Information and communication technologies for generating and disseminating know-how

Jacqueline Bourdeau, Jesús Vázquez-Abad** and Laura Winer***

OAS member countries are engaged in a process of developing, implementing and using information and telecommunications technologies for their collective development. The Plan of Action produced by the Summit of the Americas in December 1994 expressed a strong commitment by the governments of the Americas to meet the information infrastructure needs of their countries. To do this, they require recommendations for action to orient the joint initiatives to be taken. The recommendations in this document rely on studies and data collected in the field, and refer to already existing initiatives in the OAS community, as well as in other regions of the world.

1. Information highway technologies, issues and needs

1.1. Networking technologies

The Information Highway (IH) connects interoperable networks, including telephone, cable and computer networks, and empowers their users with fast, multimodal and global access. People and areas lacking access to the individual networks now also lack access to the privileges of the IH. In order to ensure equity, there need to be effective and appropriate infrastructures, access opportunities, and services. Obstacles to a seamless interconnection are non-interoperable standards, restrictive regulations and complex tariff systems for the different services. While the long-term goal is clearly universal full bandwidth capacity, both multipoint and multidirectional, in the short-to-medium term, much progress can be made before this situation is achieved. Where wires or cables are not possible, unreliable, or too expensive, as is often the case in less developed countries and in remote areas, wireless and mobile technologies can provide solutions. In the deve-

* University of Quebec.

** University of Montreal.

DOI: https://doi.org/10.48160/18517072reEspecial.805

lopment of the IH, important technological breakthroughs have been satellites, fibre optic cable and digitalization, which lead to a convergence among text, sound, images and video. The challenge is to integrate telephone, cable, satellite and wireless networks into a universal interoperable network. This combined infrastructure is what permits collaboration between peoples and organizations, via their common access to global information in a shared virtual space. Applications of networking technologies which have commercial potential include distributed manufacturing. For example, Ford's 1994 Mustang was designed in Michigan, subjected to simulated crash tests in England, made into models in Italy and evaluated by focus groups worldwide.

The potential of networking technologies lies not only in electronic messaging or information retrieval, but also in its use for the collective construction of information tools, such as databases.

1.2. Collaboration technologies

Collaboration over the IH requires both communication and coordination; collaboration technologies are therefore defined as those processes as supported or enhanced by technological tools. Communication tools include electronic mail, computer conferencing, groupware, and audio and videoconferencing. Multimedia telecommunication allows collaboration through multimodal communication, both synchronous and asynchronous. Coordination tools include teamwork planning, group scheduling, distributed project management, shared applications and navigational tools, and they work to help manage the interdependencies among the collaborators. The "collaboratory" concept is likely to become the next major direction in computing. This involves the creation of and access to, an advanced, distributed infrastructure that would use multimedia information technology to relax the constraints on time and distance, and would support and enhance intellectual teamwork. Collaborators develop interdependencies at several levels: knowledge, competencies, resources, and infrastructures. Both formal and informal collaborations must be possible, as informal collaboration based on exchanges among individuals can prove very effective and should not be underestimated. Voice technologies can be used where the keyboard is an obstacle either because of illiteracy or some kind of disability.

One exemplary spontaneous initiative is CERN's (the European Laboratory for Particle Physics in Geneva) 1989 initiative to design and develop the World Wide Web (WWW). Designed by scientists for scientists, it not only meets the needs of and corresponds to, the style of collaboration desired by the developers, it has emerged to be a global phenomenon facilitating collaboration and communication between diverse and scattered communities and individuals. Information and Telecommunications Technologies are merging to provide a transparent universal tool for networking and collaboration, supported by powerful storage technologies such as CD-ROM and sophisticated navigation and search tools combined with intelligent databases and hypermedia structures. The importance of technological networks is not only in their contribution to economic development, but also in their ability to support human networks working for social development.

1.3. Implementing infrastructures for the information highway

Many questions surround the process of implementing the necessary infrastructures for the IH. The first is cost. If one set as a goal universal full bandwidth access, the costs would be astronomical $30 billion for Canada alone. Fortunately, universal full bandwidth access is not immediately necessary for individuals and society to reap significant benefits from the IH. A second question concerns the implementation time frame, which must be planned to support the implementation strategy. Clearly, compromises must be made and a gradual implementation plan needs to be followed. One approach is that followed by Red-HUCyT, which has chosen to emphasize establishing an initial IH connection in countries, usually in a university in a metropolitan area. The network is then gradually expanded within each country. The question of who will benefit from IH services has economic, political and social aspects; for example, for what type of activities they should be available education, health, business. The priorities established will largely determine the implementation strategy and priorities. The answers to the above questions will also influence the answer to the question of who will pay for the infrastructure. Mechanisms must be worked out to ensure that public and private financing is used appropriately, that all parties concerned contribute appropriately, and that no groups or areas are denied access due to lack of money. The IH is forcing a major reassessment of the role of regulations and tariffs in international communications. One of the most significant barriers to the expansion of the IH is the complexity of tariff systems for international links, as each segment of information transportation is subject to different tariff regulations. Advanced technology is what is needed to be competitive in the current world market, and governments in Europe and Asia are not hesitating to invest public money in advanced technological telecommunications infrastructures to promote their national competitiveness. Although this is not traditional in the Americas, it needs to be considered, as studies show that public investment, when complementary to private investments, helps realize returns to private investments, and is generally beneficial to the national economy.

1.4. Universal access for social and economic development

A positive correlation exists between the deployment of telecommunications facilities and economic development; however, there is also a positive correlation with job loss. The key is access to job opportunities that transcend a specific city or country. For example, software production from teleports in Bangalore, India yielded exports worth $300 million as of mid-1994. Another phenomenon made possible by new technologies is telework, meaning people working from home using computer and communication technologies to communicate with their head office, supervisors, co-workers and clients. Telework may mean less air pollution and commuting time, but also means greater job precariousness, social isolation and an increased burden for women. Will Information and Telecommunications Technologies bring better economic development at the cost of social hardships? As underlined in the Bangeman report on the European IH,

> […] the main risk lies in the creation of a two-tier society of have and have-nots, in which only one part of the population has access to the new technology, is comfortable using it and can fully enjoy its benefits.

The G7 declaration on the Global Information Society also underlines the necessity to "avoid the emergence of two classes of citizens. Universal service is an essential pillar in the development of such a policy strategy." G7 members committed themselves to:

> Promote universal service to ensure opportunities for all to participate. By establishing universal service frameworks that are adaptable, they will ensure that all citizens will have access to new information services and thus benefit from new opportunities.

Universality of telecommunications services has traditionally been public policy in our countries. However, as underlined in the recent report from the National Association of Development Organizations Research Foundation on telecommunications and its impact in rural America, "changes in market structure and technological advancements are threatening many of our traditional policies for achieving universal service, which leaves rural America especially vulnerable." This statement is true for all rural areas in our countries, and if advanced telecommunications are considered essential for rural sustainability, public policies need to be reconsidered in order to provide and maintain universal access to telecommunication services.

Businesses in the United States and Canada are already involved in commerce using the IH as either service or information providers or users. Major players are CompuServe (more than 3,2 million subscribers); America Online (3 million subscribers); Prodigy Services Co. (1 million subscribers); and e-World and Delphi, with 100.000 each. Microsoft Net is expected to surpass 9 million subscribers. Approximately 80 mil U.S. companies are on the Internet. Service providers aim at a global market; e.g., Teledesic, a small company in Washington State, is designing a system of 840 satellites, at an estimated cost of $9 million, to provide large amounts of bandwidth on demand to fixed sites anywhere on earth, and to provide data channels of all sizes to remote users in rich and poor countries. SMEs use the IH in two ways: to obtain information useful for their commercial actitivities, and to conduct their business activities.

Many established nets service particular social groups; e.g. SchoolNets, HealthNets, LibraryNets, CommunityNets, CommerceNets, RuralNets. Many of these bypass traditional distribution and communication networks and this can have the effect of encouraging and facilitating individuals to take responsibility for their individual and community social and economic development. VITA (Volunteers In Technical Assistance, an NGO in Washington, D.C.) operates satellite links for economic development in remote areas around the world. HealthNets are Internet resources which can interconnect professionals, patients, administrators, medical and information resources; provide access to tele-diagnosis and tele-treatments in remote areas; provide access to first aid services at home; support the continuing education of personnel in hospitals and health centers; and accelerate the diagnosis process by, for instance, providing opportunities for medical specialists to discuss a case sharing the information and documents in a videoconference.

1.5. Knowledge requirements

Knowledge required by these technologies are cognitive rather than motor skills, as the “objects” are abstract or symbolic rather than physical. Highly qualified manpower is required both to operate and to develop these technologies. Technological illiteracy is an obstacle, compounded by widespread illiteracy. Both of these must be overcome to fight poverty, otherwise social divisions will be increased. The situation is serious in most OAS countries. In Canada, it is estimated that by the year 2000, 2/3 of jobs will need post-secondary education. Currently, however, 38% of Canadians lack the basic literacy skills required in today’s workplace, and even more lack computer literacy skills.

1.6. Education and Lifelong Learning

Education and Lifelong Learning are a necessity for people and for organizations to survive and work in a virtual market space. Education correlates with employment, income, and opportunity, especially for women. The Computer Systems Policy Project (CSPP), composed of the CEOs of U.S. companies that develop, build and market information-processing systems and software, argues that, “An information infrastructure for lifelong learning will offer unprecedented potential for improving lives by making knowledge readily available and usable by all Americans.” The Federal Coordinating Council for Science Engineering and Technology Committee on Education and Human Resources (CEHR), composed of 15 federal agencies and the Office of Science and Technology Policy, wants a national vision for networked resources involving public and private stakeholders. In Canada, there is an expressed interest in using the IH for personal development; 63% of people surveyed said they would use the IH for educational home study activities. Examples of applications currently underway include TeleEducation New Brunswick, which delivers classes in French and English for a variety of educational and training organizations in 26 communities across New Brunswick. More than 2000 students can access its courses. The National Network for Learning in Canada develops projects to facilitate learning through technology, focusing particularly on creating radical improvements in mathematics and science. It includes five provinces, four post-secondary institutions and three private sector partners.

1.7. Science and technology capability

Science and Technology capability is a keystone for sustainable development. The new economic order of "competitive interdependence" includes technology as a competitiveness factor, but also R&D, and collaboration in R&D activities. While technology supports one aspect of national competitiveness, i.e., the ability to sell goods and services, it is R&D that allows increases in real living standards for its citizens on a sustainable basis. National governments in the Americas spend less both on R&D and on Education-Training than many governments in Europe and Asia. As an example, the level of public investment relative to the GNP is one and a half times greater in Germany and three times greater in Japan than in the United States; the U.S. spends only 20% as much as these countries on industrial training. Both public investment and encouragement to private investment in R&D activities are needed. Science and Technology capability can be increased and supported by cooperation between experts in different countries. The increased access to information and communication networks means that scientists and researchers can communicate more easily with their peers as well as have access to information, data and computer resources physically located at distant sites. This increased access must be accompanied by programs to familiarize scientists and technical personnel with the equipment, software, and processes involved. These processes must be defined in the context of and adapted to, the local culture and practices. There is a political side to this increased cooperation as it presupposes an increased access to knowledge by a wider public. A good example is SIMBIOSIS, an OAS project for a multinational information system in biotechnology and food technology. It began with a phase in which researchers were trained in the use of information processing technologies in the area. The long-term goal is to provide access for technicians and researchers to regional resources. Another example of the convergence of information and telecommunications technologies for the dissemination of scientific knowledge is the OAS-supported Network on Natural Products Research (REDPRONAT in Latin America and CANNAP in the Caribbean) which has developed, in collaboration with the University of Illinois at Chicago, a Hemispheric Data Base on Ethnobotany (MEDFLOR) which can be accessed electronically.

In the scientific world, computer networks offer a more rapid and effective way of communicating scientific information than printed journals with their long review and publishing process. A daily wire service is operational for preprints and live reports by researchers in more than 10 disciplines in science and mathematics, the areas from which much of the impetus for electronic publishing comes. About 20,000 e-mails flow daily to more than 60 countries with abstracts of new preprints and research reports. Thousands of full papers are downloaded daily. Electronic publishing facilitates hypermedia writing and non-linear, dynamic forms of representing ideas. It also makes possible a faster turnaround time from writing to availability; while often desirable, as this reduces the chances of information being obsolete before it is published, it also lends itself to the publication of incomplete or underdeveloped information. Electronic self-publishing clutters the net and without an adequate indexing system is often just lost in space. Peer reviewed electronic journals are parallel to traditional journals but with a larger diffusion, reduced costs (on both sides) and lag times. Interactive publications open up the possibility of creating collaborative workspaces, with original works presented with commentary and rebuttals.

The transformation of scientific knowledge into commercializable technologies is a difficult process, with one of the principal difficulties coming from the lack of access to risk capital. The rapid success of the Montreal firm, Softimage, a high tech company devoted to dynamic imaging recently purchased by Microsoft, owes its success to risk capital. A new high tech firm requires between $2 and $3 million to start, with an additional $19 million required to go public and become internationally competitive. The Canadian SME Ideas Fund, a $25 million fund created by the Federal Development Bank and the Federal Office of Regional Development, provides loans to companies whose activities are centered on innovation and knowledge, notably in computer technology. Innovatech, a non-profit organization in Montreal, acts as a broker to finance high tech R&D projects by obtaining risk capital for carefully screened projects. The needs of, and the challenges faced by OAS member countries can be better understood in the light of the results of programs such as Mercocyt and Colciencias.

1.8. Social impact

Currently, IH services are available mainly in well-developed areas. The four cities with the most commercial addresses are San Francisco (1460), San Jose and Sunnyvale-Silicon Valley (1158), Boulder and Denver (942) and Greater Boston (739). A close look reveals that, on a per capita basis, 10 of the top 25 cities are in California. Demographic data show that the IH is mainly a phenomenon of highly educated young adult males, who live in North American high tech hub cities. If less developed groups, communities and countries do not attain sufficient access, these technologies will increase the gaps and divisions between rich and poor, and among communities and countries. Access to Information and Telecommunications Technologies is available in the Americas primarily in metropolitan areas and in businesses. Not only do we not find them in remote and poor areas where they would be extremely valuable, but even in well-developed countries, the poorer groups and communities have either no access or very limited access to them. Will IH technologies reinforce social divisions among groups inside a country, among countries in a region, and among regions of the world? This is the trend. Action is needed from national and international agencies to reorient the process and redress its flaws.

Special efforts must also be made to ensure equal access for women and girls. It is important to create an on-line environment that is welcoming, or at the very least, not hostile, in order to create a "critical mass" of female users. Women and girls face a range of obstacles including the fact that computers and other high-tech equipment are predominantly in math and computer science, areas that are still widely perceived as male domains. Special efforts must be made to redress the situation. For example: require each student to spend x time in the lab; reserve time slots for different groups; make sure instructions and questions are equal; be sensitive to conflicts with other interests or responsibilities; be sensitive to gender biases in computer applications.

Other factors that may influence access opportunities, such as disabilities, age, income and language, need to be considered. The IH may lead to increased independence and self-reliance for the disabled. However, certain factors must be taken into consideration so as not to impede access; for example, the disabled are more equitably served by flat rate billing vs. billing for time used because special interfaces often require longer connect time. Under-served constituencies must be identified and their needs met. For example, women in Central America, particularly rural women, are marginalized and exhibit high rates of poverty and illiteracy. Women's agricultural roles still remain largely invisible in statistics. Since women in developing countries do much of the agricultural work, they may benefit from telecommunications that can give them information about prices and markets as well as expert advice.

1.9. Needs for IH infrastructures in developing countries

In developing countries, current access to information processing infrastructure is inadequate, and progress depends on telecommunications policy reforms not yet implemented. But developing countries may be able to leapfrog and attain better and cheaper links (lower costs per capita) to subscribers than developed countries. However, a comparison of the number of phone lines per 100 residents in 1992 and the forecast for the year 2000, with the investment required to achieve it (in $ billion U.S.) shows that even with significant investment, Latin American countries will still lag significantly behind the U.S.

Countries	**1992 (%)**	**2000 (%)**	**Cost of $ million**
Brazil	6,83	9,49	10,2
Mexico	7,54	12,49	9,4
Chile	8,92	19,71	2,8
U. S.	56,49	65,92	55,8

Cellular demand and usage have exploded in Latin America. BellSouth Corp. has operations in four Latin wireless markets and estimates its annual revenues per subscriber at $2000 vs. $860 in the U.S.

This has important implications for the cost of IH access and the associated limiting of access to more favored groups. A fundamental right to access computer networks could be defined as follows: "every member of a community has an inalienable right to be an interactive node in that community's digitally converged network" and every member must have: 1) access to a minimal basic kit of equipment; 2) access to the essential facts, figures and opinions necessary to be a good citizen in that community; and 3) every citizen must have effective interfacing with the information sources. The basic kit must perform the following five functions: 1) must be able to plug into the community network and receive and interpret digital signals from that network, 2) must be able to process the incoming bit stream, 3) must have memory available to store data and applications software, 4) must have at least one display unit, and 5) must have the capacity to send digital messages back to the network. Effective interfacing must be able to interpret the information received. This requires both knowledge about information technology and critical thinking skills. The basic kits and the information services must be simple, easy and natural to use by ordinary citizens. Community information centers can extend the reach of information services to under-served rural and urban areas.

2. Initiatives in OAS countries and in other regions

2.1. OAS initiatives

The Plan of Action of the Summit of the Americas emphasized the need for numerous actions to develop and support the telecommunications and information infrastructure in the 34 participating countries. Relevant OAS initiatives have already been launched, among them Mercocyt, RedHUCyT, CITEL, CREAD and the Technical Information for Industry program. Mercocyt promotes the association of universities and research centers throughout OAS member countries, with a view to pooling skills and efforts and providing better support for innovation in enterprises and public agencies. It seeks to contribute to production, international trade, and integral development.

RedHUCyT's main objective is to connect the member countries to Internet by integrating an electronic network for the exchange of scientific and technological information among professors, researchers, and specialists at different universities in the member states. RedHUCyT's approach to the development of electronic networks in the member States is to help local initiatives for either the inception or expansion of networks in their countries. The project provides high-tech equipment, technical support, specialized training, and sponsors technical workshops and seminars in the region to prepare technical projects, improve skills, share technical knowledge, and train network managers. Important collaboration has been established with several organizations; the National Science Foundation has been particularly helpful in providing connectivity in the United States. RedHUCyT has also sponsored and co-organized several seminars and workshops in Latin America and the Caribbean to promote knowledge and experience of electronic communication networks. Among them, two Caribbean Academic and Scientific Network Workshops; four Inter-American Networking Workshops; the three Latin American Schools on Networks; and REUNA '94, a major workshop organized by the National University Network in Chile for end users with more than 400 participants.

Computer networking in Latin America and the Caribbean has had an impressive growth during the past two years. According to recent

ISOC statistics, some of these regional networks have had the highest rates of growth worldwide. About half of the new full Internet connections in the region were established during 1994. In the Caribbean region, CUNet was implemented in 1991 and now has more than 25 nodes. In Central America, RedHUCyT has worked since 1992 to support the implementation of networks such as Costa Rican National Research Network (CRNet), the Nicaraguan Academic Network (RAIN), the Panamanian Academic Network (PANNet), the National Network of Honduras (HONDUNet), the Guatemalan network (MAYANet), and a connection to the Internet for El Salvador. In Argentina, the OAS has supported the expansion of the Science and Technology Network (RECYT) and the Argentine Teleinformatics Network (RETINA). Bolivia implemented the Bolivian Data and Communications Network (BOLNET) with the support of Chilean universities and RedHUCyT. Paraguay is setting up a Point of Presence to the Internet. Uruguay received equipment to facilitate its Internet connection. RedHUCyT supported the expansion of the Ecuadorian Information Corporation (EcuaNet) in Ecuador as well as the Peruvian Scientific Network (RCP) in Peru. Discussions are under way with Colombia, Brazil and Mexico about OAS support for the future expansion of their national backbones.

Under the RedHUCyT initiative, INFOCyT is a pilot project set up to facilitate access to regional, as opposed to strictly national, databases in science and technology. The project is working to design tools for easy access to regional information, notably common access windows to databases by subject, rather than by country; for example, scholarships available, researchers, research projects. CITEL has a mandate from the OAS countries to pave the way for the IH by working on interoperability standards, on the sharing of the radio spectrum for mobile communications and on a regulatory framework. Recommended Telecommunications Policies, released December 1995, after consultation with the ITU, are to be discussed at the 1996 Meeting of Senior Telecommunications Officials. CREAD is the Consortium of distance education throughout the Americas, whose mission is to develop inter-American distance education through inter-institutional cooperation, resource sharing and partnerships. CREAD runs an electronic discussion forum called the Latin American and Caribbean Electronic Distance Education Forum (<CREAD@YORKU.CA>). Participants exchange views and information, and sometimes collaborate inside inter-American projects. The Technical Information for Industry program oversees the development of a series of SIATES (Servicio de Información y Asistencia Técnica a las Empresas). The mission of each SIATE is to help businesses in its country progress by using in the most efficient and effective ways existing technical, economic, technological and scientific know-how. As a result, SIATEs contribute to the technological and industrial development of their countries by promoting and facilitating the use of know-how for the production of goods and services.

2.2. National IH infrastructure initiatives

In the U.S., the National Information Infrastructure initiative could serve as a useful model for actions in other OAS countries. The National Information Infrastructure (NII) consists of four integrated elements: computing and information appliances; communications networks; information and computing resources; and skilled, well-trained human resources. The challenge of the NII is to extend digital connectivity to smaller users. This can be achieved with mixed technologies; for example, by mixing twisted-pair copper wiring with fibre optics. This would give access to international standard Integrated Services Digital Network (ISDN), Asymmetric Digital Subscriber Line (ADSL) and High-bit-rate Digital Subscriber Line (HDSL). The one-time cost of upgrading to narrowband digital facilities is only a few hundred dollars per subscriber, whereas rebuilding the national telecommunications infrastructure to support fibre-to-home would be several thousand dollars per subscriber. The role of the federal government is first to provide a clear statement of a national vision for the infrastructure and then to make public policy decisions that will make possible the strengthening, expanding and enhancing of the infrastructure. The government needs to create an environment in which competition can expand and provide appropriate incentives and opportunities for the private sector to invest in and deploy new technologies.

In Canada, CANARIE is a non-profit corporation representing Canada's research, university, business and government communities, with 140 private and public sector, fee-paying members. Their mission is to facilitate the development of critical aspects of the communications infrastructure of a knowledge-based society and economy in Canada, and in so doing , to contribute to Canadian competitiveness in all sectors of the economy, to wealth and job creation and to the quality of life. CANARIE Inc. is a partnership between the private sector and government to accelerate the development and application of the communications infrastructure in Canada. The federal government has invested $106 million through to 1999, while the private sector will contribute over $400 million. CANARIE's Technology and Applications Development program is a shared-cost R&D funding program with the goal of stimulating innovative research and development projects that lead to new networking products and applications for the marketplace. Under this program, CANARIE may fund up to 50% of the cost of an approved development project, to a maximum of $1 million. Projects that focus on development of commercializable products or applications in the following areas are especially encouraged: Business, Research, Health Care and Quality of Life, Education and Life-long Learning. Projects are also encouraged in the areas of the environment and Canada's cultural industries. Projects focusing on exploiting the convergence of new media, computers and broadband networks, that involve small or medium-sized enterprises, or that involve consortia, are also encouraged. The CANARIE National Test Network, built in collaboration with Stentor and Unitel, Canada's two major carriers, is the world's longest and most complex ATM test network supporting the development and testing of new broadband technologies, applications and services.

Stentor is an alliance of the 11 major telephone companies who are the owners of the three Stentor companies: Stentor Resource Centre Inc., an engineering and marketing company; Stentor Telecom Policy Inc., the government relations advisory and advocacy arm for the Stentor partners; and Stentor Canadian Network Management, which coordinates the operation and maintenance of Canada's national public telecommunications network. The Alliance enables the telephone companies to pool their resources and to tap the full potential of their collective expertise in engineering, research, product development and marketing. The Alliance also maintains the world's longest, fully digital, fibre optic network –one that forms the backbone of the Canadian information highway. The Stentor Alliance of telephone companies is investing $8 billion to provide broadband access to 80% of Canadian households by 2005. Stentor joined forty organizations from around the globe to form the Telecommunications Information Networking Architecture Consortium (TINA-C). The Consortium brings together telecommunications network providers, telecommunications and information technology suppliers and research organizations from Europe, North America and the Pacific Rim. The aim of TINA-C is to develop an architecture that will enable the efficient introduction and management of telecommunications services on a worldwide basis. The architecture will be based on advanced distributed processing, service delivery technologies, and several international standards. Over the five-year term of the Consortium, members of TINA-C will validate the effectiveness of the architecture through experiments and field trials, and will promote its use. Stentor Resource Centre is lending its expertise to a sub-team dedicated to defining the benefits of adopting the new architecture in public networks and in practical business applications.

2.3. Science and Technology

Relevant initiatives in science and technology demonstrate various types of industry/university collaboration. A number of projects involve networking and collaboration among universities, as well as between universities and industry. Examples of these include Brazilian science parks that emphasize the creation of new technology businesses by joining academic experts and business interests for a technology field, e.g., software. Brazilian "incubators" aim to integrate Latin American software companies and academic institutions to increase their participation in the world software market. In the US, besides the Technology Reinvestment Program, the "descaling" actions in the U.S. armed forces have proven useful for transferring expertise to institutions and firms. This initiative could be extended to OAS countries, including less developed countries.

In Canada, initiatives such as the Network of Centres of Excellence Program are worth studying for their possible transferability or extendibility. These networks are structures that regroup various actors in one field (the Institute for Telecommunications Research, The Institute for Robotics and Intelligent Systems, the TeleLearning Network). Another initiative is OCRI net (Ottawa-Carleton Research Institute), an infrastructure for a high-capacity test network and the world's first metropolitan area research network driven by advanced switching technologies. Created in January 1994, it links 12 nodes through fibre optic cable. Partners include high tech companies, educational institutions and government.

In the U.S., NSFNET was a partnership involving Michigan's universities through the Merit consortium, industrial partners IBM and MCI, the state government and the federal government through NSF. From 1985-92, NSFNET had a growth of over 7,000%. In 1992 there were more than 650 colleges and universities connected, encompassing more than 80% of U.S. students and 90% of federally sponsored research with traffic on the net of 15 billion packets a month. Additionally, there were more than 1,000 high schools and several hundred libraries connected. It connected to over 5000 networks worldwide, providing access to 39 countries on seven continents. NSFNET was the precursor to

NREN (National Research and Education Network) which is a component of the U.S. High-Performance Computing and Communications Program. NREN's development costs are approximately $390 million over five years, less than 1% of U.S. federal R&D expenditures.

2.4. Health

A number of initiatives have been taken in North America to make use of the IH to extend the reach of health information and services. In Canada, the HealthNet www Demonstration Project was undertaken by Health Information Infrastructure Consulting, Canadian Federal Government partners and members of the global health community to

> […] help highlight the potential of existing communications technologies that can be applied toward the development of a health information infrastructure for Canada. Its goal is to provide a single window point of access to health care resources on the Internet in order to provide easier access to health resources and demonstrate the innovative ways in which many health groups are using currently available information highway technologies.

Information on the www includes details on the HealthNet as well as Frequently Asked Questions. As stated in the general information, the project also aims at educating and bringing changes, i.e.,

> […] to raise awareness about health care applications for the Information Highway in order to help promote the development of the best possible health care information infrastructure for all Canadians, drawing on ideas and collaboration from the global community. This can be accomplished by using tools such as the www to educate health care providers, governments, private groups and any other members of the public interested in health care about what types of electronic health services are currently available, and where the future may lie. This will help to provide focus for the debate on what types of electronic health services can be developed and provide links or examples of those that are currently feasible. The technology needed to implement the applications displayed here is currently available. The next key challenge is to create the consensus necessary so that infrastructure and internal changes can be made in order for these applications to be widely utilized. Depending on the jurisdiction, major policy issues, such as standards and privacy, will also need to be addressed. The challenge of this pilot is to help decision makers understand the implications of the technologies.

The Web page presents a comprehensive set of hypertext links to current medical and health care resources currently available on the Global Internet, and provides an interactive demonstration of future medical and health care applications. Examples of current applications provide a window on what the future offers. In rural Newfoundland, 147 communities can access Memorial University Teleconference System and link up to 217 different health education user groups. Remote Consultative Network provides an electronic link between Drumheller, Alberta and the Faculty of Medicine at the University of Calgary. The telecommunications technology transmits images and allows for consulting and diagnoses. The Ottawa Heart Institute provides multimedia consultation for colleagues in isolated areas. The Hotel Dieu de Montreal and the Centre Hospitalier Universitaire Cochin de Paris are electronically linked with the capability to patch a variety of medical equipment into the system.

2.5. Education

Numerous initiatives have recently been deployed in several OAS countries to develop school networking as well as various creative ways to use the IH for education in general. In the U.S., NREN is envisioned as the link between the U.S. education infrastructure and knowledge and information centers. Elementary schools, high schools, two-and four-year colleges, and universities will be linked with research centers and labs to share access to resources such as libraries, databases, supercomputers, telescopes, and particle accelerators. NREN will logically feed into the National Information Infrastructure (NII) which will allow consumers, businesses, schools and governments to share high-quality information. NSF is supporting a series of testbeds to enable teachers, students, scientists, engineers, educational researchers and administrators to work together to determine the benefits and costs of using NREN and associated distributed resources to support innovations and reforms in education and learning. The Learning Through Collaborative Visualization Project (CoVis) is designed to reconceptualize and reconfigure high school science education. CoVis is a networking testbed funded by the NSF with the goal of enabling project-based approaches to science using low- and medium-bandwidth networks to put students in direct contact with practicing scientists and scientific tools. A program called Science and Mathematics Teaching Teleapprenticeships, involving the University of Illinois and the public school systems of

Champaign and Urbana, takes student teaching and extends it throughout undergraduate training and in classroom practice for ongoing professional development. Boston-based TERC's LabNet supports teachers in their professional growth. More than 400 teachers participate. The Hub, in partnership with the Eisenhower Regional Alliance for Mathematics and Science Education Reform in the Northeast and Islands is a collection of information and services allowing educators to take advantage of the power of the Internet. Services include custom information searches, electronic conversations, publishing and distributing thin-market materials (e.g., lab manuals, student research findings, uses for software, policy papers). Since the mid-1980's, schools have increasingly participated in specialized computer networks such as the National Geographic Society/TERC Kids Network, the Intercultural Learning Network, and FidoNet, as well as commercial enterprises such as CompuServe, America Online and Prodigy. NGS Kids Network has a professional with expertise in the unit topic to help guide student scientists. Telecommunicated data are collated and charted by the staff and returned to the participating students. TERC's Star Schools Project is a U.S. government Star Schools funded program for grades 7 to 12. Students design and carry out their own science and math projects in addition to collecting, sharing and analyzing data from investigations presented in their curriculum units.

In Canada, SchoolNet is a joint federal, provincial and territorial initiative linking schools and libraries across Canada to the Internet. By the end of 1998, SchoolNet will link all of Canada's schools, libraries, colleges and universities to the IH. The development of SchoolNet requires $52 million over four years. SchoolNet, Queen's University, University of Ottawa, OCRI and the Ottawa-Carleton Learning Foundation have a training project for primary/secondary teachers to upgrade their information technology skills.

In Latin America, a spontaneous initiative called QuipuNet has been formed to offer Peruvians in Peru educational support from Peruvians abroad over the network. Established in Washington State, this virtual organization is looking for computer resources, as expressed in CREAD's Latin American and Caribbean Electronic Distance Education Forum by President Alberto Delgado, Ph.D.:

> We are implementing a 'virtual campus' in order to develop Distance Education Activities and to support Educational Activities in Peru. Our organization is called QuipuNet (from the Inca word quipu, meaning calculator). We are a non-profit corporation registered in Washington

> State, U.S.A. Our members are Peruvian volunteers who are living abroad (U.S.A., Japan, Brazil, Spain, etc.). Many of them are with famous companies/universities. We are going to use www, moo, mailing-lists, etc. in order to accomplish our objectives. We have our own mailing list (quipunet@mit.edu) and our home page at http://www.quipu.net (under construction).

Peru has a network called Red Cientifica Peruana which regroups Peruvian scientists in Peru who are working to develop Internet services for the academic community. Colombian scientists from all over the world have formed a network called RedCaldas (r-caldas@colciencias.gov.co) to share information among the Colombian scientific community abroad. Similar to RedCaldas, Argentina has a network of scientists called CYTAR under the national program PROCITEXT.

2.6. Commerce

In the field of commerce, CommerceNet defines itself as the first large-scale market trial of electronic commerce on the Internet. The CommerceNet Consortium is a non-profit organization in the U.S., with a matching fund agreement (6M$/3yrs) from the federal government under the Technology Reinvestment Project (TRP). The core development team started at Stanford University's Center for Information Technology (CIT). Its goal is to facilitate the use of an Internet-based infrastructure for electronic commerce to allow efficient interactions among customers, suppliers and development partners to speed time-to-market and reduce the costs of doing business. In its charter, CommerceNet is committed to: operating a WWW server; conducting pilot projects on transaction security, payment services, electronic catalogs, and electronic data interchange (EDI); enhancing existing Internet services and stimulating new ones; educating organizations; and coordinating with national and international infrastructure projects. This electronic marketplace will support business services that normally depend on paper-based transactions. Buyers browse multimedia catalogs, solicit bids, and place orders. Sellers respond to bids, schedule production and coordinate deliveries. Third party services offer broker and referral services, network notaries and depositories, and financial services. CommerceNet is working on security mechanisms such as authentification and encryption to support these services. This initiative also provides a forum for members to discuss issues and business practices for electronic commerce. CommerceNet members believe that electronic commerce will benefit companies since it will: shorten procurement cycles through on-line catalogs, ordering and payment; cut costs on both stock and manufactured parts through competitive bidding; shrink development cycles and accelerate time-to-market through collaborative engineering and product implementation. CommerceNet continues to benefit from the R&D done at Stanford's CIT on collaboration tools for distributed work teams that support both real-time interaction and video mail, natural language techniques for information retrieval and translation services, and intelligent shopping agents that search through catalogs and negotiate deals.

NAFTAnet is a provider of IH services for businesses in NAFTA member countries, based on the WWW and on AT&T EasyLink Services. It offers a Global Messaging System integrating fax, data, e-mail and telex to form a complete EDI solution. Reduction of costs and of time-to-market are among the benefits offered by NAFTAnet to its members. Information is offered in Spanish and English, and advertising on the Internet is encouraged. Business directories, catalogs, and electronic malls are offered, as well as information on exportation, transportation and customs regulations between member countries.

2.7. Community development

Community networks, often called FreeNets, provide information and networking services to groups, individuals, and local organizations. They are committed to providing free public access to all information, exchange and sharing opportunities provided by the global network. They are seen as the grassroots of the NIIs and of the GII. Well-developed in the U.S. and Canada, they are still to come in Central and South American countries. FreeNets are set up in about 50 U.S. cities. The National Public Telecomputing Network will bring electronic community networks to rural America using a government grant of $900,000. In Canada, there are 28 Community Nets, built on a cooperative model, with more than 150,000 members. A national network of community access sites is being established through the Community Access Project, where communities will establish and operate public access sites in low-cost public locations (e.g. schools, libraries) to serve as IH on-ramps. The aim is to set up 300 centers annually for three years. Program objectives are: to provide rural communities with access; to stimulate development of new electronic learning tools and services; to provide local Internet training facilities; and to stimulate electronic delivery of government and other services.

2.8. Specific actions for better equity

The special needs of specific groups and minorities have not been frequently addressed to date. Successful implementations should be studied to extract relevant actions and develop guidelines for future implementations. For example, Santa Monica, California, has a Public Electronic Networking system (PEN) which had an unusually high early adoption rate among females. PEN's public terminals contribute by affording access opportunities to those who do not have access from home or work. Another significant factor was the decision to include interactive conference topics specifically dedicated to women's issues. System operators provided female users with an opportunity to participate in restructuring PEN's interactive conferences.

2.9. Governments

The Plan of Action of the Summit of the Americas stresses the importance of governments making their information more publicly available via electronic means. Governments as policy makers have an obligation to be exemplary, as well as to take actions and implement reforms to build competition. Governments as information providers (and with their purchasing power) should develop open access to information and interactive services, and thus illustrate the advantages of the IH. They must work to create an information-friendly environment; i.e. one which has coherent telecommunications reform and information policies, laws protecting investment, intellectual property and individual privacy, open and well-regulated information and communication markets, education policies that favor a skilled labor force and effective regulatory and standard-setting institutions. Open Government initiatives in the U.S. and Canada are showing the possibilities for providing access to information and services via the IH. The state of California has passed a law requiring the state legislature to convey its information to citizens electronically. When issues of privacy and security are resolved, more people will be willing to embark on this mode of communication. These initiatives are worth studying for their possible transferability to other countries if adapted to respective situations.

2.10. Initiatives in other regions of the world

Public investment initiatives undertaken by other countries that should be considered include those undertaken by the the European Community and the G7.

The G7 partners expressed their firm commitment to the Global Information Society project. They will increase cooperation efforts in selected joint projects of common interest, especially on basic technology, including interconnectivity, interoperability and human interface. Comparable opportunities for participation in projects are offered to G7 and non-G7 partners. Project themes include "global interoperability for broadband networks" to facilitate the establishment of international links among existing high-speed networks of various industrialized countries. The interconnection of these networks will provide an opportunity for network operators to experiment and establish standards, and for applications developers to collaborate with partners internationally. The Global Information Infrastructure Commission (GIIC) in Washington is interested in on-going projects in the areas of "virtual campuses" around the world and also those projects with a specific focus on developing countries.

In Europe, the objectives of the Fourth Framework Programme, which is to run from 1994 to 1998, is to implement Research and Technological Development (RTD) programs and demonstration programs by promoting cooperation with and among enterprises, research centers and universities; to promote cooperation in the field of European Community RTD and demonstration with third party countries and international organizations; to disseminate and optimize the results of European Community RTD and demonstration activities; and to stimulate the training and mobility of researchers in the European Community. Among the research areas are information technology, telecommunications and advanced telematics services. ACTS is part of the Fourth Framework Programme of research and development. Its aim is to ensure the effective application across Europe of the developments in telecommunications. Its work is carried out in the context of trials to encourage a dialogue between developers and users. There are currently 96 consortia carrying out projects in ACTS. Although ACTS has an European Community focus, participation is open to any relevant organization. CORDIS is the Community Research and Development Information Service. It provides information about all RTD activities supported by the European Community, and some privately funded RTD activities. The CORDIS Service forms a central source of quality information that is important to all organizations wishing to participate in European Community research programs, or to exploit their results. Its main purpose is the dissemination of RTD information throughout European industry and commerce. It is also important for researchers in academic and industrial establishments who need to have knowledge of research trends and details of projects, and it is an important tool for research policy makers in member states. CORDIS offers over 130,000 documents in ten databases. CORDIS databases are available on the ECHO Host, and on the CORDIS CD-ROM. Various publications and other CORDIS products are also available. CORDIS is managed by the Dissemination of Scientific and Technical Knowledge Unit, which is responsible for the dissemination and exploitation of RTD results, technology transfer, and innovation. COST stands for European cooperation in the field of scientific and technical research. The aim of COST Cooperation is to coordinate precompetitive or fundamental research or activities of public interest financed at a national level. Today, 25 European member countries as well as the European Commission are involved in COST. More than 100 COST actions are in progress at present in 15 research fields, each with an average duration of 4 years. The COST members may choose and participate in these actions "à la carte" depending on their national research priorities. Since its inception in 1971, COST has played a pioneering role in stimulating scientific cooperation in new research sectors according to a "bottom-up" approach (the cooperation being initiated by the participants themselves at a national level).

Smaller scale initiatives appear spontaneously, such as ToolNet, a network for small scale development projects that fosters exchange of information, experiences, expertise, and solutions to technical problems. ToolNet provides multifunctional electronic mail to link field workers, local organizations, technological institutions, international development organization, and individuals to each other and to national and international networks. Sponsored by TOOL, a non-profit organization in the Netherlands working for technology transfer to and among developing countries, ToolNet Access Points are operating or planned in about 25 countries worldwide.

OAS countries can benefit from participating in multinational initiatives such as those of the G7 and the European Community. Bilateral and international agreements already exist in OAS countries for science and technology programs and they are successful; witness the international cooperation in space (earth observation, satellite, tele-detection, atmospheric studies). These agreements could be expanded in order to include information and telecommunications technologies.

In concluding this section, one statement made at the G7 conference on the Information Society in February 1995 deserves mention for its value in the multicultural context of OAS countries: “All participants supported the principle of encouraging cultural and linguistic diversity. In international terms, the recognition and protection of cultural differences is an expression of good will. It is not about creating barriers; it is about tolerance.”

3. Recommendations

3.1. Implement technological infrastructures for universal access

Encourage and support the implementation of telecommunications infrastructure and services, including wireless and mobile communications systems, based on the individual needs and capacities of countries.

Expand networking capacity; i.e., increase the number of nodes in each country, the number of links within and between countries, the bandwidth capacity of those links, the number and variety of services and applications available on these networks.

Increase local institutional access capabilities via LANs and communication servers. Ensure access to non-technical people.

Expand national backbones and support the creation of new ones, where needed.

Create an investment fund for developing an infrastructure for health, education and equal access to information and trade on the Internet, as well as for work opportunities with the Internet. Negotiate agreements with common carriers to provide special reduced rates for educational institutions.

Superimpose the IH infrastructure on existing effective administrative infrastructures such as schools, health centers, libraries and on existing human networks such as associations, chambers of commerce, etc.

Build on programs such as RedHUCyT, managed by OAS, with additional funding by the World Bank and the IDB and with support and commitment from governments and industrial partners. Actions required from governments include facilitating initial introductory activities to encourage new users and innovative applications of the IH. This facilitation can be in the form of technical support, connection capabilities, infrastructure or financial contributions.

3.2. Reduce obstacles such as regulations, tariffs, lack of standards, and monopolies

Mandate CITEL to continue and reinforce its work on telecommunications standards with ITU and on information systems standards with IEEE and ISO, and on Internet standards with IETF and also with regulatory bodies. CITEL's mandate should include working on simplifying tariffs in order to prevent barriers at the level of commercial services, and also participating in international forums such as OECD. If publicly-funded networks are going to serve as the initial access point for many countries, the question of Appropriate Use Policy (AUP) for commercial use must be addressed. It may be necessary to establish separate networks for commercial exploitation.

Promote collaboration between competitors; for example, alliances such as Stentor and COMTELCA.

Give special attention to less developed countries, areas and groups.

In order to solve the problem of complex tariffs for international links, it is extremely important that regulations be reduced and monopolies be eliminated so as to encourage competition. The benefits of this can be seen in countries such as Chile, which has been a leader in deregulating and is now benefiting from a number of competing suppliers. To enhance the competitive environment, governments should eliminate unnecessary regulation in segments that have intense competition, test competition in areas where it does not presently exist, and develop policies that ensure fair access to foreign markets.

The government role in telecommunications is shifting from ownership and operation to policy and (de)regulation. For strategic information systems, government interventions (or non-interventions) must be appropriate to the needs and conditions of each country.

3.3. Develop scientific and technological capacity in the field of the IH and its applications

Support R&D activities in information technologies in order to gain expertise and to win market niches. Themes to emphasize are interconnection of networks, interoperability of services, wireless and mobile communications, development or adaptation of software applications, adaptation of services and user interfaces. Support R&D projects on technology development, applications and experimentation (e.g. by providing free access to IH services).

Support the creation of consortia and strategic alliances with manufacturers and financial institutions. Promote joint programs and networks among OAS member countries, with Commonwealth countries, with the European Community, and with Asian-Pacific countries. Encourage the networking and collaboration of researchers.

Provide loans and investments for innovative SMEs instead of tax credits, which are mainly profitable to larger firms.

Programs should request proposals for targeted areas as well as accept unsolicited proposals. Rules for funding such as the following should be elaborated: include the presence of advanced researchers or participation with advanced teams (inside and outside OAS, as practiced in the European Community). These programs could be inspired by ones such as CANARIE (Canadian Network for the Advancement of Research, Industry and Education), which used a $26 million federal contribution to lever investments of more than $125 million; and NREN (U.S.) which emphasizes education and research and service to the research and education community. The federal role consists of creating platforms for exploring new technologies. NREN is seen as an enabling technology with commercialization as a secondary priority.

3.4. Promote scientific and technological collaboration, transfer and dissemination of information

Promote cooperation initiatives based on networking and collaboration technologies in all science and technology domains. Promote transfer initiatives such as CIT at Stanford University. Support volunteer initiatives such as Red Caldas or QuipuNet. Promote the creation of a clearinghouse or "watch-dog" for information on infrastructure, and on applications and initiatives related to the IH by an organization such as the Canadian Institute for Scientific and Technical Information. Promote transfer and dissemination of scientific and of strategic information by electronic publishing. Support projects on dissemination of information, such as an observatory, a clearinghouse, databases, CD-ROM, for example by providing free access to IH services. Use the RedHUCyT infrastructure for supporting these activities.

Build on existing Mercocyt initiatives to better support the development of Science and Technology capacity in all OAS member countries. For example: add the support of national efforts by less developed countries to Mercocyt's support of multinational efforts; include providing infrastructure and services and supporting projects for the benefit of all countries to Mercocyt's focus on the identification, organization and follow-up of activities; add additional projects in education, in training highly qualified personnel, and in access to literacy and technological literacy programs to Mercocyt's focus on two projects only; specify that at least one less-developed country must be included in the international projects when Mercocyt considers supporting institutions involving at least three countries, as in European Community projects.

Encourage and support participation in joint programs and in networks within the OAS, with Commonwealth, European, and Asian-Pacific countries.

Mercocyt has identified a number of programming, financial and organizational aspects to insure the successful association of universities and research centers in science and technology. This program can be used to orient the involvement of private industry and the general public and encourage more widespread development in science and technology. Policies should include: every government funding agency supports the funding of IH infrastructure in its funded R&D projects; every government funding agency keeps a fraction of its funding envelope for projects in the area of the IH technologies and applications, as well as for study grants. The Technical Information for Industry Program could be mandated to implement and support information transfer and dissemination services on the IH. The technology and expertise transfer resulting from the descaling process in the U.S. Armed Forces could be extended to include other OAS countries.

3.5. Strengthen multiple education and training efforts

Conduct actions to support: 1) basic education, 2) technological education, 3) highly qualified manpower, 4) a lifelong learning culture.

Introduce scientists and technologists to Information and Telecommunications technologies to further their professional activities.

Develop highly qualified manpower to contribute to the development of R&D capacity in hardware, software and their applications. Provide study grants for students to study in more advanced countries, and for professionals and engineers to upgrade their skills in the field of IH technologies and their applications. Train the trainers –professionals in education and training must be trained on how to use the IH services and develop new ones.

Ensure technological literacy in addition to basic literacy in the general population. In order to ensure long-term capacity, integrate the development of technological competence in basic compulsory education. An increasing demand for specialized informatics professionals, computer literacy throughout the workforce, and lifelong training are challenges facing most countries. Meeting these challenges will require the efforts of universities, private companies, training institutions, computer societies, and accreditation councils. Project leaders must spend time in the initial stages of a project to determine what challenges may arise to an educational innovation and thereby be ready to avoid or preempt them. The goal must be to develop a culture for the knowledge-based society.

The World Bank Group, the IDB and RedHUCyT can help the development of the information economy through strategic advisory services and the mobilization of worldwide knowledge and expertise in support of individual country's needs. The World Bank and the IDB could use financing to lever and enable development, in partnership, strategic investment and policy and institutional reforms. CREAD and the Global Information Infrastructure Commission (GIIC) in Washington can also act in this direction.

3.6. Develop health information and services on the IH

Make development and deployment of HealthNets a priority to support sustainable development. Health should be considered a fundamental right and a prior requirement for education and work.

Support the use of the IH to interconnect professionals, patients, administrators, medical and information resources, to give access to tele-diagnosis and tele-treatments in remote areas, and access to first aid services at home; to provide continuing education of personnel in hospitals and health centers; and to accelerate the diagnosis and remediation processes. Implement remote consultative networks to provide electronic links between isolated areas and metropolitan hospitals.

Build upon existing HealthNets in North America. Support RedHUCyT's development of innovative applications in health services, such as the Central American Backbone Project.

Encourage collaboration with the Pan-American Health Organization.

3.7. Encourage the use of the IH for community development and social responsibility

By providing information and networking services to individuals, the IH, through networks such as FreeNets or RuralNets, can promote and support individuals taking increased responsibility for societal development. By opening up government information, individuals and community groups may more easily communicate with decision-makers to influence and be involved in decisions which affect them.

FreeNets and RuralNets should be used to provide access for all citizens. Use Canada's Community Access Project as a model for enabling widespread access to communities.

3.8. Conduct specific actions for better equity

Take actions for groups or minorities (women, girls, disabled, linguistic minorities) to redress flaws in their access to information and telecommunications technologies. Telecommunications, when presented in a collaborative context, can heighten girls' interest in new technologies. Training must recognize constraints such as family responsibilities, as well as take into account high illiteracy rates in much of Latin America. Nonformal literacy and numeracy programs for adults must include and make a special effort to reach women. Strategies appropriate to each country must be honed.

Support actions to be carried out by NGOs to serve their different communities.

Mandate the Consejo Interamericano de Mujeres (CIM, a division of OAS) to guide activities for women.

3.9. Implement exemplary government actions

According to the Plan of Action of the Summit of the Americas, stimulate governments to be exemplary in providing their citizens with universal access to public information and interactive services.

Governments should also improve the quality and efficiency of public services by process reengineering and functional divestiture. They are expected to play a catalytic role in many infrastructure projects by being primary users.

Transfer the experience of the Open Government initiative in Canada to other OAS member countries for the re-use of the expertise and tools developed.

3.10. Ensure respect of ethics, of rights and of cultural diversity

Ensure the respect of cultural diversity in the global information society; protect freedom of expression; protect intellectual property rights; prohibit unethical use of technologies (either psychological or sociological) such as hate propaganda, fanaticism and perversion.

All of the above recommendations require the cooperation of OAS member countries at governmental, institutional, associational and individual levels. Such joint efforts are essential to support and expand the information infrastructure and contribute to the political, economic, social and cultural development of all countries. Networking and collaboration technologies which can help in the achievement of these goals exist. ❏