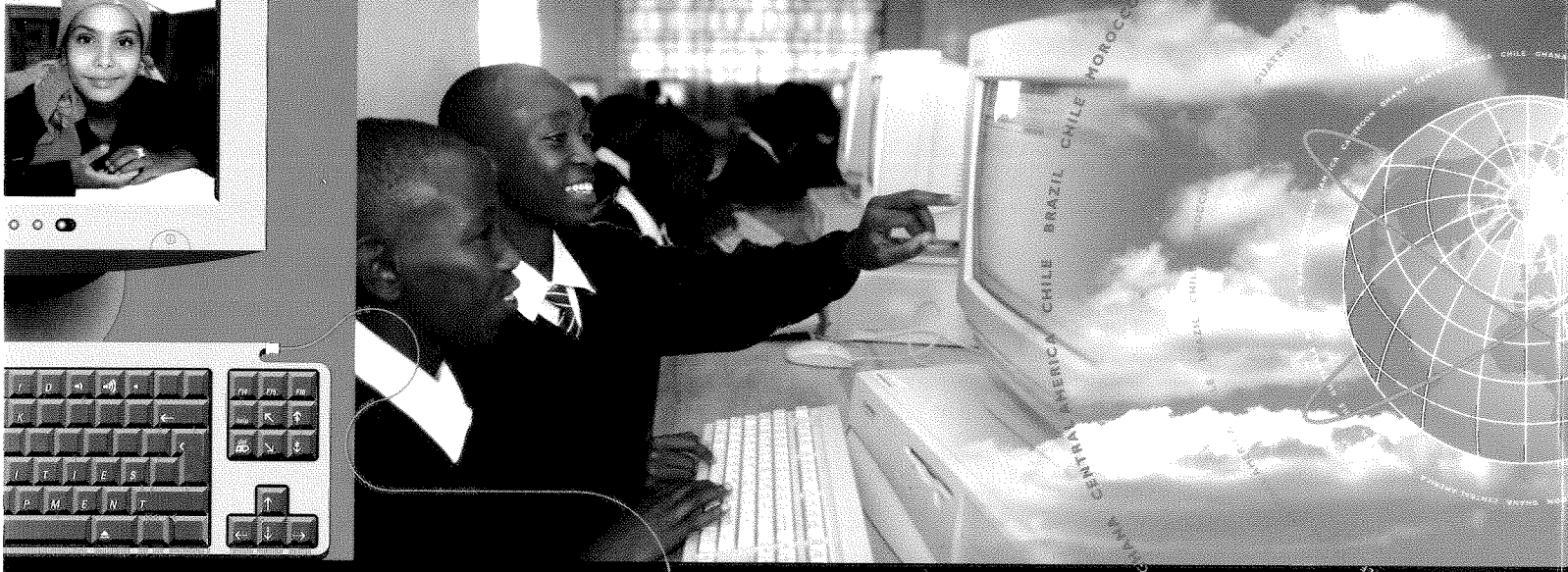

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