INFORMATION TECHNOLOGY IN THE HEALTH SECTOR OF LATIN AMERICA AND THE CARIBBEAN

CHALLENGES AND OPPORTUNITIES FOR THE INTERNATIONAL TECHNICAL COOPERATION

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PAN AMERICAN HEALTH ORGANIZATION

Pan American Sanitary Bureau, Regional Office of the
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DIVISION OF HEALTH SYSTEMS AND SERVICES DEVELOPMENT
ESSENTIAL DRUGS AND TECHNOLOGY PROGRAM

About this Publication

This brochure is directed to the PAHO/WHO staff and through them to the national health authorities. It reflects the vision of the Regional Office when reviewing the challenges and opportunities for technical cooperation in the area of information technology (IT).

Trends and major constraints are discussed, particularly regarding the issue of the "digital divide" between individuals and social groups. A brief situation analysis of the status of information technology in the health sector of Latin America and the Caribbean is presented together with a summary of the strategies that oriented the Regional Technical Cooperation in the past five years.

The Pan American Health Organization has placed high priority in the development of metrics to monitor the status and trends of many health sector components and has been promoting standardized presentation formats for primary data and indicators. Along those lines an initiative has been underway in the Essential Drugs and Technology Program to define indicators to measure the diffusion and impact of information technology in healthcare services and organizations. The initial result of this work is hereby reported and selected indicators of IT development for the countries of the Region of the Americas are presented.

Measurement of health information technology development suffers from great limitations – while there are many infrastructure and process indicators there are very few indicators of outcomes. Indicators of infrastructure and the extent of IT insertion in the society are relatively abundant and easily obtained although many are based on sampling methodologies. International organizations and technical agencies are the most important data source but, in many instances, data from leading market research companies can provide the most recent and reliable data. The extent and type of use of IT by the health sector is less known and it is by and large represented by highly aggregated data related to the utilization of automated information systems by physicians and hospitals.

Impact indicators are the most difficult to define. They are of qualitative nature and their construction must follow an explicit research design and be consistent with other narrative and descriptive information. They include judgments on the

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state-of-the-art and appropriateness (goodness of fit) of IT health applications and about the impact of IT on policy, structures, organization, equity and privacy, and technical effectiveness. Such judgments are largely inferred from descriptive data and qualitative analysis because of the difficulties in quantifying policies and levels of impact in organizations and individuals and discriminating their impact from other cause-effect factors in clinical and administrative outcomes. Studies are presently being initiated in an attempt to address the characterization of these indicators. They were not included in this report.

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1.   *An Evolving Domain*

To characterize the adoption of IT by the health sector as evolutionary is a wholly appropriate term, because the development of IT health applications can be envisioned as a struggle of adaptation to environmental changes and survival of the fittest. Healthcare is a complex enterprise, highly dependent on information for a great variety of clinical and managerial decisions and, to be useful, information systems must capture and process health and health-related data of broad diversity, scope, and level of detail. The variety of environments, priorities, organization, and operational demands of the health sector requires a great diversity of resources and solutions capable of providing support for the challenging and complex interdependent clinical, public health, and managerial decisions and interventions that characterize the ever-changing health practice. From the patient management model of the 60's to the organizational reestructuring paradigm of today, information technology has been deployed in the health sector to provide solutions tailored to the operational determinants of each health system design model.

In the past forty years, health IT applications evolved by providing a great variety of data-processing resources aiming the improvement of health services management and patient care through the support of clinical and administrative message exchange; the operation and administration of resources; the logistical management of health sector functions; storage and retrieval of structured patient information; health education and promotion; epidemiological surveillance and health status monitoring; clinical decision assistance; knowledge management; image and signal analysis; modeling; and remote consultation and intervention.

Health IT, and the health systems supported by them, have grown and changed in accordance to the particularities of each healthcare model. The reality of healthcare organizations, however, is that the introduction of a new organizational paradigm does not

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completely abolishes the previous model but adds a new dimension to it. This evolutionary perspective is clearly seen in the deployment and functioning of information systems – transactional administrative systems, logistics, resource management, administrative process control, and patient clinical information applications of previous and recent technological generations continue to coexist in support of health system operations.

As a general rule technology applications evolve by the upgrading of old applications and by the introduction of new solutions and applications to support areas hitherto not provided for and rarely by total abolition or substitution of functions (Figure 1).
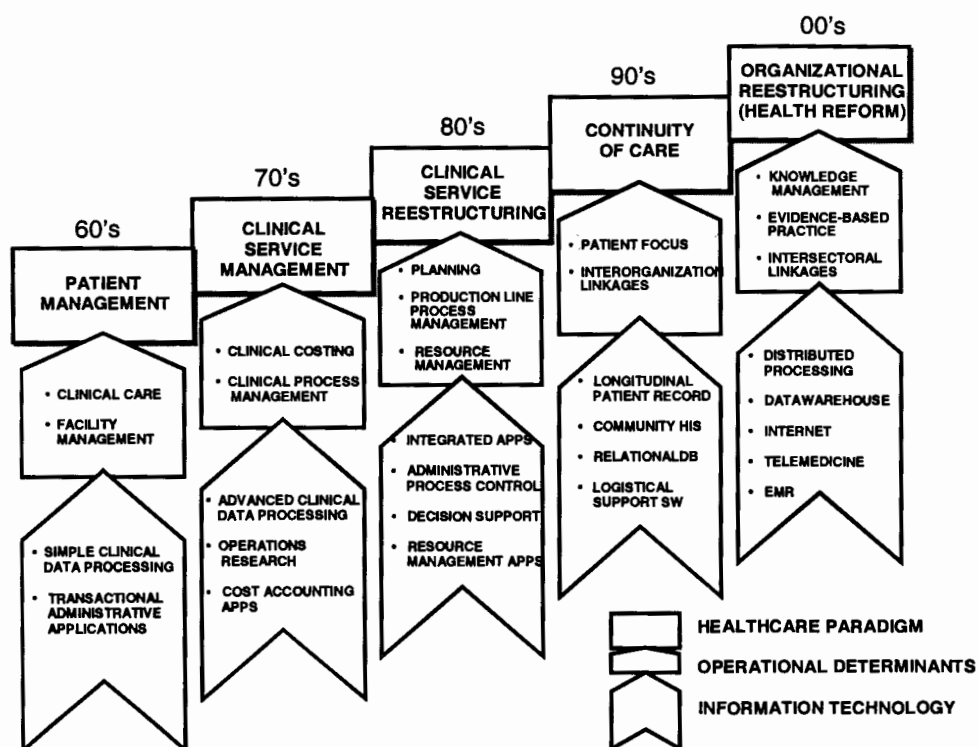
Figure 1. Over the Past Four Decades Information Technology Support has Evolved In Response to Changing Operational Determinants

Today, Information Technology (IT) encompasses the rapidly evolving methods and technical resources that use computers, networks, multimedia, robotics, artificial intelligence, virtual reality, and telecommunications. Most of the information technologies that can be applied to the health sector are identical across other sectors or share common elements. Health IT applications have characteristics common to other information- and knowledge-based industries. They (a) provide operational support of technical functions, (b) support knowledge management, (c) are implemented in complex environments, (d) require specialized human and organizational resources, (e) use computer-based technologies and telecommunications, and (f) are dependent on fast-changing innovation and market aspects [1, 2, 3].

2. Health Information Technology Trends

Information technology applications are well established in the administration of resources and logistics of service operation and already represent the central resource in the day-to-day functioning of many direct clinical care areas. Developments in digital instrumentation has been instrumental in the creation of new diagnostic and therapeutic assets, e.g., medical imaging was radically changed by the introduction of IT, and advanced networked clinical applications are gradually being established in areas such as patient records, physiologic monitoring, and diagnostic support.

However, a ubiquitous national information infrastructure ("infostructure"), the essential prerequisite for information-based health promotion and for providing continuous healthcare to the community was, until very recently, a largely incipient component of health systems. Also most national information initiatives, in the main, generate only aggregated statistical data related to mortality, morbidity, and service utilization and coverage [4]. Health organizations and the style of healthcare delivery to be supported by IT are undergoing a shift from an institution-centered to a citizen-centered model. The prime feature of the model is a new emphasis on continuity of clinical services supported by health promotion and maintenance actions. It encompasses informed citizens caring for their health and an assortment of public and private stakeholders responsible for the collaborative delivery within a region of a continuum of evidence-based health services to individuals and the environment (Figure 2).

Advances in information and communication technologies, particularly the diffusion of telecommunication-based hardware and interactive Internet-mediated applications, created new modalities of global information sharing, transformed businesses and markets, changed learning and knowledge-based processes, created new forms of governance, and empowered citizens and communities in novel ways [5, 6, 7, 8, 9]. The requirements of this new information infrastructure and corresponding technological infrastructure at organizational,

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regional, and national levels entail a complex set of definitions, standards, technologies, and applications to support communication, information, and knowledge, which are currently being vigorously developed world-wide.

THE CHANGING PRACTICE ENVIRONMENT

Current Approach	New Model
◆ Care based on visits	◆ Continuous Relationships
◆ Professional autonomy	◆ Customized Care for Patients
◆ Professionals control care	◆ Patient is source of control
◆ Information is a record	◆ Information flows freely
◆ Decision making based on training and experience	◆ Decision making is based on evidence
◆ Safety is individual responsibility	◆ Safety is a general system property
◆ Secrecy is necessary	◆ Transparency is necessary
◆ Reaction to needs	◆ Needs are anticipated
◆ Cost reduction	◆ Cost justification
◆ Individual professional roles	◆ Cooperation is a priority

Source: Janet M. Corrigan, Institute of Medicine Committee on the Quality of Health Care in America

Figure 2. Characteristics of the New Models of Health Practice

Global health trend-setters that, in the last years, have set off a renewed surge of interest and projects in health IT include:

- Advancements and availability of digital and communication technologies and the dissemination of networked processing, transmission, and display of information by electronic means in all areas of the society.

- The compelling need to control and reduce the cost of administrative tasks, to improve the effectiveness in eligibility, claims, and provider/payers reimbursement processing, and the efficiency of procurement and management of supplies.

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- Solving the logistical problems of healthcare and facilitating the customization of patient services regarding choice, access, convenience, and dynamic service and resource scheduling.

- The urgent call for better quality of care and reduction of the health impact of medical errors through better communication of administrative, scientific, and clinical data.

- Need for fast, reliable, secure, and confidential communication of clinical and administrative individual patient data and access to clinical and administrative decentralized, multi-institutional, and integrated longitudinal health records by a variety of health and non-health professionals, providers, payers, insurers, and controllers.

- Answer the increased demand for data, information, and better documentation resulting from health reform requirements, distributed multidisciplinary practice, performance and outcomes measurement needs, and improvements of accountability and transparency in health interventions

- Growing desire for swift access to biomedical knowledge (references, protocols of care, registries, and knowledge bases) to support evidence-based practice.

- The fast developing demand for mass storage and fast search and retrieval of structured and unstructured health data in a variety of formats with storage needs in the order of terabytes (10^{12} bytes) and petabytes (10^{15} bytes) being required.

- The expanding connectivity of professionals and the public to the Internet, mobile technologies, and portable data media (smart cards) giving rise to widespread

access to peer- and non peer-reviewed health information, the emergence of electronic health records and databases, and Internet-mediated care delivery, consumer health promotion information, and professional education.

While in developed nations, the deployment of IT has been more widespread because of better infrastructure and a well-structured health sector, globally, the major impediments to IT deployment has been of economic, educational, and organizational nature [10].

THE ANALOG / DIGITAL DIVIDE BY INCOME

Percentage of World Total
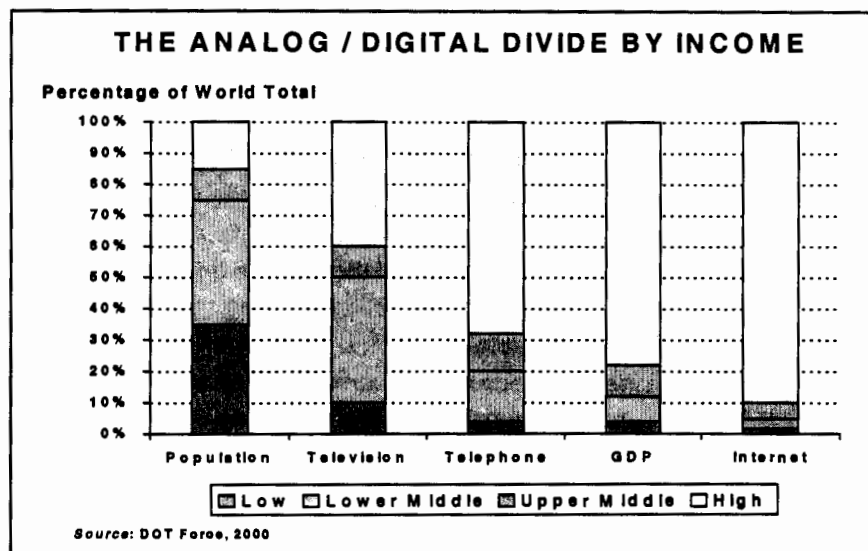
Figure 3. High and Upper Middle Income Countries Have About 22 Percent of the World's Population and 95 Percent of all Internet Users

Eighty percent of personal computers are installed in high-income countries and, worldwide, only about 0.6% of the people in low-income countries have access to the Internet. On average, a high-income country has forty times as many computers per capita as less developed societies. In Latin America and the Caribbean, personal computer ownership range from less than one percent of the population

to an average of three to five percent for upper middle income countries and the highest penetration of personal computers does not reach more than seventeen percent.

The "digital divide" between individuals, age groups, households, businesses, and geographic areas at different economic and educational levels has been well documented (Figure 3, 4 and 5). Digital divides, like social and economic divides, exist within and not just between societies. They are another symptom of existing social inequities, which will widen even further if countries are not helped to take advantage of IT in tackling economic and social problems and are denied access to markets that are becoming increasingly IT-dependent as part of globalization [10, 11].
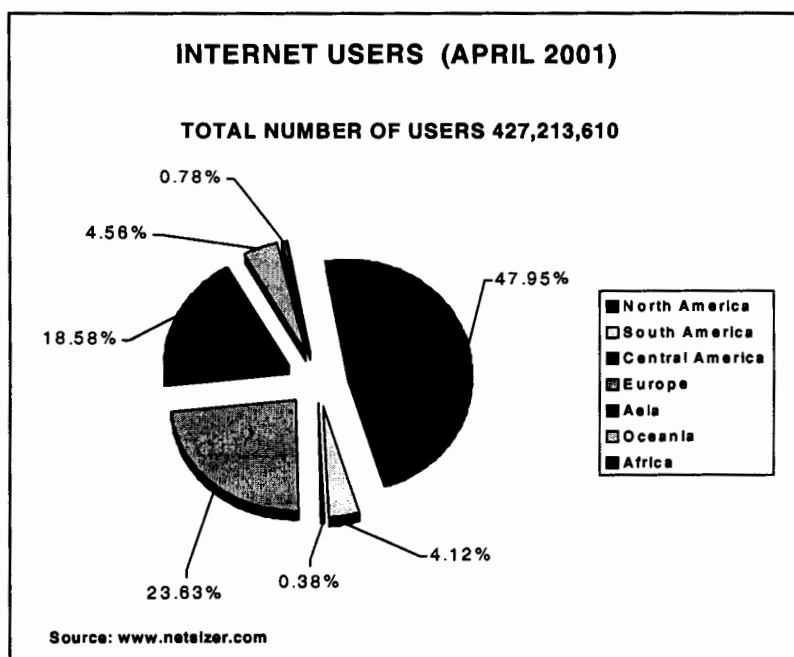
Figure 4. The "Digital Divide" Is Most Pronounced in Internet Usage

The IT utilization inequities in both industrialized and developing countries result from a combination of factors that, besides level of income and general development, include insufficient telecommunications infrastructure, high telecommunications tariffs, inappropriate or weak policies, organizational inefficiency, lack of locally created content, and uneven ability to derive economic and social benefits from information-intensive activities.

GLOBAL INTERNET USERS

Millions of Users

	1995	1996	1997	1998	1999	2000
Developed	30	47	77	124	180	232
Developing	3	7	13	25	51	83

Penetration percentages: 0.1%, 4%, 0.1%, 6%, 0.3%, 9%, 0.5%, 15%, 1%, 21%, 1.6%, 28%

Source: International Telecommunication Union, 2000
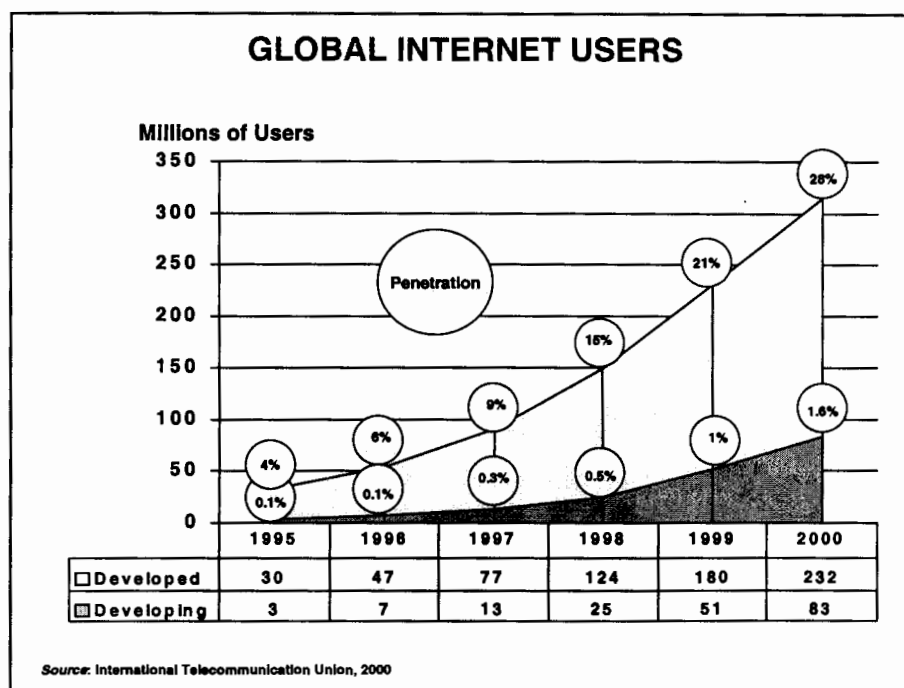
Figure 5. Nearly One-third of Internet Users are in Developing Countries But the Penetration in Terms of Percentage of Population Connected in Developing Countries is Only 1.6 Percent While in Developed Countries Penetration reaches 28 Percent

Through several documents adopted at the highest level – including the United Nations Millennium Declaration and the DOT Force Siena Plenary Meeting Report – the international community recently has set a range of goals and political commitments to bridge some of the impediments to a broader use of information and communication technologies by the developing nations [5, 12].

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Although the international community -- public, private, non-profit, and intergovernmental -- plays a central role in creating conditions for the development of digital opportunities, the most critical and difficult decisions and actions regarding the bridging of the divides and diffusion of IT resources in the health sector must be taken by national governments and the society as a whole. Although it is true that richer countries spend more on information and communication technologies per capita than poor countries, for the same income, some countries outpace others by a wide margin and some developing countries are spending more than others on new technologies (Figure 6) [10].
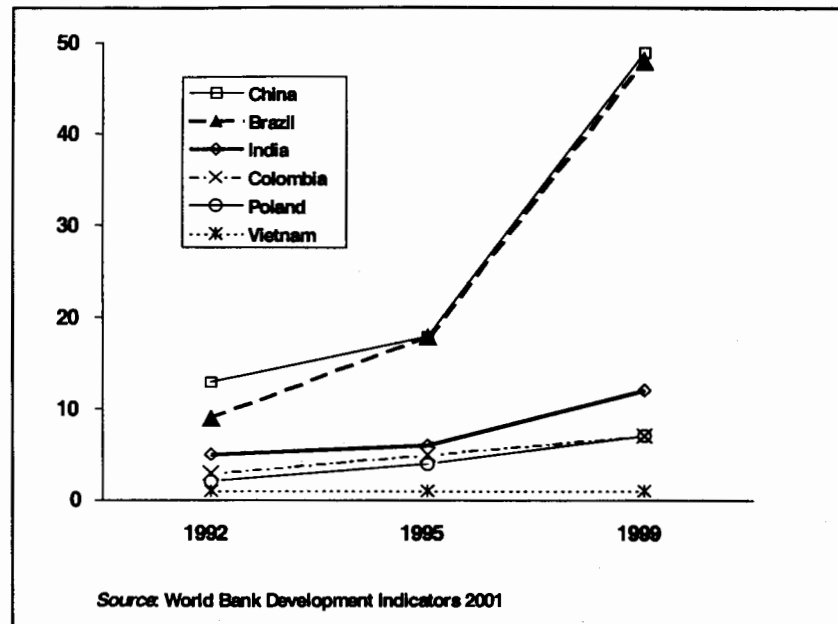
Figure 6. Annual Information and Communication Technology Spending in US$ Billions for Selected Developing Countries

In this context, developing countries have been urged to set IT goals and develop strategies as part of their comprehensive development strategies. Such strategies must address intra-country health, information, and technology inequities by ensuring universal access in order to break away from only the "income rich" being the "information rich". This is less a question of "leapfrogging", than one of

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deciding which technology model is most appropriate given a country's circumstances and institutional capacity. The power of IT for knowledge sharing has been shown to be a major contribution to development and technologies can be adapted to meet local needs, even those of the poorest in society. The full range of technologies must be considered – a technology mix of whatever is simple but effective – including posters, newspapers, telephone (fixed and mobile), radio, TV, video and audio cassettes, CD-ROM, and diskettes in addition to the Internet, although Internet-based solutions will be key as these media finally converge [11].

INTERNET USE - LANGUAGE

NUMBER OF NATIVE SPEAKERS ONLINE (MARCH 2001)

Dutch 2.1%
Russian 2.3%
Other 6.2%
Portuguese 2.5%
Italian 3.1%
French 3.7%
Korean 4.4%
Spanish 4.5%
German 6.1%
Japanese 8.6%
Chinese 9.0%
English 47.5%

Source: *Global Reach, Internet Statistics*
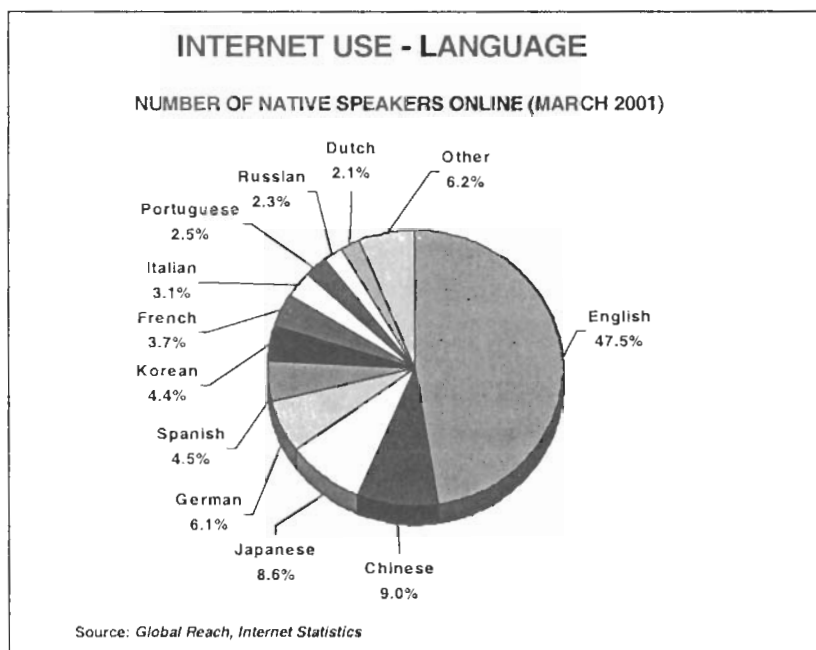
Figure 7. Spanish and Portuguese Speakers Combined Represent Seven Percent of Global Internet Users

Although English-speakers are the largest group of Internet users, native speakers of other languages constitute sizable population groups (Figure 7). Nearly seventy percent of Internet hosts are located in North America (Figure 8) and presently ninety-five percent of the networked global traffic passes through the United States. One major problem with IT applications is related to the fact that most of the contents, user interfaces, and the very programming languages demand a fairly good knowledge of English. Availability of content of local

relevance that addresses indigenous cultural characteristics and includes formal and non-formal information in national languages is vital to gaining the critical mass for success is sorely missing.

By necessity, solutions must be specific to each environment and each country or region, and even to a particular institution. They require a singular mix of priority actions and particular resources. Success in deployment the tools of the Information Age also depends upon the widespread integration of information and communication technologies that, besides economic, educational, and technical aspects, involve changes in behaviors and attitudes related to how businesses, clinics, and governments work [13].

INTERNET HOSTS (APRIL 2001)

TOTAL NUMBER OF HOSTS 121,950,540

0.25%
69.53%
1.85%
8.21%
18.67%
0.40%
1.10%

■ North America
☐ South America
■ Central America
☐ Europe
■ Asia
☐ Oceania
☐ Africa

Source: www.netsizer.com
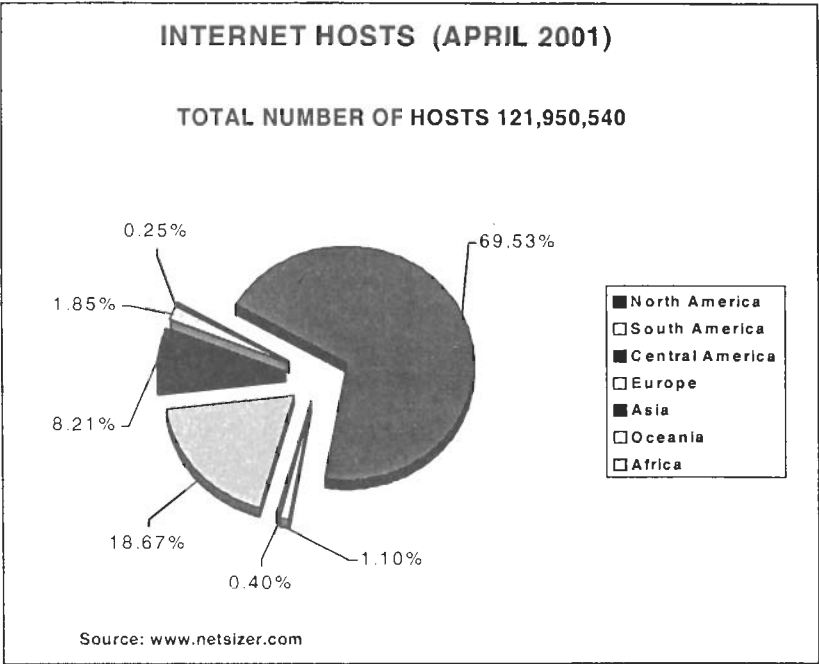
Figure 8. Only 1.5 Percent of Internet Hosts are Located in South and Central America While Nearly 95% are Located in Developed Countries

Socioeconomic status and information aptitude indicators (e.g., literacy, years of education, computer skills, capacity to read English); infrastructure indicators (e.g., number of communication devices, telephony penetration, cost of connectivity, investment in telecommunications); and extent of IT insertion and information distribution indicators (e.g., number of personal computers, Internet hosts, people connected to the Internet, expenditure in information and telecommunications, strength of the telecommunications sector, health institutions using information systems) can be used to assess the degree of readiness for IT of a community. By assessing the relative advancement in areas that are most critical for IT deployment the degree to which a community is prepared to take full advantage of IT can be gauged and used for following trends and comparison purposes (see Tables of IT Development Indicators in Section 6).

3. Challenges to Information Technology Implementation in Health Organizations and Services

The health sector, and particularly healthcare activities, produce massive amounts of data and the recording, collation, and filling of such data occupies considerable time, however, only a very limited range and quantity of clinical and administrative data are processed into meaningful information. The variety of potentially useful information that could be generated from those data is therefore not fully utilized because in most instances, there is no acceptable unobtrusive mechanisms in place to simplify data capture, to process data into information, and to make information available to the interested individuals and organizations in a timely manner and in a format that is easily communicated and understood. Key constraints to the development of information technology in the health sector involve a great number of issues [2]:

- *Policy-related Issues* – Inadequacy of policies and norms regarding information technology and, particularly in the case of the public sector, the lack of national strategies for the standardization and cost-effective use of technology and information. Failure to integrate the different visions of IT applications as they relate to health system models. Haphazard development of "islands" of innovation typically associated with centers of excellence isolated from national, regional, and local approaches. Inconsistency and continuity of political support.

- *Standardization Issues* - Main problems in this area are data-related involving institutional, and organizational standard-setting and their consistent use. Low definition level of contents (deliverables) of health interventions, indetermination of objectives and functionalities desired for applications, and conflicts in defining minimum data

sets for operational management and clinical decision-making.

- *Organizational Issues* - Centered mainly on problems related to the inevitable changes of work patterns and procedures, increased documentation workload for staff and direct healthcare professionals, and issues of retraining, physical data security, and confidentiality of patient-related data. Professional resistance to change in a profession characterized by hierarchy and clearly demarcated roles is a major obstacle resulting in unwillingness of professionals to collaborate in recording and exchanging patient data. Health organizations and providers tend to see their own data as the only good and valid data and there is a general distrust by health professionals about off-site data storage and access control.

- *Financial Issues* - Limited funding for development work outside the mainstream areas of basic administrative applications. Lack of knowledge of market opportunities and in the preparation of a "business case" for IT development and cost-benefit justification. Poor investment sustainability.

- *Technical Issues* - Complexity and variety of objectives, functions, and contents of applications. Lack of experience in procurement and contracting IT products and services. Inadequate information technology infrastructure and information technology deployment capability. Gap between technological innovation versus its actual use, integration of open and proprietary architecture and integration, fitness to the work environment. Access to reliable applications products and services (integration, customer support, training), and inter-operability in a multi-vendor environment

4. *Situation Analysis in Latin America and the Caribbean*

The private health sector, insurance companies, group practices, and other stakeholders rapidly understood the importance of information systems for organizational survival, competitiveness, and better service and have been at the forefront of IT developments in the Region. The public health sector has lagged behind despite the increasing diffusion of IT in public administration and social services.

In most countries the public health sector has not applied information and communication technologies resource, methods, and processes for the day-to-day operation and management of health systems as effectively as have other sectors of society, and health has been conspicuously underrepresented in national IT development policies and plans. Opportunities for IT deployment have not been systematically utilized and there are conflicting or misguided perspectives regarding how to bring technological innovation and integration in an environment of increasing social inequalities and polarization between local and global values and control.

Public health authorities invariably declare the criticality of information but repeatedly fail to follow up with the commitment, resources, and sustainability of efforts required for the deployment of industrial-strength applications. Conversely, when the view that IT is essential to the operation and management of health systems is acknowledged by public sector decision-makers, most resulting projects are underfunded, make use of obsolete technology, have a restricted vision of requirements and understanding of IT opportunities, and frequently resort to providers with limited experience and resources.

The justification for the cost-effectiveness of IT uses in health centers, hospitals, ministries, health programs, support programs or the national health care service as a whole, becomes a new challenge every time IT deployment is to be assessed, implemented, and sustained in a particular setting. Finally, public IT projects take long to implement, cost more, and deliver less than planned. Notable exceptions to the generally

poor engagement of the public health sector are the United States, Canada, Brazil, Mexico, Argentina, Costa Rica, Cuba, and Colombia were governments have committed significant volume of resources in information and communication technological development across different social sectors.

INTERNET HOSTS IN SOUTH, CENTRAL AMERICA & CARIBBEAN

TOTAL NUMBER OF HOSTS 1,825,760 (APRIL 2001)
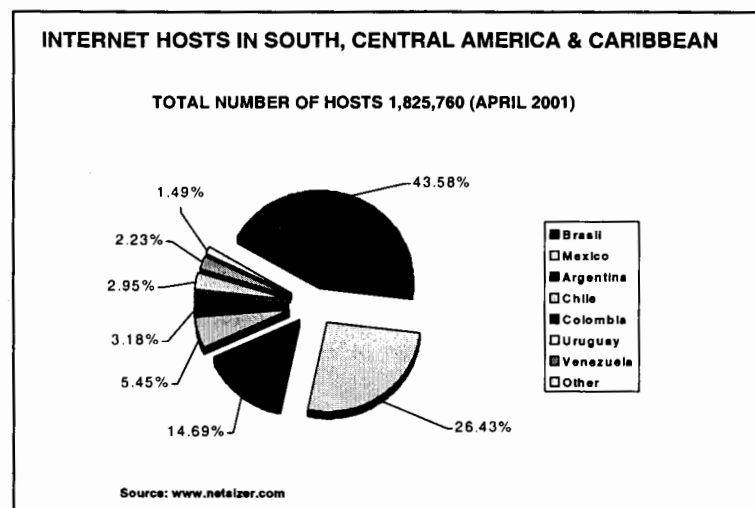
Figure 9. Internet Hosts in Latin America and the Caribbean

Infrastructure is the major constraint to deployment and broader utilization of IT in the Region [2, 11]. Poor organizational development; inadequate bidding, selection, and contracting processes; inability or inefficiency in the use of information; small number of qualified personnel, and limited access to computer and communications technologies, particularly in the public sector, limits effective application deployment and use.

Low penetration of telephony, averaging twelve percent in the Region and cost of annual subscription (averaging 3-4% of the GNP x capita, but in some countries as high as 16-18%), and very low personal computers ownership (average 3%), and low Internet connectivity (average 4%) are major challenges to be overcome. There is great variation among countries (see Tables of IT Development Indicators in Section 6).

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INTERNET USERS IN LATIN AMERICA & CARIBBEAN (2000) IN MILLIONS

TOTAL POPULATION CONNECTED 17,135,000

Source: NUA *Internet Surveys*
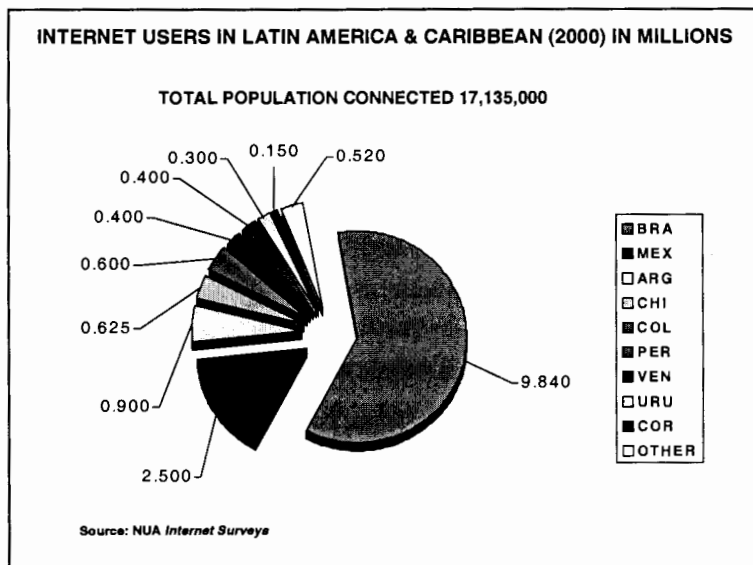
Figure 10. Internet Users in Latin America and the Caribbean

TELEPHONY INSTALLATION AND DENSITY - BRAZIL

Millions of Lines

Source: ANATEL, 2000
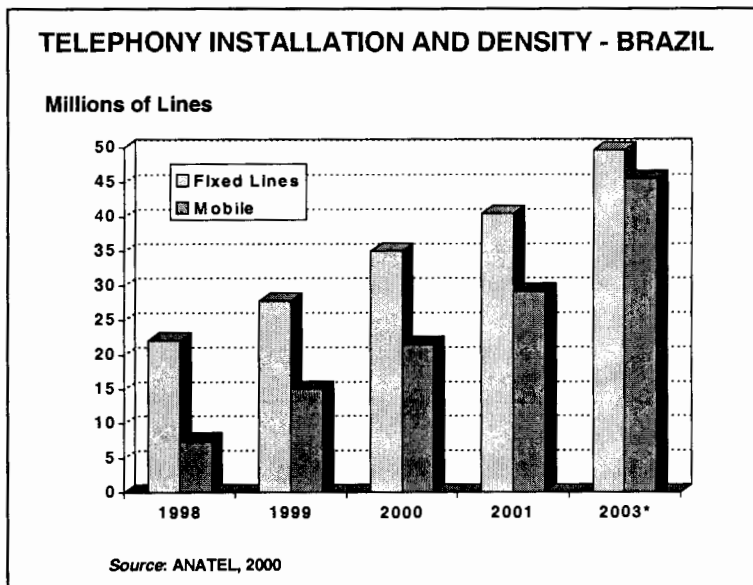
*Figure 11. Privatization of Telecommunication Markets have
Resulted in Expansion of Infrastructure. In Brazil, in a Period of
Four Years the Telephony Density Increased from 13.6 Fixed and
4.5 Mobile Lines per 100 People to 28.5 and 26.2 Respectively*

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Limited information about impending technologies and low health provider capacity to acquire and deploy IT compounded by the poor results of national economies in the last decade, limitations on operating and capital financial resources, market closure, high tariffs, public bureaucracy, and reimbursement policies that in many countries serve as disincentive, resulted in low investment in innovation and technology. Nevertheless, in the past decade the information technology sector in Latin America and the Caribbean have consistently showed an overall growth of seventeen percent, above all other world regions, particularly in the Internet (Figure 9 and 10). The telecommunications infrastructure has expanded with the privatization of state run companies and injection of external resources (Figure 11).

INTERNET USE 1996-2000

PERCENT OF POPULATION CONNECTED

Source: NUA Internet Surveys
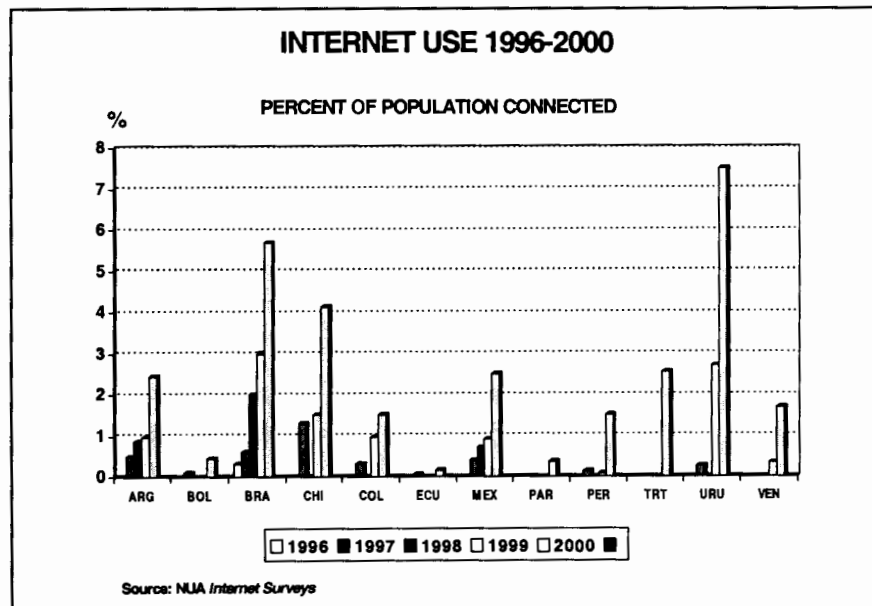
Figure 12. Internet Usage is Rapidly Growing in Many Countries

Information technology has been a constant issue in the agenda of international high-level meetings (Presidential Summit of the Americas of 1996 and 2000, G-8 Meeting, World Trade Organization, United Nations agencies) and a component in many multilateral social projects funded by the World Bank and the Inter American development

Bank. During the last five years there has been rapid expansion of the telecommunications market, very fast diffusion of the Internet (Figure12), and growth of e-Government in many countries, for example, in Brazil forty percent of customers bank online and eighty percent of the 2000 tax returns were completed on the Internet.

Major public sector IT projects are being developed but one pervasive problem in all countries is the coexistence of many uncoordinated private and public sector IT initiatives and overlapping of projects funded by different sources.
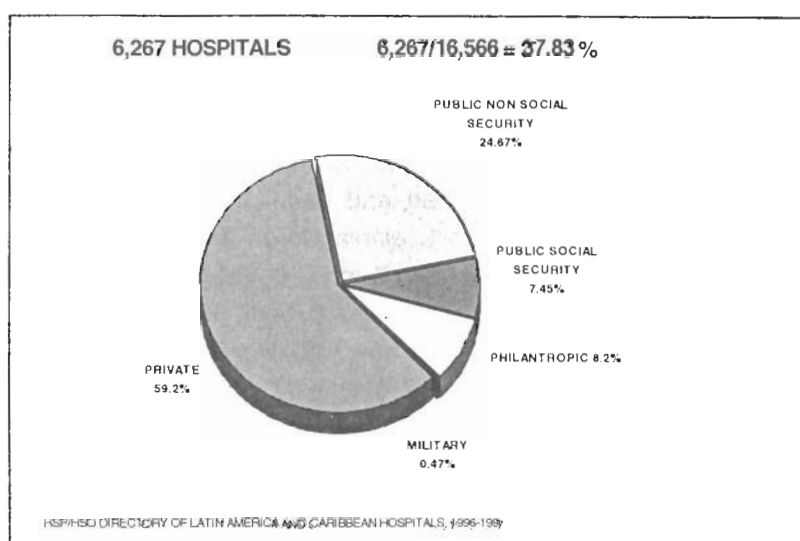
Figure 13. About 60% of Hospital Information Systems in Latin America and the Caribbean are in the Private Sector Although they represent only 47% of the Total Number of Hospitals

Penetration of information systems in health institutions of Latin America and the Caribbean is still low, data from the period 1996-1997 shows that in the hospital subsector just over one-third (37.8%) of 16,566 hospitals surveyed reported using information systems. Social security hospital facilities, which constitute 5.29% of all establishments, proportionally have the higher number of implemented information systems (53.31%), followed by private (47.67%), philanthropic (40.03%),

military (24%), and public non-social security (23.79%). In absolute number about 60% of hospital information systems are in the private sector (Figure 13). The disparity between the existence of information systems in the two types of public hospitals, public social security and public non-social security is noteworthy.

Latin America and the Caribbean represent a growing market with great potential but identification of opportunities and market development may be a long and difficult process for IT providers. Core issues in the deployment of IT in the Region that have not been fully addressed include: how to align IT solutions to institutional goals, to health improvement and the expectations of providers, clients, payers, and regulators; and how to create the critical mass of project managers and health professionals trained in the use of those new technologies.

The analog/digital divide, consequence of social and economic inequities in both developed and developing countries is a serious constraint that only now is beginning to be addressed by governments and international development agencies. Strategies and goals to deal with the divide require political will in both developing and developed countries. The digital divide is now high on the international agenda and much is expected of the emerging DOT Force and U.N. initiatives to deal with the issue [5, 12].

Income, educational level, and demographics are the major determinants of the divide (Figures 14, 15, 16, and 17). Illiteracy, limited education, lack of foreign language and basic computer skills are major limiting factors for the use of this resource by the general population. Even in developing countries there are social groups with a rate of connectivity that compares to that of industrialized countries – as an example, a 1999 survey of 42,744 physicians in Brazil, representing about twenty-five percent of all professionals, revealed that fifty-eight percent used the Internet regularly but, significantly, eighty-five percent were connected at home and only ten percent had connectivity at the office, and less than three percent at hospitals and university clinics.

PERCENT OF U.S. HOUSEHOLDS WITH COMPUTER BY LEVEL OF INCOME (1998)

	Under 5,000	5,000-9,999	10,000-14,999	15,000-19,999	20,000-24,999	25,000-34,999	35,000-49,999	50,000-74,999	75,000 +
☐U.S.	15.9	12.3	15.9	21.2	25.7	35.8	50.2	66.3	79.9
■Rural	11.9	8.1	13.8	22.1	24.7	34.0	51.0	64.2	76.5
☐Urban	16.9	13.6	16.6	20.8	26.1	36.5	50.0	67.1	80.8

Source: U.S. National Telecommunication and Information Agency, DOC, 1999
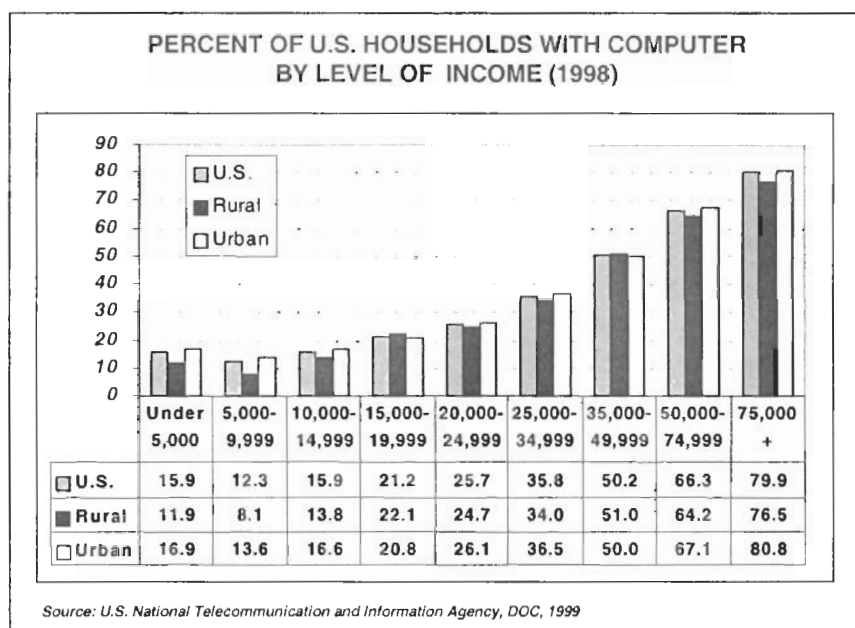
Figure 14. Even in Developed Countries the More Privileged Sectors of the Society are the ones that have Adopted Information Technology

BRAZIL - CELLULAR TELEPHONY AND COMPUTERS USE BY SOCIAL CLASS

Source: Ministry of Health, Brazil (1999)
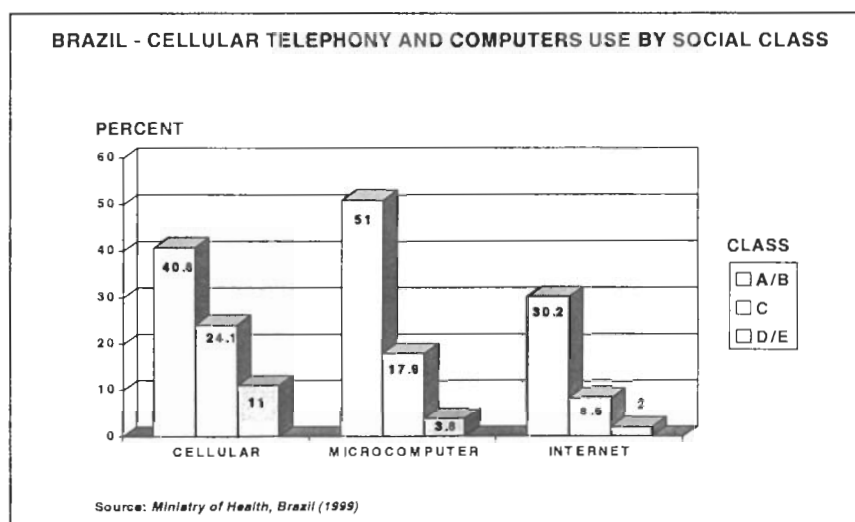
Figure 15. Income is a Determinant in the Utilization of Telecommunications and Digital Technologies

PERCENT OF U.S. HOUSEHOLDS WITH COMPUTER BY LEVEL OF EDUCATION (1998)

	Elementary	Some High School	High School or Equiv	Some Collegue	B.A. or more
U.S.	7.9	15.7	31.2	49.3	68.7
Rural	6.3	17.2	33.2	51.7	69.7
Urban	8.7	15.0	30.3	48.6	68.5

Source: U.S. National Telecommunication and Information Agency, DOC, 1999
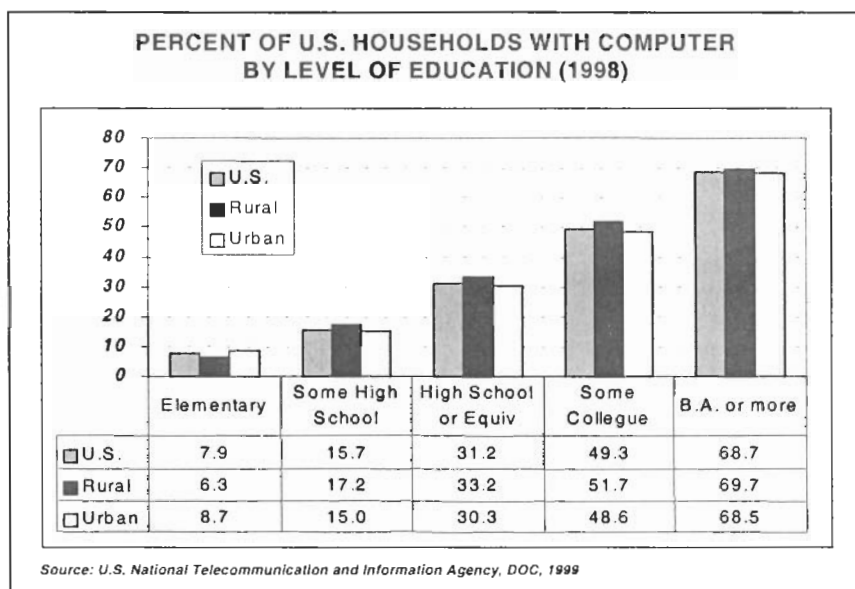
Figure 16. Even in Industrialized Countries the Educational Level is a Major Determinant of the Digital Divide

BRAZIL - CELLULAR TELEPHONY AND COMPUTERS USE BY AGE GROUP

PERCENT

AGE GROUP
- 14-19
- 20-35
- 36-45
- 46 +

CELLULAR   MICROCOMPUTER   INTERNET

Source: Ministry of Health, Brazil (1999)
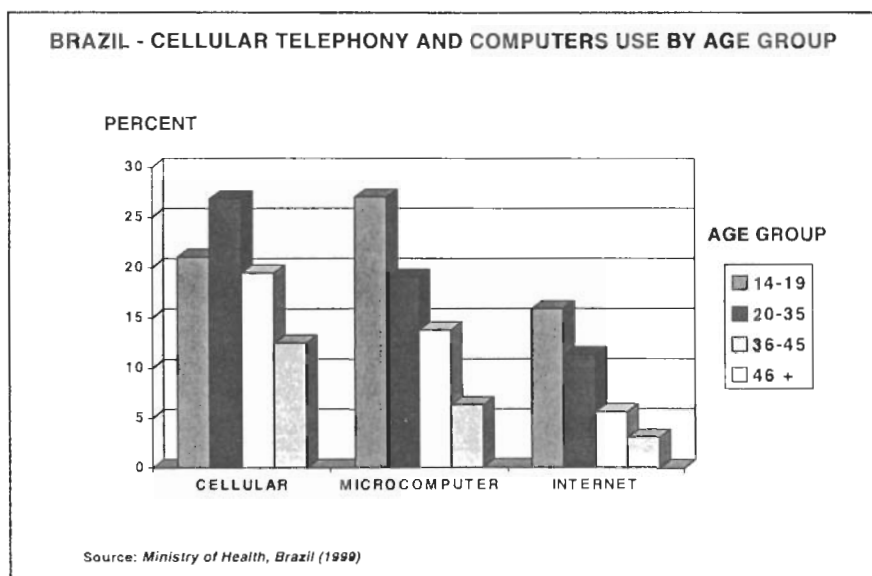
Figure 17. Besides Income and Education, Age is Another Major Determinant in the Utilization of new Technologies

Increasingly, consumers are using Internet resources as a source of wellness and medical information; for shopping for providers and services; risk assessment testing; for buying prescription, over-the-counter drugs, and health products; and for communication with special interest groups. In the U.S. in 1999, about forty percent of households had access to the Internet and level of penetration is expected to reach ninety percent by 2010. In that country, Internet access is the top reason for consumer personal computer purchase.

SOURCES OF INFORMATION ABOUT NEW HEALTH WEB SITES

HOW THE PUBLIC LEARNS ABOUT HEALTH INFORMATION IN THE WEB

Source	%
Health Professional	0.5
Billboards	1.2
Radio	6.3
Media Story	10.2
Newsprint	17.4
TV	19.1
Web Banners	26.5
Friends/Family	32.9
Internet Search	40.3
Web Links	45.7
E-mail	61.3

U.S. Survey by Gómez Advisors, Inc., 2000
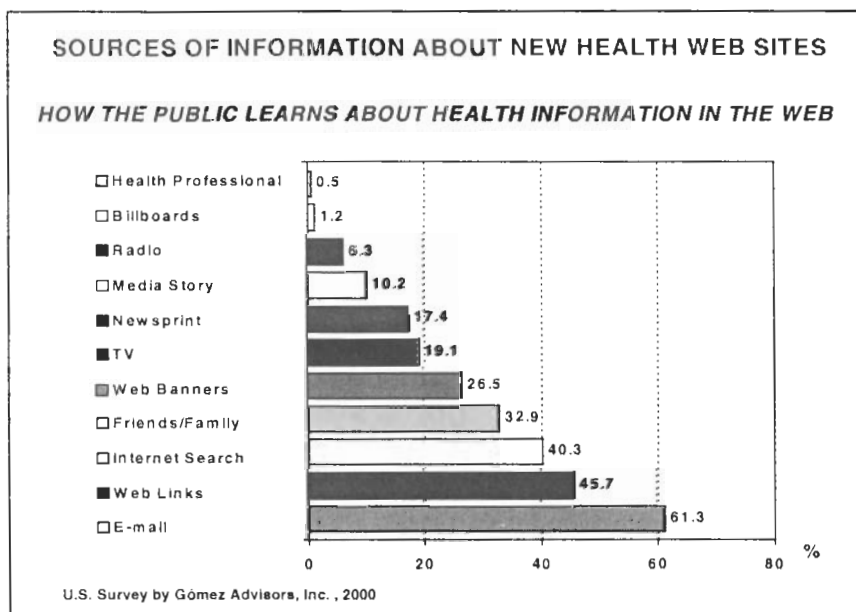
Figure 18. In the U.S., Health Professionals are the Least Important Source of Information Regarding Internet Health Sites

A survey done by Schwarz Pharma in March 1999 revealed that thirty-three percent of all adult women and twenty-four percent of all adult men use the Internet to get medical information and a Harris Poll of February 1999 indicated that sixty-eight percent of online adults in the U.S. seek health information. This poses many questions regarding the quality of health information publicly available, for instance there are more than 61,000 sites on breast cancer and over 40,000 sites on diabetes alone. At the same time, there is a disquieting growing rift

between the connected and "empowered" consumers and health professionals. These health providers in general have not taken full advantage of interactive communication technologies in dealing with consumers and they have been the least important source of information about health sites in the Internet (Figure 18).

Cyberspace is a fast-changing globally networked, multicultural, and multilingual information environment that calls into question national and international borders, cultural and ethical standards, regulations, and laws, which it bypasses and challenges.

The very qualities that make the Internet such a rich marketplace of ideas – its decentralized structure, global reach, leveling of access to the tools of publication, immediacy of response, and ability to facilitate free-ranging interchange – also make it an exceptional channel for potential misinformation, unethical use, concealed bias, covert self-dealing, fraudulent practices, and evasion of legitimate regulation [14, 15, 16, 17, 18]. The relationship physician-patient, rapidly changing by the easy access to technical knowledge by the general public, and the resources used in cyberspace healthcare have proved difficult to address in legal and ethical terms. There are many inadequacies in regard to national and international controls and legislation, especially regarding the issue of jurisdiction, basic rights and responsibilities, including freedom of access to information and expression and protection of users' data security and privacy.

Those are urgent and controversial issues that must be addressed jointly and comprehensively by international organizations, national and international scientific and technical societies, service providers, industry organizations, and users' interest groups. The United Nations specialized agencies, government organizations, independent and nonaligned consensus groups, and trustworthy service and content providers are particularly well positioned to spearhead the discussions leading to the development of innovative policies for the area.

5. Opportunities for the International Technical Cooperation

Priority needs of countries call for the development of national policies and a regulatory framework for IT; addressing the digital inequity of access; becoming skilled at how to take advantage of new technologies and reaching appropriate decisions regarding selection and deployment of IT alternatives; negotiating with vendors and providers; acquiring, contracting, and deploying IT solutions; and dealing with the pressing need to develop human resources and implement an appropriate and ubiquitous information and technological infrastructure.

Developing countries require direct assistance with developing IT strategies as part of their comprehensive development strategies and with establishing the appropriate regulatory environment for competition so that national and foreign private investment can play a role bringing in necessary seed financing through public-private partnerships. There must be a renewed national commitment to building an information infrastructure to support health care delivery, consumer health, quality measurement and improvement, public accountability, clinical and health services research, and clinical education.

Although there are many national and international actors working simultaneously and significant inversions being made by multilateral lending institutions and international technical cooperation agencies, poor coordination, and frequently overlapping of actions in the provision of technical cooperation in the area have hampered appropriate IT deployment. There are already many examples of successful initiatives, using a mix of technologies, which need to be shared widely so that countries can learn from each other and experience has shown that training, local content and languages are key to gaining the critical mass for success [5].

Until 1991, the World Health Organization (WHO) support to Member States in the area of IT fell within the mandate of the division providing those same services internally to the Secretariat. Major systems and applications for the entire Organization were developed,

put to use and improved. Collaboration with Member States was provided, through the Regional Offices, in the establishment of national policies and strategies, the development and testing of pilot systems, the development of special-purpose systems and applications, and the conducting of national and international training courses. In addition, major contributions on norms and standards were made together with Collaborating Centers and non-governmental organizations. However, when the popularity and demand for information technology support mushroomed, that strategy led to tensions on how best to allocate staff resources between the growing needs for services by the WHO Secretariat and the increasing number of requests for support from Member States, often at short notice. Today, IT activities in WHO are carried out by professional staff associated with different technical programs. Extensive collaboration has been developed with other U.N. agencies, multilateral and national technical cooperation agencies, centers of excellence, and the industry. Over the past five years, the technical cooperation of PAHO/WHO in the Region of the Americas has been conducted in the following areas:

- Assistance in the definition, detailed specification, and implementation of national information systems and information technology development standards, policies, and plans for the health sector and for specific application areas and definition of information systems and information technology development indicators of infrastructure and "preparedness" [2, 4, 9, 19].

- Guidance on user requirement analysis, including definition of objectives, functions, and utilization of health information and assistance in the evaluation of existing information systems and the development of a comprehensive health information infrastructure [1, 20].

- Guidance regarding decisions and implementation of mechanisms to strengthen the information function in health organizations and the management of information systems and information technology development projects. This includes: technological infrastructure development strategy, investment, and

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ability to handle information systems and information technology projects, capacity to acquire and maintain equipment and computer products, support to the procurement, selection, and contracting of information products, technology, and related services, and user education and training [1, 21].

- Direct technical cooperation in the design and deployment of cost-effective and country-differentiated information systems and information technology solutions.

The core of the technical cooperation strategy has been: (a) promoting the promise of IT in health by disseminating aggregate research, data, and case studies and by sponsoring exchanges among users and countries to demonstrate the opportunities of technology to the following target groups: policy-makers, providers, government, purchasers, and providers of capital; (b) promoting the concept that the deployment of IT integrates technology, geography, culture, language, and different health system models and therefore there is no single "cookbook" or "translated" solution; (c) advocating for standards, regulations, and policies; and (d) adopting a proactive engagement with other international community stakeholders.

6. Information Technology Development Indicators

Countries and communities within countries vary in the ability to incorporate information technology and telecommunications, in particular interactive communications technologies. The readiness of a country or community to adopt technological innovation and applications is a complex concept to measure, because the country may be ready to assimilate some, but not all, technological components and applications.

Information technology metrics is an important tool for the implementation of consistent and comparable information about diverse systems, platforms, configurations, and application environments. IT metrics, however, exhibit considerable limitations in their ability to provide consistent answers to many aspects of IT development:

- The most important obstacle to effective data collection is the lack of standardized definitions for IT components. Therefore, data arising by such studies may not be comparable -- for example, in some studies, IT reflects only computers, in others it may capture data related to computers and telecommunications hardware, while in others it may also incorporate the organizational and human infrastructure components.

- Data on IT are rarely collected on a systematic basis. Accordingly, there are no extensive time-series data on IT diffusion and its effects, the type of IT metrics being generated frequently reflects *ad hoc* interests rather than ongoing general analytical needs.

- The absence of cost data due to the lack of appropriate budgeting and accounting reporting systems at the organizational level results in the exclusion of important costs associated with IT use. For example, personnel and training expenses are significant elements of the cost and effective use of IT, but these expenses are not

always included in research studies or data collection. Also, other IT-associated costs should be included when collecting expenditure data on IT. Such associated costs include software, personnel expenses for IT support staff (e.g., network administrators), and training expenses for individuals who use the technology.

- Trend analysis and comparative studies are difficult by the fact that the technology itself changes rapidly.

- A further weakness of IT metrics is the relative absence of systematic data on how IT is actually being used. IT is a means to an end -- first and foremost, a real appreciation of the impacts and consequences of IT requires understanding what information is collected, maintained, and processed. Just the presence of the functioning hardware and information systems infrastructure does not tell us to what ends they are put.

- The positive as well as negative impacts are difficult to determine and quantify but they must be addressed at least from a qualitative perspective. It is often extremely difficult to isolate the effects of IT from other factors, such as industrial deregulation; management practices; employee attitudes; and a myriad of local conditions. The effects of a technology on human behavior may take years to show up and often may be reliably detected only through controlled, longitudinal study of a set of individual subjects. Finally, much insight on the effects of IT comes from case studies -- a useful form of analysis but one that cannot be used to generalize to a larger group or population.

TABLES OF INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 1. SOCIOECONOMIC AND INFORMATION APTITUDE INDICATORS

COUNTRIES	Population x 1,000	Age Structure % Population 15-64 years	Urban Population %	GNP Percapita US Dollars PPP Model	Illiteracy 15+ years %	Average Years Education for age 25	Daily Newspapers x 1,000 People	Population in Poverty %	Population Living with less US$ 1 x day PPP Model %	Population Living with less US$ 2 x day PPP Model %
Anguilla	8				4.6					
Antigua & Barbuda	67		12.0		11.5			12.0		
Argentina	37,032	62	36.8	8,890	3.3	7.8	123	25.5		
Aruba	98		89.4	9,530	3					
Bahamas, The	307		100.0	10,180	4.5					
Barbados	270		88.5	10,510	2.6	8.2				
Belize	241		50.0	4,170	7.3			35.0		
Bermuda	64		46.5		1.5					
Bolivia	8,329	60	100.0	2,860	15.6	5.0	55		11.3	38.6
Brazil	170,115	65	64.8	6,340	15.5	3.6	40	17.4	5.1	17.4
BritishVirgin Islands	21		81.3		1.8					
Canada	31,147	67	61.1	21,380	1	10.5	159	5.9		
Cayman Islands	37		77.1		2					
Chile	15,211	66	100.0	11,700	4.6	6.2	98	20.5	4.2	20.3
Colombia	42,321	61	84.6	6,720	8.8	4.1	46	17.7	11.0	28.7
Costa Rica	4,023	50	74.9	6,470	4.7	5.4	94	11.0	9.6	26.3
Cuba	11,201		51.9	5,146	3.6	6.9	118			
Dominica	71		77.9		18			33.0		
Dom' ican Republic	8,495	59	71.0	4,390	17.2	4.0	52	20.6	3.2	16.0
Ecuador	12,646	63	65.2	4,730	9.4	6.0	70	35.0	20.2	52.3
El Salvador	6,276	64	62.4	2,790	22.2	3.8	48	48.3	25.3	51.9
French Guyana	174		46.6		17					
Grenada	93		78.1	4,340	2			20.0		
Guadeloupe	456		37.9		9.9					
			99.7							

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 1. SOCIOECONOMIC AND INFORMATION APTITUDE INDICATORS

COUNTRIES	Population x 1,000	Age Structure % Population 15-64 years	Urban Population %	GNP Percapita US Dollars PPP Model	Illiteracy 15+ years %	Average Years Education for age 25	Daily Newspapers x 1,000 People	Population in Poverty %	Population Living with less US$ 1 x day PPP Model %	Population Living with less US$ 2 x day PPP Model %
Guatemala	11,385	53	40.4	3,820	32.7	2.9	33	58.0	39.8	64.3
Guyana	861		38.2	2,280	1.7	5.3		43.0		
Haiti	8,222	49	34.9	1,130	52.2	3.1	3	65.0		
Honduras	6,485	46	46.9	2,130	26.6	3.8	55	50.0	40.5	68.8
Jamaica	2,583	77	56.1	3,450	14	4.2	62	34.2	3.2	25.2
Martinique	395		94.9		7.2					
Mexico	98,881	61	74.4	7,660	9.2	6.3	97	10.1	17.9	42.5
Montserrat	11		18.4		3					
Netherlands Antilles	217		70.4		3.6					
Nicaragua	5,074	59	64.7	1,760	32.1	3.6	30	50.3		
Panama	2,856	70	57.7	7,060	8.6	7.4	62	30.2	10.3	25.1
Paraguay	5,496	55	56.0	3,480	7.2	5.0	43	21.8	19.4	38.5
Peru	25,662	58	72.8	4,410	10.8	5.9		49.0	15.5	41.4
Puerto Rico	3,869		75.2		6.7		126			
Saint Kitts & Nevis	39		34.1	7,310	2.7			15.0		
Saint Lucia	152		37.8	4,920	18.5			25.0		
St. Vincent & Grenadines	113		54.8	4,160	4			17.0		
Suriname	417		52.2		7					
Trinidad & Tobago	1,295		74.1	6,100	6.6	6.3	123	21.0		
Turks & Caicos Islands	16		45.2		1.5					
United States of America	278,357	64	77.2	28,020	0.5	12.5	215	14.1		
Uruguay	3,337	60	91.3	7,760	2.4	6.5	293	14.5	2.0	6.6
US Virgin Islands	94		46.4							
Venezuela	24,170	62	87.4	8,130	8	5.0	206	31.3	14.7	36.4
Source	[1]	[2]	[1]	[1]	[3]	[4]	[5]	[6]	[7]	[7]

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 2. INFORMATION INFRASTRUCTURE INDICATORS (1)

COUNTRIES	Radio Receivers x 1,000 People	Number Television Receivers x 1,000	Television Receivers x 100 People	Households with Television Receivers %	Number Cable TV Subscribers x 1,000	Cable TV Subscriptions as % Television Receivers	Number Home Satellite Antennas x 1,000	Home Satellite Antennas as % TV Receivers	Wired Telephone Lines (Main/Fixed) x 1,000	Wired Telephone Lines (Main/Fixed) x 100 People	Households with Telephone %
Anguilla											
Antigua & Barbuda	417	32	47.8						34	50.7	
Argentina	681	10,600	28.6	90.8	5,890	55.6	50.0	0.5	7,357	19.9	
Aruba		21	21.4		15	71.4	2.2	10.5	33	33.9	
Bahamas, The	592	72	23.5		47	65.3			111	36.2	
Barbados	876	77	28.5	95.3					113	41.9	80.0
Belize		42	17.4						32	13.1	48.0
Bermuda		70	109.4		10	14.3	3.0	4.3	54	83.9	
Bolivia	676	930	11.2	47.1	41	4.4			472	5.7	
Brazil	444	53,768	31.6	86.9	2,200	4.1	511.0	1.0	24,985	14.7	32.0
British/Virgin Islands											
Canada	1,047	21,450	68.9	99.1	8,254	38.5	275.0	1.3	19,206	61.7	98.4
Cayman Islands											
Chile	355	3,500	23.0	81.3	665	19.0			3,109	20.4	
Colombia	560	8,000	18.9	96.5	613	7.7			6,665	15.7	30.0
Costa Rica	776	870	21.6	86.0	50	5.7	2.0	0.2	803	20.0	
Cuba	355	2,660	23.7				0.6		434	3.9	7.4
Dominica	587	16	22.5		10	62.5			19	26.3	
Dominican Republic	178	790	9.3	34.0	125	15.8			764	9.0	
Ecuador	420	2,500	19.8	20.9	200	8.0	7.0	0.3	1,130	8.9	8.9
El Salvador	478	800	12.7	89.6	25	3.1			468	7.5	16.0
French Guyana		37	21.3	74.4					49	28.3	74.0
Grenada		34	36.6						28	29.6	
Guadeloupe		120	26.3	49.4					201	44.1	88.0

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 2. INFORMATION INFRASTRUCTURE INDICATORS (1)

COUNTRIES	Radio Receivers x 1,000 People	Number Television Receivers x 1,000	Television Receivers x 100 People	Households with Television Receivers %	Number Cable TV Subscribers x 1,000	Cable TV Subscriptions as % Television Receivers	Number Home Satellite Antennas x 1,000	Home Satellite Antennas as % TV Receivers	Wired Telephone Lines (Main/Fixed) x 1,000	Wired Telephone Lines (Main/Fixed) x 100 People	Households with Telephone %
Guatemala	80	660	5.8	50.0	299	45.3	2.0	0.3	605	5.3	
Guyana	493	55	6.4						64	7.4	
Haiti	55	40	0.5						60	0.7	
Honduras	395	590	9.1	32.1	50	8.5	0.3	0.1	279	4.3	16.4
Jamaica	880	480	18.6	71.3	251	52.3	21.0	4.4	474	18.4	
Martinique		60	15.2	48.5					172	43.5	93.0
Mexico	325	25,000	25.3	85.7	1,500	6.0	352.4	1.4	10,927	11.1	33.9
Montserrat											
Netherlands Antilles		70	32.3						76	35.0	
Nicaragua	277	330	6.5	29.1	190	57.6	3.0	0.9	140	2.8	
Panama	300	530	18.6	88.9	30	5.7			463	16.2	
Paraguay	182	530	9.6	68.3	81	15.3			297	5.4	
Peru	273	3,600	14.0	66.5	350	9.7	2.0	0.1	1,689	6.6	48.0
Puerto Rico	742	1,250	32.3	63.0	278	22.2			1,262	32.6	76.4
Saint Kitts & Nevis	648	10	25.6						17	44.1	77.0
Saint Lucia	759	55	36.2	94.1	7	12.7	0.1	0.2	40	26.6	
St. Vincent & Grenadines		26	23.0		3	11.5	0.3	1.2	21	18.6	
Suriname	639	98	23.5	67.6	2	2.0	0.3	0.3	71	17.0	
Trinidad & Tobago	535	430	33.2						264	20.4	
Turks & Caicos Islands											
United States of America	2,146	231,000	83.0	96.0	67,011	29.0	8,400.0	3.6	179,822	64.6	94.2
Uruguay	606	1,750	52.4	97.0	340	19.4			897	26.9	67.0
US Virgin Islands		70	74.5	85.7	27	38.6			65	69.0	
Venezuela	470	4,300	17.8	81.0	600	14.0	100.0	2.3	2,586	10.7	
Source	[8]	[9]		[9]	[9]		[9]		[10]		[9]

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 3. INFORMATION INFRASTRUCTURE INDICATORS (2)

COUNTRIES	Digital Wired Access Lines %	Number Wireless Telephone Subscribers x 1,000	Wireless Telephone Subscribers x 100 People	Number Public Pay Phones x 1,000	Public Pay Phones x 1,000 People	Public Pay Phones as % of Fixed Lines	Waiting Time for Connection in Years	Waiting List for Telephone Connection x 1,000	Number of Line Faults x 100 Lines per Year	Tariff for Residential Connection in US$	Tariff for Residential Monthly Subscription in US$
Anguilla											
Antigua & Barbuda	100.0	2	2.2	0.3	5.1	1.0			59.0	69.00	11.10
Argentina	100.0	4,434	12.0	107.6	2.9	1.5	0.1	58.2	17.3	150.00	12.80
Aruba		5	5.5	0.8	7.8	2.3	0.4	1.5		70.00	10.10
Bahamas, The	100.0	16	5.2	1.4	4.6	1.3					
Barbados	100.0	12	4.4	0.6	2.1	0.5	0.3	2.2	9.6	49.00	15.50
Belize	99.6	3	1.4	0.6	2.6	2.0	0.3	0.3	69.5	45.00	4.00
Bermuda	100.0	13	19.7	0.8	13.1	1.8				60.00	14.00
Bolivia	75.0	402	4.8	5.0	0.6	1.1				168.00	5.50
Brazil	73.2	15,033	8.8	484.1	2.8	2.8	1.1	2400.0	3.8	43.00	6.70
British Virgin Islands											
Canada	99.4	7,000	22.5	178.0	5.7	1.0				42.00	13.20
Cayman Islands											
Chile	100.0	2,261	14.9	13.5	0.9	0.5	0.2	58.3	52.0	159.00	16.30
Colombia	98.8	3,134	7.4	50.5	1.2	0.8	1.9	1594.0	56.0	214.00	3.30
Costa Rica	67.0	143	3.6	7.9	2.0	1.2	0.7	40.8	42.1	64.00	4.30
Cuba	37.0	5		10.2	0.9	2.6			14.3	100.00	6.30
Dominica	100.0	1	1.0	0.3	4.4	1.7			12.0	20.00	2.70
Dominican Republic	59.0	256	3.0	4.9	0.6	0.6				98.00	6.60
Ecuador	86.8	383	3.0	3.9	0.3	0.4			82.0	294.00	3.70
El Salvador	95.7	383	6.1	5.2	0.8	1.6			36.7	331.00	6.80
French Guyana	100.0	18	10.3	0.4	2.2	0.8	0.6	1.0		43.00	7.10
Grenada	100.0	1	1.5	0.2	2.3	0.9		0.1	9.0	85.00	14.10
Guadeloupe	100.0	88	19.3	1.3	2.9		0.3	1.3		47.00	10.60

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 3. INFORMATION INFRASTRUCTURE INDICATORS (2)

COUNTRIES	Digital Wired Access Lines %	Number Wireless Telephone Subscribers x 1,000	Wireless Telephone Subscribers x 100 People	Number Public Pay Phones x 1,000	Public Pay Phones x 1,000 People	Public Pay Phones as % of Fixed Lines	Waiting Time for Connection in Years	Waiting List for Telephone Connection x 1,000	Number of Line Faults x 100 Lines per Year	Tariff for Residential Connection in US$	Tariff for Residential Monthly Subscription in US$
Guatemala	92.0	351	3.1	4.7	0.4	1.6				258.00	0.70
Guyana	100.0	2	0.2	0.4	0.5	0.7				1.00	0.20
Haiti	100.0						10.0	100.0	108.0	46.00	5.70
Honduras	92.5	79	1.2	2.6	0.4	1.0	10.0	689.0	36.0		
Jamaica	100.0	79	3.1	2.1	0.8	0.6	3.0	183.1		16.00	2.70
Martinique	100.0	102	25.8	1.1	2.9	0.7	0.7	2.8		47.00	10.50
Mexico	97.7	7,622	7.7	314.8	3.2	3.2	0.4	137.3	4.6	107.00	14.00
Montserrat											
Netherlands Antilles	68.0	16	7.4								
Nicaragua	96.0	69	1.4	1.4	0.3	1.1	2.0	29.3		138.00	6.40
Panama	73.0	242	8.5	3.2	1.1	1.0	0.8	28.8	97.0	10.00	10.00
Paraguay	86.0	436	7.9	1.3	0.2	0.5	0.5	20.1		732.00	2.30
Peru	90.0	990	3.9	47.0	1.8	3.0	0.3	48.0	33.6	151.00	14.80
Puerto Rico	100.0	580	15.0	24.2	6.3	1.9	2.6	57.0	62.4	35.00	19.50
Saint Kitts & Nevis	100.0		1.0							27.00	3.00
Saint Lucia	100.0	2	1.3	0.4	2.8	1.3				46.00	9.00
St. Vincent & Grenadines	100.0	1	0.7	0.2	1.5	0.9	0.6	0.6		37.00	6.30
Suriname	50.0	18	4.2	0.3	0.6	0.4	7.6	33.2	47.5	152.00	0.70
Trinidad & Tobago	100.0	26	2.0	2.1	1.6	0.8	0.4	7.4	75.0	11.00	4.60
Turks & Caicos Islands											
United States of America	89.3	85,019	30.5	1745.1	6.3	1.0			13.4	44.00	19.90
Uruguay	100.0	316	9.5	9.1	2.7	1.1			95.3	214.00	8.70
US Virgin Islands	100.0	25	26.6	0.9	9.3	1.4	0.5	1.1		65.00	18.60
Venezuela	66.1	3,400	14.1	75.1	3.1	2.8	4.7	392.0	3.5	99.00	8.20
Source	[9]	[10]		[9]		[9]	[9]	[9]	[9]	[9]	[9]

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 4. EXTENT OF IT INSERTION IN SOCIETY INDICATORS

COUNTRIES	Tariff for Business Connection in US$	Tariff for Business Monthly Subscription in US$	Annual Residential Subscription as % GDP/Capita	Investment in Telecomm in millions US$	Investment in Telecomm Per Capita in US$	Investment in Telecomm as % of Revenue	Total Staff in Telecomm Services x 1,000	Main Lines Per Telecomm Employee	Information & Telecomm (ICT) Expenditures as % GDP	Total Telecomm Revenue in millions US$	Total Telecomm Revenue Per Employee in US$
Anguilla											
Antigua & Barbuda	119.00	22.20	1.6								
Argentina	150.00	36.40	1.9	1,456.7	39	22.0	21.2	347	3.41	6,611.3	311,854
Aruba	56.00	10.10	0.7				0.4	83			
Bahamas, The				16.2	53	10.3	2.2	51		156.7	71,227
Barbados	49.00	42.40	2.0	25.0	93	14.2	1.0	113		176.0	176,000
Belize	45.00	10.00	1.8	12.0	50	30.0	0.4	79		40.0	100,000
Bermuda	60.00	20.00	0.6	25.0	391	30.7	0.5	107		81.5	163,000
Bolivia	179.00	9.90	6.8	308.0	37	86.4	4.4	107		356.6	81,045
Brazil	43.00	11.60	1.7	6,930.4	41	34.4	84.8	295	5.82	20,168.0	237,830
British Virgin Islands											
Canada	58.00	37.70	0.8	4,033.9	130	23.8	90.0	213	8.52	16,919.4	187,993
Cayman Islands											
Chile	159.00	16.30	4.2	926.5	61	39.1	9.4	331	5.74	2,367.4	251,851
Colombia	305.00	5.00	1.4	1,125.5	27	30.1	35.4	188	8.85	3,735.6	105,525
Costa Rica	64.00	6.20	2.1	133.3	33	49.2	4.5	178		271.1	60,244
Cuba	100.00	9.30	5.7	74.4	7	14.2	16.5	26		524.6	31,794
Dominica	20.00	7.50	1.0				0.2	94			
Dominican Republic	120.00	19.60	4.8				3.8	201			
Ecuador	643.00	7.30	3.6	100.9	8	23.9	6.8	166		422.7	62,162
El Salvador	331.00	12.10	3.9	72.5	12	34.8	4.3	109		208.4	48,465
French Guyana	43.00	9.20					0.3	164		40.6	135,333
Grenada	85.00	40.70	4.9				0.3	92			
Guadeloupe				21.1	46	16.4	0.8	251		128.8	161,000

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 4. EXTENT OF IT INSERTION IN SOCIETY INDICATORS

COUNTRIES	Tariff for Business Connection in US$	Tariff for Business Monthly Subscription in US$	Annual Residential Subscription as % GDP/Capita	Investment in Telecomm in millions US$	Investment in Telecomm Per Capita in US$	Investment in Telecomm as % of Revenue	Total Staff in Telecomm Services x 1,000	Main Lines Per Telecomm Employee	Information & Telecomm (ICT) Expenditures as % GDP	Total Telecomm Revenue in millions US$	Total Telecomm Revenue Per Employee in US$
Guatemala	258.00	2.10	0.6				2.9	209		251.6	86,759
Guyana	1.00	0.60	0.3	53.6	62	67.3	0.7	91		79.7	113,857
Haiti	48.00	11.50	18.5	4.1	0.5	4.7	2.8	21		86.6	30,929
Honduras				53.6	8	29.1	4.5	62		184.3	40,956
Jamaica	23.00	5.80	1.5	133.9	52	31.3	4.1	116		427.7	104,317
Martinique	47.00	12.40		25.0	63	21.1	0.8	215		118.6	148,250
Mexico	383.00	19.30	3.9	1,601.5	16	17.8	55.4	197	4.20	9,005.5	162,554
Montserrat											
Netherlands Antilles							0.8	95			
Nicaragua	138.00	6.40	16.8	40.7	8	56.8	2.8	50		71.6	25,571
Panama	20.00	20.00	4.0	43.7	15	17.6	3.9	119		248.6	63,744
Paraguay	732.00	4.20	2.0	71.2	13	31.5	6.1	49		225.7	37,000
Peru	151.00	16.20	7.3	738.9	29	51.1	6.5	260		1,445.8	222,431
Puerto Rico	120.00	28.90	3.1	354.7	92	29.1	7.9	160		1,217.3	154,089
Saint Kitts & Nevis	27.00	3.70	0.6	3.1	79	11.5	0.2	86		27.0	135,000
Saint Lucia		10.10	2.9				0.4	101			
St. Vincent & Grenadines	37.00	14.80	3.0				0.2	105		23.1	115,500
Suriname	152.00	0.70	0.6	11.2	27	28.6	1.1	64		39.2	35,636
Trinidad & Tobago	22.00	27.80	1.2	34.4	27	16.2	2.8	94		212.6	75,929
Turks & Caicos Islands											
United States of America	70.00	41.30	0.8	24,218.1	87	8.5	1,021.8	176	8.87	284,515.0	278,445
Uruguay	331.00	20.00	1.7	97.4	29	14.0	5.8	155		694.7	119,776
US Virgin Islands	105.00	49.90		11.3	120	16.9	0.4	162		66.8	167,000
Venezuela	321.00	22.10	2.1	745.6	31	33.1	13.2	196	3.44	2,249.5	170,417
Source	[9]	[9]		[9]				[9]	[5]	[9]	[9]

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 5. INFORMATION DISTRIBUTION INDICATORS

COUNTRIES	Number Internet Hosts	Internet Hosts x 1,000 People	Number Internet Service Providers (ISP)	Number Personal Computers x 1,000	Number Personal Computer x 100 People	Number of Internet Users x 1,000	Population Connected to the Internet %	Number of Hospitals with Computerized Systems (all applica-tions)	% of Hospitals with Computerized Systems (all applica-tions)
Anguilla									
Antigua & Barbuda	225	3.36	2			3	4.48		
Argentina	142,470	3.85	170	1600	4.32	900	2.43	812	29.2
Aruba	353	3.60							
Bahamas, The	4	0.01		30	9.77	12	3.91	4	80.0
Barbados	68	0.25		20	7.41	5	1.85	1	12.5
Belize	276	1.15	1	30	12.45	12	4.98	1	10.0
Bermuda	2,825	44.14				25	39.06	1	50.0
Bolivia	948	0.11	9	60	0.72	35	0.42	58	15.0
Brazil	446,444	2.62	280	5000	2.94	3,500	2.06	2313	37.7
BritishVirgin Islands									
Canada	1,669,664	53.61	800	10000	32.11	11,000	35.32		
Cayman Islands									
Chile	40,190	2.64	26	714	4.69	625	4.11	144	37.4
Colombia	40,565	0.96	15	1024	2.42	600	1.42	417	39.6
Costa Rica	7,471	1.86	2	150	3.73	150	3.73	19	57.5
Cuba	169	0.02	3			25	0.22	37	15.2
Dominica	181	2.55		6	8.45	2	2.82		
Dominican Republic	6,754	0.80				25	0.29	30	14.0
Ecuador	1,922	0.15	9	225	1.78	20	0.16	59	19.7
El Salvador	975	0.16	7	100	1.59	40	0.64	23	29.8
French Guyana	125	0.72	4	20	11.49	2	1.15		
Grenada	3	0.03		10	10.75	2	2.15		
Guadeloupe	549	1.20		80	17.54	2	0.44	6	60.0

INFORMATION TECHNOLOGY DEVELOPMENT INDICATORS

TABLE 5. INFORMATION DISTRIBUTION INDICATORS

COUNTRIES	Number Internet Hosts	Internet Hosts x 1,000 People	Number Internet Service Providers (ISP)	Number Personal Computers x 1,000	Number Personal Computer x 100 People	Number of Internet Users x 1,000	Population Connected to the Internet %	Number of Hospitals with Computerized Systems (all applications)	% of Hospitals with Computerized Computerized Systems (all applications)
Guatemala	1,772	0.16	10	90	0.79	65	0.57	36	24.8
Guyana	16	0.02	5	20	2.32	3	0.35		
Haiti	1					2	0.02	3	2.9
Honduras	119	0.02	17	50	0.77	20	0.31	23	25.8
Jamaica	367	0.14	20	100	3.87	50	1.94		
Martinique	329	0.83	4	40	10.13	2	0.51	3	50.0
Mexico	404,873	4.09	148	4500	4.55	2,500	2.53	693	13.3
Montserrat									
Netherlands Antilles	97	0.45						6	54.5
Nicaragua	1,028	0.20	7	35	0.69	20	0.39	12	15.3
Panama	1,235	0.43	30	75	2.63	45	1.58	13	23.6
Paraguay	1,660	0.30	22	50	0.91	20	0.36	57	24.1
Peru	9,230	0.36	54	450	1.75	400	1.56	262	59.1
Puerto Rico	1,310	0.34				100	2.58	64	71.1
Saint Kitts & Nevis	8	0.21		5	12.82	2	5.13		
Saint Lucia	13	0.09	1	20	13.16	2	1.32	2	33.3
St. Vincent & Grenadines			1	10	8.85	2	1.77		
Suriname			2			7	1.68	4	30.7
Trinidad & Tobago	4,852	3.75		60	4.63	20	1.54	1	1.5
Turks & Caicos Islands								1	100.0
United States of America	52,207,402	187.56	4,300	124000	44.55	110,000	39.52		
Uruguay	25,385	7.61	12	300	8.99	300	8.99	66	59.4
US Virgin Islands	596	6.34	5	30	31.91	12	12.77	5	21.7
Venezuela	14,281	0.59	32	1000	4.14	400	1.65	54	15.5
Source	[11]		[11]	[9]		[10]		[12]	[12]

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