United Nations Conference on Trade and Development

Coalition of Resources for Information and Communication Technologies

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NOTE

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This publication seeks to contribute to exploring current science and technology issues with particular emphasis on their impact on developing countries.

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PREFACE

This paper has been prepared by the UNCTAD Secretariat in accordance with Economic and Social Council decision 1999/274 on the report of the United Nations Commission on Science and Technology for Development on its fourth session. This paper provides an analysis of the findings and conclusion of a number of reports on the Coalition of resources for the application of information and communication technologies (ICTs) in transmission infrastructure, education and health.

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EXECUTIVE SUMMARY

The United Nations Economic and Social Council requested the secretariat of the United Nations Conference on Trade and Development (UNCTAD) to finalize and publish the findings and conclusions of several reports on the coalition of resources for the application of information and communication technologies (ICTs) in transmission infrastructure, education and health. These reports were presented at the CSTD workshop held at the headquarters of the Economic Commission for Africa (ECA) in Addis Ababa on 17 and 18 November 1997.

This paper further explores the issues raised during the 1997 workshop, in particular the concept of the coalition of resources in the current global environment. The objectives of this paper are to synthesize the main working papers presented at the workshop and cover more recent developments relevant to ICTs in developing countries and for coalitions of resources.

Section I of the paper focuses on the evolution of the concept of coalition of resources for science and technology, particularly ICTs. It also discusses new forms of collaboration — partnerships — that seem well suited to optimizing the coalition of resources, and that have been adopted by a number of international organizations, Governments, the private sector and NGOs. Section II provides a summary, an analysis and a more detailed review of the working papers. Section III discusses market and technology developments since the workshop and provides conclusions in which recommendations and guidelines are spelt out. Selected cases discussed during the workshop are updated in the Appendix.

Coalition of Resources for Information and Communication Technologies

I. INTRODUCTION

A. Coalition of resources

The concept of a "coalition of resources", through which donor support to developing countries can be better coordinated, has received wide attention in recent years. These resources include finance and expertise, as well as support and logistical services, and involve a number of different stakeholders, including the public and private sectors and civil society.

Within the United Nations, the concept of a "coalition of resources" seems to have originated, relatively recently, in the 1979 Vienna Programme of Action on Science and Technology for Development. Ten years later, in a resolution (A/RES/44/14) that seemed to imply the need for further action, the United Nations General Assembly requested "the Secretary-General to explore the possibility of organizing a more effective coalition of resources within the United Nations development system, multilateral financial institutions, regional development banks and bilateral funding agencies to strengthen the endogenous capacity-building of developing countries in science and technology". Two years later, the General Assembly requested in resolution A/RES/46/165 the Intergovernmental Committee on Science and Technology for Development (IGCSTD, the predecessor of the United Nations Commission on Science and Technology for Development) to submit concrete proposals for organizing a more effective coalition of resources to meet the scientific and technological needs of developing countries.

The resolution's objective was apparently to obtain means by which resources can help achieve together more than they could achieve separately. A similar "multiplier effect" is found in negotiations theory:[1] negotiating parties are advised to pursue "integrative bargaining," seeking solutions that would increase the benefit for both parties, rather than "distributive bargaining," where, in a zero-sum game, one party benefits at the expense of the other. In the former case, negotiations tend to be collaborative, whereas in the latter they tend to be confrontational. Proponents of integrative bargaining typically separate the people from the problem, focus on interests, invent options for mutual gain, and use objective criteria to decide. The difference between integrative bargaining and distributive bargaining is further described in table 1.

This has corresponded to a fundamental "paradigm shift" in development issues. In the early 1990s, Governments and organizations began to examine development strategies and programmes in terms of sustainability (economic, social and environmental) so that immediate gains would not come at the expense of future generations. At the United Nations Conference on the Environment and Development (UNCED) at Rio de Janeiro in 1992, a Programme of Action entitled Agenda 21, designed to provide guidelines and goals for local, national, regional and global economic, social and environmental policies and programmes, was endorsed. The United Nations subsequently created the Commission on Sustainable Development to coordinate and monitor activities designed to achieve the goals set forth in Agenda 21. In the same spirit, the United Nations established the United Nations Commission on

[1] Raiffa (1985).

Science and Technology for Development (CSTD) to provide high-quality advice on science and technology to the General Assembly and the Economic and Social Council (ECOSOC), as well as to serve as a forum for the discussion of these issues.

Table 1. Difference between distributive and integrative bargaining

Dimension	Distributive bargaining	Integrative bargaining
Pay-off structure	Fixed, zero-sum	Variable-sum
Primary motivation	Win-lose	Win-win
Stance	Confrontational	Collaborative
Interests	Diametrically opposed	Convergent or congruent
Relationships	Short-term	Long-term

Source: Raiffa (1985).

In December 1994 a consultative meeting was convened to discuss the concept of a coalition of resources for science and technology for development. This meeting was requested by both ECOSOC (in its resolution 1993/73) and the General Assembly (in its resolution 48/179). It explored ways and means of organizing such a coalition. It emphasized the need to ensure that a coalition of resources takes into account user/recipient needs and demands and donor mandates, and stressed that instead of a single global coalition of resources, such as the one envisaged in the Vienna Programme of Action on Science and Technology for Development, it would be more effective to develop mechanisms that focused on specific and well-defined themes.

More specifically, participants also noted that funding activities related to science and technology largely depend on spontaneous demand-driven responses, and that most of the existing donor coordination schemes in the areas of science and technology have been organized on a supply-driven and ad hoc basis. A better understanding of the role of a coalition of resources as a funding mechanism and its application in the context of developing countries was found to be essential. CSTD was therefore requested to provide a forum for an exchange of views and interaction among partners on the mechanisms and strategies needed to bring about a coalition of resources for the development of science and technology in developing countries.

This recommendation was later endorsed by ECOSOC in resolution 1997/62, which recommended that CSTD convene a workshop on a coalition of resources, particularly in relation to information and communication technologies (ICTs) and their applications. This recommendation was in line with ECOSOC's decision, in its resolution 1995/4, that CSTD should focus on ICTs and their implications for development as the main substantive theme of its work during the inter-sessional period 1995-1997. The Addis Ababa workshop was therefore convened as a result of ECOSOC resolution 1997/62.

B. Partnerships vs. coalitions of resources

While the mandate of the workshop focused on "coalition of resources", many development agencies cite "partnership" as a framework for development initiatives. Interestingly, partnership precedes the development and mobilization of resources in the International Telecommunication Union's Strategic Plan for 1995-1999, although both are part of the mission of its Development Sector.[2] The World Bank's Comprehensive Development Framework (CDF) emphasizes partnerships among Governments, donors, civil society, the private sector and other development actors. The CDF's main objective is to allow developing countries to take the lead in, and acquire a sense of ownership of, their development projects. The CDF emerged from a worldwide discussion initiated by the World Bank on "Partnerships for Development". The World Bank has also provided seed funding for Business Partners for Development (BPD), a project-based initiative that supports and promotes strategic examples of "tri-sector partnerships" involving business, civil society and government working together.[3] Indeed, CSTD's own agenda for the inter-sessional period 1997-1999 would focus on partnerships and national capacity-building in science and technology. In 1999, the UN Secretary-General challenged transnational corporations to join a "global compact" to ensure that the benefits of globalization extend to both developed and developing countries. Members of the compact are encouraged to enter into partnerships with UN agencies at both the policy and the operational level. Thus, the concept of a coalition now includes "partnerships" and members of a "compact" who are encouraged to form partnerships for development.

This distinction between "coalitions of resources" and "partnerships" is not merely semantic. Formulating a project in terms of resources focuses the discussion on the contributions that each and every stakeholder is expected to make. When resources are limited (or when the environment is competitive), such an outlook may cause distributive arguments among the various stakeholders. Formulating the project from the perspective of a partnership may, on the other hand, focus the discussion on the relationships between the various stakeholders and foster conditions more favourable to integrative negotiations between them. This may improve the outcome and lead in turn to a more efficient coalition of resources.

Indeed, a meeting of experts convened by UNCTAD examined "Technology Partnerships" (TP) as a means to promote capacity-building and competitiveness, and formulated specific action items and recommendations to policy makers.[4] The meeting sought to determine, *inter alia*, how cooperation between firms in developed countries and firms in developing countries contributes to the overall technological capacities and competitiveness in the technologically weaker countries, how partnerships between these firms can be operationalized, and what role other stakeholders (e.g. Governments, financial institutions and international organizations) can and ought to play. The experts pointed to an evolution in technology partnerships which increasingly involve firms from developed and developing countries, but noted that firms in many developing countries are participating in this trend only to a limited extent — owing to, among other things, imperfections in information markets. Even though the meeting focused on inter-firm partnerships, its findings are relevant in the

[2] International Telecommunication Union (ITU) website: http://www.itu.org
[3] World Bank website: http://www.worldbank.org
[4] UNCTAD (1996).

present context. For example, the experts proposed a multi-scale framework (micro-, meso- and macroeconomic) for TP that encompasses all the stakeholders involved in the coalitions of resources considered here.

C. Promoting ICTs in developing countries

The ECOSOC decision to focus CSTD's activity on ICTs and their applications for development should be reviewed in the light of the work of many other UN or other multilateral agencies which have also focused on promoting ICTs and their utilization in developing countries through major programmes and initiatives. It is therefore instructive to look briefly at what some other agencies have done and are currently doing to promote ICTs in developing countries.

United Nations agencies and the World Bank

The International Telecommunication Union (ITU) is the UN specialized agency charged with telecommunications development, reform and standards. While originally a grouping of monopolistic telephone companies, it has now evolved into an organization within which 186 Governments and more than 600 private sector companies coordinate global telecommunications networks and services. One of ITU's main purposes is to promote the extension of information technology (IT) benefits to the world's inhabitants. ITU adopted the Valletta Action Plan in 1998 to address key elements in bridging the digital divide, such as sector reform, access to new technologies, gender issues, rural development and universal service/access, finance and economics, partnerships with the private sector and human resource development.[5]

In implementing its mandates, ITU has fully embraced the Internet and is actively promoting it throughout the world. It undertakes country studies on the diffusion of the Internet and now considers the number of Internet protocol (IP) hosts (i.e. computers with a fixed address on the Internet) to be an indicator as important as teledensity (the number of fixed telephone lines per capita). It has also established pilot projects in health-care delivery, transportation, tourism, agriculture, trade and education to demonstrate the application of new technologies. It cooperates in the management and implementation of these projects with private and public sector partners that have the necessary funds, skills and/or facilities. Thus, ITU plays a catalytic role in bringing together many coalitions of resources.

ITU has started a special initiative — E-Commerce for Developing Countries, or EC-DC — to bridge the digital divide and enable developing and least developed countries to be active participants in the networked economy. It is mobilizing support from public and private sector organizations to provide the beneficiaries with concrete deliverables in four areas:

- E-business infrastructure development;
- Human resource development to enable transfer of e-business technologies;
- E-business policies and strategies;

[5] International Telecommunication Union (ITU) website: http://www.itu.org

- Partnerships with industry (for all of the above).

The initiative has now expanded to more than 110 countries, with the participation of a total of 225 organizations, including telecom operators, ministries, chambers of commerce, trade associations and federations, non-governmental organizations (NGOs), Internet service providers, financial institutions and other private corporations. In June 1999 EC-DC was given an innovative project award by the Global Bangemann Projects Challenge in Stockholm, Sweden.

The United Nations Development Programme (UNDP) has been actively promoting the use of ICTs in support of sustainable development. Its Sustainable Development Networking Programme (SDNP) has been particularly successful. Its main purpose is to assist developing countries in building the capacity to access and to contribute to solutions for sustainable development using the medium ICTs.[6]

Each country's SDNP proceeds in a multi-stage fashion. A pre-feasibility study is carried out to identify the most appropriate local partner, which then becomes the project's operator. This partner is subsequently provided with seed funding, typically $150,000-$200,000 over a period of two to three years, during which time the partner is expected to get the basic operation running while at the same time sensitizing a wide audience of decision makers. Local operators are expected to build their own user communities and to have shifted from external to domestic financing before their seed funding runs out. By the end of the trial period the country should have acquired a national entity operating a commercially viable networking solution (hardware, software and connectivity), staffed by nationals with the requisite managerial and technical skills, and providing services to a wide range of actors in civil society.

This programme is noteworthy because it was one of the firsts for which voluntary contributions (hardware and software) were proactively sought from the private sector and acknowledged by the United Nations. But, more importantly, it is noteworthy because of its *repeated* successes. Launched in 1992 as an outgrowth of UNCED, the SDNP started off with pilot projects in 12 countries. At the present time, there are 40 programmes in various developing countries. This programme has found a successful formula and was able replicate it. Table 2 lists several of the SDNP's success stories.

Table 2. A sampling of successful SDNP national projects

Take-off year	Country	Programmes
1994	Angola	Capacity-building: SDNP helped to develop Angola's first private Internet service provider (ISP). Other projects included the establishment of cyber-centres and e-mail for all. EBONET became a highly successful commercial ISP. It worked out a unique

[6] United Nations Development Programme (UNDP) Sustainable Development Networking Programme (SDNP) website: http://www.undp.sdnp.org

		arrangement allowing NGO networks such as ANGONET to operate on their system, maintaining their own distinct identities and user bases, while gaining full access to the commercial ISP's complement of Internet services.
1997	Bulgaria	Promoting networking and access to information among Bulgarian NGOs. In addition to NGOs, target groups include the private sector (also an innovation in Bulgaria) and local municipalities, which in the past had been controlled by the central Government.
1996	Cameroon	Provision of services aimed at bridging the gaps in local infrastructure, such as training and development of e-mail facilities.
1997	Guyana	SDNP assisted in promoting public access to information and offered free Internet service to any government agencies on request.
1996	Mozambique	SDNP projects in Mozambique were focused on provision of connectivity, training and building the content of sustainable development information. As part of this initiative, Telecentres were provided for young people. Also, the VSAT (Very Small Aperture Terminals), established by SDNP, are used for transmission of data, video or voice through the satellite.

Source: SDNP website http://sdmp.undp.org

The World Bank's InfoDev shares several features with the SDNP. It is a global grant programme launched in 1995 to promote innovative projects in the use of ICTs for economic and social development. It brings together resources provided by corporations and bilateral donor agencies. Project proposals are required to show that the project would be sustainable beyond the grant period. InfoDev-funded activities fall into four categories: consensus building, information infrastructure strategies, telecommunications reform and demonstration projects. InfoDev is a global multi-donor programme that covers many sectors. Typical of World Bank programmes, it has a global scope. So far, active or completed InfoDev projects include 7 in East Asia and the Pacific region, 8 in Europe and Central Asia, 17 in Latin America and the Caribbean, 3 in the Middle East and North Africa, 9 in South Asia and 25 in sub-Saharan Africa. It also includes 35 projects that cover multiple regions or that are non-region-specific. So far, over 100 projects have been funded, including 13 devoted to education, 9 devoted to health, and over 70 projects covering telecommunications, the Internet and e-commerce.[7] Table 3 lists several InfoDev projects to illustrate its scope.

[7] InfoDevProgram website: http://www.infodev.org

Table 3. A sampling of ongoing and planned INFODEV projects

Location	Project description	Partners
Africa	African Virtual University. To conduct feasibility study leading to the creation of the African Virtual University. Study would involve definition of an organization model forming the basis for a business plan. Topics to be covered include: choices of the technological options for the delivery of instruction, arrangements with partnering institutions on both supply and demand side, structuration of programmes of studies for start-up phase, negotiated prices and contractual arrangements with suppliers (including agreements on IPR), establishment of agreements with African countries and institutions, etc.	World Bank, INTELSAT, private sector organizations and foundations, and government agencies
Global	NGO youth groups for Senegal, Ecuador and India are participating in this project as pilot nation sites by developing and operating a "cyber-café" providing Internet connectivity in a user-friendly environment. These Info (rmation) Cafés provide these services (where available) for partner youth environmental organizations, other local NGO groups and the community at large, and training in hardware and software operations for local people. Planned to be self-sustaining within three years. Foundation for the Future of Youth is establishing partnership with local organizations to manage the sites, coordinate training activities, and attract additional partners from both corporate and governmental sectors in each country as well.	World Bank, local NGOs and the Foundation for the Future of Youth
China	China's Industrial Pollution Projection System (CIPPS): New Information Tools for China's Environmental Agencies. This project is developing an industrial pollution projection system for China to allow agencies to estimate local industrial pollution loads, damage caused by pollution, and the cost of pollution abatement. The project is undertaking dissemination and training activities in order to build a core of effective users.	World Bank and China State Environmental Protection Administration (SEPA)
Caribbean	Physician-Based Sentinel Surveillance System for Emerging Health and Disease Problems in the Caribbean. The project, utilizing current and new ICT technologies, develops national capability for monitoring trends, and prompt detection, investigation and control of emerging and re-emerging health problems. An electronic information system for the real-time surveillance of emerging and re-emerging health and disease problems is being established in physician's offices in Trinidad and Tobago, Jamaica and Saint Lucia.	World Bank and PAHO/WHO Caribbean Epidemiology Centre (CAREC)
Global	Linking Poor Producers to Global Markets. With InfoDev support, PEOPLink developed a solution that enabled poor artisans to take the first steps into the world of electronic communications for product design and sales. Further details on the toolkit can be found at www.peoplink.org/infodevreport. This "toolkit" consists of a hardware package that is appropriate for developing world settings as well as the software and procedures for using them to prepare and upload Web catalogues. It also includes a basic Web tool for communicating with product design advisers. PEOPLink has already introduced the toolkit in 14 countries, many of which have already been able to upload their own Web catalogues.	World Bank and PEOPLink

Source: InfoDev Web site: http://www.InfoDev.org

The World Bank also has programmes that cover specific sectors. In particular, the World Links for Development programme (WorLD) relies on information technology to provide vital equipment, connectivity, training and access for information to countries where educational resources are minimal. Since 1997, WorLD has been connecting students and teachers in secondary schools in developing countries with their counterparts in developed countries for collaborative research, teaching and learning programmes, using information and communication technologies. The resources required are provided by WorLD's Corporate and Public Partners. WorLD is now operational in 18 developing countries, and involves approximately 100,000 students. These students are collaborating with teachers and students in over 25 industrialized countries on a range of topics, including environment, HIV/AIDS, gender equity, cultural heritage, biology and literature. The programme aims to expand its network over the next five years, to at least 3 million students in more than 40 developing countries.

In his Millennium Report in September 2000, the United Nations Secretary-General emphasized the importance for developing countries of keeping pace with information technology and proposed the creation of a global volunteer programme aimed at bridging the digital divide between developed and developing countries. The intention of the initiative — the United Nations Information Technology Service, or UNITeS — is to create a worldwide programme for information technology volunteers.[8] The objective of this programme is to assist developing countries in strengthening capacities for applying information and communication technologies to human development, especially in areas such as health, education, environment and small and micro-enterprises. The programme is coordinated by the United Nations Volunteers (UNV) programme. It functions through an international coalition of institutions from both developed and developing countries, including Governments, civil society, the private sector, development agencies and academia. Table 4 provides a sampling of ongoing and planned UNITeS projects. UNITeS is providing technical and pedagogical specialists to the World Bank's WorLD programme. One of its projects — the Orissa Super Cyclone Rehabilitation project in India — has been selected as a finalist in the 2001 Stockholm Challenge.

[8] UNITeS website: http://www.unites.org

Table 4. A sampling of ongoing and planned UNITES projects

Location	Project Description	Partners
Global	World Links for Development Programme (WorLD). This programme, managed by the World Bank, helps countries to develop sustainable solutions for mobilizing the equipment, training, educational resources and school-to-school partnerships required to bring students in developing countries on-line and into the global community. It links thousands of students and teachers in developing countries with their counterparts in industrialized countries and elsewhere for collaborative research, teaching and learning projects.	World Bank and ministries of education
Asia	Empowering Women and Girls in Poor Communities through Information Delivery and Dialogue. This pilot project, supported by the United Nations Foundation, will contribute to the human development of low-income women and girls through access to information provided by high-quality digital radio broadcasting. Its initial coverage will be on HIV/AIDS in parts of South-East Asia, aiming to reduce the spread of HIV/AIDS through educational content provided via digital radio and multimedia programming.	UN Foundation, Equal Access and UNDP
Global	Bringing the Cisco Networking Academy Program (CNAP) to LDC countries will allow students the same educational opportunities as are currently being offered to students in more than 80 countries. UN Volunteers will help the academies become instruments of human development in each country, going beyond standard offerings in computer networks training.	Cisco Systems and UNDP
Nigeria	ICT support to the New Nigeria Foundation. NNF seeks to establish partnerships, which will provide Nigeria with non-traditional sources of development funds for the implementation of start-up development activities in key areas. These include village-level health delivery systems, women's literacy, and private sector development in the agricultural sector and micro-finance.	UN Foundation, Citizens International and UNDP
Jordan	Establishment of a network of community telecentres in Jordan. The initial objective is to establish a pilot network composed of 15 centres, eventually growing to over 500. UNITeS volunteers have been involved since the start of the large programme, working in the first centre opened in Safawi, in the Northern Badia, a desert area in the north-east, and in providing expertise gained in another telecentre project in Egypt.	Government of Jordan and UNDP
Latin America	Development of the Virtual Health Library in Latin America and the Caribbean. The Virtual Health Library (VHL) is the Latin American and Caribbean framework for technical cooperation in health scientific/technical information. Its objective is to contribute to the improvement of health conditions by providing efficient access to up-to-date, relevant and affordable information sources.	PAHO and BIREME

Source: UNITeS website: http://www.unites.org/html/projects/projects.htm

In the same report, the Secretary-General also proposed the creation of a Health InterNetwork to establish 10,000 on-line sites in hospitals and clinics in developing countries to provide access to up-to-date medical information, and a disaster response initiative, "First on the Ground", which will provide mobile and satellite telephones as well as microwave links for humanitarian relief workers in areas affected by natural disasters. Health InterNetwork is supported by the WebMD Foundation, WHO, the United Nations Foundation and other partners.

The Economic and Social Council, in its resolution E/2000/L.27, decided to establish an ICT Task Force and a Trust Fund in order to provide overall leadership within the United Nations to formulate strategies for the development of information and communication technologies and for putting those technologies at the service of development. To achieve this objective, the Economic and Social Council envisaged the forging of a strategic partnership, i.e. a coalition of resources comprising the United Nations system, the private sector, financing trusts and foundations, donors, programme countries and other relevant stakeholders. Launched in November 2001, the Task Force seeks to identify and mobilize new and additional resources, financial, technical and human, for promoting and funding ICT-for-development programmes and projects. To achieve this objective, it will give particular attention to the replication and scaling up of successful projects; to social venture capital models designed to provide private venture capital for seed money for socially responsible and sustainable development of markets; and to research and development for new business models and technical innovations to expand access for poor people and for remote and rural areas at lower costs.[9]

Other intergovernmental bodies

Other new initiatives, outside the United Nations, have also been launched to support the development of information and communications infrastructure in poorer countries. Significant among these is the Dot Force launched at the G8 Summit in Okinawa, Japan, in late July 2000. The Dot Force is made up of representatives of G8 and developing nation Governments, together with representatives from the UN system, the private sector and NGOs. The Dot Force submitted a concrete nine-point plan on how to bridge the digital divide between rich and poor countries at the G8 Summit meeting that took place in Genoa, Italy, in July 2001. Earlier initiatives (notably the G7's Information Society pilot projects launched in 1995), while calling for the participation of developing countries, did not have this explicit focus on the digital divide. In conjunction with the Dot Force initiative, a public-private partnership consisting of UNDP, the Markle Foundation and Accenture (a worldwide consulting company) launched the Digital Opportunity Initiative (DOI). This initiative aims to help mobilize, focus and coordinate action by developing a strategic approach to harnessing the benefits of ICT for sustainable development. The first publication of the DOI is a comprehensive report entitled "Creating a Development Dynamic", based on case studies of the use of ICTs in several developing countries. Going beyond the report, the three partners are expected to allocate significant resources to *in situ* projects in Africa.[10]

[9] See United Nations Economic and Social Council (2001).
[10] Bank (2001).

These global initiatives are acknowledged by developing countries. For example, the declaration issued at the end of the G15 meeting of heads of state and government in Jakarta, Indonesia, in May 2001 emphasized the importance of ICTs and the need to bridge the digital divide, and expressed appreciation for the establishment of the United Nations ICT Task Force and the hope that the Dot Force initiative would benefit developing countries.

National efforts

Several donor countries have pledged large sums of money for promoting ICTs in developing countries. For example, at the meeting of the G8 in Okinawa, Japan pledged $15 billion in loans and other aid over the next five years to help bridge the international digital divide.[11] The digital divide also occurs within countries, including the most advanced, and there are many national efforts to bridge it. If successful, these efforts in turn may suggest new ways to bridge the international divide. One noteworthy national initiative is the Digital Divide Elimination Act, sponsored by Congressman William J. Jefferson and presented to the United States Congress in June 2001.[12] If passed, this bill will provide fiscal incentives for efforts to promote the use of computers by the less advantaged members of society.

These activities and programmes of ITU, UNDP, the World Bank, UNV and other United Nations agencies, aimed at providing assistance to developing countries, involve coalitions of resources and are carried out through different mechanisms, and following different guidelines. Yet all would stand to benefit from guidelines that would improve their collective efforts or coalitions of resources.

D. The Addis Ababa workshop

The workshop, held at the headquarters of the Economic Commission for Africa in Addis Ababa (17-18 November 1997), was attended by members of ECOSOC, representatives of UN agencies, financial institutions, donor organizations, and key decision makers from the private and public sectors. The discussions were based on four working papers and presentations by CSTD members and experts in ICTs, policy formulation, project management and financing.

The workshop's focus on ICTs provided an opportunity to build on earlier work of the CSTD that had highlighted the difficulties faced by developing countries in accessing ICTs and financing projects that contribute to the building of a national information infrastructure.

The objectives of the workshop were set out in a letter of invitation from Professor George Waardenburg, then Chairman of the CSTD. The objectives of CSTD can be summarized as follows:

1. To engage in dialogue with invited experts on a coalition of resources;
2. To identify existing schemes for a coalition of resources in the area of ICTs;

[11] Landers (2000).

[12] See http://thomas.loc.org, the United States Library of Congress database on legislative information.

3. To examine the various channels for networking between project managers, private sector financiers and donors, including through the Internet;
4. To examine new approaches to forming broad-based coalitions of resources for the development of ICTs in developing countries;
5. To develop guidelines and policy recommendations on coalitions of resources for financing the application of ICTs in the areas of transmissions infrastructure, health and education.

The workshop covered the following main themes:

1. Coalition of resources for *building capabilities* in ICTs in emerging economies, focused on:

   (i) Building capability in ICTs and developing a national information infrastructure (NII) in emerging economies;
   (ii) Guidelines for managing coalitions of resources.

2. Coalition of resources for the application of ICTs in *transmissions infrastructure*, focused on building and operating infrastructure, including:

   (i) Necessary adjustments to the regulatory framework;
   (ii) The financing of large-scale projects involving the private and public sectors, multilateral development banks and intergovernmental agencies;
   (iii) Innovative partnerships for the financing of small- to medium-size projects;
   (iv) New approaches to the financing of rural telecommunications infrastructure, including micro-lending schemes.

3. Coalition of resources in the *application of ICTs in education*, focused on education and learning in areas such as distance learning and teaching, including:

   (i) The shaping of country-specific policy frameworks;
   (ii) The matching of domestic and external public and private resources for financing the provision of hardware, software and materials developments as well as human resources development;
   (iii) The prospects for and limitations of self-funding;
   (iv) The prospects for and limitations of universal service provision.

4. Coalition of resources in the *application of ICTs in health*, focused on telemedicine, long-distance consultations, diagnosis and treatment, including:

   (i) The shaping of country-specific frameworks;
   (ii) The matching of domestic and external public and private resources for financing the provision of hardware and software, delivery systems and human resources development;

(iii) The prospects for and limitations of self-funding;
(iv) The prospects for and limitations of universal service provision.

The workshop's findings and recommendations are the following:

1. The changes in the global economic environment in recent years have had a major impact on both the way in which coalitions of resources for the application of ICTs are organized and the role of different stakeholders.
2. Increasingly, coalitions of resources are acquiring a global dimension, with the active participation of and contributions by the private sector, technology suppliers and global service providers.
3. To maximize opportunities for a coalition of resources in support of science and technology for development, there is a need to:

   (i) Balance private and social profitability in project design;
   (ii) Design a clear and transparent national policy and regulatory framework;
   (iii) Develop the capacity to inform potential investors, lenders, donors, equipment suppliers and service providers about specific opportunities to create new coalitions of resources in a particular location or jurisdiction.

II. REVIEW OF WORKING PAPERS

WORKING PAPER 1: BUILDING CAPABILITIES

Title: Coalitions of Resources for Building Capabilities in Information and Communication Technologies in Emerging Economies

Author: Wolfgang Hillebrand, German Development Institute, Berlin, Germany

***Summary*:**

The paper consists of five sections. Section one provides the main messages of the paper and highlights the conditions required for building a capability in ICTs and developing an NII. Section two itemizes the areas for which coalitions of resources would need to be developed to build a capability in ICTs and develop an NII. Section three provides guidelines for securing efficient resource use. Section four provides guidelines for mobilizing and attracting resources. Finally, section five provides guidelines for managing a coalition of resources.

The author begins by identifying the conditions required for building a capability in ICTs and developing an NII in emerging economies, both of which call for the mobilization of large amounts of investment and considerable expertise. To that end, emerging economies need to create a market-friendly environment, formulate explicit national ICT strategies that both address the question of financing ICTs and provide operational guidelines on how to raise and combine public and private funds from domestic, regional and international resources, and closely link the question of financing ICTs to the process of planning and implementing the NII.

Next, coalitions of resources that need to be mobilized are identified. These include the financial resources and expertise required for formulating a national ICT strategy and monitoring its implementation, as well as building and operating the telecommunications transmission infrastructure and promoting the production, maintenance and development of ICTs, computer literacy, and the application of ICTs in such fields as education, health, public sector management, agriculture, industry and the services sector.

The author then proceeds to address guidelines that will secure efficient resource use and cautions against a purely market-driven approach. An explicit national ICT strategy, with participatory planning procedures, is necessary. Such a strategy must aim at integrating development policies, building indigenous capabilities of ICTs, balancing private and social profitability, exploiting economies of scale and cooperation, emphasizing economies of harmonization, and exploiting economies of joint use, of joint production/scope and of coordination.

The author stresses the need to explicitly address financing of national ICT strategies. Guidelines to be considered for the design and implementation of programmes/projects for ICT use and development that are financially sustainable, as well as for the mobilization and attraction of domestic and external resources, are identified. These aim at focusing on self-funded programmes/projects, targeting

commercial users, accommodating commercial users in remote areas, accommodating non-commercial users, refocusing existing expenditures, building ICTs into existing projects/programmes, and coping with both high front-end investments and the foreign exchange constraint.

Finally, the author offers guidelines for the management of coalitions of resources. These call for the establishment of both a body at the highest political level to oversee the development of a coherent ICT strategy and a select number of mission-oriented task forces for such fields as telecommunications transmission infrastructure, production and development of ICTs, computer literacy/human resource development, and application of ICTs. The task forces should act as advocacy and advisory bodies and should involve government and public agencies, project operators, professional bodies, financial institutions and relevant user groups.

WORKING PAPER 2: TRANSMISSIONS INFRASTRUCTURE

Title: Coalition of Resources for the Application of ICTs in Transmissions Infrastructure

Author: Dr. Andreas Crede, Science Policy Research Unit, University of Sussex, United Kingdom

Summary:

The paper consists of five sections and is based on eight examples of coalitions which provide transmission infrastructure. Section one provides an executive summary of the paper's findings. Section two describes the background against which the cases were chosen. Section three describes the lessons learned from the cases and the guidelines that follow. Section four discusses the requirements for a transmission infrastructure, rural telephony, the financing of the transmission infrastructure and the availability of funding. Section five examines the eight cases in some detail.

SECTION ONE: OVERVIEW

Building new transmission infrastructure increasingly requires the mobilization of complex and globally based coalitions. Coalitions consist of equipment suppliers, institutional investors, bank lenders and major international telecommunications operators, as well as host Governments, local telephone operators and service/equipment suppliers.

Given the increasing scale of projects and their associated funding requirements, private capital is playing an increasing role in the financing of transmission infrastructure. There is a growing global savings pool that is in principle available to fund these new investments. The coalitions of resources required to build new transmission infrastructure into the millennium depend on competitive market-based environments that provide the right mix of risk and benefits.

The paper highlights the increasingly complex and global nature of coalitions of resources seen in both large-scale and small-scale projects. It identifies access to

international markets for private capital as a key feature and addresses the need for new financial structures to accommodate investor risk. The author identifies perceptions of political risk as a principal obstacle to the formation of coalitions of resources and access to funding. Telephony in rural areas can be addressed commercially and does not need universal service requirements. The creation of competitive market environments both internationally and nationally is recognized as a feature of projects that have successfully expanded the transmission infrastructure resource base.

SECTION TWO: EIGHT CASE STUDIES

The author continues his discussion by contrasting technological developments with areas of great need: 50 to 75 per cent of the world's population have never made a phone call, while a highly urbanized class has access to the latest technology, requiring most of the world's expenditure on infrastructure. He seeks to understand key issues required for building capacity and infrastructure, and confirms an earlier conclusion of CSTD studies, namely that there is a need to create coalitions of resources that are increasingly global in scale.

The author considers eight examples of transmission infrastructure at various stages of completion and of varying scale and scope.

Large-scale projects

- The P.T. Mitra Global Telekomunikasi Indonesia (MGTI) joint venture project in Indonesia;
- The privatization of the principal public telephone operator in Peru, now Telefónica de Peru;
- The fibre optic line around the globe (FLAG) undersea cable project;
- The ICO mobile satellite service project.

Small-scale projects

- The GrameenPhone venture in Bangladesh;
- The SUNSAT satellite project in South Africa;
- The CelTel mobile phone venture in Uganda;
- The Telenor International/Norwegian Government Artelekom project.

These examples consist of a first group of four large projects, with expenditure of around $1 billion obtained from international banks and financing involving both private and public sectors, and a second group of smaller projects with budgets of less than $50 million.

The transferability of resource mobilization models found in each case is addressed, and the stakeholders and the context in which they form coalitions are identified. The globalization of financial markets has more than ever before made a variety of funding sources available. These developments have led to new organizational and institutional forms with new opportunities for, as well as barriers to, the formation of the coalitions needed to reduce current imbalances in transmission infrastructure.

In addition to expenditure levels, the author uses four criteria to select the cases — stakeholders involved, geographical location, technology utilized and type of funding used. The cases are divided into two categories. The first is large-scale projects, which are similar in scale and involve complex financial and human resource schemes. They also reflect certain regional patterns and have all successfully raised funds. The second category is smaller projects that are noteworthy because of innovative elements in financing arrangements and coalitions of human resources.

Each project is analysed according to principal stakeholders, the nature of the coalition of resources, how the coalitions were mobilized, the level of success and the lessons that can be drawn.

After key lessons and guidelines have been drawn, the paper sets a broader context for discussion, covering the increase in demand for infrastructure, the changes in the way that funding is obtained, funding sources utilized, and the changing role of multilateral banks.

SECTION THREE: LESSONS LEARNED

In this section, the author draws six different lessons from the case studies:

- Globalization: Coalitions of resources have an increasingly global dimension in terms of key stakeholders, particularly in large-scale projects. This is due to the internationalization of commercial, technological and financial markets. The role of strategic telecom companies in financing new investments is highlighted. The coalitions of resources that need to be mobilized involve extensive cooperation and participation by international private sector and relevant public sector institutions.

- Private capital: Externally based finance is taking over as the main source of financing. Most case examples required private capital for funding. Financing for the large projects came from private sources only. Bank debt features prominently as a funding mechanism in a number of cases.

- Financial innovation: All cases demonstrate innovative financial solutions for raising private funds, with the larger projects exhibiting sophisticated funding structures. Complex risk-sharing schemes have allowed substantial funds to be raised.

- Political risks: Perceptions of political risk are a key barrier to funding, more so than the availability of funds. This has led to an increasing concentration of funds in particular geographical areas and industrial sectors.

- Competitive markets: The existence of international and regional competitive market environments is an important characteristic of projects that are successful in expanding the transmission infrastructure. Because of the need to service their cross-border

requirements, a small number of super carriers have effectively transformed the telecom business on a global scale. The contributions of these super carriers are not primarily in project funding, but in their enabling and catalytic role in attracting the international banking community.

- Rural telephony: Innovative approaches have led to an increase in service provision to rural areas and made it profitable. Imbalances remain, however.

From the case studies no simple blueprint emerges. However, coalitions can be mobilized in a creative fashion and drawn across national boundaries. This allows the creation of innovative financing arrangements. However, political risks need to be overcome. This is a key issue for the future.

Requirements for transmission infrastructure

The author illustrates the contrasts in communications infrastructure between developed and developing countries, but he also notes the differences in infrastructure development among developing countries. In this section, the author sets the scene to describe the complexities involved in the construction of a telecommunications infrastructure. He notes that the issue cannot be simply reduced to a question of relative levels of economic wealth measured by gross domestic product (GDP). In that connection, he points out that while some of the poorer countries have made rapid advances in increasing teledensity, other relatively wealthier countries have been left far behind. The author mentions the huge amounts that developing countries are now spending on their telecommunications infrastructure, noting the increasing inability to meet these requirements through traditional combinations of host government revenues and bilateral or multilateral capital flows. Such requirements are particularly acute in East Asia. Globally, in the last decade teledensity in developing countries increased by more than 50 per cent. However, it remains orders of magnitude lower than in developed countries. This inequality is being exacerbated by the establishment of the Internet. However, technological leapfrogging, such as the use of mobile telephones may, to a large extent, replace fixed telephone lines and thus reduce the need for the large investments required in transmission infrastructure.

The author also discusses the evolution of the telecommunications market, which until the early 1980s was dominated by government-owned monopolies enjoying direct support from the State and able to exclude other companies from the market. Since then, there has been a move towards less public ownership and a more competitive market environment. By 1996 more than three quarters of the worldwide telecommunications markets were already deregulated or in the process of being so. This has led to the emergence of global alliances among the largest telecom companies. The author also notes the role of international traffic, which accounts for a disproportionate part of net income.

Of course, the author notes that the advances in technology have caused the cost of voice and data transmission to drop significantly, and that emergence of the Internet has accelerated the demand for new infrastructure. That presents a problem

when internally generated cash flow is no longer sufficient to meet the demand for these new services.

Rural telephony

The author emphasizes the need to address rural telephony. In the past, telephone services in rural areas were simply subsidized by more profitable activity centres (urban local loops, international long-distance). Even though technological developments are beginning to reduce the cost of providing services, more innovative solutions are increasingly being sought in order to create the right investment climate for rural telephony projects to be undertaken on a stand-alone basis. New and innovative technologies, such as wireless and mobile means of communication, can offer alternatives to technological fixes or annual subsidies. Pooling of limited resources might be an alternative, as shown by one of the case studies.

Financing transmission infrastructure

The author notes a progressive shift over the past 15 years or so to private funding of infrastructure projects, telecommunications projects in particular. This requires a realignment of political goals to accept the principle of full-cost recovery of services in order to achieve acceptable payback times, and the development of regulatory frameworks to promote competition and ensure stakeholder support.

These requirements, in addition to the need to retain a certain measure of public control and concerns about foreign ownership, have led to the emergence of new forms of private sector involvement — BOT, BOOT and similar schemes. Performance criteria for such contracts need to be established by specific government departments that would also be responsible for supervising the contracts.

The advantages of these contracts are several. They make a private contractor responsible for both construction of new facilities and their operation, including their commercial viability, and increase the availability of existing government funds.

Funding for BOT schemes is provided as project financing loans from international commercial banks. BOT project financing is based on a contract providing the basis of the project's revenues, and reducing the risk for both lender and recipient. Particular emphasis needs to be given to political uncertainties. These need to be minimized through various mechanisms: co-financing, restrictions on expropriation and currency exchange, and a clear definition of the project's sources of revenue.

BOT projects financed by commercial banks are expected to play a major role in the development of telecommunications infrastructure. The coalitions of resources needed for such projects will be brought together by a consortium consisting of a local partner, an international operator and other investors.

Funding availability

The author highlights the increasingly large pool of capital available for investment in emerging economies, as illustrated by United States pension funds. He

also notes that multilateral bank lending has been overtaken by private capital inflows: United States-based fund managers have tended to bypass World Bank bonds and invest directly in Latin American infrastructure bonds with better yields. Thus, the issue becomes the appropriateness of the institutional framework to achieve savings intermediation, rather than the amount of capital available. However, these private inflows have been subject to sharp fluctuations based on how global investors assess political risk.

The issue therefore is not the lack of private capital, but rather the insufficient number of high-quality developing country projects that satisfy risk and reward requirements of investors in key investment markets. This explains why private capital flows to emerging economies have increased overall, yet are mostly invested in a select group of Asian and Latin American countries.

Therefore, perceptions of associated political and commercial risk must be addressed in order to improve investments in less favoured jurisdictions. Much can be accomplished in this regard with the establishment of the right institutional and legal framework.

The case studies, which are quite detailed, are reviewed in the Appendix.

WORKING PAPER 3: EDUCATION

Title: Coalitions of Resources for the Application of Information and Communication Technologies in Education

Author: Anna Stahmer, *Training Technology Monitor*, Toronto, Canada

Summary:

Section one sets out the findings drawn from the cases. Section two provides an in-depth analysis of the 12 cases. Section three provides detailed information gathered on the cases that form the basis for the analysis presented in section one. Section four offers information on 25 additional projects with significant potential relevance to the report. The examples chosen illustrate innovative uses of ICT in education and some examples of coalitions of resources that may not be highlighted in the case in the second section.

SECTION ONE: LESSONS LEARNED

The author starts by highlighting the role of private companies in the cases, as well as the framework conditions that make it attractive for them to participate in helping the growth of the educational system, which is governed by public sector mandates. Her cases that draw on private resources show that coalitions of resources appear to take place in two directions: offering real business incentives for private companies and developing business case studies to support the investment against future earnings. She notes that the role of voluntary not-for-profit organizations cannot be overlooked and that multilateral agencies as well as bilateral donor agencies are increasingly involved in ICT-education projects.

From the cases, the author draws a number of lessons, which she categorizes as follows:

1. Lessons related to framework conditions

    - In country policy frameworks, leadership or institutional re-engineering are important conditions for the coalition of resources.

2. Lessons related to trends, roles and leverage points of coalition partners

    - Participating schools and institutions have to show commitment through resource reallocations.
    - Voluntary or not-for-profit organizations can provide essential "fuel" to promote ICT.
    - Leverage points exist for bi- and multilateral agencies to support ICT in education, for attracting investment from private companies, and for ensuring participation by telecommunications and Internet service provider (ISP) firms.

3. Lessons related to prospects for and limitations of self-funding

    - Sustainable projects requiring significant organizational re-engineering by the project owners have a very long cycle from initial pilot projects to large-scale implementation.
    - Use of ICT in education can be a cost-effective proposition, given that suitable organizational models are implemented.
    - Self-funding and sustainability may be achievable with student fees for post-secondary and professional education after the initial investment in a course or infrastructure.
    - Private sector solutions are becoming more common.
    - At the post-secondary level, institution-to-institution partnerships between developed and developing countries or between advantaged and disadvantaged regions of a country can lead to the creation of innovative programmes of benefit to both parties.

SECTION TWO: FINDINGS FROM THE CASE STUDIES

The author then reviews her examples and offers observations on the use and financing of ICTs in education. A broad analysis of observations is derived from the examples detailed in section three as well as information from section four. The examples include:

- Western Cape Schools' Network (WCSN) – South Africa;
- Project Grass Roots & Computer for Schools Programme – Canada;
- Enlaces – Learning Network for Primary and Secondary Schools – Chile;
- Public-Private Partnership in School Design, Construction and Operation – Canada;
- Virtual Campus Open Learning University of Indonesia – Indonesia;

- Distance Education and Child Health for Health Professionals – South Africa/Canada;
- Distance teaching at the University of the West Indies – Caribbean;
- University of the Philippines Open University (UPOU) – Philippines;
- TeleCampus for Post-secondary Learning – Canada;
- Training and Development Communications Channel for Continuing and Professional Education (TDCC) – India;
- Information and Library Network (INFLIBNET) – India;
- Quipunet for Peruvian Education – Peru.

Findings are synthesized under issues that link to the potential impact and "replicability" of the projects. These issues are: framework conditions, technologies, education levels, disadvantaged areas, cost and effectiveness, ability and willingness to pay, and self-funding principles and limitations.

1. Framework conditions

The cases indicate that in almost all examples a policy framework that supports ICT for education is involved in the coalition of resources. This framework can be at the national, regional or even institutional level.

2. Technologies

The author notes that the use of ICTs for education in developing countries is still highly selective and virtually non-existent. However, private and public education providers in the United States and other developed countries are aggressively preparing for a future of virtual institutions through institutional reforms, technology adoption plans, staff training and the like. Students in developing countries who have access to the Internet and sufficient foreign exchange funds could therefore migrate to virtual institutions at potentially low fees. The cases indicate a trend towards networked ICT applications where the infrastructure allows. However, as noted by the author, these findings are influenced by the choice of cases. School computer laboratories equipped with educational materials are used for local exercises and study. This appears to be the direction in which schools and distance education institutions are going. These laboratories are equipped with some form of Internet access or e-mail or bulletin board services.

3. Education levels

The case examples indicate that ICTs are being used at all levels of education with a concentration in the post-secondary and professional areas. At the post-secondary and professional levels, there is typically a need to expand access to a course or to learning materials. At the lower levels, access to ICT and networking appear to be the first aim of the project, and access, via the network, to resources, such as other students, fellow teachers or Internet searches, appears to be part of an evolving collaborative learning model.

4. Disadvantaged areas

Most of the projects in the case examples address the issue of providing access to educational ICTs for disadvantaged regions. The solutions used in these projects are not necessarily applicable in the case of poorer countries. In all examples the cost of telecommunications services to reach distant regions is an expressed concern. Another key concern is access to funds with which to purchase, operate and maintain terminal equipment. A number of projects cope with the lack of infrastructure in disadvantaged areas by developing learning materials that use multiple methods, including print and learning centres as well as ICT.

5. Cost and effectiveness

Economic justifications underpin a number of the case examples. They show that the use of ICT can enable more efficient use of resources, e.g. by reducing travel costs or reaching more students, more quickly than traditional methods. A number of the examples are found in a policy framework that considers ICT and education an essential investment for future social returns and economic and industrial growth.

6. Ability and willingness to pay

The author suggests that the ability and the willingness to pay for ICT education appear to be quite closely correlated with the level of education, the target group and the level of a country's development. For post-secondary or professional-level projects, member organizations may actually save funds over time by reallocating resources from traditional to ICT education methods. Some project owners apparently manage to carry ongoing costs. However, they do need external funds to underwrite or pay for the initial ICT investment costs. At the primary and secondary school levels, the ability to pay ICT-related costs is less evident, but might be possible when it comes to covering operating and ongoing support costs (this may not apply, however, to less developed countries).

7. Self-funding principles and limitations

Self-funding for total project costs appears to be feasible in cases that operate at the post-secondary and professional levels, either through cost trade-off or by reaching large numbers of learners. However, limitations of self-financing are evident in circumstances without a broad supportive policy framework or where financial resources simply do not exist to expand services. Most case examples are simply too recent for it to be determined whether self-funding can sustain even these projects, which are typically in higher-income environments.

8. Coalition of resources – the broad patterns

The author then summarizes the key features of the case examples in terms of the resources that different partners are contributing. She notes that the reliability of some of the lessons from these projects is also very much influenced by issues related to the coalition of resources regarding access to expertise, sources of contributions and the implementation process.

An analysis of the coalition of resources in key areas of project implementation, such as materials development, human resources development, end-

user hardware, communications infrastructure, operating costs and hardware maintenance, is important for the development of broad guidelines.

9. Access to expertise

The initiatives covered by the author appear to have strong in-country project leadership, drawing on resources as wanted/needed, or as available with external funding. At the post-secondary level, institution-to-institution cooperation and partnering arrangements are most prominent in the sharing of expertise.

10. Financial and in-kind contributions

In-country project leadership parallels in-country financial contributions and in some cases completes in-country financing. The author details most significant inroads into the use of private funds for ICT in education. Technical assistance agreements also play important roles in four of the cases.

11. Coalition of resources – over the project cycle

The case studies did not yield much direct information about the coalition of resources in the planning phase. However, the author notes that inter-institutional agreements and participation in international conferences, professional workshops and study tours may play a support role during the planning phase.

During the implementation process, pilot stages are identified as quite important steps in the implementation of ICTs. At the post-secondary level, they have helped define operational requirements in such areas as technology, operating costs and staffing. Some projects include technology and proof-of-concept trials, which in turn helped in moving them on to the implementation of operational systems, and very importantly, to the definition of organizational underpinning for operational services.

According to the author, four distinct types of coalitions of resources emerge during the implementation and operational phases. These are coalitions of resources for materials development, human resources development, hardware acquisition and infrastructure development. The development of materials remains the principal responsibility of the project owner, but with occasional financial contributions and technical assistance from other stakeholders. By and large, human resource development is channelled through technical assistance in the form of seminars, workshops and study tours. Hardware, such as computers, earth stations and satellite dishes for end-users (students) at the post-secondary and professional levels are, for the most part, expected to be carried by the students or their employers. At the post-secondary levels, however, hardware investment is typically the responsibility of the owners, although several are looking at private companies to fill the gap. Most projects use the operational communication infrastructure and are thus bound by the infrastructure conditions.

12. Financing of operations

In all cases but one, the project owners were responsible for financing operating costs. The cost of telecommunications services, staff and teacher salaries, and hardware maintenance and replacement costs are mentioned as concerns.

SECTION THREE: DETAILED CASE STUDIES

In this section, the author provides a description of each project/case, for which she reviews the following: framework conditions, project overview, technical information, coalition of resources and assessment.

SECTION FOUR: ADDITIONAL CASES

Finally, the author introduces 25 additional projects with significant potential interest. The examples illustrate innovative uses of ICT in education and some examples of coalition of resources that may not be highlighted in the case examples in section two.

Sections three and four of this paper, which are devoted to the case examples, are reviewed in the Appendix.

WORKING PAPER 4: HEALTH

Title: Coalitions of Resources for the Application of Information and Communications Technologies in the Health Sector

Author: Douglas Goldschmidt, Consultant, United States

Summary:

The paper consists of three sections, and is based on a large number of cases that vary by regional focus, scale and scope, and funding. Section one provides an introduction and a summary of the paper's findings, and includes a discussion of the impact of communications media, and in particular the Internet, on telemedicine. Also included is a detailed discussion of the issues that arise during the implementation and operation of telemedicine projects. Section two examines the case examples in varying degrees of detail, with a particular emphasis on SATELLIFE and Healthnet. The author's concluding remarks are in section three.

SECTION ONE: INTRODUCTION AND SUMMARY

The author highlights the limitations of the traditional model for the delivery of health care, which tends to be less available to the poor and to rural dwellers. He then identifies the problems that arise from the fact that most health systems have been organized around archaic transportation modes, rather than the possibilities of newer communications modes. The inadequacy of communications in health care has led to the isolation of clients from the direct provision of health services, rural health providers from expert information, health providers from continuing education, and health professions from research, other medical information and colleagues. It also leads to the unavailability of surveillance, epidemiological information and management information.

A. Communications media

The author provides a historical overview showing that medicine has been an early adopter of communications technologies, starting with the telephone and the radio. This trend continued through the satellite era, beginning in the 1960s, when the first telemedicine programmes using experimental communications satellites were initiated. Satellites offered the first opportunity to link many remote health centres with the knowledge and expertise of urban hospitals and medical schools.

Unfortunately, the idea and the reality of telemedicine were separated by the uneven development of the telecommunications infrastructure in developing countries, particularly in rural areas, as well as the high cost of telecommunications services. Poor infrastructure development resulted from the technologies' high cost, the low priority many countries attach to telecommunications investment, and the monopoly/government ownership of the infrastructures, among other problems.

However, changes in the international telecommunications infrastructure over the past ten years have significantly improved the technological environment for telemedicine. First, as telecommunications networks have become more global, national network providers have increasingly had to standardize their structures and improve their facilities. Second, digital technologies have dramatically increased the capabilities of telecommunications systems while decreasing their unit costs, particularly for transmission systems. Third, telecommunications have been liberalized, increasing the number of competitive suppliers.

Over the next few years, the author expects the prospects for telemedicine to improve even further, thanks to new satellite systems that are accessible from any part of the planet via very small, hand-held units. Competition, production economies and continued technical change are expected to lead to significant reductions in costs. Hence, one can expect that all rural areas will at least have the potential for telecommunications service, so long as some form of budgetary support is found.

B. Telemedicine and the Internet

The author recognizes the Internet’s transformative effect on the communication of health information through the proliferation of e-mail services, the development of remotely accessible databases, extended international networking among all professionals, the development of commercial information services on the Internet, and the improvement and extension of telecommunications infrastructure to provide Internet services.

As an information infrastructure, the Internet minimizes the need for individual institutions to develop proprietary information systems. The challenge lies in designing appropriate programmes which can be sustained over time.

C. Implementation issues

The author identifies eight distinct implementation issues, which he discusses in varying degrees of detail.

1. Factors affecting the cost-effectiveness of telemedicine – hardware and software

A key area for review is whether the hardware and software used in making health services available are efficiently provided. Among the elements that affect the efficiency of health delivery are:

- Infrastructure issues

The case studies in this paper are of projects that heavily utilize the Internet and other digital media. While the basic Internet software infrastructure is now readily available, the hardware infrastructure is lacking in the developing world, particularly in rural areas. Ideally, the hardware infrastructure would be optimized over a large range of users, resulting in economies of scale. The reality is that such infrastructure is unavailable for use in rural areas. The author singles out SATELLIFE, which has attempted to address this problem by providing interim dedicated facilities that will be phased out in favour of a common infrastructure. In the absence of a common infrastructure, or where requirements are more specialized than would be available through common infrastructure, shared facilities will generally offer savings over dedicated facilities.

- Standardization

A major problem in developing extended communications systems and services has been the lack of hardware standardization, which liberalization and globalization have greatly reduced. The problems now are in software standardization, which raises the following concerns: vendor standards and compatibility, costs of creating and maintaining software, and costs of making software systems compatible.

- Technological trends

Health informatics is undergoing significant changes as new technologies become available.

2. Issues of scale and budget

The author notes that more efficient technology does not always lead to decreases in programme costs. More efficient technology reduces the cost per unit (e.g. per patient) served. Aside from the costs of the hardware/software associated strictly with telecommunications, introducing telemedicine will often lead to higher budgetary requirements as programme scales grow. Failure to understand this can lead to poor service delivery and poor system maintenance.

3. The central requirement for changing agency structure and management in assessing and ensuring cost-effectiveness

Project histories clearly show that in the absence of strong and creative management, the hardware and software simply become additional expenses, without the commensurate benefits one would assume. This is a continuing problem,

reflecting the naive belief that the telemedicine system can be added to the existing medical system without changes in management and agency structure and procedures.

4. Training as a prerequisite for success

User training remains perhaps the most critical issue for successful telemedicine projects.

5. Marketing, health and telematics

The author emphasizes the need for service promotion and system marketing to educate end-users.

6. Financing requirements over the project cycle

Health systems incorporating advanced communications incur a series of budgetary costs that need to be addressed even if, in many cases, they are only indirectly acknowledged:

- Planning – these are the costs for research and development of a new delivery system.
- Implementation – implementation costs refer to the one-time resource requirements to actually put a system in place. These costs will include capital, software, administration and management of the implementation, training and promotion.
- Operating – it is system operations that incur the greatest problems. The operating costs specific to the communications system will include staff, supplies, maintenance, administration, ongoing training, communications costs, licensing and access fees, and evaluation.

These costs do not specifically address all the incremental costs of implementing a telemedicine programme. Improving service access, expanding the coverage areas and adding new training programmes all incur incremental expenses that need to be studied.

- Continuing system planning – the costs of system expansion and modernization need to be accounted for.

7. Funding sources

The author identifies three broad categories of funding sources for health informatics programmes:

- Coalitions of resources, volunteer and indirect subsidies, and user fees and other means of private support.

  (a) Coalitions of resources

The case studies in this report usually had several outside sources of funds. These included NGOs, government, bilateral and multilateral agencies, and pharmaceutical companies and other private concerns.

(b) Volunteers and other indirect subsidies

Many of the programmes included in the case studies rely on volunteer work and benefit from indirect subsidies, e.g. reduced telecommunications charges.

(c) Self-funding

One of the key issues in establishing new informatics-based services is whether the service can sustain itself in the future. Sources of self-funding found in the cases include user fees (patient, practitioner and agency) and third-party payments.

8. The need for a policy framework for health telematics

The case studies indicate that policy frameworks are necessary for any health informatics system. The policy framework will need to address the financing and compensation issues discussed above. Ethical and legal questions, licensing, competing stakeholders and infrastructure development may require a larger framework than a single agency or provider can establish.

SECTION TWO: CASE STUDIES

In this section, the author presents a series of case studies using telecommunications/computer hardware and software to deliver health services to rural or otherwise isolated populations. The cases were initially selected through an intensive Internet search. Relevant cases were chosen with follow-up research via literature searches, e-mail and telephone conversations.

The cases are:

- SATELLIFE/HealthNet;
- Technology of information delivery;
- Health information;
- Country programmes;
- Library programmes on the Internet;
- The Mapping Malaria Risk in Africa project (MARA) – using the Internet to map the spread of malaria and disseminate research;
- Inforoute Francophone;
- Latin American Public Health Network;
- Programmes in Costa Rica, South Africa, Australia, China and Singapore.

SECTION THREE: CONCLUDING REMARKS

As already noted, the rapid development and standardization of the international telecommunications network, coupled with the international standards being imposed by the Internet, have permitted health providers to focus primarily on

what information they want to deliver rather than on how it should be delivered. While Internet access remains problematic in rural areas starved of basic telephone service, it is increasingly available in the cities of the developing world, permitting significant expansion of the types of resources available to healthcare personnel, and in the types of health services that can be provided via the telecommunications network.

Outside those countries with national telecommunications coverage, rural communications, and hence telemedicine, will remain problematic. However, even here there is cause for some optimism. HealthLink and similar programmes' attempts to extend Internet or other digital networking capabilities via digital radio are the likely first-stage extensions of telemedicine into rural areas.

Of far greater importance is the projected launching of multiple low-earth orbiting satellite systems. These systems will permit the use of hand-held units anywhere on earth (including the poles) for real-time communications via the international telecommunications network. While the initial equipment and use costs associated with these systems remain high, competition, technological development and the economies resulting from mass production will lower these costs, opening even the most remote areas to communications. Such openings will then permit the extension of health services to health-care workers and users in remote areas.

In the end, however, we are brought back to the problem which has plagued telemedicine projects for the past 30 years: the technology is only a minor problem relative to the efforts needed to organize, finance and sustain the extended health system. Advanced technology and the Internet shift some of the variables in terms of what can be done, and at what cost, but they do not provide the answers to what should be provided, to whom and at what cost – those questions remain in the health and political sectors.

There remains a critical need to develop integrated policy frameworks which bring together the various actors – the health-care workers, health ministries, equipment and software vendors, educators, insurers and telecommunications carriers – to create innovative systems which have the possibility of long-term support and growth.

III. MARKET AND TECHNOLOGY DEVELOPMENTS

This section deals with the changes in market conditions that have taken place since the workshop, and which may have an impact on the coalition of resources required in order to foster and promote ICT capabilities in developing countries.

To begin with, the ICT infrastructure has been expanding all over the world: more people have access to ICT services than ever before. This, in great part, has been due to the emergence of mobile communications. The number of new mobile lines now exceeds the number of fixed lines. But new modes of securing private sector involvement have also contributed to this expansion. However, the expansion has not been uniform. In many parts of the world, the digital divide, instead of shrinking, has been expanding.

What is more, the cost of using ICT services is decreasing worldwide, sometimes radically. There are two main factors regarding the decrease in price: technological developments and competition. Competition, when made possible by the regulatory environment, has been observed to lead to considerable reductions in the cost of services. Technology has made possible a range of new, bandwidth-heavy services that are now offered at competitive rates in developed countries and that may also become available (through satellites) to end-users in developing countries.

Developments in technology have occurred along two directions. The first is hardware, resulting in better, cheaper communications equipment (as illustrated by Moore's law, which states that computer processing capability is doubled every 18 months). The second is software, which has led to the emergence of common protocols that allow the use of a common hardware infrastructure more efficiently (e.g. compression algorithms) and for different services (as in Voice over IP).

The interplay of developments in technology and in market conditions has continued to affect market alliances and strategy among the major carriers. There seems to be a certain consolidation of global players along "verticals" (e.g. in satellite services). Competition among them will lead to the commoditization of bandwidth, resulting in greater access and a further reduction in communications costs. While not quite enough to offer services on a par with what is available in urban areas in the United States or Western Europe, it is sufficient to allow for order of magnitude improvements in ICT services. This will enable providers of health care and distance learning to improve their offerings to end-users.

A. Expansion of infrastructure and services

Teledensity (the number of fixed telephone lines per 100 inhabitants) is one useful indicator of the development of national ICT infrastructure. Table 5, drawn from data published by the ITU, shows teledensity in different regions of the world and their growth rates during 1998 and 1999. It also shows the corresponding numbers for mobile phone subscribers. The growth of teledensity in less-served regions is evident, except in Africa, where it has been marginal. However, in those areas, the growth of mobile services stands out. For example, mobile users in Africa

almost quadrupled between 1997 and 1999, such that mobile users there represented almost a third of all telephone subscribers, a figure that is close to the world average.[13]

The reasons for choosing wireless technologies are multiple. First, the cost per additional mobile subscriber is a fraction of what it would be for a new fixed-line subscriber. Second, the installation time is much less; indeed, delivery of a new mobile subscription could be immediate. Third, there is less reliance on existing infrastructure. Fourth, current wireless protocols would allow additional services to be upgraded. The use of mobile telephones provides a typical case for technological leapfrogging.

While wireless technology is well suited for the delivery of services to end-users and to provide access to remote areas, bulk connectivity required at the national level is best provided by fibre-optic links. For example, the Sat-3 fibre-optic cable to Europe will provide connectivity to several sub-Saharan countries on the Atlantic Coast, from Senegal to South Africa, with a 120 Gbps capacity that should lead to considerably lower costs for international phone calls and Internet connections.[14] It should be noted that uncertainties inherent to the telecommunications industry, whether technical (e.g. satellite launch delays) or market-based (e.g. decisions to stop or delay investments in large-scale projects), make it difficult for the developers of such projects to abide by expected completion dates. In 1997, for example, AT&T withdrew from AfricaOne, a high-profile competing project that would have encircled Africa with a fibre-optic link.[15]

Table 5. Teledensity and mobile users worldwide

Region	Teledensity, fixed lines/100 inhabitants			Mobile user/100 inhabitants		
	1998	1999	Growth	1998	1999	Growth
Africa	2.24	2.45	4.5 %	0.45	1.02	127 %
Americas	32.22	33.13	2.8 %	11.95	16.54	38.4 %
Asia	7.33	8.32	13.5 %	3.07	4.52	47.2 %
Europe	37.28	38.48	3.2 %	13.14	22.35	70.1 %
Oceania	41.31	40.29	-2.4 %	24.75	24.87	0.5 %
World	14.28	15.61	9.3 %	5.40	8.22	52 %

Sources: International Telecommunication Union (2001a); International Telecommunication Union, *World Telecommunication Development Report*, various issues; International Telecommunication Union website (http://www.itu.org).

Of course, one cannot discuss the development of ICTs in the last few years without discussing the Internet. The Internet has become so pervasive that Internet access and the number of IP hosts (i.e. computers with a fixed Internet address) per capita have become an important macroeconomic indicator. Table 6 shows these figures for different world regions. At the present time, the Internet is available in the overwhelming majority of countries. The increase in access in developing countries has been dramatic. However, it is still clustered in major cities. In 1997, for example, only four African countries had links to the Internet exceeding 64 kbps in capacity

[13] International Telecommunication Union (2000).
[14] Bray (2001a).
[15] Bray (2001b).

(roughly equivalent to a single modem); today, all but a small number have such links.

Table 6. Density of IP hosts and Internet users worldwide

Region	IP hosts/100,000			Internet users/10,000		
	1998	1999	Growth	1998	1999	Growth
Africa	2.09	2.41	15.3 %	21.45	34.63	61.4 %
Americas	399.05	684.56	71.5 %	913.96	1602.78	75.3 %
Asia	7.41	11.8	5.2 %	88.0	140.88	60.1 %
Europe	96.9	125.91	30 %	567.1	880.02	55.2 %
Oceania	315.0	455.12	44.5 %	1241.3	2241.7	80.6 %
World	73.7	120.05	62.8 %	266.36	439.8	65.1 %

Sources: International Telecommunications Union (2001a); International Telecommunication Union, *World Telecommunication Development Report*, various issues; International Telecommunication Union website (http://www.itu.org).

Even though the cost of a computer and of Internet access is high, large numbers of people are becoming familiar with the Internet, browsing the World Wide Web and using its resources, including free personal e-mail services. As described by an Internet cafe owner in Nairobi, "The Somalis come in to browse for news of their country. Businessmen want to check prices in other countries for computers and old and new cars. But most people just want e-mail".

This de facto democratization of the Internet has been made possible thanks to the mushrooming of Internet cafes in practically all developing countries. Indeed, the economics of Internet cafes parallels with that of GrameenPhone: thanks to a pooling of resources, a local community can have access to a communications infrastructure that otherwise would have been too costly. This, however, remains an urban phenomenon.

B. Change in regulatory environment

The change in the regulatory environment has also contributed to the expansion of ICT infrastructure. The trends outlined in Working Paper 2 have, overall, continued. Now, a fairly large number of developing countries have licensed private operators that are competing with the national provider, which may or may not be in the process of privatization. Here are a few examples. Local cellular service in Egypt is currently provided to over 1 million users by two private competitors.[16] In February 2000, a Deutsche Telekom subsidiary acquired a 51 per cent stake in Uganda Telecoms Ltd for $33.5 million and committed to investing $110 million to expand the network by an additional 100,000 lines within five years. Similarly, Camtel Mobile (in Cameroon) was sold to Mobile Telephone Network of South Africa for $61 million on condition that the South African operators invest an additional $225 million over the medium term. Since the partial privatization of

[16] International Telecommunication Union (2000a).

Telkom (South Africa) in 1997, 1.6 million new lines have been added, mostly in poor areas, and overall the telecom's efficiency has improved.[17]

One example worth underlining is that of Morocco. In 2000, it claimed the world's fastest mobile growth rate, with the number of digital subscribers exceeding the number of landlines within a year. The mobile operator is a Spanish-led group that started providing services within nine months of winning the tender, and later on acquired a second GSM licence for $1.1 billion. Last year, smaller operators were awarded VSAT (very small aperture satellite) licences at $4 million each. Vivendi Universal, a French group, acquired a 35 per cent share of Maroc Telecom, the national company, whose hold on landlines will be broken in 2002.

Morocco's experience has been well received and some have argued that it might serve as an example to others.[18] The coalition of resources that made this possible has been orchestrated by a State regulator (not the Ministry of Telecoms), who is in charge and acts as an independent arbiter. It is not surprising that bilateral cooperation programmes have been set up in which well-established regulatory agencies in developed countries will provide assistance and know-how to their counterparts in developing countries. By December 2000, the United States Federal Communications Commission, for example, had signed its tenth such international development work programme.[19]

When available, competition has led to a significant drop in the cost of Internet access. Kenya, for example, now has 47 Internet service providers and, compared with last year, the cost of unlimited Internet access has dropped sevenfold, down to $15 a month, corresponding to 50 per cent of Kenya's GDP per capita.[20]

C. The role of technology

It is quite appropriate to talk of a change in paradigm when talking about the technological changes that came to the fore over the last four years. Developments in hardware have ushered in what is now called the Optical Internet. Relatively economic backbone solutions with capacities of up to 10 Gbps that break the 4,000 km barrier are now commercially available. Optical fibres with up to 6.4 Tbps capacities have been demonstrated. What this means is that global carriers will be able to increase their transmission capability to match any requirement. In developed countries, it means that increased capacity will translate into price reduction for broadband access. Indeed, the cost of a monthly digital subscriber line (DSL) in the United States is $40, twice the cost of standard modem access but at four times the bandwidth. Current projections anticipate that in 10 years' time, the "Tera Era" will see 1Gbps connections to the desktop or home, at a monthly cost of $100. The implication is that the cost of information transmission will drop even further.[21] [22] [23]

[17] Rafiq (2000).

[18] *Economist* (2000).

[19] United States Federal Communications Commission (2000).

[20] Africa Internet Connectivity website: http://www3.sn.apc.org, Eastern Cape: Africa Cooperation Action Trust.

[21] National Science Council (1998).

[22] Additional information on future expectations can be obtained from the websites and publications of national agencies promoting research and development in basic and applied sciences, including the National Science Foundation (http://wwnsf.gov) and the Defense Advanced Research Projects Agency

Meanwhile, information-processing capacity, as a result of Moore's law, has continued to double every 18 months. Information storage capacity has improved at even better rates: over the last decade, hard-drive storage technology has improved 50 per cent faster than computing power. With the advent of optical storage, the cost of storing media for 10 Mb of data (about 3,000 pages of text) is less than $0.10.

The commoditization of bandwidth (i.e. of information transmission services) has led major players in the industry to maximize economies of scale and scope. As a result, the communications infrastructure has coalesced into a hub and spoke model, much like the airline industry, with major ISPs (so-called tier-1 providers) operating the backbones linking the main hubs and a cascade of smaller companies providing local access to the nearest hub. The commoditization of storage and, increasingly, of processing power has led to the emergence of the data centres. Data centres are secure environments where ISPs lease out storage and processing power to end-users. In the digital economy, these data centres and ISPs are, respectively, the equivalent of major cargo transit centres and shipping agents in the "old" economy. By leasing out storage, bandwidth and information processing capacity to new entrants, these ISPs allow them to avoid high upfront costs. By decreasing these barriers to entry, the ISPs have contributed significantly to the spread of the digital economy in developed countries. Recognizing the importance of these services, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has issued a "cook-book", showing how to establish multi-purpose community telecentres in Africa and offering recipes for their self-sustainability.[24] These telecentres could, in time, become full-fledged data centres.

An interesting development is the emergence of the so-called application service provider (ASP). While ISPs are aggregators of bandwidth, storage and computing capacity, ASPs are aggregators of software and usually provide higher-value-added services than ISPs. Typical examples of the ASP are the Internet search engines such as Altavista and Google, and webmail providers, such as hotmail. Note that a significant number of hotmail's registered users are based in developing countries.[25] [26]

The impact of these new technologies on developing countries can be significant, provided that they have access to the necessary transmission capability. A developing country with proximity to a node on the worldwide undersea network will benefit directly from the network. In turn, this country could become a local hub for its neighbours, as is the case with South Africa for Lesotho, Namibia and Swaziland. Remote regions would achieve access by connecting via satellite to an earth station located at this hub.

(http://darpa.mil), which are both based in the United States. Longer-term figures may be inferred from the solicitations for research projects promoted by such agencies.

[23] Information on the current capabilities of commercially available communications hardware can be obtained from vendor websites, including the following: Nortel Networks (http://www.nortelnetworks.com), Lucent Technologies (http://www.lucent.com), Cisco System (http://www.cisco.com), Alcatel (http://www.alcatel.com) and Ericsson (http://www.ericsson.com).

[24] United Nations Educational, Scientific and Cultural Organization (2001).

[25] Gilder (2000).

[26] Shepard (2000).

In industrialized markets, 70 per cent of satellite capacity is dedicated to broadcast video-related services, while 30 per cent is used for voice, data and the demand for specialized services on private networks. In the rest of the world, there is a far greater use of satellite technology for basic infrastructure. Broadcast video represents perhaps 40 per cent of the traffic, while telephony and data traffic account for 60 per cent.[27]

Satellite services have also improved. While still not capable of equalling the transmission rates of optical fibres, satellite technology has resolved a number of problems associated with geostationary satellites, latency in particular. Newer schemes of satellite deployment, known as low- and medium-earth orbit (LEO/MEO), are in the process of being implemented. The advantage of LEO/MEO satellites is that their launching costs, because of their orbits (600-1000 km), are much lower than those of geostationary satellites, which are typically at 30,000 km. These orbits criss-cross the sky, such that there is always at least one satellite within a given user's line of sight.

The best-known example of such clusters is Iridium, which was designed to offer mobile satellite telephony anywhere in the world, and turned out to be a major commercial failure. Indeed, other satellite clusters have encountered almost similar fates: ICO, one of the case studies in Working Paper 2, filed for bankruptcy in 1999 but was acquired by Teledesic – a further indication of consolidation of the industry.

However, other constellations have been successful. Globalstar's 48 array satellites offer voice, short messaging, global positioning, fax and data transfers at 9.6 kbps.

Teledesic is the most ambitious LEO satellite services company. It is expected to become operational in 2003-2004. It will have an array of 288 satellites capable of providing up to 64 Mbps of downstream and 2 Mbps of upstream bandwidth for voice, videoconferencing and data. The monthly cost of a T-1 connection with Teledesic is expected to be around $700.[28] Even though its services are not yet operational, Teledesic is expected to play a major role in providing transmission capacity to developing countries, as is borne out by the fact that it is the only observer listed amongst the World Bank's partners in the InfoDev programme.[29]

VSATs are being deployed by a large number of vendors throughout the developing world, Africa in particular. VSAT offers one of the cheapest methods of providing connectivity to nodes distributed over wide areas, e.g. a network of health clinics or schools. At the present time, VSAT links are being used by bandwidth consolidators, who are offering voice services at much lower end-user rates than national carriers.

[27] Brown (1998).

[28] Private communication by an industry insider. The author was unable to confirm this figure from published sources.

[29] Additional information on the future offerings of these companies can be obtained from their corporate websites (i.e. http://www.teledisc.com). Note that many satellite companies have had to revise their schedules, which has delayed the offering of their services for years.

D. Software developments

The most noteworthy development in software in recent years has been the emergence of the Internet Protocol (IP) and its dominance over all other networking protocols. At this point, IP (and in particular, its latest implementation, IP v.6.0) is the only universal addressing system that is available. Because of its universality, it can accommodate all devices on a local area network (computers, printers etc.), all cellular phones and pagers, indeed, any networked device. It is acceptable worldwide and, thanks to the efforts of equipment vendors, it is interoperable with network operating and signalling systems and applications.

The main benefit is that IP allows convergence of services: telephone operators can now transmit data, data transmitters can now, with Voice over IP applications, transmit voice over any network. VSAT operators can now offer both voice and data services. It is thus not surprising that VOIP international traffic has been increasing: totalling just under 2,000 million minutes in 1999, it is expected to exceed 6,500 million minutes in 2001. Moreover, its share of total international traffic increased from 1.6 per cent in 1999 to 3.2 per cent in 2000, and is expected to reach 5.5 per cent in 2001, yet another reason why the ITU attaches so much importance to the Internet.

Another noteworthy development is that of the Open-Source Movement, composed of a worldwide network of thousands of devoted software developers who make their software freely available. These developers are eager to share their work and willing to have it improved upon by others. The most notable outcome of this movement is Linux, a stable, scalable and robust operating system that is distributed free (except for the cost of the media). Linux has begun to acquire a significant share of the market, becoming an alternative, and increasingly attractive, standard. In many ways, it is a better standard as it is economically written. For a given level of performance, it requires less memory and disk space compared with its main competitors. It can therefore run on computers that are less expensive. This is all to the benefit of developing countries. The operating system of a client computer costs several tens of dollars, whereas server software costs upwards of several hundred dollars. The Free Software Movement therefore makes it possible to significantly reduce the set-up cost of a network. Indeed, Mexico has considered installing Linux as the default operating system on all government computers.

Further software developments that have a direct bearing on applications, and in particular applications in education and health care, have been the development of platform-independent programming languages and the improvement of compression algorithms. The most notable of platform-independent languages is Java, which is particularly well suited to the Internet and the World Wide Web. An application written in Java will run on a wide range of compatible platforms. This is particularly useful in client-server scenarios, typically encountered in distance learning. In such a scenario, a professor located at the server might be connected to a large number of students using different client machines. Compression algorithms, typically using wavelet image compression, have reduced the transmission requirements by an order of magnitude, enabling the transmission of byte-heavy X-rays or CAT-scans. Such algorithms are currently operational. One company offers second-opinion medical advice by doctors at leading United States medical centres to primary doctors and

their patients based in 15 different countries in Latin America, Africa, Asia and Eastern Europe.

Thus, the technology and market trends noted by the authors of the working papers have continued: the cost of transmission is still going down, transmission infrastructure in developing countries is being expanded (mainly thanks to wireless technologies), deregulation is leading to new modes of project financing, and applications in health care and education are expanding. In some cases, there have been some qualitative changes: consolidation within certain industries, new financing models, convergence on IP, the emergence of new categories of players, etc. What does this mean for the coalition of resources?

E. Implications for coalition of resources

The implications of these market and technology developments for the coalition of resources are positive. They are as follows:

1. The continued diffusion of ICTs implies a greater level of acceptance and a diminishing need to educate decision makers and end-users as to the need to allocate resources to the development of ICTs. Indeed, decision makers in developing countries are now among the established users of the Internet. For example, the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) reports that in May 1999 its website (which is its main channel for the distribution of official documents) was accessed from 112 different countries. In October 1999, the website was accessed from 147 different countries, representing 80 per cent of the countries having ratified the Convention.[30]

2. Hardware will become commoditized and the recycling of used (but still useful) hardware will grow. Continued progress in the development of hardware means that, for a given information processing capability, storage or transmission capacity, the costs have decreased and will continue to do so. Competition in the supply of new hardware will increase, pushing prices down further. Meanwhile, demand for information processing, storage and transmission capacity in developing countries is expected to continue to grow, even if growth slows down. Unsold inventory or equipment made redundant through the upgrading of equipment in developed countries (e.g. by data centres) will make large amounts of hardware available for recycling. Such data centres could become significant resources of used hardware. Thus, computing equipment is increasingly becoming more affordable, freeing resources for other purposes (e.g. staff training).

3. The standardization around software platforms and protocols brings in new private sector players – with significant resources – with a stake in the promotion of their products and a willingness to contribute resources to the promotion of ICTs in developing countries. For example, fearful of Linux, Sun Microsystems now makes its Solaris operating system available free of charge on quite generous terms. Microsoft, Cisco and Oracle (respectively, the

[30] The UNFCC was also a pioneer in "webcasting" of conferences and meetings, i.e. use of the Internet for live broadcastng of video and sound streams.

world's leading developers of operating systems, Internet networking equipment and database software) have each developed off-the-shelf training programmes to certify technicians and engineers in the use of their respective products. They are willing to provide resources to academic institutions interested in providing this training. Bir Zeit University in the Palestinian territory is one institution that has made partnership with these private sector companies a basic component of its strategy to develop a national IT capacity within a short time frame.[31]

4. Because of the convergence around IP, the transmission of information on the network (whether physical or wireless) will become a commodity, just like water or gas in a network of pipelines or electricity on a grid, leading to economies of scale and a reduction in the resources required for the transmission of information. This will trigger a consolidation among providers of transmission capacity (phone companies, ISPs, satellite operators) and the resulting entities will operate as utilities. Indeed, many utilities worldwide have begun providing telecommunications services. A case in point is that of Vivendi, which is a partner in the consortium providing mobile phone services in Morocco, and which recently acquired a 35 per cent stake in Morocco's national telephone operator; it was originally known as Lyonnaise des Eaux, a French utility provider. South Africa's electric utility, Eskom, is also following this trend. It has begun building a network of power plants and transmission/communications lines that is planned to cover the continent from South to North in 10 years.[32] The entry of such utilities into the bandwidth distribution market will lead to increased competition with incumbents, which usually leads to a drop in prices to the end-user.

5. Because of the possibility of leasing global infrastructure, the upfront financial resources for capital costs required for access to information transmission capacity will decrease, but operating costs may remain high. In certain cases, upfront costs may be negligible. A large information transmission capacity (based on satellite arrays and/or fibre-optic networks) is being developed worldwide by global operators and will be leased to both resellers and end-users. The end-users are likely to be global corporations. The resellers are likely to include bandwidth consolidators, and may even include national telephone companies or ISPs. The upfront investments in this global transmission infrastructure have been provided by the global operators and their financial backers. This will, of course, be factored into the use charges, so that while resources for start-up costs might be less, operational costs might be higher. Hopefully, the economies of scale will be significant.

6. A cost-effective allocation of resources might require a realignment of national policies. Many countries might not be willing to lease transmission infrastructure from a foreign entity, even though this might be the most cost-effective solution. This might challenge strongly held national assumptions and policies. Many countries have successfully challenged similar assumptions, but others have not.

[31] Tarazi (2001).
[32] Bray (2001).

7. As information transmission capacity becomes a commodity, the focus will shift from infrastructure operators to content owners and the quality of their information, and to the information users and their ability to use this information. Coalitions of resources will need to address these developments. Typical examples of this include telemedicine, where information owners could include on-line medical databases, and information users could include medical professionals.

These implications are summarized in table 7.

It is interesting to note that the DOI report suggests that in order to address pervasive market failures in developing countries and to create situations with positive outcomes for all involved, new collaborative partnerships capable of coordinated action, between public, private, civil society and international organisations, are needed: a strategic compact at the global, national and local levels. This echoes the United Nations Secretary-General's call for a "global compact" to ensure that the benefits of globalization extend to both developed and developing countries.

Table 7. Implications of ICT market and technology developments for the coalition of resources

Issue	Dimension	Implications on coalition of resources
Diffusion of ICTs	ICTs	The continued diffusion of ICTs implies a greater level of acceptance and a diminishing need to educate decision makers and end-users as to the need to allocate resources to the development of ICTs.
Cost of hardware	Hardware	Continued progress in the development of hardware means that, for a given information processing capability, storage or transmission capacity, the costs have decreased and will continue to do so. Thus, computing equipment is increasingly becoming more affordable, freeing resources for other purposes (e.g. staff training).
Competition between standards	Software	The standardization around software platforms and protocols brings in new private sector players – with significant resources – with a stake in the promotion of their products and a willingness to contribute resources to the promotion of ICTs in developing countries.
Commoditization of bandwidth	Transmission	Because of the convergence around IP, the transmission of information on the network will become a commodity, just like water or gas in a network of pipelines or electricity on a grid, leading to economies of scale and a reduction in the resources required for the transmission of information.
Availability of global infrastructure	Infrastructure	Because of the possibility of leasing global infrastructure, the upfront financial resources for capital costs required for access to information transmission capacity will decrease, but operating costs may remain high.
National policies and priorities	Policies	A cost-effective allocation of resources might require a realignment of national policies. Many countries might not be willing to lease transmission infrastructure from a foreign entity, even though this might be the most cost-effective solution. This might challenge strongly held national assumptions and policies. Many countries have successfully challenged similar assumptions, but others have not.
Role of information owners/users	Information	As information transmission capacity becomes a commodity, the focus will shift from infrastructure operators to content owners and the quality of their information, and to the information users and their ability to use this information. Coalitions of resources will need to address these developments.

IV. CONCLUSIONS

Even though the 29 case studies and the Addis Ababa workshop were undertaken four years ago, their main findings and recommendations still hold: trends in the global economic environment continue to impact on the coalitions of resources required for, and the roles of the stakeholders involved in, the promotion of ICTs in developing countries. There is still a need to develop a clear and transparent national policy and regulatory framework to balance private and social profitability in project design, and to increase the capability to publicize new opportunities among the stakeholders concerned. CSTD's new information network for development could play a role in this regard by disseminating information on existing conditions and facilitating networking by those who wish to form new coalitions.

In the case of transmissions infrastructure, the main constraint is essentially capital cost; financial institutions will therefore continue to be major stakeholders. Political risk was and is a key barrier in putting together public and private resources. Here, the right institutional framework and political risk guarantees could play a role.

Even though recent (and future) developments will reduce the cost of expanding the ICT infrastructure (e.g. through mobile networks and satellite connections), the recommendations of the workshop are still valid. For example, leasing the services of a foreign international carrier rather than building a nationally owned infrastructure will require, even with substantial cost savings, the realignment of political priorities – a point argued in Working Paper 2. New forms of private sector involvement, a point also argued in Working Paper 2 (e.g. BOT, BOOT), involving private contractors supervised by government agencies, are becoming more frequent. More recent work has also suggested the need for new forms of public-private sector involvement to improve cooperation. For example — partnerships global and strategic compacts proposed by the DOI report — seem particularly well suited to discussions leading to a realignment of national priorities.

In the case of applications (assuming, of course, an existing infrastructure), the main constraints are human resource capabilities and access to information and know-how. Here, stakeholders include volunteers and not-for-profit organizations. In the case of health care and education, the use of networked applications has continued to increase. In both cases, considerable resources are now available to users with access to the Internet: these include educational material and curricula, medical and epidemiological information, second opinions, and information compiled by professional societies. Because of the development of wireless communications, these resources can be made more readily available, and with improved access, to practitioners in developing countries. Indeed, pioneering examples (e.g. SATELLIFE) were discussed at some length at the workshop. The involvement of developing country education and health-care practitioners in international or bilateral knowledge networks providing access to high-quality information at acceptable costs becomes important.[33] Such networks (e.g. providing access to bibliographical information) were also discussed at the workshop.

[33] UNCTAD (1999).

With these developments, the setting up of an overall national strategy and action plan that encompass both the development of the infrastructure and the promotion of its use remains important. There is still a need in most developing countries to establish a body at the highest political level to design a national IT strategy. It is only through such a plan that resources can be used optimally and duplication and lock-in avoided. The guidelines proposed by Working Paper 1 address issues of equity (e.g. building indigenous capability, balancing private and social profitability) and sound economics (e.g. economies of scale and scope, and economies of coordination).

The first set of concerns (equity) translates into policies and regulations to be formulated by a national regulatory authority, drawing the various stakeholders into a new form of partnership – a compact. Ideally, this national authority should be independent of all stakeholders in order to be able to set its guidelines and resolve disputes, keeping in mind the common good by applying principles of integrative bargaining. For example, at the national level, such an authority could empower institutional users to access the services of international carriers if the services of the national carrier are too costly or are unavailable. By the same token, the regulatory authority could require institutional users to switch to the national carriers if they provide comparable services at reasonable cost. Similar compacts should be made at the global level.

The second set of concerns (better efficiency, increased returns on investment) can be addressed through evolving partnerships between the stakeholders involved. These partnerships will offer the frameworks through which projects that use or develop ICTs (or, better still, portfolios of such projects) can be implemented. The optimal coalition of resources will require the application of the operational guidelines discussed throughout the workshop. These include:

1. A clear and transparent national policy and regulatory framework for ICTs based on a national action plan that includes development of infrastructure and promotion of its use and a strategy for developing and running the telecommunication industry;

2. Involving financial institutions as well as new forms of private sector participation (e.g. BOT and BOOT) to invest in infrastructure;

3. Partnerships that involve all stakeholders concerned (public utilities, private sector ICT vendors, academia, NGOs, funding agencies, etc.), through both the planning and the implementation phases of the project.

In order to maximize the chance of a successful coalition of resources, there is also a need not only to balance private and social profitability as mentioned before but also to develop the capacity to inform potential investors, lenders, donors, equipment suppliers and service providers about specific opportunities for creating new coalitions of resources in a particular location or for a particular sector.

Although the findings and recommendations of the Addis Ababa workshop were formulated four years ago, they are still valid. Indeed, they are aligned with the

recommendations and findings of later efforts with access to a larger amount of empirical data.

Since the workshop was held, acceptance of and the need for ICTs has, overall, increased not only for health care and education (areas considered at the workshop) but also for economic opportunity, empowerment and participation, and the environment. The fact that ICTs can contribute significantly, even critically, to achieving development goals is more widely recognized. In this context, and with the guidelines and recommendations of the Addis Ababa workshop, coalitions of resources to promote ICTs for development should become, if not easier, at least difficult to achieve.

V. APPENDIX

SUMMARY OF CASE STUDIES

This section reviews in brief detail the majority of the case studies included in the working papers. A series of tables providing an overview of the most significant cases is then provided. Data included in the tables include both information gathered in 1997 and information gathered for the purposes of this report. The updates were completed through Internet searches and through e-mail contact with project owners. A short e-mail-based questionnaire was designed in order to collect information about the various cases included in the tables.

WORKING PAPER TWO: TRANSMISSIONS INFRASTRUCTURE

The paper considers eight cases of transmission infrastructure projects that are at various stages of completion. The first four projects have been selected for both their scale and their scope. They each involve expenditures of around $1 billion and the mobilization of finance from the major international banking and capital markets. They reflect the complex nature of such coalitions, involving coordination between the private and public sectors as well as other multilateral institutions. The second group of projects are on a more modest scale, with an average size of less than $50 million. These cases were selected to compare and contrast the innovative solutions which these projects offer for mobilizing resources in an environment where larger-scale alternatives may be either inappropriate or not feasible.

The cases were selected on the basis of a series of criteria that sought to identify different forms of coalitions in terms of key stakeholders, regional location, technologies employed and type of funding. Data were obtained from a variety of published sources and direct contact with the project sponsors.

The case examples are as follows:

Large-scale projects

- The P.T. Mitra Global Telekomunikasi Indonesia (MGTI) joint venture project in Indonesia;
- The privatization of the principal public telephone operator in Peru, now Telefónica de Peru;
- The fibre optic line around the globe (FLAG) undersea cable project;
- The ICO mobile satellite service project.

Small-scale projects

- The GrameenPhone venture in Bangladesh;
- The SUNSAT satellite project in South Africa;
- The CelTel mobile phone venture in Uganda;
- The Telenor International/Norwegian Government Artelekom project.

WORKING PAPER THREE: EDUCATION

The cases presented in this paper were selected by using criteria that focused their innovation in terms of ICT and innovation in terms of coalitions of resources involved.

The projects were principally identified through Internet searches and the author's personal knowledge. The cases are mostly computer and on-line-savvy projects. The projects are not necessarily the most prominent ones in the use of ICTs in education. They are very important, however, in their illustration of innovative coalitions of resources to implement ICTs for education. A total of 12 projects are reviewed in detail. Twenty-seven additional projects are also briefly reviewed because of their potential interest to the paper.

The cases are as follows:

- Western Cape Schools' Network (WCSN) – South Africa;
- Project Grass Roots & Computer for Schools Programme – Canada;
- Enlaces – Learning Network for Primary and Secondary Schools – Chile;
- Public-Private Partnership in School Design, Construction and Operation – Canada;
- Virtual Campus Open Learning University of Indonesia – Indonesia;
- Distance Education and Child Health for Health Professionals – South Africa/Canada;
- Distance teaching at the University of the West Indies – Caribbean;
- University of the Philippines Open University (UPOU) – Philippines;
- TeleCampus for Post-secondary Learning – Canada;
- Training and Development Communications Channel for Continuing and Professional Education (TDCC) – India;
- Information and Library Network (INFLIBNET) – India;
- Quipunet for Peruvian Education – Peru.

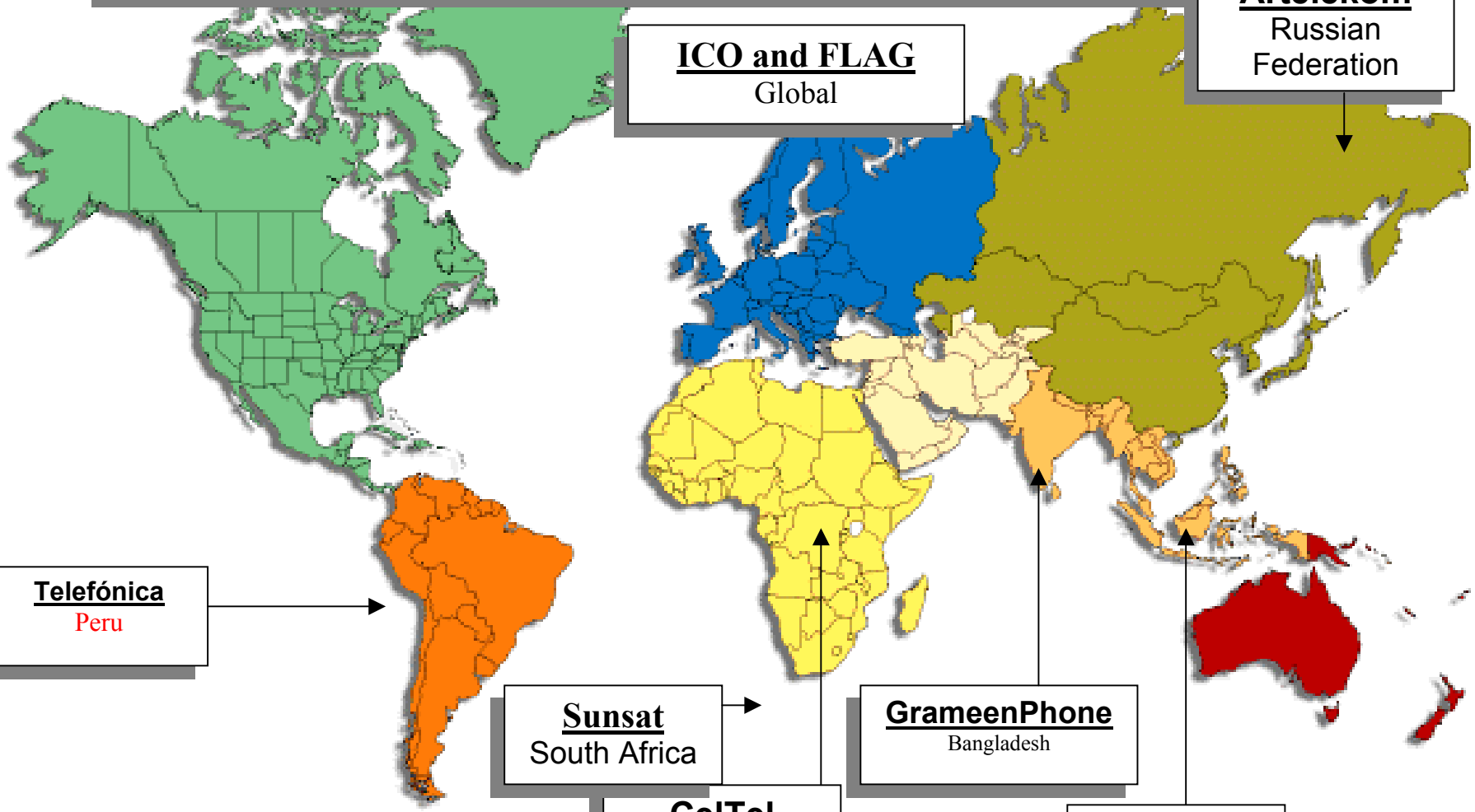
WORKING PAPER FOUR: HEALTH

Case studies using telecommunications/computer hardware and software for delivering health services to rural or otherwise isolated populations were selected through an intensive Internet search. Relevant cases were chosen with follow-up research via literature searches, e-mail and telephone conversations.

The case studies are as follows:

- SATELLIFE / HealthNet – United States;
- Library programmes on the Internet:
  - The Bach Internet National Library of Medicine Information System;
  - The Sister Library Programme;
  - University of Zimbabwe Medical Library;
- The Mapping Malaria Risk in Africa (MARA) project;
- Inforoute Francophone;
- Latin American Public Health Network;
- Programmes in Costa Rica, China, South Africa, Australia and Singapore.

CASE EXAMPLES: INFRASTRUCTURE



ARTELEKOM Russian Federation – Europe http://www.artelecom.ru		
SYNOPSIS/OVERVIEW	A project being run by Telenor (Norway) and funded by the Norwegian Ministry of Foreign Affairs (MOFA) involving the transfer of old analogue switching equipment to remote locations in the former Soviet Union. The recipient firm was the Russia-based, recently privatized telecommunications enterprise, Artelekom.	
TOPIC	**1997**	**2001**
FRAMEWORK	Privatization of Russian telecommunications in the 1990s. Technical assistance to privatized Russian Telecom from Telenor, supported by a grant from Norwegian MOFA.	Project concluded in late 1998. Artelekom has gained control of the Arkhangelsk telephone system. Artelekom is restructuring and moving towards Western-style management.
TECHNOLOGY	Installation of 42 used analogue telephone switches, adding 14,000 new telephone lines. Automatic call set-up for local, regional and international calls was established.	Transfer and installation of switches completed.
AUDIENCES/TARGET MARKETS	Individuals and businesses requiring access to telephony in remote urban communities in northern Russia. The project was located in the municipality of Kholmogorsk with 36,000 inhabitants (comprising 42 villages).	Same as 1997.
COALITIONS/STAKEHOLDERS	Telenor, Norwegian Ministry of Foreign Affairs (Grant Aid), the city of Arkhangelsk and Artelekom (local operator owned by the State telecoms holding Svyazinvest).	AIG-Brunswick Capital Management and government holding company Svyazinvest.
FUNDING	Project supported by Norwegian MOFA grant (7.1 million Norwegian Kroner), which also covered costs incurred in Russia, and operated by Telenor.	Introduction of International Accounting Standards reveals a net loss of $3.8 million. However, company is reported to have posted $2.4 million profit for first three quarters of 2000.
POLITICAL RISK MITIGATION	Minimal political risk: materials were donated, and the work was funded by the Norwegian MOFA.	The project has been concluded, hence related political risk is nil. From the firm's perspective, political risk exists to the extent that the pricing structure does not account for real costs. Reforms have been promised, but many investors are sceptical, given that similar promised changes made during the period of privatization did not bear fruit.
ROLE OF END-USERS	End-users are private-sector consumers, pay-for-use service for individuals, business entities and other institutions.	Same as in 1997. Since company is now privatized, end-users could also act as investors.
ASSESSMENT	A creative approach in which old equipment can be recycled into locations which would otherwise not be able to generate sufficient funds for new state-of-the-art equipment, leading to a tripling of teledensity, and regional and international traffic with a 50% increase in revenues. Project provides a very specific solution that may have application elsewhere (countries in transition).	

CELTEL Uganda – Africa http://www.nic.ug/CelTel/ OR http://www.celtel.co.ug/		
SYNOPSIS/OVERVIEW	Cellular telephone joint venture in Uganda with a very low subscriber break-even point. First private telecommunications system to be implemented in Uganda. Service launched in 1995, servicing the more densely populated areas of the country. Benefited from a World Bank project to promote GSM standard through investment in parent holding, Mobile Systems International Cellular Investments Holding (MSICIH), which established several cellular networks in Africa. Celtel was the first recipient of a cellular licence in Uganda.	
TOPIC	**1997**	**2001**
FRAMEWORK	Deregulation and liberalization of the Ugandan telecommunication sector. Celtel was the first recipient of a cellular licence in Uganda, won through competitive bidding. Made possible by World Bank project to help deploy GSM services in Africa, which provided a debt and equity investment in MSICIH.	Deregulated and liberalized environment in Uganda still in effect. However, the Government introduced a 10% excise tax on airtime without consultation of key players.
TECHNOLOGY	Development of a cellular network based on the GSM cellular standard.	Technology is compatible with global GSM standards: Voicemail, fax and data, roaming, VMS and SMS-MT.
AUDIENCES/TARGET MARKETS	Private and commercial users of mobile telephony in Uganda. The service covers Kampala, Entebbe and Jinja.	Launched Commercial Services Department in January 2001. Coverage has been, and continues to be, extended to other cities.
COALITIONS/STAKEHOLDERS	Vodafone, Siemens, CDC, IFC, World Bank and the Mobile Systems International Cellular Investments Holding (MSICIH).	Vodafone (35 per cent shareholder), MSI Cellular. Growing list of major international roaming partners, currently including Vodaphone, Telefonica and Swisscom.
FUNDING – FINANCING	Equity raised from strategic investors; IFC and CDC are also providing long-term debt. MSICIH investments are in the form of separate sub-holding companies, including Celtel. First private financing for a small-scale telephone joint venture in Africa. Total financing: $16 million.	It has been estimated that Uganda may lose millions of dollars in new investment as a result of the new 10% excise tax on airtime. Consequently, Celtel shareholders have recently put a $10 million investment on hold.
POLITICAL RISK MITIGATION	Involvement of IFC and CDC as both debt and equity providers. IFC contribution is $5.6 million in initial investment and $600,000 in loans.	Increased participation by IFC: additional loan of $25.8 million, equity stake of $600,000, quasi-equity investment of $800,000.
ROLE OF END-USERS	End-users are consumers of mobile telephony.	End-users are consumers of mobile telephony.
ASSESSMENT	Reveals a similar global coalition of resources that have been mobilized for the four larger projects. Had 24,443 subscribers as of September 2000 compared with 9,000 in 1996. Currently extending coverage to other areas of the country. Mobile telephony has been used during the past several years to “leapfrog” the inefficient supply-structure of the formerly government-owned telephone company, Uganda Telecom Limited (UTL), which provided landlines that were often unreliable, and for which there were long waiting lists. Mobile telephony provided by CelTel, among other providers, makes new lines available in a matter of days rather than months.	

FIBRE OPTIC LINK AROUND THE GLOBE (FLAG) **Global** www.flagtelecom.com		
SYNOPSIS/OVERVIEW	Fibre optic line around the globe. An undersea cable project linking Europe and Asia via Africa and the Middle East being developed by a consortium of companies led by Nynex (now Verizon). Became operational in 1997.	
TOPIC	**1997**	**2001**
FRAMEWORK	Greater globalization with access to the United States capital markets by an increasing number of Asian and Latin American borrowers. Increased demand for city-to-city connectivity and IP services.	Greater globalization with access to the United States capital markets by an increasing number of Asian and Latin American borrowers. Increased demand for city-to-city connectivity and IP services. Telecom technologies are converging around IP as a common platform.
TECHNOLOGY	Laying of 28,000 kilometres of undersea fibre optic cable, 12 landing points and the capacity to handle 120,000 individual 64 Kbps circuits.	First dual transoceanic terabit cable system (2001), longest transoceanic DWDM system (2002) and 26 PoPs for 2001.
AUDIENCES/TARGET MARKETS	Existing telephone operators seeking increased bandwidth communications between the Far East and Europe. Access points to include underserved regions in Africa and Asia.	Value-added services targeted at worldwide web-centric companies. 50 total carrier/customers.
COALITIONS/STAKEHOLDERS	KDD, ATT, Nynex (Verizon), CIBC, Barclays, MITI, Ex-Imbank. Commercial bank lenders and project developers.	Additional coalitions/stakeholders include among others: K.I.N Thailand, TGN Holdings, the Asian Infrastructure Fund and the Government of Singapore Investment Corporation.
FUNDING	Project finance facility supported by political risk insurance coupled with substantial contingent equity. Commercial bank debt.	FLAG initial public offering of early 2000 to finance United States-Japan undersea link.
POLITICAL RISK MITIGATION	Substantial political risk cover provided by United States Ex-Imbank and MITI Japan.	Political risk coverage provided by MITI Japan.
ROLE OF END-USERS	Private and government sector customers worldwide.	Private and government sector customers worldwide.
ASSESSMENT	Demonstrates that given the right balance of risk and reward, large amounts of funding can be raised in the form of both debt and equity for such projects. Reveals that broad and complex coalitions can be mobilized. Because of scale, magnitude and complexity, this project does not offer a blueprint that can easily be replicated.	

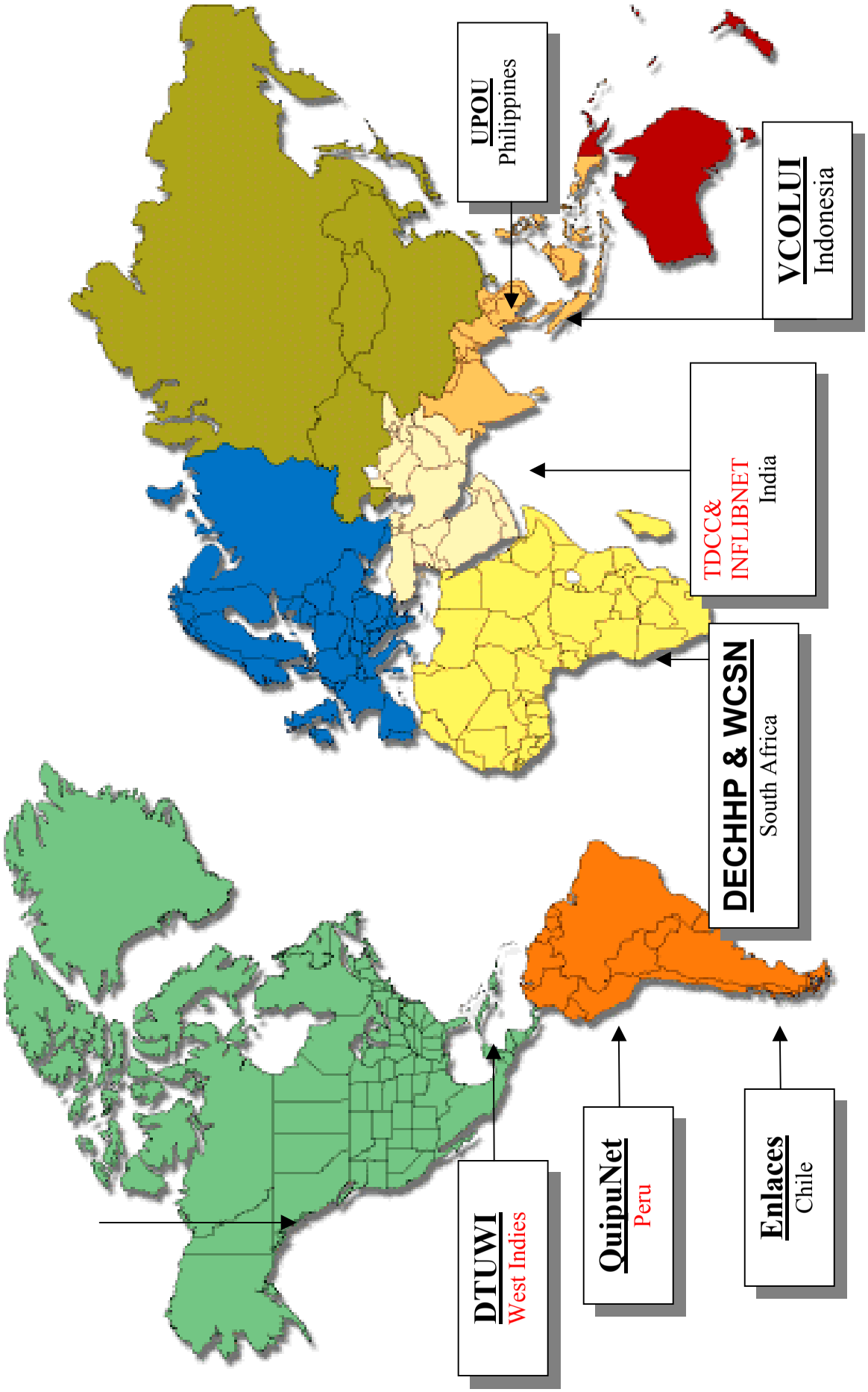
GRAMEENPHONE Bangladesh – Asia www.grameenphone.com		
SYNOPSIS/OVERVIEW	A cellular telephone joint venture involving Grameen Bank and Telenor (Norway), which aims to expand access to basic telephone service in the rural areas of Bangladesh. Launched on 26 March 1997. Aimed at reducing poverty through the empowerment of women in rural Bangladesh. The Grameen Group loans money to village women to purchase cellular phones (Village Phone), which are rented out to village farmers and other community members for a fee and also provide messaging and incoming call services.	
TOPIC	**1997**	**2001**
FRAMEWORK	End of monopoly held by Bangladesh Pacific Telecom. Competitive cell phone market. International joint ventures allowed. Extremely low teledensity.	Competitive cell phone market. International joint ventures allowed.
TECHNOLOGY	New mobile network based on the GSM cellular network (Ericsson main supplier).	Going to introduce the mobile Internet service Wireless Application Protocol (WAP). Network of cellular towers linked via fibre-optic cable.
AUDIENCES/TARGET MARKETS	68,0000 villages in Bangladesh currently without access. Businesses and women's groups.	65,000 subscribers. 3,000 are village phones, about 7.5 million users (01/2001), 95% of whom are women. Has 50% market share.
COALITIONS/STAKEHOLDERS	Telenor, Ericsson, Grameen, IFC, ADB, Marubeni Corporation, Gonofone Development Corp. Banks, Trading Companies, Investment Company.	Current stakeholders/shareholders include: Telenor S.A. (51%), Grameen Telecom (35%), Marubeni (9.5%) and Gonofone Development Corporation (4.5%).
FUNDING	Equity finance by Telenor and Grameen Bank. Bank with debt to be subscribed by ADB and IFC.	Revenue-generating operation coupled with equity finance.
POLITICAL RISK MITIGATION	$50 million loan from Commonwealth Development Corp., International Finance Corporation and Asian Development Bank. Each also holds 3% preferred stock. Involvement of Grameen Bank as local partner.	Perceived risk has decreased owing to success and growth of project.
ROLE OF END-USERS	In the case of Village Phone, a telephone also acts as an income generating mechanism for a borrower. Women can borrow about $350 from the Bank to purchase a handset and then sell telephone access to the villagers, thus generating income and paying off their loans. This creates self-employment opportunities in each village and provides telephone access to all.	Same. Women can borrow funds from the Bank to purchase a handset and then sell telephone access to the villagers, thus generating income ($700 per year after covering all costs) and paying off their loans.
ASSESSMENT	The pilot programme involving around 300 villages has confirmed that the Village Phone concept is economically viable. Average revenue generated by a Village Phone is more than twice the country's annual per capita income. A model for community development. GrameenPhone has won the prestigious GSM Association Award for its innovative Village Phone Programme and has received wide acclaim. Effective use of coalition of resources leading to enduring partnerships. GrameenPhone has become the country's dominant mobile carrier.	

ICO GLOBAL COMMUNICATIONS – NEW ICO Global http://www.ico.com		
SYNOPSIS/OVERVIEW	ICO is an Inmarsat Mobile Satellite telephony project. One of several mobile satellite services projects being developed by ICO Global Communications, a private company that was originally set up under the auspices of Inmarsat. After filing for bankruptcy in 1999 ICO re-emerged as New ICO with the backing of international investors. Satellite services are planned for 2003.	
TOPIC	**1997**	**2001**
FRAMEWORK	Progressively emerging. Memorandum of Understanding (MOU) to facilitate the development of GMPCS.	Venture incorporated in the United Kingdom involving global investors, equipment manufacturers and telecoms. To achieve optimal service, new rules for allocation of bandwidth are required.
TECHNOLOGY	Satellite network. Mobile satellite telephony. Was to have been operational in 2000 but the company filed for bankruptcy protection in the United States.	Commercial services to be launched in 2003. These include global IP services, Internet connectivity (including wireless), data/voice/fax and 3G wireless. Successful testing of first satellite in 2001.
AUDIENCES/TARGET MARKETS	Global. Individual and business users requiring access to mobile telephony in remote areas or where existing cellular networks are incompatible.	A global range of markets, including oil and gas, maritime, aviation, transportation; governmental agencies; individual consumers; small and medium-sized businesses lacking adequate broadband or voice services.
COALITIONS/STAKEHOLDERS	Hughes Telecom, NEC, Mistsubishi Electric, Panasonic, Ericsson, Deutsche Telekom, Telstra, Beijing Marine Com., Merrill Lynch. Multilateral organizations and the private sector.	New group of international investors led by Craig McCaw.
FUNDING	Substantial private equity placement. One of the largest private equity placements in the United Kingdom, including 47 investors from 44 countries.	New ICO has backing of Craig McCaw, who led a group of international investors to provide $1.2 billion to acquire the new ICO business in 2000.
POLITICAL RISK MITIGATION	Initial funding provided through equity private placement, including several major national telecom companies. Project with global reach, so political risk is spread out.	Industry market fluctuations are the greater risk. Company sought bankruptcy protection in 1999.
ROLE OF END-USERS	No particular role except as end-users.	No particular role except as end-users.
ASSESSMENT	Illustrates how a variety of solutions can be made available for creating new transmission infrastructure on a global scale. This model is particularly difficult to duplicate, given specific history, scale and background. The company re-emerged as New ICO after filing for bankruptcy protection in 1999. New ICO is to launch a broad range of satellite services in 2003.	

P. T. MITRA GLOBAL TELEKOMUNIKASI Indonesia – Asia http://www.telkom.co.id		
SYNOPSIS/OVERVIEW	A joint venture involving the expansion of telephone services on the island of Central Java using the build, operate and transfer model.	
TOPIC	**1997**	**2001**
FRAMEWORK	Removal of State-owned telecom monopolies. Changes in regulatory structure encouraging private sector participation. Private ownership of telecom assets allowed.	Indonesia ratified the WTO, APEC and AFTA agreements making the telecommunications service more competitive with the entry of regional and international competitors.
TECHNOLOGY	Installation of an additional 400,000 fixed telephone lines. Limited use of wireless telephony in remote rural areas. VSAT wireless telephony.	Cellular phone connections – over 2 million users by end of 1999. Fixed wire lines have increased 17 % a year. As of 2001, the company is to offer a broad range of services, including IP, voice satellite transponder, telex, telegram, satellite, leased lines, electronic mail, mobile communication and cellular services. Significant upgrade of infrastructure.
AUDIENCES/TARGET MARKETS	Inhabitants of Central Java currently with minimal access to telephony services.	Inhabitants of Central Java.
COALITIONS/STAKEHOLDERS	NTT, Telstra, Deutsche Bank, Lucent, Widya Duta Infotel, P.T. Indosat, Sumitomo and Itochu Corporation. International banks, funding agencies and export credit agencies.	Current partners include: Alcatel, Ericsson, Gilat Satellite Networks LTD., NEC, Japan Radio Co.
FUNDING	BOT–style project financing arranged by a syndicate of more than 20 banks.	Private equity financing; listed publicly on the Djakarta and New York stock exchanges. The Company has derived more than 58.2% of its total operating revenues through telephone services.
POLITICAL RISK MITIGATION	Export credit cover from Japanese export-import bank plus strong contingent equity support from two major telecom companies.	Political risk is mitigated by the fact that the firm is majority State-owned.
ROLE OF END-USERS	End-users are private and business consumers of telephony services; residents of Central Java.	End-users are private and business consumers of telephony services; residents of Central Java.
ASSESSMENT	Impressive broadening of telecommunications services. Demonstrates that a highly complex coalition of resources can be mobilized to build, finance and operate a telecommunications project in one of the least developed (very low teledensity) part of the world. Aggressively pursuing global partnerships. The firm is profitable.	

SUNSAT South Africa – Africa http://sunsat.ee.sun.ac.za/		
SYNOPSIS/OVERVIEW	The first satellite to be developed and launched by an African State. It was developed at Stellenbosch University in South Africa. SUNSAT was launched on 23 February 1999. It was intended to carry remote-sensing experiments and its goal is to produce images from space at lower costs than larger systems. Contact was lost in early 2001. A physical failure on the satellite is assumed.	
TOPIC	**1997**	**2001**
FRAMEWORK	University-initiated project serving research and educational purposes. Because of its high-technology nature, project has significant symbolic value.	Satellite no longer operational. However, data gathered still useful for research, educational and economic purposes.
TECHNOLOGY	Satellite. Scheduled for launch in early 1996, delayed until August 1997.	Launched in 1999 on a Delta II Launch Vehicle. Payloads include NASA experiments, Radio Amateur communications, a high-resolution imager, precision attitude control and school experiments.
AUDIENCES/TARGET MARKETS	Research and academic community in Southern Africa.	Communities involved with the data gathered: research and academic community in Southern Africa, businesses interested in satellite images.
COALITIONS/STAKEHOLDERS	Stellenbosch University, NASA, Surrey University. Co-operative venture, innovative partnerships with cross-geographical divides.	As above.
FUNDING	Funding by Stellenbosch University with support from private industry in South Africa and indirectly from NASA ($4.5 million).	No data available.
POLITICAL RISK MITIGATION	Indirect South African and United States government involvement.	Project concluded.
ROLE OF END-USERS	End-users made use of the satellite for experimental, business and research purposes. Two-year outreach effort which involved disadvantaged children.	Data exploitation.
ASSESSMENT	SUNSAT is an innovative approach to providing new transmission infrastructure facilities. The coalition of resources involved includes public sector support, funding from the private sector in South Africa and direct support from NASA. A spin-off business was formed, called Sunspace, which was an entrepreneurial company concentrating on high-performance micro satellite development. Perhaps even more important was the exposure to technology provided by the project to the youth of South Africa, familiarizing many individuals with the possibility of their becoming involved in a high-technology project. The project was also a sort of mascot for the nation; it received much media attention, and served as a positive point of attention in the country during a period of rapid change.	

TELEFONICA PERU Peru – Latin America www.telefonica.com.pe		
SYNOPSIS/OVERVIEW	Privatization of the principal public telephone operator in Peru, involving the sale of an initial strategic stake in Telefónica and the subsequent public flotation of the company.	
TOPIC	**1997**	**2001**
FRAMEWORK	Privatization of the State-owned telephone company. Significant private sector involvement in telecom.	Privatization of the State-owned telephone company. Significant private sector involvement in telecom.
TECHNOLOGY	Extensive modernization of existing network and increase in teledensity. Fixed wireless telephony. Additional services: cell and cable.	Started deploying ANTEC's RF amplifiers in an effort to bring advanced, two-way services to its more than 250,000 subscribers in 1999.
AUDIENCES/TARGET MARKETS	Population of Peru, which has one of the lowest teledensities in Latin America.	As of 1997, the teledensity in Peru was around 5.9 per cent per 100 or double that of 1994.
COALITIONS/STAKEHOLDERS	Telefónica, Goldman Sachs, JP Morgan, NM Rothschild. Complex forms of public/private sector partnerships on a transnational basis.	Minority share of State ownership of Telefónica is to be phased out over the next few years and to be sold to private investors.
FUNDING	Sale of 35 per cent interest for $2 billion, followed by public flotation with United States listing and bond placing in the United States and Peru.	Continued public ownership. Company stock is traded on the Peruvian and American stock exchanges.
POLITICAL RISK MITIGATION	Public flotation in Peru, strategic investment by Telefónica (Spain) and an international investor base.	Public flotation in Peru, strategic investment by Telefónica (Spain) and an international investor base.
ROLE OF END-USERS	End-users are private and business consumers, recipients of telephony services.	End-users are private and business consumers, recipients of telephony services.
ASSESSMENT & CURRENT STATUS	One of the most successful privatizations of its kind. Telefónica Peru appears to be on course to achieve its target of 10 lines per 100 by the year 2000 (as of 1997). Demonstrates that successful privatization programmes depend on a broad coalition of resources that include active participation by international investors. Has exceeded performance standards to which it committed.	


UPOU
Philippines
VCOLUI
Indonesia
TDCC&
INFLIBNET
India
DECHHP & WCSN
South Africa
DTUWI
West Indies
QuipuNet
Peru
Enlaces
Chile

DISTANCE EDUCATION AND CHILD HEALTH FOR HEALTH PROFESSIONALS South Africa and Canada – Africa and North America http://www.healthlink.org.za		
SYNOPSIS/OVERVIEW	Doctors, nurses and other health professionals are provided access, via the Internet, to study materials and tutors in a child health degree programme. The programme has global reach with implementation in several countries. It encourages and facilitates the use of information for decision-making by various stakeholders.	
TOPIC	**1997**	**2001**
FRAMEWORK	ICTs emerged as a suitable delivery mechanism during the project development process. An existing NGO – SATELLIFE –targets expansion of access to on-line services for health organizations.	Working partnerships with national and provincial legislators were established.
TECHNOLOGY	Store and forward system for e-mail and web searches.	Store and forward system for e-mail and web searches. Instantiation of a system for data transfer and analysis.
AUDIENCES/TARGET MARKETS	Practising health-care professionals.	Practising health-care professionals.
COALITIONS/STAKEHOLDERS	University of British Columbia, BC Institute of Technology and University of Cape Town, Canadian Government, Healthnet (NGO).	Health Systems Trust (NGO), health-care professionals, recipients of medical care, donors and educational and health-care institutions.
FUNDING	Healthnet, schools involved, bilateral assistance, Telcos, ISPs, student fees and medical fees.	Health Systems Trust (HST), health-care professionals, recipients of medical care, donors, educational institutions.
OPERATING COSTS	Schools involved, Healthnet, student fees.	Schools involved, Healthnet, student fees.
ROLE OF END-USERS	Recipients are the health-care providers, who make use of the networks and information systems as a means of information delivery.	Recipients are the health-care providers, who make use of the networks and information systems as a means of information delivery.
ASSESSMENT	Highly expandable and replicable project.	

DISTANCE TEACHING AT THE UNIVERSITY OF THE WEST INDIES West Indies – Caribbean		
SYNOPSIS/OVERVIEW	Audio-conferencing and other technologies to support distance learning. The programme equips 27 sites in 16 countries with conferencing facilities, print materials and computer software for credit and non-credit courses. The project is also referred to as UWIDITE (University of the West Indies Distance Teaching Experiment).	
TOPIC	**1997**	**2001**
FRAMEWORK	Distance education has been tested for more than two decades, and ICTs are an integral part of the university's strategic plan. Project distributed in 16 different countries.	The UWIDITE has been subsumed, and otherwise superseded, by the Distance Education Centre (DEC).
TECHNOLOGY	Dedicated phone lines between distance education centres that link PCs with telewriter software and voice. The centres also have computer laboratories that are to be connected via a WAN. Software development.	Teleconferencing sites have been added.
AUDIENCES/TARGET MARKETS	Students enrolled in post-secondary credit and non-credit courses, including adult and continuing education, in a wide range of subject matters.	Students enrolled in post-secondary credit and non-credit courses, including adult and continuing education, in a wide range of subject matters. The programme reaches students in all English-speaking Caribbean countries, which support the University of the West Indies.
COALITIONS/STAKEHOLDERS	Early support from USAID. Caribbean Development Bank, University of the West Indies, Telcos.	The Governments of the 16 countries involved.
FUNDING	Schools involved (UWI), private sector, bilateral organizations, Telcos, ISPs, IFI, student fees and technical assistance.	Every national Government that is part of the Caribbean group of countries makes contributions to the DEC.
OPERATING COSTS	University operating budget and student fees, technical costs being part of the overhead.	University operating budget and student fees, technical costs being part of the overhead.
ROLE OF END-USERS	University and continuing education students who pay fees to the university.	University and continuing education students who pay fees to the university.
ASSESSMENT	UWI has been able to access an impressive array of financial and in-kind resources for special projects from multiple donor agencies, foundations, IFIs, broadcasters and telecommunication carriers. A one-day seminar using the teleconference system cost just $1,000, compared with more than $11,000 for a face-to-face programme.	

ENLACES Chile – Latin America http://www.enlaces.cl/		
SYNOPSIS/OVERVIEW	Enlaces aims to establish Internet services for all secondary and 50 per cent of primary schools by the year 2000, as well as developing suitable learning resources. The project enables teachers to improve the quality of the curriculum and allows students from different schools to conduct collaborative projects.	
TOPIC	**1997**	**2001**
FRAMEWORK	School reform programme aims at improving primary and secondary levels. Telephone carrier and ISPs pay special attention to the sector.	School reform programme aims at improving primary and secondary levels. Telephone carrier and ISPs pay special attention to the sector.
TECHNOLOGY	Computer laboratories in all schools with 80 per cent PCs and 20 per cent Mac. E-mail, bulletin board and increased web access, modems, printers. Software development.	E-mail, bulletin board and increased web access, modems, printers. Software development. Two years of technical support are provided to participating schools.
AUDIENCES/TARGET MARKETS	Primary and secondary schools.	Primary and secondary schools.
COALITIONS/STAKEHOLDERS	Government of Chile, municipalities, universities, World Bank, private sector, Apple Computer, participating schools.	Private sector firms, the Government of Chile, municipalities, local universities, the World Bank, private sector, and participating schools.
FUNDING	Government, participating schools, universities, private sector, Telcos and ISPs, IFI.	Government, participating schools, universities, private sector, Telcos and ISPs, IFI.
OPERATING COSTS	Under discussion, schools and municipalities.	$5,880 for a small school (<100 students) to $20, 932 for a large school (100-300 students), with $78/student spent on small primary school level. Large schools cost $21/student. Hardware is 70 per cent of the budget.
ROLE OF END-USERS	End-users are consumers of the resources provided by the programme.	Evaluation studies. Evaluate the impact of ICTs on education by means of tests and surveys given to students and teachers.
ASSESSMENT	Begun in 1993, as an experimental pilot programme, it had as of 1996 managed to build a network among some 180 primary and 62 secondary schools. Highly successful use of coalitions of resources. Project may be replicable in similar environments.	

GRASSROOTS & COMPUTERS FOR SCHOOLS PROGRAMMES (SchoolNet) Canada – North America http://xinfo.ic.gc.ca		
SYNOPSIS/OVERVIEW	Promotes use of on-line services for schools and community facilities. Activities include education resources website and soliciting of business contributions. One of project's aims is to collect and distribute government and surplus computers. The GrassRoots Programme and its partners promote academic learning, employability and computer skills in youth by integrating ICT into learning.	
TOPIC	**1997**	**2001**
FRAMEWORK	The Canadian Government has identified ICT use and literacy as one of the major stepping stones towards future economic well-being.	In the 2001 Speech from the Throne, the Federal Government committed itself to providing increased access to high-speed Internet service for schools and libraries, and to focusing on creating more and better e-learning content.
TECHNOLOGY	Internet access and software development.	Internet access and software development.
AUDIENCES/TARGET MARKETS	Primary and secondary schools.	Primary and secondary schools. Project reached 750,00 students at the end of 1999. As of May 2000, there were close to half a million connected computers in Canadian schools.
COALITIONS/STAKEHOLDERS	Federal and provincial Governments, private sector, voluntary organizations, schools involved.	Federal and provincial Governments, private sector, voluntary organizations, schools involved.
FUNDING	NGOs, federal and provincial Governments, schools involved, private sector.	In 1998, Microsoft Canada became a founding partner with $1 million worth of support. AOL Canada is also a founding partner.
OPERATING COSTS	Schools, provincial Governments and corporate contributions.	Subsumed by Canadian schools, the provincial Governments and corporate contributions.
ROLE OF END-USERS	End-users of Schoolnet have developed offshoot programmes that rely on ICTs that target a wide of communities.	One of the offshoot programmes has become involved in international development of ITCs for development. Netcorps International provides scholarships such that developing countries can profit from the work experience projects of Canadian students.
ASSESSMENT	The coalition of resources involved has been successful. May not be replicable in a developing economy. Programme has received worldwide recognition. By 31 March 2001, SchoolNet will have helped encourage educators and their students to create 20,000 on-line projects. A KPMG external evaluation, available on the Internet at: http://www.schoolnet.ca/home/e/documents/SN_evaluationE.pdf, is highly favourable to this programme.	

INFLIBNET INFORMATION AND LIBRARY NETWORK India – Asia http://www.inflibnet.ac.in/		
SYNOPSIS/OVERVIEW	INFLIBNET offers Intranet capacity among university libraries to shareholdings and resources, and promotes the digitization of new and existing holdings. Major activities include library automation, database creation, software development, human resources development, information services and networking. In June 2000 INFLIBNET launched a new project for the retrospective conversion of five major library catalogues. Inflibnet was visualized as a gateway to India's academic and research community.	
TOPIC	**1997**	**2001**
FRAMEWORK	High-level institutional support at time of initiation waned at times.	Projects still draw institutional support and have led to new initiatives.
TECHNOLOGY	Satellite-based Intranet-type service with satellite terminals on university campuses provides Internet access.	SOUL, a high-end library management software package, has been developed. INFLIBNET is also involved in the creation of web-enabled databases. Storage and distribution of data via CD-ROM.
AUDIENCES/TARGET MARKETS	Academic libraries, R&D institutions and information resources.	Academic libraries, R&D institutions and information resources.
COALITIONS/STAKEHOLDERS	University Grants Commission (UGC), academic libraries, R&D institutions and information resources.	University Grants Commission (UGC), academic libraries, R&D institutions and information resources.
FUNDING	Government of India, INFLIBNET and schools and universities involved.	Government of India, INFLIBNET and schools and universities involved.
OPERATING COSTS	Operating costs covered by INFLIBNET.	Operating costs covered by INFLIBNET.
ROLE OF END-USERS	End-users utilize resources offered by INFLIBNET and provide feedback.	End-users utilize resources offered by INFLIBNET and provide feedback.
ASSESSMENT	Has increased awareness of electronic media and research information management in the academic community, as well as for librarians and R&D institutions. INFLIBNET is set to be a major player in promoting scholarly communication among academics and researchers in India. Project may be replicable in similar contexts.	

PUBLIC-PRIVATE PARTNERSHIP IN SCHOOL DESIGN Canada – North America		
SYNOPSIS/OVERVIEW	Partnership of several private companies that design, construct and own technology-rich new schools. School boards lease the facilities and retain control of the curriculum. The school system leases the facilities for 20 years at a predetermined rent that is lower than the capitalized cost of construction and furnishings. Where the developer covers the additional costs and earns a profit is in the intensive use of the facility during periods when it is not being used by the school system.	
TOPIC	**1997**	**2001**
FRAMEWORK	Government interest in partnering with private companies for the construction and operation of technology-rich schools.	Government interest in partnering with private companies for the construction and operation of technology-rich schools.
TECHNOLOGY	Computers in all learning areas, full Internet access in all classrooms, and TV monitors in all hallways and classrooms.	Computers in all learning areas, full Internet access in all classrooms, and TV monitors in all hallways and classrooms.
AUDIENCES/TARGET MARKETS	Primary, secondary and technical schools.	Primary, secondary and technical schools.
COALITIONS/STAKEHOLDERS	Consortium of companies, government and schools involved.	Consortium of companies, government and schools involved.
FUNDING	NGOs, government, schools involved and private sector.	NGOs, government, schools involved and private sector.
OPERATING COSTS	Schools involved and private sector.	Schools involved and private sector.
ROLE OF END-USERS	End-users utilize the resources provided by the programme.	End-users utilize the resources provided by the programme.
ASSESSMENT	Programme has been successful, especially in Nova Scotia, and has attracted international attention. Nova Scotia has built 55 schools using the public-private partnership (P3) model. Public-private partnerships provide exciting prospects and potential pitfalls. Relations between partners are innovative, efficiencies can be achieved, and mutual goals attained. These partnerships can also result in some loss of control by educational institutions.	

QUIPUNET Peru – Latin America http://tumi.cis.gsu.edu/quipunet/English/Welcome.html		
SYNOPSIS/OVERVIEW	QUIPUNET raises resources worldwide to support education in Latin America with emphasis on Peru, including donations of books and computers. A grassroots, "virtual" organization, made up of Peruvian volunteers all over the world whose goal is to support access to Spanish-language educational resources. Links its website pages to Spanish education sites. Started in 1995.	
TOPIC	**1997**	**2001**
FRAMEWORK	Official links to in-country policy are not apparent. Project driven by expatriates with support from foreign friends of Peru.	Official links to in-country policy are not apparent. Project driven by expatriates with support from foreign friends of Peru.
TECHNOLOGY	A website with self-study courses, computers and modems.	Video web casting, e-mail, computers and modems.
AUDIENCES/TARGET MARKETS	The people of Peru, especially in rural areas. Students and learners at all education levels.	The people of Peru, especially in rural areas. Students and learners at all education levels.
COALITIONS/STAKEHOLDERS	Volunteers, Quipunet, private sector, American university.	Volunteers, Quipunet, private sector, American university, the Service of Rural Development in Peru, EIGER, Rotary Club of la Molina Vieja.
FUNDING	NGO (QUIPUNET), private sector.	NGO (QUIPUNET), private sector.
OPERATING COSTS	QUIPUNET and other institutions.	QUIPUNET and other institutions.
ROLE OF END-USERS	End-users frequently have become volunteers and service providers in their own right.	End-users frequently have become volunteers and service providers in their own right.
ASSESSMENT	The overall objective is to create a “small school” for individuals, most of whom have a connection with Peru, who want to make some kind of contribution to education to those in need, but otherwise lack a conduit for their efforts. The project has received international acclaim in its inclusion in the Global Knowledge Partnership programme of the World Bank, as well as the involvement of the United Nations in its programmes addressing disaster preparedness, especially for rural people. Important role played by volunteers.	

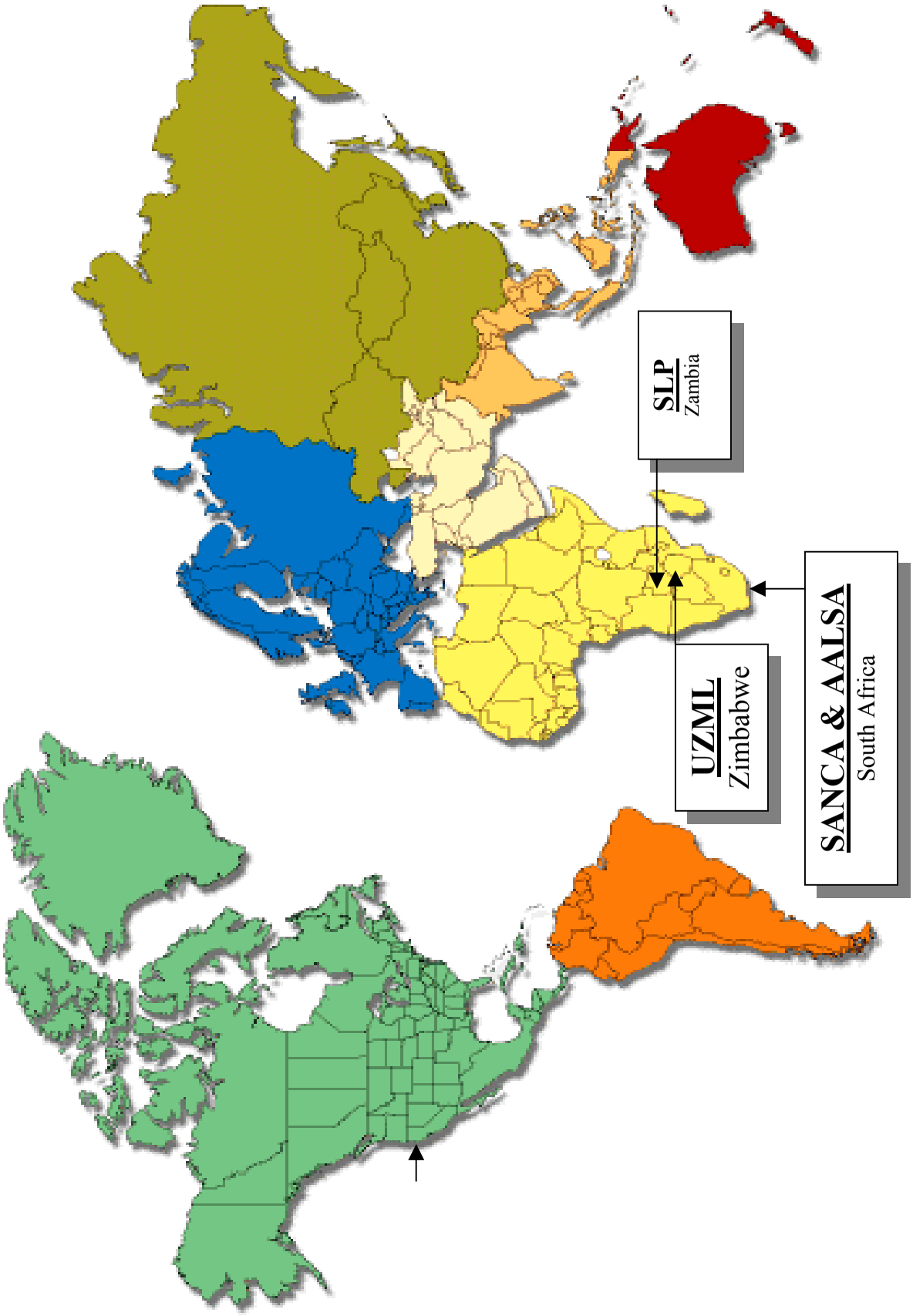
TELECAMPUS FOR POST-SECONDARY LEARNING Canada – North America http://telecampus.edu/		
SYNOPSIS/OVERVIEW	TeleCampus is accessible from anywhere with an Internet connection, for students as well as for course originators, or for courseware developers. The development and marketing of the locally developed courses is an integral part of the project.	
TOPIC	**1997**	**2001**
FRAMEWORK	ICT is seen as essential for industrial growth as well as educational development in this area, which has traditionally relied on resource-based industries.	ICT is seen as essential for industrial growth as well as educational development in this area, which has traditionally relied on resource-based industries.
TECHNOLOGY	Web-based learning environment with systems including student records, student support and competency-based testing.	Web-based learning environment with systems including student records, student support and competency-based testing.
AUDIENCES/TARGET MARKETS	Post-secondary students taking credit and non-credit courses.	Post-secondary students taking credit and non-credit courses.
COALITIONS/STAKEHOLDERS	New Brunswick Government, private sector and schools involved.	World Bank, the New Brunswick Government, private sector and schools involved, Agence de la Francophonie, and the Office of Learning Technologies.
FUNDING	New Brunswick Government, schools involved, private sector, and student fees.	World Bank, the New Brunswick Government, the Commonwealth of Learning (COL), Centre International pour le développement de l'inforoute en français (CIDIF), Carrefour international francophone de formation à distance (CIFFAD).
OPERATING COSTS	No data available.	No data available.
ROLE OF END-USERS	End-users are recipients of educational services.	End-users are recipients of educational services.
ASSESSMENT	Project has attracted worldwide attention. Dual mission of education and industrial development. Initiative is being used to seed the development of small private sector learning technology companies. Over 200 companies have grown out of the programme to date.	

TRAINING & DEVELOPMENT COMMUNICATIONS CHANNEL FOR CONTINUING & PROFESSIONAL EDUCATION (TDCC) India – Asia		
SYNOPSIS/OVERVIEW	TDCC offers a business television satellite infrastructure for organizations with dispersed training needs. The aim is to consolidate. Different education and training requirements combined on one channel to achieve savings and share investments in the ground infrastructure. Launched in 1995.	
TOPIC	**1997**	**2001**
FRAMEWORK	Result of two decades of testing by the Indian Space Research Organisation (ISRO).	Infrastructure widely used by private sector, education and government.
TECHNOLOGY	Satellite-based one-way video, two-way audio network with two fixed uplinks and studios and with 225 receiving sites in 1997. Planned use of digital video.	Use of digital video. 250 sites as of 08/1998. Efforts also initiated to introduce new technologies in TDCC network by phases. Use of Direct Reception Sets (DRS) manufactured by Indian companies.
AUDIENCES/TARGET MARKETS	Professional and continuing education students, professional trainees for large and dispersed organizations.	Several Indian States are planning to use TDCC to reach women and the masses in remote villages. Major educational institutes for distance learning, State and local governments, industrial organizations.
COALITIONS/STAKEHOLDERS	ISRO, India Open University, schools involved, private sector.	ISRO, India Open University, schools involved, private sector, government.
FUNDING	Schools involved, private sector.	Schools involved, private sector.
OPERATING COSTS	Customer and user fees.	Customer and user fees.
ROLE OF END-USERS	Some end-users have deployed their own receive networks.	Some end-users have deployed their receive networks, including studios. Also, end-users provide feedback.
ASSESSMENT	TDCC has seen extensive use. It is important to Indian industry and government. Satellite system can reach large numbers spread over large distances. Such systems can become cost-effective if the infrastructure is used by a large number of users. Requires systems management and coordination. User feedback sought and provided.	

UNIVERSITY OF THE PHILIPPINES OPEN UNIVERSITY (UPOU) Philippines – Asia http://www.upou.org/		
SYNOPSIS/OVERVIEW	The UPOU was established because the University of the Philippines could accommodate only a limited proportion of applicants for admission. Through the distance education provided by UPOU, the University will be able to better respond to the demand for quality higher education, especially in areas that do not have an UP campus. UPOU has undertaken a series of staff training courses related to designing on-line courses and developing audio-visual materials. Launched in 1995.	
TOPIC	**1997**	**2001**
FRAMEWORK	UPOU mandate to democratize access to post-secondary education.	The Telecommunications, Information Technology and Telehealth Network (TITAN) project was initiated in 1998.
TECHNOLOGY	Computers and on-line services. Various forms of educational media such as print, audio, video, computer hardware and software programs and on-line Internet services.	Two-way communication between teacher and student has been added through printed communication, electronic mail, telephone, teleconferencing, computer conferencing and even video conferencing.
AUDIENCES/TARGET MARKETS	Post-secondary and professional education students.	Post-secondary and professional education students Health-care sector and fishing industry.
COALITIONS/STAKEHOLDERS	University of the Philippines, Canadian and United Kingdom institutions (Simon Frazier University and UK Open University).	University of the Philippines, Canadian and United Kingdom institutions (Simon Frazier University and UK Open University), Foundation for Information Technology Education and Development (FIT-ED), the secretariat of e-ASEAN; the SEAMEO Regional Center for Graduate Studies in Agriculture (SEARCA); and the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC AQD).
FUNDING	University of the Philippines, bilateral organizations, student fees, technical assistance.	University of the Philippines, bilateral organizations, student fees, technical assistance.
OPERATING COSTS	University of the Philippines and student fees.	University of the Philippines and student fees.
ROLE OF END-USERS	End-users are students enrolled in UPOU programmes.	End-users are students enrolled in UPOU programmes.
ASSESSMENT	This programme is successful and has expanded substantially. It currently provides over 100 courses in 17 degree programmes from undergraduate to PhD levels. It provides a good example of coalitions of resources that involve both the private and the government sectors in education.	

VIRTUAL CAMPUS OPEN LEARNING UNIVERSITY UNIVERSITAS TERBUKA (UT) Indonesia – Asia http://www.ut.ac.id		
SYNOPSIS/OVERVIEW	The virtual campus of UT is testing the use of real-time, on-demand ICT-based access to UT's educational resources supplementing text and tutor-based service for about 400,000 students. UT was established with the mission of providing wider and equal opportunity of access to higher education to all people throughout Indonesia who otherwise would not be able to attend university. It was launched in September 1984.	
TOPIC	**1997**	**2001**
FRAMEWORK	Government policy is emphasizing educational applications of new infrastructure development.	Government policy is emphasizing educational applications of new infrastructure development.
TECHNOLOGY	E-mail for messages and conferences, summaries of course materials on the website, and radio and television broadcasts.	Mobile telephony and multi-media instructional production have been added.
AUDIENCES/TARGET MARKETS	Students enrolled in post-secondary and teacher upgrading programmes.	High school graduates, primary and secondary education practising teachers, university students located in remote areas, private sector professionals, and government employees.
COALITIONS/STAKEHOLDERS	Universitas Terbuka, telephone carrier, Indonesian, Canadian, Australian and United States Governments.	Universitas Terbuka, telephone carrier, Indonesian, Canadian, Australian and United States Governments.
FUNDING	Universitas Terbuka, private sector, bilateral assistance, telcos and students.	Government of Indonesia, PT Telekom and PT Post Indonesia, contributions from students.
OPERATING COSTS	Universitas Terbuka, student fees.	Universitas Terbuka, student fees.
ROLE OF END-USERS	End-users are students getting their education through distance learning.	End-users are students getting their education through distance learning.
ASSESSMENT	Virtual campus project currently has three locations. Project has moved beyond pilot stage and has seen some improvements. A complex international coalition of resources has been used in the planning phase of the project. For both implementation and operation the coalition is made up of Indonesian institutions only.	

WESTERN CAPE SCHOOLS' NETWORK South Africa – Africa http://www.wcape.school.za		
SYNOPSIS/OVERVIEW	The WCSN is a non-profit educational networking organization, which supplies Internet services to primary and secondary schools in the Western Cape, and promotes the use of the Internet in education, and is totally self-funded. It is a school association dedicated to networking 150 schools (out of 1,500 schools to be connected) to the Internet. It was founded in November 1993 with 10 schools.	
TOPIC	**1997**	**2001**
FRAMEWORK	Internet support strategy from the Department of Education and carrier involved. Post-apartheid government funding gives low priority to ICTs.	Still operating under the same framework. The WCSN is now a constituted organization comprising an elected committee of representatives from member schools which sets policy and makes management decisions.
TECHNOLOGY	Internet access, E-mail, and websites.	Produced complete system integrating Pegasus Mail, UUPC and Usenet newsreader. This network Internet system, called UUPLAN, is installed in all WCSN schools with LANs, and is now used elsewhere in South Africa and around the world.
AUDIENCES/TARGET MARKETS	Primary and secondary schools, donors and collaborators are being approached.	Primary and secondary schools.
COALITIONS/STAKEHOLDERS	Member schools and a foundation that supports part-time administrative and technical positions.	Member schools and a foundation that supports part-time administrative and technical positions.
FUNDING	NGO, Government, schools involved. Schools finance materials and development as well as hardware.	NGO, Government, schools involved. Schools finance materials and development as well as hardware.
OPERATING COSTS	Schools through membership fees.	Primarily through membership fees. However, WSCN does not refuse membership to any school unable to pay the full membership fee.
ROLE OF END-USERS	Schools use resources provided by WCSN. Member schools provide operating costs through membership fees.	Schools use resources provided by WCSN. Member schools provide operating costs through membership fees.
ASSESSMENT	The organization is very cost-efficient. Self-funding may have reached its limits. Expanding network to disadvantaged schools is difficult through this model.	


SLP
Zambia
UZML
Zimbabwe
SANCA & AALSA
South Africa

ALLERGY SOCIETY OF SOUTH AFRICA (AALSA) South Africa – Africa http://allergysa.org/index.html		
SYNOPSIS/OVERVIEW	A network that offers allergy information both to the general public and to health-care professionals. AALSA is planning to extend the programme to include more interactive information about specific allergy issues.	
TOPIC	**1997**	**2001**
FRAMEWORK	The AALSA is primarily a professional society for medical practitioners involved with allergic diseases and with patients. Its purpose is to advance knowledge of allergy issues and the practice of immunology through publications, meetings and conferences, foster the education of both students and the public, promote and stimulate allergy and immunology research and encourage cooperation among those engaged in allergy work and immunology.	Same.
TECHNOLOGY	Website. Also use telephone, telefax and e-mail.	Same. Website. Also, telephone, fax and e-mail.
AUDIENCES/TARGET MARKETS	The general public and health-care professionals.	The general public and health-care professionals
COALITIONS/STAKEHOLDERS	Allergy Society of South Africa, pharmaceutical companies, general public and health professionals.	Allergy Society of South Africa, pharmaceutical companies, general public and health professionals.
FUNDING	Pharmaceutical firms and diagnostic companies.	Pharmaceutical firms and diagnostic companies.
OPERATING COSTS	Website maintenance, data collection and content gathering.	Website maintenance, data collection and content gathering.
ROLE OF END-USERS	Consumers, including patients and health-care practitioners, participate by acting as receivers of information.	Peer-reviewed website. Consumers, including patients and health-care practitioners, participate by acting as receivers of information.
ASSESSMENT	Pharmaceutical funds have diminished, so that the site has not been active and maintained as it was in its early stages. AALSA has not employed a full-time person to continue managing the site. The site is not frequently updated. It still has around 12,000 visitors per month.	

SOUTH AFRICAN NATIONAL COUNCIL ON ALCOHOLISM AND DRUG DEPENDENCE South Africa – Africa http://wn.apc.org/sanca/		
SYNOPSIS/OVERVIEW	SANCA provides a series of programmes addressing the development, prevention and treatment of alcohol and other chemical addictions. It acts as a national umbrella organization consisting of 32 societies. Its Internet-based information programmes offer access to a library specializing in addiction treatment. Serves mostly South Africa. Provides services to countries as far away as Liberia.	
TOPIC	**1997**	**2001**
FRAMEWORK	Services initiated in 1956. Some services offered under the auspices of the South African Institute for Health and Training Development.	National Drug Master Plan adopted in 1998. Makes provision for establishment of national database of substance abuse material.
TECHNOLOGY	Internet and databases.	Internet and databases. Pentium computers, software development, website (SANgonet is the ISP).
AUDIENCES/TARGET MARKETS	SANCA clinics, those requiring training or assistance in the area of chemical dependency, and the general public.	SANCA clinics, students, scholars, parents, community members, private sector, authors/textbook developers, journalists, government and research organizations.
COALITIONS/STAKEHOLDERS	SANCA members and others.	National management board, Department of Welfare, SALIS Listserv (substance abuse librarians' organization), local library organizations.
FUNDING	Membership fees and other sources.	Membership fees, Department of Welfare subsidy, donations, UNDCP research projects.
OPERATING COSTS	Operates on a cost-recovery basis. On average, cost to SANCA of training programmes R300 per person per day.	Salaries, computer licence fee (both for ISP & ILIS3 Software), journal subscriptions.
ROLE OF END-USERS	No direct involvement outside the use of the services offered by SANCA.	No direct involvement outside the use of the services offered by SANCA.
ASSESSMENT	Large increases in user constituency. SANCA has submitted a project proposal on the establishment of the National Clearinghouse on Substance Abuse in South Africa.	

SATELLIFE – HEALTHNET United States – North America www.healthnet.org		
SYNOPSIS/OVERVIEW	SATELLIFE applies Internet, satellite and phones to needs of developing countries through a global computer-based communications network, HealthNet. Its mission is to improve health by enhancing exchanges of information in the areas of public health, medicine and the environment through better connectivity. Special emphasis on areas where access is limited. HealthNet programmes in 28 countries.	
TOPIC	**1997**	**2001**
FRAMEWORK	Various frameworks owing to the global nature of the multiple in-country programmes.	Access to the Internet has become widely available and affordable through local ISPs. Various frameworks owing to the global nature of the multiple in-country programmes.
TECHNOLOGY	Satellite, telephone, Internet and radio. Store-and-forward link to the Internet. GetWeb (web to e-mail tool).	HealthNets have evolved from DOS to UNIX and from Fidonet protocol to UUCP and SMTP. HealthNet Nepal evolved into full-fledged ISP.
AUDIENCES/TARGET MARKETS	Public health, medicine and environment professionals worldwide.	Same. Actual size of audience to be determined by an independent evaluator in 2000-2001.
COALITIONS/STAKEHOLDERS	NGOs, Governments, bilateral and multilateral agencies, private sector, HealthNet partners in Asia, Africa and Latin America.	NGOs, Governments, bilateral and multilateral agencies, private sector, HealthNet partners in Asia, Africa and Latin America.
FUNDING	NEC, private donors, foundations, bilateral agencies and contractual projects, IDRC and WHO grants.	Several private sector companies, non-profit foundations from various countries providing financial and in-kind support.
OPERATING COSTS	Borne by SATELLIFE and HealthNet partners.	Some HealthNets have achieved or will soon achieve complete independence from SATELLIFE.
ROLE OF END-USERS	Role of end-users is to receive and disseminate information.	Role of end-users is to receive and disseminate information.
ASSESSMENT	Efforts heavily concentrated on Africa. Over 2,700 health professionals receive e-mail information through local HealthNets. An additional 8,000 health professionals subscribe to the organization's information services. Overall, 19,500 workers in more than 150 countries use Healthnet worldwide. The implementations in Africa have not always delivered the expected level of success owing to a number of factors, including lack of reliable infrastructure, failure and high costs of local ISPs, unfavourable regulatory, licensing and taxation regimes, and user dissatisfaction with low bandwidth. Because of the widespread availability of affordable Internet access, SATELLIFE has shifted its focus from facilitating access to content provision.	

SISTER LIBRARY PROGRAMME Zambia – Africa Www.zamnet.zm/zamnet/health		
SYNOPSIS/OVERVIEW	Connects the University of Florida Science Health Center with the University of Zambia (UNZA) Medical Library. Programme allows users to access medical information at major United States health library. Programme began in 1992. Through a SATELLIFE project, UNZA obtained access to store and forward e-mail service.	
TOPIC	**1997**	**2001**
FRAMEWORK	Sister library programme linking a well-established university in a developed country to the leading university in a developing country.	Sister library programme linking a well-established university in a developed country to the leading university in a developing country.
TECHNOLOGY	E-mail, database access, CD-ROM, Internet, website.	Internet access and speed much increased with addition of radio dish to the ISP. Project to network the School of Medicine.
AUDIENCES/TARGET MARKETS	Zambia health-care community. Website is also accessible to anyone with Internet access. Health-care personnel in developing countries.	Zambia health-care community. Website is also accessible to anyone with Internet access. Health-care personnel in developing countries.
COALITIONS/STAKEHOLDERS	University of Florida, University of Zambia, Dreyfus Health Foundation, USIS, Zamnet (ISP affiliated with the University).	University of Florida, University of Zambia, Dreyfus Health Foundation, USIS, Zamnet (ISP affiliated with the University).
FUNDING	Dreyfus Health Foundation Grant Fund, University of Florida, volunteers, USIS, USAID.	Hardware donations. Fogarty Institute grant for training in medical informatics at the University of Florida. International shipping provided free-of-cost by United States Information Service, a branch of the United States Embassy in Zambia.
OPERATING COSTS	Internet access cost incurred by the University of Florida. Sending of library materials/books undertaken by University of Florida.	Internet access cost incurred by the University of Florida. Sending of library materials/books undertaken by University of Florida.
ROLE OF END-USERS	No direct involvement outside the use of the services offered by the programme.	In 2000 a "users' survey" of the website was conducted by the University of Florida to help with the redesign and emphasis of the website.
ASSESSMENT	Sister library programmes are well established. Coalition of resources could be replicated in similar contexts. Lack of hardware at the UNZA medical library is obstacle to the project. ISP is affiliated with the university and Internet access is reliable and cost-effective. This situation has led to mutual growth: the wealth of assistance in many forms given to the UNZA library has made it one of the most important medical libraries in Africa and the first to have it own Internet home page. Several new sister library projects between developed countries and developing countries have been implemented recently in the Philippines, Ghana, and other countries.	

UNIVERSITY OF ZIMBABWE MEDICAL LIBRARY Zimbabwe – Africa		
SYNOPSIS/OVERVIEW	Addresses the difficulty the University of Zimbabwe has had in financing the procurement and maintenance of its journal and book collections. The project also aimed to capture unpublished locally produced health literature in a database. It also fed into the African Index Medicus database of unpublished health literature, produced by WHO.	
TOPIC	**1997**	**2001**
FRAMEWORK	A variety of agreements/mandates, because of the multiple nature of the participants.	Same.
TECHNOLOGY	CD-ROM, databases, e-mail.	CD-ROM, on-line databases, e-mail, Internet, search engines. Started having reliable access to the Internet in 1999 thanks to WHO network.
AUDIENCES/TARGET MARKETS	Health-care professionals in Zimbabwe.	Health-care professionals in Zimbabwe.
COALITIONS/STAKEHOLDERS	University of Zimbabwe and health-care professionals.	University of Zimbabwe, health-care professionals and WHO.
FUNDING	Main library funded by many private and public institutions and international organizations, and bilateral aid agencies, including the UN and World Bank.	Main library funded by many private and public institutions and international organizations, and bilateral aid agencies, including the UN and World Bank.
OPERATING COSTS	There is not a separate budget for the medical library; it is viewed as a department of the main library, which is supported by donor funds.	There is not a separate budget for the medical library; it is viewed as a department of the main library, which is supported by donor funds.
ROLE OF END-USERS	No direct involvement outside the use of the services offered by the library.	No direct involvement outside the use of the services offered by the library.
ASSESSMENT	Project is currently inactive, lacking staff time and funds. However, the use of the CD-ROM database has increased from 4,000 searches a month in 1997 to 10,000 searches a month today. Member of HealthNet.	

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